

# International

## Conference On Materials & Environmental Science

June 09 -12, 2022, SAÏDIA, MOROCCO

“ Health, Environment, Materials  
Research & Innovation ”

# PROCEEDINGS

## ICMES 2022

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# Content

|                                |            |
|--------------------------------|------------|
| <b>Content.....</b>            | <b>1</b>   |
| <b>Organization.....</b>       | <b>2</b>   |
| <b>Introduction.....</b>       | <b>6</b>   |
| <b>Invited Speakers.....</b>   | <b>24</b>  |
| <b>Oral Presentations.....</b> | <b>54</b>  |
| <b>Posters.....</b>            | <b>247</b> |

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## Welcome Message from General Chairs

Dear Colleagues and Friends,

In lieu of the organizing committee, it is with great pleasure that I cordially invite you to the Fifth International Conference on Materials and Environmental Science **ICMES2022** Under the Theme: « *Health, Environment and Materials Research and Innovation* ». For more than 6 years, **ICMES** has served as an international stage for dissemination of current and emerging materials, environmental science and Health. This year **ICMES2022** will be held as an onsite event from June 9 to June 12, 2022 in Saïdia, Blue Pearle of Mediterranean Sea, Morocco.

**ICMES 2022** keeps its scientific edges from traditional subjects like materials, nanoscience, energy, organic, inorganic and nanomaterials, natural products to their biotechnological application, quality, water, environment, health and safety at work, electrical engineering and physics simulations, materials and devices... A dozen of renowned plenary speakers across the world will provide outstanding insights on materials and devices research at this event, along with a couple of comprehensive tutorial lectures and more than a hundred of brilliant invited talks. In addition, we will host several workshops and bilateral symposia organized by leading research groups. If you are interested in current and future research and development of materials and devices Health, please do not miss this event.

The purpose of **ICMES2022** is to provide a forum to share the most important and latest developments in the field of materials, energy development, environmental science and Health, to exchange research ideas and future trends, and to explore potential collaboration opportunities in all regions of the world.

With Great Pleasure to see You in this Beautiful City Saïdia the Blue Pearle of Mediterranean Sea.

**ICMES'22 VENUE: Hotel Radisson Blu Resort Saidia Beach, Saidia, Morocco**

I look forward to your contribution and participation.

|  |   |
|--|---|
| <b>Pr. BELKHEIR HAMMOUTI</b><br>MOHAMMED FIRST UNIVERSITY, OUJDA – MOROCCO | <b>Pr. FAOUAZ JEFFALI</b><br>MOHAMMED FIRST UNIVERSITY, OUJDA – MOROCCO   |
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<http://www.mocedes.org/icmes2022/>

## Introduction

On behalf of the Organizing Committee of the **5<sup>th</sup> International Conference on Materials and Environmental Science: ICMES2022**, we are pleased to welcome you **in Saïdia, Morocco, on June 9-12, 2022**.

The **ICMES2022** is organized by **Mohammed First University, Faculty of Sciences Oujda, Morocco, Faculty of Medicine and Pharmacy Oujda, Morocco, KAUST, King Abdullah University of Science and Technology, SAUDI ARABIA** and the **Association: Moroccan Center for Sciences Development -MoCeDeS**. This scientific meeting is the continuation of other organized sessions as follow:

**ICMES2016:** The 1<sup>st</sup> International Conference on Materials and Environmental Science **was held in** Campus University of Transfer of Technologies and Expertise – Knowledge Campus, Technopole Oujda, Morocco from 1-3 December 2016. This first session was the start point of gathering leading academic scientists, researchers and industrials to exchange and share their experiences and research results on all topics of Material and Environmental Science. The **ICMES2016** provided also a premier interdisciplinary platform for selected researchers and industrials to discuss the most recent innovations as well as possible collaboration. (<http://www.mocedes.org/icmes2016/index.htm> ).

**ICMES2018:** The 2<sup>nd</sup> International Conference on Materials and Environmental Science, which was held on 26-28 April 2018 in Melia Saïdia Beach All Inclusive Resort, Saïdia, Morocco. The ICMES2018 was an interdisciplinary platform for researchers and industrials for promoting a multi-sectoral and collaborative approach in the field of development of new and innovative approaches in materials and their applications in energy and renewable energy, environmental science and sustainable development, biotechnology and electrical engineering. (<http://www.mocedes.org/icmes2018/index.html> ).

**ICMES2019:** The 3<sup>rd</sup> International Conference on Materials and Environmental Science has been hold in 18-20 December 2019, Sofitel Agadir Royal Bay, Agadir, Morocco. It was organized by IBN Zohr University, National School of Applied Sciences, Agadir Morocco and the Association: Moroccan Center for Sciences Development -MoCeDeS. The **ICMES2019** was an international platform for participants to consulate and to collaborate in many innovative applications touching the energy, environmental science and sustainable development. (<http://www.ensa-agadir.ac.ma/icmes/> ).

**ICMES2020:** The 4<sup>th</sup> International Conference on Materials and Environmental Science has been hold virtually during the COVID pandemic period in November 18-28, 2020. The primary objective is to bring together online leading academic scientists, researchers and industrials from more than 20 countries to exchange and share their experiences and research results on all topics of Material and Environmental Science. The second objective is to provide a premier interdisciplinary platform for selected researchers and industrials

with complementary, strong and diverse expertise to discuss the most recent innovations as well as initiate possible complementary cooperation and collaboration for international programs in these fields. The other objective of the conference is to constitute a formation school for the education of young scientists in this important field by creation of direct contacts between international experts in this environmental matter and master or PhD students post docs in order to help them for their future professional careers and to the profit of our society. To initiate interactions between the 24 speakers and participants, keynotes, 120 oral presentations and 30 posters (<http://www.mocedes.org/icmes2020/index.html> ).

**The main objective for the ICMES@2022 is:** to bring together leading academic scientists, researchers and industrials from Africa, North and South America, Europe, Asia, Australia and Middle East to exchange and share their experiences and results related to Material and Environmental Science. ICMES is providing an interdisciplinary platform for researchers and industrials all over the world with complementary, strong and diverse expertise. The participants will have the opportunity to discuss the most recent innovations as well as to initiate possible complementary cooperation and collaboration through international programs by creating a direct contact between international experts. The goal here is also to promote exchange of Master, PhD students and Post docs between the different academic partners.

**The main themes selected for the ICMES@2022 are:**

- ❖ Health: Biochemistry, Nutrition and Pharmacology.
- ❖ Water, Soil, Air, Agriculture and Environmental Analysis.
- ❖ Green Energy, Renewable, Storage and Sustainable Development.
- ❖ Artificial Intelligence, Machine Learning, Electrical Engineering and Simulation.
- ❖ Innovative Devices, Chemistry and Material Physics.
- ❖ Nanoscience, Organic and Inorganic Advanced Materials.
- ❖ Natural Products and Their Biotechnological Applications.

**The scientific program includes:**



The Organizing Committee would like to thank all participants, partners and sponsors for their financial supports and participations.

Further information is available on our conference web site then visit:

<http://www.mocedes.org/icmes2022/index.html>

*Organizing Committee of ICMES2022*



**THE FIFTH INTERNATIONAL CONFERENCE ON MATERIALS & ENVIRONMENTAL SCIENCE,  
 ICMES-2022**

**UNDER THE THEME: “HEALTH, ENVIRONMENT AND MATERIALS RESEARCH AND INNOVATION”  
 JUNE 09-12, 2022, RADISSON BLU RESORT SAÏDIA BEACH**

**SAÏDIA, MOROCCO**

**ORAL COMMUNICATIONS LIST**

| <b>Authors</b>   | <b>Title</b>  | <b>ID</b>  | <b>Page</b> |
|--|---|------------|-------------|
| <b>HEALTH: BIOCHEMISTRY, NUTRITION AND PHARMACOLOGY</b>  |   |            |             |
| <b>Mouad Harandou</b> , Amjad Idrissi, Oumayma Hamdani, Abir Yahyaoui, Youssra Sbibi, Wissam Azizi, Hajar Zerouri, Doha Berraouan, El-houcine Sebbar, and Mohammed Choukri                                 | Biomedical waste management in the Central Laboratory of the University Hospital Mohammed VI Oujda                              | <b>354</b> |             |
| <b>Yousra Sbibi</b> , Amjad Idrissi, Abir Yahyaoui, Oumayma Hamdani, Wissam Azizi, Hajar Zrouri, Oussama Rahhab, Mouad Harandou, El-houcine Sebbar, and Mohammed Choukri                                   | Interest of water quality in the laboratory: Experience of the Central Laboratory of CHU Mohammed VI of Oujda                   | <b>355</b> |             |
| <b>Abir Yahyaoui</b> , Amjad Idrissi, Oussama rahhab, Youssra Sbibi, Hajar Zrouri, Omayama Hamdani, Wissam Azizi, Mouad Harandou, El-houcine Sebbar, and Mohammed Choukri                                  | Contribution of artificial intelligence in the processing of Big Data in a medical biology laboratory                           | <b>356</b> |             |
| <b>Oussama Rahhab</b> , Abir Yahyaoui, Mohammed Ghalem, Yousra Sbibi, Oumayma Hamdani, Mouad Harandou, Amjad Idrissi, Hajar Zrouri, Wissam Azizi, Doha Berraouane, El Houcine Sebbar, and Mohammed Choukri | Risk management in a medical biology laboratory: pilot experience of the central laboratory of the CHU Mohammed VI Oujda        | <b>357</b> |             |
| <b>C. El Garrab</b> , Fakri-Bouchet, L. G. Zaz, and M. Zekriti   | Optofluidic sensors for breast cancer diagnosis- A Review   | <b>49</b>  |             |
| <b>Mohammed Amine Mehdi</b> , Toufik Cherradi, Azzeddine Bouyahyaoui, Said El Karkouri and Ahmed Qachar  | Predictive approach for post-covid 19 evolution study of the pavement surface deterioration based on visual inspection results. | <b>74</b>  |             |
| <b>S. Arji</b> , A.O.T. Ahami, and R. Ziri   | Burnout in private sector and its impact on the employees well –being   | <b>109</b> |             |
| <b>S. Arji</b> , M. Elhaddadi, A.O.T. Ahami, and R. Ziri   | Stress at work among employees of a Moroccan company  | <b>110</b> |             |
| <b>S. Arji</b> , M. Elhaddadi, A.O.T. Ahami, and R. Ziri   | Does job stress affect neurocognitive functions? case of employees of a Moroccan private industrial company sector              | <b>111</b> |             |

|  |   |            |  |
|--|---|------------|--|
| <b>S. Arji</b> , M. Elhaddadi, A.O.T. Ahami, and R. Ziri   | Burnout in the Moroccan private sector  | <b>23</b>  |  |
| <b>WATER, SOIL, AIR, AGRICULTURE AND ENVIRONMENTAL ANALYSIS</b>  |   |            |  |
| <b>K. Tassaoui</b> , M. Damej, A. Molhi, M. Errili, S. Ksama, O. Ninich, A. Et-Tahir, and M. Benmessaoud                 | Inhibition effect of 4-amino-3-methyl-4-triazole-5-thione (MTSNH) against corrosion of Cu-30Ni alloy in 3%NaCl solution                                   | <b>09</b>  |  |
| <b>Cherifi Hicham</b> , and Chaouni Abdel-Ali  | On the use of weathered schist in road pavements: an experimental study on the schists of the province of Taza  | <b>01</b>  |  |
| <b>Zineb El Kerdoudi</b> , Hafssa Helli, Jaouad Bensalah, Abdelali El Mekkaoui, and Nouredine El Mejdoub                 | Adsorption of the dye (methylene blue) by the clay of Khenichet- Sidi Kacem- Morocco: Mathematical and thermodynamic modeling of experimental data        | <b>14</b>  |  |
| <b>O. Ninich</b> , K. Tassaoui, A. Et-Tahir, B. Satrani, O. Chauiyakh, S. Ksama, M. Benmessouad                          | Inhibiting effect of cedar tar on corrosion on e24 in 1M HCl  | <b>08</b>  |  |
| <b>H. Bouziane</b> , M. Arabi, Z. Irzi, and M. Sbaa  | Bathymetry Study and Sludge Characterization of Anaerobic Ponds in Al Hoceima Waste Stabilization Pond (Mediterranean Moroccan Coast)                     | <b>33</b>  |  |
| <b>M. Kadiri</b> , Y. Zarhloule, and A.E. Barkaoui   | Identification of favorable area for artificial recharge in the Tamellalt aquifer   | <b>34</b>  |  |
| <b>Abdelhay El Amri</b> , Azeddine Lebkiri, Fatima Zahra Bouhassane, Zineb Wardighi, El Housseine Rifi and Ahmed Lebkiri | Theoretical and kinetic study of the adsorption of the industrial Methyl Orange MO dye on Typha latifolia: Treatment and recovery                         | <b>40</b>  |  |
| <b>Oumaima Moumouche</b> , Hammadi El Harmouchi, Safae Alami, Redouane Khaoulaf, Khalid Brouzi, Mohamed Harcharras       | Characterization and application of corrosion of $A_2MP_2O_7$ and $AMPO_4$  | <b>56</b>  |  |
| <b>Naïma El Assaoui</b> , Abdelaziz Sadok, Ouiam Bouchanine, and Nora Maataoui   | Climate change and siltation of the Mohamed V dam (Morocco): assessment using GIS and remote sensing tools  | <b>105</b> |  |
| <b>Abdelouadoud Omari</b> , Linda Zraibi, Hameed Saleh Ali Yahya, and Nour-Elhouda Basraoui                              | Implementation of an Environmental Management System in a Company that specializes in wood and aluminum carpentry in Eastern Morocco in the city of Oujda | <b>260</b> |  |
| <b>Rachid Ouchn</b> , Y. Chaouqi, Ah. Avci, E. Curcio, O. Cherkaoui, and Miloudi Hlaïbi                                  | Efficient hydrophobic membranes based on ionic liquids for water desalination by direct contact membrane distillation processes                           | <b>47</b>  |  |

|   |  |            |  |
|---|--|------------|--|
| <b>I. Kassem</b> , E-H. Ablouh, F-Z. El Bouchtaoui, S. Boukind, M. Mhada, S. Mouhib, H. Sehaqui, and M. El Achaby                       | Slow- Release Phosphate Fertilizer Coated by Phosphorylated Cellulose Gel - Nanoclay Reduces Phosphorus Leaching and Promotes Beans Growth               | <b>50</b>  |  |
| <b>B. Ould Abdelwedoud</b> , M. Damej, K. Tassaoui, A. Berisha, H. Tachallait, K. Bougrin, N. Ouadghiri, A. Kabouri, and M. Benmessaoud | Theoretical and experimental study of saccharin derivative as a corrosion inhibitor for carbon steel in 1M HCl   | <b>59</b>  |  |
| <b>Oumaima Bourzik</b> , Nacer Akkouri, Khadija Baba, and Abderrahman Nounah  | Effect of waste marble powder on the properties of concrete  | <b>69</b>  |  |
| <b>O. Kharbouch</b> , Z. Benzekri, K. Dahmani, M. Ouakki, M. Galai, S. Boukhris, M. Ebn Touhami, H. Elkafsaoui                          | Electrochemical evaluation of novel benzoxazepinone derivatives as corrosion inhibitors for mild steel in 1 M HCL  | <b>76</b>  |  |
| <b>N. Ferraa</b> , M. Ouakki, M. Cherkaoui, M. Bennani Ziatni   | Characterization of OCPa, application on the corrosion of carbon steel in 3% NaCl medium.  | <b>77</b>  |  |
| <b>El Harmouchi Hammadi</b> , Moumouche Oumaima, Alami Safae, Ait Hmid Lahsen, Dkhireche Nadia, Ebn Touhami Mohamed, Harcharras Mohamed | The factor group analysis of the (M'', M')MP <sub>2</sub> O <sub>7</sub> diphosphate and their corrosion protection efficiency.                          | <b>78</b>  |  |
| <b>N. Al Wachami</b> , M. Chahboune, and M. Louerdi   | Chronic obstructive pulmonary disease (COPD) and air pollution: the case of Morocco  | <b>130</b> |  |
| <b>Ettayeb Mohammad</b> , Chaouni Abdel-Ali, and Cherif Hicham  | Reuse of the Marls-Limestone of Taza in Road Construction: An Experimental Study on Taza Wind Farm   | <b>83</b>  |  |
| <b>S. Elmansouri</b> , M. Galai, R. Lachhab, M. Rbaa, B. Lakhrissi, M. Ebn Touhami  | Experimental study on Quinazoline derivatives as corrosion inhibitors for mild steel in hydrochloric acid medium   | <b>90</b>  |  |
| <b>Belhadj Kamal</b> , Omar Azzouz, and Makkaoui Mohamed  | Technical-Economic Study of Slope Stabilization Solutions in the Oriental Rif Region – Morocco   | <b>91</b>  |  |
| <b>Abdelali El Mekkaoui</b> , R. Moussadek, A. Zouahri, R. Mrabet, A. Douaik, and S. Chakiri  | Effect of long-term conservation tillage on the chemical and physical properties of the soil in Moroccan Mediterranean areas (Case study of Zaer region) | <b>92</b>  |  |

|  |   |            |  |
|--|---|------------|--|
| <b>A. Hmada</b> , N. Dkhireche, R. Sayed, Z. Benzekri, M. Galai, R.A. Belkhemima, A. Habsaoui, S. Boukhris, M. Ebn Touhami                               | Corrosion inhibition of mild steel in 1M HCl solution by Quinazoline derivatives  | <b>112</b> |  |
| <b>S. Bouhout</b> , K. Haboubi, and M. S. Elyoubi  | Comparative assessment of groundwater quality challenges confronting Mediterranean coastal aquifers: A review   | <b>137</b> |  |
| <b>Abdesselam Eddaoukhi</b> , Mohamed Berradi, Yassine Bouzhar, Ahmed El Yacoubi, Mohamed Grou, Hakima Nassali, Amar Habsaoui, and Abderrahim El Bachiri | Valorization of treated vegetable waters for the cultivation of a vegetable plant (eggplant) in two types of soil   | <b>152</b> |  |
| <b>Soufiane Hmamouchi</b> , Asmae Massit, Mohamed Berradi, Mounir El Hezzat, Ahmed El Yacoubi, Brahim Chafik El Idrissi                                  | Photocatalytic decomposition of Methylene blue dye using sand-graphite composite under visible light irradiation  | <b>161</b> |  |
| <b>F. El Farhani</b> , M. Ouakki, Z. Benzekri, M. Ebntouhami   | Corrosion hindrance effectiveness of pyrazoles being environmentally-safe organic inhibitors: Thermodynamical, electrochemical and surface studies                | <b>163</b> |  |
| <b>R. Bouyakhsass</b> , S. Bouaouda, A. Taleb, and S. Souabi   | Leachate and biogas flow rate assessment at the level of Oum Azza landfill in Rabat city, Morocco   | <b>164</b> |  |
| <b>S. Karim</b> , A. Aouniti, C. Belbachir, I. Rahhou  | Evaluation of heavy metal concentrations in commercial marine fishes caught in the Mediterranean coast of Morocco and their associated health risks to consumers  | <b>184</b> |  |
| <b>H. Kajeiou</b> , M. Sbaa, and A. Darmous  | Physico-chemical, chemical and biological characterization of treated wastewater from the city of Oujda (eastern Morocco) and possibility of reuse in irrigation. | <b>218</b> |  |
| <b>Youssef Haddadi</b> , Abd -El-Kader Chahlaoui, Aziz Taouraout, and Abdelhak Saidi   | Use of house sparrows in the bio-monitoring of atmospheric pollution by metallic trace elements in the city of Meknes   | <b>222</b> |  |
| <b>M. El Rharib</b> , Z. Zaroual, S. Elghachtouli, and M. Azzi   | Adsorption of methylene violet dye from aqueous solution onto Moroccan zeolite  | <b>230</b> |  |

|  |  |            |  |
|--|--|------------|--|
| <b>Douâae Ou-Yahia</b> , Kawtarfikri-Benbrahim, and Ibsouda Koraichi Saad  | Experimental and theoretical investigations of marine yeasts adhesion and its impact on the physico-chemical properties of sea-immersed AISI 304 and 316 stainless steels. | <b>232</b> |  |
| <b>M. Bahouq</b> , H. Bahouq, and A. Douira  | Effect of salinity on Strawberry plant growth and their tolerance to water deficiency after inoculation with a composite arbuscular mycorrhizal inoculum                   | <b>253</b> |  |
| <b>A. Amahmouj</b> , E.M. Chaabelasri, A. Abakoy, N. Salhi   | A bedload transport in shallow water model applied for sediment transport in open channel flows  | <b>261</b> |  |
| <b>Ahmed Darmous</b> , Maryam Slamini, Mourad Arabi, Hamza Kajeiou, Driss Bouknana, Ikram Azzakhnini, and Mohamed Sbaa | Evaluation of the impact of land use and irrigation systems on the soil nitrogen transfer: case of five pilot farms in the Triffa plain (Berkane, Eastern Morocco).        | <b>280</b> |  |
| <b>M. Amansour</b> , and S. Zyade  | Study of the influence of microalgae in wastewater treatment   | <b>285</b> |  |
| <b>Yjyou Mohammed</b> , Dekhissi Hassane, Derkaoui, Jamal Eddine, Didi Abdessamad, and Aknouch Adil                    | Evaluation of water equivalent ratio for 3 dosimetric materials at carbon ion energies ranging 100-300 MeV/nucleon using Fluka Monte Carlo code                            | <b>288</b> |  |
| <b>I. Essebbahi</b> , C. Ouazzani, A. Moustaghfir, A. Er-Ramly, Y. El Baroudi, A. Dami, and L. Balouch                 | Analysis of the fluoride levels of well water consumed by the moroccan population in different rural areas   | <b>301</b> |  |
| <b>Y. El Baroudi</b> , C. Ouazzani, A. Er-Ramly, A. Moustaghfir, I. Essebbahi, A. Dami, and L. Balouch                 | Nitrite levels in well water from different rural areas in Morocco   | <b>302</b> |  |
| <b>S. Aftimi</b> , Y. Kerroum, A. Guenbour, A. Bellaouchou, A. Zarrouk, H. Idrissi, R. Boulif, and N. Semlal           | Corrosion-abrasion of stainless steel in phosphoric acid using acoustic emission technique   | <b>329</b> |  |
| <b>Abdelhak Saidi</b> , Abdelkader Chahlaoui, Moulay Lafdil Belghiti, Iman Taha, and Driss Bengoumi                    | Use of quality and organic pollution indices in the assessment of the physical-chemical quality of surface waters in oued khoumane (city of moulay idriss zerhoun-morocco) | <b>332</b> |  |
| <b>A. El Abdouni</b> , K. Haboubi, M. S. El Youbi  | Study of the adsorption of phenolic compounds of olive oil mill wastewater by clay extracted from Mohamed  | <b>339</b> |  |

|   |  |            |  |
|---|--|------------|--|
|   | Ben Abdelkarim El Khattabi dam in Al-Hoceima<br>(Morocco)  |            |  |
| <b>I. Merimi</b> , B. Hammouti, H. Lgaz, and M. Messali   | Correlation between study Experimental and theoretical of two triazole molecules as a new effective corrosion inhibitor for mild steel in acid medium                | <b>343</b> |  |
| <b>M. Loutfi</b> , R. Mariouch, M. Belfaquir, M. S. ElYoubi   | Removal of cationic dye from aqueous solutions by natural clay from Morocco  | <b>347</b> |  |
| <b>Touria Hachi</b> , Maryama Hachi , Youssef El Hammioui, Hamza Essabiri, Driss Belghyti, Mhamed Khaffou, Rabiaa Mounir, Rachid Benkaddour, and El Hassan Abba | Water quality and environmental performance of a municipal wastewater treatment plant (M’rirt City. Morocco)   | <b>393</b> |  |
| <b>Youssef El Hammioui</b> , Hammou Anarghou, Moulay Lafdil Belghiti, Touria Hachi, Mhamed Khaffou, Rachid Ben Kaddour, and El Hassan Abba                      | Physico-chemical and bacteriological quality of well water in khénifra province (morocco)  | <b>394</b> |  |
| <b>Touria Hachi</b> , Maryeama Hachi, Rachid Ben Kaddour, Hamza Essabiri, Adnane El Yaacoubi, Mhamed Khaffou, and El Hassan Abba                                | Assessment and relationship between organic pollution parameters and aquatic bio-indicators (Wadi tighza. morocco)   | <b>395</b> |  |
| <b>Moukaf safae</b> , Bachir Elkihel, and Ahmed Rassam  | Optimization of WWTP   | <b>368</b> |  |
| <b>C. Belmejdoub</b> , K. Benbouya, I. Forsal, S. Lahmady, M. Rabaa, and R. Tourir  | Corrosion inhibition of carbon steel in hydrochloric acidic solution 1M by Irbersartan   | <b>199</b> |  |
| <b>F. Hamouche</b> , and M. Ebn Touhami   | Corrosion Behavior of Different Types of Brass at Different Temperatures in Neutral Medium   | <b>320</b> |  |
| <b>S. El kaouahi</b> , M. Raji, N. Errahmany, M. Rbaa, R. Tourir, H. El Kafssaoui, B. Lakhrissi, H. Larhzil, A. Shaim   | Theoretical and experimental study of the corrosion inhibition of mild steel in 1.0 M HCl by new quinoxaline derivatives   | <b>372</b> |  |
| <b>H. Hailou</b> , M. Ait Himi, S. Taghzouti, M. Dahbi, C. Hajjaj, R. Tourir, H. El Kafssaoui, M. Ebn Touhami   | Investigation of brass corrosion inhibition in 200 ppm NaCl solution by new diacetate derivative: experimental study, spectroscopy analysis and theoretical approach | <b>366</b> |  |
| <b>Badr Baach</b> , Moussa Ouakki, Hanane Barebita, Soumya Ferraa , Mohammed Cherkaoui, and Taoufik Guedira   | Corrosion inhibition by new compounds based on bismuth Bi <sub>2</sub> O <sub>3</sub>  | <b>403</b> |  |
| <b>GREEN ENERGY, RENEWABLE, STORAGE AND SUSTAINABLE DEVELOPMENT</b>   |  |            |  |
| <b>Dalal Nasreddin</b> , Soumia Aboutaleb, Aymane Cheracher, Yasmine Abdellaoui, Saad Amrani Marrakchi, Inass Sabbahi, Youssef                                  | Regression and Machine Learning Modeling Comparative Analysis of Morocco’s Fossil Fuel Energy Forecast   | <b>15</b>  |  |

|  |   |            |  |
|--|---|------------|--|
| Benmoussa, Reda El Makroum, Aymane El Alami, Asmae Khaldoun, and Houssame Limami                                   |   |            |  |
| <b>A. Idrissi</b> , Z. Elfakir, R. Atir, A. Habsaoui, S. Bouzakraoui   | Designing new thiophene-based HTMs with favorable optoelectronic properties for perovskite solar cells  | <b>35</b>  |  |
| <b>M. Es Sadki</b> , A. Azouzoute, M. Benhaddou, and M. Ghammouri  | Energy audit and assessment of indoor environmental condition inside Oujda-Angads International Airport terminal building, Morocco  | <b>36</b>  |  |
| <b>Z. Elfakir</b> , A. Idrissi, R. Atir, A. Habsaoui, S. Bouzakraoui   | New Carbazole-Based Hole-Transport Materials in Perovskite Solar Cells  | <b>39</b>  |  |
| <b>Sanae Habchi</b> , Nabila Lahboubi, Brahim Sallek, Hassan El Bari   | Mesophilic anaerobic digestion of chicken slaughterhouse waste: Methane production and kinetic study  | <b>147</b> |  |
| <b>Lamreoua Abdelhak</b> , Benslimane Anas, Bouchnaif Jamal, Hairech Kamal, and El Ouariachi Mostafa               | Current harmonic reduction for grid-connected photovoltaic system (PV) based on a three-phase seven-level inverter.   | <b>68</b>  |  |
| <b>R. Aalloul</b> , A. Elaïssaoui, M. Benlattar, and R. Adhiri   | Electrical and Thermal Modelling of Solar Cells   | <b>210</b> |  |
| <b>N. El Moussaoui</b> , M. Rhiat, A. Lamkaddem, K. Kassmi, R. Malek, O. Deblecker, and N. Bachiri                 | Power Supply System for DC Solar Equipment by Batteries   | <b>250</b> |  |
| <b>Abderrahim El Bouazouli</b> , Lahssen Baidder, Hicham Bahi, Oumar Diagana, Fadil Abdehamid, Said Rhouzlane      | Prospection of geothermal resources using spatial and Geo-spatial technology: a case of clean energy mix implementation in the Moroccan Sahara and the Souss Massa Region | <b>408</b> |  |
| <b>EL HADRI Fatima Zahra</b> , KRIM Deaeddine, RRHIOUA Abdeslem, BAKARI Dikra, and ZERFAOUI Mustapha               | Nanoscale energy deposition frequencies evaluation using GATE simulation tools  | <b>362</b> |  |
| <b>El Asri Ouahid</b> , Hmadi Inass, Ramdani Mohamed, Hameed Saleh Ali Yahya, Chafi Abdelhafid                     | Green Energy from the bioresource of Nador lagoon   | <b>367</b> |  |
| <b>Youssef Kasseh</b> , Abdellatif Touzani, and Salma Elmajaty   | What management method should be deployed in the Energy Management System as a lever for efficient and sustainable management of public lighting in Moroccan cities       | <b>387</b> |  |
| <b>Salma El Majaty</b> , Abdellatif Touzani, and Youssef Kasseh  | Results and perspectives of the application of an energy management system based on iso 50001 in administrative buildings - case of Morocco                               | <b>388</b> |  |
| <b>Abdelilah Khlifi</b> , Yamina Khlifi, and Hali Aïssa  | Realization and real application of two prototypes for photovoltaic panel data acquisition  | <b>392</b> |  |
| <b>Hasna Aziam</b> , Hicham Ben Youcef, Ismael Saadoune, Abdelfattah Mahmoud, Daria Mikhailova, Messaoud Harfouche | Novel NaSICON-type structure Iron/ Vanadium phosphate-based as cathode for Lithium-ion Batteries  | <b>410</b> |  |
| <b>A. Azouzoute</b> , Z. Elmaazouzi, M. Es Sadki, M. Benhaddou, F. Jeffali   | Techno-econo-environmental study of the integration of renewable energy in a desalination plant: case study of Laayoune, Morocco  | <b>32</b>  |  |

**ARTIFICIAL INTELLIGENCE, MACHINE LEARNING, ELECTRICAL ENGINEERING AND SIMULATION**

|  |   |            |  |
|--|---|------------|--|
| <b>Miloud Errili</b> , K. Tassaoui, M. Damej, A. Molhi, Z. Lakbaibi, S. Ksama, S. El Hajjaji, and M. Benmessaoud   | Electrochemical and theoretical (DFT, MC, MD) evaluation of a new compound based the Mercaptobenzimidazole against corrosion of Cu-30Ni in a 3% NaCl solution   | <b>18</b>  |  |
| <b>M. Benhaddou</b> , M. Ess Sadki, M. Ghammouri, L. Bouselham   | New Simulation of low cycle fatigue and description of strain hardening cyclic  | <b>20</b>  |  |
| <b>I. Bezzaoui</b> , D. Bakari, A. Rrhious, D. Soubane, S. Lounis, and M. Bouhassoune  | Ab initio investigation of the electronic structure of atomic defects hosted in a Cu(111) surface   | <b>52</b>  |  |
| <b>Jabri Abdelkarim</b> , Zenasni Mourad, Kissami Rabah, and Jabri Taha  | Impacts of Fossil Fuel and Electricity Energy Consumption in degrading environment quality in Morocco: Evidence from non linear Approach  | <b>55</b>  |  |
| <b>H. Zniker</b> , B. Ouaki, Said Bouzakraoui, M. Ebntouhamia, and H. Mezouara   | Experimental study of Energy absorption of laminated and sandwich composites under repeated dynamic impacts and quasi-static indentation  | <b>72</b>  |  |
| <b>Mouna Azogagh</b> , Rachid Hsissou, Said Abbout, Fouad Benhiba, Mourad Rafik, Samir Briche, Hamid Erramli, Mohamed Ebn Touhami, Abderrahim El Bachiri, Salah Eddine Higazi, Mohamed Rafik | Elaboration identification and corrosion inhibition of epoxy prepolymer for carbon steel in 1M HCl medium: computational approaches   | <b>119</b> |  |
| <b>M. Khattabi</b> , F. Benhiba, B. M. Ebn Touhami, H. Zarrok, R. Tourir, C. M. Allali, H. Oudda, A. Zarrouk   | The prevention of corrosion inhibition of mild steel in sulfuric (0.5 M) and hydrochloric (1.0 M) environments using a pyran compound: Electrochemical performance and computational analyses.                                | <b>120</b> |  |
| <b>Ilias Laroussi</b> , Liu Huan, and Zhao Xiusheng  | How Will the Internet of Energy (IoE) Revolutionize the Electricity Sector? A Techno-Economic Approach.   | <b>101</b> |  |
| <b>M. Abdelouhab</b> , A. Senhaji, A. Attar, R. Aboutni, and J. Bouchnaif  | Improvement of the behavior of the direct torque control of an induction machine when an inter-turn short-circuit fault appears   | <b>146</b> |  |
| <b>Senhaji Abdelhamid</b> , Abdelouhab Mostafa, Attar Abdelilah, and Bouchnaif Jamal   | Backstepping Control of a Permanent Magnet Synchronous Motor  | <b>211</b> |  |
| <b>Z. Charqui</b> , M. Boukendil, L. El Moutaouakil, R. Hidki, and Z. Zrikem   | Numerical analysis of turbulent heat transfer in a double glazed Trombe wall under time-dependent conditions  | <b>213</b> |  |
| <b>Grari Meryem</b> , and Zoheir CifAllah  | Two-dimensional Simulation of Non equilibrium Silicon Nitride Plasma Discharge for Thin Film Solar Cell Deposition  | <b>224</b> |  |
| <b>H. Fakhry</b> , M. Rbaa, F. Benhiba, A. Zarrouk, H. Oudda, B. Lakhrissi, B. Hammouti, and A. Guenbour   | Density Functional Theory, Molecular modeling by MD simulation, Characterization (SEM/EDXS/UV-Visible), Thermodynamic and Electrochemical studies of the inhibitory power of two quinoline analogs for C38 in aggressive area | <b>245</b> |  |
| <b>Moulay Said Khattab</b> , Ilyass El Kadmiri, Youssef Ben-Ali, and Driss Bria  | Propagation of acoustic waves through waveguides and symmetric/asymmetric resonators based on Fano and AIT resonances   | <b>252</b> |  |
| <b>Guetbach Yassmina</b> , Grari Meryem, Said Sara, Es-Salhi Abdenacer, Zoheir Cifallah  | Numerical modeling of a hydrogenated silicon inductively coupled plasma discharge   | <b>206</b> |  |
| <b>Imane Mehdi</b> , El Mostapha Boudi   | An integrated environmental requirement modeling approach for sustainable mechatronic systems using hierarchical CP-net.  | <b>209</b> |  |



|  |   |            |  |
|--|---|------------|--|
| <b>A. El Jaouhari</b> , M. Rochdi, and M. El Kaouini   | Effect of discharge parameters on conductive behavior and characteristics of monopole plasma antenna  | <b>265</b> |  |
| <b>Sara Sabri</b> , Rachid Malek, and Khalil Kassmi  | A theoretical study of InAs/InP and InAs/GaAs QDs systems.  | <b>276</b> |  |
| <b>Lahcen Amri</b> , Smail Zouggar, and Mohamed Kebdani  | Design and optimization of a Rim Driven generator for pump application  | <b>281</b> |  |
| <b>A. Abakouy</b> , A. Amahmouj, I. Al Korachi, N. Salhi   | Depth- Averaged Large Eddy Simulation of shallow turbulent mixing layer   | <b>271</b> |  |
| <b>Zineb Aqachmar</b> , Hamid El Qarnia, and Abdelkader Outzourhit   | High leverage variables through the modeling and numerical simulation of a mono-crystalline silicon solar cell under MATLAB   | <b>374</b> |  |
| <b>Badredine Lamuadni</b> , Rachid El Bouayadi, Elhoussaine Ouabida, and Driss Zejli                       | An Improved System Dedicated to the Prediction of Junction Temperature of Multi-Chip IGBT Semiconductor Module  | <b>371</b> |  |
| <b>Yassir Elghazi</b> , Samir Didi, Dikra Bakari, Karim Bahhous, Abdeslem Rrhiaoua, and Mustapha Zerfaoui  | Verification of monitoring unit calculations for the 3D conformal radiation therapy treatment planning system   | <b>396</b> |  |
| <b>Badr-Eddine Benahmed</b> , Faouaz Jeffali, Abdellah El Barkany, and Amar Bakdid                         | Design and realization of an aeronautical cleaning robot for aircraft maintenance 4.0 based on artificial intelligence  | <b>399</b> |  |
| <b>H. Lrhoul</b> , H. Turki, B. Hammouti   | Internationalization of scholarly journals in Morocco: factors of success   | <b>358</b> |  |
| <b>INNOVATIVE DEVICES, CHEMISTRY AND MATERIAL PHYSICS</b>  |   |            |  |
| <b>Saâd Oukkass</b> , R. Ouchn, R. Louafy, Z. Habibi, I. Mechnou, Y. Chaouqi, L. Lebrun, and M. Hlaïbi     | Use of a new technique to improve the efficiency of oriented processes for the extraction and recovery of the methylene blue dye through a polymer inclusion membrane | <b>46</b>  |  |
| <b>Paul S.B Macheso</b> , and Mohssin Zekriti  | Physical Parameter Monitoring in the Fourth Industrial Revolution Using Optical Fiber Sensors B -A Review   | <b>51</b>  |  |
| <b>Benataya Karim</b> , Mejdoubi El Miloud, and Aaddouz Mohammed   | The effect of some adjuvant and heating temperature on the purification of phosphoric acid through the vapometallurgical process                                      | <b>63</b>  |  |
| <b>D. Belfadil</b> , H. Zain Elabidine, F. Bazi, and S. Zyade  | Potato peels, potato and corn starch-based bioplastics as alternative to conventional petroleum-based plastics  | <b>70</b>  |  |
| <b>N. El Biyari</b> , and M. Zekriti   | 3D-printed microfluidic device for bio-sensing applications   | <b>84</b>  |  |
| <b>Somia Fellak</b> , and Abdelhadi El Hassani   | Applicability of X-ray diffraction and FTIR spectroscopy to evaluate changing in cellulose crystallinity of softwood during natural ageing process                    | <b>107</b> |  |
| <b>Adil Bahloul</b> , Fatima-Zahra Semlali Aouragh Hassani, Zineb Kassab, Mina Oumam, and Mounir El Achaby | Development of starch bio-nanocomposite materials filled with phosphorylated and sulphated cellulose nanocrystals extracted from pepper agricultural residue          | <b>122</b> |  |
| <b>Hanane Boutkhil</b> , Ghizlane Moutaoukil, Badr Aoun, Salihaalehyen, and Mhamed Taïbi                   | Strength characteristics and Rheological behaviour of high volume Fly ash concrete  | <b>134</b> |  |

|  |  |            |  |
|--|--|------------|--|
| <b>Anouar El Magri</b> , and Sébastien Vaudreuil   | Effects of environmental aging on the mechanical and thermal performances of 3D printed Poly (ether ether ketone) / Poly (ether imide) [PEEK/PEI] blends | <b>149</b> |  |
| <b>Azeddine Lebkiri</b> , Abdelhay El Amri, Fatima Zahra Bouhassane, Zineb Wardighi, El Housseine Rifi, Amar Habsaoui and Ahmed Lebkiri            | Cellulosic-based hydrogel from biomass material for removal of dyes from waste water   | <b>155</b> |  |
| <b>Oussama Jhabli</b> , El Mountassir El Mouchtari, Mustapha Boutamart, Salah Rafqah, Yassine Redouany, Adil Bouhmmad, Khalid Nouneh, Samir Briche | The evolution of tribasic lead sulfates features during paste curing of positive active material of lead acid battery                                    | <b>186</b> |  |
| <b>A. Rguibi</b> , K. Ba, R. Driss, H. El Aaad, T. Jermoumi, A. Hsini, A. Shaim, A. Chahine  | Elaboration by coacervation method, structural investigation and durability of new glasses   | <b>266</b> |  |
| <b>Mustapha Boutamart</b> , Oussama Jhabli, Amine Hadri, Salah Rafqah, Khalid Nouneh, Salma Ziadi, Hicham Bichara, Samir Briche                    | Preparation of superhydrophobic concrete for preserving building facades   | <b>268</b> |  |
| <b>Morchid Fatima Ezzahrae</b> , Akkouri Nacer, Elfarissi Latifa, Zamma Abdellah, and Idiri Mohamed  | Thermal and mechanical properties of a high-density polyethylene (HDPE) composite reinforced with wood flour   | <b>190</b> |  |
| <b>Mohamed Hamid Salim</b> , Zineb Kassab, El-Houssaine Ablouh, Mounir El Achaby   | Fabrication of different surface-modified cellulose nanocrystals as green materials for water treatment  | <b>179</b> |  |
| <b>K. Lamhour</b> , A. Tizliouine, and O. Cherkaoui  | Effect of chemical treatment on Moroccan Alfa fiber thermal behavior   | <b>192</b> |  |
| <b>Loubna Hdidou</b> , Ayoub El Bendali, Ghizlane Elomari, Jones Alami, and Mouad Dahbi  | Si/Graphite as Anode Material for Lithium-Ion Batteries (LIBs)   | <b>255</b> |  |
| <b>F-Z. El Bouchtaoui</b> , E-H. Ablouh, I. Kassem, M. Salim, Z. Kassab, H. Sehaqui, and M. El Achaby  | Novel methylcellulose@lignin bio-composite as an eco-friendly and multifunctional coating material for good nutrients management                         | <b>287</b> |  |
| <b>Khadija Annaba</b> , Bennaceur Ouaki, Moha Cherkaoui, and Khalid Ibaaz  | Application of pozzolan as a material for thermal insulation of buildings  | <b>330</b> |  |
| <b>M. Benhaddou</b> , M. Ess Sadki, A. Azouzoute, L. Bouselham, M. Ghammouri   | The effect of bending load for two geometries design of AISI 316L cardiovascular stent   | <b>326</b> |  |
| <b>Ikhlas Hani Chennoufi</b> , Chorouk Zanane, Mehdi Ameslek, Mostafa El Louali, Hafida Zahir, and Hassan Latrache                                 | Relationship between color facemasks and their electron donor acceptor character   | <b>345</b> |  |
| <b>Abdelqader El Guerraf</b> , Sana Ben Jadi, Nurgul Bakirhan, Yalcin Ozkan, Sibel Ozkan, Mohammed Bazzaoui, and El Arbi Bazzaoui                  | Electrochemical characterization of trimetazidine hydrochloride on PEDOT modified glassy carbon electrode by stripping square wave voltammetry           | <b>382</b> |  |
| <b>Kaoutar Aghmih</b> , Abderrahim Bouftou, Said Gmouh, Sanaa Majid  | Rheology and dissolution of a cellulose/imidazolium-based ionic liquid solution  | <b>341</b> |  |
| <b>K. Lamayny</b> , O. El Abouti, M. Amrani and E. H. El Boudouti  | Surface states in one-dimensional Graphene-Dielectric photonic crystal   | <b>405</b> |  |
| <b>Achraf Delhali</b> , Ayalew H. Assen, Youssef Belmabkhout   | Porous materials for water vapor related applications  | <b>411</b> |  |

**NANOSCIENCE, ORGANIC AND INORGANIC ADVANCED MATERIALS**

|  |  |            |  |
|--|--|------------|--|
| <b>Assia Chichane</b> , Radouane Boujmal, and Abdellah El Barkany  | Bio-composites and bio-hybrid composites reinforced with natural fibers: Review  | <b>13</b>  |  |
| <b>Ilyass El Arkoubi</b> , Haytham Bouammali, Mohamed El Kodadi, El Bekkay Yousf, Rachid Touzani, Tabti Salima, and Amel Djedouani   | New ligands based of azine : Evaluation of the catecholase activity  | <b>97</b>  |  |
| <b>Fatima El Hajri</b> , Haddou Anahmadi, Driss El Mekkaoui, Zakaria Benzekri, Sarra Sibous, Ali Ouasri, Amina Hassikou, Ali Rhandour, Abdelaziz Souizi and Said Boukhris          | Bis[hydrazinium(1+)] hexafluoridosilicate (N <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> SiF <sub>6</sub> novel hybrid crystal as an efficient, reusable and environmentally friendly heterogeneous catalyst for Knoevenagel condensation and synthesis of biscoumarin derivatives. | <b>113</b> |  |
| <b>Bouhassane Fatima Zahra</b> , El Amri Abdelhay, Lebkeri Azeddine, Wardighi Zineb, Lebkeri Ahmed, El Housseine Rifi, Habsaoui Amar   | Experimental, kinetic and thermodynamic adsorption of a cationic dye by raw and activated bio-adsorbent.   | <b>123</b> |  |
| <b>Aziz El Yahyaoui</b> , Imad Manssouri, Hassane Sahbi, Othmane Nouredine, and Houssame Limami  | Physical and Mechanical Properties of Unfired Clay Bricks with Dwarf Palm-Fibers Additives as a Construction Material  | <b>129</b> |  |
| <b>Chaymae Bourhou</b> , E. Fraj, H. Benouda, B. Bouammali, A. Chalioui, T. Harit, R. Touzani, A. Asehrou, N. Bentouhami, and I. Ozdemir   | Synthesis of novel tetrazole derivatives and evaluation of their antibacterial and antifungal activities   | <b>160</b> |  |
| <b>M. Dadda</b> , K. Abdelouhadi, M, Waqif, and L. Saadi   | The use of clayey residues in the manufacturing of compacted earth blocks: optimization of formulations  | <b>165</b> |  |
| <b>E. Fraj</b> , C. Bourhou, H. Benouda, B. Bouammali, and A. Chalioui   | Synthesis of 2-thienyl (or furyl) chromones by the “one pot” Naik's method   | <b>166</b> |  |
| <b>H. Bouammali</b> , L. Bourassi, B. Bouammali, B. Serrano, A. Chelioui, and R. Touzani   | Graphene and chitosan innovative materials for water treatment   | <b>173</b> |  |
| <b>M. Mohamed</b> , F. Abrigach, S. El Kadiri, A. Moliterni, and R. Touzani  | N-Heterocyclic compounds: good extractants of heavy metals   | <b>174</b> |  |
| <b>Mohamed El Boutaybi</b> , Nadia Bouroumane, Mohamed Azzouzi, Mohamed Aaddouz, Said Bacroume, Mohamed El Miz, Ismail Warad, Abdelkader Zarrouk, Rachid Touzani, and Zahra Bahari | Synthesis, characterization, and applications of new cobalt (II) complex in catalysis  | <b>180</b> |  |
| <b>S. Dehhaoui</b> , K. Ba, R. Driss, H. El Aaad, T. Jermoumi, A. Shaim, A. Chahine  | Elaboration by sol-gel method and characterization of TiO <sub>2</sub> -P <sub>2</sub> O <sub>5</sub> coating  | <b>193</b> |  |
| <b>D. El Machtani Idrissi</b> , B. Achiou, M. Ouammou, and S. Alami Younssi  | Comparison study of green and chemical synthesis of ZnO nanoparticles by sol-gel route   | <b>198</b> |  |
| <b>Rachid Hidki</b> , Lahcen El Moutaouakil, Mohammed Boukendil, Zouhair Charqui, and Zaki Zrikem  | Impact of Cu,Al <sub>2</sub> O <sub>3</sub> -H <sub>2</sub> O hybrid nanofluid on natural convection inside a square cavity containing two heat-generating bodies  | <b>214</b> |  |
| <b>Chaymae Hejjaj</b> , A. Ait Aghzzaf, N. Scharnagl, M.L. Zheludkevich, R. Hakkou, C.B. Fischer, and J. Alami   | Insights into the preparation of Layered Aluminum Tri-Polyphosphate (ATP) intercalated with amino acids and their corrosion protection of low carbon steel   | <b>219</b> |  |
| <b>Hasna Nait M'Barek</b> , Brahim Mazian, Giana Almeida, Patrick Perré  | Dynamics of fungal mycelium growth for biomaterials production: molding the mold for a greener economy   | <b>391</b> |  |
| <b>C. Merimi</b> , B. Hammouti, R. Touzani, M.A. Mehdi, M. Neffa, R. Quesada-Cabrera, J.M.   | Highly efficient photocatalytic degradation of acid by clay-doped TiO <sub>2</sub> photocatalyst   | <b>223</b> |  |

|  |   |            |  |
|--|---|------------|--|
| Doña-Rodriguez   |   |            |  |
| <b>A. Essate</b> , B. Achiou, S.Benkhalifa, M.Ouammou, and S. Alami Younssi  | Development of composite ultrafiltration membrane made of polystyrene/NaA zeolite deposited on pozzolan flat support for organic dyes removal                           | <b>226</b> |  |
| <b>Kaoutar Aghmih</b> , Abderrahim Bouftou, Said Gmouh, Sanaa Majid  | Development of new biocomposite films based cellulose triacetate for packaging  | <b>295</b> |  |
| <b>El Mehdi Salmi</b> , Amina Amarray, Youssef Samih, Mohammed Azzi, and Sanae Eghachtouli   | Synthesis of a novel nickel sulfide nanoparticles-incorporated carbon nanofibers as effective nonprecious catalyst for methanol electrooxidation in alkaline medium     | <b>300</b> |  |
| <b>T. Ahlelhaj</b> , K. Sadraoui, K. El Mejdoubi, B. Sallek  | Optimization of synthetic oxazinone catalyzed by an efficient heterogenous phosphate catalyst   | <b>325</b> |  |
| <b>Kamal. Essifi</b> , Doha. Berraaouan, Mohamed Brahmi, Amina Amrani, Abdourahim Hammani, Ali. El Bachiri, Marie-Laure Fauconnier, and Abdesselam. Tahani | A green method for the preparation of montmorillonite essential oils nanostructured hybrid materials for protection and controlled release of volatile active compounds | <b>365</b> |  |
| <b>Ayalew H. Assen</b> , Aminat Mohammed, Youssef Belmabkhout  | Valorizing tannery effluent and waste plastic bottles as precursors for preparing functional metal-organic frameworks   | <b>412</b> |  |

### NATURAL PRODUCTS AND THEIR BIOTECHNOLOGICAL APPLICATIONS

|  |  |           |  |
|--|--|-----------|--|
| <b>S. Laaraj</b> , Y. Noutfia, C. El-Rhouttais, M. Achchoub, H. Azzouzi, H. Ennaoui, S. Salmaoui, and K. Elfazazi          | Antioxidant and antimicrobial activities of Carob leaves extracts ( <i>Ceratonia Siliqua</i> L.) from female and male trees.                                   | <b>29</b> |  |
| <b>K. Mzioud</b> , A. Habsaoui, S. Rached, M. Galai, M. Ouakki, S. El Fartah, N. Dkhireche and M. Ebn Touhami              | Valorization of the essential oil of <i>Urginea maritime</i> as an inhibitor of the corrosion of copper in acid medium   | <b>06</b> |  |
| <b>S. Rached</b> , A. Habsaoui, K. Mzioud, M. Galai, M. Ouakki, S. El Fartah, K. Dahamani, N. Dkhireche and M. Ebn Touhami | Prevention of copper corrosion in a sulfuric environment by an ecological inhibitor: <i>Mentha pulegium</i> L from western Morocco                             | <b>07</b> |  |
| <b>C. El-Rhouttais</b> , Z. El Kettabi, S. Laaraj, S. Fakhour, O. El Bezzami, M. Benaamar, S. Salmaoui, and K. Elfazazi    | Assessment of cold storage impact on technological quality and bioactive compounds of three pomegranate varieties cultivated in Béni Mellal region in Morocco  | <b>30</b> |  |
| <b>M. Dibane</b> , A. Benmoumen, D. Belfadil, and S. Zyade   | Determination of pyropheophytin a in extra virgin olive oils by HPLC method  | <b>31</b> |  |
| <b>Brahmi Mohamed</b> , Hamza Bouakline, Kamal Essifi, Amina Amrani, Ali Elbachiri, Abdesselam Tahani                      | Alginate-based encapsulation of polyphenol from <i>Pistacia Lentiscus</i> leaf extract for stable and controlled release system.                               | <b>54</b> |  |
| <b>M. Achchoub</b> , H. Azzouzi, H. Latifi, S. Laaraj, S. Salmaoui, and K. Elfazazi  | Evaluation of physicochemical, functional and sensory properties of carob pulp beverage ( <i>ceratonia siliqua</i> l)  | <b>60</b> |  |
| <b>H. Azzouzi</b> , M. Achchoub, L. Chafki, H. Latifi, S. Salmaoui, and K. Elfazazi  | Assessment of total phenolic content and antioxidant activity potential of clementine extract obtained by microwave assisted extraction method                 | <b>61</b> |  |
| <b>Z. El Kettabi</b> , A. Haddioui, C. El-Rhouttais, S. Fakhour, M. Benaamar, J. Charafi, K. Elfazazi                      | A Comparative study of chemical properties and antioxidant activity attributes of five pomegranate ( <i>Punica granatum</i> L.) cultivars grown in Béni Mellal | <b>82</b> |  |

|  |  |            |  |
|--|--|------------|--|
|  | region-Morocco.  |            |  |
| <b>H. Latifi</b> , H. Zahir, H. Latrache, M. El Louali, L. Haltout, H. Azzouzi, M. Achchoub, and K. Elfazazi   | Impact of aromatization by <i>Thymus vulgaris</i> and <i>Rosmarinus Officinalis</i> L essential oil on virgin olive oil quality  | <b>98</b>  |  |
| <b>Imane Ziani</b> , Saliha Bouknana, Hamza Bouakline, Yousra Belbachir, Mohamed Bnouham, Abdesselam Tahani, Abdelmonaem Talhaoui, and Ali El Bachiri                      | The chemical profile, antioxidant activity, $\alpha$ -Amylase Inhibition Potential and Toxicity Evaluation of the water residues from hydro distillation of Rosemary   | <b>125</b> |  |
| <b>Hamza Bouakline</b> , Mohamed Brahmi, Amina Amrani, Imane Ziani, Abdesselam Tahani, Ali El Bachiri  | The effect of the air-drying temperature on the bioactive compounds and biological effect of <i>P. lentiscus</i> leaves extracts and essential oil   | <b>141</b> |  |
| <b>Amina Amrani</b> , Hamza Bouakline, Mohamed Brahmi, Abdesselam Tahani, and Ali El Bachiri   | Extraction, characterization and antioxidant activity of the <i>Ceratonia siliqua</i> L seeds extract and essential oil  | <b>144</b> |  |
| <b>Imane Oualdi</b> , Khaoula Diass, Kaoutar Elfazazi, Hanane Azzouzi, Adyl Oussaid, and Rachid Touzani  | Rosemary Essential Oils: Chemical composition and Antimicrobial Activities   | <b>169</b> |  |
| <b>Belbachir Yousra</b> , Azizi Salaheddine, Ziani Imane, Beraich Abdessamad, Ali El Bachiri, Abdesselam Tahani, Hammadi El Farissi, Abdelmonaem Talhaoui                  | Preliminary characterization of <i>Thymus vulgaris</i> essential oil by solid-phase microextraction (HS-SPME) and gas chromatography coupled to mass spectroscopy (GC-MS)  | <b>170</b> |  |
| <b>H. Boulika</b> , M. El Hajam, M. Hajji Nabih, I. Riffi Karim, N. Idrissi Kandri, and A. Zerouale  | Definitive screening design applied to cationic & anionic Adsorption dyes on Almond shells activated carbon: isotherm, kinetic and thermodynamic studies.  | <b>171</b> |  |
| <b>Abdou Achraf</b> , Moukhfi Fatima Zahra, Bimoussa Abdoullah, Maaghloud Fatima Ezzahra, Chadli Nour-Eddine, El Makssoudi Abdelhakim, Jamaledine Jamal, and Dakir Mohamed | Antibacterial activity of acetylated and non-acetylated clove bud Essential oils and their main compounds  | <b>187</b> |  |
| <b>Hbika Asmae</b> , Daoudi Nour Elhouda, Bouyanzer Abdelhamid, Loukili El Hassania, and Mohamed Bnouham   | Chemical composition and inhibitory activity of pancreatic $\alpha$ -amylase and intestinal $\alpha$ -glucosidase in vitro and in vivo of <i>Artemisia absinthium</i> L. extracts.                               | <b>227</b> |  |
| <b>Khaoula Diass</b> , Imane Oualdi, Kaoutar El Fazazi, Hanane Azzouzi, Belkheir Hammouti, Rachid Touzani  | Essential oil of <i>Lavandula officinalis</i> : Antimicrobial activities against <i>Escherichia Coli</i> , <i>Salmonella Newport</i>   | <b>229</b> |  |
| <b>Moujabbir Sara</b> , Aboukhalaf Abdelghani, João Miguel Ferreira Da Rocha, Amraoui Belkassem, and Belhsen Rekia   | Antimicrobial and antifungal activity of metholic extract of sourdough.  | <b>239</b> |  |
| <b>A. Rkhaila</b> , M. Saga, S. G. Grohs, A. El Yacoubi, B. Chafik El Idrissi, and K. Ounine   | The Potential of Chitin Co-products in the Biocontrol of <i>Solanum lycopersicum</i> L. Phytopathogens: The Case of <i>Ralstonia solanacearum</i> and <i>Fusarium oxysporum</i> f.sp. <i>radicis-lycopersici</i> | <b>258</b> |  |
| <b>Lamiae Bourassi</b> , Allal Challioui, and Boufelja Bouammali,  | A Viscometric study of the products obtained by controlled degradation of naturel rubber   | <b>272</b> |  |
| <b>M. Hajji Nabih</b> , M. El Hajam, H. Boulika, Z. Chiki, S. Ben Tahar, N. Idrissi Kandri, and A.   | Preparation of Activated Carbon from Cardoon " <i>Cynara Cardunculus</i> " Waste: Characterization and Application   | <b>282</b> |  |

|   |   |            |  |
|---|---|------------|--|
| Zerouale  | to the Adsorption of Synthetic Organic Dyes   |            |  |
| <b>Raoudi Meryem</b> , Ziani Imane, El Bachiri Ali, Radi Smaail, Khalef Nawel, Bakri Abdelaziz, Benameur Hassan, and Mohamed Elkadiri | Preliminary identification and characterization of <i>Serenoa Repens</i> extracts   | <b>309</b> |  |
| <b>M. El Bastrioui</b> , K. Haboubi, and B. Hammouti  | Phytochemical investigation and antioxidant activity of the extracts of <i>Marrubium Vulgare</i> L. from the region of Al-Hoceima | <b>310</b> |  |
| <b>Fatima Brahmi</b> , Ouafae Mokhtari, Ashraou Abdessalam, Taibi Ben Hadda, Rachid Touzani, Bouchra Legsseyer                        | Evaluation of the antifungal activity of essential oil from <i>Mentha pulegium</i> . L  | <b>315</b> |  |
| <b>B. Douhri</b> , K. Draoui, I. Raissouni, M. Hadri, E. Khay, A. Farah, N. Skali Senhaji, J. Abrini, and H. Douhri                   | Bioactive compounds from Moroccan plants as antibiofilm agents: Case of the endemic <i>Origanum grosii</i>                        | <b>389</b> |  |
| <b>Salma Kadda</b> , Abdelmajid Belabed, Sabir Ouahhoud, Raffaele Conte, and Hamza Mechchate  | Phytochemical analysis of the residues of <i>Opuntia ficus indica</i> l seed oil of eastern region of Morocco                     | <b>397</b> |  |
| <b>Salima Haddou</b> , Belkher Hammouti, Rachid Touzani, Loukili Hassania, Asmae Hbika, Abdelkrim Chahine                             | Antioxidant activities of <i>Cannabis Sativa</i> L seeds extracts from Morocco  | <b>177</b> |  |

### POSTERS LIST

| Authors | Title | ID | Page |
|---------|-------|----|------|
|---------|-------|----|------|

#### HEALTH: BIOCHEMISTRY, NUTRITION AND PHARMACOLOGY

|  |   |            |  |
|--|---|------------|--|
| <b>Sandaoui Meriem</b> , Zaroual Zaina, El Ghachtouli Sanae, and Azzi Mohammed   | Treatment of pharmaceutical effluents by sonochemistry  | <b>158</b> |  |
| <b>Wissame Azizi</b> , Abdessamad Amrani, Mouad Harandou, Abir Yahyaoui, Youssra Sbibih, Oumayma Hamdani, Hajar Zerouri, El-Houcine Sebbar, and Mohammed Choukri           | Importance of implementing an outsourced internal control system in the quality of biochemical results  | <b>349</b> |  |
| <b>Omayama Hamdani</b> , Amjad Idrissi, Mouad Harandou, Abir Yahyaoui, Yousra Sbibih, Wissam Azizi, Hajar Zrouri, El-houcine Sebbar, and Mohammed Choukri                  | Establishment of an analytical toxicology unit in the biochemistry laboratory of university hospital Mohammed VI of Oujda   | <b>350</b> |  |
| <b>Amjad Idrissi</b> , Abir Yahyaoui, Oussama rahhab, Youssra Sbibih, Hajar Zrouri, Omayama Hamdani, Wissam Azizi, Mouad Harandou, El-houcine Sebbar, and Mohammed Choukri | The importance of setting up an external quality evaluation system in the medical biology laboratory: Experience of the biochemistry laboratory of the Mohammed VI University Hospital of Oujda | <b>351</b> |  |
| <b>Hajar Zrouri</b> , Amjad Idrissi, Mouad Harandou, Abir Yahyaoui, Youssra Sbibih, Wissam Azizi, Oumayma Hamdani, El-houcine Sebbar, and Mohammed Choukri                 | Containment levels in medical laboratories  | <b>352</b> |  |

#### WATER, SOIL, AIR, AGRICULTURE AND ENVIRONMENTAL ANALYSIS

|  |  |            |  |
|--|--|------------|--|
| <b>R. Othmane, S. Rafik, and T. Said</b>   | Kinetics, thermodynamics, equilibrium, surface modelling, and atomic absorption analysis of selective Cu(II) removal from aqueous solutions and rivers water using silica-2-(pyridin-2-ylmethoxy)ethan-1-ol hybrid material  | <b>19</b>  |  |
| <b>L. Zouhri, J. Jaunat, and P. Lutz</b>   | Characterization of contaminated sites by the perchlorate contaminant and the environmental impact on groundwater resources (Grand-Est, France)  | <b>93</b>  |  |
| <b>R. Kellal, D. Benmessaoud Left, M. Azzi, and M. Zertoubi</b>  | Anti-corrosion activity of a green inhibitor based on a Moroccan medicinal plant as an environmentally friendly corrosion inhibitor for carbon steel in 1M HCl and 0.5M H <sub>2</sub> SO <sub>4</sub> : Phytochemical screening, FT-IR, SEM-EDX, Synergetic effect and electrochemical evaluations. | <b>106</b> |  |
| <b>Redouane Elharbili, Tawfik El Moussaoui, Khalid El Ass, and Mohamed Oussama Belloulid</b>   | Simultaneous assessment of raw pollution and municipal WWTP performances: Case study of Kenitra city, Morocco  | <b>312</b> |  |
| <b>Zahaf Toufik, Sabar Hichame, Boushaba Farid, and Mimoun Chourak</b>   | Mapping the risk of flooding of the national road N °2 at the crossing of the wadi Tamdmadt north of the city of Bni Drar  | <b>57</b>  |  |
| <b>Jihane Serbout, Imane Oualdi, Anouar El Magri, Sébastien Vaudreuil, Rachid Touzani, Belkheir Hammouti</b>                                     | Corrosion inhibition of tool steel (H13) in 1 M HCl medium by pine essential oil   | <b>400</b> |  |
| <b>Abdelkarim Ait mansour, Badr El-Haitout, Fatima Zahra Thari, Khalid Karrouchi, Khalid Bougrin, Hassane Lgaz, Han-seung Lee, Rachid Salghi</b> | Exploring the corrosion inhibition mechanism of novel thiazolidinediones for N80 steel in 15 wt.% HCl solution: Insights from experimental and first-principles DFT investigations   | <b>401</b> |  |
| <b>Badr El-Haitout, Abdelkarim Ait mansour, Mustafa Raji Al-Hadeethi, Hassane Lgaz, Han-seung Lee, Rachid Salghi</b>                             | Insights into the corrosion inhibition property of novel hydrazone compounds for N80 steel in 15 wt.% HCl solution: Experimental and theoretical approaches  | <b>402</b> |  |
| <b>Badr El-Haitout, Abdelkarim Ait mansour, Gideon Idowu, Hassane Lgaz, Rachid Salghi</b>  | Study on Microplastics contamination in water and sediment of marine environment using extraction methods and FTIR analysis  | <b>409</b> |  |
| <b>GREEN ENERGY, RENEWABLE, STORAGE AND SUSTAINABLE DEVELOPMENT</b>  |  |            |  |
| <b>ARTIFICIAL INTELLIGENCE, MACHINE LEARNING, ELECTRICAL ENGINEERING AND SIMULATION</b>  |  |            |  |
| <b>Ali Srairi, Abdelmajid Dridi, Abdelouahed Ben Mhamed, Abdellatif Boumaaz, and Driss Belghyti</b>  | Reproduction study on squid « loligo vulgaris lamarck, 1798 » in the moroccan southern region of the atlantic (cape boujdor – cape blanc)  | <b>26</b>  |  |
| <b>INNOVATIVE DEVICES, CHEMISTRY AND MATERIAL PHYSICS</b>  |  |            |  |
| <b>S. Es-Sabbeur, Y. Chaouqi, A. Cherif, I. Elkoraichi, L. Lebrun, and M. Hlaibi</b>   | Reinforcement and disinfection of heritage textile materials. Characteristic and kinetic study   | <b>81</b>  |  |

|   |  |            |  |
|---|--|------------|--|
| <b>Somia Fellak</b> , Mourad Rafik and Abdelhadi El Hassani   | FT-Raman and Fourier Transform Infrared spectroscopy (FTIR) investigation of hardwood lignin: identification of guaiacyl and syringyl units  | <b>108</b> |  |
| <b>NANOSCIENCE, ORGANIC AND INORGANIC ADVANCED MATERIALS</b>  |  |            |  |
| <b>Leila Azaryouh</b> , Zineb Kassab, Adil Aboulkas, Mounir El Achaby, and Khalid Draoui  | Eco-friendly composites based on Biopolymers and Moroccan Clay for wastewater treatment  | <b>156</b> |  |
| <b>Ahmed El Yacoubi</b> , Asmae Massit, Soufiane Hmamouchi, Amine Rkhaila, Aziz Boulouiz, Khadija Ounine, and Brahim Chafik El Idrissi  | Sulphate-substituted Tricalcium Phosphate $\beta$ -TCP-S: Effect of $\text{SiO}_4^{2-}$ insertion and microwave conditions   | <b>267</b> |  |
| <b>K. Essifi</b> , A. Ed-Daoui, M. Brahmi, D. Berraaouan, A. Amrani, M. Benelmostafa, M. Dahmani, A. El Bachiri, A. Tahani  | Determination of the mechanical properties of single calcium alginate microcapsules loaded gallic acid   | <b>404</b> |  |
| <b>S. M. Almutairi</b> , W. S. El-Sayed, P. K. Sahu and M. Messali  | Ultrasound-assisted synthesis of new 4-dimethylaminopyridinium-based ionic liquids and/or salts, characterization, in silico approaches and antimicrobial evaluation                 | <b>318</b> |  |
| <b>NATURAL PRODUCTS AND THEIR BIOTECHNOLOGICAL APPLICATIONS</b>   |  |            |  |
| <b>Yahya El-Mernissi</b> , Amina Labhar, Ikrame Zeouk, M'hamed Ahari, Soufian El Barkany, Amin Salhi, and Hassan Amhamdi  | Ethnobotanical study of medicinal plants used in the treatment of dermal diseases and skin care.   | <b>139</b> |  |
| <b>R. Sayed</b> , N. Dkhireche, A. Hmada, M. Galai, A. Habsaoui, M. Harcharras, M. Ebn Touhami  | Plant essential oil as a safe corrosion inhibitor for copper in 0,5M $\text{H}_2\text{SO}_4$   | <b>89</b>  |  |
| <b>Sarah Loukmas</b> , Ebrahim Kerak, Hamza Zine, and Hasnaâ Harrak   | Assessment of physical and physicochemical characteristics of mesocarp and peel of ten Moroccan pomegranate cultivars ( <i>Punica granatum</i> L.)                                   | <b>162</b> |  |
| <b>Arrahmouni Rayan</b> , Elouazzani Chahed Chadia, Erramly Azzedine, and Ballouch Hussein  | Physicochemical qualities of commercial essential oils of : <i>M.spicata</i> , <i>M.piperita</i> , <i>M.pulegium</i>   | <b>331</b> |  |
| <b>Doha. Berraaouan</b> , Kamal. Essifi, Amina Amrani, Mohamed Brahmi, Mohamed. El Miz, Mouad. Harandou, El Houcine Sebbar, Mohammed. Choukri, and Abdesselam. Tahani                               | Development and characterization of commercial Moroccan nanoclays  | <b>353</b> |  |
| <b>M. Sabbahi</b> , A. Tahani, A. Talhaoui, and A. El Bachiri   | Cartography and chemical profiling of rosemary essential oil in Eastern High Atlas Mountains, Morocco  | <b>348</b> |  |
| <b>Sadik Hasnaa</b> , Ouazzani Chadia, Samira El Ghammarti , Abdellah Moustaghfir , and Hussein Ballouch  | Comparison of the physico-chemical characteristics of three strawberry varieties of strawberries from different regions in Morocco   | <b>346</b> |  |
| <b>Imane Naboulsi</b> , Mansour Sobeh, Rachid Lamzira, Karim El Fakhouri, Widad Ben Bakrim, Chaimae Ramdani, Rachid Boulamtat, Mustapha El Bouhssini, Jane ward, Aziz Aboulmouhadjir, and Abdelaziz | LC-MS Characterization of Moroccan Aromatic and Medicinal Plants and Their Investigations against <i>Dactylopius Opuntiae</i> (Cockerell) Under Laboratory and Greenhouse Conditions | <b>406</b> |  |



|       |  |  |  |
|-------|--|--|--|
| Yasri |  |  |  |
|-------|--|--|--|

# Invited Speakers

# Nanomaterials in Healthcare

**Chad A. Mirkin**

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## Abstract

The novel architectures and properties of nanomaterials make them extremely useful in many areas of healthcare and biomedicine. We have invented and developed a suite of methods for designing, synthesizing, and investigating a wide variety of nanostructured materials, including those based on bioconjugate chemistry, scanning probe lithography, and stereolithography. Examples include spherical nucleic acids (SNAs), dip-pen nanolithography (DPN) and related cantilever-free techniques (Polymer Pen Lithography (PPL) and Beam Pen Lithography (BPL)), and high-area rapid printing (HARP). These platforms permit exceptional control over 2- and 3-D architecture, sometimes in high-throughput, and they have enabled significant advances in biodetection, gene regulation, and

immunotherapeutics for diseases spanning many forms of cancer and infectious disease (e.g., COVID-19). They also have impacted the development of drug screening, tissue engineering, and cellular analysis and manipulation. Several aspects of medicine and the life sciences have been transformed through the development and application of these techniques, and this presentation will provide a survey of them, from the benchtop to the clinic.

## Biography

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Dr. Chad A. Mirkin is the Director of the International Institute for Nanotechnology and the George B. Rathmann Professor of Chemistry, and a Professor of Chemical & Biological Engineering, Biomedical Engineering, Materials Science & Engineering, and Medicine at Northwestern University. He is a chemist and a world-renowned nanoscientist, who is known for his discovery and development of spherical nucleic acids (SNAs) and SNA-based biodetection and therapeutic schemes, among many other accomplishments. Mirkin received his B.S. from Dickinson College (1986) and Ph.D. from Penn State (1989). He was an NSF Postdoctoral Fellow at MIT prior to joining the faculty at Northwestern in 1991. He has authored >830 manuscripts and >1,200 patent applications worldwide (>400 issued) and founded eight companies. Mirkin has been recognized with >230 awards, including the UNESCO-Equatorial Guinea International Prize for Research in Life Sciences, Kabiller Prize in Nanoscience and Nanomedicine, Dan David Prize, and NAS Sackler Prize in Convergence Research. He served on the President's Council of Advisors on Science & Technology, and he is one of very few scientists to be elected to all three US National Academies. Mirkin was an Associate Editor of *J. Am. Chem. Soc.* and is a *Proc. Natl. Acad. Sci. USA* Editorial Board Member. He has given >870 lectures and educated >300 graduate students and postdoctoral fellows in the lab, of whom >120 are now faculty members at top institutions around the world.

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# Porous Energy Materials: From Fundamentals to Applications

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## Abstract

Porous materials play a key role in the development of novel catalysts, but also mobile and stationary energy storage applications, which are important system technologies to promote the use of renewable energies and environmentally friendly electric vehicles.

Metal-Organic Frameworks (MOFs) synthesized in Dresden (named DUT-n) reach specific surface areas up to 7800 m<sup>2</sup>/g.<sup>[1]</sup> They are promising materials for natural gas storage but also reveal fundamentally interesting novel phenomena.<sup>[2]</sup> The most intriguing phenomena were recently discovered in MOFs showing distinct structural transitions causing counterintuitive adsorption phenomena such as “negative gas adsorption” (NGA).<sup>[3]</sup> Hierarchical porous carbons are more robust and their high electrical conductivity renders them as highly useful components in the area of supercapacitors, batteries and electrocatalysts.<sup>[4]</sup> Especially lithium sulfur batteries require materials with a high specific pore volume for sulfur loading.<sup>[5,6]</sup> Lithium sulfur batteries are considered as highly promising next generation batteries because of the high theoretical capacity. An increase of energy density up to 350-400 Wh/kg is within reach. However, an interdisciplinary approach is needed to resolve remaining challenges of cycling stability due to the subtle interplay of anode, cathode, electrolyte and separator technologies.

## Acknowledgement

This work has received funding from the European Research Council (ERC) under the European Union’s Horizon 2020 research and innovation programme (grant agreement no 742743). The authors thank the BMBF (no. 5K16OD3) and ANR/DFG Program FUN for financial support and Helmholtz-Zentrum Berlin für Materialien und Energie for allocated beam time and travel funding. G. P. Hao was supported by the Alexander von Humboldt Foundation.

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## Biography



Stefan Kaskel studied chemistry at Eberhard Karls University, Tübingen (Germany), and received his Ph.D. degree in 1997 from the same University in solid state chemistry, under the guidance of Prof. J. Strähle. As a Feodor-Lynen Fellow of the Alexander von Humboldt foundation he worked with J. Corbett at Ames Laboratory, USA (1998-2000) on intermetallic compounds. He was a group leader at the Max-Planck-Institut für Kohlenforschung in Mülheim a.d. Ruhr (2000-2004) in the group of F. Schüth and after his habilitation at Ruhr University (Bochum) in 2004 in the area of heterogeneous catalysis, he became full professor for Inorganic Chemistry at Technical University Dresden. Since 2008 he is also business field leader at Fraunhofer IWS, Dresden (part time). Since 2021 he is Dean of the Faculty Chemistry and Food Chemistry (TUD).

His research interests are focused on porous and nanostructured materials (synthesis, structure, function) for applications in energy storage, catalysis, batteries and separation technologies. He has been working on MOFs and porous carbon materials, CVD, CNTs, adsorption, and printing. His major activity at Fraunhofer IWS is the development of lithium sulfur batteries. He received the nanotechnology award of the German Ministry of Science and Education in 2002, the JSPS award from Japan in 2016 and the Lee Hsun-Award of the Chinese Academy of Science (IMR) in 2020. He is Adjunct Professor at Northwestern Polytechnical University, China and Distinguished Visiting Professor at Tsinghua University. He is a Henriette Herz-Scout of the Alexander von Humboldt Foundation and Appointed member of the European Academy of Science.

Stefan Kaskel has authored more than 600 publications (h-index 111) and has contributed as inventor to more than 30 patent applications. He was recognized as a Highly Cited Researcher of world’s most influential scientific minds by Clarivate Analytics.

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# Chemistry and Application of Soft Porous Crystals from MOFs/PCPs

Susumu Kitagawa

*Institute for Integrated Cell-Material Sciences (iCeMS), Kyoto University*

## Abstract

Metal-organic frameworks (MOFs) or porous coordination polymers (PCPs) possess inherent voids that allow the storage, delivery, and separation of substances, particularly gases. Among them, 3<sup>rd</sup> generation MOFs, called flexible MOFs or soft porous crystals (SPCs), exhibit a structural change from crystal to crystal in response to physical and crystalline stimuli. This feature distinguishes them from other porous materials, reminiscent of the induced fit mechanism of bioenzymes and the cooperative phenomenon of hemoglobin.<sup>1</sup> In contrast to rigid materials showing a Langmuir type I isotherm, SPCs possess a sigmoidal isotherm and higher usable capacity and efficient recognition of guest species. The flexibility depends not only on the binding ability and mobility of unit ligands and metal ions but also on other factors, including the

deformation of the entire framework as a result of the guest molecules in the pores. Strategies using ligand functionalization have been developed to investigate the properties but have mainly focused on discovering and understanding SPC phenomena in SPCs. This trend has now shifted towards controlling the adsorption properties for practical applications. This talk provides an essential and accessible overview of the historical background of the chemistry of SPCs, their features, and outlook as 4<sup>th</sup> generation MOFs,<sup>2,3</sup> in particular, design and synthesis, dynamic structure analysis, flexibility and function, and theoretical treatment and interpretation of the mechanism, as well as their applications.

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## Biography



Ph.D. in Engineering, Kyoto University. Kitagawa graduated from Kyoto University, served as Associate Professor at Kindai University, Professor at Tokyo Metropolitan University, Professor at Kyoto University in 1998, Director of iCeMS from 2013, and was appointed as Distinguished Professor at KUIAS in 2017. Kitagawa developed "porous" materials with numerous nano-sized holes. These materials are expected to be used to develop new materials to absorb carbon dioxide causing global warming and for medical applications. He was selected as a Thomson Reuters Citation Laureate in 2010 and Thomson Reuters / Clarivate Analytics Highly Cited Researcher in 2014 – 2020. He received the Medal with Purple Ribbon (The Japanese Government) in 2011, the Japan Academy Prize in 2016, the Chemistry for the Future Solvay Prize in 2017, and the Grand Prix of the Fondation de la Maison de la Chimie, France in 2018. He was elected as a member of the Japan Academy in 2019.

## Surprising Properties of 2D Metal-Organic Frameworks

Mircea Dincă\*

*Department of Chemistry  
Massachusetts Institute of Technology*

### Abstract

The emergence of electrically conductive metal-organic frameworks (MOFs) has been one of the most paradoxical developments in the field in the last few years. Indeed, how can one transport charges through a material that is mostly “empty” space? In this sense, MOFs made from layers of organic ligands connected by (typically) square-planar metal ions have shown particularly good electrical conductivity. However, a precise mechanism for charge transport is still the subject of debate, with various experimental and computational reports describing these materials as metals, semiconductors, semimetals, or even

borderline insulators. Most of the discussion on this point has been focused on the effects of in-plane metal-ligand conjugation and the efficiency of in-plane transport.

This lecture will describe the latest efforts from our group to understand the intrinsic properties of these materials, especially as related to single-crystal electrical measurement studies, and will discuss in particular the unexpectedly large influence of out-of-plane transport. Time allowing, I will discuss unexpected results stemming from the behavior of these materials as 1D metals, and applications in energy storage and conversion.

### Biography

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#### **Prof. Mircea Dincă**

*W. M. Keck Professor of Energy and Professor of Chemistry  
Massachusetts Institute of Technology, Department of Chemistry*

**Mircea Dincă** was born in Făgăraș, a small Transylvanian town in central Romania. He obtained his Bachelor of Arts degree in Chemistry from Princeton University in 2003, and did his graduate work at UC Berkeley, where he obtained a PhD in Inorganic Chemistry in 2008. After a two-year stint as a postdoctoral associate working on heterogeneous electrocatalytic water splitting at MIT, he became an Assistant Professor in the Department of Chemistry at MIT in July 2010. Promoted to Associate Professor in 2015 and to Professor of Chemistry in 2020, he currently holds the W. M. Keck Chair as Professor of Energy at MIT. His research interests focus on creating and manipulating microporous and low-dimensional solids with molecular precision for applications in various energy efficiency and environmental challenges. These include, but are not limited to: electrical energy storage and conversion, heterogeneous catalysis, fresh water harvesting, efficient air conditioning, and photophysical processes. He has been named to the world's most cited Chemists list since 2014 and has received a number of awards, most recently the Alan T. Waterman Award, NSF's most prestigious award in all sciences and engineering for researchers under 42 (2016), the ACS Award in Pure Chemistry (2018), and the Blavatnik Award in Chemistry (2021).

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## Development of Efficient and Stable Perovskite Solar Cells and Modules

Bin Ding, Yi Zhang, Yong Ding, Hiroyuki Kanda, Kim Hobeom, Keith Brooks, Gao Xiaoxin, Xia Jianxing and Mohammad Khaja Nazeeruddin

*Group for Molecular Engineering of Functional Materials, Institute of Chemical Sciences and Engineering, EPFL VALAIS, Sion, 1951, Switzerland*

### Abstract

Perovskite solar cells (PSC) are a new paradigm in renewable energy because of their high efficiency reaching over 25%. The perovskite solar cells' high efficiency is due to their excellent optoelectronic properties, which were optimized by various cations and anions with different ratios. Another advantage of perovskite solar cells is their simple fabrication through solution-processing methods, either in n-i-p or p-i-n configurations. However, the long-term stability drags down the commercialization of PSCs technology.

We have developed strategies to enhance the stability by

using functionalized additives and interface engineering by hydrophobic 2-Dimensional perovskite materials, preventing ion migration and protecting the perovskite absorber. As a result, the long-term stability of unencapsulated devices under one sun illumination retains >95% of their original efficiencies after 1000 h ageing. In this talk, we present layer by layer deposition of 3-Dimensional and 2-Dimensional perovskites and compositionally engineered perovskite resulting in over 24% certified power conversion efficiency under one sun. Notably, a record efficiency of 22% for the perovskite module with an active area of 26 cm<sup>2</sup> was achieved.

### Biography

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**Prof. Md. K. Nazeeruddin**  
École Polytechnique Fédérale de Lausanne, EPFL, Switzerland.

**Nazeeruddin** is a Professor of Chemistry at the EPFL Sion campus, and his current research at EPFL focuses on Perovskite Solar Cells and Light-emitting diodes. He has published more than 785 peer-reviewed papers, ten book chapters, and he is the inventor/co-inventor of over 90 patents. His work's high impact has been recognized by invitations to speak at over 300 international conferences. He appeared in the ISI listing of most cited chemists and has more than 150'335 citations with an h-index of 171. He teaches the "Functional Materials" course at EPFL and Korea University. According to the Web of Science in 2016, he is the 5th most cited chemist in the world and is one of the 19 scientists identified by Thomson Reuters as the World's Most Influential Scientific Minds in 2015. He has been named Thomson Reuters "Highly Cited Researcher" from 2014 to 2021 and listed among the Top 10 researchers in the perovskite solar cell research field by the Times Higher Education. He is directing and managing several industrial, national, and European Union projects. He has been appointed as World Class University professor by Korea University and Adjunct Professor by King Abdulaziz University, Jeddah. He has been elected to the **European Academy of Sciences, Fellow of The Royal Society of Chemistry, and Fellow of Telangana Academy of Sciences and has won the 34th Khwarizmi International Award (KIA) Laureate in Fundamental Sciences, 2021.**

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# New Age of Catalyst Discovery: Smart and Programmable Crystalline Sponges

Omar Farha

## Abstract

This talk will focus on metal–organic frameworks (MOFs) from basic research to implementation and commercialization. MOFs are a class of porous, crystalline materials composed of metal-based nodes and organic ligands that self-assemble into multi-dimensional lattices. In contrast to conventional porous materials such as zeolites and activated carbon,

an abundantly diverse set of molecular building blocks allows for the realization of MOFs with a broad range of properties. We have developed an extensive understanding of how the physical architecture and chemical properties of MOFs affect material performance in applications such as catalysis.

## Biography



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Omar K. Farha is the Dow Chemical Company Professor and Charles E. and Emma H. Morrison Professor in Chemistry at Northwestern University and an Associate Editor for ACS Applied Materials & Interfaces. His current research spans diverse areas of chemistry and materials science ranging from energy to defense-related challenges. Specifically, his research focuses on the rational design of metal-organic frameworks (MOFs) for applications sensing, catalysis, storage, separations, and water purification. His research accomplishments have been recognized by several awards and honors including a fellow of the European Academy of Sciences, a Fellow of the Academy of Arab Scientists, Kuwait Prize, Japanese Society of Coordination Chemistry “International award for creative work”, the Royal Society of Chemistry “Environment, Sustainability and Energy Division Early Career” Award, the American Chemical Society “The Satinder Ahuja Award for Young Investigators in Separation Science” and “ACS ENFL Emerging Researcher Award”, and an award established by the Department of Chemistry at Northwestern University in his honor: the Omar Farha Award for Research Leadership “awarded for stewardship, cooperation and leadership in the finest pursuit of research in chemistry” and given annually to an outstanding research scientist working in the department. Prof. Farha has more than 550 peer-reviewed publications, holds 17 patents, 75,000 citation and h-index of 132 (google Scholar), and has been named a “Highly Cited Researcher” from 2014 to 2021. Prof. Farha is the co-founder and president of NuMat Technologies, the first company to commercialized an engineered system-level product enabled by Metal-Organic Framework Materials.

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## New advances in analytical nanometrology for nanomaterials

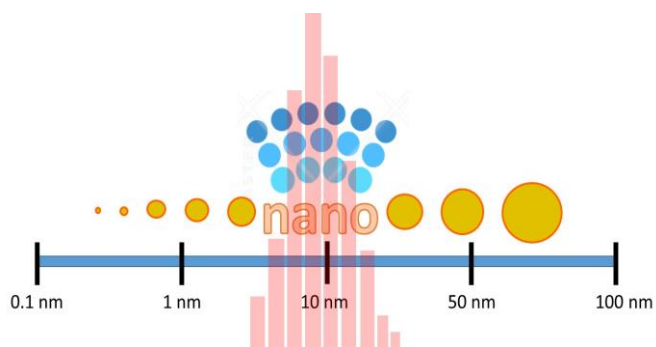
Ángel Ríos <sup>1,2</sup>

<sup>1</sup> Department of Analytical Chemistry and Food Technology, University of Castilla-La Mancha, 13071, Ciudad Real, Spain

<sup>2</sup> Regional Institute for Applied Chemistry Research (IRICA), University of Castilla-La Mancha, 13071, Ciudad Real, Spain

### Abstract

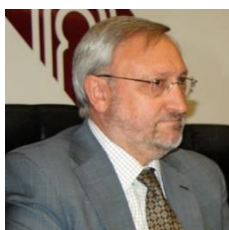
Nanoscience and Nanotechnology (N&N) have had a deep impact in Analytical Chemistry [1]. First, because the interesting use of nanomaterials as analytical tools for developing or improving analytical processes, with especial impact in sample treatment and new detection units, (bio)chemical sensors mainly [2]. Second, because the interest to monitoring or determining nanomaterials in different types of samples [3]. This double interest deals with analytical approaches from the detection and characterization to the determination of nanomaterials in different samples. Particularly, the determination of nanomaterials (nanoparticles in many cases), in specific types of samples is a recognized challenge in today analytical science [3,4]. Analytical nanometrology (ANM) merges as the metrology applied to nanomaterials for analytical purposes. In this field nanomaterials are considered as analytes, and the analytical goal is the development of analytical strategies for the analysis of specific samples in which they are present. This approach is different than the proper characterization of nanomaterials, and it can be seen as full analytical processes, or screening methods for a rapid information about the presence of nanomaterials in particular samples. For this last objective direct spectroscopic and electrochemical techniques can be very useful, whereas for full analytical processes commonly instrumental separation techniques must be involved [5].



### Recent Publications

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2. Corps A.I., Feras A., Guzmán F.J., Rodríguez R.C., Ríos A., *Trends Environ. Anal. Chem.*, 27 (2020) e00097.
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5. Adelantado C., Ríos A., Zougagh M., *Talanta*, 219 (2020) 121385.

### Biography



Angel Ríos is Full Professor of Analytical Chemistry in University of Castilla – La Mancha (Faculty of Chemistry, Ciudad Real, Spain). He received his PhD (1983) from the University of Córdoba. His research interests dealt with automation, simplification and miniaturization of chemical measurement processes, particularly the development of chemical sensors integrated in screening analytical systems or miniaturized arrangements, and the use of nanomaterials for analytical purposes. He has published more than 300 articles in international journals. Its research activity has also been addressed to metrology in chemistry, analytical nanometrology, and the development of new tools for the validation of qualitative analytical methods in the framework of quality assurance programmes. His H-index is 42.

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# Novel Nanocomposites for Solid Phase Microextraction of Trace Species from Environmental Samples

Mustafa Soylak

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Technology Research and Application Center (ERUTAUM), Erciyes University, Kayseri, Turkey  
Turkish Academy of Sciences (TUBA), Cankaya, Ankara, Turkey*

## Abstract

The microextraction of organic, inorganic species and nanoparticles from environmental samples has important place for the preconcentration and separation of them prior to their instrumental detection. Solid phase microextraction is an important technique at separation-preconcentration studies. The preparation and characterization of novel nanosized composites including carbon nanotubes, modified carbon nanotubes, nanocomposites, titanium dioxide nanoparticles and magnetic nanoparticles (MNPs), nanoflowers etc. for solid phase microextraction, which has resistant for acid and bases; high surface area, high adsorption capacity, useable many times

without any losses its adsorption properties are very popular recent studies in analytical chemistry.

The fabrication, characterization and usage of novel nanosized materials for solid phase microextraction of organic, inorganic and nanoparticle species for their some industrial applications have been discussed.

## Biography



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Prof. Mustafa Soylak is working on Environmental Analytical Chemistry, Nanotechnology, Nanomaterials, Nanocomposites, Separation/ Preconcentration Techniques including Solid Phase Extraction, Coprecipitation, Cloud point extraction, membrane filtration, speciation and microextraction of trace organic and inorganic species. He has over 660 papers, his H-index is 103. He is now Professor at Erciyes University, Faculty of Sciences, Department of Chemistry, Kayseri-Turkey. He has Ilim Yayma Award (2021), TUBITAK Science Award (2020) and TUBITAK Encouragement Award (2001) in Basic Sciences. He is a member of Turkish Academy of Sciences (TUBA).

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## Hereditary metabolic diseases

Layachi Chabraoui

*Faculté de Médecine et de Pharmacie de Rabat, Ex-Chef du Laboratoire Central de Biochimie et du Centre d'Etude des Maladies Héréditaires du Métabolisme – CHU Ibn Sina Rabat, Maroc.*

### Abstract

Hereditary metabolic diseases are rare pathologies when considered one by one, but taken together they are relatively frequent diseases. In our experience at the center for the study of hereditary metabolic diseases at the CHU Ibn Sina in Rabat, we were interested in the group of amino-acidopathies and that of lysosomal storage diseases. Among the amino-acidopathies the most common is phenylketonuria (more than 400 cases detected) followed by type 1 tyrosinemia and then homocystinuria. However, other aminoacidopathies such as leucinosi and urea cycle abnormalities are not uncommon. dozens of cases have been diagnosed and the patients followed up. As far as lysosomal storage diseases are concerned, mucopolysaccharidosis are the most frequently diagnosed with mucopolysaccharidosis type 1 at its head (more than 200 cases diagnosed) followed by Hunter's disease, Morquio disease type A, San -filippo diseases and Maroteaux-Lamy disease. Among sphingolipidoses the most common is Gaucher's disease, but

the other pathologies (Niemann-Pick A and B, GM1 and GM2 gangliosidoses, Fabry disease, X-linked adrenoleukodystrophy, metachromatic leukodystrophy, Krabe disease) are not exceptional. .

In conclusion, the collaboration between our team and the pediatricians of the various Moroccan university hospitals has made it possible to develop a notional network of patients care. consequently inherited metabolic diseases are no longer considered orphan diseases.

### Biography



Dr Layachi CHABRAOUI

Biologiste médical. Ancien interne des hôpitaux de Lyon. Titulaire des diplômes de spécialités de Biochimie Clinique, Hématologie, Bactériologie et Virologie, Immunologie et Parasitologie.

Ex-Professeur à la Faculté de Médecine et de Pharmacie de Rabat

Ex-Chef du Laboratoire Central de Biochimie et du Centre d'Etude des Maladies Héréditaires du Métabolisme – CHU Ibn Sina Rabat

Président de la Société Marocaine de Chimie Clinique et Biologie Médicale (SMCC)

President of de The Moroccan Society for Study of Inborn Errors of Metabolism (MSSIEM)

Président de la Fédération Internationale Francophone de Biologie Clinique et Médecine de Laboratoire (FIFBCML)

Past-President of the Arab Federation of Clinical Biology (AFCB)"

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# Defluorination and Adsorption of Tetrafluoroethylene (TFE) on $\text{TiO}_2(110)$ and $\text{Cr}_3\text{O}_3(0001)$

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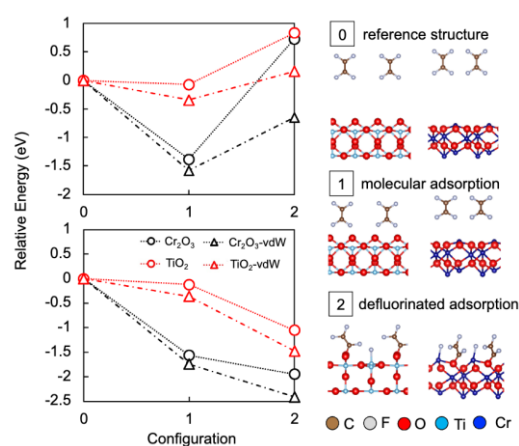
<sup>6</sup>Laser Technology Laboratory, Hirotec Co., Ltd., Saeki-ku, Hiroshima 731-5197, Japan

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## Abstract

Being able to join dissimilar materials allows design engineers to create new structures or parts with tailor-engineered properties, e.g., exhibiting high temperature resistance in one area and good corrosion resistance in another. Notable examples include polymer-metal composites used in various specialized applications. All these applications fundamentally start with polymer adhesion on metal surfaces. We showed that metal oxide surfaces catalyze the formation of intermediate defluorinated tetrafluoroethylene (TFE) radicals, resulting in enhanced binding on the corresponding metal oxide surfaces (cf., Figure: 1). As expected, reactivity of the corresponding metal oxide surfaces depends on the oxygen coordination of metal surface atoms. Thus, introducing oxygen vacancies and non-ionizing radiations to form intermediate radicals could promote binding of polymers to metals and metal-oxide surfaces, allowing for better materials design. This could find significant applications not only in joining dissimilar materials, but also allow for flexibilities in realizing materials with the desired (pre-determined) characteristic properties. Further details will be presented at the meeting.

**Figure: 1:** (Right panel) A depiction of TFE interaction with  $\text{TiO}_2(110)$  and  $\text{Cr}_2\text{O}_3(0001)$  in 3 different configurations, viz., reference structure (0), molecular adsorption (1), and defluorinated adsorption (2) on the corresponding surfaces. Upper left panel shows the corresponding relative energies for optimized adsorbates on frozen surfaces. Lower left panel shows the corresponding relative energies upon surface relaxation. (Note stronger TFE adsorption on  $\text{Cr}_2\text{O}_3(0001)$  than on  $\text{TiO}_2(110)$ . Energy trends remain even after implementing van der Waals (vdW) correction). (Taken from [1]).



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2. N. Arrousse et al., *J. Tawain Inst. Chem. Eng.* 120 (2021) 344-359.
3. Y. Tsuda et al., *Sci. Rep.* 11 (2021) 3906-1-8.
4. J.S. Gueriba et al., *e-J. Surf. Sci. Nanotech.* 18 (2020) 307-311.
5. Y. Hikita et al., *Optik* 224 (2020) 165529-1-7.

## Biography



### Wilson Agerico Diño

1999: Doctor of Engineering, Osaka University.  
1999-2001: Japan Society for the Promotion of Science (JSPS) Special Invited Foreign Researcher Fellow.  
2001-2002: The University of Tokyo, Institute Industrial Science Researcher.  
2002-2002: Academia-Industry Collaborative Researcher.  
2002-2004: Advanced Computational Science and Technology-Japan Science and Technology Agency (ACT-JST) Researcher.  
2004-present: Adjunct Professor, De La Salle University, Philippines.  
2004-2005: Specially Appointed Research Asst., Osaka University Nano Center.  
2005-2007: Specially Appointed Assoc. Prof., Osaka University Nano Center.  
2007-2010: Assoc. Professor, Osaka University, Graduate School of Science.  
2010-present: Assoc. Professor, Osaka University, Graduate School of Engineering.  
2010-present: Assoc. Professor, Osaka University, Center for Atomic and Molecular Technologies (concurrent).

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# Synthesized Functional Materials for Industrial and Environmental Applications

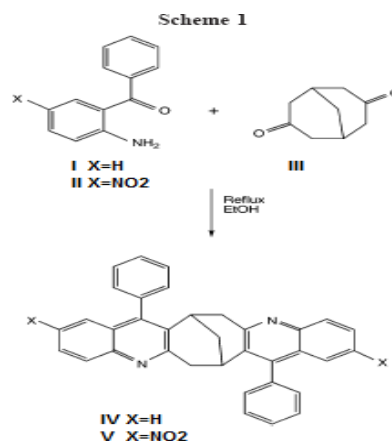
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## Abstract

The large environmental challenge that the world faces today is the scarcity of water. Definitely, water is the significant feature in the population/resources equation where water resources in the world are limited and the world's population has continued to rise. The increasing interest in suitable wastewater treatment technologies has generated the urgent need for alternative non-organic adsorbents due to their innate merits in terms of raw abundance, removal efficiency, and operational safety. Organic materials, one of the most important adsorbent systems, have been widely used for removal of toxic substances. However, the large-scale application of organic adsorbents is hampered by the concerns of limited removal efficiency, high production cost, and safety issues. In this regard, the development of new materials is urgently needed for the next generation adsorbent technologies.

Non-organic (TiO<sub>2</sub>, CuO, etc.) nano-adsorbents for the removal of heavy metals and organic pollutants have attracted great attention as emerging low-cost and high removal efficiency technologies for large-scale applications. However, the development of these approaches is hindered by the limited choice of high-performance adsorbent materials.



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7. Mohammed M. Al-Mahadeen, Anwar G. Jiries, Salah A. Al-Trawneh, Solhe F. Alshahateet, Ahmad S. Eldouhaibi and Suresh Sagadevan. *Chemical Physics Letters*, 2021. 783. 139053.
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9. Suresh Sagadevan, J. Anita Lett, Selvaraj Vennila, P. Varun Prasath, Gobi Saravanan Kaliaraj, Is Fatimah, Estelle Léonard, Faruq Mohammad, Hamad A. Al-Lohedan, Solhe F. Alshahateet, Chew Tin Le. *Chemical Physics Letters*, 2021, 771, 138527.
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## Biography



Prof. Solhe F. Alshahateet received his PhD from University of New South Wales (UNSW), Australia in 2003. He holds a full professor position in the Department of Chemistry, Mutah University, Jordan. He served in various positions such as President of Aqaba University of Technology in Jordan. He has been a Visiting Scientist, in the ICES & A\*STAR, Singapore, and in the Department of Chemistry, the University of South Florida, USA. He was as a Visiting Fellow at the University of New South Wales, Australia.

He has 25 years of teaching and 30 years of research experience. He has published more than 90 papers in internationally reputed journals with sound knowledge of research in his field. His field of the research area is focused on crystal engineering and supramolecular chemistry involving industrial applications.

He is an expert group leader as well as an associate member of various scientific societies, reorganizations, and professional bodies. He has been involved as the editor/ editorial board member/ reviewer for various high-impact factor journals. He has delivered many lectures as the chairperson and also contributed Plenary, Keynote, and Invited lectures worldwide. At present, his google scholar citation is 1,134 h-index is 21, and i10 index is 38. As well as Scopus citations is 729 and h-index is 17 and also, his Research score (RG) is 33.15 which strongly endorses his high research productivity.

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# Cellulose and chitin biopolymers for sustainable bioproducts preparation

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## Abstract

Cellulose and chitin are two biopolymers widely available as biomass. Cellulose is a homopolymer composed of repeating units of  $\beta$ -D glucopyranose linked together by 1 $\rightarrow$ 4 glycosidic bonds (Figure 1-a). A single cellulose polymer chain is comprised of several hundreds to over ten thousand repeating glucose units. Because of the extensive intra- and interchain hydrogen bondings and van der Waals forces, cellulose chains are assembled into highly crystalline micro-fibrils. Cellulose is a promising candidate as a raw material for the preparation of various “green” materials such as fibers, films [1] (Figure 1-b), food casing, membranes, porous materials [2] (Figure 1-c), nanocrystals [4], and sponges, which are currently predominantly prepared from petroleum based synthetic polymers. Chitin is made of  $\beta$ -(1 $\rightarrow$ 4)-linked 2-deoxy-2-acetamido-D-glucose units (Figure 1-d). It is obtained from crustacean shells, skeletons of insects, fungi, etc., and is applicable in various fields including biomedicine [5].

Because biopolymers do not melt, their transformation to bioproducts requires dissolution in a solvent system which does not lead to polymer degradation. In this presentation, we will review emerging applications of cellulose and chitin to prepare sustainable bioproducts as potential alternatives to non-renewable and non-biodegradable polymers.

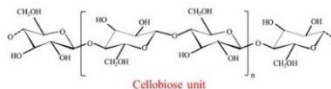


Figure 1-a. Structure of cellulose.

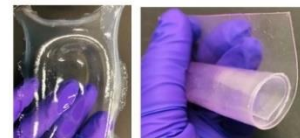


Figure 1-b. Hydrogels and films prepared from cellulose.

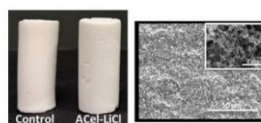


Figure 1-c. Aerogels prepared from cellulose.

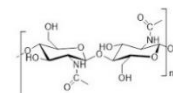


Figure 1-d. Structure of chitin.

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## Biography



Dr. Noureddine Abidi is Professor of Biopolymers and Bioproducts and Director of the Fiber and Biopolymer Research Institute at Texas Tech University. His focus is on the chemistry of biopolymers, particularly cellulose, and their transformation to advanced materials. He holds a “Habilitation à Diriger les Recherches” from the University of Haute Alsace in France and a Ph.D. from the University of Montpellier II in France. Dr. Abidi has generated 134 refereed journal publications and book chapters, 3 books, more than 160 presentations, 7 patents/provisional patents. Abidi has served as PI or co-PI on funded research grants totaling more than \$17M. He received several awards such as Texas Tech University Chancellor’s Council Distinguished Research Award, Texas Tech University Outstanding Research Award, Texas Tech University President’s Mid-Career Award, Fulbright US Scholar Award, Texas Tech University Integrated Scholar Award, American Chemical Society Cellulose and Renewable Materials Division Fellow.

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# Local structure in mixtures of ionic liquid with molecular solvent: vibration spectroscopy, NMR and molecular dynamics simulation

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## Abstract

Ionic liquids (IL), being low-temperature melts by their nature, are of considerable scientific interest due to a number of their unique properties. The practical application of ILs, especially in electrochemistry, has significantly expanded due to the use of mixtures with molecular solvents of various natures. A detailed microscopic description of the local structure in such systems, depending on the nature of its constituent components and the composition of the mixture, remains an urgent problem of modern chemistry of liquid state. In this chapter, we review the results obtained by vibration spectroscopy and NMR chemical shift on the variations in microscopic structure as a function of mixture composition. We point out the controversy about the assignment of the imidazolium C-H stretching vibration mode and systemized its red shift as associated with the outcome of the competition of the solvent molecules and the anions for the C-H bond. Furthermore, the introduction of the double difference relative chemical shift helps us to compare and rationalize the  $^1\text{H}$  chemical shift literature data obtained in various ionic liquid/solvent mixtures. The most significant changes in the  $^1\text{H}$  chemical shift occur at low ionic liquid content. Dilution and stacking interactions between the cation rings induce negative variation of the  $^1\text{H}$  relative chemical shift. As the solvent and the ions can establish hydrogen bond interactions, when these interactions are weaker, almost equal or higher than the interionic interactions, this results in negative, almost equal to zero or positive values of the relative chemical shift, respectively.

Moreover, starting from the idea that the nearest neighbor anions or solvent molecules of the C-H bond are strongly influencing the associated C-H vibration mode and the  $^1\text{H}$  chemical shift, we used molecular dynamic simulation and the nearest neighbor approach to calculate radial distribution and spatial radial distribution functions, and to define two statistical distance descriptors of the hydrogen bond structure C-H... X (X being atom of either the anion or of the solvent) to characterize the local structure around the C-H bond of the cation. The mole fraction dependence of these statistical properties, calculated by taking only the nearest neighbor into account, correlates consistently with spectroscopic data. Indeed, these descriptors are relatively unaffected in the ionic liquid mole fraction ( $x_{IL}$ ) range between 1.0 and 0.3, while with further decrease of  $x_{IL}$  a large effect on these descriptors is observed. These changes are compatible with the physical picture that the solvent molecules compete with the anions to occupy positions close to the cation ring hydrogen atoms. They are associated with the expected weakening of the cation – anion interactions in the chosen solvents. These results are in good agreement with the behavior of the  $^1\text{H}$  chemical shift and the C-H vibration mode as a function of  $x_{IL}$ . Furthermore, the results of the MD simulations point out the importance of the anion – solvent interactions in weakening the interionic ones.

## Biography



Abdenacer Idrissi received his M.Sc. in Physics from the University of Mohammed I (Oujda, Morocco), and his PhD in Physical Chemistry from the University of Lille (France), where he is a Professor of Chemistry and Physics at the present time. His research interest is focused on the understanding of the structure and dynamics of fluids including ionic liquids and supercritical fluids. The main problematics are the understanding of the cellulose dissolution, the control of the polymorphic forms of the bioactive molecules and the characterization of the short time dynamics of the dyes used in solar cells. These research are carried out using a combination of an array of spectroscopic technics (IR, Raman, neutron scattering, time resolved spectroscopy) with molecular dynamics simulation.

# Opportunities and Challenges in the Development of Phosphate based Materials for Large-Scale Electricity Storage

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## Abstract

Research interest in large-scale electricity storage, especially sodium-ion batteries (NIBs) has increased rapidly because of eco-friendliness and environmental friendliness of sodium compared to lithium [1]. The NIBs are a very promising alternative for energy storage, such as lithium-ion batteries. The low-cost and massive sources of sodium make them attractive for high mass batteries. Moreover, the uncertainty related to lithium resources and their suppliers could become a major problem in near future. Moreover, intense studies on electrodes materials and electrolyte are required to realize satisfactory cyclability for various negatives and positives electrodes for practical applications in NIBs [2,3].

Recently, several companies in the world are now developing NIBs for practical use based on high abundant materials. In this presentation, our recent progress and future aspects in the electrode's materials are reviewed and discussed towards high performance lithium and sodium-ion batteries for large scale energy storage, e.g. combined with large-scale photovoltaic solar farms envisioned over the Sahara Desert.

Throughout this presentation sheds light on NIBs: carbonaceous materials, phosphates (as sodium insertion materials), alloy/compounds and so on. These electrode materials have different reaction mechanisms for electrochemical processes. Moreover, not only active materials but also binders, current collectors, electrolytes, electrode/electrolyte interphase and its stabilization are essential for long cycle life NIBs. In the view point of the practical use of batteries, we will present and discuss the importance not only of electrodes materials but also electrolyte and binder chemistry to improve the cycle-life and cost-friendliness energy for large-format NIB environmentally-friendly and low cost energy with motivation to develop new battery based on inexhaustible sources such as sodium, phosphate, carbon, iron, etc.

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## Biography



Mouad Dahbi, is a Professor in Materials Science, Energy and Nanoengineering (MSN) Department at Mohammed VI Polytechnic University since September 2017 and Editor in Scientific African Journal (Elsevier). Received Maitrise degree in chemical process from Tangier Faculty Science and Technique, Morocco. Graduated top of the class from The University of Lille (2009). He earned Ph.D. in Chemistry and Electrochemistry from the University of Tours, France where his doctoral work was focused on the high-power asymmetric lithium-ion capacitor in nonaqueous electrolytes. He was then a postdoctoral researcher at Tokyo University of Science, Japan from 2013 to 2015. In 2015, Dahbi was promoted to Professor (Assistant) at Tokyo University of Science and a Project Assistant Professor of the Elements Strategy Initiative for Catalysts and Batteries (ESICB) at Kyoto University, Kyoto, Japan. His work was focused on developing materials for negative electrodes and electrolytes for lithium-, sodium- and potassium-ion batteries, synthesis and characterisation of materials and electrochemical evaluation of synthesized materials with due correlation. His current research focuses on developing high-energy density electrode materials system for efficient energy storage technology and low-cost batteries based on the abundant elements in Earth's Crust. Professor Dahbi has authored/co-authored over 50 Peer Reviewed Articles, awarded two times best poster prize from International Society of Electrochemistry. He is also an external expert in French National Research Agency (ANR), RSIF PhD scholarship expert reviewer (PASET), and peer reviewer of many journals: *Electrochemistry Communications (ELSEVIER)*, *Advanced Energy Materials (WILEY-VCH Verlag)*, *ACS Applied Material Interface (American Chemical Society)*, *Chemistry Letters (Chemical Society of Japan)*, *Journal of Materials Chemistry A (Royal Society of Chemistry)*.

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# X-ray hierarchical investigation of type I collagen in tissue engineering and pathology

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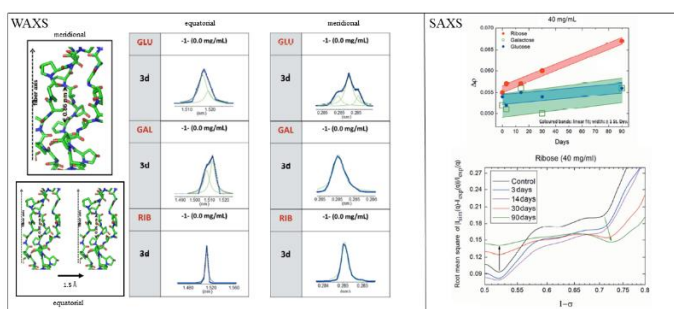
<sup>3</sup>Tissuegraft srl., Novara Italy

<sup>4</sup>Paul Scherrer Institut, Villigen PSI, 5232, Switzerland

## Abstract

Glycation is the main issue of aged tissues and diabetes, as it is the most important long-term reaction that leads to the structural and functional alterations of biological tissues. It is due to a hyperglycemic condition, more than 110mg/dL of sugar in blood, over a long period and consists of the non-enzymatic formation of sugar bridges between sugars and biological macromolecules, leading to loss of physiological and mechanical functions in tissues and organs. As collagen is the main fibrous protein of the extracellular matrix it is widely glycated both in diabetes and when aging. Although the impact of glycation on nano-scale collagen fibrils is well established, less is known about the effects at the molecular level. Furthermore, there is a lack of ex vivo model systems. Our studies combine ex vivo X-ray scattering (SAXS/WAXS) imaging techniques for the characterization of intra- and inter-molecular parameters of collagen in decellularized bovine pericardial tissues, prepared at the University of Piemonte Orientale. Samples were soaked in different sugar solutions, d-glucose and d-galactose as well as d-ribose, at increasing concentrations (0, 2.5, 5, 10, 20 and 40 mg ml<sup>-1</sup>), and incubated at 37°C for 3, 14, 30 and 90 days. We found three different regimes related to glucose concentration. Moreover, we observed that in collagen there are similar changes when incubate with glucose and galactose. Our data show that these type of sugars mainly affect the lateral packing of collagen molecules. Regarding ribose, it appears to be faster in glycation than the other sugars, leading to a larger effect on the nanoscale packing.

Figure:



## Recent Publications

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3. De Caro, L., Terzi, A., Fusaro, L., Altamura, D., Boccafosci, F., Bunk, O. & Giannini, C. (2021). IUCrJ 8, 1024-1034

## Biography



Dr. Alberta Terzi has a post-doc research fellow at the Institute of Crystallography (IC) of CNR (National Research Council), in Bari, Italy. Her main research interests are in the field of X-rays (SAXS, WAXS) structural characterization of extracellular natural polymers (i.e. type I collagen) in physiologic and pathologic tissues and their application for the development of engineered tissues for regenerative medicine.

During her research career, she performed experiments at The SwissLight Source (SLS) at Paul Scherrer Institut and she worked for six months at REMODEL – Regenerative, Modular & Developmental Engineering Laboratory of the National University of Ireland, Galway. She received the “Best PhD thesis award 2019” from the Italian Society of Synchrotron Light (SILS).

Dr. Terzi is co-author of 10 scientific publications in ISI journals and 2 proceedings (H-index: 5)

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# Improvement of Molecular Metal-Ligand Catalysts via fast Catalytic C-H bond Functionalization of pyridines and Phosphine Ligands

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## Abstract

Catalysis with Metal-Ligand complexes has been shown to decrease the energy of combination of molecules, or the transformation of renewables, to form useful derivatives, without the use of toxic reagents and with atom economy.

Polypyridines are key ligands for photocatalysts such as  $\{Ru(bipy)_3\}^{2+}$ <sup>[1]</sup> and to promote selective catalytic addition of radicals. In parallel Phosphine ligands have been shown to control the activity of molecular metal catalysts for numerous useful catalytic reactions. Fast modifications of these P and N ligands via C-H bond functionalization<sup>[2,3]</sup> have potential to create quickly new and more efficient catalysts for useful transformations.

The lecture will present several aspects of C-H bond functionalization of pyridines and phosphines.

### i), Pyridines

-Ruthenium(II) catalysts in water solvent without surfactant can promote  $sp^2$ C-H bond activation and can be directed to produce polyheterocycles and even hexa(hetero)arylbenzenes leading to simple metal complexes.

-Copper catalysts can be applied for the  $C(sp^3)$ -H bond functionalization of pyridine alkyl groups using in situ generated radicals to produce functional pyridines or heterocycles<sup>[4,5]</sup>.

### ii) Phosphines

-Ruthenium(II)-catalyzed selective  $sp^2$ C-H bond alkylations with alkenes of arylphosphine oxides can be controlled to give access to bifunctional phosphines with carboxylic group<sup>[6]</sup>.

-Rhodium(I) catalysts promote the regioselective mono or dialkylation of the biaryl ortho' C-H bonds of phosphines to produce functional dialkylated phosphines even with long

chain<sup>[7]</sup>.

-The modified phosphines will be shown to increase tremendously the activity of catalysts for carboxylation with  $CO_2$  of arylhalides with photocatalyst<sup>[7]</sup>

-New Bulky dialkenyl phosphines with Palladium salt will be shown to efficiently catalyze the amidation of arylchlorides via Cross coupling of C-N bonds. <sup>[8]</sup>

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## Biography



**Pierre H. Dixneuf** created a CNRS-University center of Organometallics and Catalysis in Rennes innovating towards Green and Sustainable Catalysis successively via selective transformations of alkynes, incorporations of  $CO_2$  such as in vinylcarbamates and carbonates, ruthenium-vinylidenes and -allenylidenes in catalysis, creation of alkene metathesis catalysts from ruthenium-allenylidenes and catalytic transformations of plant oils. He is now contributing to Green C-H bond activation/functionalization using Ru(II) catalysts operating in water or Rhodium catalysts for the activation of molecules and ligands such as Heterocycles, Pyridine and Phosphine ligands to improve Catalyst activity. He has co-authored 470 publications and reviews, co-edited 7 books with a Hindex = 70. His work has led to various prizes : A. v Humboldt prize for Research 1990, French Le Bel SFC award and Grignard-Wittig Prize (GDCh) in 2000, Institut universitaire de France member since 2000, academie des sciences IFP prize, Sacconi medal (Italy) in 2006, Spanish and Chinese Society of Chemistry award in 2014, member of the European Academy Sciences and arts in 2014, of Portugal academy of sciences in 2017 and of National Academy of Sciences, India in 2020. He is currently a Research and Emeritus Professor at the University of Rennes.

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# Particle Technology for Science, Technology, Economic, and Education

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## Abstract

Particle technology has great potential applications in various industrial fields. It is important to develop new synthesis methods in producing particles having controlled characteristics; includes optimum size distribution, morphology, crystallinity, and composition. To be industrially relevant, the process should be simple, cost-effective, continuous process, and high production rate. In this presentation, the recent researches in synthesizing of particles and composites, surface/interface modification of materials, and their applications in industry, as well as applications in education and potential uses from techno-economic analysis, are reviewed. Some novel techniques for preparing particles and composites were developed. Oxides such as porous particles,

as a model material (i.e. for adsorption, photocatalytic applications, etc.), were fabricated from either its colloidal nanoparticles or oxide source. Necessary techniques for making composites are introduced as well. Some applications are described. Potential uses for delivering particle technology from education perspective to students are also explained.

**Keywords:** *Particle technology, Chemical Engineering, Material Science*

## Biography



Asep Bayu Dani Nandiyanto is an Associate Professor in the Department of Chemistry Education at Universitas Pendidikan Indonesia. He received B.Eng (2005) in the Department of Chemical Engineering at Institut Teknologi Bandung, Indonesia. He received M. Eng. (2008) and Dr. Eng. (2011) in the Department of Chemistry and Chemical Engineering at Hiroshima University, Japan. After graduation, he was selected as a prestigious JSPS (Japan Society for the Promotion of Science) postdoctoral fellow (2011-2013). He was also a Visiting Professor in The Center of Excellence in Nanotechnology (CENT) at King Fahd University of Petroleum and Minerals (KFUPM)-Saudi Arabia (2011), an Assistant Professor in Chemical Engineering at Hiroshima University-Japan (2013-2014), a visiting scholar at Tokyo Institute of Technology (TIT)-Japan (2018), and a visiting lecturer at Universiti Tun Hussein Onn Malaysia (UTHM)-Malaysia (2021). He got a Fulbright US-Ristek Dikti as a visiting scholar at Virginia Commonwealth University (VCU) US (2018). Nandiyanto's research is in the area of particle technology, specifically the production of fine particles, starting from gas, aqueous, organic, or colloidal precursors via liquid-phase and gas-phase (aerosol) routes, and their applications to the development functional materials (e.g. optical, medical, catalyst, energy, and environmental technologies). He has published more than 8 patents and 35 copyright, 14 books, 2 book chapters, 3 review papers, 201 peer-reviewed scopus-indexed article journals and 61 proceedings. Further, since his research has touched many aspects of particle science and technology and applicable for industrial applications, he has received several awards and honors (more than 33 awards), such as the Society of Chemical Engineers Japan Award for Outstanding Young Researcher (2013) and the George Klinzing Award from American Institute of Chemical Engineer (2014). He is now in the list of top 10 best scientist in Indonesia (SINTA Ristek BRIN).

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# Electroactive low dimensional materials for advanced electrocatalysis and sensors applications

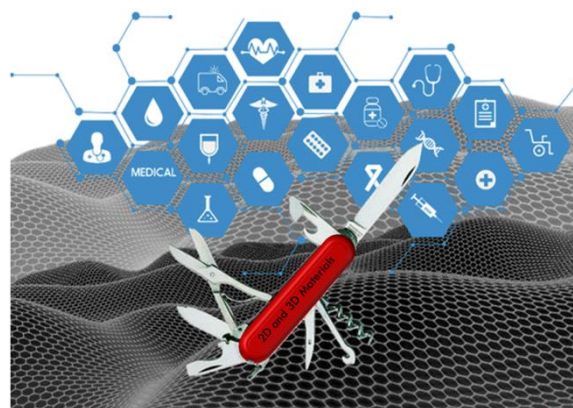
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## Abstract

This presentation focuses on multifunctional 2D and 3D materials and structure/property relationships to control graphene-like and transition metal dichalcogenides nanostructure to be used as three-dimensional hybrid electrodes for hydrogen evolution reaction, sensors and supercapacitors fabrication. We developed a platinum-free electrocatalyst (3D MoSe<sub>2</sub> rose-like structure) for the hydrogen evolution reaction (HER) as a first step for large-scale production and application of water splitting devices. Recently, we demonstrated a facile strategy to synthesize decorated molybdenum oxide (MoO<sub>2</sub>) nanoparticles on graphene oxide (GO) layers. The hybrid membrane exhibits excellent performance for HER. In the same endeavor, we showed a novel strategy to synthesize vertically aligned porous MoSe<sub>2</sub>. This designed architecture based on an oriented vertical structure possesses fully exposed active edges and open structures for fast ion/electron transfer, leads to remarkable HER activity with a low onset potential and a 3D binder-free without the need for a transferring step or a conductive additive to build the electrodes. This work opened a new class of nanomaterials in my lab, in which we start the fabrication of photoanodes via in-situ reduction-graphitization approach toward efficient solar hydrogen evolution. For sensing applications, we investigated the direct effect of GO sheets sizes on biosensor performance. For that, we developed a procedure yielding graphene flakes with various amounts of oxygenated defects by using a double liquid phase extraction technique (DLPE) assisted by cholesterol-based polymers and a green method to avoid the use of chemicals and heat to promote the coprecipitation and the reduction of GO and GO based foam (membranes) immobilized aptamer as a highly selective hormone removal. Recent emphasis is on controllable synthesis and development of one-dimensional oriented CdS-based nanoarray photoanodes for efficient solar water splitting / solar hydrogen.

*Figure: Many uses of 2D and 3D materials, with applications in sensing, biomedical diagnostics, catalysis, functional materials, electronic devices and processes, and energy-related technologies.*



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4. a) Huang, S. et al. Highly Stable Ag–Au Core–Shell Nanowire Network for ITO-Free Flexible Organic Electrochromic Device. *Advanced Functional Materials* 31, (2021). b) Yu, T. et al. 3D Nanoscale Morphology Characterization of Ternary Organic Solar Cells. *Small Methods* 6, (2022).
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## Biography



Mohamed Siaj received his Ph.D. in Chemistry at Laval University, Quebec, Canada. Following postdoctoral training at the Colin Nuckolls group at Columbia University, New York, a leading institution in 2D materials research, Siaj joined the Department of Chemistry at université de Quebec à Montréal as an assistant professor in 2008, and he is holding the rank of full professor since 2016. He is the Director of the Research Center on Nanomaterials and Energy (NanoQAM), (<http://nanoqam.ca/wp/en/>), the adjunct Director of Quebec Centre for Advanced Materials center (QCAM) (<http://cqmf-qcam.ca>) and Director of Analysis of Materials and Microsystems Regrouping (RAMM), Faculty of Science, UQAM. Prof. Siaj has extensive experience in different areas of surface science and nanomaterials-based graphene. Siaj's group activities focus on the growth, synthesis, processing and characterization of advanced nanostructured electroactive materials and their integration into chemical and biosensors and 2D-Materials for Energy Harvesting and Storage Applications.

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## Interlinkages between climate change and air pollution

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CNRS, Orléans (France), University Mohammed V, Rabat (Morocco), Shandong University, Qingdao/Jinan (China)

### Abstract

Climate change is arguably the most significant threat facing humanity. The use of fossil fuels is the main cause so far. This climate change is inevitable due to the lack of tangible action taken so far. In addition, future emissions of greenhouse gases, particularly CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O, pose a major threat. The Paris Agreement, although endorsed by many countries, has not produced the expected greenhouse gas emission reductions - CO<sub>2</sub> emissions are not falling to meet the goal of containing the rise of the planet's average temperature well below 2°C compared to pre-industrial levels and even less than the objective of +1.5°C.

The same use of fossil fuels, along with other aggravating factors, has led to deteriorating air

quality, first in developed countries and now in developing countries. The health impact of fossil fuel use due to deteriorating air quality is immense – current estimates point to more than 2 million premature deaths each year, mostly in developing countries. The deterioration of air quality is now most visible in Asia. It is very likely that Africa and Latin America will follow the same pattern of deteriorating air quality if they pursue the same economic ends. And it will certainly endanger other lives in the future.

The present talk will address the interlinkage between Climate Change and Air Quality through a description of the involved chemical mechanisms and a number of examples.

### Biography



Dr. A. Mellouki is director of research at the National Center for Scientific Research (CNRS, France), he is the head of the “Atmosphere and Environment” theme at the ICARE laboratory in Orléans. He worked at the Aeronomy Laboratory of the National Oceanic and Atmospheric Administration (NOAA) in Boulder-Colorado (1990-1992) as research assistant before joining the CNRS. He is Distinguished Professor at Shandong University (Jinan/Qingdao-China) and visiting professor at Fudan University (Shanghai) and RCEES-Chinese Academy of Science (Beijing). Dr. A. Mellouki holds a doctorate in atmospheric chemistry from the University of Paris (Paris VII). He is co-author of more than 220 scientific publications in peer-reviewed journals and book chapters dedicated to atmospheric chemistry (air quality and climate change). Dr. Mellouki is the recipient of the 2020 J. Kaufman Outstanding Research and Unselfish Cooperation Award from the American Geophysical Union.

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# How MOF/Polymer Interfacial void shape/size affect the gas permeability of Mixed Matrix Membranes

Aydin Ozcan<sup>1</sup>, Dong Fan<sup>1</sup>, Shuvo Data<sup>2</sup>, Rocio Semino<sup>1</sup>, Osama Shekhah<sup>2</sup>, Mohamed Eddaoudi<sup>2</sup>, **Guillaume Maurin**<sup>1</sup>

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## Abstract

Mixed matrix membranes (MMMs) incorporating Metal-organic frameworks (MOF) into polymeric matrices show promising properties for several industrial applications, such as gas separation, water desalination and pervaporation among others. Especially in the field of gas separation, MMMs have attracted a great attention owing to their potential for merging the processability of polymers and the excellent selectivity of MOF materials. Therefore, understanding gas transport through the MMMs is of significant importance in MOF-based materials. Here, we choose AIFVIVE-1-Ni, a MOF with a one-dimensional channel, as the filler in the polymer matrix and use our previously developed computational methods to construct a series of MOF/Polymer interfaces with the selection of both rigid and more flexible polymers. Subsequently, we performed Grand Canonical Monte Carlo and our recently proposed concentration gradient-driven molecular dynamics (CGD-MD) simulations to assess the thermodynamic and dynamic adsorption properties

of these MMMs. Our simulations revealed that the distinct characteristic of polymer backbones result in different interfacial void regions. We evidenced that not only the size but also the shape of the interfacial voids region have eminent effects on the gas transport properties of the MMMs with respect to a selected range of molecules, e.g. CO<sub>2</sub>, N<sub>2</sub> and CH<sub>4</sub>. Our results constitute an important step toward the rational design of MMMs with the optimal interfacial void size/shape to achieve the highest performance for the separation of industrially relevant gas separations.

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## Biography



**Guillaume Maurin**, received his PhD in Physical Chemistry from Université Montpellier 2 (France) in 2001. After a Post-Doctoral Marie Curie Fellowship at the Royal Institution of Great Britain in London (U.K.) in the group of Pr. C.R.A. Catlow, he became Lecturer in 2002 at the Université Provence-Marseille (France) and later at the Université Montpellier 2 where he received his “Habilitation to Direct Research” in 2006. He is currently Professor at the Université Montpellier and at the Institut Universitaire de France. He is head of the Axis Adsorption/interfaces of the Department Porous & Hybrid Materials at the Institut Charles Gerhardt Montpellier and his research interests include the development and applications of advanced molecular simulations techniques to design new nanoporous materials and related membranes, and model their performances for energy and environment-related applications.

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# Application of the concepts of sustainability and social responsibility to healthcare organizations

**Intissar HADDIYA**

*MD, PhD*

*Professor of medicine*

*Faculty of medicine, Mohamed Premier University, Oujda-Morocco*

## Abstract

Healthcare organizations, even non-private ones could be considered as a good example of corporations, as they offer care services and face many challenges regarding the way they provide these services in terms of quality and ethics. They, therefore, should be socially responsible.

Recently, the concept of sustainability has been considered and applied in the context of healthcare. In fact, sustainability consists of adopting a strategy that enables hospitals to achieve a balance between the environmental, economic, humanistic and social aspects. Therefore, they can achieve professional performance while respecting the environment through actions such as rationalizing the consumption of energy, water or reducing waste production for instance, that can lead to optimizing resources and decreasing the costs. Besides, these actions can also have individual, global and systemic impact on the community and the society.

Furthermore, according to several studies, hospitals that are recognized as practicing sustainability do deliver better healthcare in the terms of quality and relevance, and are perceived as socially responsible by the various stakeholders.

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## Biography



Intissar HADDIYA (MD, PhD), is a nephrologist and French-writing Moroccan author. She is currently a professor of Nephrology and the head of the medical department in the faculty of Medicine of Oujda, University Mohamed Premier- Morocco and a hospital practitioner at Mohammed VI University hospital (Oujda-Morocco).

She is the president of the Information and Communication Commission of the Moroccan Society of Nephrology, the university coordinator of the Young Moroccan Nephrologists' club, and a member of the International Society of Nephrology (ISN).

Furthermore, Professor Haddiya did contribute to the national nephrology and kidney transplant guidelines.

Her major degrees and certificates include “Global health & humanitarianism” (university of Manchester), “Global health: An interdisciplinary overview” (University of Geneva), “Management of patients in nephrology resuscitation” (Faculty of Medicine “Pierre and Marie Curie” – Paris), “Renal replacement therapy techniques” (Faculty of Medicine of Strasbourg- France), “Pedagogy of health sciences” (Faculty of Medicine of Bordeaux), “Bioethics / medical ethics- Training and Resources in Research Ethics Evaluation” (Swiss medical association).

Her various activities do also include the help and support of kidney disease patients through a very active association in Eastern Morocco, as she is the general Secretary of “the association of kidney disease patients’ support” and “the federation of kidney disease patients’ support associations in Eastern Morocco.

Besides, Intissar HADDIYA is an editor of the Moroccan Journal of Nephrology. She has authored with her team, several medical articles published both nationally and internationally, and is a reviewer of medical articles for international indexed journals.

Her fields of interest are clinical Nephrology, hypertension, dialysis and organ transplantation and donation, social responsibility and sustainability of healthcare organizations.

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## Challenges of artificial intelligence

Mohammed Benlahsen

*Université de Picardie Jules Verne*

### Abstract

Over recent years we have seen an unprecedented revival of interest in Artificial Intelligence (AI) due to major technological advances, particularly in the field of machine learning, which extend the capabilities of computers and increase their performance in a large number of domains (language processing, speech understanding, image recognition, robotics, etc.). These advances have opened up vast opportunities in terms of technological innovations and automation in work situations. Therefore, we clearly need regulation to keep essential decision-making to humans and not to mathematical models, whose skills and biases

are not controlled.

It is therefore necessary to clarify the place of scientific knowledge and expertise in the political decision-making process, which must find a balance between “argued convictions” and the different internal logics. We must promote the duality “science in society, versus society supported by science”. This notion leads us to constantly invent new frameworks that make it possible to compare knowledges and to promote a dialogue between citizens and science. It allows us by the same time to question the integration of scientific expertise during the decision-making process. We must from now on talk of “science in society” and no longer of “science and society”.

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### Biography



Doctorat ès Sciences en 1993 à l’université de Poitiers.

Mohammed Benlahsen, 60 ans, est professeur à l’Université de Picardie Jules Verne (UPJV) où il a assuré plusieurs responsabilités administratives et pédagogiques : directeur du département de Physique, directeur de l’UFR des sciences, ... Il est actuellement **Président de l’UPJV** (depuis 2016), une université très investie sur trois thématiques fortes : le stockage électrochimique de l’électricité (Labex STORE-EX, Réseau RS2E, coordination du réseau européen Alistore, ...), les agro-sciences et la technologie de la Santé (six premières mondiales depuis 2014 en robotique).

Membre du Laboratoire de Physique de la Matière Condensée (LPMC) depuis 1994, il s’est intéressé au désordre dans la matériaux carbonés (couches minces, nanotubes, ...). Parallèlement, il s’est tourné vers les systèmes dynamiques en collaboration avec des mathématiciens (fluides complexes couches limites, instabilités), les surfaces dynamiques, les couches minces et ultraminces fonctionnelles, la dynamique et la vectorisation des vésicules, ...).

Mohammed Benlahsen est l’auteur de soixante-dix articles, a encadré vingt thèses et post-doc, animé une vingtaine de projets régionaux, nationaux et européens, co-animation des réseaux de recherche nationaux et européens (GDR, ...) et a été membre de comité d’évaluation nationales (CNU 28ème section, AERES, HCERS...) et de sociétés savantes (CA de Société Française de Physique, ...).

Actuellement, il occupe le poste de président de l’Alliance nationale de coordination de la recherche pour l’énergie (ANCRE).

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## The Next generations of Cancer Treatment

Souâd Naimi

### Abstract

Cancer is the second leading cause of deaths all over the world. Globally 7.6 million deaths are caused by cancer which represents 13% of all global deaths. Surgery, chemotherapy, and irradiation are the mainstream therapeutic approaches for cancer, chemotherapy being an important component of treatment for cancer patients. However, its success is limited due to lack of selectivity for tumor cells over normal cells resulting in insufficient drug concentrations in tumors, systemic toxicity and the appearance of drug-resistant tumor cells. Recently new therapies are gaining importance such as targeted therapy and Immunotherapy due to their efficacy and specificity towards cancer cells while sparing toxicity to off-target cells.

Targeted therapies aim to specifically block the activity of crucial proteins or signaling pathways necessary for the growth and survival of tumor cells. A breakthrough in targeted cancer therapy was the introduction nearly two decades ago of imatinib, an inhibitor of the BCR-ABL tyrosine kinase for the treatment of chronic myeloid leukemia. Over the last years, significant advances in our understanding of tumor biology have facilitated the development of many drugs targeting not only kinases, but also other protein families and cellular processes. Several of these agents are currently employed or being implemented for the treatment of different hematologic and solid cancers.

Moreover, it is now acknowledged that the immune system plays

a major role in a tumor's microenvironment. The theory of immunosurveillance was first stated by Paul Ehrlich at the beginning of the twentieth century and later clarified by Robert Schreiber in his theory of the three Es. This theory refers to three successive phases of tumor development: (i) elimination: there is a strong and effective immune response leading to the destruction of tumor cells; (ii) equilibrium: the immune reaction allows control of tumor proliferation which, however, persists; (iii) escape: the immune system can no longer fight against tumor proliferation making tumor growth possible. Occurrence, growth, persistence, and progression of a tumor may be considered as a successful escape from the anti-tumoral immune system. Immune evasion is regarded as a key hallmark of cancer, generating an environment permissive for survival and progression. In the past few years, modulation of this system has been regarded as a promising approach among treatment options offered to cancer patients. Currently, one of the best described mechanisms of immune system escape is the expression of inhibition co-stimulatory molecules. These co-stimulation molecules are called “immune checkpoints”. They can activate or inhibit molecules and make it possible to regulate the immune response. An adequate immune response results from a balance between activating and inhibiting signals. Then Immunotherapy has become a promising new approach for the treatment of patients with various cancers.

### Biography



Souâd NAIMI a obtenu son Doctorat en 2008 à l'Université de Paris VII. Avant de rejoindre l'industrie pharmaceutique, elle était chercheuse et scientifique associée au laboratoire de Neuroplasticité et Thérapie (INSERM U421 – Paris) où elle a travaillé avec le Pr. Marc PECHANSKI qui a été le pionnier des approches de thérapie cellulaire et de thérapie génique pour les maladies de Huntington et de Parkinson. Elle a acquis une solide expertise scientifique en Histopathologie moléculaire et en Bio-imagerie avec un accent particulier sur les maladies neurodégénératives. Elle a joué un rôle clé dans le dépôt de toutes premières demandes d'essais cliniques pour effectuer une thérapie cellulaire chez les patients de Huntington et de Parkinson.

Après une carrière académique réussie, Souâd a rejoint Sanofi en 1995 où elle a occupé diverses fonctions de scientifique de laboratoire, à chef de groupe et à des postes de direction plus élevés. Elle a débuté par un premier poste au sein de Gencell (la division Thérapie Génique de Rhône Poulenc Rorer) en dirigeant un petit groupe dont la mission consistait à évaluer des vecteurs viraux (AAV, Adénovirus) et non viraux dans le système nerveux central, l'oncologie et les maladies cardiovasculaires.

Elle a mis en place avec succès une plateforme d'histopathologie moléculaire et digitale de pointe basée sur des technologies translationnelles innovantes qui sont rapidement devenues un pilier clé chez Sanofi pour soutenir le développement préclinique et clinique de plusieurs candidats-médicaments (petites molécules et produits biologiques).

Après 26 ans chez Sanofi, Souâd a acquis une solide expérience dans la découverte et le développement de médicaments. Elle a également développé de solides compétences en gestion de projet et d'équipe qui ont amené à prendre des responsabilités croissantes et des postes de direction chez Sanofi.

Actuellement, Souâd est responsable du Centre d'Excellence d'Histopathologie Moléculaire et Digitale et d'Unité de Médecine de Précision de la R&D de Sanofi. En plus de diriger une équipe de plus de 30 scientifiques comprenant des docteurs, des médecins, des ingénieurs et des techniciens, Souâd est également impliquée en tant que leader ou membre senior de nombreux projets du pipeline de R&D de Sanofi.

Elle est co-auteur de plusieurs publications scientifiques évaluées par des pairs et de plusieurs brevets.

Souâd est également membre actif de plusieurs comités scientifiques et stratégiques et dispose d'un large réseau scientifique et médical à l'échelle internationale.



# Carbon Dots as Novel Antimicrobial Agents

Mohammed J. Meziani<sup>1</sup>, Ya-Ping Sun<sup>2</sup>, Liju Yang<sup>3</sup>

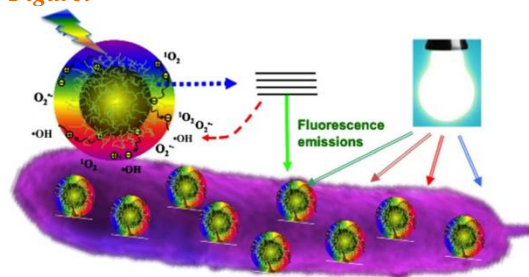
<sup>1</sup>Department of Natural Sciences, Northwest Missouri State University, 800 University Drive, Maryville, MO 64468, USA. <sup>2</sup>Department of Chemistry and Laboratory for Emerging Materials and Technology, Clemson University, Clemson, South Carolina 29634, USA.

<sup>3</sup>Department of Pharmaceutical Sciences, Biomanufacturing Research Institute and Technology Enterprise, North Carolina Central University, Durham, NC 27707, USA.

## Abstract

Carbon dots, generally defined as small carbon nanoparticles with various forms of surface passivation, have emerged as a new class of quantum dot-like nanomaterials, with their optical properties and photocatalytic functions resembling those found in conventional nanoscale semiconductors. For example, carbon dots have been demonstrated as effective visible-light photocatalysts for oxidation and reduction reactions. The same photoinduced redox processes responsible for the photocatalytic activities should make carbon dots an excellent candidate as antibacterial agents, for which a major advantage is the visible-light activation. Here we report the synthesis of photoexcited carbon dots with different surface functionalization molecules and their bactericidal functions under household LED lighting or ambient laboratory light conditions for their inhibiting *E. coli* cells.

Figure:



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## Biography



Dr Mohammed Jaouad Meziani received his B.S. (1994) degree in chemistry from the University of Mohamed I in Morocco, and both his M.S. (1995) and Ph.D. (1999) degrees in physical and analytical chemistry from the University of Montpellier II in France under the supervision of Dr Stanislas Partyka and Dr Deborah Jones. He then worked as a senior research associate with Prof. Ya-Ping Sun in the Department of Chemistry at Clemson University in USA. He is currently a Professor at the Northwest Missouri State University. His research is in the development of nanostructures and nanomaterials for optical, electronic, and biomedical applications. He published more than 100 papers in peer-reviewed journals.

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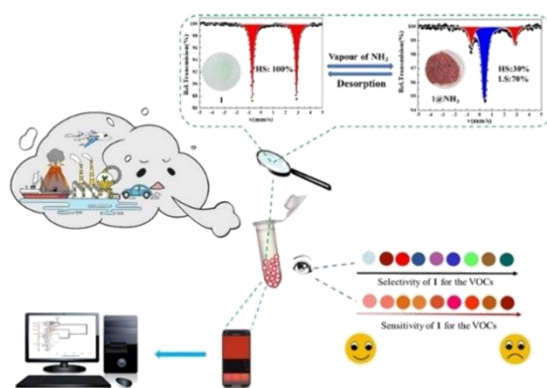
## New sensors based on spin crossover materials

Yann Garcia <sup>1</sup>

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### Abstract

In recent years, more attention has been focused on the efficient detection of chemical pollutants, especially small volatile organic compounds (VOCs) and hazardous gases (HGs), as well as bacterial agents.<sup>1</sup> This area is very challenging because such molecules are relatively volatile at room temperature, even at low concentration levels. Such species can enter the body through normal breathing, and cause serious health issues.<sup>2</sup> Our investigations led us to focus on a series of azole based coordination polymers,<sup>3</sup> for which intriguing iron(II) spin crossover properties were disclosed.<sup>4</sup> In particular, we have recently identified a new colorimetric chemosensor of formula  $[\text{Fe}(\text{H}_2\text{btm})_2(\text{H}_2\text{O})_2]\text{Cl}$  (**1**) ( $\text{H}_2\text{btm}$  = di(1H-tetrazol-5-yl)methane), allowing to detect at real time, with a high selectivity and ultra-sensitivity, 14 different VOCs and HGs.<sup>2</sup> In particular amines, which are detected very quickly (< 2 min) with very high sensitivity. The detection is accompanied by significant and fast colour changes detectable by the naked-eye at ambient conditions. In addition, different VOCs could be distinguished by simple and intuitive standard chemometric means using a handful smartphone-based analytical method, offering a large colour panel depending on detected molecules. The crystal lattice of **1** reconstructs after adsorbing VOCs vapours, reconstruction which is accompanied by a spin state and a colour change. In addition to its high thermal stability (up to 170 °C), the colorimetric sensor showed excellent reusability by consecutive 7 cycles of adsorption–desorption. This sensor is low-cost, environmentally friendly, easy to use, and shows excellent and fast detection performances. Such features offer attractive prospects for **1** which could be used for in-field detection and food safety control in environmental conditions. In this invited talk, I will review latest advances highlighting the impact of <sup>57</sup>Fe Mössbauer spectroscopy for quantitative analysis of spin states of selected iron(II) complexes, used as sensors for various toxic industrial chemicals (TICs).<sup>5-9</sup>



### Recent Publications

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14. W. Li, L. Sun, Y. Garcia, *Hyperfine Interact.* 242 (2022) 7.

Special thanks to Wallonie Bruxelles International (WBI)

### Biography



Yann Garcia is prof. of analytical chemistry. His research activities extend from MOFs and coordination chemistry of azole based magnetic frameworks to photo- and thermoswitchable coordination compounds. He is using Mössbauer spectroscopy and muon spin relaxation to solve coordination chemistry issues. He was awarded his doctorate in Jan. 1999 with the highest distinction from the Univ. of Bordeaux, after writing a dissertation supervised by Prof. O. Kahn at ICMCB-CNRS. This researcher has co-authored more than 270 papers with several cover pages of top chemistry journals, including 13 book chapters on Inorganic Chemistry, several guest editions and two patent applications. His h-index is 54 with 13073 citations (GScholar, April 2022). He is associate editor of the Mössb. Eff. Ref. Data J. (CAS) and Chem. Synth (OAE Pub). Since 2007, he chairs the Mössbauer French Speaking Society ([www.gfsm.fr](http://www.gfsm.fr)), which met in 2017 in Béni-Mellal. He is also IBAME vice chair (IBAME.org) since 2021. He collaborates with UMP Oujda (Prof. Smaïl Radi) with whom he promotes chemistry and scientific publishing towards the next generation of Moroccan scientists. He co-chaired ICAMANA 2019 in Oujda

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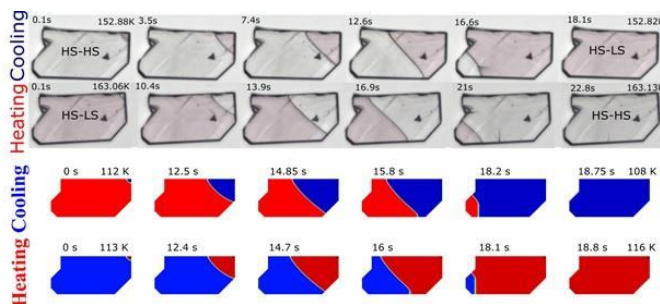
# New paradigm in the spatiotemporal properties of spin-crossover single crystals: interface control and photo-induced effects

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## Abstract

Recent developments in techniques of visualisations and imaging allow tackling the problem of phase transition in a unique single crystal. The spin-crossover (SCO) materials, which are perfect prototypes of first-order transitions, combine at the transition between the low-spin (LS) and the high-spin (HS) states, changes in colour and size of the crystals in the concomitant way. They revealed to be excellent candidates for spatiotemporal studies of thermo- and photo-induced phase transitions on a unique single crystal. In this presentation, we will show several experimental examples of spin transitions measured on different types of single crystals, demonstrating the richness and the complexity inherent to these materials. In addition to their thermochromic character, SCO exhibit a volume change accompanying the spin transition, allowing an extra degree of freedom, complicating the measurements on one single crystal, which often jumps at the transition, due to the accumulation of elastic stress. However, systems exhibiting an incomplete hysteretic thermal transition revealed to be very robust and their resilient character made possible their imaging in both cooling and heating processes, without crystal damage. We then could observe well-defined transformation fronts<sup>1-5</sup> between macroscopic HS and LS phases. The shape, the orientation and the motion of the front interfaces (see Figure) will be discussed in detail on the videos of the spin transition. Moreover, at very low temperature (~10 K), under light, metastable photo-excited HS phase can be generated thanks to LIESST effect. Interestingly, the emerging photo-excited HS state is stabilized by the volume change accompanying the photo-transformation. This volume change, considered as problematic for equilibrium phase transition, is now an ally helping to obtain the photo-induced metastable phases. Finally, if time permits we will illustrate some of the developed models<sup>6-9</sup> allowing a fair description of these phenomena, notably the HS/LS front dynamics.



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Special thanks to University of Versailles, Paris-Saclay, CNRS and French National Agency of Research (ANR).

## Biography



Kamel Boukheddaden completed his Ph.D in Physics in 1993 from the Université Pierre and Marie Curie in Paris, France. He was an Assistant Professor at the University of Versailles (1994), then Associate Professor in 1995. He became a full Professor in the same University in 2005. His main field concerns the thermo- and photo-induced phenomena in switchable molecular solids (spin-crossover, Prussian blue analogs and charge transfer solids). He is interested in both equilibrium and non-equilibrium properties of these molecular materials through direct visualization of the crystal transformation along their phase transition by means of optical techniques. His current work focusses on the control the front interfaces motion and the emergence of photo-induced self-organized structures. The modeling of these phenomena using statistical mechanics models based on spinelastic models associating Monte Carlo and Molecular dynamics simulations and/or reaction diffusion descriptions represent also specific topics of interest. K.B. has co-authored more than 240 papers in well recognized physics and chemistry journals, including 12 book chapters on physics and guest editions. His h-index is 47 with 7031 citations (GScholar, April 2022).

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## Environnement, santé et épigénétique

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### **Abstract**

Au cours des deux dernières décennies, nous avons assisté à deux grandes ruptures conceptuelles et technologiques concernant l'origine des maladies chroniques (non transmissibles) et leur prise en charge.

Les maladies chroniques représentées par les maladies cardiovasculaires, métaboliques, (auto) immunes, neurodégénératives, liées à la reproduction (infertilité, endométriose), constituent la majeure partie des causes de décès, aussi bien dans les pays à haut revenu que ceux à revenu moyen.

Concernant la première grande rupture, conceptuelle, elle a clairement signé la fin du tout génétique à l'origine des maladies chroniques. Suite au séquençage du génome, en particulier, il est apparu que l'origine des maladies chroniques est majoritairement liée à notre monde extérieur, notre mode de vie: déséquilibres nutritionnels, exposition aux toxiques (eau, air, alimentation) et au stress psychosocial et psycho-émotionnel. L'impact de ces effecteurs du mode vie modifie l'expression de notre génome via la mécanique épigénétique comme la méthylation de l'ADN, les modifications post-transcriptionnelles des histones (euchromatine, hétérochromatine) et l'expression des ARNs non codants.

Ces découvertes ont ouvert la voie à une deuxième rupture cette fois technologique comme la modélisation des maladies chroniques, les séquençages à haut débit, la naissance d'une nouvelle génération de biomarqueurs pour l'étude de cohortes de patients, qui dans l'ensemble seront optimisées par les outils du e-learning et de l'IA.

L'ensemble de ces ruptures ouvrent actuellement sur un nouveau paradigme de la Médecine qui va se surajouter à celui de la Médecine Curative : la Médecine 4 P (Prédictive, Préventive, Personnalisée et Participative) et Intégrative. En effet, cette dernière intègre en particulier la dimension nutritionnelle via la Nutrition de Précision tant en amont de la maladie que pendant la maladie, couplé à l'approche pharmacologique classique.

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### **Biography**



## Hospital information system and big data: Feedback from the central laboratory of the CHU Mohammed VI in Oujda

**Mohammed Choukri**

*Central Laboratory Department of the CHU Mohammed VI of Oujda, Faculty of Medicine and Pharmacy of Oujda, Morocco*

### **Abstract**

The hospital information system (HIS) which is in perpetual evolution, is able to acquire data, to evaluate them, to treat them by computer or organizational tools, to distribute information containing a strong added value to all the internal or external partners of the establishment, collaborating in a common work oriented towards a specific goal, namely the care of a patient and his recovery. The HIS can combine several functions and modules necessary for the management of laboratory, radiology services, pharmacy, operating room, payroll, invoicing, budget monitoring, medical activity statement, communication (internet, intranet, protocols, messaging, forum, order form, etc.). The current trend is moving outside the hospital: the development of health networks, the Personal Medical Record, telemedicine and why not the surgical piloting of a remote robot.

The big data generated by the HIS constitutes a real big data of information whose characteristics in terms of volume, velocity and variety require the use of specific technologies and analytical methods to create value and allow predictive, trend analyzes and forecasting as well as risk management and decision making. In this work, we will present our feedback on the use of the HIS in the central laboratory service of the CHU Mohammed VI of Oujda, the strengths, the constraints, the challenges and the opportunities for improvement.

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### **Biography**



**Mohammed Choukri** is Professor of Higher Education in Chemistry-Biochemistry at the Faculty of Medicine and Pharmacy of Oujda and Head of the Central Laboratory Department of the CHU Mohammed VI of Oujda. He is also responsible for the IVF laboratory of the medically assisted procreation unit. In addition to the doctorate degree in pharmacy and the specialty degree in medical biological analyses, he holds several university degrees: in Medical Assistance of Procreation, in Audit of Medical Biology laboratories, in Quality Assurance in Clinical Biology, Medical Pedagogy. He is a member of several national commissions at the Ministry of Health and the Ministry of Higher Education. Pr Mohammed Choukri is an active member in several learned societies and holder of more than 40 international publications.

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## La phase pré analytique en Biologie médicale Management et aspects réglementaire et normatif

EL JAHIRI Younes

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### Abstract

L'acte de biologie médicale comporte trois phases : la phase préanalytique, analytique et post analytique. La phase pré analytique comprend toutes les étapes, de l'enregistrement de la demande d'analyses au traitement de l'échantillon biologique. Tout au long de cette étape, la prise en charge des examens de biologie médicale est caractérisée par sa complexité évidente à cause du nombre d'opérateurs, de la multiplicité des tâches et des interfaces, du risque d'erreur dans l'identification des échantillons, de la diversité des sites de prélèvement et des contraintes d'acheminement et de transfert des examens. Malgré le développement de moyens de maîtrise de cette phase notamment la mise en place d'un système de management de la qualité, de procédures de gestion des nonconformités et de traçabilité ainsi que la disponibilité des systèmes d'information des laboratoires (SIL), l'amélioration des matériels de prélèvement, la réduction voir l'élimination des risques pouvant entacher les soins prodigués reste un défi permanent de tout biologiste soucieux de la qualité et de la fiabilité des résultats de ses patients. De plus, le texte réglementaire GBEA marocain et ses recommandations pré-analytiques opposables ainsi que

les référentiels normatifs ISO 9001vs 2015 avec l'approche risque et surtout l'ISO 15189 vs 2012 dans son chapitre 5-4, mettent tous l'accent sur la maîtrise de cette étape critique afin d'éviter tout risque d'erreur pouvant retentir négativement sur la prise en charge diagnostic, pronostic et thérapeutique de nos patient. Il est donc indispensable que tout biologiste doit se fixer un objectif pour réduire les risques inhérents à la phase préanalytique et contribuer efficacement à la chaîne de soins. Tout d'abord par l'application obligatoire des exigences réglementaires du GBEA marocain et dans un second temps, en fonction de la volonté du biologiste, par la mise en place d'un SMQ selon des normes internationales type ISO.

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### Biography



Docteur EL JAHIRI Younes

- Directeur du laboratoire BIOCENTRE
  - Biologiste médical
  - Spécialiste des Hôpitaux des Armées -Val De Grâce-Paris
  - Ex. Enseignant aux facultés de médecine -Rabat et Marrakech
  - Ex. Biologiste à l'Hôpital militaire Avicenne -Marrakech
  - Ex. Assistant aux Hôpitaux : Bégin - Saint Mandé-
  - Diplômé en « Assurance qualité en Biologie Médicale » - Paris V
  - Diplôme universitaire « Assistance médicale à la procréation : prise en charge clinique, biologique et génétique » - Université de Montpellier-France
  - Diplôme Inter-universitaire « Infertilité masculine et AMP ( Andrologie) »- Université de Montpellier – Université Paul Sabatier Toulouse – France.
  - Diplôme universitaire « Auditeur qualité en biologie médicale (ISO15186 VS2012) – Université Paris Descartes UM6SS
-

The Fifth International Conference on **Materials & Environmental Science, ICMES-2022**  
Under the theme: “**Health, Environment and Materials Research and Innovation**”  
June 09-12, 2022, Radisson Blu Resort Saïdia Beach, Saïdia, Morocco

# Oral Presentations

**HEALTH: BIOCHEMISTRY, NUTRITION AND PHARMACOLOGY**



## Biomedical waste management in the Central Laboratory of the University Hospital Mohammed VI Oujda

Mouad Harandou<sup>1,2</sup>, Amjad Idrissi<sup>1,2</sup>, Oumayma Hamdani<sup>1,2</sup>, Abir Yahyaoui<sup>1,2</sup>, Youssra Sbibih<sup>1,2</sup>, Wissam Azizi<sup>1,2</sup>, Hajar Zerouri<sup>1,2</sup>, Doha Berraouan<sup>1</sup>, El-houcine Sebbar<sup>1,2</sup>, Mohammed Choukri<sup>1,2</sup>

<sup>1</sup>Biochemistry laboratory, University Hospital Mohammed VI of Oujda

<sup>2</sup>Faculty of Medicine and Pharmacy of Oujda

### Abstract

Proper handling, treatment, and disposal of biomedical waste plays a key role in hospital infection control program. The biomedical waste generated during the process of sampling, testing and diagnosis can have a huge negative impact on human health and environment if not well managed, such as: transmission of diseases like HIV, Hepatitis B, C through improperly contained contaminated sharps; increased risk of nosocomial infections; proliferation and mutation of pathogenic microbial population in the municipal waste; Physical injury and health hazards.

The main objectives of Biomedical waste management includes preventing transmission of diseases from patient to patient, from patient to health worker and vice-versa; preventing injuries to health worker while handling biomedical waste. Furthermore, it helps avoiding general exposure to the harmful effects of the cytotoxic, genotoxic and chemical biomedical wastes.

Regarding this, controlling the management of biomedical waste produced by the laboratory of Medical biology is based on the compliance with the requirements of the following crucial steps: sorting, packaging, storage, transportation and treatment.

In the central laboratory of Medical biology based in the Mohammed VI University Hospital Oujda, the biomedical waste management follows the rules and regulations prescribed by the minister of Health according to the Decree n°2-09-139 concerning the medical and pharmaceutical wastes.

Figure: Biomedical waste management



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3. Roussille, F. (2010). Gestion des déchets dans un laboratoire de biologie médicale. *Immuno-Analyse & Biologie Spécialisée*, 25(5-6), 276–280.

### Biography



Mouad is a Medical Doctor (MD), first year resident in the central Laboratory of the Mohamed VI University Hospital Oujda, studied and graduated from the Faculty of Medicine and Pharmacy of Oujda.

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## Interest of water quality in the laboratory: Experience of the Central Laboratory of CHU Mohammed VI of Oujda

Yousra Sbibih<sup>1,2</sup>, AmjadIdrissi<sup>1,2</sup>, AbirYahyaoui<sup>1,2</sup>, Oumayma Hamdani<sup>1,2</sup>, WissamAzizi<sup>1,2</sup>, Hajar Zrouri<sup>1,2</sup>, Oussama Rahhab<sup>1,2</sup>, Mouad Harandou<sup>1,2</sup>, El-houcine Sebbar<sup>1,2</sup>, Mohammed Choukri<sup>1,2</sup>

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### Abstract

Water is the most used reagent in clinical laboratories. It is used for all levels of chemical, biological and physical analysis. It is important to know the type of water used because many analyses can be affected by its quality. Several agencies have established preparation and purity criteria for water. The objective of our work is to highlight the interest of water quality in the laboratory by presenting the experience of the Central Laboratory of CHU Mohammed VI of Oujda.

The quality of purified water is divided into different types of water numbered from I to III. The classification of water is based mainly on the choice of parameters to be respected. The minimum parameters to be controlled to define acceptable water quality for a clinical laboratory are resistivity, pH, silicate concentration, microbial content, particulates and organic contaminants. Poor water quality can greatly influence the preparation of culture media. Impure water can give abnormal color, inaccurate pH, atypical precipitates, and be toxic to microorganisms. The use of such a medium may affect the results of, for example, an antibiotic susceptibility test. Preparation of reagents and dyes, reconstitution of lyophilized material, dilution techniques are procedures that can be affected by laboratory water. The use of poor quality water can greatly influence the results obtained. For example, the presence of pyrogens/endotoxins in the water can affect cell growth in cell culture and tissue assays or affect certain immunofluorescence techniques.

Our laboratory is committed to a quality policy that includes an accreditation process. The study of water in the medical biology laboratory will constitute a solid base to guarantee the reliability of the results of the examinations according to the NF EN ISO 15189 standard.

### Biography



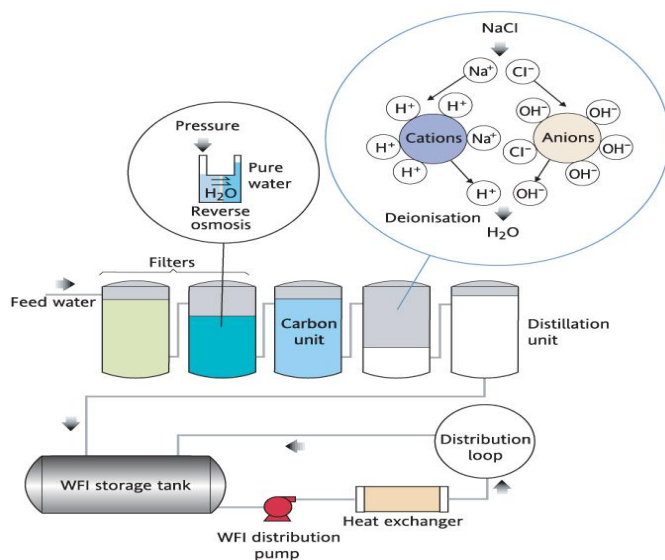
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Figure



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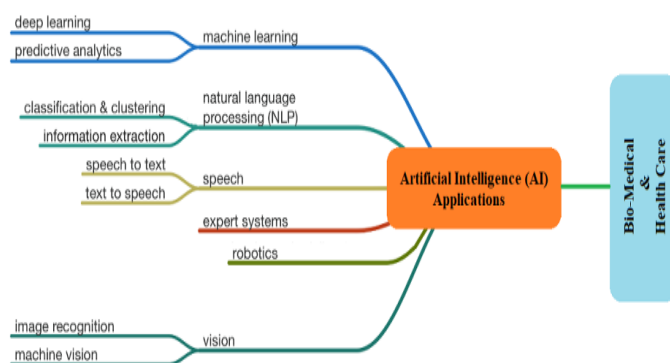
## Contribution of artificial intelligence in the processing of Big Data in a medical biology laboratory

Abir Yahyaoui<sup>1,2</sup>, Amjad Idrissi<sup>1,2</sup>, Oussama rahhab<sup>1,2</sup>, YoussraSbibih<sup>1,2</sup>, Hajar Zrouri<sup>1,2</sup>, Omayama Hamdani<sup>1,2</sup>, Wissam Azizi<sup>1,2</sup>, Mouad Harandou<sup>1,2</sup>, El-houcineSebbar<sup>1,2</sup>, Mohammed Choukri<sup>1,2</sup>

### Abstract

In the field of medical biology, Big Data refers to all clinical and biological data, available from different sources that collect them for various reasons. Hospitals are an integral part of the institutions that Big Data can help. Indeed, the growth of the hospital population requires the implementation of a rational and fast management, hence the need to introduce the concept of Big Data and artificial intelligence (AI) in the medical field allowing the development of prescription support systems and tools for personalizing medical biology requests and medical decisions from the processing of large masses of clinical and biological data. Thus, AI must be a tool for medical diagnosis thanks to the use of sophisticated algorithms, combining biological data and coupled with deep learning, for which the computer tool is trained as the situations are analyzed. The exploitation of these data has many interests, for this, the central laboratory of the CHU Mohammed VI Oujda seeks to ensure a continuous activity and quality to meet the expectations of patients. Therefore, this service needs a computerized solution to diagnose and detect the average delay of the biological requests of the services. In order to achieve this goal, a production Big Data cluster was implemented in a virtual architecture using VMware vSphere ESXI 6 hypervisors, in order to have a web application for detecting the average delay of biological requests. The multidimensional data collected from the patients of the CHU Mohammed VI of Oujda, allowed to identify the services concerned by the delay of the medical biology requests, and to write a cartography allowing to underline the various anomalies concerning the routing and the reception of the medical biology samples. The results of the Big Data are then used to build preventive actions and set up programs for medical services.

Figure: Branches of AI applied in biomedical domain.



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10. FU, Xiao. Application of artificial intelligence technology in medical cell biology. In: 2019 International Conference on Robots & Intelligent System (ICRIS). IEEE, 2019. p. 401-404.

### Biography



Abir Yahyaoui, resident in medical biology at the Mohammed VI University Hospital Oujda,holder of a doctoral degree in general medicine, Faculty of Medicine and Pharmacy Oujda.

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## Risk management in a medical biology laboratory: pilot experience of the central laboratory of the CHU Mohammed VI Oujda

Oussama Rahhab<sup>1,2,4</sup>, Abir Yahyaoui<sup>1,2</sup>, Mohammed Ghalem<sup>1,2</sup>, Yousra Sbibih<sup>1,2</sup>, Oumayma Hamdani<sup>1,2</sup>, Mouad Harandou<sup>1,2</sup>, Amjad Idrissi<sup>1,2</sup>, Hajar Zrouri<sup>1,2</sup>, Wissam Azizi<sup>1,2</sup>, Doha Berraouane<sup>3</sup>, El Houcine Sebbar<sup>1,2</sup>, Mohammed Choukri<sup>1,2</sup>

<sup>1</sup>Central Laboratory, Mohammed VI University Hospital

<sup>2</sup>Faculty of Medicine and Pharmacy Oujda

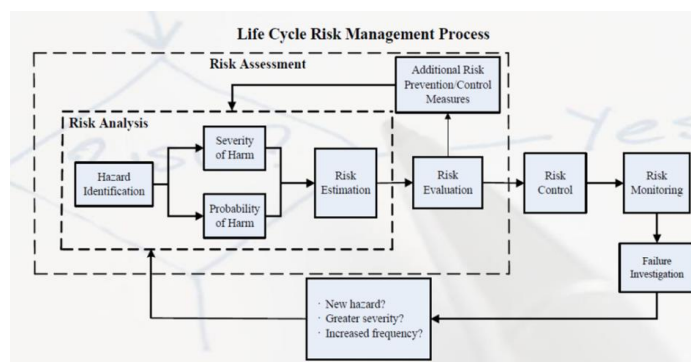
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<sup>4</sup>Research laboratory on maternal, child and mental health (LSMIM)

### Abstract

The majority of tests performed by medical laboratories are essential in the medical decision-making process of prescribers with their patients and, in this respect; they must be reliable and accurate. However, no laboratory process is infallible and errors can occur during the three sub-processes: pre-analytical, analytical and post-analytical phases. To guarantee a good quality service to the users (patients, prescribers, suppliers) of a medical analysis laboratory, the identification and resolution of failure modes and errors and the instigation of corrective and preventive actions must be included in the daily work process. Risk management is a normative requirement of the international standard ISO 15189 V 2012 for medical laboratories. Therefore, the central laboratory service of the CHU Mohammed VI of Oujda applies a quality approach in accordance with the ISO 15189 V 2012 standard, and in this regard, our establishment evaluates the impact of work processes and potential failures on the safety of examinations according to the FMEA method (Failure Mode and Criticality Analysis), The assessment of risks by calculating the criticality (Criticality = Severity × Frequency × Detectability), the instigation of monitoring means by quality indicators and finally by the documentation of decisions and actions taken to reduce or eliminate the identified risks.

**Figure:** Risk management process extracted from CLSI EP23-A Laboratory quality control based on risk management



### Recent Publications

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4. Sciacovelli, Laura, et al. "Risk management in laboratory medicine: quality assurance programs and professional competence." (2007): 756-765.

### Biography



Rahhab Oussama, 24 years old, third year PhD student and researcher in the field of medical laboratory quality management. I'm affiliated to the Research Laboratory on maternal, child and mental health at the faculty of Medicine and Pharmacy Oujda. I'm currently working on my PhD thesis at the Central Laboratory of Mohammed VI University Hospital. The subject of my thesis is : Contribution to the accreditation of medical biology laboratories in Moroccan public hospitals: pilot experience of the biochemistry laboratory of CHU Mohammed VI Oujda

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## Burnout in private sector and its impact on the employees well –being

S. ARJI<sup>1</sup>, A.O.T. AHAMI<sup>1</sup>, R. ZIRI<sup>2</sup>

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<sup>2</sup>Department of Biology, Laboratory of Plant and Animal productions and Agro-industry, Faculty of Sciences, University Ibn Tofail, Kenitra, Morocco.

### Abstract

Burnout or professional exhaustion syndrome is a neuropsychological disorder resulting from chronic stress in the workplace. Several studies have shown that it has negative repercussions on the health and well-being of employees. The purpose of this study is to analyse the impact of burnout on the subjective well-being of 102 employees that work at a private industrial metallurgy company. three questionnaires were used: Maslach Burnout Inventory , Positive Affect and Negative Affect Scales and Satisfaction With Life Scale. The analysis of the results showed that the burnout had a significant influence on the subjective well-being of the employees. So it is essential that company managers take this pathology into account to ensure the continuity, productivity and performance of the company.

*Figure:*

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1. Parent-Lamarche A. and Marchand A., IJWHM. 12 (2019) 298-317
2. Anglim J. and Grant, S. (2016), Journal of Happiness Studies. 17 (2016) 59 – 80.
3. Auzoult L. and Guilbert L., Psychologie du Travail et des Organisations. 25 (2019) 63-65
4. Collangea J., Gaucherb R., Georgeb M., Saunderb L., Albert E., Archives des Maladies Professionnelles et de l'Environnement. 78 (2017) 27-36.
5. Mellor N., Dufoix F., Saunder L., Albert E., Collange J., Archives des Maladies Professionnelles et de l'Environnement. 79 (2018) 23-33.

### Biography



I have been teaching life and earth sciences since 1998. I obtained a specialized master's degree entitled human neurocognition and population health in 2017 at the Faculty of Sciences at Ibn Tofail University in Kenitra, Morocco. Currently I am preparing my doctoral thesis in neuroscience. My research focuses on work stress and its impact on psychological, mental and neurocognitive health. This article is part of my research topic.

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## Stress at work among employees of a Moroccan company

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<sup>2</sup>Department of Biology, Laboratory of Plant and Animal productions and Agro-industry, Faculty of Sciences, University Ibn Tofail, Kenitra, Morocco.

### Abstract

Job-strain and iso-strain are perceived when there is a conflict between the demands placed on a person and their resources to cope with them. They have negative repercussions on the health of workers, and the productivity and performance of organizations. Our study consists in evaluating job stress and its components using the Karasek questionnaire (JCQ) among 102 employees of a metallurgy company. The analysis of the results showed a significant prevalence of iso-strain and job-strain. Thus, low decision latitude and high psychological demand are the most widespread stress factors. These results show the need for spreading information and prevention programs against stress at work to company managers and staff to ensure company performance.

*Figure:*

### Recent Publications

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2. Hamid Esserdi H., Chaudat P., Mériade L., *Congres Institut de l'audit social autour de l'homme et de l'homme au travail.* (2019) hal-02457732.
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4. Magrouna I., Ghannouchib H., Fehrib S., Chattib M., Ben Salaha F., Nouaiguia H., *Archives des Maladies Professionnelles et de l'Environnement.* 77 (2016) 747-755.
5. Sauvezon C., Ferrieux D., Priolo D., *Psychologie du Travail et des Organisations.* 25 (2019) 86-99.

### Biography



I have been teaching life and earth sciences since 1998. I obtained a specialized master's degree entitled human neurocognition and population health in 2017 at the Faculty of Sciences at Ibn Tofail University in Kenitra, Morocco. Currently I am preparing my doctoral thesis in neuroscience. My research focuses on work stress and its impact on psychological, mental and neurocognitive health. This article is part of my research topic.

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# Does job stress affect neurocognitive functions? case of employees of a Moroccan private industrial company sector

S. ARJI<sup>1</sup>, M. Elhaddadi<sup>1</sup>, A.O.T. AHAMI<sup>1</sup>, R. ZIRI<sup>2</sup>

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## Abstract

Depending on its stage, stress influences cognitive functions. Indeed, several authors have ensured the degradation of cognitive functions by stress. Others didn't find any association between the two. A third group of authors claimed that stress improves the performance of certain cognitive functions. Faced with this inconsistency of results, we conducted this study with the aim of finding out whether job stress alters or stimulates cognitive functions. For this, we conducted a survey among employees of a Moroccan private industrial company in Kenitra. Our study focused on 102 employees who were asked to freely and anonymously complete a questionnaire deemed relevant at the international scale, after that they underwent two neurocognitive tests using the ELIAN software. The analysis of results shows high percentages of tense work, job stress especially with executives, with a non-significant stimulation of the studied cognitive functions.

*Figure:*

## Recent Publications

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2. Sapolsky R.M., Nat. Neurosci. 18 (2015) 1344–1346.
3. Oumohand S. E., David D. Ward D. D., Boenniger M. M., Merten N., Kirschbaum C., Breteler M. M. B., Psychoneuroendocrinology. 121 (2020) 104810.
4. Korten N. C. M., Comijs H. C., Penninx B. W. J. H., Deeg D. J. H., Int. J. Geriatr. Psychiatry, 32 (2017) 439-445.
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- 7.

## Biography



I have been teaching life and earth sciences since 1998. I obtained a specialized master's degree entitled human neurocognition and population health in 2017 at the Faculty of Sciences at Ibn Tofail University in Kenitra, Morocco. Currently I am preparing my doctoral thesis in neuroscience. My research focuses on work stress and its impact on psychological, mental and neurocognitive health. This article is part of my research topic.

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## Burnout in the Moroccan private sector

S. ARJI<sup>1</sup>, M. ELHADDADI<sup>1</sup>, A.O.T. AHAMI<sup>1</sup>, R. ZIRI<sup>2</sup>

<sup>1</sup>Biology and health laboratory, Faculty of Sciences, University of Ibn Tofail, Kenitra, Morocco.

<sup>2</sup>Plant and Animal productions and Agro-industry laboratory, Faculty of Sciences, University of Ibn Tofail, Kenitra, Morocco.

### Abstract

Burnout or professional exhaustion syndrome is a neuropsychological disorder resulting from chronic stress at work. Employees of private companies are highly exposed to this risk because of the overload of work in addition to the long daily working hours. This is why we conducted a study whose objective is the evaluation of burnout and its components amongst these employees. Our study focused on 102 employees who were asked to complete freely and anonymously a general information sheet and the MBI questionnaire "Maslach Burn-out Inventory". The analysis of the results showed a high prevalence of burnout, emotional exhaustion is the most widespread component in exhausted subjects. Professional exhaustion or burnout exists strongly in Moroccan companies, which is why there is a strong need to improve the psychosocial work environment to prevent it.

*Figure:*

### Recent Publications

1. Guan S., Xiaerfuding X., Ning L., Lian Y., Jiang Y., Liu J., Ng T.B., Int. J. Environ. Res. Public Heal. 14 (2017) 872.
2. Maslach C., Leiter M. P., World Psychiatry. 15 (2016) 103-111.
3. Naczenski L. M., De Vries J.D., Van Hooff M.L.M., Kompier M.A.J., J. Occup. Heal. 59 (2017) 477–494.
4. Mekoulou Ndongo J., Bika Lélé C. E., Owona Manga L. J., Moueleu Ngalagou P. T., Ayina Ayina C. N., Lobe Tanga M. Y., Guessogo W. R., Barth N., Bongue B., Mandengue S. H., Etoundi Ngoa L. S. and Assomo Ndemba P. B., AIMS Public Heal.7 (2020) 319–335.
5. Zawieja P., Sciences Humaines (2017) 17.

### Biography



I have been teaching life and earth sciences since 1998. I obtained a specialized master's degree entitled human neurocognition and population health in 2017 at the Faculty of Sciences at Ibn Tofail University in Kenitra, Morocco. Currently I am preparing my doctoral thesis in neuroscience. My research focuses on work stress and its impact on psychological, mental and neurocognitive health. This article is part of my research topic.

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# Predictive approach for post-covid 19 evolution study of the pavement surface deterioration based on visual inspection results

Mohammed Amine MEHDI<sup>1</sup>, Toufik CHERRADI<sup>1</sup>, Azzeddine BOUYAHYAOU<sup>1</sup>, Said EL KARKOURI<sup>2</sup> and Ahmed QACHAR<sup>3</sup>

<sup>1</sup>Civil Engineering and Construction Laboratory, Mohammadia School of Engineers, Rabat 10090, Morocco.

<sup>2</sup>National Center for a Road Studies and Research, Ministry of Equipment, Transport, Logistics and Water, Rabat 10100, Morocco

<sup>3</sup>Moroccan Road Directorate, Ministry of Equipment, Transport, Logistics and Water, Rabat 10100, Morocco

## Abstract

This study proposes a statistical approach to examine the pavement surface deterioration trends resulting from the COVID-19 pandemic. Motivated by the road inspection results, historical road databases and condition analysis, pavement management in Morocco, as well as world-wide, is a major challenge for managers. The traffic decrease, the maintenance work stoppages, the difficulties to get information on the field, all these imperative ingredients are a consequence of the covid-19 pandemic. In this regard, the historical analysis, remote monitoring and damage prediction has become increasingly important. In collaboration with the Moroccan National Center for Road Research, this study examines the impact of pandemic-induced locking on the variation of three essential pathologies: pullout, cracking and potholes, based on the visual inspection results carried out in 2020 on a 50 km long section connecting Meknes and Khemisset cities. Firstly, reduction of data based using the deterioration represented in four levels (A, B, C and D), secondly, comparison of the different pathologies before and post-Pandemic, the pandemic impact on the system quality, and on the end, a prediction of the pathology evolution by linear regression method. This study will support decision-makers in considering pandemics and health failures in their pavement management approaches, and especially in preventing future damage for budget allocation.

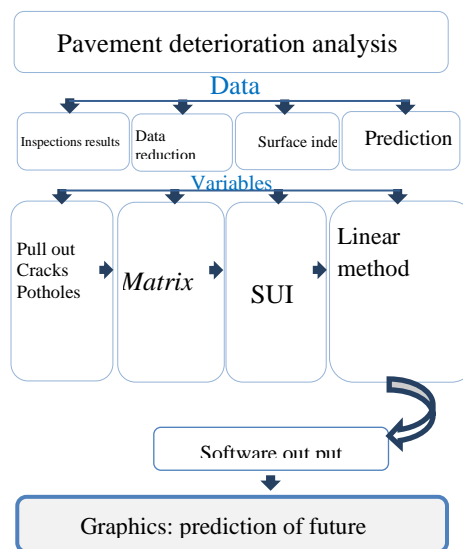
## Biography



The author has 4 years of experience as a geotechnical engineer, 2 years in the construction materials analysis and with the practice of expertise in the road pathology evaluation. His research field is aimed at improving pavement management on the one hand, and the proposal of a cartographic model of the geolocalized variation of the different pathologies. It focuses on the use of visual road inspection results and on the approach to quantify structural deformations by means of measuring devices. The author is in the last year of his doctoral studies. The thesis is expected to be finished by the end of 2022 at Mohammed V University, Mohammadia School of Engineering. Four proceedings articles published (Two in progress), and 4 journal articles in progress.

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Figure:



## Recent Publications

1. M.A.Mehdi, T.Cherradi, S.El Karkouri, and Ahmed Qachar<sup>3</sup>Applying Geographic Information Systems (GIS) for surface condition indicators modelling of a flexible pavement E3S Web of Conferences 298, 04001 (2021).
2. M.A.Mehdi, T.Cherradi, M.Quachar, A.Chigr, Analysis of structural and surface deteriorations of a flexible pavement, based on inspection results using the MCA method Materials Today Proceedings, Volume 45, Part 8, 2021, Pages 7538-7546.
3. Mehdi M.A., Cherradi T., Elkarkouri S., Qachar A. (2022) The Macroscopic Effect of COVID 19 on Flexible Pavement Condition Indicators Based on Analysis of Road Inspection Results. In: Saidi R., El Bhiri B., Maleh Y., Mosallam A., Essaïdi M. (eds) Advanced Technologies for Humanity. ICATH 2021. Lecture Notes on Data Engineering and Communications Technologies, vol 110. Springer, Cham. [https://doi.org/10.1007/978-3-030-94188-8\\_39](https://doi.org/10.1007/978-3-030-94188-8_39).
4. Mohammed Amine Mehdi, Toufik Cherradi, Azzeddine Bouyahyaoui, Said El Karkouri, Ahmed Qachar, Evolution of a flexible pavement deterioration, analyzing the road inspections results, Materials Today: Proceedings, 2022.

# Optofluidic sensors for breast cancer diagnosis- A Review

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## Abstract

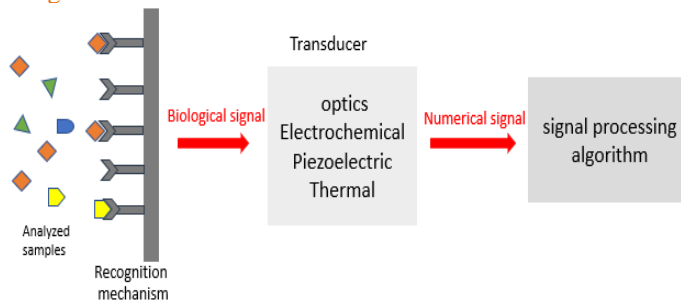
New data from world health organization, reveals that the breast cancer, accounts for 22% of diagnosed cancers and 14% of causes of death. It reports an increase in breast cancer mortality in 2020, "685,000 women died of breast cancer in 2020 and most breast cancer cases and deaths are in low- and middle-income countries" [1].

Today, the majority of diagnostic tests are performed in centralized hospital laboratories and uses large-scale and expensive equipment [2, 3]. Significant improvement of biosensors technology has sought to remedy this situation by enabling Point of Care (POC) and home testing on inexpensive, disposable biosensor chips. The benefits of POC testing are evident, especially from the patient's perspective who benefits of earlier treatment due to the faster decision-making, in addition to fewer hospital visits.

The Microfluidic biosensor chip is an attractive technique to detect and quantify a smaller number of analytes with a greater degree of certainty. It allows multiple detection by making multiple spots, dedicated to screening for the same analyte, thereby reducing experimental error, which is particularly important for diagnosing conditions where a high degree of confidence is required to make the diagnosis and decide future treatment [4].

This review focuses on the use of optofluidic bases sensors for the early diagnosis of breast cancer, one of the most dangerous cancers diagnosed in women. The detection principle of optofluidic biosensors will be briefly introduced. Then, we review the status of research activities that have been recently conducted to fabricate accurate, miniaturized, portable and fast processing biosensors. Finally, a comparative study of the performance characteristics of the most widely used optical techniques for early diagnosis of breast cancer will be presented.

**Figure:** Descriptive diagram of the different detection steps using a biosensor.



## Recent Publications

1. <https://www.who.int/news-room/fact-sheets/detail/breast-cancer>
2. <https://www.cancer-environnement.fr>
3. Shahbazi N., Zare-Dorabei R., Naghib SM., Journal of Materials Science and Engineering: C, 127 (2021) 112-249.
4. M. Engavale, M. B. Engavale, and M. v Deshmukh, "Fabrication of Microfluidic Biosensor," Journal of Pharmacy and Biological Sciences (IOSR-JPBS). 10 (2022) 5-08.

## Biography



Chaimae Elgarrab is a Phd Student at Euro Mediterranean University of Fes since 2021 She is awarded of a scholarship under a project of Al Khawarizmi program funded by CNRST and DDA. She received her Bachelor's degree in Materials Physics in 2019 from the Faculty Sciences, University Sidi Mohamed Ben Ablalleh Fes, and a Master's degree in Physics of New Materiels and Renewable Energies in 2021 from the same University. Her research interests include Materials Science, Optics and Photonics, and Dielectrics Materiels and their Application to Sensors design.

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**WATER, SOIL, AIR, AGRICULTURE AND ENVIRONMENTAL ANALYSIS**

# On The Use of Weathered Schist in Road Pavements: An Experimental Study on The Schists of The Province of Taza

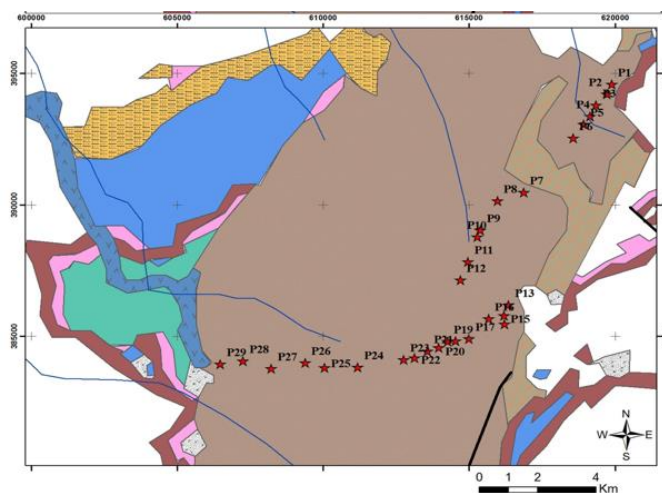
**Cherifi Hicham**<sup>1</sup>, Chaouni Abdel-Ali<sup>1</sup>

<sup>1</sup>*Intelligent Systems, Georesources And Renewable Energies Laboratory, Faculty of Sciences and Technics, Sidi Mohamed Ben Abdellah University, Fez, Morocco*

## Abstract

In Morocco, the management of materials in the road sector is framed by a panoply of technical and normative standards including the Moroccan guide of road earthworks dating from 2002. This document was inspired by its French counterpart and dictates the rules for soil reuse in embankments constituting an important part of the pavement structures. In fact, this document made the use of friable rocks (category R) complicated and leaves to the geotechnical engineer the definition of the necessary precautions. This ambiguity often discourages the administrative services from considering these materials as a reusable deposit and consequently they resort to more stable soils or rocks. This work illustrates the results of an experimental campaign carried out at the level of the Taza Province on several schistose massifs. The conclusions indicate the possibility of reusing these materials by adapting them through secondary treatment. In addition, the laboratory tests carried out on 250 samples from 35 different sites indicate the possibility of using these schists as road aggregates for low traffic roads constituting 70% of the provincial network of Taza. In addition, the treatment of this rock via hydraulic binders constitutes a promising and viable solution allowing its reuse in backfill and roadway subgrades. Indeed, the findings have shown that reduced proportions can significantly improve the behavior of schists and reduce their sensitivity to erosive factors.

**Figure:**



## Recent Publications

1. Cherifi, H., Chaouni, A. A., Fattah, G., Jalouni, A., Jabri, I., El Asmi, H., & Raini, I. (2021). Physico-mechanical characterization of schists in Tazzeqa complex [Taza Province, Eastern Morocco]. *Case Studies in Construction Materials*, 15, e00692. Mohd H. H., Mohammed J. K., *J Phy. Sci.* 21 (2010) 1. DOI: 10.1016/j.cscm.2021.e00692
2. Impact of Limestone Deposit Operation on the Yield of Surrounding Agricultural Land: Case of the Western Rif, Morocco Ghizlane Fattah, Fouzia Ghrissi, Jamal Mabrouki, Hicham Cherifi E3S Web Conf. 337 02005 (2022) DOI: 10.1051/e3sconf/20223370200

## Biography



I am currently the chief of geotechnical service within the Public Laboratory of tests and study - the Regional Technical Center of Fez-Meknes. I am graduated from the Hassania School of Public Works as a civil engineer and I am conducting my thesis within the Intelligent Systems, Georesources And Renewable Energies laboratory. indeed, my research is focused on the physical-mechanical characterization of shales and their reuse in the field of civil engineering.

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## Inhibition effect of 4-amino-3-methyl-1,2,4-triazole-5-thione (MTSNH) against corrosion of Cu-30Ni alloy in 3%NaCl solution

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<sup>1</sup>Energy, materials and sustainable Development Team, CERN2D, Higher School of Technology Salé, Mohammed V University, Rabat 8007, Morocco

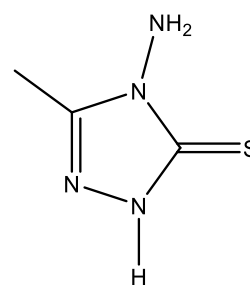
<sup>2</sup>Laboratory S3MN2E-CERNE2D, Faculty of Sciences, Mohammed V University Rabat, Av. Ibn Battouta, B.P. 1014, M-10000 Rabat, Morocco

<sup>3</sup>Materials, Energy, Acoustics Team, École Supérieure de Technologie – Salé, Université Mohammed V de Rabat Morocco

### Abstract

The inhibiting effect of 4-amino-3-methyl-1,2,4-triazole-5-thione (MTSNH) on the corrosion behavior of copper-nickel alloy (Cu-30Ni) (cupronickel) in NaCl 3% solution has been investigated at 298 K using potentiodynamic polarization, impedance spectroscopy (EIS) methods and surface characterization. Polarization measurements showed that the organic compound investigated act as mixed type inhibitor retarding both anodic and cathodic reaction. The impedance results show a change on the corrosion mechanism of alloy in the presence of inhibitor. Appropriate electric equivalent circuit model was used to calculate the impedance parameters. Changes in the impedance parameters are related to the adsorption of organic inhibitor on the metal surface, leading to the formation of protective film. This film depends on the immersion time. Inhibition efficiencies obtained from different studied methods are in good agreement. Inhibition efficiency up to 96.82% can be obtained at 1 mM of inhibitor and after 60 min of immersion time.

**Figure:**



### Recent Publications

1. Tassaoui K., Damej M., Molhi A., Berisha A., Errili M., Ksama S., Mehmeti V., Elhajjaji S., Benmessaoud M., Int. J. Corros. Scale. Inhib. 11 (2022) 221-241.
2. Benmessaoud M., Es-Salah K., Kabouri A., Hajjaji N., Takenouti H., Srhiri A., Mater. Sci. Appl. 02 (2011) 276–283.
3. Damej M., Chebabe D., About S., Erramli H., Oubair A., Hajjaji N., Heliyon. 6 (2020), e04026.
4. Damej M., Benassaoui H., Chebabe D., Benmessaoud M., Erramli H., Dermaj A., Hajjaji N., Srhiri A., J. Mater. Environ. Sci., 7 (2016), 738–745.

### Biography



Tassaoui kaoutar is a Ph.D student at University Mohammed V of Rabat, she got her Euro-african master of analytical chemistry and environment, and she started directly her Ph.D research on study of the corrosion inhibition of copper-nickel by triazole compounds in 3% NaCl solution. She published an article in an international journal indexed Scopus (IP=2.81)

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# Water quality and environmental performance of a municipal wastewater treatment plant (M'rirt City. Morocco)

Touria HACHI<sup>1</sup>, Maryama HACHI<sup>2</sup>, Youssef EL HAMMIOUT<sup>3</sup>, Hamza ESSABIRI<sup>3</sup>, Driss BELGHYTI<sup>1</sup>, Mhamed KHAFFOU<sup>3</sup> Rabiaa MOUNIR<sup>3</sup>, Rachid BENKADDOUR<sup>4</sup>, and El Hassan ABBA<sup>\*3</sup>

<sup>1</sup>Laboratory of Agro- physiology, Biotechnology, Environment, and Quality, Department of Biology, Ibn Tofail University, Faculty of Science, Kenitra, Morocco

<sup>2</sup>Laboratory of Botany, Biotechnology and Plant Protection, Department of Biology, Faculty of Science, BP. 133, Ibn Tofail, Kenitra University, Morocco

<sup>3</sup>Higher School of Technology. Sultan Moulay Slimane University B.P. 170, 54000 Khénifra, Morocco.

<sup>4</sup>Materials, Energy, Civil Engineering and Environment team. Higher School of Technology. United. Mohamed first. Oujda.

## Abstract

The objective of the study is to characterize the water of Oued Tighza of M'Rirt city and evaluate the performance of one of the first treatment plants on Oued Tighza, which is the tributary of the great river of Bouregregue. The results of the various analyses carried out in 9 sampling stations upstream and downstream of the treatment plant show that the average water temperature (20.46°C) and pH (7.46) meet the standards of Moroccan surface waters. For dissolved oxygen (4.9mg/l), this concentration classifies the water as medium quality. The electrical conductivity (2249.70 µS/cm), the total dissolved solids (1440.646mg/l), the turbidity (202.3956 mg/l) classify the waters of the different stations of poor quality. The suspended solids (339.3289mg/l) classify the waters in the average class and the BOD5 (194.4267mg/l), exceed by far the limit value of the waters and classify the stations in the worst class. The comparison of the waters upstream and downstream of the wastewater treatment Plant shows that the latter allows a 65% abatement for BOD5, but which remains insufficient since the value of the station S4 is 199,17mg/l and which exceeds that of 150 mg/l that is the acceptable value. The decrease in BOD5 downstream of S4 can be explained by the self-purification of Oued Tighza For suspended mater, the values downstream of the station far exceed the Moroccan standard of 150 mg/l. The decrease downstream of is explained by sedimentation along the stations.

**Keywords:** physicochemical, water quality, performance, wastewater treatment plant, Oued Tighza.

## Recent Publications

1. El Hassan Abba<sup>1</sup>, Imam Idrissi<sup>2</sup>, Younes Bennani<sup>1</sup>, Adnane El Yaacoubi<sup>1</sup>, Sanae Cherroud<sup>1</sup>, Tarik Ainane<sup>1</sup>, Mhamed Khaffou Assessment of water quality of Oum Er Rabia River by Microbiological Quality Index and Water Quality Index Pollution 2021, 7(3): 561-571 DOI: 10.22059/poll.2021.319490.1025
2. Abba El Hasan<sup>1</sup>, Ajiyel Halim<sup>2</sup>, Zine Nasser Eddine<sup>3</sup>, Idrissi Imame<sup>4</sup>, Ainane TariK<sup>5</sup>, El Yaacoubi Adnane<sup>6</sup>, BenKaddour Rachid<sup>7</sup>, Merimi Imane. Assessment of the water quality of Oued El Kell by physicochemical and bacteriological approach. Materials Today: Proceedings 45 (2021) 7511–7516. Materials Today: Proceedings
3. Abdellah Ouigmane, Otmane Boudouch, Aziz Hasib, Omar Ouhssine, Rima Isaifan, Mohamed Berkani, El Hassan Abba. The impact of RDF valorization on emissions from cement kiln and leachate quality. Case study of a region in Morocco. (2021)ID: POLL-202009-890 (R3). Journal "Pollution" Accepted
4. E. H. Abba, L. Bahouar<sup>1</sup>, I. Idrissi<sup>2</sup>, T. Ainane<sup>1</sup>, A. El Yaacoubi<sup>1</sup>, S. Cherroud<sup>1</sup>, R. Mounir<sup>1</sup>, A. Ainane<sup>1</sup>, R. Benkaddour<sup>3</sup> and A. Zarrouk<sup>4</sup>. (2021) Assessment of the impact of the water quality on ichthyological biodiversity in Morocco: Case of Oum Er Rabia River. ID: CJES-2012-1756. Accepted.
5. El Hassan Abba, Halim Ajiyel, Nasser Eddine Zine, Imame Idrissi, TariK Ainane, Adnane El Yaacoubi, Rachid BenKaddour, Imane Merimi, Assessment of the water quality of Oued El Kell by physicochemical and bacteriological approach, Materials Today: Proceedings, 2021, ISSN 2214- 7853, <https://doi.org/10.1016/j.matpr.2021.02.265> . - Ainane, Ayoub; Cherroud, Sanaa; El Kouali, - M'hammed ; Talbi, Mohammed ; El yaacoubi, Adnane ; Abba, El Hassan ; Ainane, Tarik\*. Chemical Compositions, Insecticidal And Antimicrobial Activities Of Two Moroccan Essential Oils Of Citrus Limonum And Syzygium Aromaticum. Archives • 2020 • vol.2 • 190-199. <http://pharmacologyonline.silae.it>.ISSN: 1827-8620

## Biography



Pr. ABBA El Hassan, holder of a Doctorate in environmental sciences at the Faculty of Sciences, Ibn Tofail University/ Khénifra since 2011. Researcher professor at Higher School of Technology / Khénifra /Sultan Moulay Slimane University since 2014. Acquired expertise in the field of the environment through all of the environment modules taught and participation in the various international and national scientific events and the supervision and co-supervision of some research works. Since 2011, the number of articles published has exceeded 30 as the first author or co-author in the field of the environment, management and recovery of natural substances.

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## Physico-chemical and bacteriological quality of well water in khénifra province (morocco)

Youssef EL HAMMIOUI<sup>1\*</sup>, Hammou ANARGHOU<sup>1</sup>, Moulay lafdil BELGHITI<sup>2</sup>, Touria HACHI<sup>1</sup>, Mhamed KHAFFOU<sup>3</sup>, Rachid BEN KADDOUR<sup>4</sup>, El Hassan ABBA<sup>1,3</sup>

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<sup>2</sup>Natural Resources Management and Recovery Team, Department of Biology, Faculty of Science Meknes-Morocco.

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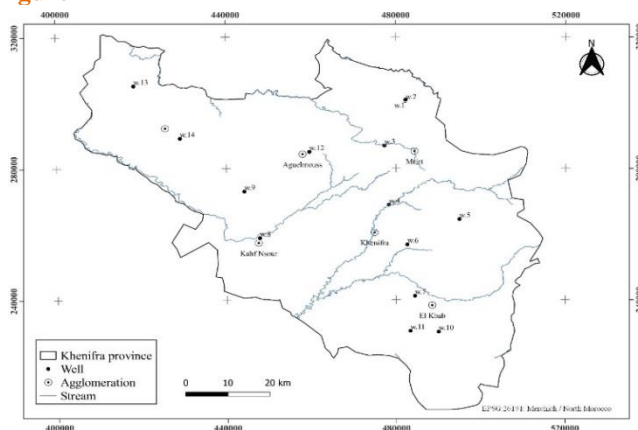
<sup>4</sup>Materials, Energy, Civil Engineering and Environment team. Higher School of Technology. United. Mohamed first. Oujda.

### Abstract

In khenifra province, groundwater is an important source of drinking water for rural populations and agricultural production. This study aims to assess the quality of water from some wells in the study area. To this end, physicochemical and microbiological analyses were carried out on 14 wells in 2021. The objective of the study is to assess the hygienic quality of well water used as a source of drinking water and also for irrigation. The results of the analyses were processed using hydrochemical methods and multivariate statistical analysis methods. From a physicochemical point of view, most of the wells analyzed to comply with Moroccan standards of potability. Microbiologically, the concentrations of total aerobic mesophilic germs vary from 1 to  $30.10^3$ CFUs/ml, total coliforms (1 to  $3 \times 10^2$  CFUs/100ml), Escherichia Coli(1 to  $3 \times 10^2$  CFUs/100ml) and intestinal enterococci(1 to 290 CFUs/100ml). The presence of a very high microbial load showed that most wells in the study area are subject to microbial contamination.

**Keywords:** Groundwater, physico-chemical , microbiological quality, Khénifra.

Figure



### Recent Publications

1. El hammioui et al Evaluation of the metallic and bacteriological quality of well water in Khénifra province (Morocco).IOP conference series earth and environmental science(2022).

### Biography



Youssef El hammioui is a PhD student at faculty of Sciences and technics, Sultan Moulay Slimane University, Beni-Mellal. youssef does research in groundwater quality. Their current project is “the evaluation of the physical-chemical and bacteriological quality of groundwater and its impact on the human health in khenifra province”.

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## Assessment and relationship between organic pollution parameters and aquatic bio-indicators (Wadi tighza. morocco)

TOURIA HACHI<sup>\*1</sup>, MARYEAMA HACHI<sup>1</sup>, Rachid BEN KADDOUR<sup>3</sup>, HAMZA ESSABIRI<sup>2</sup>, ADNANE EL YAACOUBI<sup>2</sup>, MHAMED KHAFFOU<sup>2</sup>, EL HASSAN ABBA<sup>2</sup>

<sup>1</sup>Faculty of Science, Ibn Tofail University Kenitra Morocco

<sup>2</sup>Higher School of Technology, Khenifra. Sultan Moulay Slimane University. Beni Mellal Morocco.

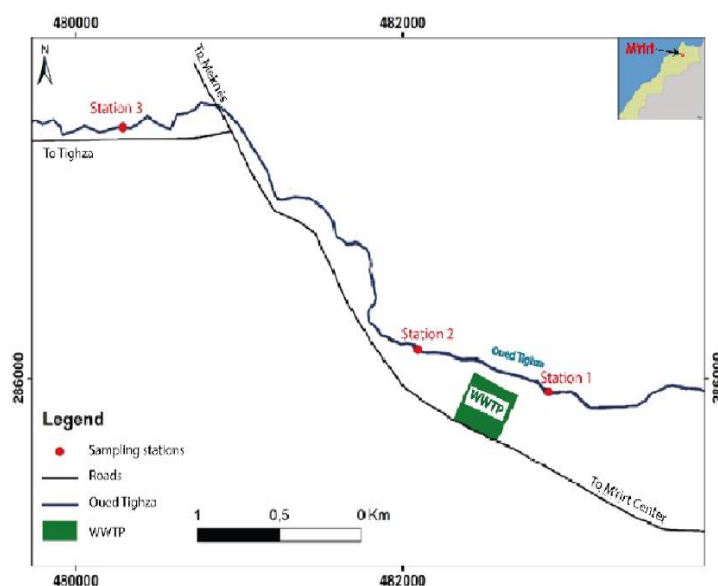
<sup>3</sup>Materials, Energy, Civil Engineering and Environment team. Higher School of Technology. United. Mohamed first. Oujda.

### Abstract

The aim of this study is to evaluate the relationship between pollution organic of wastewater and aquatic macroinvertebrates assemblages at the wadi of Tighza in the Bouregreg basin hydraulic. To respond of this objective, we are used indicators parameters of organic pollution such Ammonia (NH<sub>4</sub><sup>+</sup>), Nitrogen dioxide (NO<sub>2</sub><sup>-</sup>), Phosphate (PO<sub>4</sub><sup>3-</sup>), Biochemical Oxygen Demand (BOD<sub>5</sub>) and the analysis of Bio-indicators (benthic macroinvertebrates) at the level of Oued Tighza. All these indicators provide the state of health of the aquatic ecosystem to propose solutions by water managers. The results obtained of Lisec-Index in different stations (S1, S2 and S3) show that the water quality is highly polluted (Organic Pollution Index =1), these results corroborate with the bio-indicators found in the different stations studied. i.e., absence of polluo-sensitive bio-indicators such as ephemeroptera, plecoptera, and trichoptera and are replaced by polluo-resistant bio-indicators mainly Tubifex Tubifex and Asellus aquaticus.

**Keywords:** Water quality, Wastewater, Lisec-Index, Bio-indicators, Oued Tighza, Morocco

Figure



### Biography



Dr Touria Hachi, PhD in life sciences and environment, holder of a national doctorate at the Faculty of Sciences of Kénitra, Ibn Tofail University since 2017. The field of expertise is the evaluation of water quality by different approaches, wastewater treatment as well as environmental impact studies and sustainable development.

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# Adsorption of the dye (methylene blue) by the clay of Khenichet- Sidi Kacem- Morocco: Mathematical and thermodynamic modeling of experimental data

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<sup>2</sup>Laboratory of Advanced Materials and Process Engineering (LAMPE), Department of Chemistry, Faculty of Sciences, Ibn Tofaïl University, B.P. 133, 14000 Kenitra, Morocco.

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## Abstract

The presence of colored pollutants in nature is not only harmful to environmental life but also to many biological cycles [1]. These pollutants pose a great risk to human health and the environment due to their high stability and low biodegradability. [2,3]. To reduce the harmful effect of the discharged pollutants, several treatments were used [4]. Adsorption remains one of the most used and simple techniques to realize. The removal of coloring substances by adsorption on different solid materials, especially on clays, has notably made many trials. [5-6].

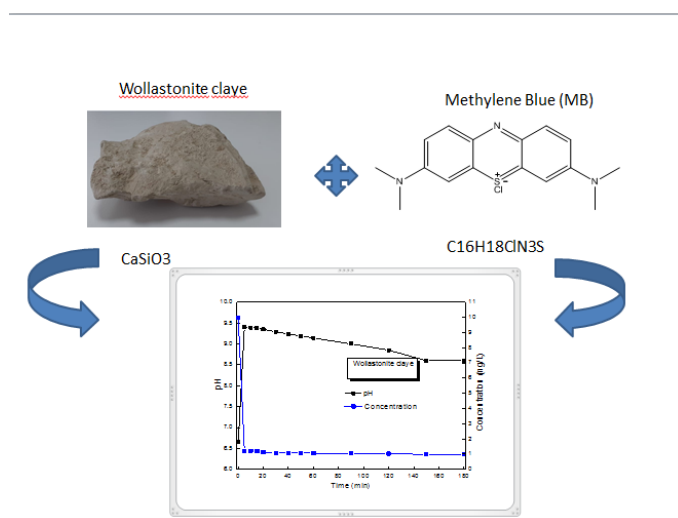
This work presents the results of the adsorption of the cationic dye called "methylene blue" on the raw clay of GHARB (KHENICHETE - SIDI KACEM)-Morocco.

The results of the studies of the effect of several parameters on the adsorption performance such as contact time, mass of the support, pH of the effluents and others were obtained at an adsorption equilibrium after 180 min of contact at a mass of 0.02 g of clay, and at pH = 6.5 towards a cationic dye (MB). This was done with an increase in temperature to 55 °C with a decrease in adsorption capacity for both clays  $Q_{max} = 45$  mg/g for the methylene blue dye.

The study of kinetic models shows that the adsorption of Methylene Blue (MB) dye by clay followed the pseudo-second order model and that the Freundlich isotherm is the most appropriate model to explain the process of this adsorption. The thermodynamic parameters related to the studied adsorbent/adsorbate system indicate that the adsorption process is spontaneous and exothermic.

**Keywords:** Adsorption, clay, cationic dye, methylene blue

Figure:



## Recent Publications

1. J. Bensalah, A. Habsaoui, B. Abbou, L. Kadiri, and I. Lebkiri, Adsorption of the anionic dye methyl orange on used artificial zeolites: kinetic study and modeling of experimental data," Mediterranean Journal of Chemistry. 9 (2019) 311-316
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## Biography



Author he has experience in the study of adsorption by clay materials in the environmental field. He was enrolled in the PhD program in 2017 at the University of Kenitra, Morocco.

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# BATHYMETRY STUDY AND SLUDGE CHARACTERIZATION OF ANAEROBIC PONDS IN AL HOCEIMA WASTE STABILIZATION POND (MEDITERRANEAN MOROCCAN COAST)

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## Abstract

Morocco is engaged to ensure sustainable development and promote the domestic and industrial wastewater's treatment. In this context, several sewage treatment plants were created, in order to protect the environment from direct wastewater's discharges, and to reuse it, a specially in harsh conditions of drought. This work is interested to a by-product of Wastewater Stabilization Pond (WSP) that affects directly the hydraulic system and the treatment efficiency, it is sewage sludge. The main objective of this study was to diagnose the sludge accumulation of the wastewater treatment plant (WWTP) of Imzouren-Béni Bouayach zone, Province Al Hoceima, North of Morocco. It appears from this study that the treated water has efficiencies around of 35%, 50%, 37% and < 20% for TSS, BOD<sub>5</sub>, COD and NH<sup>4+</sup>, against 60%, 60 till 80%, 50 till 70% and 60% till 80% recommended.

The question was at this level; are low yields due to silting up? To have an answer, a bathymetric study was conducted. Indeed more than 80% of anaerobic ponds are occupied. The Bathymetry confirmed the silting expressed by a sludge production rate estimated on the entire system of (0.0394 m<sup>3</sup>/person/year). Physicochemical analyzes, trace metals and bacteriological characteristics have done. The study of sludge's quality shows that it is rich in organic matter and fertilizer elements (N, P, K). Trace metals show negligible levels and a presence of eggs lower than the norm.

*Figure:*

**Keywords:** Wastewater stabilization pond, Sludge accumulation rate, effluent quality, Bathymetry, Sludge characterization, Mediterranean Moroccan coast.

## Biography



Author got her PhD from the University Mohammed I, Oujda Morocco. Her expertise is specifically in evaluation and monitoring the environmental studies. Her focus is based on the reuse of solid and liquid waste to have application in different fields.

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# Identification of favorable area for artificial recharge in the Tamellalt aquifer

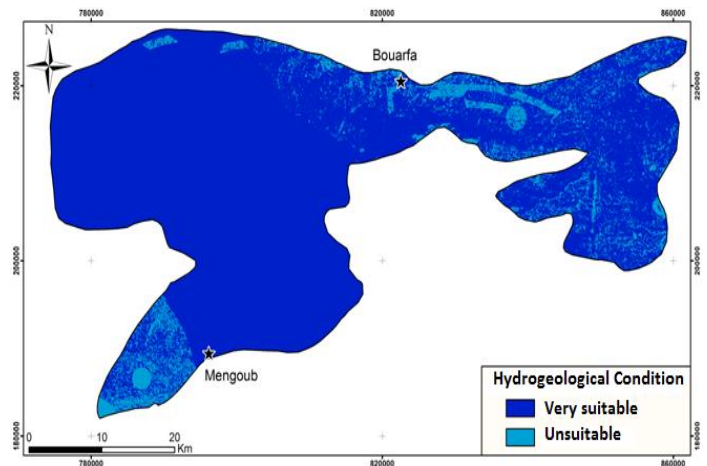
M. Kadiri<sup>1,\*</sup>, Y. Zarhloule<sup>1</sup>, A.E. Barkaoui<sup>1</sup>

<sup>1</sup>Laboratoire Géo-patrimoine, Géo-environnement et Prospection Minière et Hydrique, Faculté Des Sciences Université Mohamed Premier Oujda.

## Abstract

The study of the mode of renewal of aquifers becomes indispensable. In arid to semi-arid climatic contexts, these aquifers are under water stress as a result of prolonged periods of drought, overexploitation of groundwater and significant losses by evaporation. This work therefore aims to assess the contribution of a system. Geographical Information Systems (GIS) and to identify permeable zones favoring the infiltration and artificial recharge of surface aquifers at the base of geological, hydrological and hydrogeological data. The study concerns the Triassic grit aquifer in the large Tamellalt watershed. The determination of these zones could be made by following a coherent and clear method based on the use of geomatics and the definition of the parameters that control the recharge of the aquifers, namely climate, fracturing, slope, soil type and lithology. These parameters were extracted from Landsat TM and ETM + images and refined by fieldwork. The Digital Terrain Model (DTM) was used to define the slope factor.

Figure:



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1. Lakshmi, S. V., & Reddy, Y. V. K. (2018). Identification of groundwater potential zones using GIS and remote sensing. *International Journal of Pure and Applied Mathematics*, 119(17), 3195-3210.
2. 2Murmu, P., Kumar, M., Lal, D., Sonker, I., & Singh, S. K. (2019). Delineation of groundwater potential zones using geospatial techniques and analytical hierarchy process in Dumka district, Jharkhand, India. *Groundwater for Sustainable Development*, 9, 100239.
3. Anbarasu S, Brindha K, Elango L (2019) Multi-influencing factor method for delineation of groundwater potential zones using remote sensing and GIS techniques in the western part of Perambalur district, Southern India. *Earth Sci Inf.* <https://doi.org/10.1007/s12145-019-00426-8>.

## Biography



Kadiri Mohammed PhD student in final year in Geosciences and Civil Engineering Department. He is a civil engineering engineer from the Faculty of Sciences Oujda in 2012. He was the head of Technical department and quality control at GTGCO company from 2013.

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# Theoretical and kinetic study of the adsorption of the industrial Methyl Orange MO dye on *Typha latifolia*: Treatment and recovery

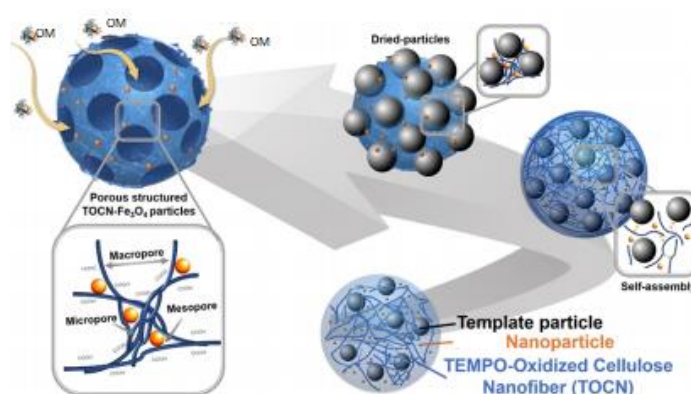
Abdelhay El amri<sup>1</sup>, Azeddine Lebdiri<sup>1</sup>, Fatima Zahra bouhassane<sup>1</sup>, Zineb Wardighi<sup>1</sup>, El Housseine Rifi<sup>1</sup> and Ahmed Lebdiri<sup>1</sup>

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## Abstract

The current study included the use of a new natural, biodegradable adsorbent based on filters of reed plant (*Typha latifolia*) for the removal of an anionic dye methyl orange from aqueous solutions. The adsorbent has been used in rough (RB) and activated (RAS) form. The carried out Tests have proved a significant elimination capacity during the first 20 minutes. The effects of various experimental parameters such as particle size, adsorbent mass, pH, contact time, initial methyl orange concentration, and temperature were investigated. The experimental results have shown that the adsorption of methyl orange dye on crude resin and modified resin reached respectively 72.61 and 93.23 % with pH =5 at room temperature. The isothermal study is shown that the Freundlich model describes well the methyl orange adsorption through reed fibers. In addition, Theoretical studies were carried out using DFT simulations investigated the interactions between the most reactive areas of the main component of the biosorbent, between the most reactive groups of the main component of the *Typha Latifolia* biosorbent, namely the cellulosic polymer, and the anionic dye OM. The comparison of all experimental and theoretical results confirmed the biosorption capacity of the studied biosorbent for dye removal

Figure:



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2. A. Zalaghi, F. Lamchouri, H. Toufik, et M. Merzouki, « Valorisation des matériaux naturels poreux dans le traitement des Lixiviats de la décharge publique non contrôlée de la ville de Taza (Valorization of natural porous materials in the treatment of leachate from the landfill uncontrolled city of Taza) », p. 10, 2014. <https://doi.org/10.1007/s13762-020-02729-6>
3. N. Abidi et al., « Removal of anionic dye from textile industries' effluents by using Tunisian clays as adsorbents. Zeta potential and streaming-induced potential measurements », *Comptes Rendus Chim.*, vol. 22, no 2-3, p. 113-125, févr. 2019, doi: 10.1016/j.crci.2018.10.006.

## Biography



EL AMRI Abdelhay has its expertise in the development and characterization of new bioorganic materials application to the adsorption of organic and inorganic pollutants as well as corrosion. Its focus is based on synthesis and grafting onto biopolymers. She has been preparing her doctorate since 2018 at Ibn Tofail University, Faculty of Sciences. Morocco. She has published more than 6 articles.

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## Characterization and application of corrosion of $A_2MP_2O_7$ and $AMPO_4$

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<sup>1</sup>Ibn Tofail University, Advanced Materials and Process Engineering laboratory, Faculty of sciences, Kenitra, Morocco

<sup>2</sup>Mohammed V University, Laboratory of spectroscopy, Molecular Modeling, Materials, Nanomaterials, Water and Environment, LS3MN2E-CERNE2D, Faculty of sciences, Rabat, Morocco

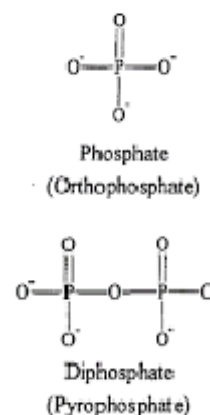
<sup>3</sup>Mohammed V University, Laboratory of Energy, Materials and Sustainable Development, EMDD, Rabat, Salé, Morocco

### Abstract

In this work we have tried to make a comparative study between two phosphate groups with identical cations  $AMPO_4$  and  $A_2MP_2O_7$  (A monovalent cation and M divalent cation); we fixed the cation and changed the phosphate group.

concerning applications and analysis techniques, we first synthesized our two compounds and then began with the electrochemical study on the inhibition corrosion of steel in an a NaCl 3% medium for the purpose of calculating the various electrochemical and thermodynamic parameters, and for the infrared spectra of these compounds are interpreted using the factor group analysis.

Figure:



### Biography



I am Oumaima Moumouche, holder of a specialized master in materials engineering treatment characterization and quality control, my graduation project was at the LPEE laboratory on the subject of the durability of concrete in the marine environment.

I am currently a PhD student at Advanced Materials and Process Engineering laboratory Ibn Tofail University, Faculty of sciences, Kenitra. The topic of my thesis it's under the name of: characteristics of phosphate materials DFT calculation and electrochemical applications under the supervision of Professor Mohamed Harcharras.

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# Efficient hydrophobic membranes based on ionic liquids for water desalination by direct contact membrane distillation processes

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<sup>2</sup>Laboratory of Fundamental Chemistry of Membrane Technology, Department of Environmental and Chemical Engineering, University of Calabria, 87036 Rende, CS, Italy.

<sup>3</sup>Research Laboratory on Textile Materials (REMTEX), ESITH B.P 7731 Casablanca, Morocco.

## Abstract

The relatively large pore size of the membranes and the surface hydrophobicity and stability of the membranes may limit their application for direct contact membrane distillation (DCMD). The incorporation of ionic liquid IL is a potential method to enhance this process.

In this study, a new membrane based on a mixture of polytetrafluoroethylene (PSU) and polyvinylpyrrolidone (PVP) and based on ionic liquid tetrabutylammonium hexafluorophosphate (TBAPF<sub>6</sub>) was fabricated and applied to DCMD.

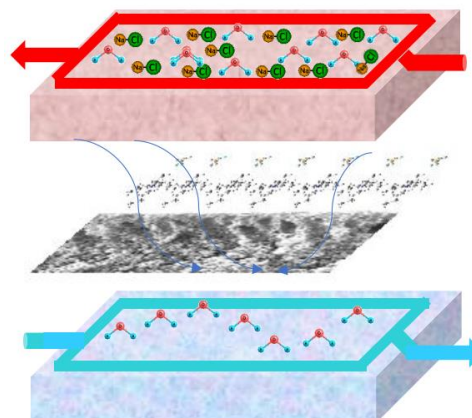
The effects of IL on membrane permeability, hydrophobicity, porosity, membrane morphology, DCMD performance and salt rejection were studied.

The incorporation of IL at an optimal concentration allowed the flux of water vapor through the membrane to reach a value of 1.6 kg/m<sup>2</sup>.s While the flux of WV through the support alone gave the value 7.4 kg/m<sup>2</sup>.s which indicates an increase of almost five times. The PSU-PVP-TBAPF<sub>6</sub> membrane demonstrated perfect stability for approximately five weeks.

In this study, we were able to reveal the mechanism of den WV diffusion through the membrane by calculating the energy parameters ( $E_a$ ,  $\Delta H^\ddagger$  and  $\Delta S^\ddagger$ ), and with the presence of IL, we were able to reduce the energy of 37.2 kJ/mol to 19.72 kJ/mol.

Which makes this membrane composite a promising candidate for DCMD application.

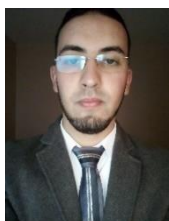
Figure:



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## Biography



Rachid OUCHN PhD student at the university Hassan II faculty of sciences Ain Chock, member of the Genie Laboratory of Materials for the Environment and Valorization (GeMEV), member of the REMTEX laboratory within ESITH.

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# Slow- Release Phosphate Fertilizer Coated by Phosphorylated Cellulose Gel - Nanoclay Reduces Phosphorus Leaching and Promotes Beans Growth

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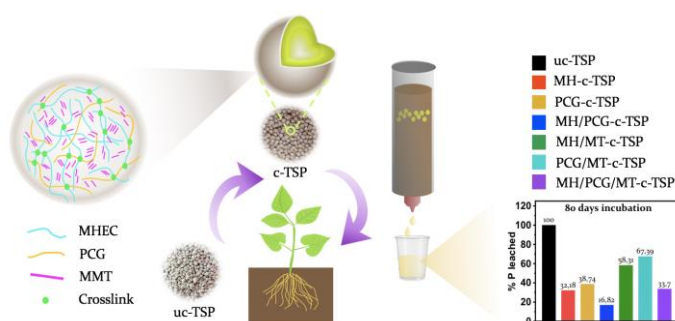
<sup>1</sup>Materials Science, Energy and Nanoengineering Department (MSN), Mohammed VI Polytechnic University (UM6P), Lot 660 – Hay Moulay Rachid, Benguerir, 43150, Morocco.

<sup>2</sup>AgroBioSciences Department (AgBS), Mohammed VI Polytechnic University (UM6P), Lot 660 – Hay Moulay Rachid, Benguerir, 43150, Morocco.

## Abstract

Sustainable management of phosphorus (P) is crucial for efficient plant nutrition and global food security. Polymer coating of highly soluble P fertilizers is an effective technology that can limit the risks of P-leaching and/or runoff into water systems, thus, increasing P- bioavailability and reducing water pollution. In this context, a novel coated Triple Superphosphate (TSP) fertilizer is developed using a simple process and green materials based on extracted and phosphorylated cellulose, methyl hydroxyethyl cellulose and montmorillonite clay. Experimental results showed an improved morphology and hardness of phosphate fertilizer granules after coating as well as a positive impact on the water retention capacity of the soil. P leaching in soil was monitored for 80 days and substantial reduction of P leaching up to 80 % was successfully achieved by coated TSP fertilizer. Common bean growth was stimulated by coated TSP treatments that have showed remarkable effect on leaf parameters and roots architecture

Figure:



## Recent Publications

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2. Kassem I., Ablouh EH., El Bouchtaoui FZ., Kassab Z., Khoulood M., Sehaqui H., Ghalfi H., Alami J., El Achaby M., Int. J. Biol. (189) (2021) 1029–1042
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## Biography



Ihsane KASSEM, 29 years old, is currently a PhD student at Materials Science and Nanoengineering department –Mohammed VI Polytechnic University– Benguerir- Morocco. She received in 2016 her master’s degree in Functional Materials from Faculty of Sciences and Technologies – Cadi Ayyad University-Marrakech-Morocco. She is currently working on the development of slow/ controlled release fertilizers by coating technology using cellulose- based biodegradable formulations.

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## Theoretical and experimental study of saccharin derivative as a corrosion inhibitor for carbon steel in 1M HCl

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### Abstract

Many researchers have become interested in corrosion as a result of the resulting alteration and degradation of many metal installations in the chemical, petroleum, and mining industries [1].

Corrosion research has recently been focused on the development of low-cost, environmentally friendly compounds [2-3].

Recently, saccharin derivatives have been studied as corrosion inhibitors, the addition of these molecules in electrolytes affects the corrosion resistance of metals. In this context, N-propargyl saccharin (NPS) was synthesized and her inhibition against corrosion on carbon steel in a 1 M HCl solution was studied using electrochemical measurements, and scanning electron microscopy (SEM) techniques. The results showed that the inhibition efficiency of NPS improved with increases in inhibitor concentration but decreased with temperature increase. Results from potentiodynamic polarization and EIS showed that the corrosion inhibition efficiency of NPS was excellent. The adsorption of inhibitors on the carbon steel surface followed Langmuir adsorption isotherms. Morphology observation revealed that the carbon steel was greatly protected by inhibitors. Further, density functional theory (DFT) was used to investigate the relationships between molecular structure and inhibition efficiency.

### Figure:

### Recent Publications

1. T. Douadi, H. Hamani, D. Daoud, M. Al-noaimi, S. Chafaa, J. Taiw Insti . Chem. Engi, 71, (2016) 388-404.
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3. W. Belmaghraoui, A. Mazkour, H. Harhar, M. Harir, S. El Hajjaji, , Anti-Corr Meth and Mater. 66 (2019) 121–126.
- 4.

### Biography



Biography 150 I am the writer. I have experience in my field of specialization, which is corrosion, and its focus is that it is damage to the material (metal, and it Is alloys) as a result of a chemical or electrochemical reaction with the surrounding medium. Now, I am a doctoral student at Mohammed V University in Rabat, I have published one article in my field.

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## Effect of waste marble powder on the properties of concrete

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Civil Engineering and Environment Laboratory (LGCE), Mohammadia Engineering School, Mohammed V University, Rabat, Morocco

### Abstract

Concrete, the most widely used construction material in the world, consumes a large volume of natural resources. The growing concern for the preservation of the environment has led to the development of new technologies for the valorisation of industrial by-products in the construction sector. The objective of this paper is to study the feasibility of using waste marble powder (WMP) as a partial replacement of sand in concrete. A group of five concrete mixtures were prepared with sand substitution levels of 0%, 5%, 10%, 15% and 20%. Several tests were performed to evaluate workability, density, ultrasonic pulse velocity and compressive strength. The test results show that increasing the ratios of marble waste powder leads to an increase in the compressive strength of the concrete with an optimum percentage of 15%. Therefore, it is shown that mixtures containing a percentage of WMP lower than 15% have improved the mechanical properties compared to conventional mixtures, which indicates that WMP can replace sand in concrete. Furthermore, the use of WMP is a viable source of raw materials for the construction industry as well as an eco-friendly solution for the disposal of WMP to preserve natural aggregate reservoirs.

Figure:



### Recent Publications

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### Biography



Oumaima BOURZIK, PhD student in her 2nd year at the Laboratory of Civil Engineering and Environment (LGCE), Mohammadia School of Engineering, Mohammed V University, Rabat, Morocco.

Her research field is the valorization of industrial by-products in civil engineering.

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## Electrochemical evaluation of novel benzoxazepinone derivatives as corrosion inhibitors for mild steel in 1 M HCL

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<sup>1</sup>Laboratory of Materials Engineering and Environment: Modeling and Application, Faculty of Science, University Ibn Tofail BP. 133-14000, Kenitra, Morocco.

<sup>2</sup>International Institute for Water and Sanitation (IEA), National office of Electricity and the potable Water, Morocco

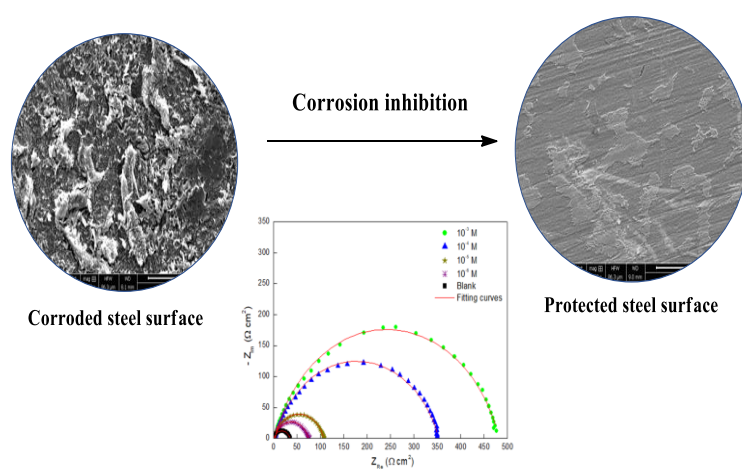
<sup>1</sup>Laboratory of Advanced Materials and Process Engineering, Faculty of Science, Ibn Tofail University, PB. 133-14000, Kenitra, Moro

<sup>2</sup>Laboratory of Organic Chemistry, Catalysis and Environment, Faculty of Science, Université Ibn Tofail, PB. 133-14000, Kenitra, Morocco

### Abstract

In this potential research, based on potentiodynamic polarization techniques and by electrochemical impedance spectroscopy (EIS) techniques. We studied the corrosion inhibition performance of two benzoxazepinone derivatives for mild steel in 1M HCL solution, which is widely used in several industrial processes due to its distinctive characteristics. The results of electrochemical methods showed that the studied molecules are good corrosion inhibitors between 81% and 90%. The thermodynamic parameters show that the molecules are chemically adsorbed on the steel surface following the Langmuir isotherm. The immersed steel surface was identified by SEM/EDS, FT-IR, AFM spectroscopy and contact angle ( $\theta$ ) measurements. Corrosive solutions after corrosion tests were identified by UV-vis and ICP-OES analysis.

Figure:



### Recent Publications

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2. Ouass A., Galai M., Ouakki M., Journal of Applied Electrochemistry. 51 (2021) 1009-1032.
3. Ouakki M., Galai M., Benzekri Z., Aribou Z., Ech-chihbii EL., Guo L., Dahmani K., Nouneh K., Briche S., Boukhris S., Cherkaoui M., Journal of Molecular Liquids. 344 (2021) 117777.

### Biography



The author has expertise in materials science. he was enrolled in a PhD program in 2019 . Faculty of Science of Kenitra, at Ibn Tofail University, Morocco.

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## Characterization of OCPa, application on the corrosion of carbon steel in 3% NaCl medium.

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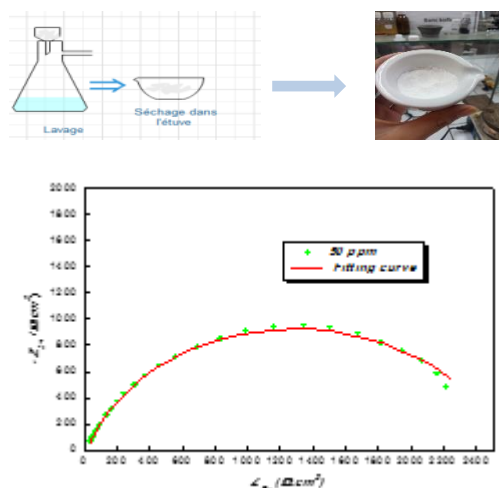
<sup>2</sup>École nationale supérieure de chimie ENSCK, University Ibn Tofail, PB 133-14050 Kénitra, Morocco.

### Abstract

Corrosion of steel is one of the major problems that concern industries when it comes into contact with aggressive environments. Therefore, the use of non-toxic and biodegradable inorganic inhibitors is the primary solution. Synthetic biomaterials based on calcium phosphate, in particular apatites, are the subject of a lots of studies in different fields. They are widely used in the medical field for bone regeneration in orthopedics and dentistry, due to their composition that is close to the mineral part of the bone tissue and their properties. They are also used in environment as catalyst, water treatment and corrosion inhibitor.

In this context, our objective is to evaluate the inhibitory action of OCPa on steel in 3% NaCl medium in order to reduce the damage caused by the corrosion. OCPa was synthesized by co-precipitation in water-ethanol medium, characterized by chemical analysis (CA), infrared adsorption spectroscopy (FTIR), X-ray diffraction (RDX) and SEM/EDX. The efficiency of OCPa was then tested by different electrochemical techniques: Electrochemical impedance spectroscopy (EIS), stationary polarization (PDP). The results obtained show that our inhibitor acts as a mixed type inhibitor in NaCl 3% with an inhibitory efficiency around 92% at a concentration of 50 ppm. These results were confirmed by SEM/EDX surface analysis. Also, some thermodynamic parameters of the activation process have been studied and discussed.

Figure:



### Recent Publications

1. Ferraa, N., Ouakki, M., Cherkaoui, M., & Ziatni, M. B. Journal of Bio-and Tribo-Corrosion, 8(1), (2022). 23.
2. May M., Journal of Sebha University-(Pure and Applied Sciences), 15(1), (2016), 12.
3. Sahoo S., Nayak S., Sahoo D., et Mallik M., Materials Today: Proceedings,18,(2019),2642-2648 .

### Biography



The author is interested in the synthesis of calcium phosphate-based biomaterials and their applications in the field of electrochemistry. She is registered as a PhD student since 2018 at the Laboratory of Materials, Electrochemistry and Environment LMEE, Faculty of Sciences, Ibn Tofail University, Kenitra, Morocco.

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# Reuse of the Marls-Limestone of Taza in Road Construction: an Experimental Study on Taza Wind Farm

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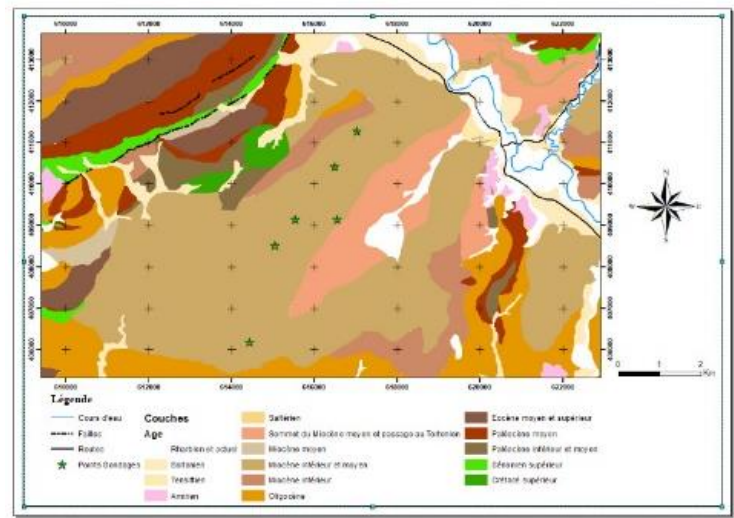
## Abstract

To expand and maintain the Moroccan road network, millions of tonnes of aggregates from natural resources are extracted annually. This has a major impact on the environment and natural environments, namely, a disturbance or disappearance of the ecosystems of the rivers in which the materials are taken, a reduction in natural aggregate reserves and an extension of open-air quarries. For this purpose, the recovery and reuse of the materials in place by a specific treatment become more important. However, Moroccan regulations exclude very plastic soils with changing characteristics, which are generally fragmentable and degradable materials.

The soils constituting the road accesses and the platform of the wind energy project of the city of Taza in Morocco are evolving marls-limestone. These materials are the subject of our research subject to see the possibility of their reuse. The first step of this research topic is the realization of a characterisation of marls-limestone of Taza, in order to identify the materials by physical, mineral and non-destructive testing. The second stage concerns the valorization of this evolving material with additives to improve the intrinsic characteristics of these soils, and check the possibility of reuse in embankments and earthworks. This improvement consists in measuring the cohesion, the friction angle and the bearing capacity of the materials, as well as giving the optimum amount of lime for practical design.

**Keywords:** lime treatment, geotechnical reconnaissance, marl-limestone, clay content, soil plasticity index.

Figure: Geological map of project site - Province of Taza



## Biography



I am currently an engineer within the Public Laboratory of tests and study - the Regional Technical Center of Fez-Meknes. I am graduated from the national school of mineral industry Rabat as a geotechnical engineer and I am conducting my thesis within the Intelligent Systems, Georesources And Renewable Energies laboratory. Indeed, my research is focused on the physical-mechanical characterization of marls-limestone of Taza and their reuse in the field of civil engineering.

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# Technical-Economic Study Of Slope Stabilization Solutions In The Oriental Rif Region – Morocco

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## Abstract

After having established the risk maps of landslides in the eastern Rif of Morocco. Which were the subject of the article "Forecast risk maps of land movements in the eastern rif-Morocco". Subsequently published in the ELSERVIER platform, and which highlighted large areas susceptible to suffer from ground instabilities that we recommended to avoid in the planning of land use, it turns out that in the case that it is inevitable to bypass these areas of risk of sliding it is necessary to provide adapted reinforcement solutions.

The purpose of this article is to establish a technical-economic study of slop reinforcement solutions. The results of which will be used by the various stakeholders in the study region to be chosen for each of the dominant soils in the study area, the best technically adopted stabilization solution and the least costly from an economic point of view among a variety of solutions.

By analyzing the results of the cost estimates of the slope stabilization solutions studied, it turns out that the least expensive solution is that relating to the Geometric Modification of the slope since it does not require special implementation equipment. Nor expensive materials, which justifies the wide use of this solution in most slop reinforcement sites.

However, it should be noted that this solution requires maintenance since the slope, although stable remains exposed to erosion agents, which causes its frequent alteration, the recurring maintenance of which during its lifespan is expensive.

Furthermore, this maintenance constitutes an obstacle for traffic on the main roads and railways or even a temporary shutdown, the economic consequences of which on the passenger and freight transport are exorbitant for the main axes connecting the ports and large agglomerations, hence the need to invest initially in solutions more effective and lasting stabilization, especially bored piles.

*Figure:*

## Recent Publications

1. Kamal Belhadj, Omar Azzouz, Makkaoui Mohamed, Forecast risk maps of land movements in the eastern Rif-Morocco, Materials Today Proceedings (Volume 45, Part 8), 2021, 7622-7627

## Biography



The author is a state engineer in civil engineering from the Hassania School of Public Work promotion of 2011. Currently, he is regional director of a technical control office of national renown in construction and civil engineering since 2015; besides, he is a temporary professor at the Mohammed first University since 2012 for the benefit of the master's degrees M1 and M2 and licenses L1 and L2.

He is currently a Ph.D. student in the fifth year at the Applied Geosciences laboratory in the Specialty of Geosciences of Environment and Civil Engineering. He recently participated as a speaker at the international conference ICMES 2020 which was held by virtual conference due to worldwide spread of the COVID-19 pandemic , furthermore he has published a recent paper untitled Forecast risk maps of land movements in the eastern Rif-Morocco in the journal Materials Today Proceedings (Volume 45, Part 8), 2021, 7622-7627 .

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# Effect of long-term conservation tillage on the chemical and physical properties of the soil in Moroccan Mediterranean areas (Case study of Zaer region)

Abdelali El MEKKAOUI<sup>1,2\*</sup>, R. MOUSSADEK<sup>1</sup>, A. ZOUAHRI<sup>1</sup>, R. Mrabet<sup>1</sup>, A. DOUAÏK<sup>1</sup> and S. CHAKIRI<sup>2</sup>

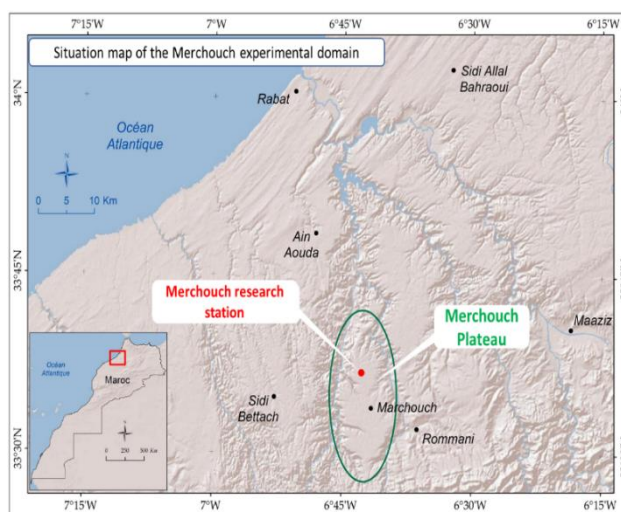
<sup>1</sup>National Institute of Agronomic Research (INRA), CRRAR, URECRN, Department of Environment and Conservation of Natural Resources - Rabat, Morocco

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## Abstract

Conservation agriculture (CA) is based on low to no soil disturbance, with no-till (NT), mulching and crop rotation [1]. Compared to conventional agriculture (CT), CA practices contribute to mitigating the impact of climate change by reducing carbon emissions and conserving natural resources [2]. Indeed, CA improves the chemical, physical, water and biochemical processes of soils [3]. It increases the organic matter (SOC) content in the soil, saves 30-40% in terms of labour time, labour and fossil energy and facilitates water infiltration and significantly reducing runoff and erosion [4]. A long-term experiment comparing NT with CT systems in a vertisol and on a cereal legume rotation. Physical and chemical properties were measured five replicates at five depths (0-5, 5-10, 10-20, 20-40, and 40-60 cm). Generally, the tillage system changed the physical and chemical properties of the soil, mainly in the surface layer. After thirteen years of experimentation at the Merchouch site, the NT system showed a bulk density BD ( $p < 0.05$ ), gravimetric moisture  $\theta_g$  ( $p < 0.05$ ), organic carbon SOC ( $p < 0.05$ ), and aggregate stability SS in three tests ( $p < 0.05$ ) significantly higher than CT. For NPK nutrients, a significant effect between NT and CT was found on  $P_2O_5$  (p value = 0.0027  $< 0.05$ ) and total N (p value = 0.00  $< 0.05$ ). In contrast, no significant effect was observed on  $K_2O$  at all depths (p-value = 0.8183  $> 0.05$ ). This finding is on concordance with previous study occurred in the studied region by Laghrour et al (2015) [5]. Our results indicate that NT improve the soil fertility (chemical and physical quality) in this semi-arid Mediterranean region.

Figure: Location of the study site in Morocco and the Zaer region



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2. Kumara T.K., Kandpal A. and Pa, S., Journal of Environmental Management 269(2020)110773.
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4. Piazza G., Pellegrino E., Moscatelli M.C. and Ercoli L., Soil and Tillage Research 196(2020)104482.
5. Laghrour M., Moussadek R., Mekkaoui M., Zouahri A., Dahan R. & El Mourid M., J. Mater. Environ. Sci.6 (2015) 391-396.

## Biography



Abdelali El Mekkaoui has her expertise in Conservation Agriculture and Soil Science. He is a Student member of the Moroccan Association of Conservation Agriculture (AMAC). Also, he is a Ph.D. student in the second year from the university IBN TOFAIL, kénitra in the main topics related to soil science: land suitability, soil fertility management, soil carbon sequestration in the agricultural system in relation to climate change modelling ect. He was participated in different national projects (OCP soil fertility map, ANDZOA ...), international projects (CRDI, ICARDA ...).

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# Climate change and siltation of the Mohamed V dam (Morocco): assessment using GIS and remote sensing tools

Naïma EL ASSAOU<sup>1</sup>, Abdelaziz SADOK<sup>2</sup>, Ouiam BOUCHANINE<sup>1</sup>, Nora MAATAOUI<sup>1</sup>

<sup>1</sup>Water and Environment Geosciences Laboratory, Science School, Mohammed V University, Rabat, Morocco

<sup>2</sup>Department of Civil Engineering, Mohammed V University, Rabat, Morocco

## Abstract

Water erosion remains one of the important problems to be addressed in the management and planning of water basins in Morocco. The Moulouya watershed, located in the North East is characterized by specific erosion degradation among the highest in Morocco, causing siltation rates of the Mohamed V and Mechraa Hammadi dams worrying since these two hydraulic works represent the keystone of the Moulouya hydraulic complex. The Moulouya watershed is subject to a high climatic aggressiveness which favors an extremely serious erosion, and an important specific degradation, contributing to the irreversible silting up of the Mohamed V dam reservoir which provides the lower Moulouya perimeter and the city of Nador. In this research we present a spatio-temporal method using multirate satellite imagery and GIS tools, through the NDWI. This method allowed to evaluate the monitoring of the evolution of the water resources stored in the Mohammed V dam reservoir taking into account the climate changes. It consists in carrying out a cartography on four different years, in order to compare the evolution of siltation from one year to another and to estimate the quantity of water retained in the dam-reservoir. The application of this method, coupled with multi-date satellite images and a geographic information system (GIS) has allowed to establish the mapping representing the risk of silting of the Mohamed V Dam. The results obtained show the distribution of water reserves stored in the dam. These waters occupy more the upstream part of the dam than the rest of the reservoir, and represent about 60% of the surface of the dam, and the rest on the downstream part is filled with sediments deposited in the form of silt.

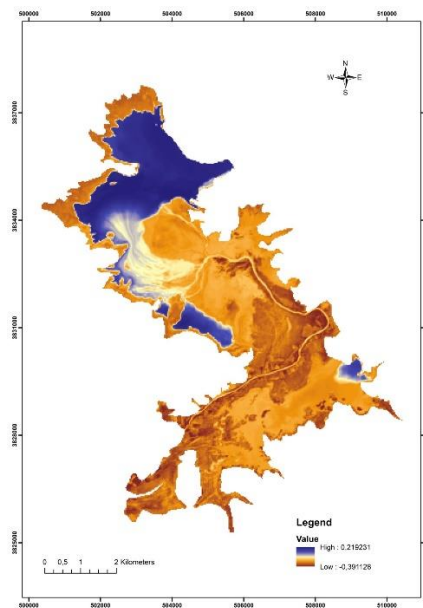
## Biography



Author Naïma EL ASSAOU, Professor in the geosciences department, Water and Environment Geosciences Laboratory (GEE) of the Faculty of Sciences, Mohammed V Rabat University. She is a State Engineer in Hydrogeology from the Moscow Academy of Geological Prospecting. She is graduated of a Master in GIS and Land Management and PHD in Geosciences at the Faculty of Sciences Ain chock of Casablanca. Her thesis was awarded Best Thesis 2017, in Geosciences from Hassan II University. She has carried out several researches in the field of geosciences and in particularly: the management and planning of groundwater, computational modeling of groundwater flows, water erosion, remote sensing applied to water systems, as well as the impact study of climate change on surface and groundwater resources (Berrechid aquifer as case study). she's the author of several scientific publications (scientific journals, journals, technical documents. She's member of: the the International Association of Hydrogeologists (IAH); Moroccan Association for the Development of Research and Scientific Information (AMIS); Tunisian Association for Digital Geographical Information (TADGI); Euro-Arab Geomatics Union (UEAG); International association Francophone for Bibliothecarial and Documentation (AIFBD); scientific and organization committees for several scientific congresses and events.

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Figure:



## Recent Publications

1. = REMINI B., une nouvelle approche de gestion de l'envasement des barrages Larhyss Journal, ISSN 1112-3680, n°31, Sept 2017, pp. 51-81.
2. El Assaoui, N., Sadok, A., Charafi, M., 2021. Analysis of a water supply intake from a silted dam using two-dimensional horizontal numerical modeling: Case of Mechraa Hammadi dam (Morocco). Mater. Today Proc. <https://doi.org/10.1016/j.matpr.2021.03.337>
3. Mammou, A.B., Louati, M.H., 2007. Évolution temporelle de l'envasement des retenues de barrages de Tunisie. Rev. Sci. Eau 20, 201–210. <https://doi.org/10.7202/015813ar> Boukna D., Hammouti

## Optimization of WWTP

Moukaf safae<sup>1</sup>, Pr. Bachir Elkihel<sup>2</sup>, Ahmed Rassam<sup>3</sup>

<sup>1</sup>université Mohammed premier Maroc, Ecole nationale des sciences appliquées Oujda, Maroc

<sup>2</sup>université Mohammed premier Maroc, Ecole nationale des sciences appliquées Oujda, Maroc

<sup>3</sup>envirchemie Maghreb s.a.r.l

### Abstract

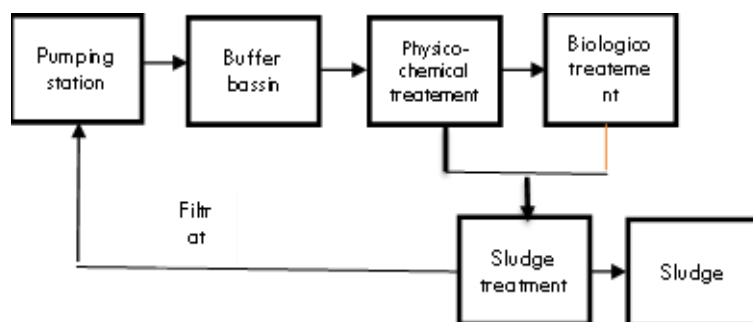
Moroccan industry, like most industries around the world, today faces a water scarcity. Water is one of the basic utilities for all kinds of production, especially in the agro-food sector. Morocco, a country of bioclimatic and ecological transition with fragile resources, is threatened with rapid degradation in the event of overexploitation of underground water reserves. Indeed, the evolution of the water supply over the last decade already testifies to the irregularity of the outlook and confirms climate failure. “From 1990 to 2000, the resources in m<sup>3</sup> per inhabitant per year fell from 1200 to 950. In 2020 the water resources are only around 600m<sup>3</sup> / inhabitant / year, at a time when the demand for water total has reached the ceiling of 20 to 21km<sup>3</sup> of water that can be mobilized. The country will drop to the shortage threshold for 500m<sup>3</sup> / inhabitant / year around the year 2030. ”[1]. In fact, Morocco has launched programs to save water and review some resource allocations in order to meet growing needs. One of these programs is the launch of 10-95 law. It about the regulation of water discharges by establishing a financing instrument based on “ the polluter pays” principle. Several industries, have been forced, by this law, to install wastewater treatment plants for their water discharges to the extent that they meet the standards defined by Law 10-95.

On this work, we will present an analysis of the operation of a wastewater treatment plant in a Moroccan dairy, the issues that have arisen and the solutions that have been provided.

The analysis of the influential of the WWTP during the different phases of treatment gave results which allowed us to optimize the performance of each phase and reduce the cost of running the WWTP.

**Keywords:** WWTP, Moroccan law, food industry, dairy industry, optimization.

Figure: diagram of WWTP process



### Recent Publications

1. rapport ABHM.

### Biography



Moukaf safae is an Industrial engineer working for a dairy industry since 2016. Graduated from EMI, she started her PhD research in 2017 in the field of treatment water and environment. She was project manger of a project of wase water treatment plan of a diary industry.

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# Chronic obstructive pulmonary disease (COPD) and air pollution: the case of Morocco

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## Abstract

Chronic obstructive pulmonary disease (COPD) is a chronic respiratory condition characterized by irreversible airflow limitation developed because of significant exposure to particulate matter and noxious gases. It is a major health problem with a considerable health, economic and sanitary burden. Smoking is by far the most important risk factor for COPD. Recently, much attention has been focused on air pollution as a risk factor for a wide range of cardiovascular and respiratory diseases including COPD. An extensive literature has confirmed the strong relationship between exposure to various air pollutants and the development of COPD. Indeed, strong evidence has shown a significant association between air pollution, incidence and the prevalence of COPD. In addition, exposure to air pollutants leads to worsening health outcomes in people with COPD. Systemic inflammation, increased frequency of exacerbations and respiratory symptoms, decreases in various lung parameters, development of emphysema and cardiac lesions are all effects observed in COPD patients exposed to particulate or gaseous pollutants. In Morocco, studies evaluating air pollution as a risk factor for COPD are rare or non-existent. However, Morocco has undergone significant economic and demographic change, as has its climate, which favors the emission of several toxic components to human health. Therefore, there is a need for studies with long follow-up times, accurate and objective measurements of exposure to air pollutants. We sought to review the epidemiological evidence on the effect of air pollution on COPD with a focus on Morocco.

**Table.** Selected studies of the association between air pollution and COPD prevalence

| Study              | Location of the study | Type of study         | Objective  | Main results  |
|--------------------|-----------------------|-----------------------|--|---|
| Seposo et al 2021  | Philippines           | Cross-sectional study | To investigate the association between ambient air quality and the risk of developing COPD among metro manila development authority traffic enforcers in Metro Manila. | A statistically significant association was found between PM 2.5 and COPD (OR: 1.24, 95% CI: 1.07 to 1.44)  |
| Huang et al 2019   | Taiwan                | Cross-sectional study | To assess the relationship between PM<2.5 and COPD in non-smokers  | Exposure to high concentrations of PM 2.5 was significantly associated with COPD. (OR, 1.29 ; IC 1.01-1.65)   |
| Doiren et al 2019  | Great Britain         | National cohort study | To investigate the association between ambient air pollution and COPD  | A statistically significant association was found between the prevalence of COPD and the concentration of different gaseous and particulate pollutants. <ul style="list-style-type: none"> <li>• PM 2.5: (OR 1.52, 95% CI 1.42-1.62, per 5 µg-m<sup>-3</sup>).</li> <li>• PM 10 (OR 1.08, 95% CI 1.00-1.16, per 5 µg-m<sup>-3</sup>) and</li> <li>• NO 2 (OR 1.12, 95% CI 1.10-1.14, per 10 µg-m<sup>-3</sup>)</li> </ul> |
| Brakema et al 2019 | Central Asia          | Cross sectional study | Comparing the prevalence of COPD and its risk factors between highland and lowland resource-poor areas   | Significantly higher prevalence in highland regions vs. lowland regions (36.7% vs. 10.4%; p<0.001)  |

COPD: chronic obstructive pulmonary disease  
 PM: particulate matter  
 NO2:nitrogen dioxide

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2. Iheanacho I., Zhang S., King D., Rizzo M., Ismaila AS., Int J Chron Obstruct Pulmon Dis., 15(2020)439.
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5. Park J., Kim HJ., Lee CH., Lee HW., Environ. Res., 194 (2021)110703.

## Biography



AL WACHAMI NADIA, PhD student in second year, laboratory of health sciences and technologies, Higher Institute of Health Sciences, Hassan First University of Settat. Her work focuses on the study of chronic obstructive pulmonary disease in Morocco.

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# Comparative assessment of groundwater quality challenges confronting Mediterranean coastal aquifers: A review

S. Bouhout<sup>1,2</sup>, K. Haboubi<sup>2</sup>, M.S. Elyoubi<sup>1</sup>

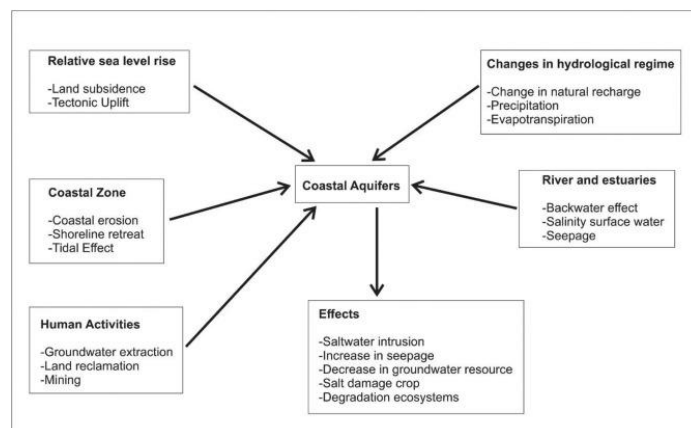
<sup>1</sup>Laboratoire Chimie Organique, Catalyse et Environnement, Faculté des Sciences, Université Ibn Tofail, Kénitra, Maroc

<sup>2</sup>Laboratoire Sciences de l'ingénieur et applications, Ecole Nationale des Sciences Appliquées d'Al-Hoceima, Université Abdelmalek Essaâdi, Maroc

## Abstract

Coastal aquifers play significant roles in securing water-supply needs for agricultural, domestic and industrial purposes. However, groundwater-dependent littoral regions, especially along the Mediterranean coast, are facing great challenges in terms of ensuring a sustainable supply of potable water due to the combined impacts of anthropogenic activities, climatic hazards and geogenic factors resulting in groundwater qualitative degradation associated with the inflow of saline water. In this context, qualitative appraisal of groundwater's chemical characteristics and comprehension of the main causes and processes enhancing aquifer salinization are of major importance to prevent further worsening of its quality. Findings of foregoing case studies performed in three Mediterranean coastal aquifers were reviewed and discussed herein. The Pleistocene aquifer of Gaza strip (Palestine), karstic aquifer of Bokkoya (Morocco) and the Mio-Plio-Quaternary aquifer of Djefara of Medenine (Tunisia) were selected since they are facing increasing deterioration associated with the impact of groundwater over-exploitation and arid/semi-arid environment. The present review attempts to provide an insight and compare the various tools, employed in each study, enabling the assessment of the groundwater quality general status and demarcation of overlapping sources of groundwater mineralization; these approaches include the application of statistical analysis, geostatistical modelling, groundwater quality indices as well as GALDIT vulnerability index. This work is also expected to outline the limitations found in these methodologies and to suggest strategies to reduce research gaps, particularly those related to seawater intrusion as common phenomenon in the Mediterranean basin.

Figure:



## Recent Publications

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2. Bouaissa M., Ghalit M., Taupin, J.D. et al., Arab J Geosci 14, 242 (2021).
3. Abu Al Naeem M.F., Yusoff I., Ng T.F., Maity J.P., Alias Y. et al., J. African Earth Sci., 156 (2019), pp. 75-93.

## Biography



Sara Bouhout is a Moroccan PhD student within the faculty of sciences at Ibn Tofail university. She graduated in civil engineering from ENSA Hoceima in 2017. Since 2018, she has been conducting research, under the guidance of Dr. Khadija Haboubi and Dr. Mohamed Salaheddine Elyoubi, to contribute to the investigation and remediation of seawater intrusion combined with groundwater overdraft occurring within a coastal aquifer, located in the north-east of Morocco. Her current research focus also includes the characterization of groundwater-surface water interactions processes and prediction of the sustainability of groundwater resources within this stressed aquifer system using multivariate, geostatistical tools and numerical modelling. Her research is funded by the National Centre for Scientific and Technical Research (Morocco).

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## The factor group analysis of the (M'', M')MP<sub>2</sub>O<sub>7</sub> diphosphate and their corrosion protection efficiency

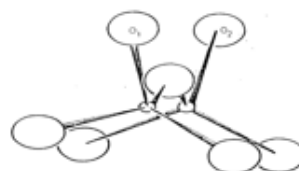
El Harmouchi Hammadi<sup>1</sup>, Moumouche Oumaima<sup>1</sup>, Alami safae<sup>1</sup>, Ait Hmid Lahsen<sup>1</sup>, Dkhireche Nadia<sup>1</sup>, Ebn Touhami Mohamed<sup>1</sup>, Harcharras Mohamed<sup>1</sup>

<sup>1</sup>Laboratory of Advanced Materials and Process Engineering, Faculty of Science, Ibn Tofail University, Kenitra, Morocco

### Abstract

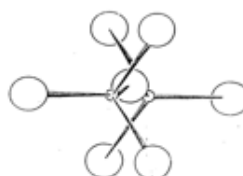
Phosphate compounds offer a considerable number of structures which can give a very interesting properties due to their industrial applications for example in the inhibition of corrosion area. In the current work the two materials, M''MP<sub>2</sub>O<sub>7</sub> and M'MP<sub>2</sub>O<sub>7</sub> (M is the same metal cation) are synthesized and analyzed. Their infrared and DRX spectra are obtained and analyzed. With the site method, the numbers of normal internal vibration modes of the [P<sub>2</sub>O<sub>7</sub><sup>4-</sup>] ion with different conformations is determined based on the infrared and DRX data. A comparison between these two materials in corrosion protection of steel efficiency showed the efficacy of M'MP<sub>2</sub>O<sub>7</sub> in HCl (1M) medium, the higher values of efficacy are obtained with 10<sup>-3</sup> M at 298 K.

Figure:



Molecular group C<sub>2v</sub>

(a) Eclipsed Conformation of the P<sub>2</sub>O<sub>7</sub> Group



Molecular group C<sub>s</sub>

(b) Staggered Conformation of the P<sub>2</sub>O<sub>7</sub> Group

### Biography



EL HARMMOUCI Hammadi has expertise in the vibrational and structural analysis, His focus is based on the synthesis new phosphates materials and their application in the different field, he's PhD student from the university of Ibn Tofail, Kenitra, Morocco.

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## Valorization of treated vegetable waters for the cultivation of a vegetable plant (eggplant) in two types of soil

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### Abstract

The current study aims to investigate the valuation of raw and diluted margins from Moroccan lakes olive industries at various concentrations (0, 25, 50, 75, and 100 percent) as well as vegetable water treated by two prototypes of the treatment. The first prototype relied solely on lagooning aerobic/adsorption in the presence of activated carbon, while the second relied on a combination of activated carbon and lime. Following this assessment, a toxicological study was carried out on the eggplant study plant, which was grown on two different types of soil from the Loukkos-Ksar El Kebir and Gharb-Sidi Yahia regions.

According to the findings, the contribution of the vegetable waters treated by the prototypes used in eggplant cultivation made it possible to improve the conditions for the development of the plant as well as the yield in terms of fruit production. In comparison to the witness, this demonstrates that these margins are richer in fertilizing elements such as nitrogen, potassium, and phosphorus than their physicochemical properties based on the type of soil used. These findings also revealed that raw and more concentrated vegetable waters (greater than 50% concentration) cause plant asphyxiation and the alteration of a large number of leaves.

The phenomenon observed can be explained by the high concentration of salts in the most concentrated vegetable waters, as well as the presence of phenolic compounds, the harmful effects of which on plants were studied in raw vegetable waters.

Furthermore, spectroscopic analysis (ICP-AES) of the elements Cu, Fe, Mn, Zn, and Pb revealed that irrigation of these plants with vegetable waters treated according to the prototypes considered and vegetable waters diluted at different concentrations reduced the bioaccumulation of these metallic elements in the various organs of the eggplant plant.

**Keywords:** Vegetable water valorization, aerobic/adsorption lagooning, toxicological investigation, eggplant, soil, fertilizing elements, bioaccumulation.

### Biography



The Author specializes in the treatment of wastewater, whether of urban or industrial origin, and its utilization in a variety of fields, including agriculture and composting. In 2012, he earned a master's degree in wastewater engineering from Faculty of Sciences, Ibn Tofail University Kenitra. He has presented oral communications or posters at a number of scientific conferences.

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# Leachate and biogas flow rate assessment at the level of Oum Azza landfill in Rabat city, Morocco

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## Abstract

Landfilling is the most used treatment technique for waste in developing countries due to its low cost, but it leads to a significant production of leachate and biogas, highly polluted effluents that can affect surface water, groundwater, soil, air and human health. This work aims to assess the quantities of leachate and biogas produced at the Oum Azza landfill in Rabat city, Morocco.

We used the Water Balance Method, the Ouled Berjal landfill ratio, the World Bank ratio, and 3 mathematical formulas to assess the volumes of leachate produced at the Oum Azza landfill.

The water balance method gave that on average, the production of leachate is 490,92 m<sup>3</sup>/d for the studied years. For the ratio method of the Ouled Berjal landfill, it gave 473.45 m<sup>3</sup>/d which is close the reality.

However, for the same years, the leachate volumes estimated by the World Bank method gave results that were about 4 times the actual quantities. Regarding the 3 simple formulas applied, they gave very low results compared to reality, with averages of 1.12 m<sup>3</sup>/d, 2.70 m<sup>3</sup>/d, and 0.66 m<sup>3</sup>/d respectively for the ANRED, TORCY, and DDAE methods. On the other hand, we used The LandGem and SWANA models to estimate the quantity of biogas produced in the landfill. It showed that the peak of methane production is observed around the date of closure of the landfill with values of 80228082.2 m<sup>3</sup>/year, 45899429.4 m<sup>3</sup>/year, 42582896.7 m<sup>3</sup>/year respectively for the three methods.

These estimations are very essential for the sizing of the landfills, of the treatment plant, and the valorization unit.

Figure 1. Leachate storage basins at the Oum Azza landfill



## Biography



Bouyaksass Roukaya is a second-year Ph.D. student at the Faculty of Sciences and Techniques of Mohammedia. Her main research interest centers around waste management. She is interested in the estimation of leachate and biogas produced in landfills and thus be able to propose treatment and valorization methods for these two effluents that are very harmful to the environment and human health.

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## Corrosion inhibition of mild steel in 1M HCl solution by Quinazoline derivatives

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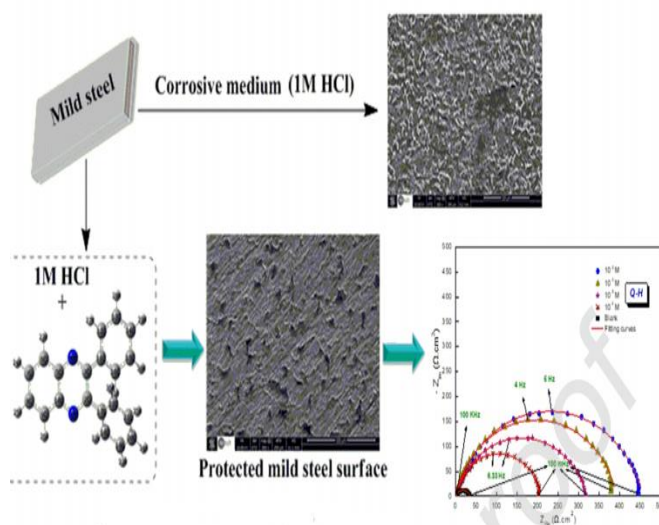
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### Abstract

Corrosion is a universal problem that causes massive economic and safety damage in developed and developing countries. In addition to economic and safety losses, steel is an iron alloy used in metal construction, foundation reinforcement and water transportation. A large amount of metals degrade by corrosion, in acidic environment. The use of organic inhibitors is one of the most efficient and cost-effective methods to combat corrosion of metal parts in aggressive environments. Most of the inhibitors used in the industry are organic compounds mainly composed of nitrogen, oxygen and sulfur atoms. Inhibitors containing double or triple bonds of the aromatic chain play an important role in facilitating the adsorption of these compounds. This potential work presents new organic molecules as a corrosion inhibitor for mild steel in HCL solution (1.0 M). The inhibition effect of these molecules on the corrosion of mild steel in 1 M HCL solution was studied by potentiodynamic polarization, electrochemical impedance spectroscopy (EIS) and electrochemical frequency modulation (EFM), surface analysis of steel after corrosion tests was identified by scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS) and atomic force microscopy (AFM). The experimental studies and analytical techniques clearly show that these molecules are a good corrosion inhibitor (94%), (84%) of steel in HCL solution and the polarization studies show that the corrosion rate of steel decreases with increasing concentration of organic molecules.

Figure:



### Recent Publications

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3. R. Touir, N. Dkhireche, M. EbnTouhami, (2009) 922–928.

### Biography



The author is interested in the inhibition of mild steel in 1M HCl solution by Quinazoline derivatives. He was registered for a PhD in 2019, Faculty of Sciences of Kénitra, University IbnTofail, and Morocco.

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# Physico-chemical, chemical and biological characterization of treated wastewater from the city of Oujda (eastern Morocco) and possibility of reuse in irrigation

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## Abstract

The wastewater treatment system by aerated lagoon has great simplicity, when the necessary land is available, the establishment of The wastewater treatment system by aerated lagoon has great simplicity, when the necessary land is available, the establishment of a set of stabilization basins has many advantages, compared to a conventional station, the biological process treatment by aerated lagoons depends essentially on several climatic factors, and the no control of these treatment factors and their variations over time makes the quality of treatment variable depending on the season. This is observed at the wastewater treatment plant (WWTP) of the city of Oujda, object of our study, the objective of which is to verify the treatment performance from the diagnosis of WWTP. To do this, we diagnosed the operation of the different steps of treatment during a year of exploitation 2020 by determining the physico-chemical, bacteriological and parasitological characteristics of the treated wastewater, throughout their treatment process, in comparison with the Moroccan standards of direct liquid discharge into the natural environment, or to have the possibility of reusing them in irrigation. Data analysis showed, that the efficiency of the combined system reached respectively 79%, 85% and 84% of SM, COD and BOD with pollutant loads at beginning of treatment step of 13,306.45 Kg/d of suspended solids, 32,407.39 kg/d of COD and 20,752.29 kg/d of BOD and pollutant loads at the last treatment step of 3,379.80 kg/d of SM, 4,949.08 kg /d of COD and 3,261.93 Kg/d of BOD. The bacteriological analysis shows faecal pollution of human origin, which is of the average order of  $3.2 \cdot 10^7$  at the beginning of the treatment step and  $4.4 \cdot 10^3$  at the final treatment step.

**Keywords:** Wastewater treatment, Aerated lagoon, Reuse.

Figure



## Biography



Author has his expertise in the field of water. Its objective is based on the treatment of wastewater and its reuse in irrigation. He obtained his professional license in water sciences and technologies in 2013 and his specialized master's degree in water chemistry in 2015 at the Mohammed Premier University of Oujda, Morocco.

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## Experimental study on Quinazoline derivatives as corrosion inhibitors for mild steel in hydrochloric acid medium

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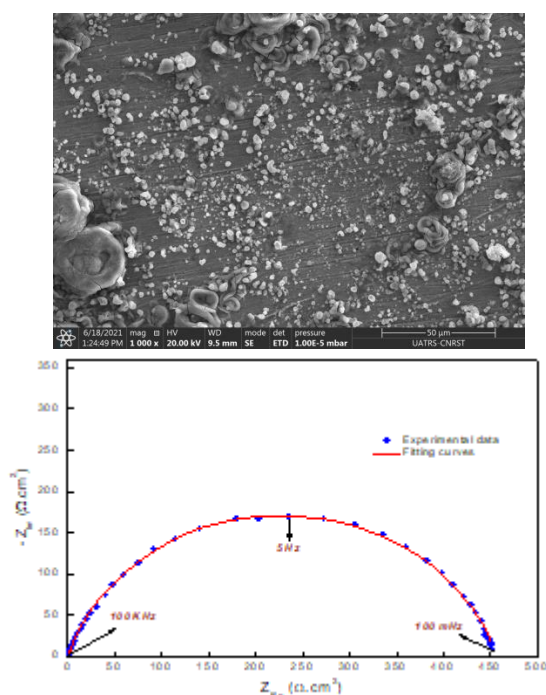
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### Abstract

Mild steel has been widely used in many industrial processes because of its distinctive characteristics. However, they can inevitably be corroded due to the harsh environment around them. Recently, the use of organic corrosion inhibitors is the most effective and economical approach of all anti-corrosion methods. The corrosion inhibition performance of the three organic compounds derived from quinazoline, namely Q-Cl, Q-NO<sub>2</sub> and Q N(CH<sub>3</sub>)<sub>2</sub>, for mild steel in 1.0 M HCl solution were investigated by different analysis namely potentiodynamic polarization, electrochemical impedance spectroscopy (EIS), scanning electron microscopy (SEM) in order to have a precise indication of the reactivity. The data obtained from the EIS studies were analyzed by fitting the inhibition process using an appropriate equivalent circuit model.

The results of the electrochemical methods showed that the studied molecules conferred high resistance. Thermodynamic and kinetic parameters were calculated and discussed. The adsorption of the inhibitor molecules on the mild steel surface was found to be chemisorption. The adsorption of the tested quinazoline derivatives on the mild steel surface follows the Langmuir adsorption model.

Figure:



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### Biography



Author has her expertise in Materials and Corrosion Science. He was registered her PhD in 2018 at Ibn Tofail University, Morocco.

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## Evaluation of the impact of land use and irrigation systems on the soil nitrogen transfer: case of five pilot farms in the Triffa plain (Berkane, Eastern Morocco)

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### Abstract

In most irrigated areas, excessive water and nitrogen fertilizer inputs for crops are suspected in diffuse agricultural pollution of groundwater. This pollution is often amplified by the short time to transfer water-soluble molecules in vadose zone, and soil organic nitrogen abundance (litter and organic amendments). Thus, the levels of the nitric groundwater pollution of these plains are beginning to become increasingly critical. In these soils, nitrates leached at a speed equal to that of water. They can be delayed by the root uptake, microbial immobilization or transformation. Root uptake is limited to the root zone. Microbiological activity decreases with depth. As a result, the transfer times of nitrates to the aquifers are relatively short. Studies performed in the Triffa aquifer (Berkane, eastern Morocco) are unanimous on the degradation of water quality linked to agricultural intensification. To understand the nitrate pollution, research study was performed to evaluate the impact of the land use (citrus orchard), soil occupation (weeds) and irrigation type (flood or drip) on the transfer of nitrogen in the soil profile of five pilot citrus farms in the Triffa plain. Composite soil samples were taken from these different farms, at different horizons and locations (inter-row, under drippers and under tree), then analyzed to assess spatial and seasonal variation (winter and summer) of total soil nitrogen, soil organic nitrogen, nitrate and ammonium concentrations and their transfer into the soil profiles. Results showed that, independently of irrigation type, soil nitrate concentrations increase in depth under inter-row weeded sites. However, independently of irrigation type, weed management and during the wet season, soil ammonium concentration increases in depth. These results confirm the importance of the plant cover to protect soil, prevent the groundwater from nitric pollution, and suspect poor management of weed in this issue.

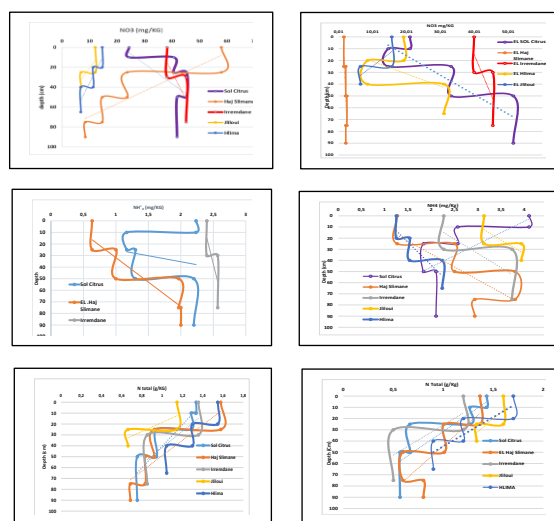
### Biography



The author has expertise in assessing the impact of diffuse agricultural pollution, landfills and urban effluents on surface and groundwater. Graduate in environmental ecology and holder of a master's degree in horticultural and landscape engineering (IHP). PhD student at the Faculty of Sciences of Oujda theme: Study of the impact of agrochemical inputs and organic matter on the quality of soils and groundwater under citrus orchards in the plain of Triffa (Eastern Morocco).

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Figure



### Recent Publications

1. Driss Bouknana, Shehdeh Jodeh, Mohamed Sbaa, Belkheir Hammouti, Mourad Arabi, Ahmed Darmous, Maryam Slamini &
2. Khadija Haboubi . Environmental Monitoring and Assessment. 191, Article number: 405 (2019).
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# Corrosion Behavior of Different Types of Brass at Different Temperatures In Neutral Medium

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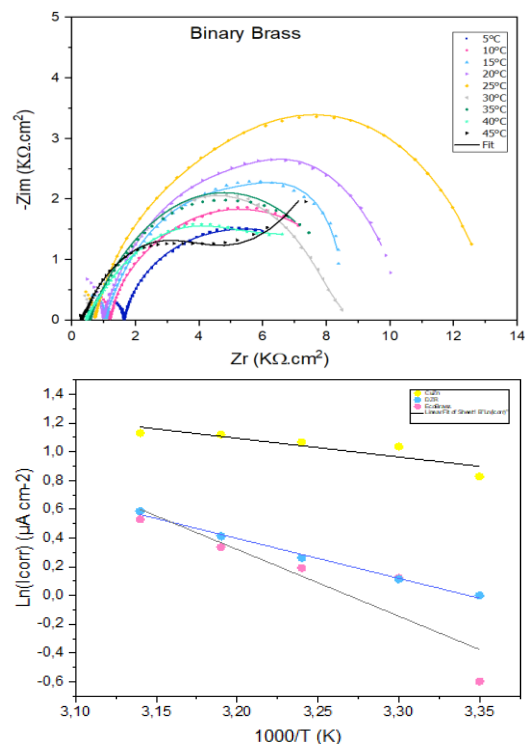
## Abstract

The corrosion behavior of three copper-zinc alloys in contact with drinking water at different temperatures has been studied. The experimental results of the exposure tests that were made revealed that the alloys reacted differently under the same experimental conditions. In order to study the effects of temperature on the degradation of Copper-Zinc alloys from 05°C and up to 45°C with jumps of 05°C, an integral study of electrochemical analyzes was made.

The alloys were characterized by X-ray diffraction. The results show that the corrosion potential has higher values for lead-free brass CuZn20Si3 compared to simple brass Cu60Zn40 and lead-rich brass CuZn36Pb2As. These electrochemical polarization tests also showed that the CuZn36Pb2As alloy tends to resist very low temperatures in a remarkable way.

The degradation was approved by increasing the temperature for all three samples, further decreasing it towards very low temperatures. The thermodynamic measurements confirmed these results, but only from 25°C. The ICP results gave a general idea about the most leached metals in the electrolyte.

Figure



## Biography



F. Hamouche is currently studying the degradation of materials and their corrosion behavior. Its objective is based on the study of the behavior of different copper alloys in a neutral environment to have an application in the field of drinking water pipes. She is a PhD in materials and engineering laboratory at the Faculty of Sciences Ibn Tofail University.

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## Use of quality and organic pollution indices in the assessment of the physical-chemical quality of surface waters in oued khoumane (city of moulay idriss zerhoun-morocco)

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### Abstract

In Morocco, as in many other countries in the world, superficial waters are threatened by multiple problems, mainly the strong anthropogenic pressures caused by agricultural activities also by industrial as well as domestic activities.

The pollution of superficial waters is a major problem which influences the supply of groundwater it affects also the conservation of biodiversity.

Thus, this study aims to evaluate the quality and the state of the organic pollution of waters of the Khoumane river(oued khoumane), hence, this monitoring of the quality of waters of the Khoumane river, based on the index of water quality (IQE) and the index of organic pollution (IPO). Monthly samples were taken at six stations along the Khoumane river from upstream to downstream.

The results acquired in this study showed that waters of the khoumane river present organic pollution with the exception of the S1 station. These results exceed Moroccan standards for the quality of superficial water intended for irrigation.

Figure Location of sampling stations



### Biography



The author has experience in water quality assessment. Its objective is based on the use of quality and organic pollution indices. He enrolled in a doctorate in 2021/2022 at Moulay Ismail University in Meknes, Morocco.

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## Photocatalytic decomposition of Methylene blue dye using sand-graphite composite under visible light irradiation

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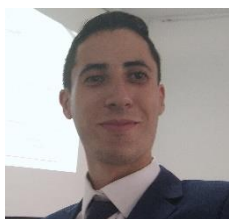
<sup>3</sup>Laboratory of Applied Chemistry and Environment, Mineral solid chemistry team, Mohamed First University, Oujda, Morocco3

### Abstract

The growth of the industrial sector, combined with the massive degradation of natural water sources, is reducing the availability of drinking water and causing numerous risks to human and animal health. The textile industry, leather tanning, dyes, and pharmaceuticals, among others, generate a large amount of effluent that is discharged directly into the environment, posing a serious human health problem. The removal of these pollutants presents a serious challenge for researchers, who must employ an efficient, cost-effective, and eco-friendly process. Photocatalysis appears to be the best solution for purifying polluted water. The present work aims to synthesize a new composite based on sand and natural sugar with a simple method for photocatalysis application. The obtained photocatalysts were characterized by different techniques, including X-ray diffraction (XRD), scanning electron microscopy (SEM), Fourier transform infrared (FTIR), and Ultra-violet Visible (UV-Vis). The photocatalytic performances of the synthesized samples were studied for the degradation of methylene blue (MB) dye as a model pollutant under visible light irradiation. Natural sand, the prepared graphite, and sand-graphite composite samples were used as photocatalysts for the degradation of methylene blue (MB) dye in aqueous solution.

The effects of different experimental parameters on the adsorption capacity and degradation of methylene blue (MB) dye were investigated, such as pH, photocatalyst weight, and contact time. Furthermore, the MB concentration, time irradiation, and temperature were fixed for all experiment tests: 10mg/L, 60 min, and 20-25°C, respectively. The optimized conditions for best adsorption were determined as follows: pH = 9, photocatalyst mass = 2.4 g/l for graphite sand composite, and pH = 12, photocatalyst mass = 0.2 g/l. According to the results, the sand-graphite composite showed the best photocatalytic performance with a removal efficiency of 87.12% degradation of methylene blue (MB) dye compared to graphite and sand with a rate of 70.52% and 38.13%, respectively. These results indicate that the combination of sand and graphite particles enhanced the photocatalytic performance and adsorption capacity of the composite. According to this, the synthesized sand-graphite photocatalyst can be used as an alternative material for the degradation of dye wastewater under visible light irradiation.

### Biography



I obtained a master's degree in materials science in 2021 at the faculty of Science – University Ibn Tofail, I am currently studying first-year PhD student, my research is based to synthesize materials and find out how they affect photocatalysis in order to degrade organic waste textile industrial colorants that means to have application in environment field.

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# Corrosion hindrance effectiveness of pyrazoles being environmentally-safe organic inhibitors: Thermodynamical, electrochemical and surface studies

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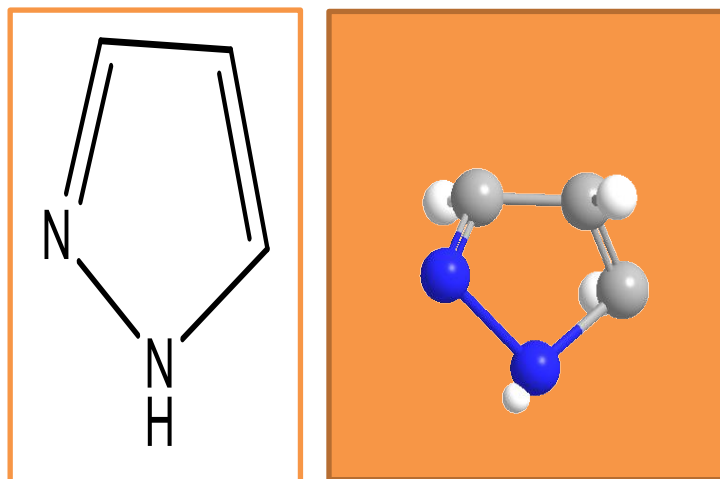
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## Abstract

Besides Corrosion inhibition efficiency, the environment and its safety are among the essential factors to care about during fighting against corrosion phenomenon. In fact, effective and environmentally friendly inhibitors appeared to be mutually exclusive. Therefore, organic compounds are the best choice, which their efficiency is decided by the presence of aromatics and heteroatoms and multiple bonds in their molecules. Given what has been said, we have spotlighted pyrazoles as environment friends to figure out how are their efficiency as corrosion inhibitors and this was our Piece of work.

In spite of the Big part of researches were worked on pyrazoles but no one has the opportunity to discover (ZBe2) and (ZBe3)'s abilities in the electrochemical field. In our lab work, the ZBe2 and ZBe3 were investigated by using electrochemical impedance spectroscopy and potentiodynamic measurements at various concentrations and temperatures. The results put on view that the prepared organic compounds manifest high efficiency as corrosion inhibitors for dissolution prevention of Mild steel in HCl solution 1M through augmenting concentration, to far exceed 90 % for both ZBe2 and ZBe3. Investigations show up that the adsorption mechanism takes place and by different types, to fix the inhibitors molecules on the MS surface, which make the MS corrosion process comes to end. Also for both inhibitors, Adsorption follows the Langmuir adsorption isotherm. Tafel curves suggest that both inhibitors act as mixed-type. The formation of protective layers of inhibitors on MS surface was confirmed by the outcomes of MEB surface characterization. The composition of adsorbed layers on the MS surface was proved by EDX analysis.

Fig. Pyrazole Molecule



## Recent Publications

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## Biography



El Farhani Fatine has her expertise in chemistry and engineering materials in faculty of science, Her focus is based on the use of organic compounds as corrosion inhibitors for steels protections in industry field; She is a PhD student since 2018 in the University of IbnTofail, Kenitra, Country Morocco.

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# Corrosion-abrasion of stainless steel in phosphoric acid using acoustic emission technique

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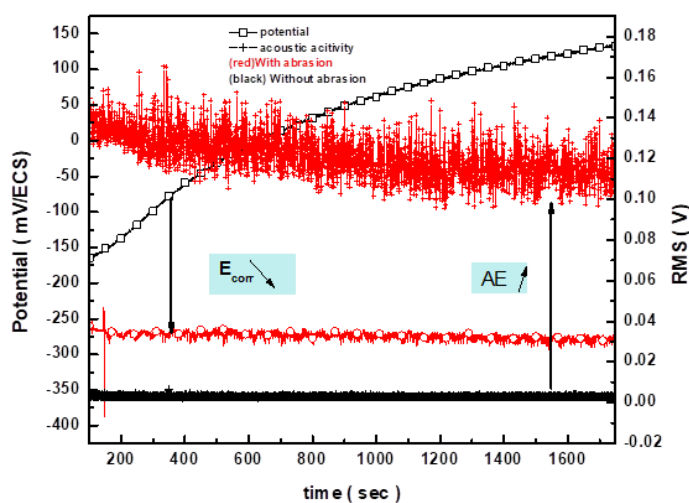
## Abstract

While wet process production of phosphoric acid, the presence of solid and chemical impurities leads to materials' wear through corrosion-abrasion phenomenon. The interactions of corrosion and abrasion when acting simultaneously are complicated to interpret and quantify. They can generate a synergistic effect on the material loss and the degradation of the materials.

Stainless steels are widely used in the phosphoric acid industry, because of their good properties. The spontaneously formed oxide film on the surface, present a barrier protective layer, this layer has an important mechanical and electrochemical resistance. This study is dedicated to the evaluation of the effect of abrasion on the electrochemical behaviour and the acoustic emission activity of stainless steel in polluted phosphoric acid without and with the presence of abrasives grit SiC. For this purpose, time analysis of both corrosion potential and the acoustic emission energy is performed. Also, the electrochemical impedance spectroscopy, then a surface characterization based on MEB-EDX are applied.

The experimental results confirm that the phosphoric acid and the solid particles' jet impingement enhances the total wear of stainless steel. The correlation between corrosion potential and acoustic emission demonstrates that the acoustic emission technique is useful for quantifying and predicting the damage in corrosion-abrasion conditions. The electrochemical impedance spectroscopy proves that the corrosion resistance is lower with the presence of abrasion. The surface characterization fulfilled this study and shows that abrasion overthrows the corrosion resistance properties of the alloy.

**Figure:** Evolution of corrosion potential and acoustic activity of the stainless steel in polluted phosphoric acid with and without abrasion.



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## Biography



PhD student in the laboratory of materials, nanotechnology and environment in the faculty of sciences Rabat, working on the study of corrosion abrasion of stainless steels and monitoring by acoustic emission in phosphoric media.

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# Implementation of an Environmental Management System in a Company that specializes in wood and aluminum carpentry in Eastern Morocco in the city of Oujda

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## Abstract

The present work concerns the implementation of an environmental management system in a company that specializes in wood and aluminum carpentry in Eastern Morocco in the city of Oujda. The implementation of this system was based on the ISO 14001:2015 standard (environmental management). Therefore, the chosen approach was the PDCA approach: plan, do, check, act. The implementation of action plans established from the analysis of the environmental aspects of the company's activities allowed for the decrease of environmental hazards within the company, such as fire risk, as well as the decrease in energy consumption, such as electricity consumption, which decreased by 8% in three months. In addition, the realization of action plans led to a more efficient waste management, in particular by waste sorting and the increase of recycling of wood and aluminum scraps.

Figure:



## Biography



Omari A. is currently studying for a PhD thesis in Life and Environmental Sciences. His thesis concerns the introduction of Safety-Environment concepts in the industrial companies of Eastern Morocco.

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# Effect of salinity on Strawberry plant growth and their tolerance to water deficiency after inoculation with a composite arbuscular mycorrhizal inoculum

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## Abstract

This study was conducted under greenhouse conditions to determine the effects of salinity on strawberry plants and the effects and their tolerance to water deficiency after their inoculation with a composite arbuscular mycorrhizal inoculum. Three level of salinity were used and the parameters measured were: mycorrhization status, roots diameter, roots length, salinity index, visual score and the relative water content. The results showed that the salinity affects negatively plants growth and fruiting. The index, at the level of 50% of salinity, was highly correlated to the roots diameter and the RWC. Visual score, for the three salt treatments, were dependent to the mycorrhization status (yes/no), the roots diameter, the roots length and the RWC. For the three salt treatments, the RWC was dependent to the index of salinity, the roots length and the mycorrhization status (yes/no). Our study suggests a positive effect of inoculation by mycorrhizas on strawberry plants tolerance under salt stress.

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## Biography



The author has relevant experience in the fields of biology, physiology and plant biotechnology with knowledge of related fields. She has a respectable number of publications and participation in international conferences. She completed her doctorate at the Faculty of Sciences University Ibn Tofail Kenitra Morocco after a study and Engineer diploma in Agronomy from the IAV Hassan II of Rabat.

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# Adsorption of methylene violet dye from aqueous solution onto Moroccan zeolite

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## Abstract

Many industries such as textile and printing use dyes and pigments and thus produce highly colored waste effluents. Disposal of these wastes into waters causes environmental problems. Various methods for dye and color removal, such as aerobic and anaerobic microbial degradation, coagulation and chemical oxidation, membrane separation process, electrochemical, filtration, softening and reverse osmosis have been proposed from time to time. However, all of the methods suffered from one or another limitation and none of the processes described above were successful in removing color from waste water completely. Adsorption is the simplest process for dye removal.

Among the adsorbents there is natural zeolite, this material will be used as a low-cost adsorbent, an abundant resource, and present a high cation exchange capacity.

The objective of this work was to study the interaction results between the natural adsorbent and methylene violet in aqueous solutions. The kinetic, equilibrium isotherm and thermodynamics on adsorption phenomenon will be presented and discussed.

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## Biography



MERYEM EL RHARIB, received his Master's degree in management and valorization of waste at Hassan II University, faculty of science Ain Chok-Casablanca. She is currently a PhD student in chemistry and valorization at Hassan II University at the laboratory of Materials Environment Interface, under the direction of Pr. Zaina ZAROUAL and Pr. Mohammed Azzi. She is working on the characterization of new naturel material and the use of this later as adsorbent for dyes removal and heavy metals from wastewater.

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# Experimental and theoretical investigations of marine yeasts adhesion and its impact on the physico-chemical properties of sea-immersed AISI 304 and 316 stainless steels.

Douâae Ou-yahia<sup>1</sup>, KawtarFikri-Benbrahim<sup>1</sup>, Ibensouda Koraichi Saad<sup>1,2</sup>

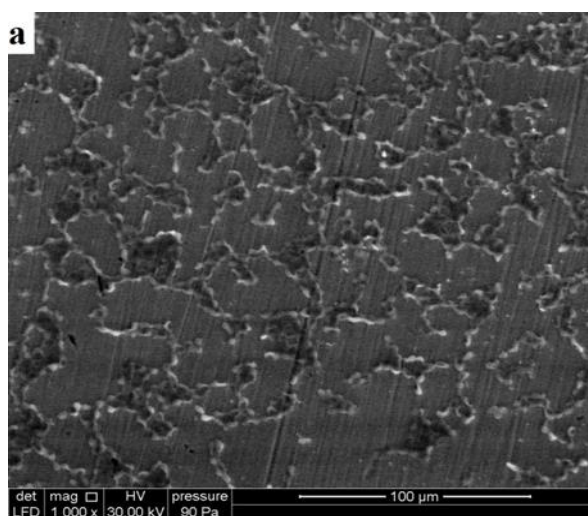
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## Abstract

Biofilms can affect different environments including the marine one leading to serious damages. Furthermore, the biofilm is multistage process that begins by microbial adhesion which is affected by many physico-chemical properties. Therefore, the understanding of interactions between marine microorganisms and sea-immersed materials is mandatory before looking for methods to palliate the biofilm. Thus, in this study, we investigated in one hand the adhesion potential of marine yeasts isolated from seawater in the port of Chmaâla, Morocco, to sea-immersed 304 and 316 stainless steels using thermodynamic approach and the Environmental Scanning Electron Microscopy (ESEM) and in the other hand, the effect of adhesion of the combination of the isolated strains on physicochemical characteristics of stainless steel surfaces. The molecular identification indicated that the strains were *Candida tropicalis* BR and *Candida tropicalis* H195A. The obtained results also showed that both yeast cells have a hydrophilic character with  $\Delta G_{\text{wi}} = 23.34 \text{ mJ m}^{-2}$  for *Candida tropicalis* BR and with  $\Delta G_{\text{wi}} = 27.71 \text{ mJ m}^{-2}$  for *Candida tropicalis* H195A, strong electron donating ( $\gamma^-$ ) and weakly electron accepting ( $\gamma^+$ ). For substrates surfaces, we found that both sea-immersed stainless steel types were hydrophilic and present strong electron-donor character ( $\gamma^- = 49 \text{ mJ m}^{-2}$  for 304 and  $\gamma^- = 55.07 \text{ mJ m}^{-2}$  for 316) and weak electron-acceptor character ( $\gamma^+ = 5.4 \text{ mJ m}^{-2}$  for 304 and  $\gamma^+ = 8.3 \text{ mJ m}^{-2}$  for 316). The theoretical prediction showed that both tested strains, *C. tropicalis* BR and *C. tropicalis* H195A, exhibited positive values of  $\Delta G^{\text{Total}}$  vis-a-vis the two sea-immersed stainless steel types which indicates unfavorable adhesion while the ESEM electro-micrographs show that both strains were able to adhere to both stainless steels surfaces. Furthermore, the results revealed that the physico-chemical properties of the sea-immersed 304 and 316 stainless-steels surfaces changed significantly following the adhesion of yeasts.

**Figure:** Electro micrographs of *Candida tropicalis* BR adhered onto 304 stainless steel, visualized by ESEM.



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## Biography



Douâae Ou-YAHIA has her expertise in the study of corrosive biofilms in different fields, mostly in the marine and petroleum environments. Her focus is based on the understanding of the bioadhesion phenomenon by studying the interactions between microbial biofilms and surfaces, the evaluation of the biofilms corrosive effect called Microbiologically Influenced Corrosion (MIC) via electrochemical and surface analysis techniques as well as the elaboration of anti-adhesive and anti-corrosive treatments using eco-friendly molecules. She recently participated as a visiting researcher within the European Project Horizon 2020-MSCA-RISE-2016-734759 VAHVISTUS about the preparation and the characterization of functional nanomaterials. She was awarded her PhD in 2021 from Sidi Mohamed Ben Abdellah University, Morocco. She has published 5 papers. Her H-index is 2 in Scopus.

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## Study of the influence of microalgae in wastewater treatment

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### Abstract

Wastewater treatment is one of the main environmental concerns in the world. This water loaded with biodegradable organic matter, inorganic and organic chemicals, toxic substances, and pathogenic micro-organisms, makes it difficult to choose the treatment process. The choices of economical and effective processes are the concern of many researchers. The use of natural treatment methods has proven its effectiveness in the treatment of industrial wastewater. In this context, our study focused on the evaluation of the performance of microalgae in the treatment of wastewater from oil refineries. We monitored the following physicochemical parameters: Suspended solids (SS), conductivity, pH, Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD) and phosphorus and nitrogen content.

At the end of this study, we found that the rate of suspended solids is reduced in a significant way, the microalgae have shown themselves to be effective in the elimination of nitrogen and phosphorus because of their ability to absorb nutrients and convert them into biomass. COD and BOD5 are reduced by up to 80%, in accordance with the requirements of the standards in force. We observed that the pH value went from a value of 5 to a value between 7 and 8.

The results obtained are very significant and show that the natural technology of water treatment by microalgae is very effective and it is also part of the processes of green chemistry for sustainable development.

### Biography



Meriem Amansour is a fourth-year PhD student at Hassan II University of Casablanca, Morocco. She received a master's degree in analysis and quality management QSHE option from Faculty of Sciences and technologies FST in Settat, Morocco. Her current field of research is green chemistry, waste recovery and sustainable development.

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# Evaluation of water equivalent ratio for 3 dosimetric materials at carbon ion energies ranging 100-300 MeV/nucleon using Fluka Monte Carlo code

Yjjou Mohammed<sup>1</sup>, Dekhissi Hassane<sup>1</sup>, Derkaoui Jamal Eddine<sup>1</sup>, Didi Abdessamad<sup>1</sup>, and Aknouch Adil<sup>2</sup>

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<sup>2</sup>Department of Physics, Nuclear Physics and Techniques Team, Faculty of Science, Ibn Tofail University, Kenitra, Morocco

## Abstract

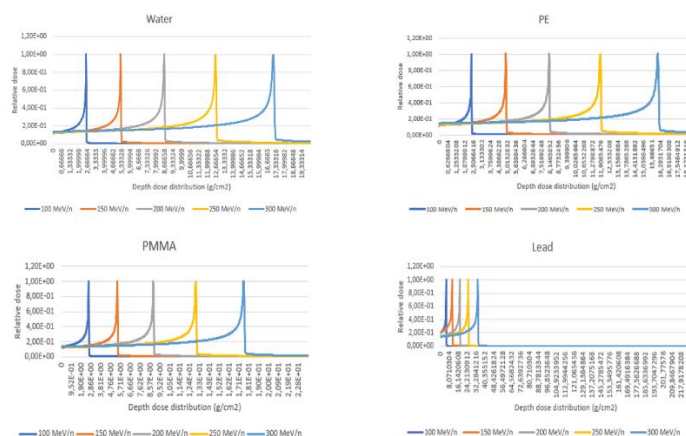
Pursuing the repeated use of the studied materials in dosimetric practices in the domain of hadrontherapy, we

came up to calculate the water equivalent ratio of only three dosimetric materials (polyethylene (PE), polymethyl methacrylate (PMMA) and lead). Then, we made the

remark that the closest and farthest WER values are 0.982 and 0.510 respectively, were obtained for the PMMA and the lead. The calculated WER values were compared with the values from MCNPX code, and those from the previous analytical methods (NM, BK, BB,

EBB). Good agreement was obtained between the results of the MC codes and the previous analytical methods. The largest discrepancy of 7.6% and 1.37% were observed between the two MC codes for PMMA at 100 MeV/n, and between Fluka and the analytical method (BB) for Lead at 291.67 MeV/n, respectively. Among the materials, PMMA showed the closest average WER of 0.982 for carbon ion energy ranging 100 to 300 MeV/n.

## Figure



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## Biography



Yjjou Mohammed is a PhD student at Mohammed First University – LPTPME, FSO – Oujda/Morocco. His main research work is focused on modeling and simulation of hadrontherapy situations.

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## Analysis of the fluoride levels of well water consumed by the moroccan population in different rural areas

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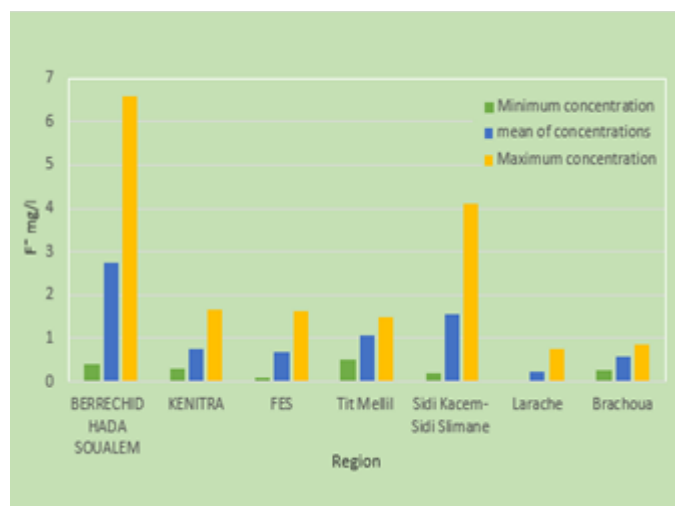
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### Abstract

Fluoride plays an essential role in preventing cavities when consumed in small amounts. However, continuous excessive fluoride ingestion could cause significant adverse health effects in humans, ranging from mild dental fluorosis to debilitating skeletal fluorosis, depending on the level and period of exposure to fluorides. In rural areas, the source of fluoride in well water could be due to natural, industrial, or anthropogenic contamination. The purpose of our work was to assess the degree of contamination of groundwater by fluorides from different regions in Morocco located in agricultural campaigns, where the only source of consumable water is well water. A total of 40 well water samples were collected from 7 rural Moroccan areas. Fluoride level analyses were performed using a fluoride-specific ion electrode (HI-4110). The fluoride levels found in the various well waters of the different regions range from 0.2 mg/l to 6.58 mg/l. Five wells have levels that exceed the recommended adult standards, while 28 wells have levels above the recommended standards for children. These results help warn the public about the risk of developing dental fluorosis and encourage them to change the sources of water consumption from the well waters with high fluoride content.

**Figure:** Minimum - Average - Maximum fluoride (mg / l) concentration by region



### Recent Publications

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2. El Baroudi Y., Ouazzani C., Er-Ramly A., Moustaghfir A., Essebbahi I., Dami A., Balouch L., Eco. Env. And cons. 27 (2021) 39-47
3. Essebbahi I., Ouazzani C., Moustaghfir A., Dami A. Et Balouch L., Int. j. biol. chem., 2020. 14 (4): 1203-1213.

### Biography



The author obtained the master of Oral Biology and Materials from the Faculty of Dental Medicine, Mohammed V University. He is a Ph.D. student in the Laboratory of Biochemistry and Molecular Biology, Faculty of Medicine and Pharmacy, Mohammed V University in Rabat, Morocco. He published 3 papers.

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## Nitrite levels in well water from different rural areas in Morocco

Y. El Baroudi<sup>1</sup>, C. Ouazzani<sup>1</sup>, A. Er-ramly<sup>2</sup>, A. Moustaghfir<sup>2</sup>, I. Essebbahi<sup>1</sup>, A. Dami<sup>1</sup> and L. Balouch<sup>1</sup>

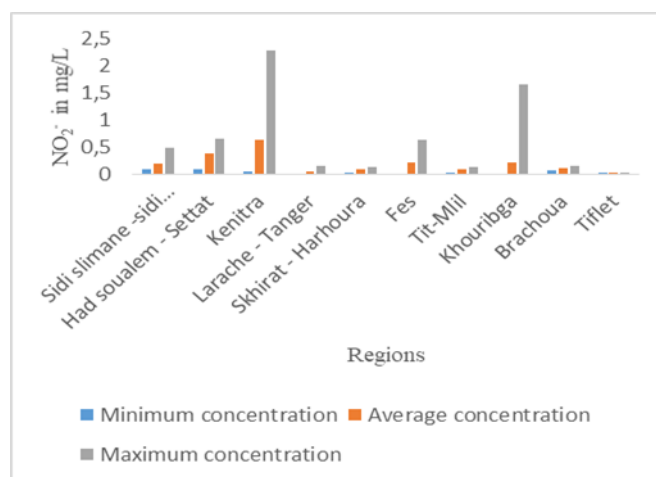
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### Abstract

Nitrites are an intermediate product involved in the oxidation and reduction reactions of the nitrogen cycle. They are considered toxic and are only found in minimal concentrations in well water. Agricultural (manure, use of nitrogen fertilizers...) and industrial activities, discharges from wastewater treatment plants, urban waste and human and animal excreta are the main parameters that lead to the increase in concentration and contamination by nitrites in well waters. The objective of this study was to determine and evaluate the level of contamination of well water in different rural areas in Morocco and to show the potential impact of this contamination on the health of the population. This is a prospective study carried out on 53 samples collected in 10 rural areas in Morocco. The physico-chemical analyses showed that out of the 53 samples, 25 exceeded the Moroccan standards (N.M. 03.7.001) of 0.1 mg/l at the exit of water treatment facilities and 9 samples exceeded the international standards of 0.2 mg/l set by the WHO. The consumption of this water contaminated by nitrites can have, in the long term, a harmful effect on health and mainly by the appearance of methemoglobinemia. These results show the seriousness of the problem and the need to implement concrete sanitary measures to correct it in order to ensure the protection of the health of the population living in rural areas.

**Figure:** Min - Average - Max nitrite concentrations by region in mg/l



### Recent Publications

1. El Baroudi Y., Ouazzani C., Er-Ramly A., Moustaghfir A., Essebbahi I., Dami A., Balouch L., *Eco. Env. And cons.* 27 (2021) 39-47
2. Essebbahi I., Ouazzani C., Moustaghfir A., Er-Ramly A., El Baroudi Y and Balouch L., *Int. J. Environ. Sci. Dev.*, (Accepted in 2021 for publication in 2022).

### Biography



The author obtained the master of Oral Biology and Materials from the Faculty of Dental Medicine, Mohammed V University. He is a Ph.D. student in the Laboratory of Biochemistry and Molecular Biology, Faculty of Medicine and Pharmacy, Mohammed V University in Rabat, Morocco. He published 2 papers.

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# Use of house sparrows in the bio-monitoring of atmospheric pollution by metallic trace elements in the city of Meknes

Youssef HADDADI<sup>1</sup>, Abd -el-Kader CHAHLAOUI<sup>1</sup>, Aziz TAOURAOUT<sup>2</sup>, Abdelhak SAIDI<sup>3</sup>

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<sup>2</sup>Pollution, Ecotoxicology and Health Risks Unit, Scientific Institute (IS ) of Rabat

## Abstract

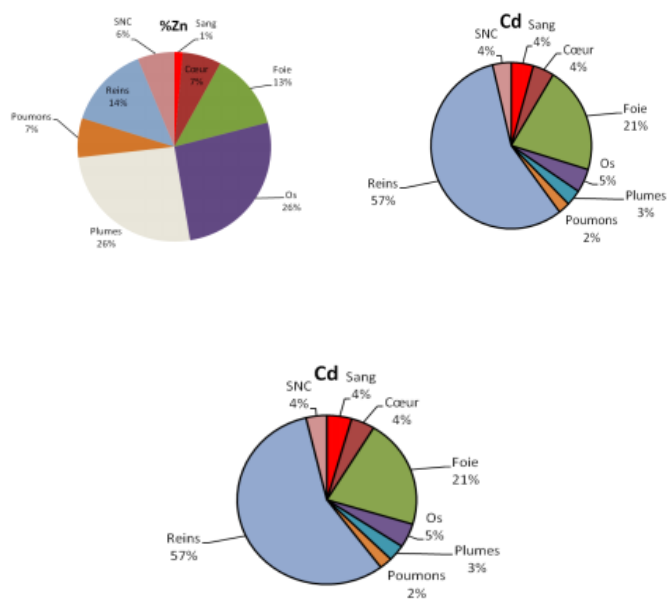
Atmospheric contamination by MTEs has a lasting impact on the various compartments of the environment (air; soil; water) and the health of living beings; In this context, our work aims to assess the air quality in areas classified according to their activities in the city of Meknes through a biomonitoring approach by house sparrows: (bioindication. )

With the analysis of the different organs of birds, we will be able to identify the main sources of pollution by ETM in the city of Meknes and the tissue distribution of these elements.

All of these results will be invested in order to present the degree of atmospheric pollution in the form of a map of contamination by lead, cadmium and zinc in the different study areas of the city of Meknes, this during a work period from January 2022 to December 2022.

**Keywords:** bio-indicators, ETM (Zn; Pb Cd), accumulation, atmospheric pollution, target organs; vulnerability map; distribution diagram.

**Figure:** Organotropism of the 3 elements (Cadmium; Zinc; Lead)



## Biography



Youssef HADDADI PhD. student in the laboratory of Biology and toxicology elements in the Faculty of Sciences Meknes, from the University of Moulay Ismail. I'm working on atmospheric pollution of meknes city

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# Corrosion inhibition of carbon steel in hydrochloric acidic solution 1M by Irbersartan

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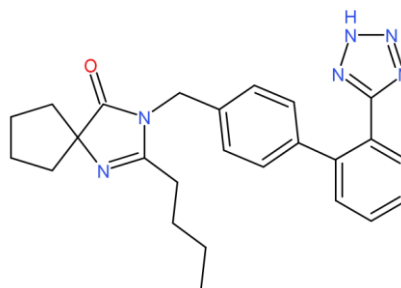
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## Abstract

The inhibition efficiency of IRBERSARTAN on carbon steel in a 1M HCl medium is evaluated by analysis of the potentiodynamic polarization curves and by electrochemical impedance measurements (EIS). The organic compound acts as an effective inhibitor of carbon steel corrosion in an acidic medium. The effect of the inhibitor concentration and the electrode immersion time, as well as the solution temperature on the corrosion rate of carbon steel are studied. The inhibition efficiency of this inhibitor increases with increase in concentration, which offered an inhibition efficiency up to 94.30% according to (EIS) measurements.

The analysis of polarization curves highlights the mixed nature of the inhibitor used. The study showed that this inhibitor acts by adsorption on the metal surface. The thermodynamic and activation parameters revealed adsorption of IRBERSARTAN onto carbon steel surface as endothermic and the adsorption was conformed to Langmuir model, and involved both physical and chemical mechanisms.

Figure: Structure of the inhibitor IRBERSARTAN



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## Biography



Chadine has her expertise in evaluation and passion in corrosion inhibition of carbon steel material used in industries. Her focus is based on the use of organic inhibitors to have application in industrial field. She got her Master degree in materials sciences in 2020 in Kenitra. She is pursuing her PhD studies since 2020 in the University of Mohamed 5, Rabat. She is willing to publish her first paper this year on Scopus.

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## Inhibiting effect of cedar tar on corrosion on E24 in 1M HCL

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### Abstract

The purpose of this study was to determine the effectiveness of cedar tar as a corrosion inhibitor for E24 steel in 1M HCL Medium solution using a variety of methodologies, including stationary electrochemical and electrochemical impedance spectroscopy (EIS). The results of stationary electrochemical shows that Cedar Tar controls both cathodic and anodic reactions. The inhibition efficiency reaches 93.09 % at a concentration of 1.5g/l of the inhibitor tasted. These findings are confirmed by electrochemical impedance spectroscopy, which shows that a rise in concentration is accompanied by an increase in inhibitory efficiency due to the formation of a resistant layer. The adsorption of the inhibitor on the E24 Steel surface follows the Langmuir adsorption model. Furthermore, cedar adsorption is of mixed nature; a synonym for physical-chemical adsorption.

Figure: Cedar wood tar



### Recent Publications

1. Ninich, O., Et-Tahir, A., Kettani, K., Ghanmi, M., Aoujdad, J., El Antry, S., Ouajdi, M., Satrani B., J. Ethnopharmacol., (2022). 285, 114889.
2. Jaouadi I., Cherrad S., Tiskar M., Tabyaoui M., Ghanmi M., Satrani B, Chaouch A., Int. J. Corros. Scale. Inhib. 2020;9(1):265-83.
3. Tassaoui K., Damej M., Molhi A., Berisha A., Errili M., Ksama S. , Mehmeti V., Elhajjaji S., Benmessaoud M., Int. J. Corros. Scale. Inhib. 11 (2022) 221-241.

### Biography



Ninich Oumaima is a Ph.D students at University Mohammed V of Rabat, she got her Euro-african master of biosafety and biosecurity (MEABB), and she started directly her Phd research on the valorization of tars in Morocco. She is a newbie researcher in the domain of medicinal plants.

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# Study of the adsorption of phenolic compounds of olive oil mill wastewater by clay extracted from Mohamed Ben Abdelkarim El Khattabi dam in Al-Hoceima (Morocco)

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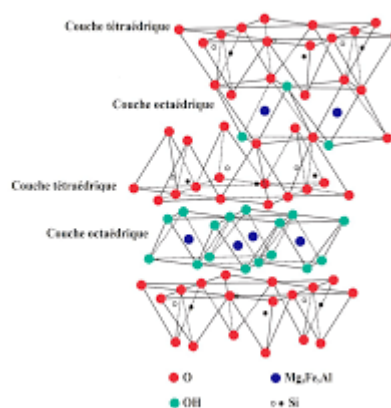
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## Abstract

The liquid waste from the olive industry is characterized by a high load of organic matter, very high acidity, and many phenolic compounds, very important. The main of this work is to valorize the sediments of Mohamed Ben Abdelkarim El Khattabi dam as an adsorbent to absorb phenolic compounds. The work is composed of two essential parts, the first concerns the characterization of our clay, and the second is devoted to the kinetic study of adsorption.

The results show that our sample allows the removal of 63% of phenolic compounds and 71% of COD, and after thermal activation, our clay increases the removal rate by 14%

Figure:



## Recent Publications

1. El Abdouni, A., Haboubi, K., Merimi, I., & El Youbi, M. S. M. (2020). Olive mill wastewater (OMW) production in the province of Al-Hoceima (Morocco) and their physico-chemical characterization by mill types. *Materials Today: Proceedings*, 27, 3145–3150.

## Biography



Aouatif ELABDOUNI is a Ph.D. student in the chemical environment at Ibn Tofail University. Her research revolves around the treatment and valorization of olive mills wastewaters. Recently she published two articles about that. She is currently involved in research/creation projects related to her Ph.D.'s subject with Dr. Khadija Haboubi. She holds a diploma in environmental engineering from the National School of Applied Sciences of Al Hoceima.

She believes that the environment and the development of any country are both two sides of the same coin, if we cannot sustain the environment, we cannot sustain ourselves.

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# Evaluation of heavy metal concentrations in commercial marine fishes caught in the Mediterranean coast of Morocco and their associated health risks to consumers

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<sup>3</sup>Higher Institute of Nursing and Health Technology Professions. Oujda. Morocco

## Abstract

The purpose of our study is to evaluate the health risk assessment of some heavy metals attributed to consumption of common edible fish species available for consumers. Concentrations of Cd, Pb, Cu, Fe, Zn, Ni and Cr were determined in muscles, gills and livers, of seven common edible fish species, namely (*Octopus Vulgaris Cuvier, on 1797, Sardina Pilchardus, Trachurus Trachurus, Palaemon Serratus, Sparus aurata, Dicentrarchus labrax and Solea Vulgaris*) caught in the Mediterranean coast of Morocco, landed in the port of Nador during the autumn and spring of the year 2018. Concentrations of heavy metals were determined by inductively coupled plasma- atomic emission spectroscopy (ICP-AES) and expressed as mg/kg of wet tissue. The data obtained in the present work were compared well with the counterpart data reported internationally. The estimated values of all metals in muscles of fish in this study were below the permissible limits. Generally, risk values for the measured metals do not pose unacceptable risks at mean ingestion rate for muscles. It can be concluded that the investigated metals in edible parts of the examined species have no health problems for consumers.

## Figure



## Recent Publications

1. Evaluation of heavy metal concentrations in seven commercial marine fishes caught in the Mediterranean coast of Morocco and their associated health risks to consumers. S. Karim, A. Aouniti, M. Taleb, F. El hajjaji, C. Belbachir, I. Rahhou, M. Achmit, B. Hammouti. Journal of Environment and Biotechnology Research, Vol. 8, No.1, Pages 1-13, 2019.
2. Study of the Influence of the Operating Parameters on the Fractions in HOCl and OCl- During the Disinfection Phase. M Achmit , M Machkor , M Nawdali, G Sbai, S Karim, A Aouniti1 and M Loukili. Journal of Chemical and Pharmaceutical Research, 2018, 10(4): 122-127
3. Contamination by heavy metals of fishery products in Morocco S. Karim, A. Aouniti, C. Belbachir and I. Rahhou. Arabian Journal of Chemical and Environmental Research ,04 (2017) 01–17

## Biography



Author has her expertise in environmental pollution, environmental chemistry and environmental toxicology, Her focus is based on the study of metal pollution in fishery products and seawater in order to preserve the environment and human health. She was awarded her PhD in 2018 from the University of Mohamed first. Oujda .

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# Removal of cationic dye from aqueous solutions by natural clay from Morocco

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<sup>1</sup>Laboratory of Organic Chemistry, Catalysis and Environment, Department of Chemistry, Faculty of Sciences, Ibn Tofail University, B.P. 133, Kénitra, Morocco

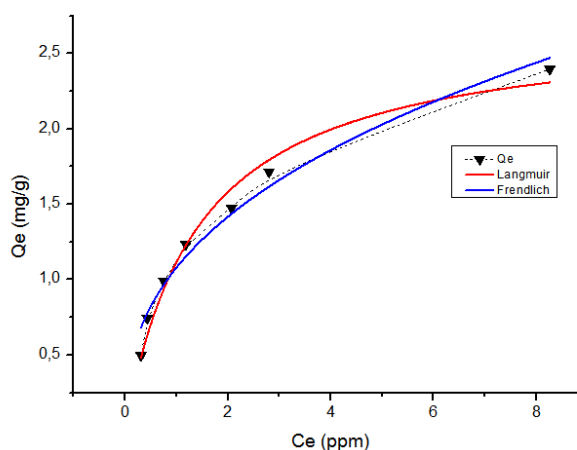
<sup>2</sup>Laboratory of Materials Physics and Subatomics, Department of Physics, Faculty of Sciences, Ibn Tofail University, B.P. 133, Kénitra, Morocco

<sup>3</sup>Laboratory of Advanced Materials and Process Engineering, Department of Chemistry, Faculty of Sciences, Ibn Tofail University, B.P. 133, Kénitra, Morocco

## Abstract

The aim of this work was the removal of the cationic dye (methylene blue (MB) chosen as the pollutant model) from wastewater by natural clay was carried out. Parameters influencing Methylene Blue adsorption such as adsorbent dose (0.5–5 g/L), initial dye concentration (20–120 mg/L), contact time (5–120 min), temperature (25–40 °C), and solution pH (2–10) were investigated. The results obtained showed that the adsorption of MB on the clay strongly depends on the initial dye concentration, the temperature, and the pH of the solution. The pseudo-second order model and the intraparticle diffusion model were applicable to describe the adsorption of MB on the adsorbent. Langmuir and Freundlich isotherms were used to determine the adsorption mechanism. According to the results, the kinetic study indicated that the adsorption of MB on clay was well suited to pseudo-second-order kinetics with a correlation coefficient  $R^2 = 1$ , the initial dye concentration. The Langmuir model better described the adsorption of MB with a maximum adsorption capacity of 230.03 mg/g. The thermodynamic study suggested that the adsorption of the cationic dye is physisorption, spontaneous and endothermic. Desorption and regeneration studies have shown that the investigated medium can potentially be used for the removal of cationic dye from wastewater.

Figure:



## Recent Publications

1. L. Mao, H. Guo, W. Zhang, *Construc. Buil. Mater*, 163 (2018), pp. 875-879.
2. A. Teyssier, J.J. Counioux, M. Kaddami, C. Goutaudier, *J. Chem. Thermodyn.* (2017), 10.1016/j.jct.2017.12.006.
3. Sakalova G. V., Vasylynych T. M., Koval N. O., Kashchei, A. *Investigation of the metod of chemical desorption for extraction of nikel ions (II) from bentonite clays. Enviromental problems.* 2017. No. 4, Vol. 2. P. 187–190.

## Biography



2017 started my doctorate in chemistry at the age of 28 at ibn tofail university kenitra Morocco and postdoctoral studies at sultan molay sliman bani mellal university of sciences and I was a member of the chemistry laboratory research committee.

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# Correlation between study Experimental and theoretical of two triazole molecules as a new effective corrosion inhibitor for mild steel in acid medium

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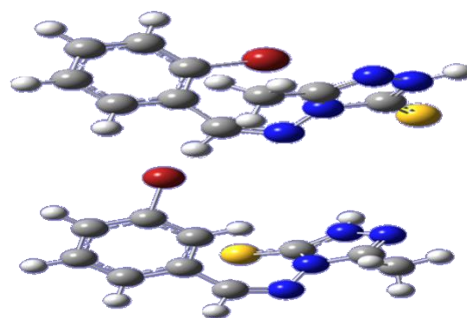
<sup>2</sup>Laboratory of Applied Chemistry and Environment, Faculty of Sciences, University Mohammed Premier, B.P. 717, 60000 Oujda, Morocco,

<sup>3</sup>Department of Applied Bioscience, College of Life & Environment Science, Konkuk University, 120Neungdong-ro, Gwangjin-gu, Seoul 05029, South Korea,

## Abstract

Electrochemical measurements as well as the weight loss method were investigated to determine the mechanism and performance of inhibition of (Z) -4 - ((2-bromobenzylidene) amino) -5-methyl-2-4-dihydro -3H-1,2,4-triazole-3-thione (2i) and (Z) -4 - ((3-bromobenzylidene) amino) -5-methyl-2-4-dihydro-3H-1,2,4 - triazole-3-thione (21) for the corrosion of mild steel in 1.0 M HCl. The outcomes show that the two triazole derivatives act as good inhibitors, and the efficiency of the inhibition follows the order (2i) > (21). Both derivatives are mixed inhibitors and adsorb on the metal surface according to the Langmuir model. An optical microscopy study points out an improved morphology of the surface of mild steel in the presence of the inhibitor studied. The inhibition mechanism was explored by the potential of the zero charge (Epzc) at the solution / metal interface. Dynamic simulation indicates the possibility of progressive substitution of water molecules on the surface of the iron surface. Thermodynamic and kinetic parameters were calculated and discussed. The quantum chemical parameters are calculated using the GAUSSIAN09W suite. A good correlation between theoretical and experimental results has been shown.

## Figure:



## Recent Publications

1. C.Verma, M.Quraishi, A.Singh, 2-Amino-5-nitro-4, 6-diarylcyclohex-1-ene-1, 3, 3-tricarbonitriles as new and effective corrosion inhibitors for mild steel in 1 M HCl: Experimental and theoretical studies, *J. Mol. Liq.* 212 (2015) 804–812.
2. L.Bertolini, B.Elsener, P.Pedferri, E.Redelli. Corrosion of steel in concrete: prevention, diagnosis, repair. John Wiley & Sons. & Polder. R. B, 2013.
3. I.Merimi, Y.Ouadi, K.R. Ansari, H. Oudda, B.Hammouti, M A.Quraishi, F.F.Al-blewi, N.Rezki, M.R. Aouad and M.Messali. Adsorption and Corrosion Inhibition of Mild Steel by ((Z)-4-((2,4-dihydroxybenzylidene)amino)-5-methyl-2,4-dihydro-3H-1,2,4-triazole-3-thione) in 1M HCl :Experimental and Computational Study. *Anal. Bioanal. Electrochem.* 9(5) 2017 640- 659.
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5. R.G.Parr, Y.Yang, *Density Functional Theory of Atoms and Molecules*, Oxf. Univ. Press N. Y. (1989).

## Biography



Imane MERIMI her expertise is in evaluation and investigation of corrosion materials and environment. Her Focused is in the application of different inhibitors in order to reduce the corrosion inhibition of materials caused by acidic solution. Studied her PhD in 2018 from the University IBN TOFAIL, kénitra. She published more than 20 papers. Her H-index is 6.

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# A bedload transport in shallow water model applied for sediment transport in open channel flows

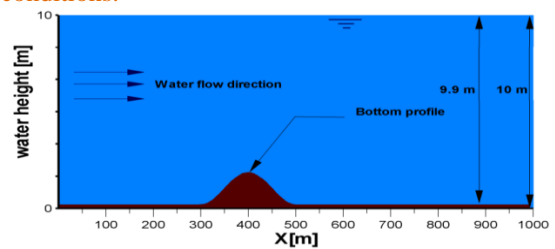
A. Amahmouj<sup>1</sup>, E.M. Chaabelasri<sup>1</sup>, A. Abakoy<sup>1</sup>, N. Salhi<sup>1</sup>

<sup>1</sup>LME, Faculty of Science, Mohammed First University, Oujda Morocco

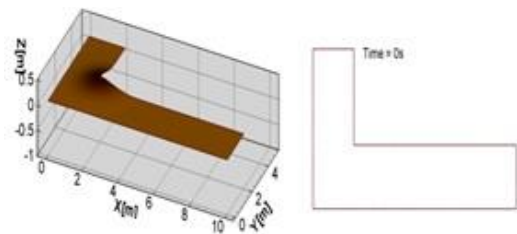
## Abstract

This paper presents the numerical approximation of bedload sediment transport due to shallow layer flows. The hydrodynamical component is modeled by a 2D shallow water system and the morphodynamical component by a solid transport discharge formula that depends on the hydrodynamical variables. The coupled system can be written as a non-conservative hyperbolic system. To discretize it, first we consider a Non-Homogeneous Riemann Solver scheme as well as a variant based on the use of flux limiters. In order to develop second-order scheme, we use a MUSCL method incorporating slope limiters in the spatial approximation and a two-step Runge-Kutta method for time integration. The comparison between results based on the proposed scheme and analytical results shows good agreement.

**Fig. 1.** Transport of parabolic sediment layer: Bed and initial conditions.



**Fig. 2.** Sediment evolution in an L-shaped channel: Evolution of the bed (left) as well as the velocity field (right).



## Recent Publications

1. E. M. Chaabelasri , A. Amahmouj, M. Jeyar, A. G. L. Borthwick, N. Salhi, and I. Elmahi, Numerical Survey of Contaminant Transport and Self-Cleansing of Water in Nador Lagoon, Morocco, Modelling and Simulation in Engineering, vol. 2014 , Article ID 179504, 8 pages, 2014 .

## Biography



Abdelouahab Amahmouj is a Doctor in the Department of Physics, laboratory of mechanic and energy, first Mohamed University, Oujda, Morocco. Is a temporary professor in the Faculty of Science and Technology Al Hoceima, Abdelmalek Essaadi University, Tetouan, Morocco. His current area of research includes Mechanics fluid, numerical method especially finite volume.

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# Theoretical and experimental study of the corrosion inhibition of mild steel in 1.0 M HCl by new quinoxaline derivatives

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## Abstract

Two new quinoxaline derivatives, namely 2-(2,3-dioxo-3,4-dihydroquinoxalin-1(2H)-yl) acetohydrazide (QL-H) and 2-(7-methyl-2,3-dioxo-3,4-dihydroquinoxalin-1(2H)-yl) acetohydrazide (QL-CH<sub>3</sub>) were prepared and characterized by proton and carbon NMR spectroscopy (<sup>1</sup>H NMR and <sup>13</sup>C NMR). Thus, these compounds were examined for corrosion inhibition of mild steel in 1.0 M HCl solution by using electrochemical methods, SEM/EDX analysis, UV-visible spectroscopy, AFM analysis coupled with theoretical studies. The potentiodynamic polarization curves showed that these products act as a cathodic-type inhibitor. So, EIS diagrams reported that the charge transfers resistance value increases from 67.96 Ω cm<sup>2</sup> to 809.06 Ω cm<sup>2</sup> and 751.60 Ω cm<sup>2</sup> at 10<sup>-3</sup> M of QL-CH<sub>3</sub> or QL-H, respectively. Moreover, it is found that the adsorption of two compounds on the mild steel surface obeys to the Langmuir isothermal adsorption. In addition, the effect of temperature on the inhibition efficiency of QL-CH<sub>3</sub> and QL-H was studied and indicated that these products take their performance at high temperature. The SEM/EDX and UV- visible analyses of the mild steel surface and the solution indicated the formation of a protective layer on the metal surface and an inhibitor complex in solution, respectively. These finding were confirmed by AFM analysis. Finally, to understand the adsorption properties of the studied quinoxaline derivatives, density functional theory (DFT) calculations and molecular dynamics (MD) simulation were performed. These theoretical studies indicated that the anti-corrosion performances of the tested molecules follow the trend: QL-CH<sub>3</sub> > QL-H; confirming the trend obtained experimentally.

**Keywords:** Corrosion inhibition; Mild steel; 1.0 M HCl solution. Electrochemical measurements; SEM/EDX analysis; UV- visible ; AFM analysis ; Theoretical studies.

*Figure:*

**Recent Publications**

## Biography



**E-mail:**

# Investigation of brass corrosion inhibition in 200 ppm NaCl solution by new diacetate derivative: experimental study, spectroscopy analysis and theoretical approach

H. Hailou<sup>1,2</sup>, M. Ait Himi<sup>2,3</sup>, S. Taghzouti<sup>1,2</sup>, M. Dahbi<sup>2</sup>, C. Hajjaj<sup>2</sup>, R. Tourir<sup>1,4</sup>, H. El Kafssaoui<sup>1</sup>, M. Ebn Touhami<sup>1</sup>

(1) *Laboratoire Matériaux Avancés et Génie des Procédés, Faculté des Sciences, université Ibn Tofail, Kénitra*

(2) *Materials Science and Nano-engineering, Mohammed VI Polytechnic University (UM6P), Lot 660 Hay Moulay Rachid, Ben Guerir, Morocco*

(3) *Laboratoire Interface Matériaux Environnement, Faculté des sciences Ain Chock, Université Hassan II, Casablanca, Morocco*

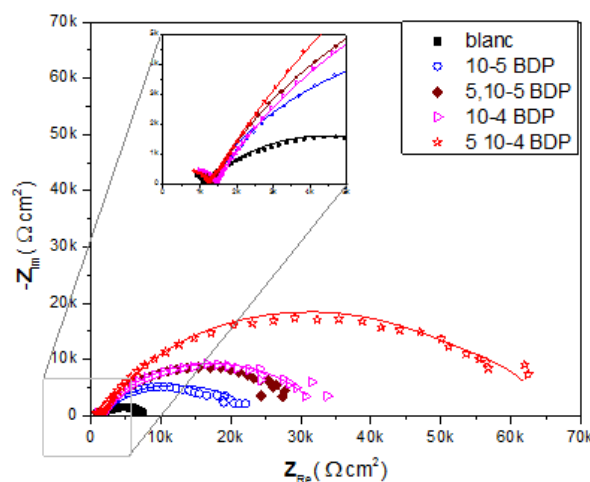
(4) *Regional Center of Education and Training Professions (CRMEF), 23 Street AbdelAziz Boutaleb, 17 Mimousa, Kenitra, Morocco.*

## Abstract

The effect of (pyridin-2-ylmethylene) bis (4,1-phenylene) diacetate (PMPD) on brass corrosion in 200 ppm NaCl medium was investigated by electrochemical measurements, scanning electron microscopy analysis and theoretical studies. The obtained I-E curves showed that this compound acts as a mixed type inhibitor.

Furthermore, the EIS indicated that the inhibitory efficiency of PMPD depends on its concentration, and reaches approximately a maximum value of 90 % at  $5 \times 10^{-4}$  M of PMPD. In addition, the effect of temperature solution on the PMPD performance was investigated, and the obtained thermodynamic activation parameters showed that the adsorption of PMPD on the brass surface is done according to a chemical adsorption. On the other hand, the SEM/EDX analysis of the brass surface confirms the formation of a protective layer like as obtained by EIS measurements. Finally, the DFT calculations and MD simulation studies confirm the strong interaction between PMPD molecules and the brass surface.

Figure:



## Recent Publications

1. *KHRIFOU R., TOUIR R., KOULOU A., EBN TOUHAMI M., Hammouti B., Surface and interface (24) (2021).*
2. *Bouassiria M., Laabaissi T., Benhiba F., El Faydy M., TOUIR R., ZARROUK A., Inorganic Chemistry Communications (213) (2020).*
3. *Hongjoo Ha, Park Kapsong, Guyong Kang, Sungjong Lee, Ecotoxicologie, (29) (2019) 333–342.*
4. *Susanne Halkjara, Jon Iversena, Line Kyhla, Feng Yu, Corrosion Science, (125) (2019) 1-9.*

## Biography



Author is a PhD student in Ibn Tofail University Its objective is based on the use of non-toxic inhibitor to reduce the corrosion of materials used in the sanitary and food industry.

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## Corrosion inhibition by new compounds based on bismuth Bi<sub>2</sub>O<sub>3</sub>

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<sup>2</sup>National Higher School of Chemistry, Ibn Tofail University, PB 133-14050 Kénitra, Morocco.

### Abstract

The plurality of alloys available in the industries allows obtaining materials adapted for each field. The competitive cost of steel is very attractive for its use, to the detriment of other metals or stainless steel. On the other hand, mild steel is an alloy that is more susceptible to corrosion. It therefore frequently happens that steel installations suffer losses of their initial mechanical properties. Thus, to minimize this problem, many inhibitors are used. Inorganic inhibitors are generally crystalline compounds such as chromates, vanadates, molybdates, or phosphates, which form positively and negatively charged ions [1-4].

Our work consists in studying the action of three inorganic inhibitors, of the family of bismuth vanado-phosphates, on the corrosion of mild steel in 1.0 M HCl medium through electrochemical measurements. The effect of inhibitor concentration and the temperature was studied. The results of this study confirm the effectiveness of these three inhibitor products in providing corrosion protection due to their adsorption quality.

### Recent Publications

1. S. Ferraa, M. Ouakki, H. Barebita, A. Nimour, M. Cherkaoui, T. Guedira, Corrosion inhibition potentials of some phosphovanadate-based glasses on mild steel in 1 M HCl, *Inorg. Chem. Commun.* 132 (2021), 108806.
2. A. Elbadaoui, M. Galai, S. Ferraa, H. Barebita, M. Cherkaoui, T. Guedira, Effect of bismuth and bore content in glass system inhibitor on the corrosion behavior of mild steel in 1M hydrochloric acid solution. *Mediterranean Journal of Chemistry.* 8(4) (2019) 328-337.
3. G. Ghenimi, M. Ouakki, H. Barebita, A. El Fazazi, T. Guedira and M. Cherkaoui, *Anal. Bioanal. Electrochem.* 12 (2020) 1-20.
4. A. Elbadaoui, M. Galai, M. Cherkaoui, T. Guedira, *Der Pharma Chem.* 8 (2016) 214.

### Biography



Badr BAACH is currently a Ph.D. student at the University of Ibn Tofail, under the supervision of Dr. Tawfik GUEDIRA . His research interests include the study of interesting crystallin and glass materials. Her focus is based on the exploration of new materials based on bismuth oxide to have application in different technological fields.

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**GREEN ENERGY, RENEWABLE, STORAGE AND SUSTAINABLE DEVELOPMENT**

# Realization and real application of two prototypes for photovoltaic panel data acquisition

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## Abstract

In this study, two low-cost photovoltaic (PV) data acquisition circuits are conceived for PV panel characterization. The first designed circuit is based on classical current and voltage sensors. However, the second new proposed prototype uses only simple and low-cost electrical components. A typical T9C-M20-36 photovoltaic panel has been chosen for experimental tests and simulation in Proteus Isis and MATLAB/Simulink software. This PV panel provided, under standard test conditions (STC) ( $1000 \text{ W/m}^2$  and  $25^\circ\text{C}$ ), a maximum power of 20 W at an optimal current of 1.2 A and an optimal voltage of 18 V.

As can be seen in figure 1, simulation results, at STC, under Proteus Isis show a significant shift between current-voltage I(V) curves obtained using the two proposed circuits. It should be noted that I(V) resulting from the new proposed circuit agree very well with the reproduced I(V) curve simulated in MATLAB/Simulink using the three remarkable points (TRP) provided from PV panel datasheet at STC [1].

After simulation under Proteus Isis software, the proposed data acquisition circuits were implemented with low-cost Arduino UNO Board. Using a data acquisition interface, users can check in real time the evolution of recorded data such as irradiation level, PV panel temperature, voltage, current and power.

In this work, experimental tests are conducted under  $800 \text{ W/m}^2$  and  $45^\circ\text{C}$  as shown in figure 2. The main results show that the new proposed prototype perform well than the classical circuit of data acquisition.

A validation of the new proposed circuit is performed by translation [2] of current-voltage curves from ( $800 \text{ W/m}^2$  and  $45^\circ\text{C}$ ) to STC as presented in figure 2. Comparison of the translated I(V) curves and the current-voltage characteristics, reproduced accurately by simulation in MATLAB/Simulink environment by taking account of TRP at STC, illustrates a good agreement for the first prototype.

The new realized prototype is easy to implement, low in cost, saves times and reduces human effort in measuring current-voltage characteristics. Moreover, the new developed prototype could be extended by integrating fault detection and diagnostic algorithms.

Figure 1. Current-Voltage I(V) curves simulated under Proteus ISIS and MATLAB/Simulink at STC.

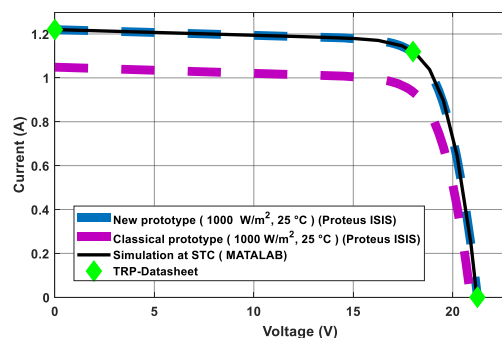
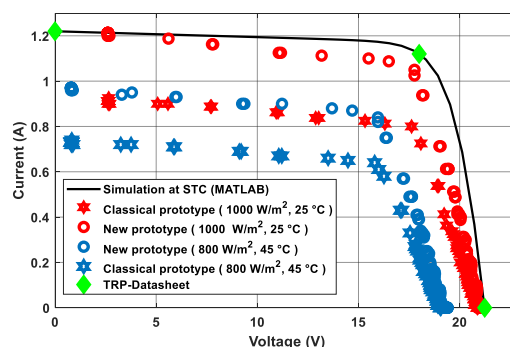


Figure 1. Simulated and experimental I(V) curves under various meteorological conditions.



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2. Bleasser G., Zaïman W., In: Tenth EC photovoltaic solar energy conference. (1991) 1240-1243.

## Biography



Khelifi Abdelilah is a Ph.D. student in Renewable Energy, Embedded Systems, and Data Processing Laboratory at Mohammed First University. National School of Applied Sciences in Oujda, Morocco. My research centered on fault detection and diagnostic in PV system.

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# Novel NaSICON-type structure Iron/ Vanadium phosphate-based as cathode for Lithium-ion Batteries

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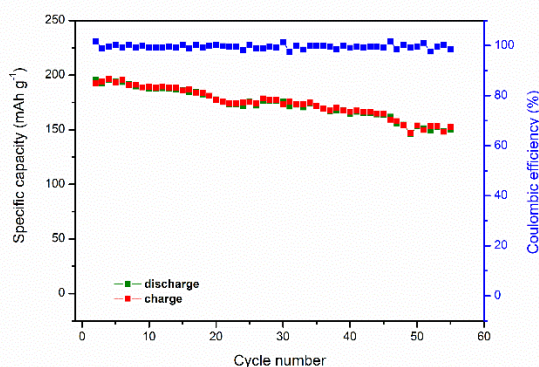
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<sup>6</sup> Synchrotron-light for Experimental Science and Applications in the Middle East (SESAME), Allan 19252, Jordan.

## Abstract

NaSICON-type structure phosphates were widely investigated as cathode and anode candidates for high energy density lithium-ion batteries.  $\text{Li}_3\text{V}_2(\text{PO}_4)_3$  reported with the highest theoretical capacity of  $197 \text{ mAh g}^{-1}$ . However, the material suffers from sluggish kinetics upon the extraction of the third  $\text{Li}^+$  ion due the low electronic conductivity of  $\text{V}_2(\text{PO}_4)_3$  framework. Therefore, the substitution of vanadium with eco-friendly and cheap iron was targeted for this work. Novel NaSICON-type structure phosphate  $\text{Li}_3\text{V}_{2-x}\text{Fe}_x(\text{PO}_4)_3$  (LVFP) was synthesized using one step reaction via sol-gel route. The electrochemical properties of the obtained material were enhanced by the optimization of the electrolyte and the voltage range. As shown in Fig. 1, this material delivers a reversible capacity of  $150 \text{ mAh g}^{-1}$  with 99% coulombic efficiency after 55 cycles. Furthermore, this material was studied using  $^{57}\text{Fe}$  Mossbauer spectroscopy, X-ray absorption spectroscopy and magnetic measurements. The findings of this study will be communicated during this conference.

**Figure 1.** Specific capacity & coulombic efficiency versus cycle number of LVFP at C/2 current rate



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1. H. Aziam, S. Indris, R. Witte, A. Sarapulova, H. Ben Youcef, I. Saadoune, *J. Alloys Compd* 906 (2022) 164373.
2. M. Amou, H. Aziam, B. Larhrib, N. Sabi, H. Martinez, H. Ben Youcef, I. Saadoune, *J. Power Sources* 532 (2022) 231310.

## Biography



focuses on the synthesis and characterization of novel electrode materials for lithium and sodium ion batteries.

In December 2019, Hasna received her Ph.D. Degree in Electrochemistry – Battery Materials from Cadi Ayyad University in collaboration with Mohammed VI Polytechnic University. During her Ph.D. time, she worked on the synthesis and characterization of novel phosphates as negative electrode materials for lithium-ion batteries. She has studied three different families of phosphates, iron (III) based oxyphosphates  $\text{MFeOPO}_4$  (M: Ni, Co), orthophosphates  $\text{Ni}_{3-x}\text{Co}_x(\text{PO}_4)_2$ , and NASICON structure-type materials  $\text{Li}_{0.8}\text{M}_{0.1}\text{Ti}_2(\text{PO}_4)_3$  (M: Mg, Co). She focused on investigating new materials and understanding their lithiation/ delithiation mechanisms using advanced characterization techniques.

Dr. Aziam authored/ co-authored 13 peer-reviewed papers: 5 conference papers, 7 full papers, and 1 book chapter in high impact factor Journals.

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# Designing new thiophene-based HTMs with favorable optoelectronic properties for perovskite solar cells

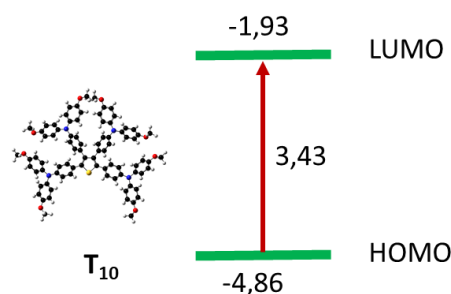
A. Idrissi<sup>1</sup>, Z. Elfakir<sup>1</sup>, R. Atir<sup>1</sup>, A. Habsaoui<sup>1</sup>, S. Bouzakraoui<sup>1</sup>

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## Abstract

Perovskite solar cells recently gained a lot of attention due to their high absorption coefficient, high mobility of charge carriers, a length of high carrier diffusion and high yield. HTMs are an important active material in PSC, responsible for efficiently extracting holes at the perovskite / HTM interface and preventing unwanted charge transfer processes resulting in improved device performance. Computational calculations are carried out to design new thiophene derivatives as HTMs. Ground state structural geometries, Frontier molecular orbitals, excitation energies, oscillator strengths, reorganization energies, and free energies in dichloromethane solvent were computed. The results point out that all under probe molecules are preferential candidates for HTMs in perovskite solar cells because of their excellent HOMO delocalization, lower hole reorganization energies, and high light harvesting efficiency.

Figure:



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## Biography



Abdennacer IDRISSE is a PhD student from Ibn Tofail University. He is a computational chemist trying to understand relationships between the structure and optoelectronic properties of thiophene derivatives as HTMs in Perovskite Solar Cells. He is also designing new small molecules as active materials in Organic Solar Cells. Abdennacer published already two research articles in have few others on their way to be published.

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# Regression and Machine Learning Modeling Comparative Analysis of Morocco’s Fossil Fuel Energy Forecast

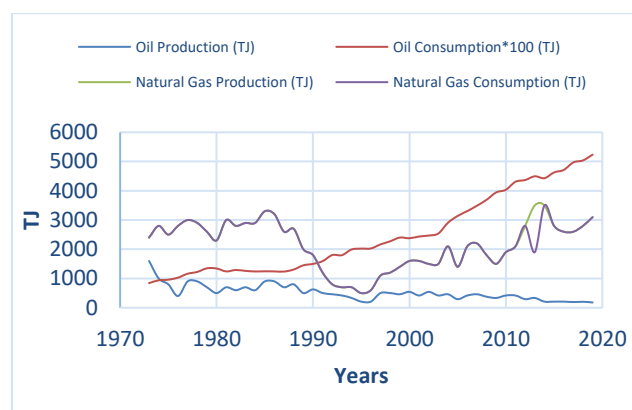
Dalal Nasreddin<sup>1</sup>, Soumia Aboutaleb<sup>1</sup>, Aymane Cheracher<sup>1</sup>, Yasmine Abdellaoui<sup>1</sup>, Saad Amrani Marrakchi<sup>1</sup>, Inass Sabbahi<sup>1</sup>, Youssef Benmoussa<sup>1</sup>, Reda El Makroum<sup>1</sup>, Aymane El Alami<sup>1</sup>, Asmae Khaldoun<sup>1</sup>, Houssame Limami<sup>1</sup>

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## Abstract

Despite the numerous advantages introduced by renewable energy technologies to the global energy market, fossil fuels still hold the major share. Due to their greater reliability, many countries, for instance the Kingdom of Morocco, still depend heavily on fossil fuels. In fact, conventional energy sources account for more than 80% of the Moroccan energy mix. However, energy security is one of the main issues that Morocco is facing. One of the major challenges the country is facing is not having complete control over external factors influencing the consumption and production of fossil fuels. Therefore, its energy security could be described as susceptible to instability. For this purpose, it is important for Morocco to assess future perspectives related to energy security while relating them to the framework of the Nationally Determined Contributions (NDCs). This paper deploys Morocco’s historical data (from 1973 to 2019) by identifying 20 parameters influencing energy consumption and production of both oil and natural gas. Following the collection of data, these parameters were divided into five main categories: Energy consumption by sector, local socio-economic factors, local energy use, global energy trends and national trilemma index. Two forecasting models were developed to predict the energy consumption and production of oil and natural gas in Morocco up to 2040. The two used models consist of a regression analysis via excel and a machine learning model. Obtained findings are expected to inform policy and decision makers of the impact that the investigated factors have on the Moroccan energy sector; leading them to the development of strategies with the goal of strengthening the country’s energy stability.

**Figure:** Energy Consumption and Production of Oil and Natural Gas in Morocco (1973-2019)



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1. H. Limami, I. Manssouri, K. Cherkaoui, A. Khaldoun, “Study of the suitability of unfired clay bricks with polymeric HDPE & PET wastes additives as a construction material”, *Journal of Building Engineering*. 27 (2020) 100956. doi:10.1016/J.JOBE.2019.100956.
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3. R. El Makroum, A. Khallaayoun, R. Lghoul and M. Chraïbi, “A Linear Programming Based Load Scheduling System Considering Dynamic Pricing and Renewable Energy,” 2021 12th International Renewable Engineering Conference (IREC), 2021, pp. 1-5, doi: 10.1109/IREC51415.2021.9427821.
4. M. Berrissoul, R. E. Makroum and Y. S. Alj, “Biomass Energy Processes Involved in Heating: Morocco Case Study,” 2021 10th International Conference on ENERGY and ENVIRONMENT (CIEM), 2021, pp. 1-5, doi: 10.1109/CIEM52821.2021.9614865.
5. Benmoussa, A. Mabrouki, S. Berrada, I. Azhari and Y. Salih-Alj, “Design and Analysis of a Renewable Energy-Based Hybrid SWRO Desalinator: Case Study in the Atlantic Coast of Morocco,” 2021 9th International Conference on Smart Grid and Clean Energy Technologies (ICSGCE), 2021, pp. 92-97, doi: 10.1109/ICSGCE52779.2021.9621372

## Biography



Dalal Nasreddin is currently a Master of Science student at Al Akhawayn University, Morocco. Prior to this, she was awarded a Bachelor of Engineering in 2021 in Civil Engineering from the University of Surrey, England. She is currently focused on the area of sustainable energy management and has a passion in improving energy efficiency globally with a particular interest in the Kingdom of Morocco.

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# Current harmonic reduction for grid-connected photovoltaic system (PV) based on a three-phase seven-level inverter

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<sup>1</sup>Laboratory of Electrical Engineering and Maintenance (LEEM), Higher School of Technology, University of Mohammed I, Oujda, Morocco

<sup>2</sup>Laboratory Renewable energy, embedded system and information processing, National School of Applied Sciences, University of Mohammed I, Oujda, Morocco

## Abstract

The multilevel inverters are increasingly important for the conversion of the energies that come from the photovoltaic (PV) sources. In this article, we improved the control for three-phase seven-level of packed U-Cell inverter, the latter considered as a new multilevel converter topology and has the advantage of very high energy efficiency, and the number of components reduced but has disadvantages related to the harmonics injected into the grid causing switching states if the number of levels increased. In this paper, an improved control based on the sinusoidal (SPWM), and space vector control (SVPWM) for the seven-level packed PUC-Cell inverter has been proposed. The Proportional resonant (PR) controllers are implemented in the DQ frame to adjust the grid currents in the synchronous DQ frame and to generate the reference current and maintain synchronism between the inverter and the grid, a Phase-locked loop technique (PLL) can be used. This control is composed of two regulation loops the first allows to regulate the active and reactive currents injected into the grid and the second regulate the DC bus voltage. The evaluation of our results obtained is based on the value of the harmonic distortion rate obtained ( $THD \ll 5\%$  the international standard). This control strategy eliminates current harmonics, and improves the quality of power injected into the grid from the photovoltaic system under non-linear load conditions (NLL). An analysis and comparison between the seven-level PUC-cell inverter structure, and the conventional seven-level cascade inverter structure is done, and the simulation results in Matlab/Simulink demonstrate the effectiveness and feasibility of the proposed control method.

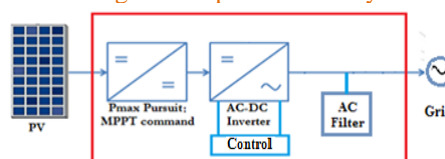
## Biography



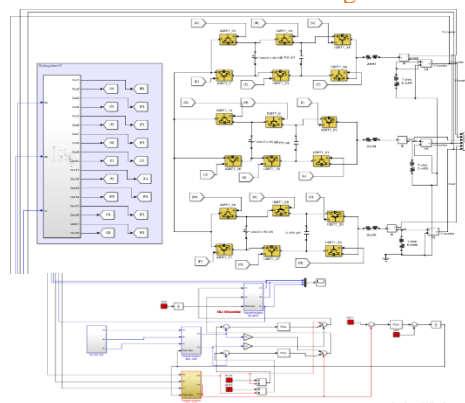
Lamreoua Abdelhak is a Ph.D. Researcher a Laboratory of Electrical Engineering and Maintenance (LEEM), Higher School of Technology, University of Mohammed I. His research interests include the field of power electronics, electrical engineering, and renewable energy. Her focus is based on is to improve inverter controls to reduce current harmonics and improve the quality of current injected by photovoltaic sources into the grid. She published more than 2 papers on Scopus.

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**Figure:1.** Block diagrams of photovoltaic system inverter



**Figure:** Simulation model of three-phase seven-level of packed U-Cell inverter connected to the grid



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1. G. V. V. Nagaraju1, G. Sambasiva Rao, Three phase PUC5 inverter fed induction motor for renewable energy applications, International Journal of Power Electronics and Drive System (IJPEDS), Vol. 11, No. 1, March (2020), 1-9.
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# Energy audit and assessment of indoor environmental condition inside Oujda-Angads International Airport terminal building, Morocco

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<sup>2</sup>Ecole d'Architecture Oujda.

<sup>3</sup>Materials, Energy and acoustics team, EST Sale, University Mohamed V Rabat.

## Abstract

Airports are energy-intensive buildings where the bulk of energy consumption is due to HVAC systems and other factors, namely: large volume, architecture with large bay windows, technical installations of wingspan, heat loss, and passenger movement. This work aims the evaluation of the energy-saving potential and the improvement of the occupants' comfort in the terminal of the international airport of Oujda-Angads, in Morocco. It presents the results of the detailed energy audit phase. The basis is site visits (20 days in December 2021 and 15 days in February 2022), occasional temporary measurements, information, and data received from the National Airports Office. Although energy is the main subject of the study, some considerations on water use and consumption are also made. The results indicate that the HVAC system consumes the largest share (64%) of the building's overall electricity demand. In addition, the indoor temperatures are within the acceptable range of comfort. A significant reduction in monthly energy consumption is achieved by increasing the HVAC setpoint temperature from 18 to 21°C; a reduction equal to 18.7% of the total energy consumption during the hot months. The results of this study are with high interest for sustainable solutions to reduce energy consumption and improve the thermal comfort of passengers inside the terminal.

*Figure:*

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## Biography



Ph.D. student at Mechanics and Scientific Calculation Team, Mohammed 1st University. Energy Engineer, PPL aircraft pilot, Deputy Director of Oujda-Angad airport, Ex-head of technical service at Oujda airport, Ex-technical director of the design office. Part-time professor in several modules in energy and Mechanics.

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# Prospection of geothermal resources using spatial and Geo-spatial technology: a case of clean energy mix implementation in the Moroccan Sahara and the Souss Massa Region

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<sup>a</sup>Laboratory of Geosciences, Faculty of Sciences Ain Chock, University Hassan II of Casablanca;

<sup>b</sup>School of Architecture, Planning and Design, Mohammed VI Polytechnic University, Benguerir, Morocco;

<sup>c</sup>Faculty of Sciences Technical, University Al Asriya of Nouakchott, Mauritania;

<sup>d</sup>Hassania School of Public Works/(EHTP), Morocco;

<sup>e</sup>Polytechnic School of Montreal, CANADA;

## Abstract

Geothermal reservoirs refer to any heat stored, naturally, in the earth's crust; It is considered as resource coming from a natural complex depending on the geological, geophysical aspect and territories geochemistry. Although this natural resource remains distinguished by his characters to be a renewable, ecological, universal and sustainable mining energy, it stills not, yet, sufficiently exploitable worldwide. The same finding was brought up in Moroccan context, despite the presence of some hot resources and capitalizable scientific research to develop this potential. Prospecting for underground geothermal resources is an expensive project that deserves to mobilize scientific and technical methods in order to overcome this risky impasse. Thus, Geomatics has been used, drawing on Remote Sensing for geo-spatial exploration in order to guide prospecting through the development of geothermal deposits potential maps at very low and medium depth on Moroccan territories.

Furthermore, we explore smart tools to support short and long-term decision-making in terms of creating of clean energy mix and complementary mining energy as well as investment in energy exploration operations.

And, as an experiment, we chose for this study, areas distributed mainly in the Moroccan Sahara and the Souss Massa Region, known, probably, by a potentially high geothermal gradient, and therefore constituting geothermal energy reservoirs. As for the exploration methodology adopted, it consists in processing of the imageries: LANDSAT 8, MODIS AND ASTER, in order to extract exploitation indices such as the surface temperature, the layer of lineaments and cracks density, and evidence of hydrothermal alteration that may indicate geothermal activity. The correlation between these three factors, will lead us to conclude that the Moroccan Sahara area is considered as one of the most potential geothermal reservoir areas in Morocco.

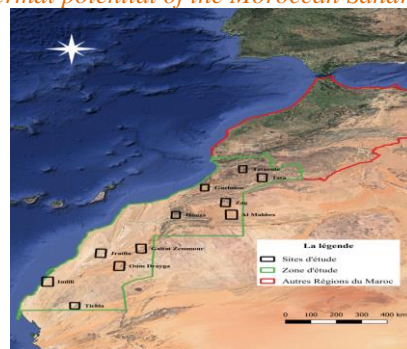
## Biography



Abderrahim El\_bouazouli is an ex responsible of research and development in Hassania School of Public Works (EHTP) and specialist in geothermal resources field. Actually, he is follows his PhD study in the geothermal deposits as renewable, ecological, universal and sustainable energy. He obtained his Engineer Degree in Earth Sciences in 1986 in Mineral Industry National School of Rabat; a Master degree in project and Property Management in 1994 in Special School of Public Works of Paris, France; Graduate of Specialized Higher Studies in 1995 of grouping National School of Bridges and Pavements - Special School of Architecture - University Pantheon Sorbonne, France; Master's Degree in Engineering Education and Training in 2003 from the Lille University, France.

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**Figure: Geo-spatial prospecting sites in 2022 via geomatics of the geothermal potential of the Moroccan Sahara**



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# New Carbazole-Based Hole-Transport Materials in Perovskite Solar Cells

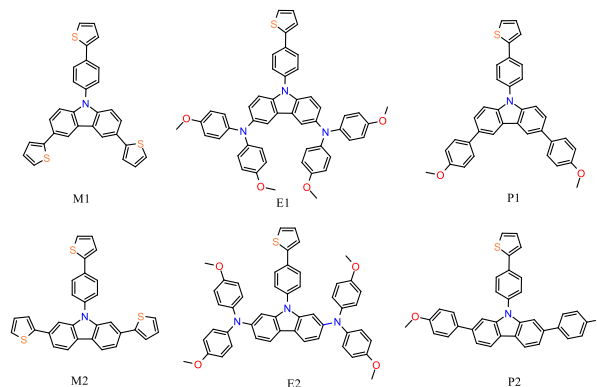
Z. ELFAKIR, A. IDRISSE, R. ATIR, A. HABSAOUI, S. BOUZAKRAOUI

Laboratory of Advanced Materials and Process Engineering, Faculty of Sciences, Ibn Tofail University

## Abstract

New sources for energy generation are essential for our society. Emerging photovoltaics (PVs) based on perovskites have been shown to have unparalleled performance due to their high absorption coefficient, high mobility of charge carriers, a length of high carrier diffusion and high yield. HTM, is an important active material in PSCs, is responsible for efficiently extracting holes at the perovskite/HTM interface and preventing unwanted charge transfer processes, thereby enhancing device performance. In this study, we focus on mixt carbazole-thiophene based HTMs, particularly on the effect of changing substitution positions of carbazole core on the structural and optoelectronic properties of the investigated molecules. Calculations were carried out based on the theoretical approaches including density functional theory (DFT), time-dependent density functional theory (TD-DFT) and Marcus theory. Some important parameters, such as Electronegativity, solubility and stability, absorption and emission spectra, Stokes shift, Exciton binding energy, and Frontier Molecular Orbitals energies and distributions were obtained and discussed.

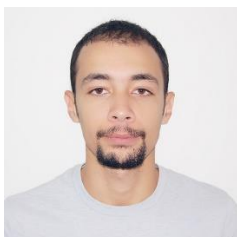
Figure:



## Recent Publications

1. Atir, Redouane et al. 2022. “Carbazole-Based Hole-Transport Materials for Efficient Perovskite Solar Cells. A Computational Study.” *Optik*: 168793. <https://linkinghub.elsevier.com/retrieve/pii/S0030402622001954> (March 3, 2022).
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## Biography



Zouhair El fakir is a PhD student in the Laboratory of Advanced Materials and Process Engineering in Ibn Tofail University. He is working on computational studies of carbazole derivatives as active hole transport materials in Perovskite Solar Cells.

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# What management method should be deployed in the Energy Management System as a lever for efficient and sustainable management of public lighting in Moroccan cities

Youssef KASSEH<sup>1</sup>, Abdellatif TOUZANI<sup>1</sup>, Salma ELMAJATY<sup>1</sup>

<sup>1</sup>Mohammadia School of Engineering , Mohammed V University-Rabat

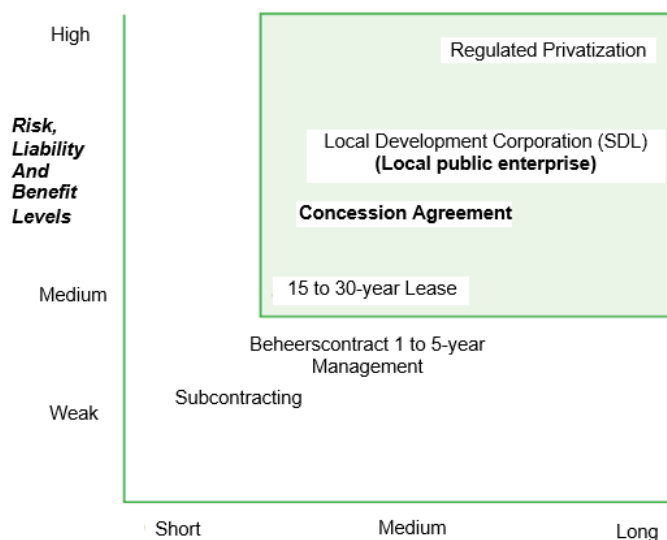
## Abstract

Street lighting strategy is now a real urban issue: a well-lit city satisfies citizens and is a factor of attractiveness, safety and economy for communities. The current challenge for street lighting is to find the right balance between economy and ecology. Urban authorities must therefore define the right light, where it is needed, when it is needed, how it is needed and at the best cost. In the midst of economic and industrial growth, in the face of societal challenges, while respecting its commitments to sustainable development, Morocco is aiming to achieve ambitious goals of non-polluting energy independence. To this end, Morocco has developed an energy efficiency strategy [1] that includes the implementation of efficient public lighting services as one of its main axes.

Morocco has a large public lighting network, with an estimated 1.2 million light points [2] installed in the urban environment in 2017. The objective of this paper is to present an analysis of public lighting management in Morocco. It presents the various obstacles and constraints to achieving effective management of public lighting. It also assesses the impact of the public lighting management mode on energy performance and on the environment. The first step consists of an analysis of the public lighting assets in Moroccan cities [3]. Then, the design of a sustainable public lighting programme including the financing model. Finally, an action plan is proposed to improve the energy performance of public lighting, including performance monitoring.

A clear improvement in energy performance was observed: more than 4% reduction in annual consumption, and up to 30% reduction in some newly installed areas where lighting quality was even improved. This allows us to conclude that the energy management method has an added value on the energy performance of the street lighting activity.

**Figure:** Outlines the advantages and limits of each management model.



## Recent Publications

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2. Authorities, Directorate General of Local. Overview of public lighting in EMN member cities, CoMun - municipal cooperation in the Maghreb. September 2015.
3. Elias Andersson, Oskar Arfwidsson, Victor Bergstrand, Patrik Thollander. A study of the comparability of energy audit program evaluations, *Journal of Cleaner Production*, Volume 142, Part 4, Pages 2133-2139 . <https://doi.org/10.1016/j.jclepro.2016.11.070>. [Online] 2017.

## Biography



The author is an engineer by training and has more than 15 years of expertise in the development and implementation of management systems, particularly in the energy sector. He is a second-year doctoral student at the Mohammadia School of Engineering in Rabat, Morocco, and has participated in the writing of several articles in the field of energy and sustainable development.

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# Mesophilic anaerobic digestion of chicken slaughterhouse waste: Methane production and kinetic study

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## Abstract

Anaerobic digestion (AD) represents an interesting technology to transform slaughterhouse waste into bioenergy, for the production of biomethane and for the reduction of pathogens.

We studied biomethane production from AD of chicken intestines from poultry slaughterhouses in batch-fed reactor experiments at 37°C. These processes were carried out at laboratory scale in a CSTR digester operating in batch mode. The inoculum used for this experiment is sludge from a wastewater treatment plant. The methane yield is about 227,22 Nml/g VS. The biodegradability is of the order of 37%. The mathematical modeling of biomethane production from slaughterhouse waste was studied using sigmoidal bacterial growth curve equations (Gompertz, Logistic and transfer function) to investigate their ability to describe degradation patterns associated with complex substrates, mainly composed of fats. The most adequate kinetic model for our experiment is the logistic function with an R2 value of 0.9912 and a margin of error that does not exceed 4%.

## Figure



Fig. 1 : CSTR digester

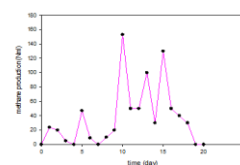


Fig. 2: Daily methane production as function of time

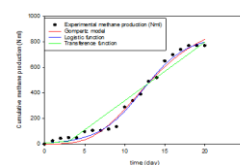


Fig. 3: Experimental methane production compared with kinetic curves

## Recent Publications

1. Habchi S, Nabila L, Fadoua K, et al (2022) Effect of Thermal Pretreatment on the Kinetic Parameters of Anaerobic Digestion from Recycled Pulp and Paper Sludge. *Ecol Eng Environ Technol* 23:192–201.
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5. Lahboubi N, Kerrou O, Karouach F, et al (2020) Methane production from mesophilic fed-batch anaerobic digestion of empty fruit bunch of palm tree. *Biomass Convers Biorefinery*.

## Biography



The author ‘Sanae HABCHI’ is PhD student. Her thesis topic is the valorization of organic waste by the technology of anaerobic digestion, the objective of this study is the production of biomethane optimization which is a source of clean energy and the reduction of the pollution of this waste in our environment by reducing the emission of greenhouse gases. The author has already published her first article indexed Scopus.

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## Results and perspectives of the application of an energy management system based on iso 50001 in administrative buildings - case of Morocco

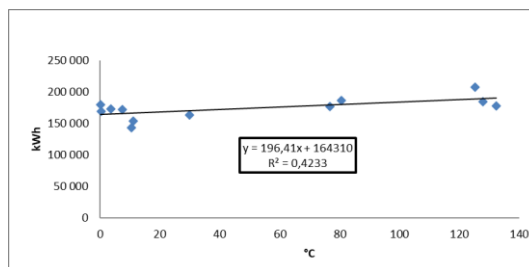
Salma El Majaty<sup>1</sup>, Abdellatif Touzani<sup>2</sup>, Youssef Kasseh<sup>3</sup>

Mohamedia School of Engineering – Rabat  
Mohamedia School of Engineering - Rabat  
Mohamedia School of Engineering - Rabat

### Abstract

The National Strategy for Sustainable Development (1) responds to the commitments made by Morocco to achieve the 17 Sustainable Development Goals (SDGs) by 2030 and to contribute to the fight against climate change. With this commitment, Morocco aims to reduce its greenhouse gas emissions by 17% by 2030 in key economic and social sectors (2). The building sector has a mitigation potential of nearly 8%. In terms of energy, the building sector is the second most energy-intensive sector in Morocco, behind transport and ahead of industry. It consumes more than 33% of final energy and emits more than 12% of national greenhouse gas emissions (2). Within the framework of the national energy strategy, energy efficiency has been set as a national priority, with a target of reducing energy consumption to 14% in the building sector by 2030 (3). This study focuses on an energy management system to improve the energy performance and environmental impact of an administrative building based in Casablanca, the economic capital of Morocco. The system consists of an energy performance report based on the ISO 50001 Version 2018 standard (4). The system collects data from various sources to provide information about the building's energy consumption. Energy-intensive systems can then be isolated, monitored and compared to continuously updated benchmarks to identify missed savings opportunities (5). The system was implemented and resulted in a significant reduction in energy consumption. These results prove that the energy performance of an office building can be improved with minimal investment using an energy management system.

Figure: Electricity consumption VS DJU Air conditioning



### Recent Publications

1. Sustainable, Ministry of Energy Transition and Development. [https://www.environnement.gov.ma/images/a\\_la\\_une/JANVIER2022/Rapport\\_Strategie\\_Nationale\\_DD\\_juin2017\\_Mai\\_2017\\_Web.pdf](https://www.environnement.gov.ma/images/a_la_une/JANVIER2022/Rapport_Strategie_Nationale_DD_juin2017_Mai_2017_Web.pdf). www.environnement.gov.ma. [Online] 2017.
2. National, Ministry of Land Management. ENERGY EFFICIENCY - Outreach Support. 2017. 3. Sustainable, Ministry of Energy Strategy and Development. National Energy Efficiency Strategy. 2017. 4. AFNOR. ISO 50001 standard. 2018.y.
3. Wiehan A. Pelsler, Jan C. Vosloo, Marc J. Mathews, Results and prospects of applying an ISO 50001 based reporting system on a cement plant

### Biography



The author is an engineer by training and has more than 21 years of expertise in the development and implementation of management systems, particularly in the energy sector. He is a first-year doctoral student at the Mohammadia School of Engineering in Rabat, Morocco, and has participated in the writing of several articles in the field of energy and sustainable development.

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## Electrical and Thermal Modelling of Solar Cells

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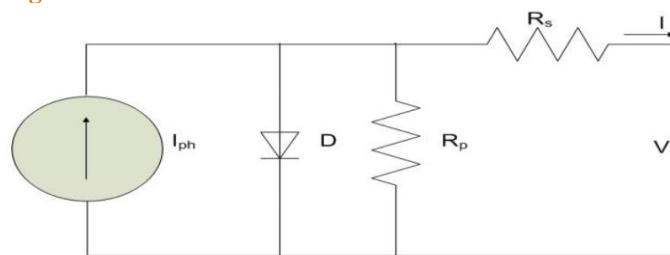
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### Abstract

All discussions on climate change generally make to intervene renewable energies as the only means to avoid the effects of the global increase in temperature. Photovoltaic energy is considered one of the sources of energy not emitting carbon dioxide and other greenhouse gases which thus contribute to warming. Seen its simplicity and low maintenance costs, photovoltaic energy is considered an emerging energy resource [1,2]. But, the photovoltaic (PV) system confronted many challenges due to its limited efficiency [3] and high costs. Another challenge is how to handle the current/voltage output of a photovoltaic panel which is non-linear. Several PV electrical and thermal models have been proposed and developed in literature [4-6]. These models are constructed, developed and tested to estimate the parameters of these PV panels. In general, the data sheet of the manufacturer of a PV panel, mentions the open circuit voltage ( $V_{OC}$ ), the short-circuit current ( $I_{SC}$ ), the MPP current ( $I_{MPP}$ ), the voltage ( $V_{MPP}$ ) the power ( $P_{MPP}$ ), as well as the values of the temperature coefficients for the open circuit voltage ( $K_V$ ) and for the short circuit current ( $K_I$ ). Unfortunately, in the majority of cases, the PVs operate under different conditions and it is not possible to have the same temperature coefficients and the same efficiency. Based on a large number of publications concerning PV solar cell modeling and parameter extraction, this work presents four methods for extracting PV parameters using the single diode Model, including experiment at the field in order to validate the best method that works well for the chosen PV system.

Figure



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2. M. Asim, M. Tariq, M. A. Mallick, I. Ashraf, S. Kumari, and A. K. Bhoi, "Critical evaluation of offline MPPT techniques of solar PV for stand-alone applications," Lect. Notes Electr. Eng., vol. 435, pp. 13–21, 2018, doi: 10.1007/978-981-10-4286-7\_2.
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5. Sandia National Laboratories, Database of Photovoltaic Module Performance Parameters, 2002

### Biography



Radouane AALLOUL is PHD student in Faculty of Sciences Ben M'Sik, Hassan II University of Casablanca. he has also a mechanical engineer degree from the National higher School of Electricity and Mechanics (ENSEM) in 2015. he actually works on Modelling the thermal and electrical behavior of PV system with the collaboration of the Laboratory of Agricultural Engineering and Energy, National Institute of Agricultural Research (INRA).

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# Nanoscale energy deposition frequencies evaluation using GATE simulation tools

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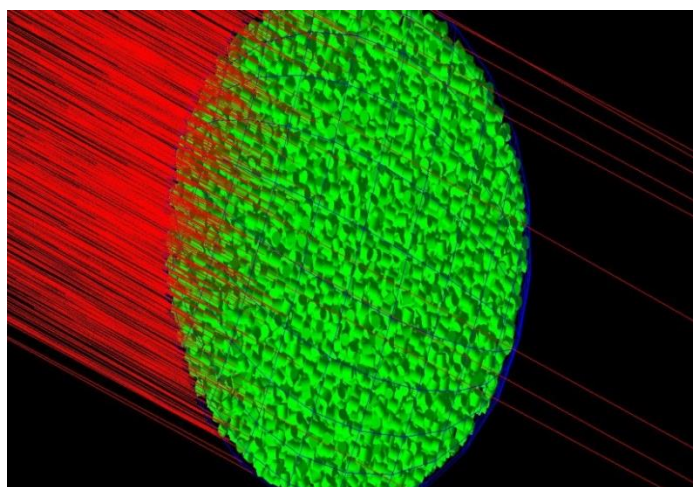
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<sup>2</sup> National School of Applied Sciences, Mohammed First University, Oujda, Morocco

## Abstract

Over the past decade, the treatment of cancer with radiation therapy has evolved significantly, in part due to improved treatment planning systems. Ideally, this software makes it possible to obtain the dose distribution at the macroscopic scale, but this remains impractical at the cellular and intracellular level due to the lack of knowledge of the secondary effects of this radiation at the nanometric scale. This study presents a new Monte Carlo modeling approach of the nano-dosimetric effects of particles used in radiotherapy on real cell models. First, a simulation of the irradiation of two volumes by protons is performed in order to show the ability of Geant4-DNA models to simulate very low energy particle interactions. Next, we simulated the DNA molecule, which is represented by cylinders of three nanometric sizes corresponding to the building blocks of the cell nucleus (10 bp, nucleosome, chromatin fiber), and calculated the frequency of energy deposition distributed in each cylinder by irradiating these geometries with both electron and proton beams. The energy deposition frequency distributions in nanoscale cylinders obtained with the Gate simulation platform are in reasonable agreement with the results of the series of MOCA codes published in the literature.

Figure:



## Recent Publications

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## Biography



Author is a first year PhD student at the University of Mohammed First in Oujda, Morocco. Her work concerns micro and nano-dosimetric studies in radiotherapy.

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## Green Energy from the bioresource of Nador lagoon

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<sup>2</sup>Biology and health laboratory, Faculty of Sciences Kenitra, Morocco.

<sup>3</sup>Laboratory for improving agricultural protection, biotechnologies, and the Environment (LAPABE), Faculty of Sciences of Oujda), Morocco.

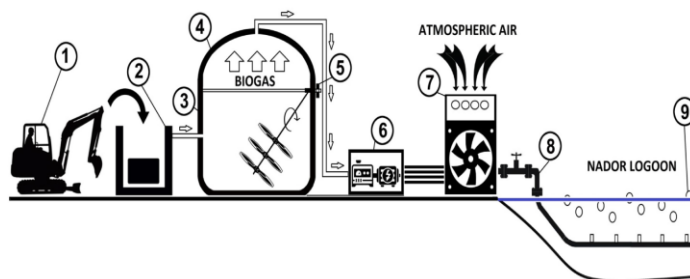
### Abstract

The Nador lagoon is one of the best lagoons in the Mediterranean [1]; it currently suffers from eutrophication caused by algae proliferation. In this study, we presented some energetic valorization types of significant algae responsible for the pollution of the lagoon, such as *Caulerpa prolifera* [2]. Firstly, we determine the potential of biogas production, green energy capacities, and effects on anaerobic bacteria proliferation in the digester. The energetic valorization of algae shows produced high green energy (more than 400 kWh per ton). So, we consider these lagoon algae as an exploitable energy reservoir [3-4]. *Caulerpa prolifera* is characterized by sulfated galactans, an essential agent in stimulating anaerobic cells, which is used as a sustainable alternative for synthetic stimulants in the digester. We have demonstrated that this alga can be utilized as an easily accessible source of green energy. Finally, these seaweeds generate economic benefits through anaerobic digestion. So, the Nador lagoon in Morocco has a great diversity of seaweed species. Despite this algae richness, no valorization of this biomass is envisioned.

On the other hand, the anaerobic biodegradation of Nador lagoon algae made it possible to propose a new solution to remove environmental and energy constraints. Thus, installing digesters based on anaerobic digestion makes it possible to improve the national energy balance, mainly for countries that do not have energy resources. We can therefore declare that anaerobic digestion makes it possible to consolidate several pillars of the socio-economic environment: i) Obtain green energy that can improve the country's energy balance. ii) Reduce the risk of pollution. iii) Correlate agricultural and industrial sectors with other socio-economic sectors. iv) Improve the aesthetic and hygienic aspects of all the surroundings of the waste storage areas units. V) Increase the gross domestic product GDP of our country.

To achieve these main axes, the creation of companies for the installation of units based on anaerobic digestion allows the creation of value and the improvement of these pillars.

**Figure: Biogas plant proposal for the protection of Nador Lagoon. 1: Algae harvesting; 2: Cutters; 3: Digester; 4: Gasometer; 5: Agitator motor; 6: Cogeneration motor; 7: Aerator; 8: Aeration channels; 9: Air bubbles.**



### Recent Publications

1. El Asri Ouahid, Soufiane Fadlaoui, Mohamed Ramdani, et Sanae Errochdi. (2021). « Microbial Degradation of Biowaste for Hydrogen Production ». In *Recent Advances in Microbial Degradation*, édité par Inamuddin, Mohd Imran Ahamed, et Ram Prasad, 431-47. Environmental and Microbial Biotechnology. Singapore: Springer Singapore. [https://doi.org/10.1007/978-981-16-0518-5\\_17](https://doi.org/10.1007/978-981-16-0518-5_17).
2. El Asri Ouahid, Ramdani Mohamed, et Fadlaoui Soufiane. (2021). « Green Seaweed Polysaccharides Inventory of Nador Lagoon in North East Morocco ». In *Polysaccharides*, édité par Inamuddin, Mohd Imran Ahamed, Rajender Boddula, et Tariq Altalhi, 1re éd., 163-75. Wiley. <https://doi.org/10.1002/9781119711414.ch8>
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4. Mohamed Ramdani, Moulay Brahim Oufekkir, Ouahid El Asri, Najat El Khiaï, Mohammed Ramdani, Françoise Denis and Roger J. Flower. (2020). First report of *Cystoseira aurantia* Kützinger from the Mediterranean coast of Morocco. *Botanica Marina*, December 23. <https://doi.org/10.1515/bot-2020-0061>.

### Biography



Professor ELASRI OUAHID from Faculty of science, Ibn Zohr University, Agadir, Morocco. Currently, he work on improving the Moroccan waste management and sustainable solution. He is expert of green entrepreneurship and innovation process. He is an advisor in several companies and investment centers. He is author of more than 30 research papers in international journals. He also reviewer in several international journals. He has received several research and innovation awards nationally and internationally.

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## Power Supply System for DC Solar Equipment by Batteries

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<sup>1</sup>Mohamed First University, Faculty of Science, Department of Physics, Laboratory of Electromagnetic, Signal Processing & Renewable Energy LESPRES, Team Electronic Materials & Renewable Energy EMRE, Oujda, Morocco

<sup>2</sup>University of Mons, Polytech. Mons - Electrical Power Engineering Unit, Mons, Belgium

<sup>3</sup>Association Humain and Environnement of Berkane (AHEB), Berkane, Morocco.

### Abstract

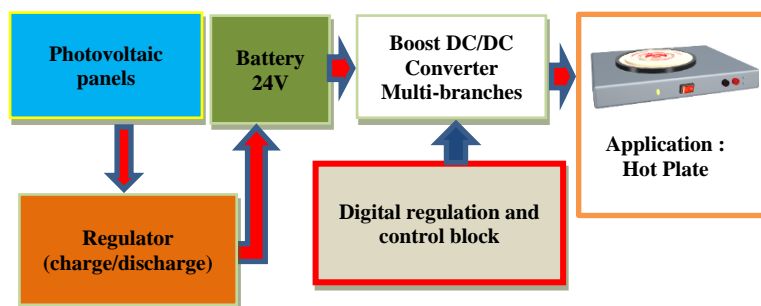
In this paper, we present the structure, the sizing and the experimentation of a power system which makes it possible to supply, by solar batteries, DC equipment with photovoltaic renewable energies (Cookers, distillers, refrigerators, drying, etc.) .

The proposed system is based on the use of a Boost-type DC/DC converter with several branches, controlled by a Microcontroller, which generates PWM signals with a frequency of 20 kHz and a variable duty cycle  $\alpha$ . The electrical energy, produced by the photovoltaic panels (600 W), is stored in the solar batteries (24V, 520 Ah) then transferred to the application through the proposed DC/DC converter.

Experimentation of the proposed system to power a 500-600 W solar cooker (heating plate), heated by thermal resistances, shows DC/DC converter efficiencies of 84%, heating temperature of the thermal resistance and cooking which reach 640°C and 230°C after 20 seconds and 40 min, energy consumed by the cooker of 647.36 Wh (i.e. 5 % of the total energy of the battery).

The comparison of all the results obtained with those simulated and the economic analysis of the use of renewable energies stored in the batteries, show the proper functioning and validity of the power system proposed in this work

**Figure:** Synoptic diagram of the power system proposed to supply DC equipment by solar batteries, charged by photovoltaic panels.



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### Biography



This work is part of the projects:

- National Initiative for Human Development INDH, Berkane Province, Morocco, project 2017//29.
- Wallonie-Bruxelles International WBI, 2018-2022, no : 4.2
- Long-term Europe Africa Partnership on Renewable Energy LEAP-RE, 2022-2025, no: 963530

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- Olivier DEBLECKER, University of Mons, Belgium

# Techno-econo-environmental study of the integration of renewable energy in a desalination plant: case study of Laayoune, Morocco

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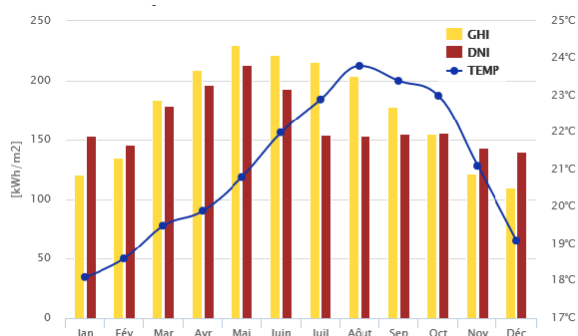
## Abstract

The aim of this work is the energy, economic and environmental evaluation of the integration of a hybrid system in a desalination plant at Laayoune in the south of Morocco. The region is known for its arid climate with a huge potential for the development and deployment of a sustainable source of energy for desalination units. The main conclusions that can be determined from the economic and environmental analysis of the system studied:

- The economic feasibility study confirms that the coupling of Reverse Osmosis desalination units with conversion systems presents a promising solution to meet the energy and drinking water needs of rural populations living in isolated regions of southern Morocco.
- The comparison study between the hybrid system and the conventional system (generator only + grid) revealed that even if the diesel generator alone has the lowest investment cost, it results in the highest net present value (NPV) of the whole project. In addition, the diesel generator is harmful to the environment and operates at lower efficiency (22.1%).

Hybrid systems using wind generators offer better economic feasibility, lower emissions, and the generator set operates at a higher efficiency (29%) which ensures a longer operating time.

Figure:



## Recent Publications

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2. A. Azouzoute, C. Hajjaj, H. Zitouni, M. El Ydrissi, O. Mertah, M. Garoum, A. Ghennioui, Modeling and experimental investigation of dust effect on glass cover PV module with fixed and tracking system under semi-arid climate. Solar Energy Materials and Solar Cells (2021). <https://doi.org/10.1016/j.solmat.2021.111219>.
3. A. Azouzoute, M. El Ydrissi, Z. Elmaazouzi, M. Benhaddou, C. Hajjaj, M. Garoum, Thermal Production and Heat Cost Analysis of the Potential of Solar Concentrators for Industrial Process Applications: A case study in six sites in Morocco, Scientific African (2021). <https://doi.org/10.1016/j.sciaf.2021.e00765>.
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## Biography



Doctor in Energy and Engineering Sciences, Mohammadia School of Engineers, Mohammed V University. Currently is the head of the Research and Innovation Platform, Cluster Valbiom in Oujda. He is a CEO and co-founder of IOM Solutions startup, Intelligent Operation and Maintenance Solutions.

Research interest

- Solar technologies for Water Desalination and Hydrogen production application.
- Solar thermal for Industrial process heat (SHIP) and solar heating/cooling (SHC) applications.
- Assessment of the performance of hybrid PV/CSP plants.

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**ARTIFICIAL INTELLIGENCE, MACHINE LEARNING, ELECTRICAL ENGINEERING AND  
SIMULATION**

## Verification of monitoring unit calculations for the 3D conformal radiation therapy treatment planning system

Yassir Elghazi<sup>1</sup>, Samir Didi<sup>2,4</sup>, Dikra Bakari<sup>1</sup>, Karim Bahhous<sup>3</sup>, Abdeslem Rrhiaou<sup>2</sup> and Mustapha Zerfaoui<sup>2</sup>

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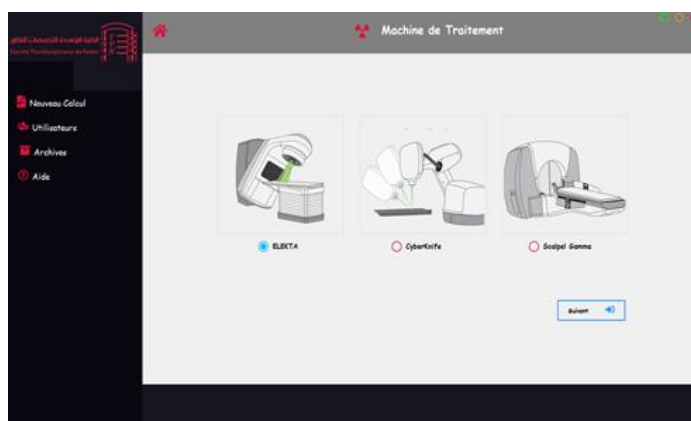
<sup>3</sup>Equipe Sciences de la Matière et du Rayonnement (ESMaR), Faculty of Science, University Mohammed V in Rabat, Rabat, Morocco.

<sup>4</sup>Department of Physics, Multidisciplinary Faculty of Nador, University Mohammed First, Morocco.

### Abstract

The present research paper aims to validate an independent calculation of the monitor units software (ICMU), which is developed to be able to calculate accurately the number of monitor units (MU). The calculation was performed for the photon beam with several characteristics, which include the both techniques of treatment DSP and DSA, with different treatment field sizes ranging from 3cm x 3cm to 40cm x 40 cm under the beam energy of 6MV and 18 MV. The software ICMU written in C-sharp (C #), uses the equivalent square concept on the calculation of the beam field sizes and in addition, the ICMU is connected to database which contains measured quantities (TPR, FOC ...). In context of the validation, the ICMU was successfully validated by comparison with the treatment planning system TPS. A satisfactory agreement has been attained and within the required standards (3%).

### Figure



### Recent Publications

1. Slassi, Nouredine, Hmad Ouabi, and Naïma El Khayati. "Comparison of an in-house developed monitor unit double-check program for 3D conformal radiation therapy and treatment planning system verification." *Journal of Radiotherapy in Practice* 18.3 (2019): 251-261.
2. Dąbrowska-Szewczyk, Edyta, et al. "Independent verification of treatment planning system calculations." *Nukleonika* 66.2 (2021): 47-53.
3. Stern, Robin L., et al. "Verification of monitor unit calculations for non-IMRT clinical radiotherapy: report of AAPM Task Group 114." *Medical physics* 38.1 (2011): 504-530.
4. Zhu, Timothy C., et al. "Report of AAPM Task Group 219 on independent calculation-based dose/MU verification for IMRT." *Medical physics* 48.10 (2021): e808-e829.

### Biography



Yassir El ghazi is a PhD student at the University Mohammed 1 of Oujda, His dissertation research focuses on medical physics. Previously, he received a license degree in Physics sciences from The Multidisciplinary Faculty of Nador (FPN) in 2019, and the Master degree in Materials and Energies from FPN in 2021.

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## **Ab initio investigation of the electronic structure of atomic defects hosted in a Cu(111) surface**

**I. BEZZAOUI<sup>1</sup>, D. BAKARI<sup>1</sup>, A. RRHIOUA<sup>2</sup>, D. SOUBANE<sup>3</sup>, S. LOUNIS<sup>4</sup>, M. BOUHASSOUNE<sup>3</sup>**

<sup>1</sup>Laboratory of Industrial Engineering and Seismic Engineering, National School of Applied Science, first Mohamed University, Oujda,

<sup>2</sup>Department of Physics, Laboratory of physics of matter and radiation, Faculty of sciences, first Mohamed University, Oujda

<sup>3</sup>Département de Physique, FPS, Cadi Ayyad University, 40000 Marrakech, Morocco

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### **Abstract**

Using ab initio computational methods, we study electronic proprieties of different magnetic and non-magnetic impurities; Fe, Co, Mg, Ag, and Au, hosted in a Cu(111) surface. The electronic signature of these impurities can be probed using scanning tunneling spectroscopy (STS). Based on the extended Hubbard model including on-site and inter-site electronic interactions within density functional theory (DFT+U+V), we also determine the exchange interaction between two magnetic impurities adsorbed on the Cu(111) surface as function of different separation distances. Hubbard U and V parameters, in this work, have been computed using linear-response theory in the framework of density-functional perturbation theory (DFPT).

*Figure:*

### **Recent Publications**

1. Vivaldo Leiria Campo Jr and Matteo Cococcioni 2010 J. Phys.: Condens. Matter 22 055602.
2. Nicolas Tancogne-Dejean and Angel Rubio Phys. Rev. B 102, 155117 – Published 13 October 2020
3. Khajetoorians, A., Wiebe, J., Chilian, B. et al. Atom-by-atom engineering and magnetometry of tailored nanomagnets. Nature Phys 8, 497–503 (2012).

### **Biography**



BEZZAOUI Imane is a PhD student in Laboratory of Industrial Engineering and Seismic Engineering, National School of Applied Science Oujda. Her researches interests concern the study of the electronic properties of impurities in metals

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# Impacts of Fossil Fuel and Electricity Energy Consumption in degrading environment quality in Morocco: Evidence from non linear Approach

JABRI Abdelkarim<sup>1</sup>, Zenasni Mourad<sup>2</sup>, Kissami Rabah<sup>3</sup>, Jabri Taha<sup>4</sup>

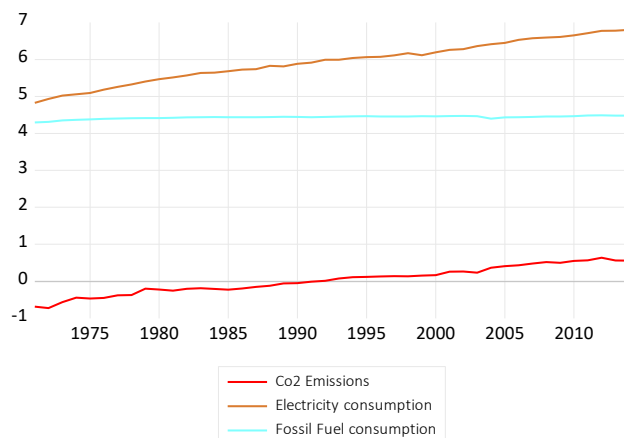
<sup>1,2,3</sup>LARMATIF Laboratory in ENCGO-Oujda

<sup>4</sup>LMII Laboratory in ENSEM-Casablanca

## Abstract

The aim of this study is to analyse the dynamic relationship between Fossil Fuel and electricity energy consumption and CO<sub>2</sub> emissions in the case of Morocco during the period of 1971-2014. In order to verify the long-term relationship between the variables taken into account, we used different unit root tests. The cointegration relationship was validated and the latter was performed using the NARDL approach. The results confirm the existence of cointegration for long run between fossil fuel energy and electricity consumption and CO<sub>2</sub> emissions. Moreover, our empirical exercise indicates the presence of environmental Kuznets curve (EKC) in long run as well as in short run.

**Figure:** Evolution of CO<sub>2</sub> Emissions, Electricity and Fossil Fuel consumption



## Recent Publications

1. Jabri, A. and JADDAR ,A. Trade Openness and CO2 Emissions in Morocco: An ARDL bounds testing approach in Proceedings of the 2nd International Conference on Electronic Engineering and Renewable Energy Systems, pp.629-636. Springer.
2. Jabri, A. , JADDAR ,A and Kerkour El miad A, The Relationship Between Energy Consumption, Foreign direct Investment, Growth and Co2 Emissions: A Time Series with Structural Breaks For Morocco, Journal of Business And Economics (2019), Vol.1 N° 1&2.
3. Jabri, A., The Nexus between Energy Consumption, Economic Growth and CO 2 Emissions: Evidence from Panel Data with Cross-section dependence and structural breaks for MENA Region. Third International Symposium ( Compola@2016), 12-15 april 2016, Saïdia, Morocco. WP.
4. Jabri, A , Guesmi .K and ABID.I, Determinants Effects of FDI in MENA Region : A panel Cointegration Analysis, Journal of Applied Business Research, Vol.29 , N°4. 2013.
5. Jabri, A, Brahim, M, Institutional Determinants Of Foreign Direct Investment In MENA Region: Panel Co- Integration Analysis, , Journal of Applied Business Research, Vol.29, N°4. 2015.

## Biography



Abdelkarim Jabri, Ph.D, Dr. Abdelkarim Jabri, Ph.D. in Economics, he is professor at National School of Business and Management (ENCGO), Mohammed Premier University, Oujda- Morocco. His research focuses on nonlinear Panel and Time Series Econometrics applied to Finance, Macroeconomics, and International Trade. He was awarded his PhD in 2012 from the University of Paris Ouest Nanterre La Defense, France.

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# Electrochemical and theoretical (DFT, MC, MD) evaluation of a new compound based the Mercaptobenzimidazole against corrosion of Cu-30Ni in a 3% NaCl solution

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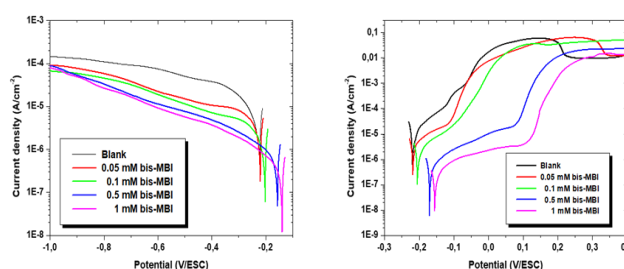
<sup>1</sup>Laboratory of Spectroscopy, Molecular Modelling Materials, Nanomaterial Water and Environment –CERNE2D, Faculty of Sciences, Mohammed V University in Rabat, Morocco

<sup>2</sup>Laboratory of Molecular Chemistry, Materials and environment (LCME2), Multidisciplinary Faculty Nador, Mohamed first University, Oujda, BP 300 Selouane 62700, Nador, Morocco.

## Abstract

The electrochemical behavior of Cu-30Ni in NaCl 3% solution without and with the addition of bis-Mercaptobenzimidazole (bis-MBI) has been studied. Electrochemical measurements have been used to analyze the inhibition behavior of bis-MBI. The adsorption mechanism was examined by a quantum theoretical study including density functional theory (DFT) calculations, natural bond orbital (NBO) calculations, electrostatic potential surface (EPS) analysis, dynamic molecular (DM) and radial distribution function (RDF) simulations. The alloy surface in the absence and presence of bis-MBI was also assessed employing a Scanning Electron Microscope (SEM) and energy dispersive X-Ray analyzer (EDX) investigations. Generally, findings showed that the polarization curves analysis shows that Bis-MBI is a mixed-type inhibitor. The electrochemical impedance measurements indicate that the inhibition efficacy increases with inhibitor concentration and with immersion time. The results showed that the inhibitory efficiency reach 97,65% at 10–3 M of inhibitor. The adsorption of inhibitor onto the alloy surface follows the Langmuir adsorption model. Similarly, SEM/EDX results indicated that the inhibition process is due to a corrosion protective film. The computational study was performed to identify the factors most associated with the anti-corrosive properties of the tested compound.

**Figure:** Cathodic and Anodic polarization curves of Cu-30Ni alloy in aerated 3% NaCl solution without and with various concentrations of inhibitor bis-MBI at 25°C.



## Recent Publications

1. Benmessaoud M., Serghini Idrissi M., Labjar N., Rhattas K., Damej M., Hajjaji N., Srhiri A. and El Hajjaji S. Inhibition effect of aminotriazole derivative on the corrosion of Cu-40Zn alloy. *Der Pharma Chemica*, 2016, 8 (4) 122.
2. Benmessaoud M., N. Labjar, M. Serghini Idrissi, D. Bartout, S. El Hajjaji Corrosion inhibition of Cu-30Ni in neutral chloride media polluted by sulphide ions in presence of 2-Mercaptobenzimidazole. *Journal of Mater. Environ Sci* . 2017 Volume 8, Issue 11, Page 4057.
3. M. Damej, H. Benassaoui, D. Chebabe, M. Benmessaoud, H. Erramli, A. Dermaj, N. Hajjaji and A. Srhiri. Inhibition effect of 1,2,4-triazole-5-thione derivative on the Corrosion of Brass in 3% NaCl solution. *J. Mater. Environ. Sci.* 7 (3) (2016) 738-745
4. M. Damej, D. Chebabe, M. Benmessaoud, A. Dermaj, H. Erramli, N. Hajjaji and A. Srhiri. Corrosion inhibition of brass in 3% NaCl solution by 3-methyl-1,2,4-triazol-5-thione. *Corrosion Engineering, Science and Technology*. 2014

## Biography



The author is a third-year doctoral student working in the field of corrosion and metal protection techniques in the laboratory of Mohamed V University in Rabat. For his subject is focused on the protection of copper and its alloys using inhibitors in a medium NaCl 3%, to improve the effectiveness of their applications.

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# Two-dimensional Simulation of Non equilibrium Silicon Nitride Plasma Discharge for Thin Film Solar Cell Deposition

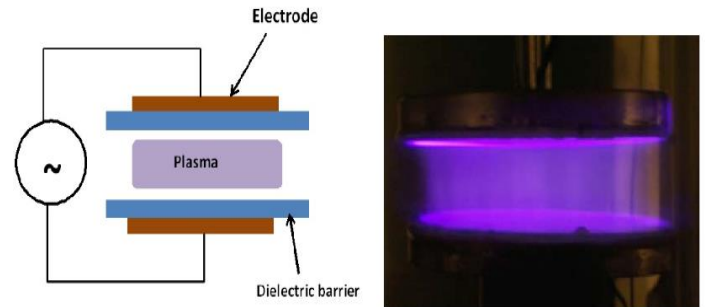
Grari Meryem<sup>1</sup>, Zoheir CifAllah<sup>1</sup>

<sup>1</sup>Mohamed first University, Department of Physics, LETSER Laboratory, Oujda, Morocco

## Abstract

In this work, we model a Two-dimensional (2D) radiofrequency (RF) plasma discharge of hydrogenated silicon nitride ( $\text{SiH}_4/\text{NH}_3/\text{H}_2$ ) in a capacitive coupled plasma reactor (CCP), using non-Maxwellian electron energy distribution function (EEDF). The purpose is to investigate whether there is a real advantage and a significant contribution in 2D simulation using non-Maxwellian EEDF rather than Maxwellian one for determining the fundamental characteristics of a radiofrequency plasma discharge. The results show a comparative study of the 2D evolution of the fundamental characteristics of the RF plasma using Maxwellian and non-Maxwellian EEDF. By considering the criterion of the density and the electronic temperature, the analysis of the results shows that the adoption of the non-equilibrium 2D EEDF makes it possible to obtain an approximation closer to the real conditions and thus a better understanding of the plasma discharge.

Figure



## Recent Publications

1. Hagelaar G.J.M., and Pitchford L.C., Plasma Sources Sci. Technol. (2005) 14, 722.
2. M. Grari, C. Zoheir, Yousfi Y., et al. Chin. Phys. B 30 (2021) 055205
3. Grari M. and Zoheir C., International Conference on Electronic Engineering and Renewable Energy, Springer, Singapore, (2020) 223-230.
4. Grari M. and Zoheir C., Int. J. Eng, 33 (2020) 1440-1449.
5. Grari M. and Zoheir C., Materials Today: Proceedings, 13, Springer (2019) 882-888

## Biography



She Holds a PhD degree in Electric Discharges and Renewable Energies. His research areas are Plasma discharge, Numerical simulation and Thin Film Solar Cell. She was warded her PhD in 2021 from the Mohamed first University, Department of Physics, LETSER Laboratory, Oujda, Morocco.

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# Effect of discharge parameters on conductive behavior and characteristics of monopole plasma antenna

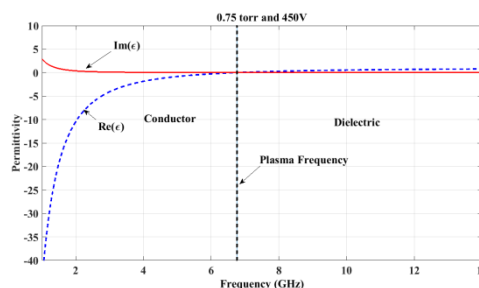
A. EL JAOUHARI, M. ROCHDI, M. EL KAOUINI.

LMA SI, Electromagnetism, Physics of Plasmas and Applications, Polydisciplinary Faculty of Nador, Selouane 62700, Morocco.  
{ayoub.eljaouhari & m.rochdi & md.elkaouini}@ump.ac.ma

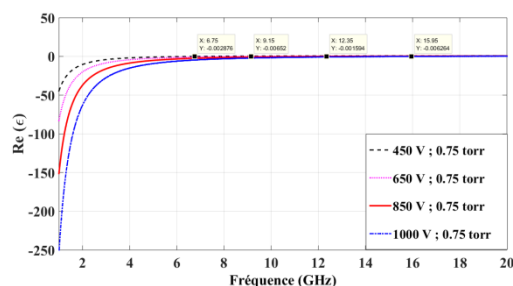
## Abstract

The plasma is used as radiating element in the reconfigurable antennas applications. For this, the plasma must behave like a conductor medium. In the first part of this paper, we study the conductive behavior of plasma medium for different discharge characteristics. The fluid model combined with the drift diffusion approach is used to calculate the plasma characteristics, such as the plasma density and the gas collision frequency. Then, the Drude model is used to determine the electrical parameters of the plasma. The results show that the conductive behavior depends on the operating frequency and the discharge characteristics. Indeed, the frequency bandwidth where the plasma medium behaves as conductor increases by increasing the electrode voltage and the plasma pressure. In the second part of this paper, we study the performance of the monopole plasma antenna. For this, a fluorescent tube filled with a low-pressure argon gas is used. The reflection coefficient  $S_{11}$  for different discharge characteristics is performed by the CST software.

**Figure 1:** dielectric constant of the argon discharge versus operating frequency.



**Figure 2:** Real part of plasma permittivity vs operating frequency for different values of the applied voltage



## Recent Publications

1. ANDERSON, Theodore. Plasma antennas. Artech House, 2020.
2. Podolsky, V, et al, S. O. (2020). Experimental and Numerical Studies of a Tunable Plasma Antenna Sustained by RF Power. IEEE Transactions on Plasma Science, 1–11.
3. Kamboj, G. K, et al, R. S. (2021). Development of Reconfigurable Plasma Column Antenna. IEEE Transactions on Plasma Science, 49(2), 656–662.

## Biography



Ayoub El jaouhari received the License degree in Physical science from Multidisciplinary Faculty of Nador (FPN) in 2018 and the Master degree in Materials and Energies from FPN of Nador in 2021. The PhD student on plasma antenna and electromagnetic waves in Faculty of Sciences, Mohammed 1 University of Oujda. His research interests include plasma antennas.

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# Density Functional Theory, Molecular modeling by MD simulation, Characterization (SEM/EDXS/UV-Visible), Thermodynamic and Electrochemical studies of the inhibitory power of two quinoline analogs for C38 in aggressive area

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<sup>2</sup>Laboratory Agro-Resources, Polymers and Process Engineering, Faculty of Sciences, Ibn Tofail University, PO Box 133, 14000 Kenitra, Morocco.

<sup>3</sup>Laboratory of Materials, Nanotechnology and Environment, Faculty of Sciences, Mohammed V University, Av. Ibn Battouta, P.O. Box 1014 Agdal-Rabat, Morocco.

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## Abstract

Metal corrosion with its various forms, is a phenomenon that is continuous in space and time and often difficult to eliminate completely. Indeed, Metallic materials such as steels, which are the basic materials in the construction of many structures and technological industry, are strongly affected by corrosion in aggressive environments. The present paper aims to validate the power inhibition of the two new organic compounds of the Quinoline family [DEM] and [HBM] against the dissolution of C38 steel in HCl electrolyte. Gravimetric, ac impedance, potentiodynamic polarization measurements (PDP) and surface morphology analyze by scanning electron microscopy with energy dispersive spectroscopy (SEM/EDXS) and UV-Vis-NIR spectroscopy were coupled to establish inhibition performance. Then, quantum mechanics methods like Density Functional Theory (DFT) and Molecular Dynamic Simulation (MD) were used to demonstrate the adsorption process of inhibitory molecules. Based on EIS results, the investigated derivatives effectively inhibit the degradation of C38 steel over the entire concentration range with a maximum efficiency of 96,9 % and 95,8 % for [DEM] and [HBM], respectively at 10<sup>-3</sup> M. In addition, the PDP studies revealed that [HBM] and [CBM] compounds acted according to a mixed-type mechanism. Moreover, the adsorption mechanism follows the Langmuir isotherm model. The quantum theoretical study by DFT and MD confirmed the experimental results. The theoretical approach confirms the experimental study. Both analogues exhibit a high degree of protection and high stability at high temperatures in aggressive area.

## Recent Publications

1. M. Rbaa, F. Benhiba, I.B. Obot, H. Oudda, I. Warad, B. Lakhrissi, A. Zarrouk, Two new 8-hydroxyquinoline derivatives as an efficient corrosion inhibitors for mild steel in hydrochloric acid: Synthesis, electrochemical, surface morphological, UV-visible and theoretical studies, *Journal of Molecular Liquids*, 276 (2019) 120–133.
2. H. Fakhry, M. El Faydy, F. Benhiba, T. Laabaissi, M. Bouassiria, M. Allali, B. Lakhrissi, H. Oudda, A. Guenbour, I. Warad, A. Zarrouk, A newly synthesized quinoline derivative as corrosion inhibitor for mild steel in molar acid medium: Characterization (SEM/EDS), experimental and theoretical approach, *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 2020, doi.org/10.1016/j.colsurfa.2020.1257.

## Biography



Pr. Hicham Fakhry PhD at Ibn Tofail University in Laboratory of Separation Processes, and Laboratory of Materials, Nanotechnology and Environment, Faculty of Sciences, Mohammed V University (Rabat-Agdal).

Presenter Name: Hicham Fakhry.

Type of Presentation: Oral presentation

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# Propagation of acoustic waves through waveguides and symmetric/asymmetric resonators based on Fano and AIT resonances

Moulay Said Khattab<sup>1</sup>, Ilyass El Kadmiri<sup>1</sup>, Youssef Ben-Ali<sup>1,2</sup>, Driss Bria<sup>1</sup>

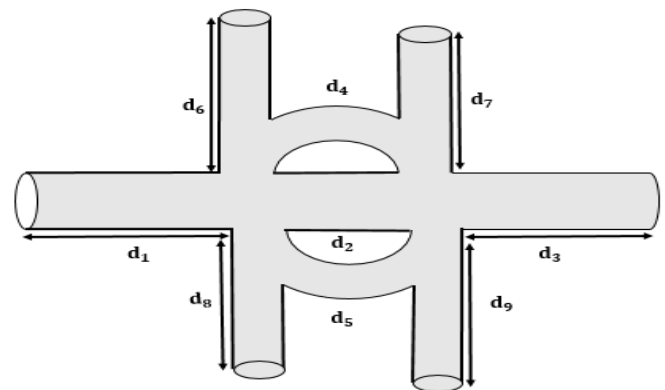
<sup>1</sup>Laboratory of Materials, Waves, Energy and Environment, Team of Waves, Acoustics, Photonics and Materials, Mohamed I University, Oujda, Morocco.

<sup>2</sup>Engineering Sciences Laboratory (LSI), Multidisciplinary Faculty of Taza, Sidi Mohamed Ben Abdellah University, B.P. 1223, Taza Gare, Morocco.

## Abstract

In this paper, we study the propagation of acoustic waves through a finite acoustic waveguide containing parallel waveguides and symmetric/asymmetric resonators. We present the phenomenon of acoustically induced transparency (AIT) and Fano resonance when the resonators are grafted in parallel at the same site or the resonators grafted in series are identical. Our proposed system contains five waveguides of length  $d_i$  ( $i=1-5$ ) and four asymmetric resonators of length  $d_j$  ( $j=6-9$ ). This system creates acoustic eigen modes due to the interaction between the incoming acoustic waves and the waveguide and resonator modes. The AIT resonance appears as a maximum transmission peak wedged between two transmission zeros and the Fano resonance appears as a maximum transmission peak near to a transmission zero. Theoretical results are obtained using the transfer matrix method which allows calculating the transmission and reflection rates in energy. This system is useful for guiding and filtering applications.

**Figure:** Waveguide geometry mounted in series and parallel by inserting of four resonators located in two different sites.



## Recent Publications

1. 2021 El Kadmiri I., Ben-Ali Y., Khaled A., Bria D., Materials Today: Proceedings, 31 (2020), S33-S40.
2. El Kadmiri I., Ben-Ali Y., Errouas Y., Khaled A., Bria D., Materials Today: Proceedings, 45 (2021) 7576-7583.
3. Quotane I., El Boudouti E. H., Djafari-Rouhani B., Phys. Rev. B, 97 (2018) 024304.

## Biography



Author has expertise in acoustic and phononic cristal. Her focus is based on the propagation of acoustic waves through waveguides and resonators. Im PhD student in 2022 from the first Mohamed University, Faculty of Sciences Oujda, Morocco.

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## Elaboration identification and corrosion inhibition of epoxy prepolymer for carbon steel in 1M HCl medium: computational approaches

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<sup>1</sup>Laboratory of Organic Chemistry, Environment, and Catalysis, Faculty of Sciences, Ibn Tofail University, BP 242, 14000, Kenitra, Morocco.

<sup>2</sup>Laboratory of Advanced Materials and Process Engineering, Faculty of Sciences, Ibn Tofail University, BP 242, 14000, Kenitra, Morocco.

<sup>3</sup>Laboratory of Advanced Materials and Process Engineering, Faculty of Sciences, Ibn Tofail University, BP 242, 14000, Kenitra, Morocco.

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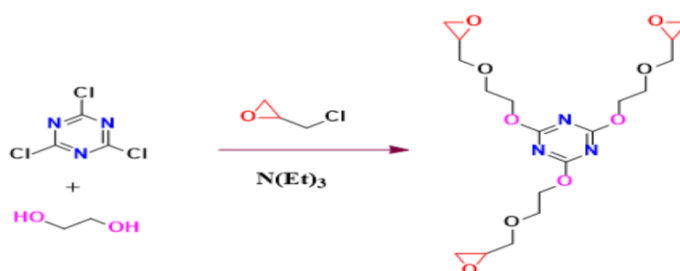
<sup>5</sup>Royal Naval School, University Department, Boulevard Sour, Jdid, Casablanca, Morocco.

### Abstract

Epoxy prepolymer (EP) was synthesized and used as potential anticorrosive protection for carbon steel (CS) in 1M HCl solution. The corrosion inhibition of EP for CS in 1M HCl solution was utilized by electrochemical impedance spectroscopy (EIS) measurements and potentiodynamic polarization (PC) curves, adsorption isotherm, atomic force microscope, DFT, and molecular dynamics (MD) simulations. Then, EP prepolymer displayed high inhibition efficiency at  $10^{-3}$  M for EIS and PDP techniques are 95.02 and 94.23, respectively. AFM data display that the prepolymer could be stopped the acid attack by chemical adsorption on a metallic surface. PC data suggests that EP acts as a mixed inhibitor type and its adsorption of EP obeyed the Langmuir adsorption isotherm model. DFT calculation indicates that the EP molecule is very well adsorbed by the adsorption on the CS area. MD computational approaches again support our experimental data and EP could be investigated as potential anticorrosive protection for carbon steel in 1M HCl solution.

**Keywords:** Prepolymer; corrosion inhibition; Langmuir adsorption; DFT approach coaches.

### Figure



### Recent Publications

1. R. Hsissou, S. Abbout, A. Berisha, M. Berradi, M. Assouag, N. Hajjaji, and A. Elharfi, 340-351, 2019.
2. R. Hsissou, O. Dagdag, S. Abbout, F. Benhiba, M. Berradi, M. El Bouchti, A. Berisha, N. Hajjaji, and A. Elharfi,
3. N. Gladkikh, Y. Makarychev, M. Petrulin, M. Maleeva, L. Maksaeva, and A. Marshakov,
4. O. Dagdag, Z. Safi, R. Hsissou, H. Erramli, M. El Bouchti, N. Wazzan, L. Guo, C. Verma, E. Ebenso, and A. El Harfi, 14, 2019.

### Biography



Mouna Azogagh is interested in the Organic synthesis and elaboration of new epoxy resins and their use in corrosion inhibition. She was registered for a Ph.D in 2020, Faculty of Sciences of Kenitra, University Ibn Tofail, Morocco.

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# The prevention of corrosion inhibition of mild steel in sulfuric (0.5 M) and hydrochloric (1.0 M) environments using a pyran compound: Electrochemical performance and computational analyses

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<sup>b</sup>Laboratory of Materials, Nanotechnology and Environment, Faculty of Sciences, Mohammed V University in Rabat, P.O. Box 1014, Agdal-Rabat, Morocco.

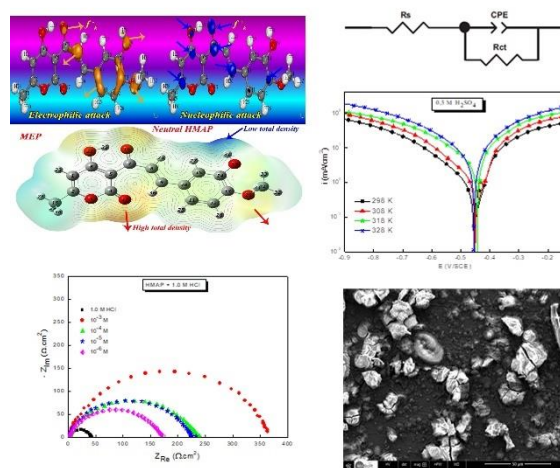
<sup>c</sup>Regional Center for Education and Training Professions (CRMEF), Kenitra, Morocco.

<sup>d</sup>Institute of Nursing Professions and Health Techniques Fez, EL Ghassani Hospital, Fez 30000, Morocco.

## Abstract

The goal of this study is to see how mild steel (MS) corrosion is affected by (E)-4-hydroxy-3-(3-hydroxy-4-methoxyphenyl)acryloyl)-6-methyl-2H-pyran-2-one (HMAP) in acidic solutions HCl (1.0 M) and H<sub>2</sub>SO<sub>4</sub> (0.5 M). The compound was evaluated at different temperatures (298, 308, 318, and 328 K) and concentrations to find the optimum concentration and temperature range for the greatest corrosion inhibiting action. Weight loss measurement, potentiodynamic polarisation measurement (PDP), electrochemical impedance spectroscopy, SEM/EDS, and theoretical techniques were employed to assess inhibitory effectiveness. The inhibition efficiency rises with increasing concentration and fall with increasing temperature. At 298 K, the maximal inhibitory efficiency was determined to be 89.3% in HCl and 91.32 % in H<sub>2</sub>SO<sub>4</sub> in the presence of 1mM HMAP. The experimental adsorption results were consistent with the Langmuir isotherm model. HMAP are mixed type inhibitors, according on the polarisation parameters. According to the findings of the EIS research, these chemicals prevent corrosion through an adsorption process. Theoretical and experimental findings were found to be highly correlated.

Figure:



## Recent Publications

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2. R. Kumar, O.S. Yadav, G. Singh, J. Mol. Liq. 237 (2017) 413–427.
3. K. Tarfaoui, M. Ouakki, M. Galai, M. Nehiri, M.E. Touhami, N. Barhada, M. Ouhsine, 2019. www.medjchem.com.
4. X. Li, S. Deng, H. Fu, Corros. Sci. 53 (2011) 302–309.
5. M. Rbaa, M. Galai, Y. El Kacimi, M. Ouakki, R. Tourir, B. Lakhri, M. Ebn Touhami, Port. Electrochim. Acta. 35 (2017) 323–338.

## Biography



**Mohamed Khattabi**, PhD student of the chemistry in several fields: electrochemistry, spectroscopy, analytical chemistry in faculty of science at Ibn Tofail University, Morocco. He had published 2 papers in international journals and presented 2 communications in international meetings. His main research interests are in the field of Physical Chemistry, Especially electrochemistry, (Corrosion and corrosion inhibition in all media for metals and alloys using various techniques) and determination of new acidic and basic functions in strong acid media.

# Design and optimization of a Rim Driven generator for pump application

Lahcen AMRI<sup>1</sup>, Smail Zouggar<sup>2</sup>, Mohamed Kebdani<sup>3</sup>

<sup>1</sup>Laboratory of Electrical engineering and Maintenance, EST,Oujda

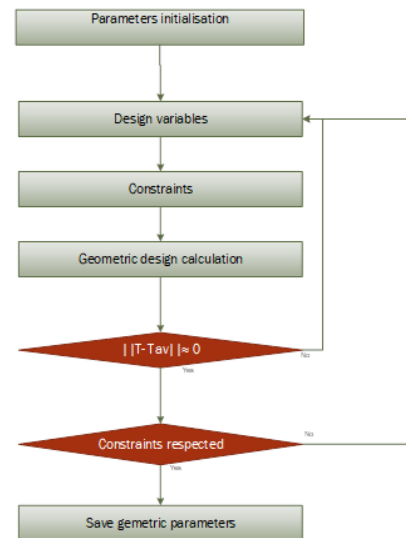
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## Abstract

The paper's aim is to present an optimization algorithm to design rim driven (RD) machines. This algorithm calculates the RD geometry that allows to produce a desired average torque. The algorithm inputs are the rated power, the desired average torque, and relative constraints. The work starts by testing several combinations of variables design. It returns the best combination that respects the specifications, then calculate the optimal dimensions of the RD geometry. To validate the functioning of the algorithm, we propose to concept a RD pump with a rated power of 5KW and a rated torque of 10Nm. The RD pump geometry is drawn on Rmxpert software using the optimal dimensions of the geometry obtained from the algorithm. The simulation results conform with the assumptions made in our algorithm. This validation allows to use the algorithm to design the RD machine for any application.

Figure: Algorithm process



## Biography



Author is a Phd student in Laboratory of Electrical engineering and Maintenance. His focus is based on the study of electrotechnics and aeronautic constraints of the implementation of rim driven system in wind turbine's conception. He starts his PhD studies at 2020, in the High School of Technology (ESTO) of Oujda, Morocco.

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## A theoretical study of InAs/InP and InAs/GaAs QDs systems

Sara SABRI<sup>1</sup>, Rachid MALEK<sup>1,2</sup>, Khalil KASSMI<sup>1</sup>

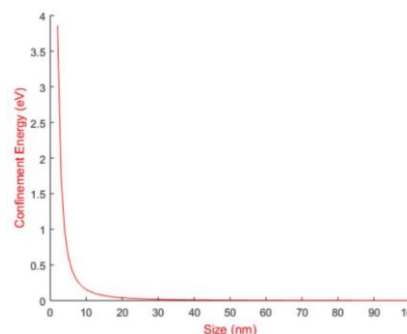
<sup>1</sup>MEER/LETSER – Faculté des Sciences d'Oujda (FSO) – Université Mohammed Premier – Oujda/Maroc

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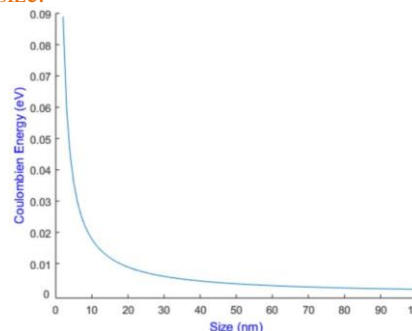
### Abstract

In this work, we have studied structural, electronic and optical properties of InAs/InP quantum dots (QDs) using theoretical and experimental results reported in the literature and compared them with those of InAs/GaAs QDs which is the most studied system. The main shared characteristics and dissimilarities between the InAs/InP and the InAs/GaAs QDs systems have been pointed out. It has been shown that these dissimilarities have a significant impact on their applications. Our photoluminescence (PL) characterization simulation model, presented in a previous work, was used. For InAs/InP QDs system, two cases were considered: the strong quantum confinement regime and the weak one. For each regime, two hypotheses were analysed, one with non-radiative recombination centers and another without. It was highlighted a shift of the PL peaks and a broadening of the spectra with the increase of the QDs size for both systems. But, for InAs/InP QDs system the broadening of the spectra is less strong. This is attributed to the lattice mismatch which is smaller for InAs/InP compared with InAs/GaAs. It has been shown that InAs/InP QDs are less suitable for applications in solar cells, due to the short lifetime of the charge carriers. On the other hand, InAs/GaAs QDs are not able to reach the 1.5  $\mu\text{m}$  wavelength for telecom applications, also called C-band telecom, because they strongly degrade for emission wavelengths larger than 1.3  $\mu\text{m}$ .

**Figure 1.** Confinement energy of InAs/GaAs QDs as functions of size.



**Figure 2.** Coulomb interaction energy of InAs/InP QDs as function of size.



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### Biography



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# Backstepping Control of a Permanent Magnet Synchronous Motor

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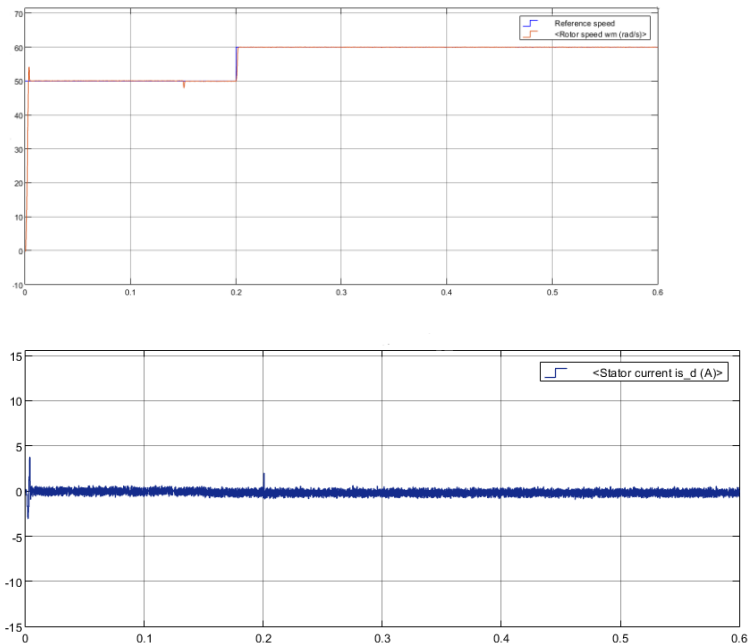
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## Abstract

This paper presents a speed control strategy for the PMSM using Backstepping control technique, which is a recursive and systematic method to synthesize nonlinear control laws using the Lyapunov stability concept. The objective of this control is to establish a virtual control at each step of the synthesis ensuring the convergence of the speed to the desired value and the direct current to zero for achieve a maximum torque operation. First, the state model representing the dynamics of the PMSM in the  $d,q$  reference frame is defined, then the synthesis of the control by Backstepping is established. The results of the simulation on Matlab/Simulink prove that the speed control is effective.

**Keywords:** PMSM, Backstepping, Lyapunov, Stability, nonlinear control.

**Figure:** The evolutions of rotor speed and is-d of the PMSM



## Recent Publications

1. Lan, Yong-Hong. "Backstepping control with disturbance observer for permanent magnet synchronous motor." *Journal of Control Science and Engineering* 2018 (2018).
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3. Ting, Chen-Sheng, et al. "Adaptive backstepping control for permanent magnet linear synchronous motor servo drive." *IET Electric Power Applications* 9.3 (2015): 265-279.

## Biography



A. SENHAJI was born in Ouarzazate, Morocco. He received his M.Sc. from Hassan first University, Settat, Morocco in 2014.

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# Numerical analysis of turbulent heat transfer in a double glazed Trombe wall under time-dependent conditions

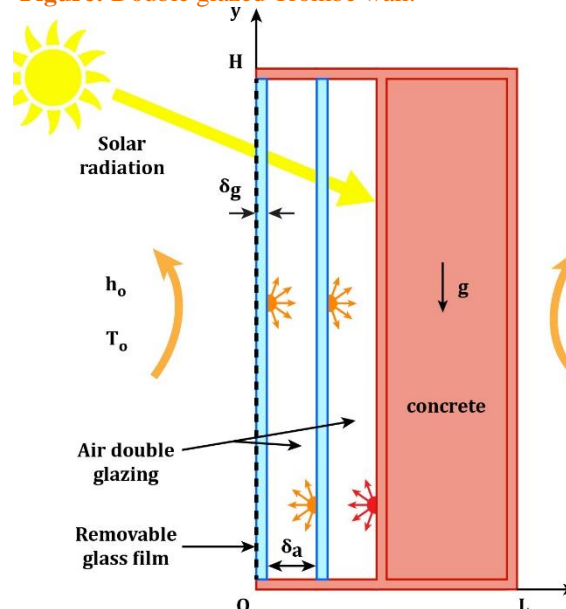
Z. CHARQUI<sup>1</sup>, M. BOUKENDIL<sup>1</sup>, L. EI MOUTAOUAKIL<sup>1</sup>, R. HIDKI<sup>1</sup>, Z. ZRIKEM<sup>1</sup>

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## Abstract

Recently, several numerical and experimental investigations have been conducted to study passive solar systems of Trombe wall type [1-4]. These systems attract the interest of many researchers due to their ability to cover a large part of the energy demand of buildings. Bellos et al. [1] studied the thermal behavior of an unvented Trombe wall bearing a window. They found that this configuration is much more appropriate for buildings located in Athens. Abbassi et al. [2] studied the thermal behavior of a Trombe wall having multiple fins to improve its thermal efficiency. Kaloyanov et al. [3] analyzed the thermal performance of a single and double-glazed Trombe wall and they also examined the effect of heat transfer on the mechanical behavior of such a construction. Stazi et al. [4] experimentally studied the thermal behavior of a Trombe wall under summer conditions. They found that a shaded Trombe wall can reduce the cooling energy by 59.7% to 72.6%. In the present work, we are interested in studying, under unsteady-state, coupled heat transfer by conduction, convection, and radiation in a double glazed Trombe wall subjected to solar flux (Figure). The extreme surfaces of the structure exchange heat with the outside and inside ambiances with heat transfer coefficients  $h_o = 17 \text{ W/m}^2\text{K}$  and  $h_i = 8.3 \text{ W/m}^2\text{K}$ , while the horizontal surfaces are assumed to be adiabatic. The temperature of the internal environment is maintained at  $T_i = 20^\circ\text{C}$  while that of the external environment and the solar flux are time-dependent. The effect of solar flux and the temperature of the outside ambiance on the flow and heat transfer in such a structure will be the subject of this study.

Figure: Double glazed Trombe wall.



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## Biography



Zouhair Charqui received his Bachelor in physics sciences from Cadi Ayyad University, Marrakesh, Morocco, in 2017. Two years later, he earned his Master degree in Fluid Mechanics and Energetics from the same university. He is currently a Ph.D. student. His main areas of research interest are computational fluid dynamics, heat transfer, and solar energy.

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# Improvement of the behavior of the direct torque control of an induction machine when an inter-turn short-circuit fault appears

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## Abstract

In this article, we propose the simulation of the behavior of the direct torque control (DTC) of an induction machine (IM) when an inter-turn short-circuit (ITSC) fault appears. The simulation of this type of converter-machine gave very interesting results in terms of stability, precision, torque ripple and speed ripple. This article presents an interesting possibility of improving the behavior of the (DTC) for a tolerable short-circuit rate. Otherwise, this command cannot be started and therefore a diagnosis at zero speed is essential before starting the regulation.

Figure 1. Block diagram of the DTC command

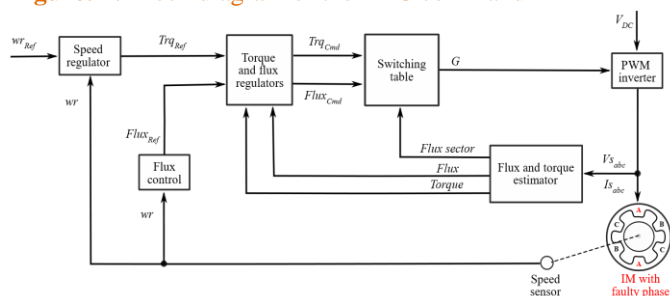
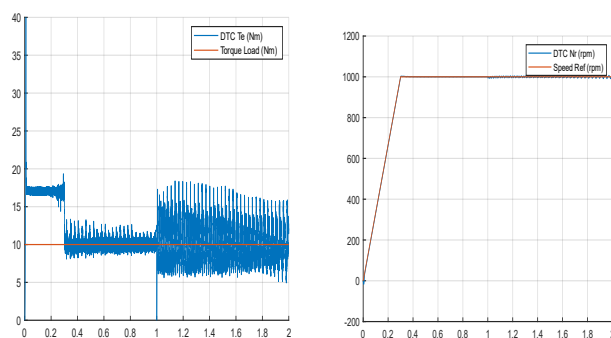


Figure 2. Torque and speed behavior when fault appears in phase A



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## Biography



Author is a PHD student in Mohamed 1st university, Oujda, Morocco. He is particularly interested in the control of rotating machines especially switched reluctance motors and induction motors. He received his Master's degree in electrical engineering from the ENSET engineering school of Mohammed 5 university, Rabat.

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# An Improved System Dedicated to the Prediction of Junction Temperature of Multi-Chip IGBT Semiconductor Module

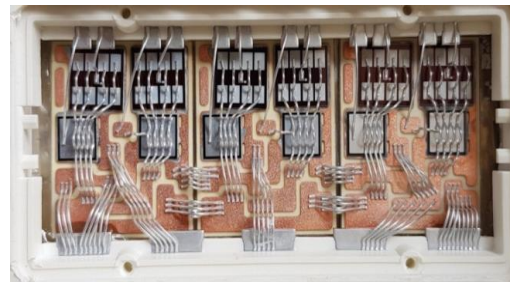
Badredine Lamuadni<sup>1</sup>, Rachid El Bouayadi<sup>1</sup>, Elhoussaine Ouabida<sup>1</sup>, Driss Zejli<sup>1</sup>

<sup>1</sup>ASEL, Advanced Systems Engineering Laboratory, ENSA, Ibn Tofail University, Kenitra, Morocco.

## Abstract

The determination of the degradation or failure of a high-power semiconductor module necessitates the measurement of the junction temperature ( $T_j$ ). Indeed, environmental and operating conditions influence the temperature evolution of a high-power component. These temperature fluctuations induce thermo-mechanical stresses that lead to the deterioration of the power module by affecting its electrical and thermal performance and its reliability. Nevertheless, several methods have been developed to improve the accuracy of  $T_j$  measurements. Among the best-known methods is the use of temperature-sensitive electrical parameters (TSEP). The purpose of this presentation is to present a reliable improved system dedicated to measuring with very good accuracy the temperature  $T_j$  of an insulated gate bipolar transistor (IGBT) using the TSEP method. Scientific researchers could be used the developed system in predictive maintenance to monitor the health state of an IGBT, thus reducing the probability of failure or degradation of the power components.

*Figure: Internal structure of the studied IGBT power module*



## Recent Publications

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## Biography



**Badredine Lamuadni** received the M.Sc. degree from the Sidi Mohamed Ben Abdellah University, Faculty of Sciences and Technologies of Fez, in 2013. He is currently pursuing a Ph.D. degree at the Advanced Systems Engineering (ISA) Laboratory of the National School of Applied Sciences, Kenitra, Ibn Tofail University. Since 2017, his main research interests are the reliability of power electronics devices and power semiconductor module thermal modeling.

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# High leverage variables through the modeling and numerical simulation of a mono-crystalline silicon solar cell under MATLAB

Zineb Aqachmar<sup>1</sup>, Hamid El Qarnia<sup>2</sup>, Abdelkader Outzourhit<sup>1</sup>

<sup>1</sup>Cadi Ayyad University, Faculty of Sciences Semlalia, Department of Physics, Laboratory of Materials, Environment and Energy, Marrakesh 40000, Morocco

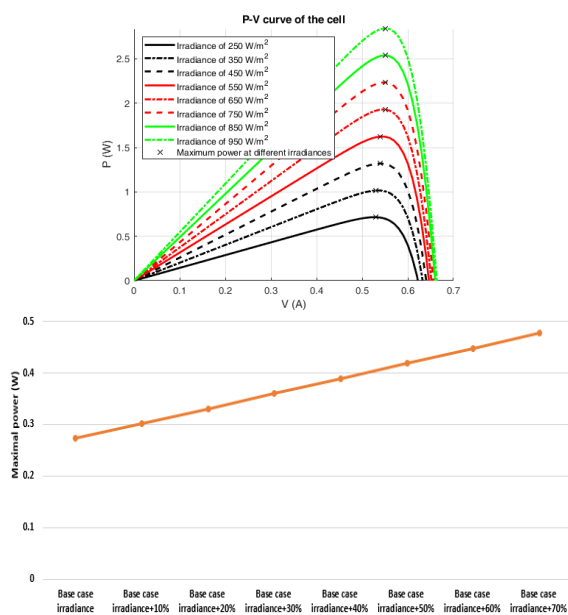
<sup>2</sup>Cadi Ayyad University, Faculty of Sciences Semlalia, Department of Physics, Fluid Mechanics and Energetic Laboratory, affiliated to CNRST, URAC 27, Marrakesh, P.O. 2390, Morocco

## Abstract

In order to face the increasing demand of electricity while respecting the environment, moving to renewable energies is crucial.

Solar energy and mono-crystalline silicon cells can be used to meet such demand<sup>123</sup>. The proposed study deals with a monocrystalline silicon cell for its modularity, low consumption of water, and high efficiency<sup>4</sup>. Sensitivity study was conducted to plot the I-V and P-V curves under different parameters: series resistance, diode ideality factor, irradiances, and cell temperature. The innovation of this paper consists on finding high leverage parameters that impacts the most performances. The results reveal that the most impacting parameter among the studied ones is the irradiance. It is shown that increasing the series resistance  $R_s$ , the diode ideality factor  $n$ , the irradiance, and the cell's temperature by 10% varies the maximal power produced by the solar cell by an average of 0.0059 W, 0.026 W, 0.029 W, and 0.0189 W respectively. Hence, putting a priority on the maximization of irradiance should be undertaken carefully by the authorities involved in the sizing of photovoltaic solar cells and power plants.

Figure:



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## Biography



Zineb Aqachmar has an expertise and passion in electronics and energetics. She is a professor and researcher at the University Cadi Ayyad in Marrakesh in Morocco. She was awarded her PhD in 2021 from the University of SMBA, Morocco. She is an engineer in electronics from ENSEEIHT in France, she worked in many international laboratories as Fraunhofer in Germany. Email: [zineb.aqachmar@uca.ac.ma](mailto:zineb.aqachmar@uca.ac.ma)

Hamid El Qarnia has an expertise in energetics. He is a professor and researcher at the University Cadi Ayyad in Marrakesh in Morocco. He was awarded his PhD in 1999 from the University of Sherbrooke, Canada. He has more than 56 publications and a H-Index of 16.  
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Abdelkader Outzourhit has an expertise in solar cells. He is a professor and researcher at the University Cadi Ayyad in Marrakesh in Morocco. He was awarded his PhD in 1992 from the Colorado School of Mines, USA. He has more than 260 publications and a H-Index of 28.  
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# How Will the Internet of Energy (IoE) Revolutionize the Electricity Sector? A Techno-Economic Approach

Ilias Laroussi<sup>1</sup>, Liu Huan<sup>2</sup>, Zhao Xiusheng<sup>2</sup>

<sup>1</sup>Division of Air Pollution Control, Tsinghua University, Beijing, China

<sup>2</sup>Al Akhawayn University, Ifrane, Morocco

## Abstract

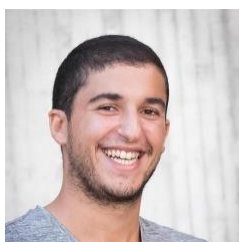
As many experts had predicted before, we are experiencing a transitional era from a traditional to a digital society where everything is interconnected with each other. A number of researchers and energy experts including Jeremy Rifkin, the author of the ‘third industrial revolution’ book, have presented a concept that is called the Internet of energy IoE. The concept that is literally the application of the internet of things IoT in the energy sector presents ambitious targets. One of them is to make renewable energy the main global source of energy generation. Several pilot projects have shown that the concept has a great potential to decarbonize, decentralize and digitize our electricity sector. And many countries including China, have adopted action plans to start applying IoE in their electricity sector. We will present in this paper the opportunities that the internet of energy could bring to the electricity sector based on research that was conducted by R&D centers, energy agencies and consulting firms. Our analysis is a systematic study about the potential benefits of IoE applications in the electricity sector. We proposed the different changes that IoE will bring to the three main layers of the electricity sector including the production, distribution/transmission and consumption.

**Keywords:** Internet of energy IoE, internet of things IoT, decentralization, energy blockchain, techno-economic analysis.

We also proposed the future architecture of IoE implementation in the power sector in which we chose energy blockchain to be our main electricity trading platform. We presented a macroenvironmental approach on the implementation of IoE in China with a focus on the main drivers behind the implementation of this concept. We also conducted a techno-economic case study of the implementation of IoE solutions in real life. Using modeling from Meteonom, PV-syst and Excel, we analyzed three different scenarios to show the added value of applying IoE solutions to a 6 KWp PV solar farm in Ouarzazat-Morocco. Lastly, we presented key recommendations concerning the development phases of IoE.

*Figure:*

## Biography



Ilias Laroussi is currently a second year PhD student at Tsinghua University [China] and a Lecturer at Al Akhawayn University [Morocco]. Previously, he worked at Goldwind China, one of the largest global wind energy manufacturers, he was involved in establishing power strategy models for the integration of storage technologies to wind farms in the Northern regions of China. Ilias also worked as a business developer with Greenfish France, working on projects to test the market entry of new promising solar energy technologies. Prior to that, he also worked as a research engineer at Al Akhawayn university. He holds a BS degree in Engineering and Management Science from Al Akhawayn University [Morocco], a Master Degree in Energy Management from Ecole Mines Paristech [France] and Master Degree in Power Engineering from Tsinghua University [China]. He is a citizen of Morocco.

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# Experimental study of Energy absorption of laminated and sandwich composites under repeated dynamic impacts and quasi-static indentation

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<sup>1</sup>Laboratory of Advanced Materials and Process Engineering, Ibn Tofail University, Kenitra, Morocco.

<sup>2</sup>The national higher school of mining of Rabat (ENSMR), Rabat, Morocco.

## Abstract

The high sensitivity to low-velocity impact is a particular characteristic of composite materials. This feature is considered as a limitation for engineering applications. Therefore, understanding the impact energy absorption is important for improving the damage tolerance of those composite materials under the repeated dynamic impact. This experimental investigation aims to study and compare the energy absorption ability of PVC-foam sandwich and GFRP laminated composites under successive dynamic impact with reduced energies and quasi-static indentation. For this purpose, low-velocity impact repeated tests until total absorption of the impact initial energy were performed and quasi-static indentation tests were carried out. Furthermore, a cumulative energy absorbed index was proposed to assess energy absorption capacity. The results indicated that 80 % of the initial impact energy was absorbed by the sandwich composite consisting of two 4 mm laminated skin, in comparison to approximately 60 % for 8 mm laminated composite directly after the first impact thanks to the damping ability of the core. However, the absorbed indentation energies for the two materials are almost equals. This result proves that the core has no significant effect on the quasi-static response of the PVC-foam sandwich due to its low puncture resistance.

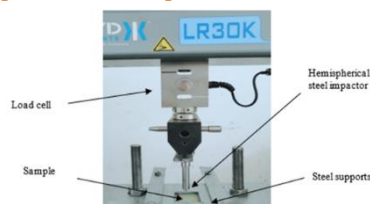
## Biography



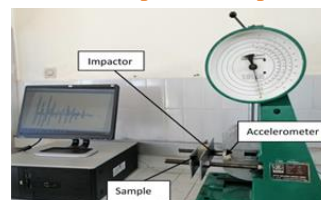
The author works on the study of the behavior of composite materials under the effect of quasi-static and dynamic loadings. He used experimental and numerical methods to study energy absorption and damage response during quasi-static and dynamic testing. He is a Ph.D. Student since 2018 from the Ibn Tofail University of Kenitra, Morocco. She has published two articles.

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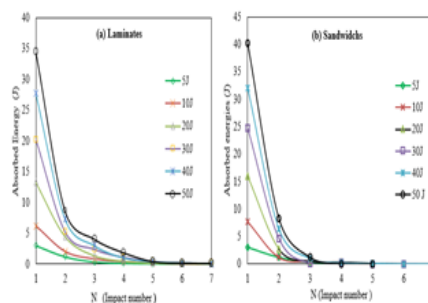
**Figure:** Experimental setup of the Quasi-static test.



**Figure:** Experimental set-up of the impact test.



**Figure:** Evolution of the absorbed energies under loading impact: (a) laminate composites, (b) sandwich composites



## Recent Publications

1. Zniker H., Ouaki B., Bouzakraoui S., EbnTouhami M., Mezouara H. Energy absorption and damage characterization of GFRP laminated and PVC-foam sandwich composites under repeated impacts with reduced energies and quasi-static indentation, *Case Studies in Construction Materials*, (2022) 5-e00844.
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# Numerical modeling of a hydrogenated silicon inductively coupled plasma discharge

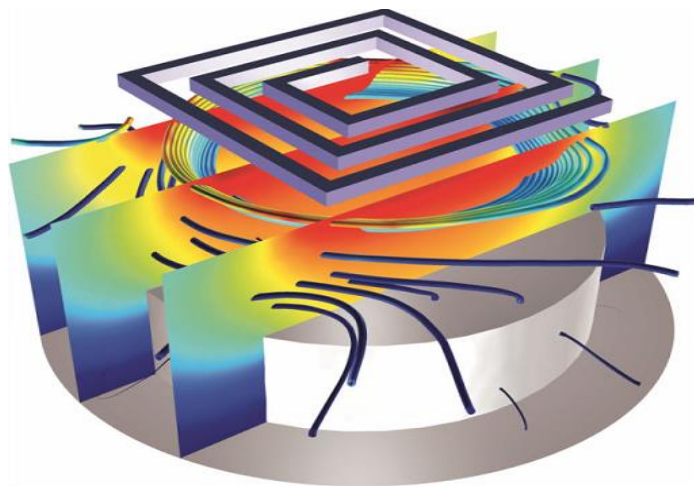
Guetbach Yassmina<sup>1</sup>, Grari Meryem<sup>1</sup>, Said Sara<sup>1</sup>, Es-Salhi Abdenacer<sup>1</sup>, Zoheir cifAllah<sup>1</sup>

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## Abstract

In favor of the global manufacturing industry, recent developments in plasma processing technology are of great importance, especially in semiconductor manufacturing processes. Mainly when plasma discharge studies are required. In our work, we have studied the properties of 2D numerical modeling of the deposition of thin films based on silicon diluted with argon and hydrogen in an inductively coupled plasma (ICP) reactor operating at low pressure of 0.5Torr and a low temperature of about 500K. The plasma discharge in this reactor is fed by a radio frequency source; whose working frequency is of the order of 13.56MHz, is modeled by a fluid approach that describes the plasma in terms of macroscopic quantity; assuming a specific form of the distribution function and taking the velocity moments of the Boltzmann equation. This results in a set of coupled partial differential equations that can be solved using the finite element method until a steady state is obtained. The results obtained show the evolution of the fundamental characteristics of the plasma discharge in an ICP reactor for more efficient and less costly deposition of silicon thin films.

Fig



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## Biography



My name is Yassmina Guetbach, I am a Ph.D. student at the LETSER Laboratory of the University Mohammed the First's physics department, Oujda, Morocco. My research area is Plasma Discharge and Renewables Energies, and My thesis focuses on plasma discharge in an ICP plasma reactor to have applications in the field of thin-film solar cells.

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# Dynamics of fungal mycelium growth for biomaterials production: molding the mold for a greener economy

Hasna Nait M'Barek<sup>1</sup>, Brahim Mazian<sup>1</sup>, Giana Almeida<sup>2</sup>, Patrick Perré<sup>1</sup>

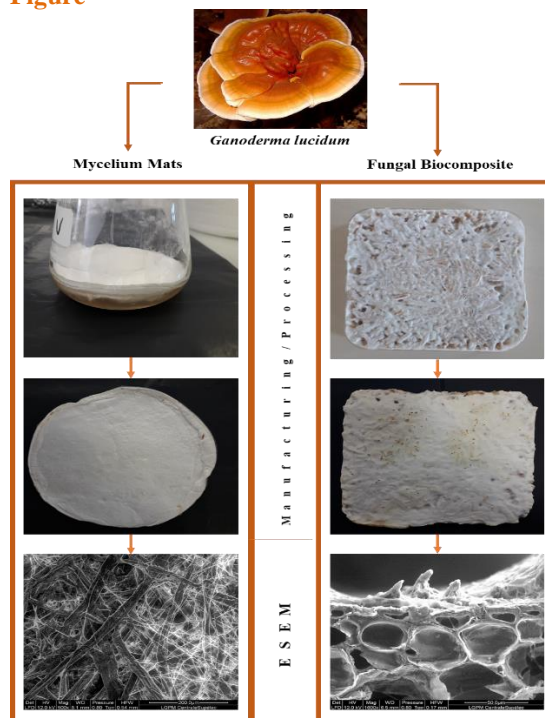
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## Abstract

Fungal Mycelium-based Composites (FMCs) are new-generation and self-growing materials on the front line between fungal biotechnology and material engineering sciences. They find their interest in combining the knowledge of living fungal cells and their interactions with the environment to tune new agrowaste-based green materials for applications such as building, design and healthcare. In particular, White-Rot Fungi (WRF) have great potential for this application. They naturally decay agricultural matter, producing a variety of plant cell wall-decomposing enzymes enabling them to colonize their substrate and thrive on it using their hyphal network. Moreover, WRFs present a high level of naturally-produced biopolymers (chitin, polysaccharides, proteins, etc) which contribute to the final properties of the FMC. Recent studies providing snapshots on the fabrication and the use of FMCs raised the variability of their properties depending on the fungal species, the substrate, and the manufacturing process. Hence, the characterization of the mycelial network and its properties is essential to better design the targeted properties. In this work, we report the production and the characterization of mycelium mats produced using *Ganoderma lucidum* in liquid culture. Flasks containing autoclaved nutritive broth were inoculated using one-week-old culture and incubated at 25 °C for 4 weeks in absolute darkness to avoid fungal fructification. Mats of the hyphal network formed on the surface after 2, 3 and 4 weeks were filtered, rinsed with MilliQ-grade water, dried on filter paper, and observed under Environmental Scanning Electron Microscopy (ESEM). Thermogravimetric analysis (TGA) is being used to assess thermal degradation of the components constituting the mycelium. As a first result, the produced mats were white-colored, rubber-like, and appear to have a low stiffness. ESEM images demonstrated that *G. lucidum* hyphae were grown in two shapes: tube-like and thread-like filaments of  $25.5 \pm 3.4 \mu\text{m}$  and  $3.5 \pm 0.7 \mu\text{m}$  in width, respectively. Preliminary results on the hemp shives-based FMC demonstrated its potential to produce a substitute material for expanded polystyrene suitable for insulation in the building sector.

Figure



## Recent Publications

1. Nait M'Barek H., Taidi B., Smaoui T., Ben Aziz M., Mansouri A., Hajjaj H. (2019). *Biotechnol. Agron. Soc. Environ.* 23(4), 207-217.
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## Biography



Hasna Nait M'Barek is a research engineer in the Chair of Biotechnology of CentraleSupélec, France. She has her expertise in microbial biotechnology and focuses on the use of fungi as a renewable resource to produce natural biopolymers, biomaterials, and enzymes with high-value biotechnological applications. She was awarded her Ph.D. in 2021 from the University of Moulay Ismail, Morocco, and has published 7 peer-reviewed papers so far, has co-supervised 5 Master's degree thesis, and has participated in the organization of 2 international conferences.

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# New Simulation of low cycle fatigue and description of strain hardening cyclic

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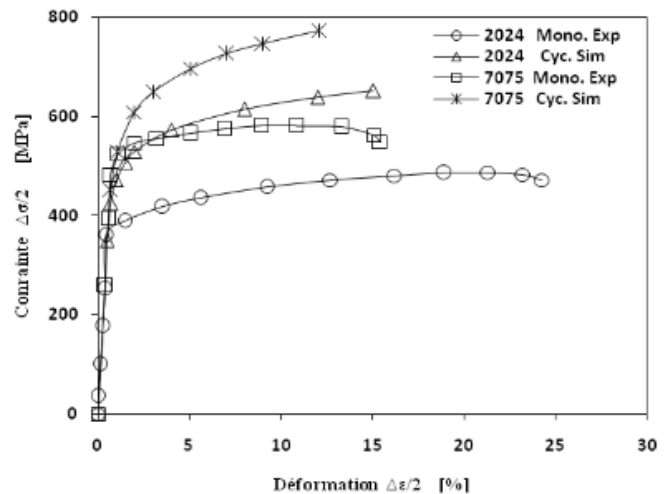
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## Abstract

The cyclic work hardening is a very important parameter to translate the behavior elasto-plastic materials, which depending on the imposed loading paths, this work constitutes a contribution to a modeling of low-cycle fatigue with imposed deformation, using three types of alloys using the Abaqus calculation code. This modeling enabled us to determine the mechanical characteristics in traction and compression of the materials studied and to establish their curves of monotonous and cyclic work hardening. The results obtained made it possible to determine the service life of aluminum alloys.

Figure:



## Recent Publications

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2. Benhaddou M., Ghammouri M., Hammouch, Z, Latrache, F. International Journal of Engineering Research in Africa, 50 (2020).
3. Giannella V., Citarella R., Fellingner J., Esposito R., Structural Integrity Procedia, 8, pp.318-331, (2018).
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5. Bianca K., Nadja O., Anna-Lena P., Ludger L., Steffen A., Michael H., International Journal of Fatigue, Volume 153, 2021.

## Biography



Professor at the Oujda National School of Architecture, specializing in civil engineering. holder of a doctorate in mechanics and materials (fatigue of materials) from the national school of applied sciences oujda in 2017. several of my works are published in the field of low-cycle fatigue and endurance fatigue.

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# An integrated environmental requirement modeling approach for sustainable mechatronic systems using hierarchical CP-net

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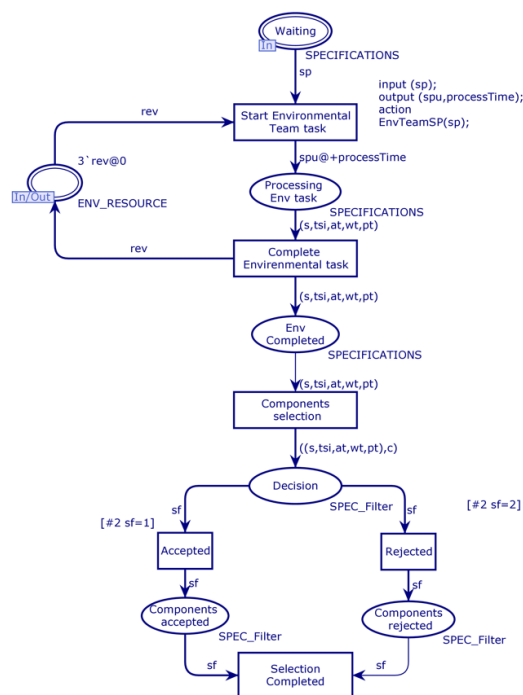
Fig

## Abstract

Mechatronics design is a multidomain exercise involving concurrent design evaluations and respective decision making in various fields of engineering. In fact, these systems cannot be effectively designed by a single technical domain. Besides, at a time of growing environmental impacts, the control of mechatronic systems impact on the environment is becoming a must. Environmental requirements are driven by political and public awareness concerning potentially accelerating climate change, growing water pollution and waste disposal as well as rapid consumption of natural resources. Against this background the industry and particularly the product designers are faced with legislative regulations, environmental procurement requirements, and eco-conscious customers. Due to that fact, Designing a sustainable mechatronic system and assessing its performance in an earlier project phase invite us to combine Eco-design, conceptual design and mechatronic systems modeling principles

Design for sustainability of mechatronic systems gains currently a high importance. Mechatronics system modeling is a very important milestone in mechatronic products development process. It enables the admissible solutions to be mapped using models and thus assess the required performances.

This paper presents an integrated environmental requirements modeling approach for eco-designed mechatronic systems using coloured Petri nets.



## Recent Publications

1. Mehdi, I., & Boudi, E. M. (2021). Towards a sustainable conceptual design of mechatronic systems application to a regenerative braking system. *Materials Today: Proceedings*, 45, 7588-7596.
2. Mehdi, I., & Boudi, E. M. (2021, November). Qualitative Functional and Dysfunctional Analysis and Physical Modeling of an Eco-Designed Mechatronics System Using Coloured Petri-nets: Application on a Regenerative Braking System. In *International Conference on Advanced Technologies for Humanity* (pp. 495-506). Springer, Cham.

## Biography



Author has her expertise in the quality reliability safety and environment fields. She studied at the National School of Applied Sciences in Oujda, Morocco. Her graduation project was about the eco-conception of a new plant for Safran Engineering in Casablanca, she has experience as quality, change management and environmental audits responsible and as QSE, continuous improvement and reliability manager in automotive and aeronautic industries. She is now a PhD student at Mohammadia School of Engineers in Rabat, Morocco. At a time of growing environmental crisis, She is targeting to propose a new methodology to design eco-friendly mechatronic systems and to assess their behavioral proprieties using different mathematical models, as Coloured Petri-Net.

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## Depth- Averaged Large Eddy Simulation of shallow turbulent mixing layer

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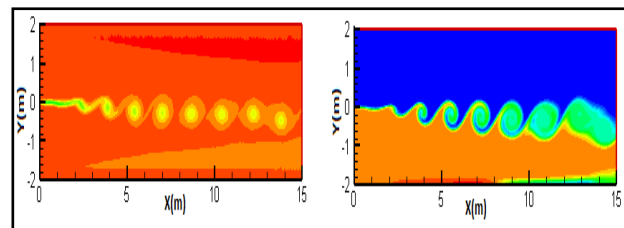
<sup>3</sup>Ecole Euromed de Génie Civil Université Euromed de Fès, BP 51 Fès, Maroc.

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### Abstract

This paper presents the DA-LES large-scale simulation model of turbulent shallow flows, which is based on double filtering, the first filter removes vertical scales with  $h$  being the cut-off length and the second filtering, as a filter spatial, removes all scales from the movement of sizes smaller than the mesh size. To validate this model, we consider the mixing layer problem in a shallow flow of two different velocities imposed on the input: Chu, V. H. and Babarutsi [38]. In this work, we consider the finite volume method based on an unstructured mesh for turbulent equations, the numerical results are presented and compared to experimental data.

**Fig.** Contour of vorticity (left) and concentration (right) for the mixture layer corresponding to the test with  $h = 67\text{mm}$  and  $C_s = 0.2$ .



### Recent Publications

1. H. Chu, J. H. Wu, and R. E. Kayat, J. Hyd Eng (1991) 117- 128 .
2. S. Babarutsi, M. Nassiri, and V. H. Chu, J. Hydr. Engrg (1996) 122-367.
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### Biography



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# Design and realization of an aeronautical cleaning robot for aircraft maintenance 4.0 based on artificial intelligence

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## Abstract

Preventive and corrective maintenance of aircraft are key elements in the aviation industry, with the aim of keeping the aircraft in good condition and available to personnel when they are needed. To do this, maintenance operations must be carried out rigorously and with great precision. The cleaning of an aircraft is a critical task in the preventive maintenance of the aircraft. This operation requires a human intervention after each stopover which causes unexpected material failures such as shocks on the fuselage in addition to a bad execution of the operation of cleaning of the seats evoking problems between the crew of the aircraft and the teams of cleaning, this causes a delay in the planning of the flights and financial overloads for the airline companies.

In this study, we presented the design and realization of a cleaning robot that performs most of the tasks done by the cleaning teams such as vacuuming the carpet and collecting large waste. This robot is equipped with a camera and an artificial intelligence program installed on a raspberry4 board. We expect robotics to be one of the keys to replacing humans in the heart of production facilities in the Factory of the Future. As they can perform their tasks with infinite perfection in a precise time.

**Keywords:** preventive maintenance, aeronautics industry, artificial intelligence, robotics.

Figure



## Recent Publications

1. El barkany A., A. Benali, M. El Ghorba, A. Choukir, “The inspection of crane wire ropes in Moroccan service: Discard criteria and monitoring procedure”, International Journal of Engineering and Advanced Technology (IJEAT), ISSN: 2249 – 8958, Volume-2, Issue-3, pp. 351-364, February 2013.
2. F. Jeffali, all , Diagnosis of three-phase induction motor and the impact on the kinematic chain using Non-Destructive Technique of Infrared Thermography, Journal Infrared Physics & Technology, ScienceDirect, Volume 102, November 2019, 102970.
3. Three-phase induction motor fault detection based on thermal image segmentation Ammar K. Al-Musawia, Fatih Anayib, Michael Packianathe, Infrared Physics & Technology, Volume 104, January 2020

## Biography



The experience that BENAHMED Badr Eddine had in previous fields such as industrial engineering and aeronautical industry gave him the idea of the project and the passion to accomplish the task, He was awarded a master degree in industrial engineering at “EMSI” an international school of engineering and then experience in the field of airline company Royal Air Maroc , where he began the planning of the project while working on aircrafts. He was influenced by robotics devices and the way they complete their tasks as planned and without mistakes, also expected that in the future they will replace human workers in production facilities and factories. That's where the idea of the cleaning robot design got its origin. Email:

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# Internationalization of scholarly journals in Morocco: factors of success

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## Abstract

New information technologies have improved the exploitation and dissemination of Scientific Information that is recorded in electronic databases. Many bibliographic tools have been developed for the analysis of research activities, but "Scopus" and "WoS" are undoubtedly the most widely used by universities to measure the impact of their output (Mongeon, 2016). The Directory of Open Access Journal is another database that covers open access journals and guarantee the quality of their content (Bjork, 2019).

Scopus and WoS index two Moroccan journals: "Moroccan Journal of Chemistry" and "Journal of Materials and Environmental Science", whereas the DOAJ index nine journals (Houissa, 2020). The objective of our analysis is to provide a mapping of JMES and MJC and to analyze the link between their diffusion in open access and their indexation in international databases.

Our methodology is based on datavisualization and qualitative analysis. We will identify, through the mapping of the journals, indicators about their language, collaboration network and research topics. We will identify the factors of success of JMES and MJC and propose recommendations to strengthen the internationalization and influence local journals to enhance the quality of their articles.

The results showed that the internationalization of journals requires the alignment with the international standard of quality of scientific publications; On the other hand, the visibility of a journal is related to its accessibility, hence the interest of the indexing of Moroccan journals in the DOAJ. Both journals are published in open access and their accessibility in the DOAJ has played a major role in increasing their internationalization (Bouabid, 2016). The indexation of JMES and MJC in prestigious databases is a proof that the open access, not only guarantees the quality of the publication but also the impact of its researchers.

## Figure:

### Recent Publications

1. Björk, B. C. (2019). *Open access journal publishing in the Nordic countries. Learned Publishing*, 32(3), 227-236.
2. Bouabid, H. (2016). *De la production à la diffusion du savoir: expériences réussies au Maroc de deux revues scientifiques indexées. L'Université en contexte plurilingue dans la dynamique numérique*, 213.
3. Houissa, S. (2020). *What's in a "NAME"? A Study of African and Arab Journals in the DOAJ*, *DOAJ News Service* 11 May.
4. Mongeon, P. (2016). *The journal coverage of Web of Science and Scopus: a comparative analysis. Scientometrics*, 106(1), 213-228.
5. Young, J. S. (2020). *Green and gold open access citation and interdisciplinary advantage: A bibliometric study of two science journals. The Journal of Academic Librarianship*, 46(2), 102105.

## Biography



**Lrhoul Hanae** is Professor of Library and Information Science at Rabat School of the Information Sciences in Morocco. Her current work focuses on open access resources, open repositories and science mapping. She's currently president and founder of the Moroccan association for the development of scientific information aiming to develop the open access and open repository in the North Africa region. She also serves on the board of the DOAJ (Directory of Open Access Journal) as Associate Editor for Middle East and North Africa (MENA) region and the Creative Commons chapter lead.

Houcemeddine Turki is a research assistant in Scientometrics and Biomedical Data Science at Data Engineering and Semantics Research Unit, University of Sfax, Tunisia. He is also a long-term contributor to Wikimedia Projects and an open science advocate promoting the use of open resources to drive computer applications in the Global South. He has several research publications in highly-referred scholarly journals including *Scientometrics* and *Journal of Biomedical Informatics*.

Belkheir Hammouti

**INNOVATIVE DEVICES, CHEMISTRY AND MATERIAL PHYSICS**

# Use of a new technique to improve the efficiency of oriented processes for the extraction and recovery of the methylene blue dye through a polymer inclusion membrane

Saâd OUKKASS<sup>1</sup>, R. Ouchn<sup>1,3</sup>, R. Louafy<sup>1</sup>, Z. Habibi<sup>1</sup>, I. Mechnou<sup>1</sup>, Y. Chaouqi<sup>1,3</sup>, L. Lebrun<sup>2</sup>, M. Hlaïbi<sup>1,2</sup>

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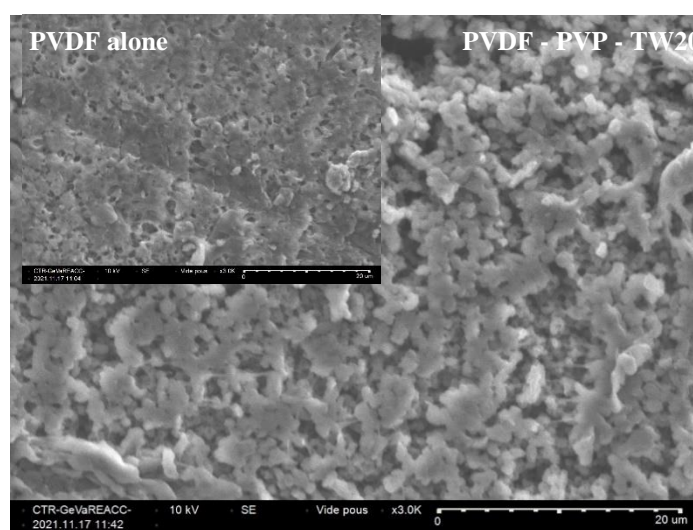
## Abstract

Membrane technologies have grown considerably in recent years, thanks to their numerous applications and advantages over other conventional techniques. Today, these processes represent a key research topic, especially affinity polymer membranes, which are very convenient for oriented processes.

Methylene blue is one of the most widely used dyes in various fields such as: chemistry, medicine, dentistry and the dye industry. Our objective is to develop a polymer inclusion membrane for the extraction and recovery of methylene blue dye in the presence of activated carbon. The polymer inclusion membrane is developed using a mixed polymer support, polyvinylidene fluoride (PVDF) and polyvinylpyrrolidone (PVP) and Tween 20 (TW20) as extractant. After having characterized the morphology and porosity of the membrane, kinetic and thermodynamic models were applied to define the values of the parameters of permeability ( $P$ ), initial flux ( $J_0$ ), association constant ( $K_{ass}$ ) as well as apparent diffusion coefficient ( $D^*$ ). Subsequently, we measured the activation parameters (activation energy ( $E_a$ ), enthalpy ( $\Delta H^{#}_{ass}$ ), entropy ( $\Delta S^{#}$ )). Finally, we studied the effect of activated carbon on the processes performed through the membrane, which shows a clear improvement.

This makes the membrane developed in this study a potential factor for membrane separation.

Figure:



## Recent Publications

1. H. M. YACINE, “Etude de capacité d’adsorption d’un déchet végétal,” Thèse de Magister Université Abdelhamid Ibn Badis De Mostaganem, 2020.
2. I. Mourtah, Z. Habibi, Y. Chaouqi, T. Eljaddi, N. Sefiani, L. Lebrun, M. Hlaïbi, Oriented Membrane Processes for Selective Separation and Recovery of Direct Red 80 and Methylene Blue Dyes from Textile Wastewater, in: 2021
3. F. Hamza, “Élimination du Colorant Azoïque Bleu Noir Naphtol dans l’Eau par Sonochimie et Procédés Innovants d’Oxydation,” Thèse de Doctorat Université Badji Mokhtar-Annaba, 2016.
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## Biography



Oukkass Saad is a fourth year Ph.D. student in chemistry and valorization. His main research interests are membrane technologies, more specifically affinity membranes and their application for the treatment of pharmaceutical effluents while protecting the environment. He has contributed to several national and international conferences.

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# Physical Parameter Monitoring in the Fourth Industrial Revolution Using Optical Fiber Sensors B -A Review

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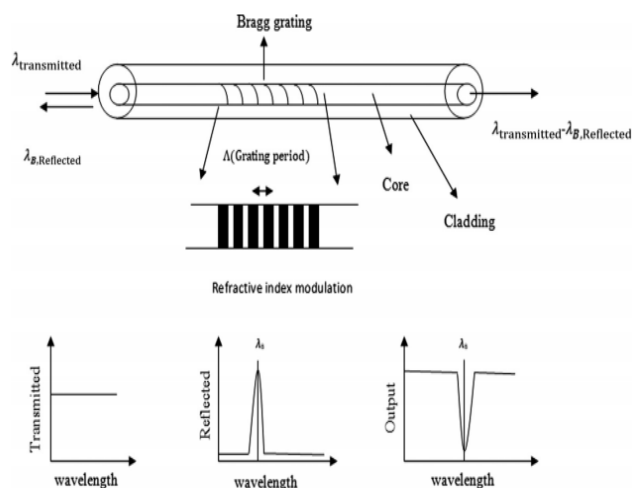
## Abstract

In the fourth industrial revolution, also called Industry 4.0, the integration of miniaturized sensors in machines and equipment for accurate real time monitoring of complicated industrial processes is of paramount importance [1]. Several research studies have been conducted and found that conventional sensors such as plasmonic sensors, piezoelectric sensors, and thermocouples, can be easily embedded during the manufacturing process and employed if the monitoring conditions met. However, there are areas where this is not the case and which require a specific sensor [2].

In the last two decades, Fiber Bragg Grating (FBG) sensors have made vast advances in terms of both development of the technology and its applications [3]. Due to small size, immunity to electro-magnetic interference, and high sensitivity, optical sensors-based fiber bragg grating have attracted great deal of attention as one of the most powerful temperature and strain sensing techniques [4] and as such it can have a pivotal role in the fourth industrial revolution (4IR).

This paper reviews advances in FBG sensor technology and its applications since the year 2000. FBG sensors employing conventional dielectric waveguides [3,4], multiplexing [5] and networking [5] will be introduced briefly. Moreover, the review will focus on the use of FBG in mainstream of the fourth industrial revolution applications.

**Figure:** Structure of Fiber Bragg Grating



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1. Sahota, J. K., Gupta, N., & Dhawan, D. (2020). Fiber Bragg grating sensors for monitoring of physical parameters: A comprehensive review. *Optical Engineering*, 59(6), 060901.
2. Hill, Kenneth O., and Gerald Meltz. "Fiber Bragg grating technology fundamentals and overview." *Journal of lightwave technology* 15.8 (1997): 1263-1276
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## Biography



Paul S.B Macheso is a Ph.D. student in Engineering Sciences with Euromed University of Fes. He is also Lecturer in Electronics at the Department of Physics and Electronics, University of Malawi. Paul holds a Master of Science in Internet of Things Wireless Intelligent Sensor Networking from University of Rwanda, College of Science and Technology and also Bachelor of Education Science with a major in Physics and Electronics from University of Malawi. His research interests extend from Internet of Things, Wireless Sensor Networks Embedded Systems to Photonics, Optic fiber sensors and Fiber Bragg Grating (FBG).

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## 3D-printed microfluidic device for bio-sensing applications

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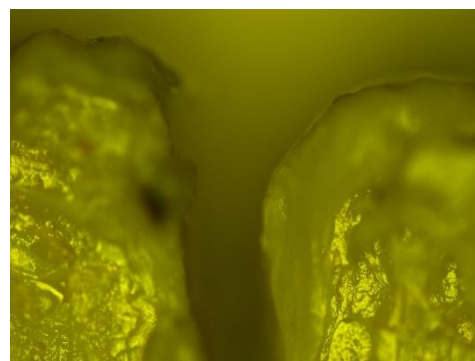
### Abstract

Nowadays, microfluidic systems attract a great deal of interest, due to their potential technological applications, particularly in sensor devices [1]. In this regards, microfluidic systems have emerged as an appealing field based on the microfabrication processes and size reduction effects. A diverse array of sophisticated and reliable microfabrication techniques has been used [2, 3], including direct laser writing, soft lithography and thermoforming process.

Recently, 3D printing has become an international concern as a cheaper and easy to use technique, and a suitable method to produce original microfluidic systems quickly [4, 5]. Moreover, the use of 3D technology allows, after optimization of manufacturing process parameters, to obtain smooth surface channels devoid of residues, which means that the pressure drops are low and, consequently, the administration of the liquid to analyzing requires very low-energy.

In this paper, we present some of our results of the fabrication of microfluidic systems by using 3D printing technology for bio-sensing applications. We show the effect of the manufacturing parameters on the quality of the microfluidic channels, such as the roughness of the surface of the walls and the presence of obstacles at the level of the channels which can harm the circulation of the liquid. Then, we demonstrate the viability and versatility of 3D printing in the fabrication of microfluidic systems.

**Figure:** Optical microscope image of the inlet of the microfluidic channel.



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### Biography



EL BIYARI NIDAL, Mechatronics engineer, graduated from the Faculty of Science and Technology of Fez in 2019, joined the Euro-Mediterranean University of Fez in the same year for PhD studies. My fields of interest are microfluidic, geometric and wave optics, 3D design by CATIA V5, and additive manufacture. The main goal of my thesis project is the development of an opto-fluidic biosensor for the detection of breast cancer. The objective is based on the realization of microfluidic chips by 3D printing, starting with 3D design and going through 3D printing using the technique of additive manufacturing by stereolithography.

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# Potato peels, potato and corn starch-based bioplastics as alternative to conventional petroleum-based plastics

D. BELFADIL<sup>1</sup>, H. ZAIN ELABIDINE<sup>1</sup>, F. BAZI<sup>1</sup>, S. ZYADE<sup>2</sup>

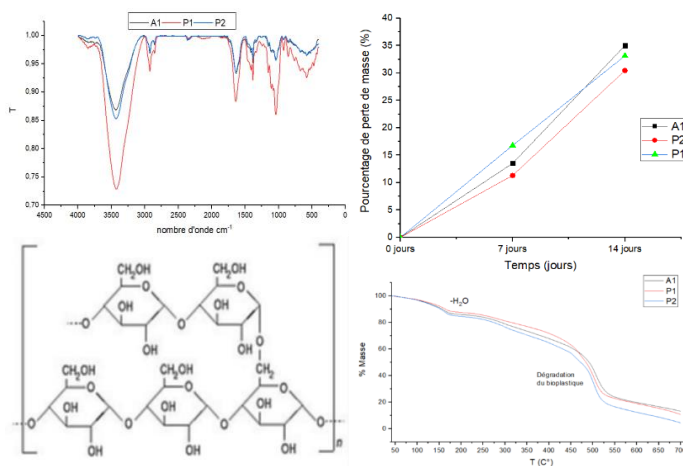
<sup>1</sup>Laboratory of Analytical Chemistry and Physico-Chemistry of Materials (LCAPCM), Faculty of Sciences Ben M'Sik, Hassan II University of Casablanca, Casablanca, Morocco

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## Abstract

Recently, environmental problems caused by petroleum-based plastics have been increasing. Therefore, researchers have begun to investigate new materials that may be alternatives to plastics. Bioplastics are considered as green materials alternatives to plastics and they are produced from renewable resources. The aim of this work was the production of bioplastics from corn, potato and potato peels starches. In order to determine the chemical, mechanical and thermal properties of the products, Infrared (IR), thermogravimetric (ATG) analyzes, and the tensile strength test, were carried out. The IR spectra of the product showed the presence of characteristic peaks of bioplastic, O-H, C-H, C=O and C-O. The tensile strength obtained for the bioplastic based on potato starch, peels and corn was 0.82 MPa, 0.23 MPa and 0.57 MPa respectively also the ATG results showed that a weight loss of 50% occurred respectively at 483 °C, 471 °C and 492 °C According to biodegradability test these bioplastics have exhibited high biodegradability properties.

Figure:



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## Biography



Doha BELFADIL is a first-year PhD student at Hassan II University of Casablanca, Morocco. She received a master's degree in instrumentation and physico chemical techniques of analyse from Faculty of Sciences Ben M'Sik in Casablanca, Morocco. Her current field of research is green chemistry, waste recovery and sustainable development.

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# Effects of environmental aging on the mechanical and thermal performances of 3D printed Poly (ether ether ketone) / Poly (ether imide) [PEEK/PEI] blends

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## Abstract

High-performance engineering polymers satisfy a wide range of applications, such as those of aerospace, energy, and automotive when compared to conventional thermoplastics. These high-performance thermoplastic polymers exhibit superior physical and chemical properties even at elevated temperatures and under severe conditions. Poly (ether ether ketone) (PEEK) and Polyetherimide (PEI) are the most used engineering polymers. These thermoplastics have a high glass transition temperature ( $T_g$ ), and a service temperature up to 260 °C. Having also high mechanical properties. The blending of these two engineering polymers has been considered by many scientists as an interesting approach to achieving a thermoplastic matrix with high-performance properties. The present study focuses on the impact of physical aging on thermal, and mechanical properties of 3D-printed PEEK-PEI parts. Results showed that the  $T_g$  of printed PEEK-PEI samples remains stable for the different tested types of aging. Dry and wet aging, however, results in a 10% decrease in Young's modulus, while the tensile strength values remain almost stable compared to unaged parts. Characterization results prove that printed parts based PEEK/PEI (70/30 wt/wt%) blend exhibit good stability and retention of physical properties at high temperatures and aggressive environmental conditions.

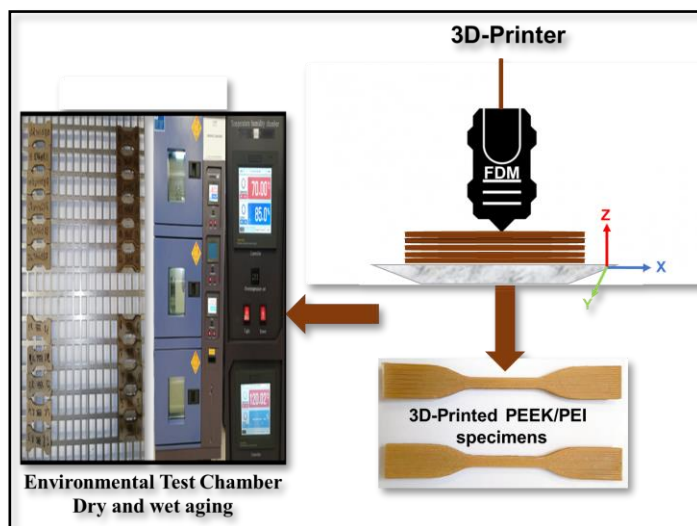
## Biography



Anouar El Magri currently works as a full professor at the Euromed University of Fes. Their current project is additive manufacturing of high-performance materials (polymers) and their composites. <https://scholar.google.com/citations?user=4wcm1GcAAAAJ&hl=fr>.

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Figure



## Recent Publications

1. Thiam, B.G.; El Magri, A.; Vanaei, H.R.; Vaudreuil, S. 3D Printed and Conventional Membranes—A Review. *Polymers* (2022), 14.
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3. A. EL MAGRI, S. VANAEI, M. SHIRINBAYAN, S. VAUDREUIL, A. TCHARKHTCHI, An investigation to study the effect of process parameters on the strength and fatigue behavior of 3D printed PLA-Graphene. *Polymers*. 13(19), 3218. (2021).
4. A. EL MAGRI, K. EL MABROUK, S. VAUDREUIL, Preparation and characterization of poly(ether ether ketone)/poly(ether imide) [PEEK/PEI] blends for fused filament fabrication.

# Cellulosic-based hydrogel from biomass material for removal of dyes from waste water

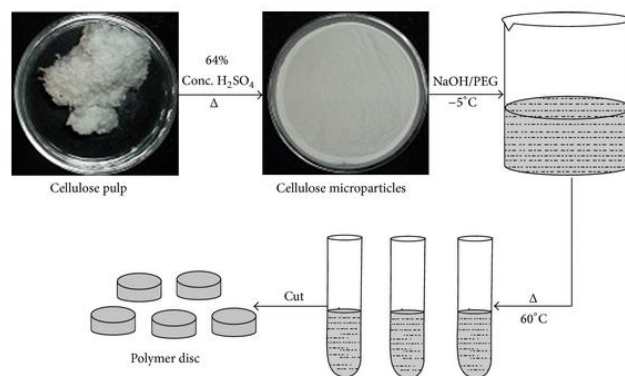
Azeddine Lebkiri<sup>1</sup>, Abdelhay El amri<sup>1</sup>, Fatima Zahra bouhassane<sup>1</sup>, Zineb Wardighi<sup>1</sup>, El Housseine Rifi<sup>1</sup>, Amar absaoui<sup>1</sup>, and Ahmed Lebkiri<sup>1</sup>

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## Abstract

Cellulose, prepared from straw of the filter plant reeds, were used for the hydrogel preparation, either separately or in a mixture of the two in a ratio of 1:1, 1:4, 1:9, with epichlorohydrin (ECH) were used as a crosslinking agent for the Cellulose: CMC mixture. The mechanism of the polymerization was studied and the resulting hydrogels were characterized for their appearances, their percentage yield and their water absorption capacity [1]. Fourier transform infrared (FT-IR) spectroscopy and XRD analysis were also investigated for the hydrogel samples. Since the textile industry produces large volumes of wastewater which contain dangerous compounds such as dyes, heavy metals such as Cu(II) and surfactants, The aim in this research was to use the hydrogel samples for crystal violet (CV) that can be introduced in wastewater. The FT-IR spectrum, before and after absorption, indicated that the product prepared the hydrogels were able to absorb the CV the hydrogel can be recovered and dried for reuse again [2]. On the one hand, the effect of several parameters on the adsorption efficiency was studied such as the mass of biosorbent, the adsorption time, the dye concentration and the pH of the solution. All these parameters influence the absorption capacity. The maximum amount of adsorption of the biosorbents studied is estimated at  $t$  104.73 mg.g<sup>-1</sup> at pH 6.

Figure



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## Biography



LEBKIRI Azeddine has its expertise in the development and characterization of new hydrogel based on cellulose applications for the adsorption of organic and inorganic pollutants. Its objective is based on the synthesis of the hydrogels. She has been preparing her doctorate since 2020 at Ibn Tofail University, Faculty of Sciences, Morocco.

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# Development of starch bio-nanocomposite materials filled with phosphorylated and sulphated cellulose nanocrystals extracted from pepper agricultural residue

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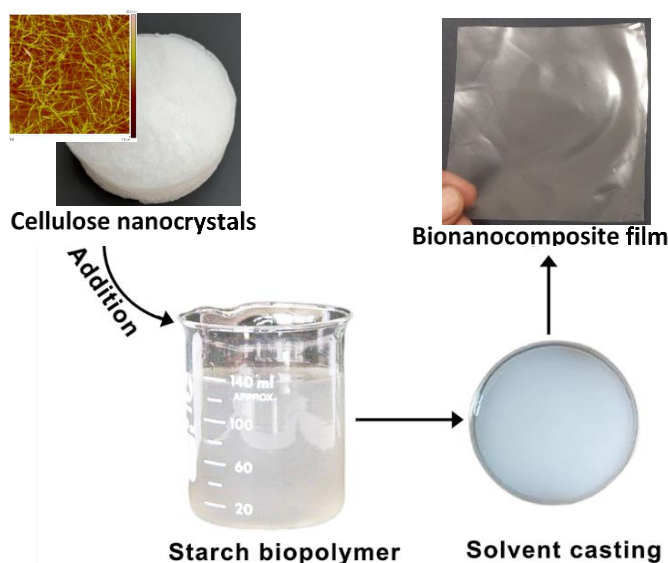
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<sup>2</sup>Materials Science, Energy and Nanoengineering Department (MSN), Mohammed VI Polytechnic University (UM6P), Lot 660 – Hay Moulay Rachid, 43150, Benguerir, Morocco.

## Abstract

Nowadays, the production used of plastics derived from petroleum has increased enormously in the world over the last decades due to its wide range of application such as packaging, automobile parts, etc. And after the use of these plastics they are rejected as waste, which are imposing a problem for the environment because they are toxic and not biodegradable. To reduce their use and gradually replace them with environmentally friendly materials, much research is focused on the development of bionanocomposites with bio-based reinforcing elements produced from renewable resources, biodegradable and nontoxic. The literature abounds with studies on the extraction of cellulose fibers and fibrils as well as nanocrystals that are part of their structure. Cellulose nanocrystals (CNCs) often have good reinforcing properties due to their microstructures and high crystallinity. The objective of this work is to investigate the pepper plant residues, as a non-conventional renewable source, for the isolation of cellulose nanocrystals (CNCs), to develop an alternative bionanocomposite film for food packaging application. After their successful extraction using two different types of acids for hydrolysis (sulfuric acid and phosphoric acid), the as-obtained CNC were successfully characterized in terms of their physicochemical properties, and used as nanoreinforcing fillers for polymer nanocomposites development, using potato starch as a polymeric matrix. The Starch-CNC bionanocomposites were produced through solvent casting method and characterized regarding their thermal, transparency and mechanical properties.

Figure: Preparation of Starch-CNC bionanocomposites



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## Biography



We have analytical knowledge and a strong desire to recover agricultural residues for use in the industrial sector. Our goal is to create a bionanocomposite film that may be used in food packaging by extracting cellulose and its derivatives as nanofiller on biopolymer. Since 2019, I've been a doctoral student at Hassan II University's Ben M'sik Faculty of Sciences in Casablanca, Morocco. So far, I've published two articles. On Scopus, my H index is 2.

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# Thermal and mechanical properties of a high-density polyethylene (HDPE) composite reinforced with wood flour

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## Abstract

In order to keep up with the rate of growth and global demand, it is necessary to manufacture products with high performance and improved durability. Wood-plastic composites (WPCs) are a rapidly growing class of construction materials formed by mixing wood fibers with a polymer matrix at a high temperature. However, significant technical issues remain, such as low thermal resistance, low water resistance, and limited interfacial contact or compatibility between wood (fiber or flour) and the polymer matrix, which results in poor adhesion of the wood particles, etc. The structure and properties of the matrix/fiber interface can indeed have an impact on the final properties of the composites. To this end, good interfacial adhesion improves stress transmission from the matrix to the fiber, as well as composite performance. Therefore, chemical modification of the fiber surface has been the most effective way to chemically bond the matrix to the forcing agent. This modification is achieved by using coupling agents that promote the formation of chemical or material bonds between the wood flour (WF) and the polymer matrix. In addition to the coupling agents, compatibilisants, and grafted copolymers, there are thermal and mechanical surface treatments performed on the fibers. Five WF/HDPE composite blends with WF contents of 40%, 50%, 60%, 65% and 70% were evaluated for density, tensile strength, hardness test and thermal conductivity. The physical tests showed that the density and hardness of WPC increased with the wood content of the composite. In addition, the experimental results show that the thermal conductivity of WPC decreases with increasing WF content. In general, the results indicate that the developed WF/HDPE has suitable mechanical and thermal properties.

**Figure:** Specimens with different wood flour content (40%, 50%, 60%, 65% and 70%)



## Biography



Morchid Fatima Ezzahrae is currently a first year PhD student in Engineering Sciences at University of Hassan II, ENSETM, working under the supervision of Professor Zamma Abdellah. Her doctoral work focuses on wood-plastic composite materials. She holds a MS in Physics and New Technologies, Materials and Nanomaterials and a BA in Physics and Applications.

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## Effect of chemical treatment on Moroccan Alfa fiber thermal behavior

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### Abstract

The esparto plant stems are rich in cellulose and are an inexpensive and easily renewable source of natural fibers that can be reinforced with polymers. However, large quantities of non-cellulosic material, surface impurities, and low degradation temperature make natural fibers less attractive for reinforcement with polymeric materials unless they can be modified in a suitable manner. In this paper, Alfa stems were treated with NaOH solution with three different concentrations (1,2 and 3 Mol) for 2hours at a temperature of 100 °C.

In order to compare the thermal stability of Alfa fibers, a thermogravimetric (TG) analysis was used. The comparison and analysis of the results confirmed some thermal changes of the fibers after the treatment due to the removal of some non-crystalline constituents from the plant and the thermal stability of the treated Alfa fibers were improved.

**Keywords:** Natural fibers, Alkaline treatment, Thermal analysis, Structural modification

Figure: Alfa plant stems



### Recent Publications

1. K. Lamhour et A. Tizliouine, « Operation and approximation based on the history of failure modes recorded by SCADA system of Amougdoul Moroccan wind farm using FMECA maintenance model »: Wind Eng., mars 2021, doi: 10.1177/0309524X21992456. Mohd H. H., Mohammed J. K., J Phy. Sci. 21 (2010) 1.
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### Biography



**LAMHOUR Kawtar** is a PhD student in Laboratory of Mechanics Production and Industrial Engineering Higher School of Technology Hassan II University (Morocco). Her researches interests concern bio composite materials as an application in wind turbine blade.

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## Surface states in one-dimensional Graphene-Dielectric photonic crystal

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### Abstract

In this work, we study the propagation and localization of electromagnetic waves in a semi-infinite and infinite superlattice made out of graphene/dielectric bilayers [1-2]. Our goal is to show

- i- The possibility of existence of band gaps in an infinite superlattice even though the weak thickness of the graphene layer.
- ii- The possibility of existence of surface modes in a semi-infinite superlattice terminated by a thin cap layer by analogy with the surface modes already obtained in one dimensional superconducting photonic crystal [3]. The cap layer can be either dielectric or graphene. These modes fall below the light line of vacuum and inside the superlattice band gaps. An analysis of the electric and magnetic fields of these modes allowed us to study the spatial localization of these modes in the system.

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### Biography



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## Si/Graphite as Anode Material for Lithium-Ion Batteries (LIBs)

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### Abstract

All over the world, the decarbonization of the energy network, the integration of wind and solar electricity generation systems, and the use of hybrid and electric vehicles were considered as a priority. Meeting the increasing requirement of these markets, lithium-ion batteries (LIBs) with their higher specific energy density of 250 Wh. Kg<sup>-1</sup> [1] still non-competitive to the conventional gasoline engines of 13.000 Wh kg<sup>-1</sup> [2]. To overcome these limitations, exploring new chemistries for higher energies, safer and cost-effective batteries are required, in this perspective, the next generations LIBs call for developing new electrode formulations, including the cathode and the anode materials. the Si-based materials have been attracting great interest due to its abundance (second richest element in the Earth's crust), its high specific capacity of 3580 mAh. g<sup>-1</sup> and its proper working potential around 0.4 V vs. Li<sup>+</sup>/Li [1][2]. In addition to that, its mature processing industry put it at the top of the most promising next-generation anode materials [3]–[4]. However, numerous challenges limit its practical use, namely its huge volume change during the lithium insertion extraction, the poor electrical conductivity, and the unstable solid-electrolyte interphase (SEI) layer inducing its capacity decay and its poor coulombic efficiency [5].

In this work, we are reporting the elaboration of graphite microparticles decorated by silicon nanoparticles as an efficient strategy to address the aforementioned challenges, by combining the advantages of the Si (high specific capacity) and the graphite (better capacity retention). Evaluated as anode material for LIBs, the mixture exhibits an initial charge capacity of 669 mAh/g with an initial coulombic efficiency of 86% and a capacity retention of 75% after 50 cycles.

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### Biography



Dr. Loubna HDIDOU is a post-doc researcher at Materials Science and Nano-engineering Department (MSN), at the Mohammed VI Polytechnic University (UM6P). Graduated as a process, energy, and environmental engineer from the National School of Applied Sciences of Khouribga in 2014. Dr. Loubna has developed a great interest in the field of material chemistry and has become more aware of the increasing world's energy demands and environmental concerns. For these reasons, she joined the MSN department at Mohammed VI Polytechnic University and the LIMAT laboratory at Hassan II University as a Ph. D. student. In 2020 she received her Ph. D at Materials Sciences.

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# Novel methylcellulose@lignin bio-composite as an eco-friendly and multifunctional coating material for good nutrients management

F-Z. EL BOUCHTAOUI<sup>1</sup>, E-H. ABLOUH<sup>1</sup>, I. KASSEM<sup>1</sup>, M. SALIM<sup>1</sup>, Z. KASSAB<sup>1</sup>, H. SEHAQUI<sup>1</sup>, M. EL ACHABY<sup>1,\*</sup>

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## Abstract

To obviate adverse effects from the non-biodegradability of certain polymer-based slow-release fertilizers (SRFs) and to offset higher operational costs, the use of biopolymers as coating material has recently caught interest in the research circles. The present work aims to design a sustainable coating material based on biodegradable polymers. To this end, Alfa plant was initially exploited as a viable sustainable source for the extraction of lignin (LGe), that was in turn integrated in the development of a three-dimensional crosslinked network, including methylcellulose (MC) as a matrix and citric acid (CA) as a cross-linking agent. Then, the designed coating material was applied onto Di-ammonium Phosphate (DAP) and Triple Superphosphate (TSP) water-soluble fertilizers in a rotating pan machine. Chemical and physical characterizations, in addition to biodegradation investigation, have all ensured that the coating material was benign to the environment. Nutrients release experiments in water as well as in soil environments have proved the effectiveness of the MC and MC@LGe coating layers in delaying the nutrients discharge. Besides, the nutrients release from coated DAP and TSP lasted longer than 30 days. Furthermore, the bio-composite membrane enhanced the fertilizers mechanical resistance and boosted the soil water retention capacity. These results showed that this hybrid composite based on extracted lignin and methyl cellulose could be used as an efficient coating material to produce slow-release fertilizers with multifunctional performances.

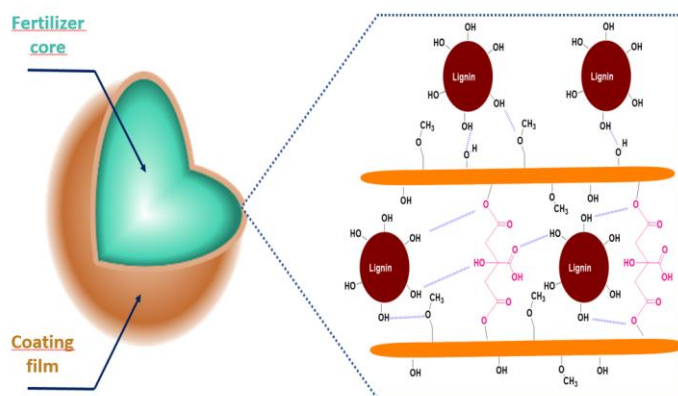
## Biography



Fatima-Zahra EL BOUCHTAOUI, 25 years old, is currently a PhD student at Materials Science, Energy and Nanoengineering department –Mohammed VI Polytechnic University– Benguerir- Morocco. She received in 2019 her master's degree in Polymer Materials & Environment from Faculty of Sciences and Technologies – Cadi Ayyad University-Marrakech-Morocco. She is currently working on the development of new lignin-based formulations for the coating of water-soluble fertilizers, in order to achieve slow-release fertilizers with high nutrients use efficiency.

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**Figure:** Physico-chemical interactions inside the polymeric membrane.



## Recent Publications

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2. Kassem I., Ablouh EH., El Bouchtaoui FZ., Kassab Z., Hannache H., Sehaqui H., El Achaby M., *Prog. Org. Coat.*, (189 (2021) 1029–1042

# Electrochemical characterization of trimetazidine hydrochloride on PEDOT modified glassy carbon electrode by stripping square wave voltammetry

Abdelqader El Guerraf<sup>1</sup>, Sana Ben Jadi<sup>2</sup>, Nurgul Bakirhan<sup>3</sup>, Yalcin Ozkan<sup>4</sup>, Sibel Ozkan<sup>5</sup>, Mohammed Bazzaoui<sup>2</sup> and El Arbi Bazzaoui<sup>1</sup>

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<sup>5</sup> Department of Analytical Chemistry, Faculty of Pharmacy, Ankara University, Ankara, Turkey

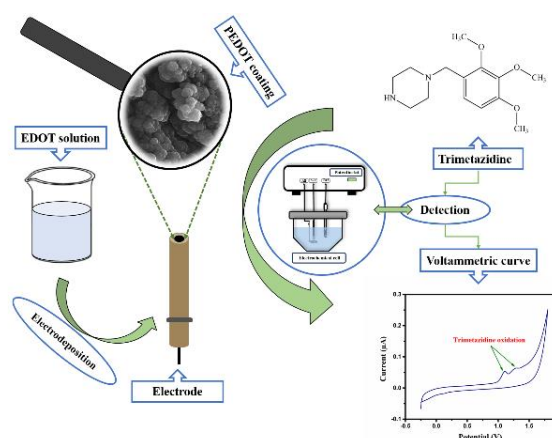
## Abstract

Trimetazidine (TMZ) dihydrochloride [1-(2,3,4-trimethoxybenzyl)-piperazine dihydrochloride] is a highly effective, well-tolerated drug, usually known for its antianginal effect, maintains cellular homeostasis, correcting the disorder of ion pumps and sodium/potassium cross membrane flow and acts as a scavenger of oxygen radicals. Up to these days, the action mechanism of TMZ is still hard to explain.

In the following study, we report the modification of glassy carbon electrodes using PEDOT coatings in order to investigate the electrooxidation of TMZ as well as a possible mechanism of action. The electrochemical analysis of this drug was studied by cyclic, differential pulse, and square wave voltammetric methods in solutions of different pH values and the results have shown that square wave voltammetry (SWV) is the most suitable one for analytical characterization. This latter can offer a rapid analysis, simple operation, and low-cost instrumentation.

In this work, the main objective is the possible practical use of the proposed method on an industrial level, thus, the analytical characterization of the sensor was undertaken for the direct determination of TMZ in urine and serum. All results confirmed the good sensitivity, accuracy, and selectivity of the elaborated polymer.

**Figure:** Schematic illustration for the electrochemical detection of TMZ on PEDOT modified GCE



## Recent Publications

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## Biography



### Abdelqader El Guerraf

A passionate research scientist from Mohammed First University with over 5 years of experience in physical chemistry and electrochemistry. Exceptional expertise in electrosynthesis, electroanalytical techniques, conducting polymer, nanomaterials, food packaging, corrosion, sensor, and fuel cell.

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## Elaboration by coacervation method, structural investigation and durability of new glasses

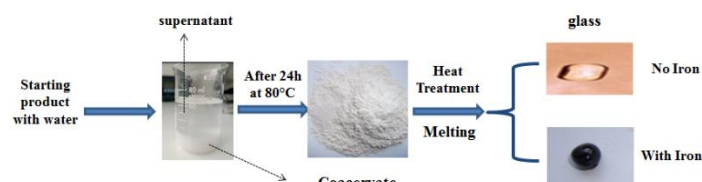
A. RGUIBI<sup>1</sup>, K.Ba<sup>1</sup>, R.Driss<sup>1</sup>, H.El Aaad<sup>1</sup>, T.Jermoumi<sup>1</sup>, A. Hsini, A.Shaim<sup>1</sup>, A.Chahine<sup>1</sup>

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### Abstract

The structure of phosphate glasses has been the subject of many researches due to their superior physical properties such as high thermal expansion, low melting and softening temperatures. In addition, the hygroscopic nature of these glasses offers them a limited field of application. Through this method of soft chemistry which names coacervation one make the glasses with the same properties as those of glasses prepared by meltquench method, with the power to control through different processing parameters: the concentrations and the initial pH. However, it makes an attractive method for coating and joining processes on the industrial scale. The aim of this work is to study and characterizing the zinc iron phosphate glasses prepared by coacervation method. The obtained glasses were examined by ICP-AES, density methods, FTIR spectroscopy, XRD, and DSC. A linear correlation was identified between the evolution of the experimental Fe/P ratio and the theoretical one, with a slope close to unity. Thermal analysis shows that the difference between the glass transition temperature  $T_g$  and the crystallization onset temperature  $T_c$  decreases with the addition of iron oxide. The incorporation of iron at increasing rates in the glass significantly increases its water resistance, according to the study of chemical durability of these glasses.

Fig. Experimental Protocol



### Recent Publications

1. R.O.Omrani,S.Krimi,J.J.Videau,I.Khattech,A.ElJazouli,M.Jamal. Structural and thermochemical study of Na<sub>2</sub>O-ZnO-P<sub>2</sub>O<sub>5</sub> glasses,J.of Non-Crystalline 390(2014)5-12.
2. G. palavit, L. Montage. R.Devalal,Preparation of zinc sodium phosphate glass precursors by coacervation, JNon. Cryst. Solids. - 189(1995)27.
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### Biography



Rguibi Amina was started her PhD in 2019, from the Laboratory of Advanced Materials and Process Engineering, Faculty of Science, Ibn Tofail University under the supervision of Mr Chahine Abdelkrim Her primary research interests are in the field of materials. Specifically, she is interested in manufacturing of new materials used in different applications (durability, photocatalysis and corrosion inhibitors)

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# Application of pozzolan as a material for thermal insulation of buildings

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## Abstract

The energy consumption in the building continues to increase, as In Morocco the annual energy consumption (from all sources) per capita is 0.5 toe. This energy consumption increases by 4.3% every year. The electricity consumption per capita is 781KWh per year, with an annual increase of 7.8%[AMEE]. The improvement of energy efficiency is necessary to reduce this consumption.

The present work consists to enhance thermal properties of Pozzolan by combining it with plaster. Indeed, Pozzolan is a volcanic rock and renewable product with thermal properties very interesting due to its microstructure and porosity. It is coming from Taza (Moroccan)The main objective of this work is to study how the embedded Pozzolan with plaster modifies thermal properties of mortar; this study will be a contribution to the understanding of the thermal behavior of this composite to motivating the proposal that it will be used as a double partition between two walls.

**Keywords :** Pozzolan; energy efficiency, concrete, mortar.

## Biography



Khadija Aanaba is a Moroccan Ph.D student from National School of Mines, Rabat Morocco. She is working on energetic efficiency of buildings, ecological concrete and electrochemical characterization.

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# Applicability of X-ray diffraction and FTIR spectroscopy to evaluate changing in cellulose crystallinity of softwood during natural ageing process

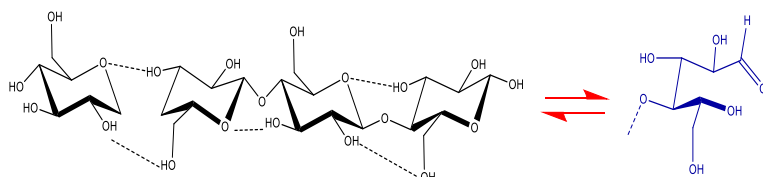
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## Abstract

The purpose of the present study is to report the main changing of crystalline cellulose fraction originated from four samples of Moroccan softwood using X-ray diffraction (XRD) and Fourier transform infrared spectroscopy (FTIR). Qualitative evaluation of superposed diffractograms showed the presence of three fundamental peaks characteristic of cellulose  $I_{\beta}$  detected at  $2\theta=14,8^{\circ}$ ;  $16,5^{\circ}$  and  $22,6^{\circ}$  and attributed to the  $(1\bar{1}0)$ ,  $(110)$  and  $(200)$  crystallographic plans, respectively<sup>1,2</sup>. The XRD analysis confirms the crystalline cellulose sensitivity to degradation by showing the decrease in the crystallinity index (CrI %) during ageing process. No significant changes were observed on crystallite size ( $D_{200}$ ) exception marked for some samples, when the significant size value could be justified by re-crystallization of degraded cellulose after removing of the amorphous fraction, consequently, formation of larger crystals. The appearance of additional diffraction peaks at  $2\theta$  of  $43^{\circ}$  and  $73^{\circ}$  refers to the residual fraction resulting from the decay of wood components and/or the secretion substances due to the living organisms. The recorded spectra of FTIR for different samples indicate significant decrease in the intensities of the bands assigned to the crystalline cellulose located at 3278, 1425, 1318, 898 and 710  $\text{cm}^{-1}$ . This decline can be justified by decreasing cellulose crystallinity accompanied by an increase of disordered structure (amorphous form) identified by the absorptions located at 1337 and 1156  $\text{cm}^{-1}$ <sup>3</sup>. The appearance of new vibration band ascribable to carbonyl groups (1738  $\text{cm}^{-1}$ ) revealed by FTIR spectra is a result of cellulose oxidation (Fig. 1)<sup>4</sup>. The present data developed a detailed understanding of changes that occur at the cellulose microcrystalline structure and may be applicable to other types of cellulose polymorphs.

Figure: Cellulose Oxidation mechanism



## Recent Publications

1. M. Cairul, I. Mohd, A. G. Abadi, and H. Katas, Carbohydr. Polym., vol. 99, pp. 180–189, 2014.
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## Biography



Dr. Somia FELLAK is a Ph.D. researcher who has been extensively involved in materials sciences. She obtained her Ph.D in Sciences and Engineering of Materials and Process from Sidi Mohammed Ben Abdellah University, Morocco, in December 2020. She had an extensive research experience in material characterization and the study of their chemical, mechanical, elemental and morphological properties using vibrational spectroscopy, molecular spectrometry, microscopy and spectrophotometry. The strong experience that she gained in the survey of effect of degradation processes on the material's structure will be carried on the research of new materials for reversible conservation-restoration and exhibiting good stability for the studied works.

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# The evolution of tribasic lead sulfates features during paste curing of positive active material of lead acid battery

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## Abstract

As decarbonization continues to be a need and a necessity, energy storage continues its race to ensure a better transition to a green world. The automotive sector is one of the ecosystems where the demand for new functions is increasing, so the Pb-acid battery is now facing a challenge where electrification is at the heart of the challenge. The scientific community is then in search of new configurations allowing better performances to meet the requirements of the automotive sector today. However, the positive electrode of lead acid battery (LAB) still limits battery performance due to shedding of matter, but several approaches have been attempted to remedy this problem either with the incorporation of additives[1,2] or by electrode modification[3]. Because of LAB manufacturing process is very sensitive, any change can be manifested in final performances, we aim to retrace the development path of LAB and to preserve electrode mechanical properties. We modeled five experimental responses: crystallite size and content of both PbO and tribasic lead sulfates (3BS) phases, and specific surface area of cured paste. The design of experiments was performed using the AZURAD® software. This design considers three factors, two are quantitative factors (water/LO ratio and acid/LO ratio) while the third one is a qualitative factor (curing) with two levels. SEM, XRD and BET were used to characterize the pastes after curing.

The acid to oxide ratio is significant in controlling the 3BS content. At high temperature, the acid to oxide ratio (acid/LO ratio) shows more influence on the 3BS size, above 10% the 3BS size becomes very slightly impacted by both ratios. The peak temperature in the curing phase mitigates the effect of both ratios on the size of 3BS. Results reveals two zones of nanostructured paste material evolution delimited at 10% of acid/LO ratio.

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## Publications

1. Boutamart, M., Jhabli, O., Nouneh, K., Rafqah, S., Eid, A. I., Briche, S., & Salem, Y. A. B. (2022). Environmental-friendly superhydrophobic bioactive nanocoatings. In *Fundamentals of Bionanomaterials* (pp. 77-110). Elsevier.

## Biography



PhD Student in Ibn Tofail University / MAScIR.

Currently pursuing a PhD in the subject of Pb-acid batteries for automotive application. The goal of my PhD thesis work is to investigate and optimize the electrical and electrochemical performances of the Pb-acid cell through the development and elaboration of additives that address the new needs of the automotive battery..

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# Rheology and dissolution of a cellulose/imidazolium-based ionic liquid solution

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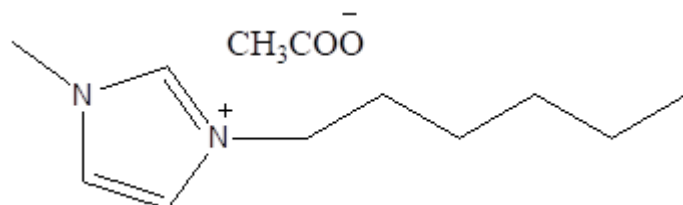
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## Abstract

Cellulose is the most abundant organic compound found on earth, it has highly desirable properties such as biocompatibility, biodegradability, thermal and chemical stability. It is widely used in several industries such as textiles, plastics, wood, cosmetics and pharmaceuticals. Cellulose presents a difficulty of dissolving in water due to its intermolecular and intramolecular hydrogen bonds, which limits the extent of its application. Therefore, the search for power and eco-friendly solvents for cellulose processing has been a key issue in this field for decades. Recently, considerable attention has been received in the research related to the application of ionic liquids (ILs) in the dissolution of cellulose. ILs are defined as pure compounds, consisting only of cations and anions. They have negligible vapor pressure, thermal stability, low melting point (< 100 °C), recyclable, lower viscosity and are non-flammable. In this work, the dissolution of cellulose in 3-hexyl-1-methylimidazolium acetate ionic liquid was carried out in order to study the impact of the anion acetate of the IL on the cellulose dissolution. The viscosity properties of cellulose dissolved in IL were studied in the concentration range of cellulose from 2 to 10 wt%.

Figure:



## Recent Publications

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2. Aghmih K., Wakrim H., Boukhriss A., El Bouchti M., Majid S., Gmouh S., *Polym. Bull.* (2021) 1-13.
3. Aghmih K., Tourarssi I., Gmouh S., Hlaïbi M., Majid S., *E.M.J.E.* (2019) 1733-1737.
4. Azmami O., Sajid L., Boukhriss A., Majid S., El Ahmadi Z., Benayada A., Gmouh S., *J. Sol-Gel Sci. Technol.* 97 (2021) 92-105.

## Biography



Dr. Sanaa Majid (female) is an Associate Professor (HDR) in chemistry, member of the laboratory of Materials Engineering for the Environment and Valorization. Her research focuses on development of new innovative (nano) composite materials for natural resources valorization and environment monitoring. She supervises 3PhD students and has supervised more than 20 undergraduate and postgraduate students. She has participated in 7 projects funded by the EU, International and national bodies (Prima, Erasmus, PHC Toubkal, FP7, Moroccan Ministry of Education and Tempus). Her H-index is 7 on Scopus.

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## Preparation of superhydrophobic concrete for preserving building facades

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<sup>1</sup>Department of Energy Storage and Multifunctional Coatings, Moroccan Foundation for Advanced Sciences, Innovation & Research (MAScIR), Rabat, Morocco

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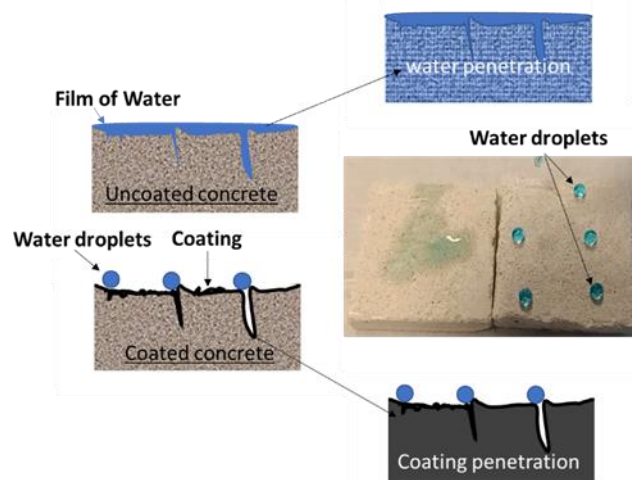
<sup>3</sup>Laboratoire de Chimie Analytique et Moléculaire (LCAM) Safi Polydisciplinary Faculty, Cadi Ayyad University Sidi Bouzid, B.P. 4162, 46000 Safi, Morocco

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### Abstract

Concrete facades can deteriorate for a variety of reasons, and damages is often the result of a combination of several factors, such as ultraviolet radiation, temperature changes (thermal cracking), abrasion, erosion, fine dust pollution, and microbial adhesion, which increases their vulnerability to developing surface defects. The permeability and water penetration associated with the hydrophilic character of concrete allows water to quickly penetrate into its structure during rainy seasons. This penetration is the principal cause of all major physical and chemical degradation processes affecting concrete structure. Protecting the concrete surface with superhydrophobic coatings remains one of the best alternatives for overcoming water penetration. In this study, a fluorine-free water-repellent coating based on siloxane as low surface energy material was developed and successfully applied to concrete substrates using dip-coating technique. The prepared formulations have a high stability during storage in the bottle, and the coated concrete showed superhydrophobicity with high water contact angle (WCA) over than 150°. Besides, the self-cleaning properties, mechanical robustness, stability under UV radiations, resistance to temperature and humidity were investigated. After 10 cycles of abrasion test and 720 hours at 45°C and 80% humidity, the coated concrete maintained its self-cleaning properties. Natural out-door aging tests have shown that the coating is weather resistant.

### Figure



### Recent Publications

1. M. Boutamart et al., « Chapter 4 - Environmental-friendly superhydrophobic bioactive nanocoatings », in Fundamentals of Bionanomaterials, A. Barhoum, J. Jeevanandam, et M. K. Danquah, Éd. Elsevier, 2022, p. 77-110. doi: 10.1016/B978-0-12-824147-9.00004-2.
2. I. Jellal et al., « Enhanced photocatalytic activity of supported Cu-doped ZnO nanostructures prepared by SILAR method », Optical Materials, vol. 111, p. 110669, janv. 2021, doi: 10.1016/j.optmat.2020.110669.
3. M. Boutamart, S. Briche, K. Nouneh, S. Rafqah, et Y. Agzenai, « Transparent and Self-Cleaning Surfaces Based on Nanocomposite Sol-Gel Coatings », ChemistrySelect, vol. 5, no 28, p. 8522-8531, 2020, doi: 10.1002/slct.202002027.

### Biography



Since 2017, Mustapha BOUTAMART has started working on thin films for glass in MAScIR foundation. He is currently a Phd student in third year of study, and his research focuses on the development of technological solutions based on nano-composites for self-cleaning applications. During all this period, Mustapha was able to participate in several research works, among these works: Transparent and Self-Cleaning Surfaces Based on Nanocomposite Sol-Gel Coatings, Chapter 4 - Environmental-friendly superhydrophobic bioactive nanocoatings....

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## Relationship between color facemasks and their electron donor acceptor character

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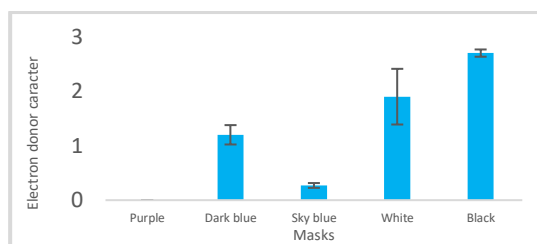
### Abstract

Protective facemasks made of non-woven fabric are widely used during the Covid-19 pandemic. In the literature, it is reported that the surface properties of the facemasks are among the factors that could influence their filtration efficiency. Moreover, these properties could even have an effect on the step that precedes the filtration, which consists in the adhesion of the microorganism on the surface of these facemasks. In this study, we evaluate electron donor and acceptor character of the surface of five colored masks made of non-woven fabric using the contact angle method. The contact angle measurements showed that the five masks used in this work are classified as hydrophobic while the electron donor/acceptor character varies according to the color of the five facemasks. These results are discussed in terms of their potential impact on adhesion of microorganisms on the surface of the mask.

Figure: Electron acceptor character of five facemasks



Figure: Electron donor character of five facemasks



### Recent Publications

1. Koubali, H., Louali, M. E., Zahir, H., Soufiani, S., Mabrouki, M., & Latrache, H. (2021) *International Journal of Adhesion and Adhesives*, 104, 102754.
2. Elgoulli, M., Aitlahbib, O., Tankiouine, S., Assaidi, A., Louali, M. E., Zahir, H., & Latrache, H. (2021). *Folia Microbiologica*, 66(4), 607-613.

### Biography



Ikhlas Hani Chennoufi, third year PhD student at the Faculty of Science and Technical in Beni Mellal, Morocco. I am interested in the interfacial phenomena involved in the biocontamination of medical device surfaces.

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# The effect of bending load for two geometries design of AISI 316L cardiovascular stent

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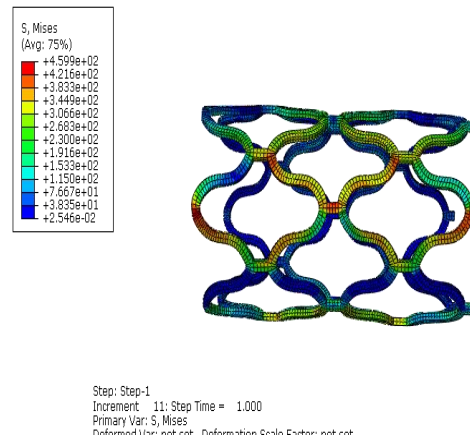
<sup>2</sup>ENSAO, Mechanics and Scientific Calculation Team, Mohammed 1st University.

<sup>3</sup>Materials, Energy and acoustics team, EST Sale, University Mohamed V Rabat

## Abstract

In the present study, Abaqus finite element modelling was used to explore the durability of cardiovascular stent made of AISI 316L under bending loading. In order to achieve this purpose, two geometries of stent are explored: the U-shaped and  $\Omega$ -shaped stent. The cyclic loading of blood pressure doesn't cause fracture. This result was confirmed by many studies. However, when subjected to bending loading the stent was found to experience an in-service failure. The last proved to the artery movement and depends on the increase of bending loading. However, the  $\Omega$ -shape stent permits a better distribution of load than the U-shape one. The cyclic work hardening is a very important parameter to translate the behavior elasto-plastic materials, which depending on the imposed loading paths, this work constitutes a contribution to a modeling of low-cycle fatigue with imposed deformation, using three types of alloys using the Abaqus calculation code. This modeling enabled us to determine the mechanical characteristics in traction and compression of the materials studied and to establish their curves of monotonous and cyclic work hardening. The results obtained made it possible to determine the service life of aluminum alloys.

Figure



## Recent Publications

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6. Bianca K., Nadja O., Anna-Lena P., Ludger L., Steffen A., Michael H., International Journal of Fatigue, Volume 153, 2021.

## Biography



Professor at the Oujda National School of Architecture, specializing in civil engineering. holder of a doctorate in mechanics and materials (fatigue of materials) from the national school of applied sciences oujda in 2017. several of my works are published in the field of low-cycle fatigue and endurance fatigue.

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# Strength characteristics and Rheological behaviour of high volume Fly ash concrete

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## Abstract

The objective of this work is the valorisation of fly ash of class C (FA-C), industrial waste generated by the JERADA thermal power plant in the production of green concrete. Concrete being one of the most used materials in construction; the incorporation of this mineral addition has the effect of reducing the cost of concrete and greenhouse gases emissions. The effects of FA-C on the mechanical properties (compressive strength) and rheological (viscosity) were systematically investigated.

Several concrete mixes have been formulated: the first serves as a control, and does not contain any mineral admixture. The others contain FA-C in the order of 15 to 50% in partial replacement of cement. For each series of tests, a set of standard size cylinders (15-30) was performed. The raw materials and the elaborated specimens were analysed using several analytical methods such as X-ray diffraction (XRD), scanning electron microscopy (SEM), and Fourier transform infrared spectroscopy (FTIR).

The compressive strengths of the prepared concrete were measured after 7 and 28 days and then compared to the conventional concrete (CC). The results showed that the mixture with 15% of FA-C showed the maximum compressive strength. To successfully process concrete, it is necessary to predict and control its flow behavior. In order to investigate the rheological properties of blended cement pastes, a rotational viscometer was used to determine the flow characteristics of ordinary and blended cement pastes. The results showed that the addition of fly ash decreases yield stress and plastic viscosity cement pastes.

## References

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## Biography



Hanane Boutkhil

PhD student, I started my PhD in 2019 at Laboratoire de Physico-Chimie des Matériaux Inorganiques et Organiques, Ecole Normale Supérieure- Mohamed V University in RABAT MOROCCO. My focus is based on building material mineral additions and geopolymers.

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## Fabrication of different surface-modified cellulose nanocrystals as green materials for water treatment

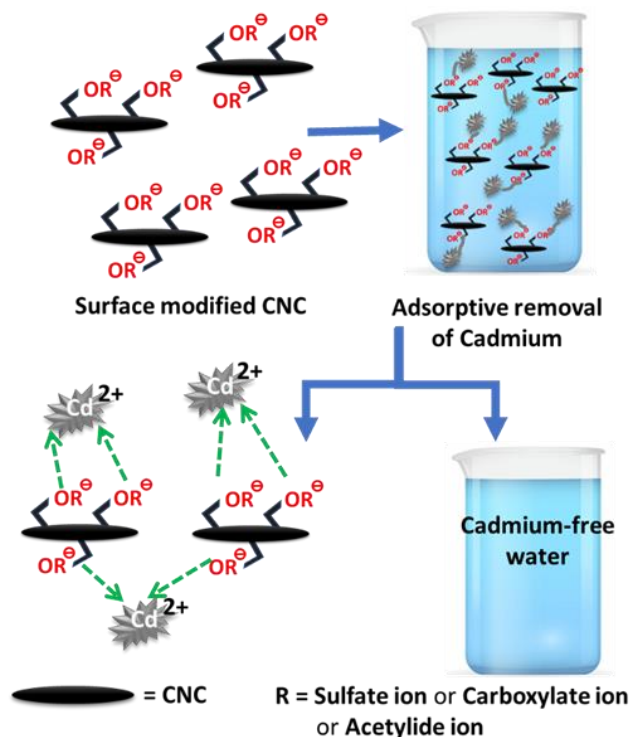
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### Abstract

Anionization of cellulose nanocrystals (CNC) is the most widely used fabrication of CNC for adsorption, because of the necessity to remediate wastewater from cationic metal ions [1]. Sulfation, acetylation, and carboxylation are the most common CNC anionization techniques with strong reaction conditions that could destroy the structure of the CNC [2,3]. In this work, sulfonated, acetylated, and carboxylated cellulose nanocrystals were studied as nano-adsorbent for the effective removal of cationic toxic cadmium. All extracted CNC were characterized by FTIR, zeta potential, conductometric titration, AFM, and XRD techniques. The adsorption capacity of  $\text{Cd}^{2+}$  was subsequently studied, and the effect of adsorption process parameters was determined in a controlled batch system. Based on the results, the highest removal percentage (85%) and adsorption capacity of 269 mg  $\text{Cd}^{2+}$  per g of CNC was obtained for sulfonated-CNC, which was remarkable compared to other modified CNC capacities cited in the literature. Furthermore, the  $\text{Cd}^{2+}$  removal mechanism was investigated based on characterization results before and after adsorption and based on the kinetics results. Overall, this study demonstrated the potential application of sustainable and biodegradable quinoa stalks-based CNCs as an environment-friendly adsorption material with an excellent  $\text{Cd}^{2+}$  removal effect.

Fig. Surface-modified green cellulose nanocrystals for wastewater treatment application



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1. P. Moharrami, E. Motamedi, Bioresour. Technol. 313 (2020) 123661.
2. H. Yu, L. Zheng, T. Zhang, J. Ren, P. Meng Environ. Sci. Pollut. Res. 1 (2022) 1–14.
3. O.A. Oyewo, B. Mutesse, T.Y. Leswif, M.S. Onyango. J. Environ. Chem. Eng. 7 (2019) 103251.

### Biography



Mohamed Hamid Salim has his expertise in evaluation and passion in reducing water pollution using green technologies. His focus is based on the use of natural plant resources and biomass to have application in different fields such as water treatment. He was awarded his master's degree in 2019 and is currently a Ph.D. student at Mohamed VI Polytechnique University, Morocco. He published more than 8 papers. His H-index is 4 on Scopus.

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# The effect of some adjuvant and heating temperature on the purification of phosphoric acid through the vapometallurgical process

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## Abstract

Phosphoric acid ( $H_3PO_4$ ) is commonly used in the several industries, including pharmaceutical, food, electronics or as fertiliser. Commercially phosphoric acid is usually obtained from phosphate ores through a wet or thermal process. Using the wet process, the obtained phosphoric acid is loaded with several impurities such as  $Cd^{2+}$ ,  $Mg^{2+}$ ,  $Pb^{2+}$  that limits its utilisation especially in fertilisers or food industries. In this study the thermal process is used to minimise the presence of undesirable elements in the phosphoric acid. Thus, phosphate rocks from de Boucraâ/Laâyoune (Morocco) was grounded and then heated with some adjuvant such as  $LiCl$  and  $MgCl_2$  at two different temperatures (700 and 900°C). Then, the phosphoric acid was produced and the reduction of heavy metals was evaluated. The obtained results indicated that treating phosphate rocks with  $LiCl$  enhanced the removal efficiency than other adjuvants. The purified phosphoric acid is next used to prepare calcium phosphate phases to be applied for medical and environmental applications.

**Keywords:** Phosphoric acid, purification, thermal processes, Boucraâ-Morocco, calcium phosphate

Figure: Raw phosphate nanoparticles



## Recent Publications

1. A.Nounah , M. FERHAT, Thèse 2015 . page 132
2. M. HUTTON, Phosphorus and Potassium, n°132, 33, (1983)
3. J.L IACOUT, Thèse, Institut National Polytechnique de Toulouse, (1983).

## Biography



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## Porous materials for water vapor related applications

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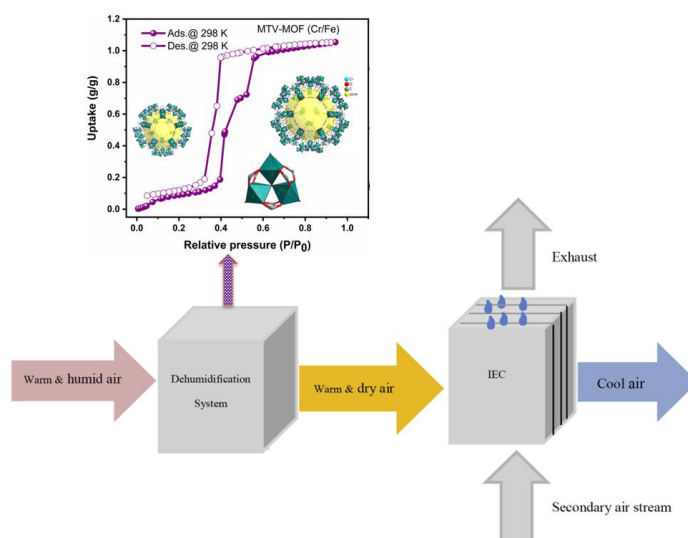
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### Abstract

Morocco and north African countries are known by their hot weather in some regions such as the south of Morocco with an average of almost 30 °C. This creates a permanent need supply of air-conditioning all over the four seasons which is currently dominated by vapor compression systems (VCS). The VCS has several drawbacks, the high cost and the toxicity of refrigerants being some of them. On the other hand, the alternative evaporative cooling system is an eco-friendly cooling technology, but the cooling efficiency is very low under humid conditions. To increase the cooling efficiency of an evaporative cooling system, the air could be pre-dried (dehumidified). Adsorption over a solid desiccant holds a lot of promise for air dehumidification. Among the different porous solids, metal-organic frameworks (MOFs), have recently shown huge promise for deployment in such applications. This work concerns the synthesis and characterization of Cr and Al based MOFs that have promising water adsorption properties to be deployed for evaporative cooling systems. The MOFs were prepared mainly by solvothermal (hydrothermal) synthetic routes. For those MOFs that were evidenced to be phase pure by powder X-ray diffraction analyses, further characterizations were conducted using FT-IR and specific BET surface area measurements. Moreover, mixed-metal approach was attempted to assemble multivariate MOFs that could have potential impact on the water adsorption profiles of the pristine MOF. Water adsorption isotherms were also collected for some of the synthesized MOFs and gave S-shaped isotherms with different onset points.

Figure:



### Recent Publications

1. Mentrane A., Delhali A., Ouikhalfan M., Assen A., and Belmabkhout. A, Submitted to Journal of Chemical & Engineering Data (under revision)
2. Ouikhalfan M., Lakbita O., Delhali A., Assen A., and Belmabkhout. Y Energy & Fuels 2022 36 (8), 4198-4223.

### Biography



**Achraf Delhali** is a Ph.D. student at Mohammed VI Polytechnic University. He obtained his bachelor at Cadi Ayyad university as a valedictorian in chemical analyses and quality, after his graduation he moved to Mohammed VI polytechnic university to prepare a M.Sc. degree in chemical sciences and valorization of natural phosphate (valedictorian). During his study, he acquired a solid background in phosphate chemistry and different phosphate-based fertilizers manufacturing processes. His current research is on development of porous solid-state materials for water-related and energy efficient applications.

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**NANOSCIENCE, ORGANIC AND INORGANIC ADVANCED MATERIALS**



# Bio-composites and bio-hybrid composites reinforced with natural fibers: Review

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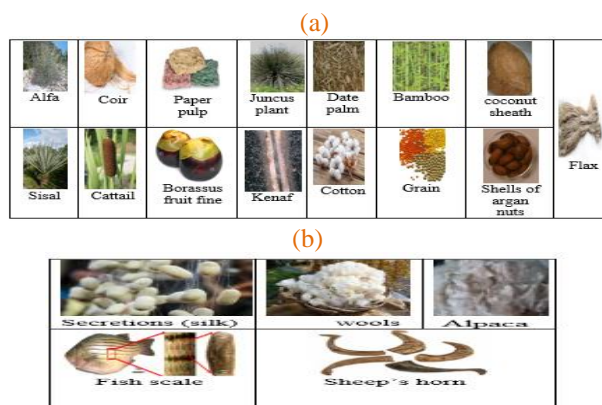
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## Abstract

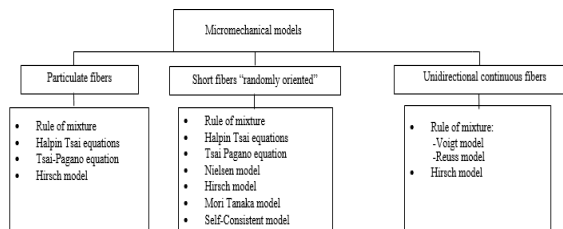
The need to adapt to sustainable development, green chemistry, and industrial ecology, which appear later, leads to the development of new materials. Among this new generation of materials are composites that are characterized by high performance. Several types of research are studying the evolution of bio-composites to obtain efficient and less expensive products, especially since the availability of petroleum and conventional materials seem to be exhausted, and their cost is high. This literature review presents a summary of composite materials reinforced with natural organic and inorganic fillers. Besides, it describes the hybrid composites materials reinforced with "natural/synthetic fibers" or with "natural fibers". These materials with natural reinforcement have a great capacity to replace conventional composites thanks to their low cost, lightness, and ecological advantages. In addition, it reports an idea about the resources of natural reinforcements, as well as their mechanical and chemical properties and their application domains. Thus, the last part summarizes the modelling approaches.

**Keywords:** Composite, Hybrid composite, Natural fiber, Mechanical and chemical properties, Modelling.

**Figure:** Natural reinforcement: (a) vegetables resources; (b) animals resources



**Figure:2.** Micromechanical models classified



## Recent Publications

1. Kumar S.M., Durairababu D., Subramanian K., *Materials and Design* 59 63–69, 2014.
2. Haba B., Agoudjil B., Boudenne A., Benzarti K., *Construction and Building Materials* 154 963–971, 2017
3. Nailia H., Jelidia A., Limama O., Khiari R., *Industrial Crops & Products* 107 172-183, 2017.
4. Boujmal R., Kakou C.A., Nekhlaoui S., Essabir H., Bensalah M., Rodrigue D., Bouhfid R and Qaiss A., *Journal of Thermoplastic Composite Materials* 1–18, 2017.
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## Biography



Author is currently a Ph.D. student at Mechanical Engineering laboratory. Faculty of Sciences and Technologies Fez. Her research focuses on the modeling of the mechanical and thermal behavior of composite materials and hybrid composites with natural reinforcements.

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## New ligands based of azine: Evaluation of the catecholase activity

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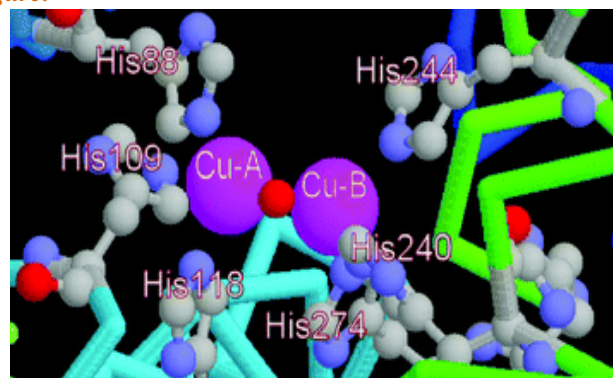
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### Abstract

Azines with C=N-N=C functional unit are important compounds with high interesting chemical properties and undergo a wide variety of chemical processes such as isolation, purification, and characterization of carbonyl compounds in addition They have several advantages as protective agent for example economic advantage due to low cost. Azines have been conventionally synthesised by the condensation of hydrazine with ketones and aldehydes and many alternate routes are also available [1].

Our main goal from this study is chowing the catecholase activity of complexes which are formed in situ by combination of azine derivatives and different metal salts. the study shows that azine derivatives ligands give high performance to catecholase activity in oxidizing catechol to quinone [2].

Figure:



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### Biography



Ilyass El Arkoubi is a student in the second year of a master's degree in applied chemistry, option polymer and applications at the Faculty of Science of Oujda, he obtained his professional licence in processes and physico-chemical analysis at the Polydisciplinary Faculty of Taza. He is currently working on the graduation project which is focused on the evaluation of the catecholase activity of new ligands azine based.

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# A green method for the preparation of montmorillonite essential oils nanostructured hybrid materials for protection and controlled release of volatile active compounds

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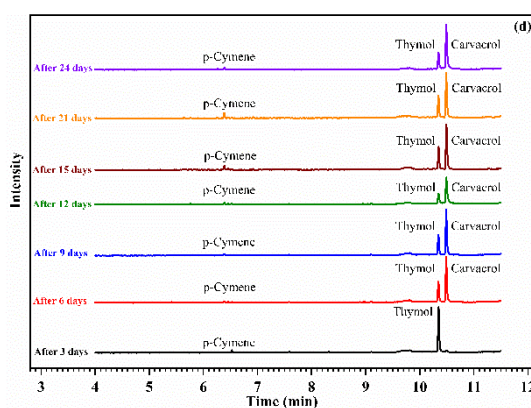
## Abstract

Encapsulation systems based on nanostructured biomaterials are of considerable scientific interest due to a number of their unique properties. A green method that can be easily used in different industrial applications, based on the modification of sodium exchanged montmorillonite (Na<sup>+</sup>-Mt) with essential oils (EO) such as thyme oil, thymol and carvacrol was presented. The obtained results show the prepared clays-essential oils hybrids were promising nanomaterials to encapsulate the active compounds and to control their release in the functional applications.

The obtained results show that the adsorption of thyme EO, thymol or carvacrol molecules on the Na<sup>+</sup>-Mt took place on the external surface i) by hydrogen bonds between the OH groups of thyme EO, thymol or carvacrol molecules and OH groups of Na<sup>+</sup>-Mt surface, and ii) by hydrogen bonds between these adsorbed molecules. The release study shows that the adsorption of EO like thyme, and its constituents such as thymol and carvacrol onto an inorganic porous material such as Na<sup>+</sup>-Mt provides extended controlled release of all adsorbed active molecules with their chemical stability.

**Keywords:** Na<sup>+</sup>-montmorillonite; Thyme oil; Thymol; Carvacrol; Controlled release.

**Figure:** The qualitative release chromatograms of thyme EO from Na<sup>+</sup>-Mt/OE hybrid materials



## Recent Publications

1. **Kamal Essifi**, Abdourahim Hammani, Doha Berraaouan, Ali El Bachiri, Marie-Laure Fauconnier, Abdesselam Tahani. *Materials Chemistry and Physics* (2021).
2. **Kamal Essifi**, Mohamed Brahmi, Doha Berraaouan, Abderrahim Ed-Daoui, Ali El Bachiri, Marie-Laure Fauconnier, and Abdesselam Tahani. *Journal of Chemistry* (2021).
3. **Kamal Essifi**, Mohammed Lakrat, Doha Berraaouan, Marie-Laure Fauconnier, Ali El Bachiri, Abdesselam Tahani. *Polymer Bulletin* (2020)
4. **K. Essifi**, A. Ed-Daoui, D. Berraaouan, M. Benelmostafa, M. Dahmani, A. Tahani. *Materials Today: Proceedings* (2020)
5. **Kamal Essifi**, Mohammed Nor, Doha Berraaouan, El Houssien Akichouh, Ali El Bachiri, Allal Challioui, Abdesselam Tahani. *Moroccan Journal of Chemistry*, Vol 9, No 1 (2021).

## Acknowledgement

This work was supported by the MESRSFC and CNRST (Morocco) under grant No. PPR 15-17, and UMP under grant No. PARA1-2019. The authors are also thankful to the Professor Abdelmonaem Talhaoui, Head of Department of Chemistry, Faculty of Sciences, Mohammed first University, Oujda, Morocco, for managing Department of analysis.

## Biography



**Kamal Essifi** is a PhD student at faculty of Sciences, Mohammed 1<sup>st</sup> University, Oujda. Kamal does research in microencapsulation by the organic, inorganic and hybrids biomaterials. Their current project is “Microcapsules of Hydrogels of Natural Substances: Relationship Structure Properties and Applications”.

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## Experimental, kinetic and thermodynamic adsorption of a cationic dye by raw and activated bio-adsorbent

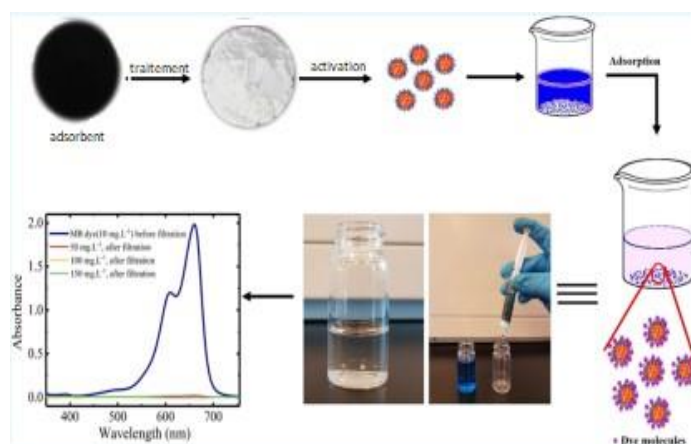
Bouhassane Fatima Zahra\*<sup>1</sup>, EL Amri Abdelhay<sup>1</sup>, Lebkiri Azeddine<sup>1</sup>, Wardighi Zineb<sup>1</sup>, Lebkiri Ahmed<sup>1</sup>, El Housseine Rifi<sup>1</sup>

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### Abstract

Natural adsorbents based on plant are among the most widely used low-cost biomass materials for removing pollutants from aqueous media. The behavior of the cationic dye in the presence of a natural adsorbent (SB) and activated by a T.A (SA) is closely related to the physico-chemical parameters of the studied system[1]. They were conducted on the effect of contact time, initial adsorbate concentration, pH, mass of the support and temperature. The composition of the adsorbent was studied by Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDX) techniques[2]. Adsorption was mainly fitted to Langmuir and Freundlich isothermal models and pseudo first and second order kinetic model. The examination elucidated the excellent potential power for the removal of the dye by (SA), as well as the sorption process reached a steady state in 1h. The thermodynamic results revealed that the pH has a remarkable influence on the removal process of cationic dyes from aqueous solutions, the cationic dye removal rates corresponding to (SB) and (SA) were 82.47% and 91.73% respectively, it was also observed that the adsorption is highly spontaneous and that the supports have a high reuse potential, which highlights their value for industrial applications[ 3]. Modeling of the adsorption by kinetic models showed that the adsorption process by (SB) and (SA) follows a pseudo-second order and langumir .

Figure:



### Recent Publications

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3. [Martens, M., Karlsson, N. P., Ehde, P. M., Mattsson, M., & Weisner, S. E. (2021). The greenhouse gas emission effects of rewetting drained peatlands and growing wetland plants for biogas fuel production. *Journal of Environmental Management*, 277, 111391.

### Biography



Fatima Zahra Bouhassane received a master's degree in Organic Chemistry from the Faculty of Sciences, Ibn Tofail University, Morocco, in 2019 and is now a Ph.D. student in organic chemistry at Ibn Tofail University. His research has focused on the liquid-solid extraction of organic and inorganic materials by a natural adsorbent.

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# Bis[hydrazinium(1+)] hexafluorosilicate $(N_2H_5)_2SiF_6$ novel hybrid crystal as an efficient, reusable and environmentally friendly heterogeneous catalyst for Knoevenagel condensation and synthesis of biscoumarin derivatives

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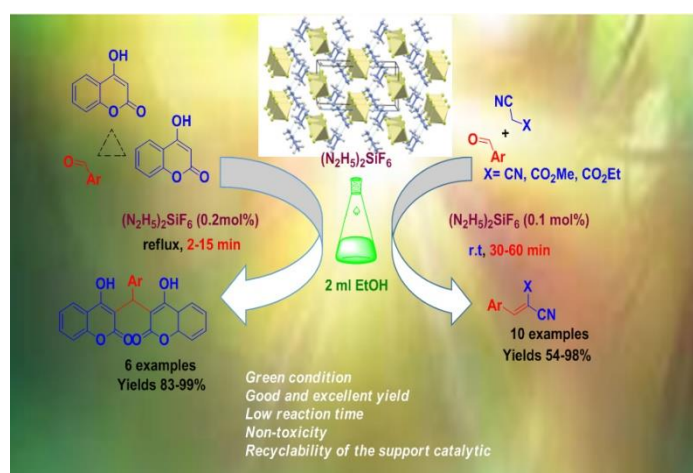
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<sup>3</sup>Regional Center of Education and Training of the Trades, Madinat Al Irfane, Souissi, BP 6210, Rabat, Morocco.

## Abstract

According to the principles of green chemistry, sustainable synthesis routes are highly sought after, not necessarily to maximize conversions and yields, but rather to minimize energy consumption and waste production<sup>1</sup>. In this context, the integration of catalytic processes played an important role in the chemical and pharmaceutical industries<sup>2</sup>. This interest is due to the catalyzed reactions simplicity, the energy and solvents reduction, and the increase in the product yield. Generally, the Knoevenagel condensation<sup>3</sup> and the coumarin synthesis are reactions still frequently applied, in the synthesis of certain new drugs<sup>4</sup>. Moreover, the biscoumarin derivatives have a broad spectrum of biological activity<sup>5</sup>. In this work, we have developed a simple, effective, green, and non-toxic protocol that was used for the Knoevenagel condensation and the biscoumarin derivatives synthesis. It has demonstrated that the use of a new hybrid crystal as a heterogeneous catalyst makes it possible to obtain several advantages such as a short reaction time and exceptional catalytic activity. Furthermore,  $(N_2H_5)_2SiF_6$  was examined for five successive cycles without significant loss of catalytic activity.

Figure:



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## Biography



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# Three-Dimensional Lattice Boltzmann Simulation of MHD Natural Convection in the Cuboid Cavity Centred by a Rectangular Cylinder uniformly heated and filled with ferrofluid $Fe_3O_4-H_2O$

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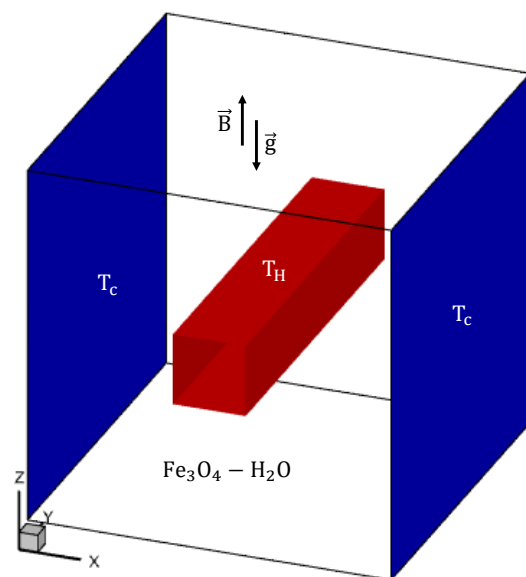
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<sup>2</sup>UPJV, University Institute of Technology, LTI, Amiens, France

## Abstract

Heat transfer by natural convection in 3D enclosures is one of the most important phenomena due to its interest in various practical and industrial applications, such as solar power collectors, cooling of electronic components and nuclear reactors, etc. [1]. More recently, the Boltzmann lattice method has become one of the most widely used numerical methods to study heat transfer by natural convection due to the many advantages that favor this method, such as simplicity of programming, simple implementation of boundary conditions, adaptability to parallel computation, etc. Several numerical studies have chosen the LBM to investigate heat transfer by natural convection in 3D cavities saturated with the nanofluid [2,3] or solid-liquid phase change problem [4]. The literature review showed that there is little work dealing with heat transfer by natural convection in 3D cavities containing a rectangular heating cylinder. In the present study, the heat transfer by natural convection in a cuboid cavity centered by a rectangular cylinder uniformly heated by a temperature  $T_h$  and cooled by the two opposite vertical facades, while the other facades are thermally insulated, and it is filled by  $Fe_3O_4 - H_2O$  ferrofluid and subjected to a vertical magnetic field as shown in Figure 1.

Figure: 3D physical model



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## Biography



Khalid Chtaibi is a cotutelle Ph.D. student enrolled in the frame of a joint thesis between Cadi Ayyad University, Marrakesh (Morocco) and Picardie Jules Verne University, Amiens (France). He received his master's degree in 2019 in Fluid Mechanics and Energetics at Cadi Ayyad University. His thesis work focuses on heat transfer by MHD convection using the lattice Boltzmann method.

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# Phenylenediamine based Amorphous Organic Phosphazene Frameworks (PDA-POFs) as Thermally Stable and Flame Retardant Materials. Studies of (PDA-POFs) on Functionalization of Graphene Oxide and their Applications as Super Electrode Materials for Supercapacitors

Ahmad EIDouhaibi<sup>1</sup>, Mohamed Sijaj<sup>2</sup>, Khaled Rhili<sup>2</sup>

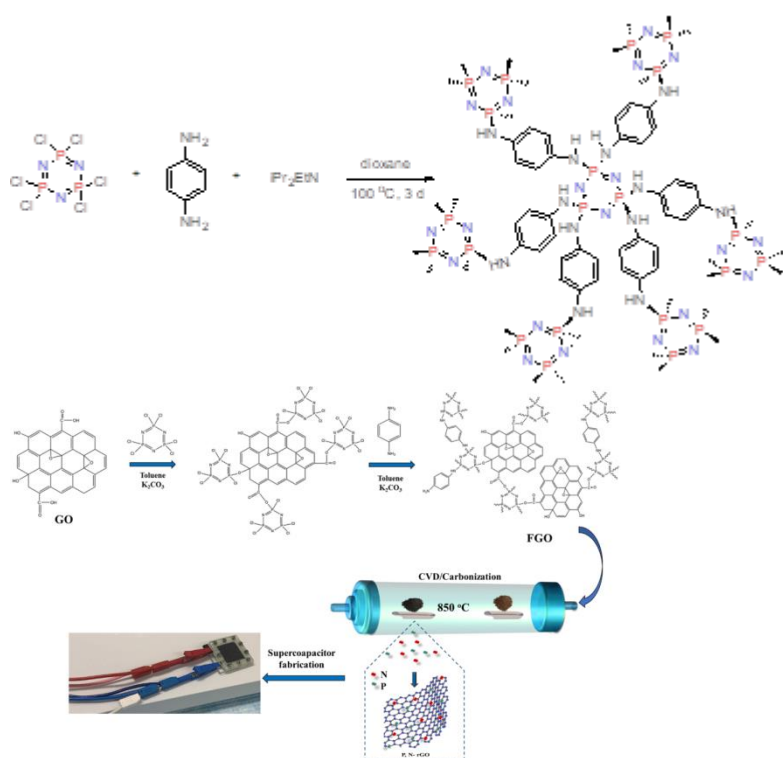
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## Abstract

Amorphous porous organic phosphazene polymers (POPs) were synthesized from p-phenylenediamine (PDA) and hexachlorocyclotriphosphazene (HCCP) in presence of diisopropylethylamine as shown in the reaction scheme below (Fig 1). The amorphous polyphosphazene framework obtained was flame retardant, and showed excellent thermal stability with about 30% weight loss at 1000°C. The structures and size of the polymer microspheres depended on the method used to synthesize the polymer. Running the same reaction in presence of graphene oxide (GO) resulted in different polymeric material that also exhibited high thermal stability. Functionalization of GO by PDA and HCCP was revealed in the SEM, TEM, and TGA analyses of the obtained material. In addition, electrochemical studies showed that GO-doped phosphazene cyclomatrixes exhibited excellent supercapacitance, when compared to cyclomatrixes without GO, although both materials showed promising electrochemical properties (Fig 2).

Figure:



## Recent Publications

1. Rhili, K.; Chergui, S.; EIDouhaibi, A. S.; Sijaj, M. Hexachlorocyclotriphosphazene Functionalized Graphene Oxide as highly Efficient Flame Retardant. *ACS Omega*, 2021, 6, 6252–6260.

## Biography



Author has expertise in multistep synthesis of complex organic compounds. He is also expert in preparing phosphazene and triazene covalent organic frameworks and studying their different thermal and electrochemical applications.

# Physical and Mechanical Properties of Unfired Clay Bricks with Dwarf Palm-Fibers Additives as a Construction Material

Aziz El Yahyaoui<sup>1</sup>, Imad Manssouri<sup>1</sup>, Hassane Sahbi<sup>2</sup>, Othmane Nouredine<sup>1,3</sup>, Houssame Limami<sup>1,3</sup>

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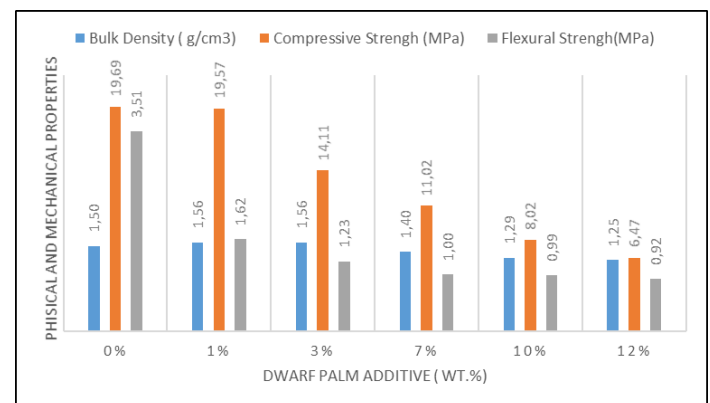
<sup>2</sup>Moulay Ismail University, Presidency, Marjane 2, BP:298, Meknes 50500, Morocco

<sup>3</sup>Laboratory of Sustainable Energy Materials, Al Akhawayn University, Ifrane Morocco

## Abstract

With the aim of obtaining construction bricks with improved properties, this paper provides a design of unfired clay bricks based on extracted clay from Oulad Azam village in the region of Taounate in Morocco; using fiber additives of dwarf palm (*Chamaerops Humilis*). The main objective of this study investigates the influence of dwarf palm fibers content on the physical and mechanical properties of unfired bricks. First, X-ray diffraction analysis, according to standard NM EN 13925-1, on a sample of powdered clay showed that the studied clay is of type Illite with non-swelling characteristics. Dwarf palm additive was incorporated in the form of fibers of different sizes ranging from 1 cm to 4 cm, manufactured manually via a chisel by preserving the leaves and eliminating the stem part. Various percentages by weight of the additive (0%; 1%; 5%; 7%; 10% & 12%) were assessed. Bulk density measurement, according to NM EN 772-16 showed that obtained bricks are light as their bulk density does not reach 2.75 g/cm<sup>3</sup> as the maximum allowable limit following the corresponding standard. Compressive strength properties showed a noticeable decrease as the percentage of the additive exceeds 1%, due to the better consistency between the layers of clay at low content additive. This prevents the deformation of the brick, promoting homogeneity and uniforming clay-additive distribution. Flexural strength testing, according to NM EN 772-2, showed a notable decrease in bricks resistance following a direct increase in the dosage of dwarf palm additives. According to the German DIN 18945(2013-08) standard, a dosage of 12% of the additive produces Earth Blocks Class 5(EB5), while below this dosage the bricks obtained are classified EB6.

**Figure:** Physical and mechanical properties of unfired clay bricks samples with dwarf palm-fibers additives



## Recent Publications

1. Limami H., Manssouri I., Cherkaoui K., Khaldoun A., J. Energy Eng. 147,4 (2021) 04021020.
2. Limami H., Manssouri I., Cherkaoui K., Khaldoun A., Cleaner Eng. and tech. 2 (2021) 100050.
3. Limami H., Manssouri I., Cherkaoui K., Khaldoun A., J. Build. Eng. 27 (2020) 100956.
4. H. Limami, I. Manssouri, K. Cherkaoui, M. Saadaoui, A. Khaldoun, J. Build. Eng. (2020) 101251.
5. H. Limami, I. Manssouri, K. Cherkaoui, L. Amazian, A. E. Baraka and A. Khaldoun, 7th International Renewable and Sustainable Energy Conference (IRSEC), Agadir, Morocco. (2019), pp. 1-6



Author is a PhD student at ENSAM-Meknes, Moulay Ismail University, and holder of a civil engineering degree of FST Marrakech, Cadi Ayad University. He started his professional career in the private sector as a structural engineer. Then he joined the public sector as Engineer in charge of the Infrastructure Service in the Ministry of Equipment and Water. His focus is based on ecological construction material based on clay and bio-based additives.

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## Synthesis of novel tetrazole derivatives and evaluation of their antibacterial and antifungal activities

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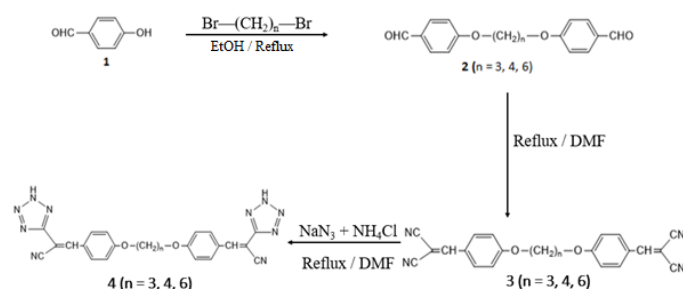
<sup>2</sup>Laboratory of bioresources, biotechnologies, ethnopharmacology and health, Faculty of Sciences, Mohammed First University, 60000 Oujda, Morocco.

<sup>3</sup>Catalysis Research and Application Centre, Faculty Science and Arts, İnönü University, 44280 Malatya, Turkey.

### Abstract

Infectious diseases caused by bacteria and fungi remain a major worldwide health problem due to the emergence of the microbial resistance to various anti-infective drugs. This resistance phenomenon resulted from the overuse of antibiotics [1]. Common multidrug-resistant pathogens reported by many researchers are *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Salmonella*, *Candida*, *Aspergillus* and *Fusarium* [2]. Therefore, the search for novel and effective antimicrobial agents is of paramount importance to combat these pathogenic microorganisms. In this context, several drugs endowed with antimicrobial and antifungal activity have been developed. Among them, tetrazoles have been reported by many researchers as potential antimicrobial against different strains of pathogenic microbes [3]. In the view of the above literature findings and in the continuity of our research work on the synthesis of new antimicrobial compounds [4], novel malonate derivatives incorporating a tetrazole moiety have been synthesized through the Knoevenagel reaction of various 1,6-Bis(4-formylphenoxy)alkane followed by 1,3-dipolar cycloaddition of the cyano group with azide. Their structures were determined on the basis of spectroscopic analyses, including IR, NMR, and HR-ESI-MS. Subsequently, the synthesized compounds were tested in vitro for their antimicrobial activities against four bacterial strains (*Listeria innocua*, *Escherichia Coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*) and three fungal strains (*Candida albicans*, *Rhodotorula*, *Aspergillus*) using a broth microdilution and an agar-disc diffusion method. The in vitro bioassay results indicated that all synthesized compounds displayed moderate to high antifungal activity against the fungal strains. For the antibacterial activity, only product 4 (n=6) showed a moderate antibacterial activity against *Staphylococcus aureus*.

Figure: Synthesis scheme of tetrazole derivatives



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3. E.A.Popova, R.E.Trifonov, V.A.Ostrovskii. Russ. Chem. Rev., 2019, 88 (6) 644 – 676.
4. H. Benouda, B. Bouchal, A. Challioui, A. Oulmidi, T. Harit, F. Malek, A. Riahi, Mohammed, B.\*; B. Bouammali\*. Letters in Drug Design & Discovery, 2019, 16(1), 93-100.

### Biography



Chaymae Bourhou is currently a third-year Ph.D. student under the supervision of Prof Bouammali B. at the faculty of sciences Oujda. As part of my doctoral research, I have acquired expertise in the synthesis and characterization of new organic compounds based on nitrogen heterocycles such as tetrazole. My research also focuses on the valorization of aromatic and medicinal plants and the characterization of new biomolecules extracted from natural products and their applications in the therapeutic domain.

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## The use of clayey residues in the manufacturing of compacted earth blocks: optimization of formulations

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### Abstract

Earthen construction techniques have been used for a long time all over the world in different forms: adobe, cob, rammed earth, compressed earth blocks (CEB)... CEB are the most accepted form of unbaked earthen material for the construction of modern buildings and have known a growing interest as an alternative, sustainable and recyclable material. The aim of this work is to evaluate the potential use of Moroccan clayey soils from the Youssoufia region in the development of an eco-construction with promising mechanical and thermal properties. Thus, two by-products of different granular textures, generated in large quantities in the Youssoufia region, were the subject of the present investigations. The work was developed in two phases: in the first phase, a series of tests were carried out to determine the geotechnical, mineralogical, chemical, and thermal characterization of the waste rock collected in order to choose the most suitable mixture for the manufacture of the CEBs in compliance with the requirements of the French standard XP P 13-901. To do this, different proportions of crushed sand 0/4 (20, 30, 40 and 50% by weight), and clayey soil were subjected to particle size analysis and tests to determine the limits of

Atterberg. The second phase of this work focused on studying the effects of varying the compaction rate on the mechanical and physical properties of the CEB elaborated by the selected mix. The material properties that have been quantified include compressive strength, flexural strength, and thermal conductivity. However, an improvement in the mechanical performance of the CEB was observed based on the results of these tests.

### Biography



The author has an experience in the field of construction and a passion for the development of Eco materials. He focuses on the use of Moroccan clayey soils for the development of sustainable building materials. He obtained his master degree in 2012 from FSSM University and his state engineering degree from UPM University. He is currently preparing his PhD thesis in the field of Eco materials at FSSM University. He presented his work in the Arabian Journal of Geosciences Conference CAJG November 2021.

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## Synthesis of 2-thienyl (or furyl) chromones by the “one pot” Naik's method

E. Fraj<sup>1\*</sup>, C. Bourhou<sup>1</sup>, H. Benouda<sup>1</sup>, B. Bouammali<sup>1\*</sup>, A. Chalioui<sup>1</sup>

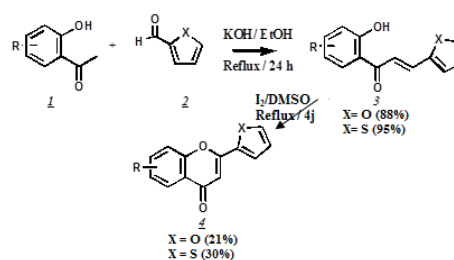
<sup>1</sup>Laboratory of applied Chemistry and Environment (LACE), Faculty of Sciences, Mohammed First University, 60000 Oujda, Morocco.

### Abstract

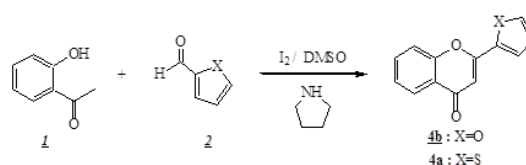
Flavones or 2-phenylchromones are a group of oxygenated heterocyclic compounds belonging to the family of flavonoids. The study of these secondary metabolites renewed interest since they have been attributed many biological activities, such as anti-cancer, anti-microbial, anti-inflammatory activities...<sup>[1,2]</sup> As a consequence of these vital properties researchers were explored extensively the synthesis of these substances using various methods. Among the most used methods of synthesis of flavones, there is the condensation of 2'-hydroxyacetophenone with aromatic aldehydes in the presence of sodium hydroxide as base, followed by the oxidative cyclization of obtained 2'-hydroxychalcones using iodine as catalyst in DMSO. Recently, Naik et al. were reported a good yield one pot synthesis of flavones established from 2'-hydroxyacetophenones and substituted aromatic aldehydes using domino aldol-Michael-oxidation reaction catalyzed by pyrrolidine as a base and iodine as an oxidant in DMSO.<sup>[3]</sup>

In this study, we report the synthesis of 2-thienyl (or furyl) chromones by Naik's method (Scheme 2) and the results obtained are compared with those of the classical two-step method (Scheme 1).

### Scheme 1: Scheme of flavone synthesis via the classical two-step method



### Scheme 2: "One pot" synthesis of flavones via Naik's method



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3. 23-41
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### Biography



Elmehdi FRAJ, first year PhD student at the Laboratory of applied Chemistry and Environment (LACE), under the supervision of Prof. Boufelja BOUAMMALI at Mohammed 1st University, Morocco. My research activities focus on the synthesis and biological screening of new flavones and their structural analogues.

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## Elaboration by sol-gel method and characterization of TiO<sub>2</sub>-P<sub>2</sub>O<sub>5</sub> coating

S. Dehhaoui<sup>1</sup>, K. Ba<sup>1</sup>, R. Driss<sup>1</sup>, H. El Aaad<sup>1</sup>, T. Jermoumi<sup>1</sup>, A. Shaim<sup>1</sup>, A. Chahine<sup>1</sup>

<sup>1</sup>Laboratory of Advanced Materials and Process Engineering, Faculty of Science, Ibn Tofail University, BP.133-1400, Kenitra, Morocco.

### Abstract

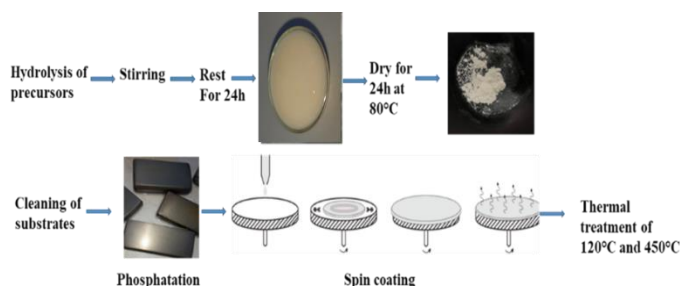
This work treats the synthesis of P<sub>2</sub>O<sub>5</sub>-TiO<sub>2</sub> glass deposited on steel samples by using sol-gel process. In a previous study by Kalidou Ba the P<sub>2</sub>O<sub>5</sub>-TiO<sub>2</sub> coating did not adhere to the substrate (steel). For that purpose, prior to depositing the glass, the steel sample is treated with an amorphous phosphatation in order to enhance his adhesion.

Following that, a corrosion protection was assured under the form of thin films consisting of six layers of P<sub>2</sub>O<sub>5</sub>-TiO<sub>2</sub> glass, which was deposited by spin coating with thermal treatment at 120° and 450°C. Phosphoric acid, titanium tetra-isopropoxide and trimethyl phosphate was used as precursors.

A structural and spectroscopic characterization of the coatings was performed using Fourier Transform Infrared Spectroscopy, X-Ray Diffraction and SEM microscopy.

The characterization of the composite showed a proper structural formation as confirmed by the FTIR and XRD. While, the morphology and the elements of the coating were identified as expected by SEM-EDX.

Figure:



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2. ZHANG J., LI B., WANG Z., CHENG G. and DONG S., *Analytica Chemica Acta*, vol 71,p388, (1999).
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4. Khalidou Ba, Abdelkrim Chahine, Mohamed Ebn Touhami, Johan G. Alauzun, Abdelatif Manseri, *Preparation and characterization of phosphate-nickel-titanium composite coatings obtained by sol-gel process for corrosion protection*. *SN Applied Sciences* 350 (2020).

### Biography



Dehhaoui salma started her PhD in 2022, In the Laboratory of Advanced Materials and Process Engineering, Faculty of Science, Ibn Tofail University under the supervision of Pr. Chahine Abdelkrim Her studies are focused on the properties of phosphate-based materials, for the purpose of optimizing and getting a variety of applications.

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# Graphene and Chitosan Innovative Materials for Water Treatment

H. Bouammali<sup>1,\*</sup>, L. Bourassi<sup>1</sup>, B. Bouammali<sup>1</sup>, B. Serrano<sup>2</sup>, A. Chelioui<sup>1</sup>, R. Touzani<sup>1</sup>

<sup>1</sup>Applied Chemistry and Environment Laboratory (LCAE), Faculty of Sciences, Mohammed Premier University, Oujda, MROCCO.

<sup>2</sup>Department of Materials Science and Engineering and Chemical Engineering, IAAB, Universidad Carlos III de Madrid, Avda. de la Universidad, 30, 28911 Leganés, Madrid, Spain.

## Abstract

Pollution is a serious problem in many parts of the world, especially in urban areas [1]. Nanomaterials have emerged as the new next generation materials for high performance water treatment membranes with the potential to solve the global water pollution problem [2]. Films based on nanocomposites prepared from graphene (Figure 1) and chitosan (Figure 2) have shown their performance in the field of water pollution control by nanofiltration. In this presentation we will present the essential development of these new nanocomposites in this vital field [3].

Figure 1. Chemical structure of graphene [4]

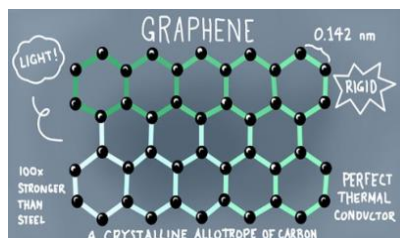
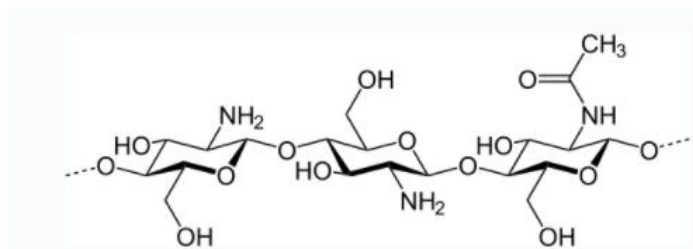


Figure 2. Chemical structure of chitosane [5]



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## Biography



Author has expertise in organic chemistry. He can speak 4 languages (Arabic, French, English and Spanish) and he can work alone or with groups easily. He is a PhD student at the Laboratory of Applied Chemistry and Environment (LCAE), under the supervision of Prof. R. Touzani at Mohammed 1st University, Oujda, Morocco. He works on natural or synthetic materials.

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## N-Heterocyclic compounds: good extractants of heavy metals

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<sup>1</sup>Laboratory of Applied Chemistry and Environment (LCAE), Faculty of Sciences, Mohammed Premier University, Oujda, Morocco. Email: mohamed.mounir@ump.ac.ma

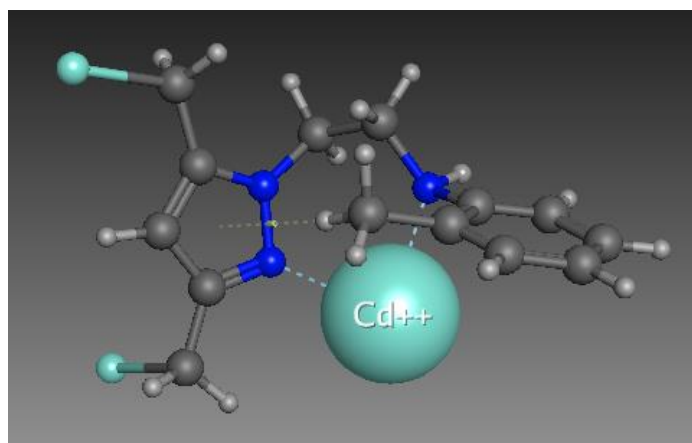
<sup>2</sup>Institute of Crystallography-CNR via Amendola 122/0,70/26 Bari, Italy.

### Abstract

Nitrogen chemistry containing multimodal molecules is attracting current interest in the scientific world because of their specificity for biological targets. These compounds are also of great importance for the construction of polynuclear complexes. as models for bio inorganic systems as well as for the discovery of new catalyst precursors, the pyrazole ring appears to play a key role since it is involved in several types of chelating ligands [1], In recent decades many pyrazoles and triazole derivatives have been synthesized for biological, medical and industrial purposes [2]. These compounds open many and diverse applications such as corrosion, biological, catalysis and theoretical studies.

We report here the complexing power evaluated by atomic absorption of diazoles (pyrazole) on the ions of heavy metals. These ligands are synthesized by simple methods of condensation. The extraction of these ions is based on a fairly simple principle (Figure 1). Theoretical calculations have confirmed that the extracting power depends on the energy gain ( $\Delta E = E_{LUMO} - E_{HOMO}$ ) between the HOMO and LUMO orbital of the ligand [3]. Our modest contribution to this study is to analyze the electronic structure of these ligands in order to find a plausible correlation between the electronic structure of these ligands and the low energy gain  $\Delta E$  found to predict the structure of a compound likely to give similar results.

Figure: extraction of heavy metal ions by diazoles



### Recent Publications

1. C. Karim, Sebbar, N. Kheira, K. Khalid et E. Mokhtar, «Etude des propriétés complexante des dérivés du pyrazole et du benzamidazole vis à vis des métaux.» Mar.Chim.Heterocycl, vol. 17, p. 1, 2018.
2. R. D. Abreu et C. Morais, «Study on separation of heavy rare earth elements by solvent extraction with organophosphorus acids and amine reagents.» Miner. Eng. , vol. 61, p. 82–87., 2014.
3. A. Boda, S. M. Ali, H. Rao et S. K. Ghosh, «Ab initio and density functional theoretical design and screening of model crown ether based ligand (host) for extraction of lithium metal ion (guest): effect of donor and electronic induction.» J. Mol. Model, vol. 18 (8), p. 3507–3522, 2012.

**Acknowledgments:** Bilateral project between CNR Italy and CNRST Morocco (project 2020/2021, CUP B54I20000340001, IC-CNR Bari, Italy, A.M., and UMP Oujda, Morocco, R.T.)

### Biography



M.Mohamed is a first-year PhD student in organic chemistry affiliated with the Applied Chemistry and Environment Laboratory (LCAE) of the Faculty of Sciences of Oujda. he obtained his bachelor's degree in organometallic heterocyclic chemistry-catalysis at the Semailia Faculty of Sciences in Marrakech. he then continued his Master's studies in Applied Chemistry at the Faculty of Sciences of Oujda. he is particularly interested in the valorization of aromatic nitrogen heterocycles. these compounds are extremely valuable added by their electronic richness, which confers on them very interesting properties in several fields such as health and energy.

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## Synthesis, characterization, and applications of new cobalt (II) complex in catalysis

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<sup>a</sup>University Mohammed Premier, Multidisciplinary Faculty of Nador, Laboratory of Molecular Chemistry, Materials and Environment (LCME), Nador-Morocco.

<sup>b</sup>University Mohammed Premier, superior School of Technology, Laboratory of Applied Mathematics and Information Systems (LAMIS), Nador-Morocco.

<sup>c</sup>An-Najah National University, Science College, Department of Chemistry, P.O. Box 7, Nablus 00970, Palestine.

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<sup>e</sup>University Mohammed Premier, Faculty of Sciences, Laboratory of Environment and Applied Chemistry (LEAC), Oujda-Morocco.

### Abstract

The efficiency and selectivity of copper-containing metalloenzymes in the oxidation of catechol to o-quinone by atmospheric oxygen, has led coordination chemists to study the structural and catalytic properties of these enzymes. However, this present work is a study of the catalytic activity of the oxidation of catechol to o-quinone by atmospheric oxygen, using a complex of cobalt (CoCl<sub>2</sub>L), with L is 5-chloro-N - ((3,5-dimethyl-1H-pyrazol-1-yl) methyl) pyridin-2-amine. The results obtained show that our complex catalyzes the reaction of the oxidation of catechol to o-quinone with the rate of 1.37 μmol.L<sup>-1</sup>.min<sup>-1</sup> in THF, and that the catalytic activity is proportional with the reaction time. The cobalt (II) complex was synthesized and characterized by X-ray diffraction, thermal analysis, FTIR analysis and Uv-visible. The density functional theory (DFT) and time dependent density functional theory (TD-DFT) studies were employed using optimized geometry of the complex to pursue the electronic spectra and to predict the localization of HOMO and LUMO electron densities.

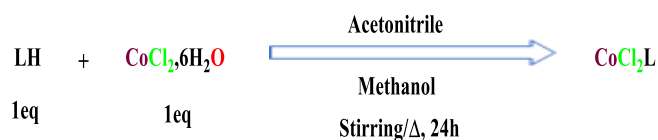
### Biography



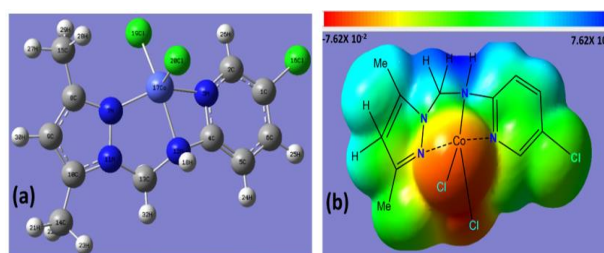
Mohamed EL BOUTAYBI is a 3rd year PhD student; joint supervised by Professor Zahra BAHARI and Professor Rachid TOUZANI, He got his Bachelor's degree (2017) and DEUG (2016) in Chemical Sciences at University Mohammed First (pluridisciplinary faculty of Nador), He was awarded his master in 2019 from the University of Abdelmalek ESSAADI, Tetouan, Morocco. His main subject focus on the synthesis and characterization of new transition metal complexes based on pyrazolic ligands and their applications in catalysis.

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**Figure 1.** Synthesis of the CoCl<sub>2</sub>L complex.



**Figure 2.** (a) DFT-optimization, (b) Solid MEP



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2. M. El Boutaybi, A. Taleb, R. Touzani et al., Materials Today: Proceedings 31 (2020) S96-S102.
3. N. Bouroumane, M. El Boutaybi, S. Chetioui et al., Materials Today: Proceedings 45 (2021) 7603-7607.
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## Comparison study of green and chemical synthesis of ZnO nanoparticles by sol-gel route

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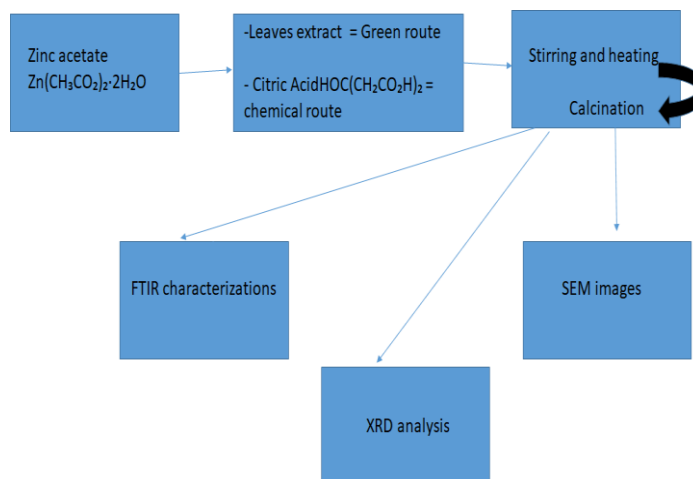
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### Abstract

Nanomaterials are gaining increasing attention every day. Owing to their large applications in different fields such as electronics, optics, bio-medicines, and many other usages [1], they proved their places as one of the growing disciplines of research. In recent years, metal oxides nanoparticles (Nps) and specifically ZnO Nps are reported to attract high attention among scientists because of their usage in biomedical, and drug delivery applications with their excellent antioxidant and antimicrobial properties [2]. However, their synthesis requires hazardous chemical products and produces environmental harm [3]. In this current study, a green and cost-effective route to produce the ZnO nanoparticles is proposed using leaves extract as reducing agents via sol-gel. As the shape, size, and morphology are the most characteristic of nanomaterials, different leaves extracts were investigated and were compared to chemically synthesized sol-gel ZnO Nps. The obtained powders were characterized using Infrared spectroscopy, X-ray diffraction, and scanning electron microscopy.

The two routes evidence the synthesis of ZnO as both methods showed characteristic bands of ZnO, however, the crystalline structure and the particles size of both pathways were different due to the compositions of leaves extract. To overcome the alterations, ultrasound and centrifugations were used during the green synthesis.

Figure



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2. Velsankar K., Venkatesan A., Muthumari P., Suganya S., Mohandoss S., Sudhakar S., J Mol Str. 1255 (2022) 132420.
3. Bhayvyasree P.G., Xavier T.S., J Cur Res In Gr and Sus Chem. 5 (2022)100249.

### Biography



Doha started her PhD in Materials Science and Membrane Technology in 2020 at Hassan II University on the preparation and characterization of ceramic membranes based on the mixture of natural geomaterials for microfiltration and ultrafiltration. The prepared membranes were applied for the treatment of industrial and municipal wastewater and the treatment of dyes. Additionally, she has contributed to the adsorption studies using zeolite and clays and the preparation of low-cost ultrafiltration membranes made from Moroccan geomaterials of pyrophyllite. Currently, she is interested in the synthesis of nanoparticles at low cost using green methods.

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# Impact of Cu,Al<sub>2</sub>O<sub>3</sub>-H<sub>2</sub>O hybrid nanofluid on natural convection inside a square cavity containing two heat-generating bodies

Rachid Hidki<sup>1</sup>, Lahcen El Moutaouakil<sup>1</sup>, Mohammed Boukendil<sup>1</sup>, Zouhair Charqui<sup>1</sup>, Zaki Zrikem<sup>1</sup>

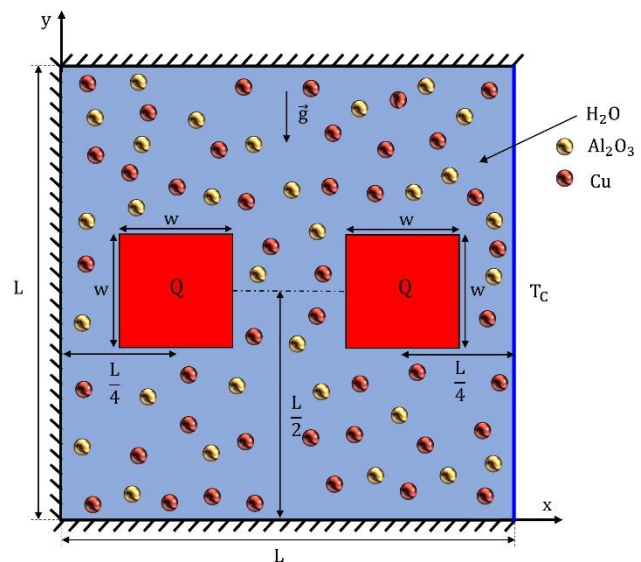
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## Abstract

Recently, natural convection in cavities, with or without heating blocks, and filled with a hybrid nanofluid has attracted the attention of several researchers [1-5]. The hybrid nanofluid is used as a new innovative class of nanofluid by dispersing two types of nanoparticles in the base fluid. There are two types of nanoparticles: metallic nanoparticles, which have a high thermal conductivity (such as Cu, Al, Ag, Au), or non-metallic nanoparticles, which have a low thermal conductivity compared to the first type, such as Al<sub>2</sub>O<sub>3</sub>, MgO, TiO<sub>2</sub>, CuO. The interest in this type of fluids comes from their multiple applications in engineering and industry, such as nuclear reactors, cooling of electronic equipment, heat exchangers, food storage, etc.

As shown in the above literature review and to the best of the authors' knowledge, natural convection in the presence of hybrid nanofluid is a current topic due to its multiple advantages in several practical fields. Therefore, the objective of this study is to investigate the impact of Cu,Al<sub>2</sub>O<sub>3</sub>/water hybrid nanofluid on natural convection in a square cavity containing two heating blocks (Figure). The latter have the same thermal and geometrical properties and generate the same amount of heat. The cavity is insulated on all the walls, except the right one maintained at a cold temperature T<sub>C</sub>. In order to numerically solve the equations governing the present problem, the finite volume method based on the SIMPLE algorithm has been used. The effect of several parameters influencing the dynamic and thermal characteristics is studied, namely the fraction of nanoparticles and the Rayleigh number.

Figure: Studied configuration.



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## Biography



Rachid Hidki is currently a Ph.D. student at the Department of Physics, Faculty of Science Semlalia, Cadi Ayyad University, Marrakesh, Morocco. He obtained his Master of Fluid Mechanics and Energy in 2019 at Cadi Ayyad University. His thesis work focuses on numerical simulation of heat transfer and fluid flows in cavities containing heating blocks.

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# Insights into the fabrication of Layered Aluminum Tri-Polyphosphate intercalated with amino acids and their corrosion protection of low carbon steel

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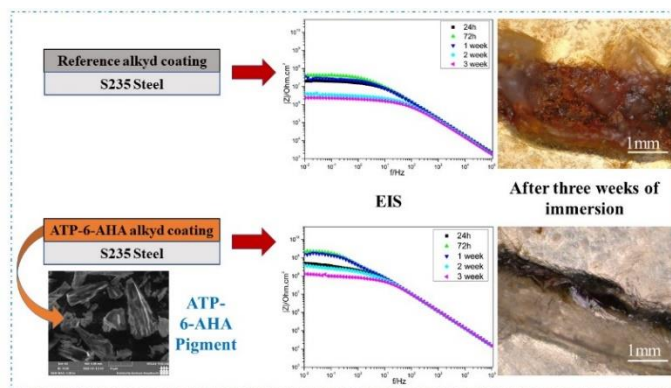
<sup>7</sup>Department of Physics, University Koblenz-Landau, 56070, Koblenz, Germany

## Abstract

The development of environmentally sustainable and eco-friendly compounds for steel protection is of crucial importance for industry but also for the preservation of metallic components. This investigation reports the synthesis and characterization of a new hybrid materials based on the intercalation of two amino acids : (6-AHA) and (4-ABA) in layered Tri-polyphosphate and their application for corrosion protection of S235 low carbon steel. The microstructure and morphology of the inorganic-organic systems are characterized by X-ray diffraction (XRD), thermal gravimetric analysis (TGA), infrared spectroscopy (IR), Raman spectroscopy, and scanning electron microscope (SEM).

The results clearly show that the host material and the hybrid compounds were successfully synthesized. The corrosion efficiency of new hybrid phosphate material were evaluated both as inhibitor and as pigment in alkyd resin in sodium chloride electrolyte solution using electrochemical impedance spectroscopy (EIS). The overall results demonstrated that the synthesized hybrid systems significantly decrease the corrosion behavior of S235 steel.

Figure



## Biography



Chaymae Hejjaj is a post doc researcher at Materials Science, Energy and Nano-engineering Department (MSN), University Mohammed VI Polytechnic (UM6P) in Benguerir. Her research focus is based on the use of friendly pigments as alternatives of heavy chromate containing pigments for corrosion application.

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## Highly efficient photocatalytic degradation of acid by clay-doped TiO<sub>2</sub> photocatalyst

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<sup>1</sup>Laboratory of Applied Analytical Chemistry, Materials and Environment (LC2AME), Faculty of Sciences, University Mohammed First, Oujda, Morocco

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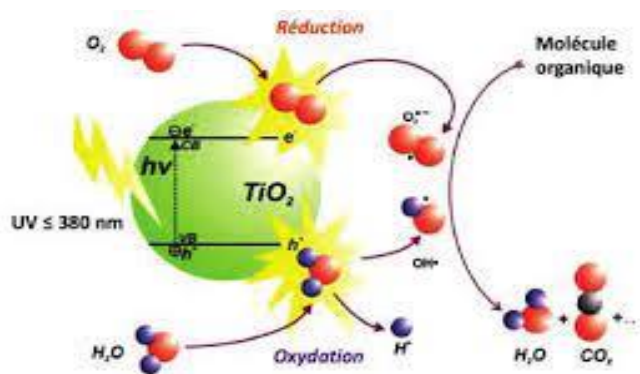
<sup>3</sup>Bioresources, Biotechnology, Ethnopharmacology and Health Laboratory University Mohammed First, Oujda, Morocco.

<sup>4</sup>Grupo de Fotocatálisis y Espectroscopía para Aplicaciones Medioambientales (FEAM), Instituto de Estudios Ambientales y Recursos Naturales (i-UNAT), Universidad de Las Palmas de Gran Canaria, Campus Universitario de Tafira, 35017 Las Palmas, Spain

### Abstract

Clay-doped TiO<sub>2</sub> particles (A-TiO<sub>2</sub>) were prepared by the sol-gel approach. The structural and optical properties of the particles were characterised by X-ray diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR), High Performance Liquid Chromatography (HPLC), Energy Dispersive X-Ray Analysis (EDX) and High Performance Liquid Chromatography (SEM). The methods were used to optimise the activity of A-TiO<sub>2</sub> catalysts for acid degradation. It was found that A-TiO<sub>2</sub> has a more intense absorbance in the UV range than only clay. Therefore, the photocatalytic degradation of landfill acids by A-TiO<sub>2</sub> was much higher than that of pure clay.

Figure



### Recent Publications

1. José M. Doña-Rodríguez and Elisenda Pulido Melián , J Nanomaterials 2021, 11, 688.
2. E. Pulido Melian , M. Nereida Suarez ,T. Jardiel , D.G. Calatayud , A. del Campo , J.M. Dona-Rodri ´guez , J. Arana, O.M. Gonzalez Di ´az, International Journal of Hydrogen Energy, Volume 44, Issue 45, 20 September 2019, Pages 24653-24666
3. R Quesada-Cabrera, A Mills, C O'Rourke, Applied Catalysis B: Environmental 150, 338-344

### Biography



The author has expertise in the field of materials engineering, characterization processing, quality control and surface treatment.

He is currently a third year PhD student at the Faculty of Sciences of Oujda at the University Mohamed Premier. His expertise in evaluation and his passion for the use of advanced oxidation methods, photocatalysis for the degradation of organic and inorganic pollutants and have applications in industries.

And had an Erasmus+ 2021-2022 mobility to the research laboratory of Las Palmas Grand Canaria Spain

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# Synthesis of a novel nickel sulfide nanoparticles-incorporated carbon nanofibers as effective nonprecious catalyst for methanol electrooxidation in alkaline medium

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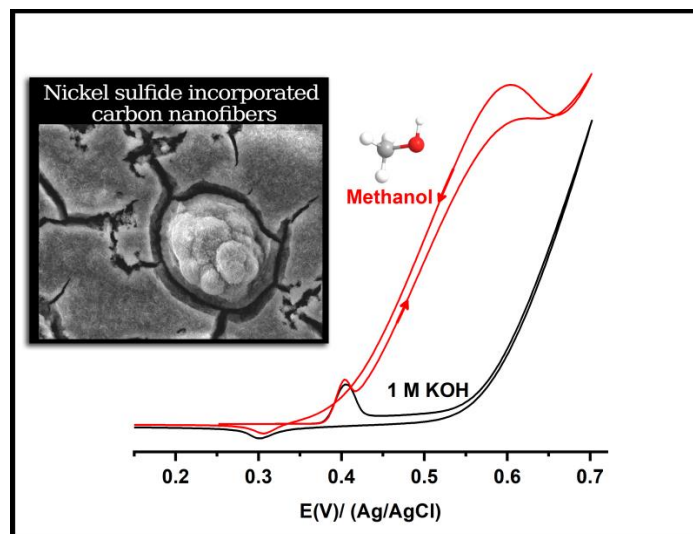
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## Abstract

The adoption of fuel cells, in particular direct methanol fuel cells (DMFCs), as renewable energy devices for automobiles and portable electronic devices appears to be an efficient promising approach to mitigate the energetic dependence to fossil fuels. Thus far, Pt has been regarded as a highly reactive catalyst for the methanol oxidation reaction (MOR). However, the high cost and rarity of Pt significantly hinder its commercial use. The synthesis of highly efficient, long-term stable, and noble metal-free electrocatalyst for MOR is a challenge for researchers. Nickel sulfides, despite being actively employed in the field of lithium ion batteries, supercapacitors, and as electrocatalysts, only few studies report their use as MOR electrocatalyst in alkaline medium. In this work, we report a facile and single-step electrodeposition of Nickel sulfides thin film incorporating carbon nanofibers (CNFs) on indium tin oxide (ITO). Electrodeposition technique was used as it has the following advantages: easy to carry out, time-saving, non-polluting, and the precursors employed are cheaper.

The electrodeposited Nickel sulfide thin film was characterized by different spectroscopic techniques (XRD, SEM-EDS...). The electrocatalytic activity of Nickel sulfides electrode toward MOR was investigated by cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS), and chronoamperometry (CA) methods. The electrocatalyst exhibited a good electrocatalytic activity toward methanol electrooxidation in alkaline media. Impressively, the catalyst retained up to 80% of its initial state after 6h of durability test. These results indicate that the incorporation of carbon nanofibers into Nickel sulfides thin film causes the catalyst to gain a higher specific surface area and high tolerance toward the catalyst-poisoning species generated during MOR.

Figure:



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1. Badwal SPS, Giddey SS, Munnings C, Bhatt AI, Hollenkamp AF., *Front. Chem.* 2 (2014) 79.
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5. Jingchao Zhang et al., *J. Electrochem. Soc.* (2017) 164 B92.

## Biography



El Mehdi SALMI obtained his master's degree in electrochemical and catalytic processes, and waste valorization in 2019 and a fundamental license in natural and synthetic organic compounds from Hassan II University, Faculty of Sciences Ain Chock - Casablanca. He is currently a Ph.D. student in chemistry and valorization at Hassan II University since 2021 at the Materials Environment Interface Laboratory, under the direction of professor S. ELGHACHTOULI. His research project focuses on the development of new electrocatalyst for the electrochemical reduction of carbon dioxide.

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## Development of new biocomposite films based cellulose triacetate for packaging

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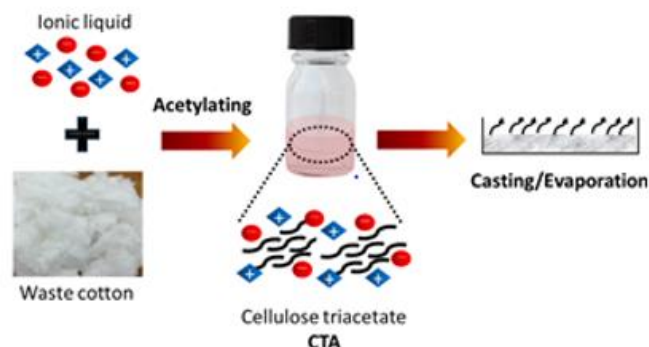
<sup>2</sup>Research laboratory on textile materials (REMTEX), Higher School of Textile and Clothing Industries (ESITH), 7731, Casablanca, Morocco.

<sup>3</sup>Laboratory of Engineering and Materials (LIMAT), Faculty of Sciences ben m'sik, Hassan II University of Casablanca, 7955, Casablanca, Morocco.

### Abstract

The global increase in the use of petroleum-based polymers has exceeded the capacity to process the waste produced. Polymers from renewable resources hold great promise due to their many benefits. For example, they can replace synthetic polymers derived from petroleum, reduce pollution thanks to their biodegradability or even reduce greenhouse gas emissions. Cellulose and its derivatives, such as cellulose ethers and esters, can open new opportunities to produce specific products at competitive prices. Cellulose triacetate (CTA) is a cellulose ester with high crystallinity, hydrophobicity, chemical, mechanical, and thermal resistance. It is widely used in the electronics industry as a protective film for electronic screens, as well as in the water treatment industry as a metal separation membrane. Their high stiffness and crystallinity, however, limit their use as packaging film. As a result, TAC must be combined with other polymers or additives in order to produce a thermoplastic film with high flexibility. In this context, cellulose triacetate (CTA) was synthesized from industrial waste cotton fibers. Then, a series of ionic liquids were synthesized and used as plasticized CTA film materials. Afterward, the physical, mechanical, and thermal properties of produced films were investigated. The obtained films have high flexibility and transparency, as well as high tensile strength, thermal stability, and fire resistance, opened up the way for the development of new fire-resistant and packaging films as an alternative to synthetic films.

Figure



### Recent Publications

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### Biography



Dr. Sanaa Majid (female) is an Associate Professor (HDR) in chemistry, member of the laboratory of Materials Engineering for the Environment and Valorization. Her research focuses on development of new innovative (nano) composite materials for natural resources valorization and environment monitoring. She supervises 3PhD students and has supervised more than 20 undergraduate and postgraduate students. She has participated in 7 projects funded by the EU, International and national bodies (Prima, Erasmus, PHC Toubkal, FP7, Moroccan Ministry of Education and Tempus). Her H-index is 7 on Scopus.

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# Optimization of synthetic oxazinone catalyzed by an efficient heterogenous phosphate catalyst

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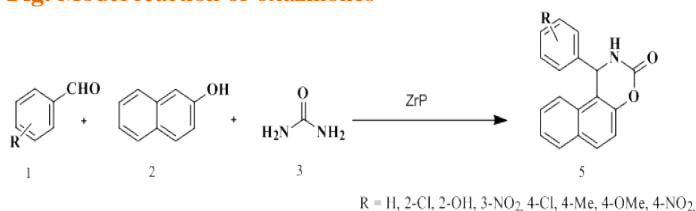
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## Abstract

Oxazinones and their derivatives are an interesting class of heterocyclic compounds. Many of these heterocyclic systems have biological activities, Including anti-inflammatory, anti-ulcer, anti-pyretic, anti-hypertensive and anti-fungal agents[1,2] and can be used as a precursor in the preparation of phosphinic ligands[3].

In this present work, we have shown that is possible to synthesize a derivative of oxazinones using a zirconium phosphate catalyst by the intuitive method of studying the effect of mass on this reaction. A planned experimental centred composite was defined, with the influential factors chosen, we were able to represents the variations of the response y (yield of the compound obtained) as a function of these factors by a second degree polynomial equation. The coefficients were determined from the tests performed through a multilinear regression, also the study of the isoresponse curves allowed us to determine optimal conditions for this reaction.

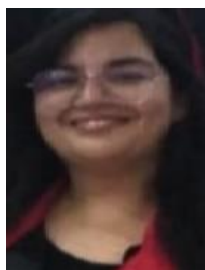
Fig. Model reaction of oxazinones



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## Biography



AHL EL HAJ Touayba has her expertise passion in catalysis chemistry. Her focus is based on the use of phosphate materials alone, modified or supported to have their application in organic synthesis . She was preparing her PhD since 2020 from the University of Ibn tofail , kenitra morocco

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# Development of composite ultrafiltration membrane made of polystyrene/NaA zeolite deposited on pozzolan flat support for organic dyes removal

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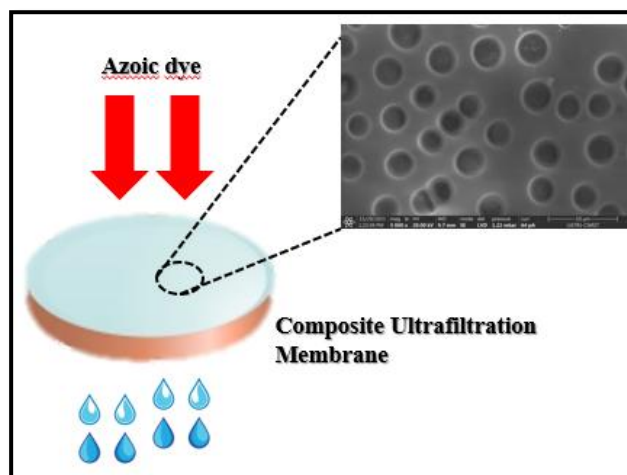
## Abstract

Water scarcity has become a critical challenge in our time, resulting from the decline in freshwater resource. The rapid growth in industrialization, urbanization, and population influences the availability of freshwater resources. As a result, more than two-thirds of the worldwide population would live in water stress by 2050. Therefore, membrane separation technology is considered one of the essential solutions for wastewater treatment, at the same time a solution that promotes good energy management, eco-friendly maintenance, and has no secondary pollution.

This study concerns the preparation and characterization of PS/NaA zeolite mixed-matrix membranes (MMMs) deposited on pozzolan support. Zeolite seeds were hydrothermally synthesized. The mixed matrix membrane was deposited on ceramic support by dip-coating method. The effect of zeolite content (2.5%-10 wt. %) on membrane properties in terms of microstructure, filtration, and antifouling performance was investigated. The prepared membranes were characterized using several techniques such as Fourier transform infrared spectroscopy (FTIR), nuclear magnetic resonance spectroscopy (NMR), X ray diffraction (XRD), scanning electron microscope (SEM) and contact angle. The morphology analysis showed that PS-NaA zeolite membrane layer is homogeneous and strongly adherent on the pozzolan support. Furthermore, performances of the prepared mixed matrix membranes were evaluated by filtration of direct red 80 (Dr 80) and rhodamine B (RB) solutions at pressure of 3 bar.

The water permeability flux increased from 24,45 to 75,357 L/h.m<sup>2</sup> with increasing NaA zeolite concentration from 0 to 10wt %. Rejection studies showed an improved rejection efficiency of 99,06%, which is higher than the neat PS membrane (84,88%). Based on promising filtration results as well as the low cost of prepared membrane, industrial applications for treatment of wastewater particularly colored wastewater generated from textile industries may take place.

Figure



## Recent Publications

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2. Abdallah. Talidi, Abdelmjid. Bouazizi, Ahlam Essate, Abdallah. Aaddane, Mohamed. Ouammou, Rachid. Saadani, S. AlamiYounssi. Novel low-cost pyrophyllite- based ceramic membrane for pretreatment of raw seawater and industrial wastewater, *Desalination and Water Treatment*, (2022)

## Biography



Ahlam ESSATE is a PhD student at materials, membranes, and environment. Chemistry department, Faculty of Sciences and Technologies of Mohammedia. She obtained her Master's degree in materials engineering in 2018 at Sultan Moulay Slimane University. Currently, she worked on the preparation and characterization of composite membranes based on organic and inorganic materials for dyes and heavy metals treatment. Additionally, Ahlam ESSATE co-authored 2 scientific articles in an indexed journal and has 5 oral/poster communications in national and international conferences.

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# Valorizing tannery effluent and waste plastic bottles as precursors for preparing functional metal-organic frameworks

Ayalew H. Assen<sup>1,2</sup>, Aminat Mohammed<sup>2</sup>, Youssef Belmabkhout<sup>1</sup>

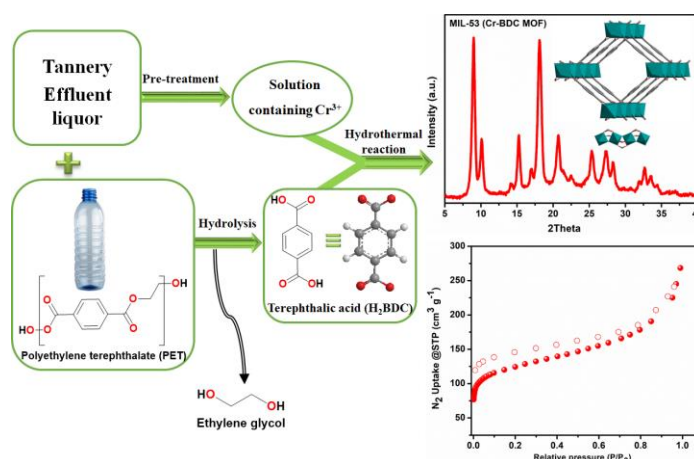
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<sup>2</sup>Department of Chemistry, College of Natural Science, Wollo University, Dessie, Ethiopia

## Abstract

Due to environmental concerns, the increasingly growing waste disposal from local and industrial sources drives the Research and Development (R&D) aiming to discover new ways to capture waste matters from different sources and further use them in different sectors. One way to valorize wastes is to use them as raw materials and convert them into functional solid-state materials. This work demonstrated the preparation of metal-organic framework (MOF) from metal salt derived from tannery effluent and organic linkers extracted from waste plastic bottles. The wastes from tanneries served as Cr(III) sources, and the plastic bottles gave terephthalic acid linker up on alkaline hydrolysis. Employment of appropriate hydrothermal reaction led to the assembly of the well-known functional Cr-MOF, namely MIL-53(Cr). The formation of the MOF and its purity were confirmed by powder X-ray diffraction (PXRD) characterization. The MOF was assembled by a two-step solvothermal reaction that involves hydrolysis of the PET bottles to get pure terephthalic acid prior to the MOF synthesis. The extraction of pure terephthalic acid by alkaline hydrolysis of PET bottles was confirmed by <sup>1</sup>H and <sup>13</sup>C NMR spectroscopy. N<sub>2</sub> adsorption experiments at cryogenic conditions confirmed the porosity of the obtained MOF. The prepared MOF also showed comparable properties (surface area, pore-volume, chemical, and thermal stabilities) to the MOF previously synthesized from pure commercial grade precursors as confirmed by N<sub>2</sub> adsorption at 77 K, PXRD, and thermogravimetric analysis (TGA).

Figure



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2. Ouikhalfan M., Lakbita O., Delhali A., Assen A.H., Belmabkhout Y., *Energy Fuels*, 36(8) (2022), 4198–4223.
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## Biography



Dr. Ayalew H. Assen is a postdoctoral researcher at Mohammed VI Polytechnic University, Morocco, and an assistant professor of inorganic chemistry at Wollo University, Ethiopia. He received his Ph.D. degree from King Abdullah University of Science and Technology (KAUST), Saudi Arabia. He obtained his double M.Sc. degrees, one in Advanced Spectroscopy in Chemistry from the University of Lille I and Universität Leipzig (Erasmus Mundus program) and the other in Organic chemistry from Addis Ababa University. His research focuses on preparing porous solid-state materials in general, metal-Organic Frameworks (MOFs) in particular, for gas storage, gas/liquid separation, chemical sensing, and other applications. He published about 20 papers. His H-index is 12 on Scopus.

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**NATURAL PRODUCTS AND THEIR BIOTECHNOLOGICAL APPLICATIONS**

## Valorization of the essential oil of *Urginea maritima* as an inhibitor of the corrosion of copper in acid medium

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### Abstract

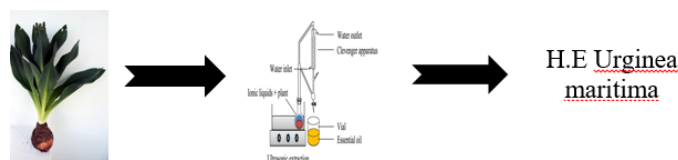
Corrosion is a natural phenomenon that causes millions of dollars in losses to many industries. Consequently, the use of inhibitors to prevent or reduce this phenomenon is considered to be one of the means most commonly used by manufacturers. In general, effective corrosion inhibitors are synthetic chemicals that can harm human health and the environment. It is therefore essential to study this criterion of harmfulness, on health and the environment, during the development of these compounds.

In this context, several researchers have turned to the use of non-toxic inhibitors called "green inhibitors", these are natural organic compounds such as non-volatile plant extracts and essential oils ... because of their availability, lower cost of production and the absence of harmful effect on the environment or danger to human health.

In order to bring our stone to the building, we studied the inhibiting power of the essential oil of *Urginea maritima* on the corrosion of copper in medium  $H_2SO_4$  0.5M. The study is carried out by coupling stationary and transient electrochemical methods..

The results obtained show that the addition of the essential oil to the corrosive medium slows down the corrosion process, which results in an increase of the inhibitory efficiency which reaches 94% for a concentration of 0.5 g/L. The comparison between the results obtained through the stationary and transient electrochemical methods shows a satisfactory consistency.

Figure:



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### Biography



The author is interested in the valorization of essential oils and plant extracts in the field of electrochemistry. She was registered for a PhD in 2017, Faculty of Sciences of Kenitra, University IbnTofail, Morocco.

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## Prevention of copper corrosion in a sulfuric environment by an ecological inhibitor: *Mentha pulegium* L from western Morocco

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### Abstract

Metals are amongst the most widely used materials, particularly in mechanical engineering, the transport industry, electronics and construction. However, the usefulness of metals and alloys is limited by the common problem of corrosion. Several studies have been exploited in the field of corrosion to examine the possibility of inhibiting the corrosion of metals in different acidic media, with respect to organic inhibition mechanisms.

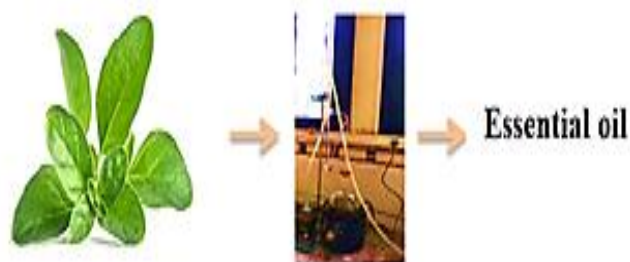
A large number of organic compounds have been studied for their corrosion inhibiting potential as green inhibitors. These retard the corrosion of metals by adsorbing onto a metal surface. This process is influenced by factors such as the size of the molecules, the nature of the atoms which constitute them, the concentration, the temperature and the nature of the solution to be tested.

All these studies indicate that organic compounds containing nitrogen N, sulfur S and oxygen O in their structures lead to significant inhibition efficacy.

Our work is part of an important line of research aimed at enhancing the plant resources and in particular the aromatic and medicinal plants of Morocco. In this context, we have chosen to study the anticorrosive power of *Mentha pulegium* L with respect to copper in a 0.5M sulfuric acid medium by varying two essential parameters: concentration and temperature.

The study is carried out by coupling stationary and transient electrochemical methods. The oil inhibiting effect studied on copper corrosion in a 0.5 M H<sub>2</sub>SO<sub>4</sub> solution shows a mixed type behavior. We were able to show that the essential oil of *Mentha pulegium* L inhibits the corrosion of copper in the tested solution with a significant efficiency which increases with the oil concentration to reach a maximum of 91.0%. This inhibitory efficiency depends on the concentration of the essential oil and the temperature.

**Figure:**



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### Biography



The author is interested in the valorization of essential oils and plant extracts in the field of electrochemistry. She was registered for a PhD in 2020, Faculty of Sciences of Kenitra, University Ibn Tofail, Morocco.

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# Chemical composition and inhibitory activity of pancreatic $\alpha$ -amylase and intestinal $\alpha$ -glucosidase *in vitro* and *in vivo* of *Artemisia absinthium L.* extracts

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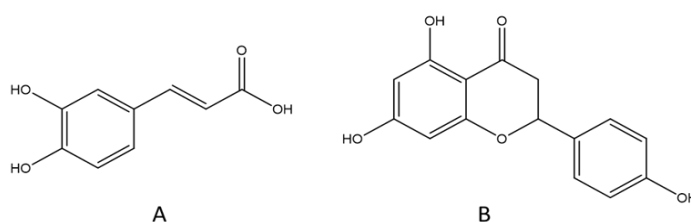
<sup>2</sup>Laboratory of Bioresources, Biotechnology, Ethnopharmacology and Health, Department of Biology, Faculty of Sciences, University Mohamed First, Boulevard Mohamed VI; BP: 717; 60000, Oujda, Morocco.

## Abstract

Diabetes mellitus is among the most common diseases in the world. Indeed, in 2017, 325 million people suffered from type 2 diabetes, and the number of cases is progressively increasing [1]. In 2006, type 2 diabetes was responsible for about 5% of global deaths, according to World Health Organization. The incidence of diabetes is increasing daily, and it is proposed that the number of cases will around 552 million by the year 2030 [2]. The variety of molecules constituting aromatic and medicinal plants presents several interests especially in the pharmaceutical industry. For this reason, various researches have been oriented towards the characterization and identification of new bioactive substances that can improve pharmaceutical production. This study aims to analyze the chemical composition of the *Artemisia absinthium* ethyl acetate EAE and aqueous extracts AQE and to evaluate their antidiabetic effect *in vitro* and *in vivo*, for this purpose the inhibition of the pancreatic  $\alpha$ -amylase and intestinal  $\alpha$ -glucosidase enzymes causing the reduction of blood glucose has been examined.

The determination of the chemical composition of the extracts was carried out by high-performance liquid chromatography- The photodiode array detector (HPLC-DAD), and this analysis revealed the presence of Naringenin and caffeic acid as major products in AQE and EAE respectively. Indeed, this study was showed that AQE significantly inhibited the pancreatic  $\alpha$ -amylase and intestinal  $\alpha$ -glucosidase, *in vitro* and *in vivo*. The EAE had no in-hibitory activity against intestinal  $\alpha$ -glucosidase enzyme, *in vivo*, by contrast, a remarkable effect *in vitro*.

**Figure:** structures of the main compounds found in the extracts.



## Recent Publications

1. Solomon, S.D., et al., Diabetic retinopathy: a position statement by the American Diabetes. Ass. Diab. care 40 (2017) 412-418.
2. Gowd, V., et al., Antioxidant and antidiabetic activity of blackberry after gastrointestinal digestion and human gut microbiota fermentation. Food chem. 269 (2018) 618-627.

## Biography



Author has her expertise in evaluation and passion in the search for new bioactive molecules from plants. Her focus is based on the use of aromatic and medicinal plants in different field. she is a PhD student in her fourth year at LC2AME laboratory at the University of Mohamed First Oujda in Morocco.

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## Alginate-based encapsulation of polyphenol from Pistacia Lentiscus leaf extract for stable and controlled release system

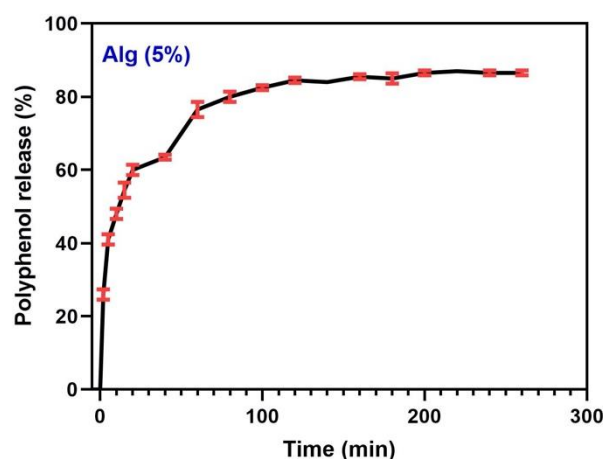
**BRAHMI Mohamed<sup>1</sup>**, Hamza BOUAKLINE<sup>1</sup>, Kamal ESSIFI<sup>1</sup>, Amina AMRANI<sup>1</sup>, Ali ELBACHIRI<sup>1</sup>, Abdesselam TAHANI<sup>1</sup>

<sup>1</sup>Physical Chemistry of Natural Substances and Process Team, Laboratory of Applied Chemistry and Environment (LCAE-CPSUNAP), Mohammed First University, Faculty of Sciences, Oujda

### Abstract

Pistacia Lentiscus leaf extract has a high content of polyphenols, which is very valuable in the biological field. However, encapsulation of plant extracts is mainly used to improve their stability and protect the polyphenolic compound from environmental conditions, biopolymers are widely used to protect and control the release of the active compound from the plant extract. The aim of this work was the encapsulation of Pistacia lentiscus extract on calcium alginate beads using an ionic gelation process. The effect of polymer concentration (2-5%), CaCl<sub>2</sub> (3-6%) and extract concentration was used to study the elaborated alginate beads containing Pistacia Lentiscus leaf extract with high encapsulation efficiency. The release kinetics of the polyphenol was performed at different pH, furthermore, the chemical interaction between the extract compound and the alginate matrix was evaluated using FTIR, and the thermal stability was characterized using TGA/ATD and DSC measurements. The calcium alginate beads were found to have high encapsulation efficiency for Pistacia extract with the improvement of their thermal stability, which promises a wide range of applications.

Figure:



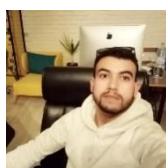
### Recent Publications

1. K. Essifi, M. Brahmi, D. Berraouan, A. Ed-Daoui, A. El Bachiri, M.L. Fauconnier, A. Tahani, Influence of Sodium Alginate Concentration on Microcapsules Properties Foreseeing the Protection and Controlled Release of Bioactive Substances, J. Chem. (2021) 2021.
2. M. Benković, I. Sarić, A.J. Tušek, T. Jurina, J.G. Kljusurić, D. Valinger, Analysis of the Adsorption and Release Processes of Bioactives from Lamiaceae Plant Extracts on Alginate Microbeads, Food Bioprocess Technol. (2021).

### Acknowledgment

The authors are sincerely thankful to MESRSFC, CNRST-Morocco and UMP for financial support of Project PPR 15-17 and PARA1- 2019. The authors also would like to thank ANPMA / CNRST / UMP 2020-2023 for financial support. Project.

### Biography



**Mohamed Brahmi** a PhD student at faculty of Sciences Oujda of Mohammed 1st University, Mohamed run research about the interactions between polymers and clay, his current project is “Elaboration of polymer or hydrogels composites and their applications”.

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## Antimicrobial and antifungal activity of metholic extract of sourdough

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<sup>2</sup>Department of Biology, Center of Molecular and Environmental Biology, University of Minho, Portugal.

### Abstract

In recent decades, increasing bacterial resistance to antimicrobial agents has become a topic of interest in the scientific community [1]. So the national surveillance and research programs have been initiated to monitor resistance in isolates from foods, animals, and environment [2].

so for this reason we decide to study the microbial composition of sourdough much as a natural probiotics and how they influence on human health.

the aim of our study, is to test the bactericidal and bacteriostatic effect of methanolic and crude extract of sourdough against bacterial and fungal .

The results showed that methanolic and crude extract of different sourdough samples have a higher activities as antimicrobial and antifungal agents. However as expected, the agreement between the two-step incubation colorimetric micro dilution method was higher than that obtained for the Scan MIC method by agar dilution method. However, the overall effects on accuracy were within accepted limits.

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### Biography



MOUJABBIR Sara is a Ph.D. student at Chouaib Doukkali Univesrity Morocco. MOUJABBIR does research in natural product and their effect on human health . The current project is “sourdough using in bread and quality of bread”.

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# The Potential of Chitin Co-products in the Biocontrol of *Solanum lycopersicum* L. Phytopathogens: The Case of *Ralstonia solanacearum* and *Fusarium oxysporum f.sp. radicis-lycopersici*

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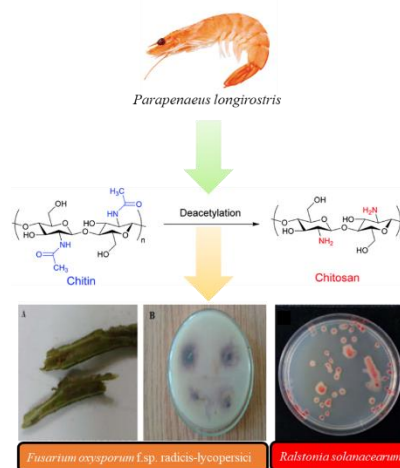
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## Abstract

*Ralstonia solanacearum* and *Fusarium oxysporum f.sp. radicis-lycopersici* (FORL) are the most destructive phytopathogens of vegetables, causing very important economic losses [1, 2]. In order to control these phytopathogens, synthetic pesticides were the only valuable solution, in spite of their harmful effects on health and the environment [3]. This setting encourages the exploration of more ecologically beneficial interventions [4]. The aim of the present work is based on the recovery of pink shrimp shells waste (chitin and chitosan) by their uses as growth inhibitors of *R. solanacearum* and FORL in vitro and as *Solanum lycopersicum* L. protectors against the causal agent of bacterial wilt and the causal agent of vascular wilt in vivo. To attempt these objectives, the inhibitory effect of colloidal chitin and chitosan was evaluated in vitro on Mueller-Hinton solid medium for *R. solanacearum* and on PDA medium for FORL, supplemented with these biopolymers. Chitosan at 25 mg L<sup>-1</sup> contributed to significant growth inhibition (68.74%) of the isolated strains. Furthermore, the highest concentrations (100 mg L<sup>-1</sup>) of chitin and chitosan reduced mycelial development by 56.55% and 73.04 %, respectively. Likewise, in experiments with inoculated *Solanum lycopersicum* L. seedlings (*R. solanacearum*), chitin at 25 mg L<sup>-1</sup> significantly promoted stem length by 54.95%, while soil amendment with 100 mg L<sup>-1</sup> of chitosan increased root length by 82.55% compared to the control. However, soil amendment by 50 mg L<sup>-1</sup> of chitin improves the stem and root lengths by 73.89% and 405.26%, respectively. The severity of bacterial wilt was reduced by 142.86% when the soil was amended with chitin at 50 mg L<sup>-1</sup>. However, the contagiousness of vascular wilt was attenuated by 73.34% in the presence of chitin at 25 mg L<sup>-1</sup>. These findings are consistent with prior research that suggests using this technique to manage these phytopathogens [5].

## Figure



## Recent Publications

1. Sadi, S. K., Saidou, A. K., Boube, M., & Aune, J. B. Effets de la Fertilisation à Base de la Biomasse du Sida cordifolia L. sur les Performances Agronomiques et la Rentabilité Économique de la Tomate (*Lycopersicum esculentum* Mill.) en Culture Irriguée. *European Scientific Journal*, 16(3), (2020), 127–150.
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5. Kumaraswamy, R. V., et al. Engineered chitosan based nanomaterials: Bioactivities, mechanisms and perspectives in plant protection and growth. *International journal of biological macromolecules* 113, (2018), 494-506.

## Biography



Amine RKHAILA received the PhD degree in Plant and Microbial Biotechnology with an Honorable Mention from Ibn Tofail University-Kenitra in 2020. His research interests include the application of natural products and beneficial bacteria in agriculture, such as extracted biopolymers (Chitin and chitosan) and endophytic Bacillus species. He conducted research on these subjects during his thesis preparation and after his graduation. In his work, Amine RKHAILA set a special focus on the chemical extraction of chitin and chitosan from pink shrimp shell waste and its future use as plant protectors. Recently, he has been able to optimize the chemical extraction of chitin derivatives from *Parapenaeus longirostris*, which led him to obtain products comparable to those of Sigma Aldrich (based on high-level chemical analysis).

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# A Viscometric study of the products obtained by controlled degradation of naturel rubber

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## Abstract

Natural rubber is a product that can be used in the manufacture of tyres, trucks and aircraft, engine mountings, gloves, balloons, adhesives, etc. However, they have a high molecular weight which explains their low degradation rate [1]. In this context, researchers have developed methods that can cleave natural rubber chains and produce low molecular weight natural rubber that can be used in the recycling processes of this polymer, among them: the controlled degradation of natural rubber NR which can be derived from several techniques such as photochemical degradation [2], degradation by metathesis [3] and degradation using specific double bond cleavage reagents [4]. In particular, the degradation of NR in the presence of periodic acid allows rubber waste to be recycled and respects strict specifications such as, easy to handle, inexpensive, allowing products with well-defined chemical structures to be obtained [2] [5]. Furthermore, this reaction constitutes a useful procedure for the chemical modification of natural rubber NR, and the preparation of reactive functional polymers and oligomers, which are of additional. Indeed, telechelic oligomers can be used as macro-monomers capable of being scratched or polycondensed with various natural and synthetic polymers which multiplies the fields of application of natural rubber such the manufacture of biodegradable materials based on rubber and other natural polymers [6].

In this work, we are interested in the controlled degradation of 25% epoxidized natural rubber ENR 25% and the viscosimetric study the products obtained. We are also interested in determining the Mark-Houwink parameters "k" and "a" of the telechelic oligomers at different temperatures using the values of their molar masses determined by NMR (<sup>1</sup>H and <sup>13</sup>C) spectroscopy, size exclusion chromatography (SEC) and light scattering measurements.

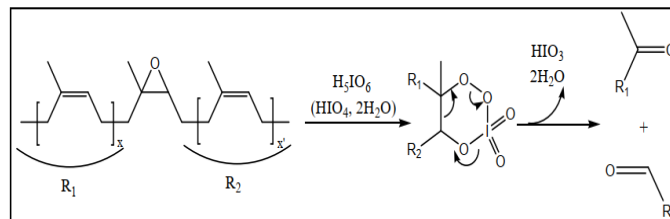
## Biography



\*BOURASSI Lamiae 24 years old, a PhD student in faculty of science, Mohammed first university, Oujda. I have an experience in polymer chemistry. My focus is based on the use of natural polymers to have application in field of biodegradable materials and to simulate them by molecular dynamics study.

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**Figure:** Degradation of polyisoprene epoxied with periodic acid



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# Preparation of Activated Carbon from Cardoon "Cynara Cardunculus" Waste: Characterization and Application to the Adsorption of Synthetic Organic Dyes

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<sup>2</sup>Processes, Materials and Environment Laboratory (PME), Faculty of Sciences and Techniques, Sidi Mohammed Ben Abdellah University, Route Imouzzer, BP2202, Atlas, FEZ, Morocco

## Abstract

There is increasing interest in adsorption of pollutants on biosorbents, including the use of natural plant-based materials. This study examines the feasibility of using activated carbon based on Cardoon Leaf waste as a low-cost adsorbent for synthetic organic dyes. The carbons were used in their raw states and chemically activated with H<sub>3</sub>PO<sub>4</sub> for the adsorption of two organic dyes "Crystal Violet" and "Congo Red". The obtained activated carbons are characterized by scanning electron microscopy coupled with EDX, X-ray diffraction, fourier transform infrared adsorption spectroscopy, inductively coupled plasma atomic emission spectroscopy and thermogravimetric analysis. Other complementary analyses were performed such as moisture, ash and fixed carbon contents, quantification of acid and basic groups on the surface, pH at zero charge and iodine value. The different adsorption experiments were monitored as a function of adsorbent mass, contact time, pH value, initial dye concentration and salinity of the medium. The results obtained indicate that the adsorption equilibrium is reached at 45 minutes of contact for the Crystal Violet and at 105 minutes of contact for the Congo Red. The adsorption rates remain proportional to the mass of each adsorbent, their optimal values are 60 mg for Crystal Violet and 180 mg for Congo Red. The influence of the ionic strength is negligible for both dyes. These results show that Cardoon waste can be a potential precursor for the preparation of environmentally friendly adsorbents for the reduction or even elimination of polluting organic dyes.

Figure



## Recent Publications

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2. Hajji Nabih M., El Hajam M., Boulika H., Hassan M., Idrissi Kandri N., Hedfi A., Zerouale A., Boufahja F., sustainability. 13 (2021) 13905.
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## Biography



PhD student in third year in chemistry of materials under the direction of Professor N.IDRISSE KANDRI. in systems, signals and compounds laboratory at Faculty of Science and Techniques in Fes Morocco (SSCL-FST-USMBA). I am working on an environmental research subject, which aims to characterize and evaluate the vegetable wastes for Eco-friendly applications.

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## Preliminary identification and characterization of *Serenoa Repens* extracts

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<sup>1</sup>LCAE, Faculty of Sciences, Mohammed first University, BP 717, 60000, Oujda, Morocco.

<sup>2</sup>Pharmaceutical Engineering Department, CNRS 5525, School of Pharmacy of Grenoble, Grenoble Alpes University, France

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### Abstract

*Serenoa repens*, also known as saw palmetto, is a small, low-growing, extremely sturdy dwarf-palm tree with bluish-green and fan-shaped leaves with a single short stipe. The species grows wild in sandy soils of south-eastern United States of America. Its flower is the source of a commercial high-grade honey. The flowers are followed by small, yellow berries that turn black. These berries are an important food source for many mammals and birds. The saw palmetto extracts are considered active ingredients to be used for medicines, such as phytotherapeutic agent for the treatment of symptoms related to benign prostatic hyperplasia.

For this inquest, we were interested in the seeds extracts and oil of *Serenoa Repens*. The extraction was carried out using Soxhlet extraction and cold maceration. These substances consist of several active compounds that are used in different fields such as medical and pharmaceutical industry. Among these compounds, there is free fatty acids, phytosterols, phenolic acids, etc. We used GC and HPLC to identify some of these components. Some values were defined to determine the quality of the oil as well as some antioxidant activity.

Figure



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### Biography



Raoudi Meryem, a PhD student at the faculty of sciences Oujda of Mohammed first university, working on the optimization of grinding process and the development of extraction and identification methods for active ingredients.

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# Phytochemical investigation and antioxidant activity of the extracts of *Marrubium Vulgare* L. from the region of Al-Hoceima

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## Abstract

*Marrubium vulgare* L (Lamiaceae), a medicinal plant used in folk medicine to treat different pathologies (1). This plant originated in the region between the Mediterranean sea and central Asia, has become a widespread species, currently inhabiting all continents (2).

Several studies has been shown the pharmacological effects of *Marrubium vulgare* L (3) (4) (5).

The aim of this work was to further investigate the phytochemical composition of three organic solvents extracts and aqueous extract of the whole plant, then the antioxidant activity of this extracts.

The characterization tests are based in part on qualitative analysis, either on the formation of insoluble complexes using precipitation reactions, or on the formation of colored complexes, using color reactions.

In this *in vitro* study, antioxidant activity of the organic solvents and aqueous extract of *Marrubium vulgare* L. were investigated. Antioxidant activity was evaluated by 2,2'-diphenyl-1-picrylhydrazyl (DPPH) radical-scavenging activity and (FRAP) method.

## Figure



## Recent Publications

1. Molina-Salinas, G. M., Ramos-Guerra, M. C., Vargas-Villarreal, J., Mata-Cárdenas, B. D., Becerril-Montes, P., & Said-Fernández, S. (2006). Bactericidal activity of organic extracts from *Flourensia cernua* DC against strains of *Mycobacterium tuberculosis*. A.
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## Biography



Mohamed EL BASTRIOUI.

I am registered in 4th year doctorate in ENSAH. I obtained my DESA from the Faculty of Sciences of Oujda in 2006 in physico-chemistry of materials. Our research project concerns the study of plants from our region of alhoceima and the application of their extracts in various biological and pharmacological activities

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# A Comparative study of chemical properties and antioxidant activity attributes of five pomegranate (*Punica granatum L.*) cultivars grown in Béni Mellal region- Morocco

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## Abstract

Pomegranate fruit is generally consumed fresh or processed into food products depending mainly on its composition, characteristics, and technological quality. This study aims to assess the variability in terms of physicochemical and biochemical properties of four foreign pomegranate cultivars, newly introduced in Béni Mellal region, to better know their fruit potential in comparison with the local dominant cultivars “*Sefri Ouled Abdellah*”. Total phenolics contents (TPC), total flavonoids contents (TFC), total anthocyanins contents (TAC), soluble sugars contents (SSC), titrable acidity (TA), pH, total soluble solids (Brix°), and juice color (L\*, a\*, b\*, Chroma C\*, and hue°) were determined in pomegranate juices. The radical scavenging activity was measured using DPPH to evaluate antioxidant potential. For physicochemical descriptors, the variance was highly significant. The cultivar *Wonderful* has the highest acidity followed by *Smith* (2.449 g/100 mL and 3.11 g/100 mL). *Wonderful* and *Purple Queen* recorded higher values for all biochemical parameters, except for soluble sugars. In fact, cultivars rich in anthocyanins, polyphenols, and flavonoids presented the highest antioxidant activity. Regarding *Sefri Ouled Abdellah*, this cultivar has the highest values of SSC (154.54±19.08 g/L). Matrix of correlations revealed significant positive among variables particularly DPPH, TPC, TAC and, TFC. This research has highlighted the typicity, the nutritional and functional potential of the introduced cultivars compared to “*Sefri Ouled Abdellah*” which will help in proposing and orienting their exploitation in Agro-food industries.

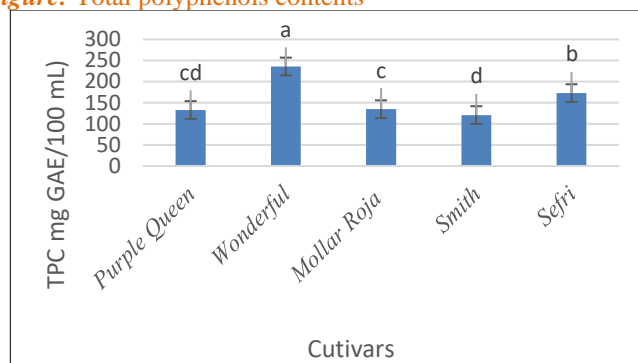
## Biography



Zahra EL KETTABI hold a Master degree in in Biotechnology, Food and Health from Abdelmalek Essaadi University, Faculty of Science of Tetouan Morocco. She is a PhD student at Sultan Moulay Sliman University, Faculty of Science and Technology Beni Mellal Morocco in collaboration with the National Institute of Agricultural Research (INRA) since 2020 in agro-food science and plant genetics.

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**Figure: Total polyphenols contents**



## Recent Publications

1. Loukhamas, S., Kerak, E., Outaki, M., Belaqqiz, M., & Harrak, H. (2020). Assessment of minerals, bioactive compounds, and antioxidant activity of ten moroccan pomegranate cultivars. *Journal of Food Quality*, 2020.
2. Adiba, A., Hssaini, L., Haddioui, A., Hamdani, A., Charafi, J., El Iraqui, S., & Razouk, R. (2021). Pomegranate plasticity to water stress: attempt to understand interactions between cultivar, year and stress level. *Heliyon*, 7(6), e07403.
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4. Kandyliis, P., & Kokkinomag, E. (2020). Food applications and potential health benefits of pomegranate and its derivatives. *Foods*, 9(2), 122.

# Preliminary characterization of *Thymus vulgaris* essential oil by solid-phase microextraction (HS-SPME) and gas chromatography coupled to mass spectroscopy (GC-MS)

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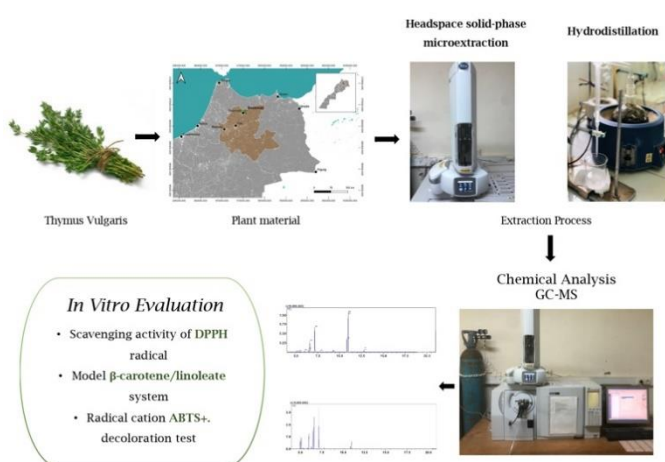
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## Abstract

The essential oil composition of *Thymus vulgaris* was determined by gas chromatography-mass spectroscopy (GC-MS) and Headspace Solid Phase Microextraction (HS-SPME). The essential oil extracted from *Thymus vulgaris* L. by hydrodistillation provided a yield of 4%. GC/MS analysis of the essential oil allowed the identification of 11 components. It is essentially rich in oxygenated monoterpenes (56.97%) and contains carvacrol 37.63% and thymol 17.35% in appreciable quantities forming 54.98% of the global composition. The chemical composition analysis of thyme extract by HS-SPME identified 27 compounds and showed that monoterpene hydrocarbons are the most dominant compounds (85.94%) while oxygenated monoterpenes represent (12.69%). The in vitro antioxidant activity was evaluated by three methods: the DPPH free radical scavenging test with an IC<sub>50</sub> of 0.51 ± 0.11 mg/ml; the β-carotene/linoleic acid bleaching test which recorded an IC<sub>50</sub> of 2.58 ± 0.10 mg/ml; and finally the ABTS which was found to be low compared to that of ascorbic acid.

The essential oil of *Thymus vulgaris* was evaluated for its antioxidant effect proving that it could play the role of a food preservative.

Figure



## Recent Publications

1. **Kamal Essifi**, Abdourahim Hammani, Doha Berraaouan, Ali El Bachiri, Marie-Laure Fauconnier, Abdesselam Tahani. Montmorillonite nanoclay based formulation for controlled and selective release of volatile essential oil compounds. *Materials Chemistry and Physics* (2021)
2. **Malgorzata Olszowy**, Andrzej L. Dawidowicz. Essential oils as antioxidants: their evaluation by DPPH, ABTS, FRAP, CUPRAC, and b-carotene bleaching methods.

## Biography



Yousra Belbachir, a PhD student at the University of Mohammed the First, has expertise in the evaluation of lipophilic plant substances and the valorization of aromatic and medicinal plants. She is interested in the aromatization of vegetable oils by essential oils in order to evaluate their oxidative stability

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## Physicochemical qualities of commercial essential oils of : *M.spicata*, *M.piperita*, *M.pulegium*

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\*Laboratory of Biochemistry and Molecular Biology. Faculty of Medicine and Pharmacy. University Mohamed V-Rabat.

### Abstract

This work is a synthesis of the characterization of the physicochemical quality of commercial essential oils (EOS) of aromatic and medicinal plants of the genus *Mentha*: *Mentha spicata*, *Mentha piperita*, *Mentha pulegium*. The EOS of these plants are used specifically in the oral environment given their various antibacterial and antifungal properties. These activities are due to their chemical composition, which can vary due to several factors which will directly influence their activities. The objective of this research is to study the chemical composition of EOS that were collected from different networks as well as different origins. The quality of EOS was identified by the number and the nature of certain components that were used as controls constituting each oil, using the technique of thin layer chromatography (TLC).

**Keywords :** Essentials oils, *Mentha spicata*, *Mentha piperita*, *Mentha pulegium*, oral environment.

Figure



### Biography



The author obtained her master's degree in 2020 specializing in Biology and materials of the oral environment at the faculty of dental medicine Rabat. Then she enrolled in a doctorate in March 2021 at the Faculty of Medicine and Pharmacy Rabat. She specializes in the study of the effect of essential oils of the *Mentha* genus on oral health. She has just published an article on the physicochemical quality of commercial essential oils of the *Mentha* genus: *M.spicata*, *M.piperita*, *M.pulegium*. And at the same time she is preparing another article on the chemical composition of the essential oils of *Mentha* genus: *spicata*, *piperita*, and *pulegium* of Rabat region.

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## Bioactive compounds from Moroccan plants as antibiofilm agents: Case of the endemic *Origanum grosii*

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<sup>2</sup>Materials and Interfacial systems Laboratory, Department of Chemistry, Faculty of Science, Abdelmalek Essaadi University, BP 2121, Tetuan, Morocco.

<sup>3</sup>Laboratory of Applied Organic Chemistry, Faculty of Sciences and Technology, Sidi Mohammed Ben Abdellah University, 30000 Fez, Morocco.

### Abstract

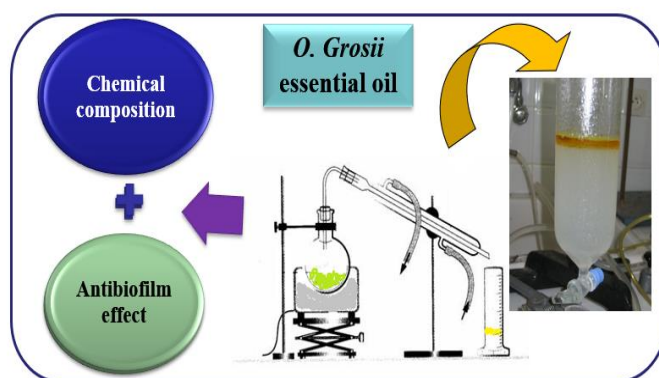
The aim of this research was to study the chemical composition and biological activity of essential oil of the Moroccan endemic *Origanum grosii* on biofilm of *Staphylococcus aureus* strains. Qualitative and quantitative composition of the essential oil was analyzed by gas chromatography and gas chromatography-mass spectrometry. The Minimum Inhibitory Concentration was determined using the broth microdilution method.

The antibiofilm effect of essential oil of *Origanum Grosii* was tested against three staphylococcal strains (*Staphylococcus aureus* MBLA, *Staphylococcus aureus* CECT976 and *Staphylococcus aureus* ATCC25923).

Results showed that the essential oil of *Origanum Grosii* presented a high antibiofilm effect against different staphylococcal strains by the inhibition of the biofilm formation and showed also a significant antibacterial activity (dose-dependent). Phytochemical analyses revealed a high content of carvacrol and thymol.

The essential oil of *Origanum grosii* seems to be a promising alternative for both microbial control and therapeutic treatment against pathogenic resistant bacteria.

Figure



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### Biography



Dr. Hikmat DOUHRI was awarded her PhD from the Abdelmalek Essaadi University (Tetuan, Morocco) in 2018. She is author of several research papers in international journals and she has also participated in many national and international conferences. Her research interests are in the area of development of natural bioactive compounds.

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# The chemical profile, antioxidant activity, $\alpha$ -Amylase Inhibition Potential and Toxicity Evaluation of the water residues from hydro distillation of Rosemary

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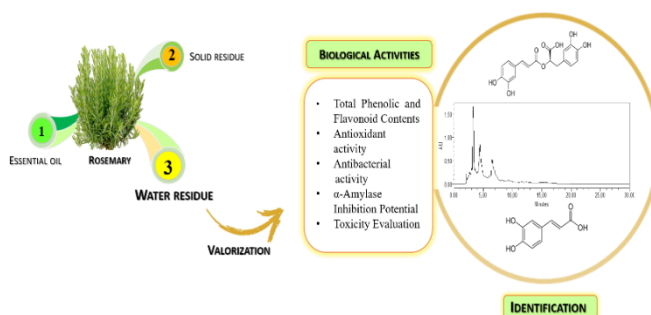
<sup>2</sup>Bio-Resources, Biotechnology, Ethno-Pharmacology and Health. Research Team, Faculty of Sciences, Mohammed First University, 60000 Oujda, Morocco

## Abstract

The liquid residues of hydrodistillation generated by the agricultural industry based on aromatic and medicinal plants presents a real risk of environmental problem. The aims of this work are to reduce this risk and to produce value added materials. The liquid residue of Rosemary has been valorized in biological field by quantification of polyphenol content ( $46.80 \pm 1.098$  mg GAE/g DW) and the identification of Caffeic acid and Rosmarinic acid as two molecules present in this liquid residue using HPLC-DAD analysis. The antioxidant potential of this liquid residue was disclosed by the Beta-Carotene/linoleate model system ( $IC_{50} = 3.955 \pm 0.71$  mg/ml), DPPH ( $IC_{50} = 0.166 \pm 0.007$  mg/ml) and ABTS ( $IC_{50} = 0.188 \pm 0.013$  mg/ml) radical scavenging assay. Furthermore, including diabetes Pancreatic  $\alpha$ - amylase ( $IC_{50} = 1 \pm 0.11$  mg/ml) was used to investigate the inhibitory effect of the liquid residue and we studied also its acute oral toxicity for a short and long period of time.

The liquid residue was evaluated for its antioxidant, Pancreatic  $\alpha$ - amylase, Acute oral toxicity from which there is evidence that it could be a source of the bioactive compounds.

Figure: Valorization process of rosemary water residue



## Recent Publications

1. Hassouni, A. El, Bachiri, A. El, & Belbachir, C. (2019). Lavandula dentata Solid Residue from Essential Oil Industry. Journal of Essential Oil-Bearing Plants, 22(6), 1601–1613. <https://doi.org/10.1080/0972060X.2019.1709906>
2. Sabbahi, M., El-Hassouni, A., Tahani, A., & El-Bachiri, A. (2019). Volatile variability and antioxidant activity of rosmarinus officinalis essential oil as affected by elevation gradient and vegetal associations. Asian Journal of Chemistry, 31(6), 1279–1288. <https://doi.org/10.14233/ajchem.2019.21898>

## Biography



Imane Ziani has her expertise in the evaluation and valorization of solid and liquid residues generated by the agricultural industry based on aromatic and medicinal plants. Her focus is based on the extraction, fractionation, and isolation of biomolecules present in these residues for application in the biomedical field. She is a third-year Ph.D. student from Mohammed First University.

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## Evaluation of the antifungal activity of essential oil from *Mentha pulegium. L*

Fatima Brahmi<sup>1\*</sup>, Ouafae Mokhtari<sup>1</sup>, Ashraou abdessalam<sup>2</sup>, Taibi ben hadda<sup>3</sup>, Rachid Touzani<sup>3</sup>, Bouchra legsseyer<sup>1</sup>

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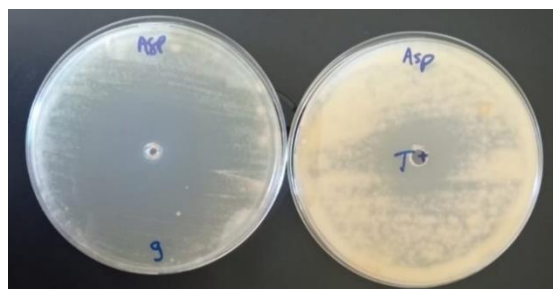
<sup>3</sup>Laboratory of Applied Chemistry and Environment (LCAE) Morocco, Faculty of Sciences, Department of Chemistry, University Mohammed Premier, Oujda, Morocco

### Abstract

In Morocco, rot problems in storage conditions are a major constraint for the development of fruit sectors such as the citrus sector which is threatened by microbial proliferation. This situation encourages farmers to use synthetic pesticides intensively. This has posed numerous environmental and human health problems and has led to the development of the resistance of pathogens to the chemical molecules used. Indeed, the search for new biocides has proved necessary and has focused on the identification of new antimicrobial drugs such as natural bioactive compounds based on the use of plant extracts more precisely essential oils. The objective of this study is the chemical and biological characterization of essential oils extracted from *Mentha pulegium. L*, to confirm their antifungal power. Leaves of *Mentha pulegium. L* (1kg) was extracted with the steam method, and 0,018mL of essential oil was obtained. GC /MS analysis was identified ten components that represented 100% of the total detected constituent. The major components of the leaves were pulegone (74,88%), 2-(2,2,4-Trimethyl-3-cyclopentene-1-yl) ethanol l' $\alpha$ -terpinéol (5,43%), Verbenone (3,21%). The antifungal activity of essential oils of *Mentha pulegium. L* was examined against three strains, the tests were carried out, and the results showed a strong activity of essential oil against *Aspergillus Niger* (MIC= 0,09  $\mu$ l/ml), *Penicillium* (MIC=0,5  $\mu$ l/ml), and *Geotrichum* (MIC=1  $\mu$ l/ml). This essential oil would be of interest in both agriculture and the food industry by acting as a bio-fungicide.

**Keywords:** *Mentha pulegium L*, essential oil, chemical composition, antifungal activity, bio-fungicide.

**Fig.** Inhibition diameter of *Mentha pulegium. L* essential oil and positive control against *Aspergillus*.



### Recent Publications

1. Bekka-Hadji, F., Bombarda, I., Djoudi, F., Bakour, S., & Touati, A. (2022). Chemical Composition and Synergistic Potential of *Mentha pulegium L.* and *Artemisia herba alba* Asso. Essential Oils and Antibiotic against Multi-Drug Resistant Bacteria. *Molecules*, 27(3), 1095.

### Biography



BRAHMI Fatima is a Ph.D. student at the faculty of Sciences, Mohammed 1st University, Laboratory for the Improvement of Agricultural Production, Biotechnology and Environment, Faculty of Sciences, UMP, Oujda, Morocco. Fatima researches “the biocidal power of the aromatic and medicinal plants of Eastern Morocco”.

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# The effect of the air-drying temperature on the bioactive compounds and biological effect of *P. lentiscus* leaves extracts and essential oil

Hamza BOUAKLINE<sup>1</sup>, Mohamed BRAHMI<sup>1</sup>, Amina AMRANI<sup>1</sup>, Imane ZIANI<sup>1</sup>, Abdesselam TAHANI<sup>1</sup>, Ali EL BACHIRI<sup>1</sup>

<sup>1</sup>University Mohammed Premier, Faculty of Sciences, chemistry department, Laboratory of Environment and Applied Chemistry, Oujda, Morocco

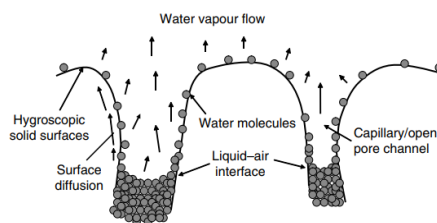
## Abstract

The plants are an essential element of nature, they are of great importance medically and economically all over the world, moreover have been the main source of primary health care, also have been a rich source of effective medicines. The main properties of aromatic and medicinal plants are generally depending on the region of production, the techniques and period of harvest, as well as the process of drying.

The drying is one of the most important operations in the conservation process of the aromatic and medicinal plants. In the other hand its main interests is conservation and increasing the concentrations of the active compounds and protection against any depreciation or rotting; these interests are affected by many characteristics such as the type, the duration of drying and the drying temperature.

Concerning our study, we have brought to light the effect of the air-drying temperature on the bioactive compounds of essential oils and extracts.

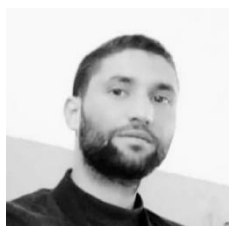
Figure



## Recent Publications

1. V. Vidrich, P. Fusi, A. Graziano, E. Silvestrini, M. Michelozzi, and F. Marco, “Chemical composition of the essential oil of pistacia lentiscus L.,” *J. Essent. Oil Res.*, vol. 16, no. 3, pp. 223–226, 2004, doi: 10.1080/10412905.2004.9698703.
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## Biography



Hamza Bouakline a PhD student at faculty of Sciences - Mohammed 1st University Oujda, Hamza runs research about the effect of the drying process on the bioactive compound of the Medicinal and Aromatic Plants.

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## Extraction, characterization and antioxidant activity of the *Ceratonia siliqua* L seeds extract and essential oil

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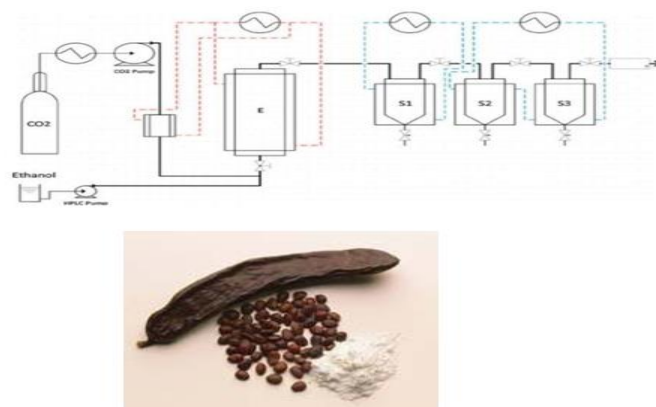
<sup>1</sup>LCAE Laboratory, Physical Chemistry of the Natural Resources and Environment Team, Mohammed first University, BP 717, 60000, Oujda, Morocco.

### Abstract

The *Ceratonia siliqua* L. is a plant that belongs to the family of legumes, which is known as "kharoube". A lot of people are interested in this tree thanks to its strength, qualified wood, ornamental, and landscape value, but especially for its seeds, which is the subject of commercial transactions whose value exceeds that of the production of wood. This medicinal plant is widely used in traditional medicine as an anti-diarrheal and treats gastrointestinal disorders.

In our study, we will be particularly interested in the seeds extract and essential oil of *Ceratonia siliqua* which the extraction had been done using the supercritical CO<sub>2</sub> extraction and cold maceration. On the other side, this material represents an important source of an immense variety of bioactive molecules that have multiple interests used in the food industry, cosmetology, and pharmacy. Among these compounds are identified by GC and HPLC. Also, the antioxidant activity of essential oil and extract are evaluated for both.

Figure



### Recent Publications

1. L. Ceratonia and I. Batlle, "Carob tree."
2. R. El Kahkahi, R. El Kahkahi, M. Moustaine, A. Mouhajir, S. Bachir, and A. Lemrhari, "Technical sheet on the culture carob tree (*Ceratonia Siliqua* L.) in Morocco Technical sheet on the culture carob tree (*Ceratonia Siliqua* L.) in Morocco," ResearchGate, no. December, 2016
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### Biography



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# Evaluation of physicochemical, functional and sensory properties of carob pulp beverage (ceratonia siliqua l)

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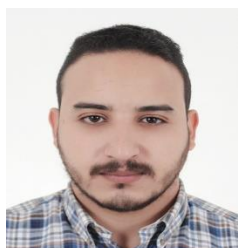
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## Abstract

In Morocco, carob tree (*Ceratonia siliqua* L.) is of considerable socio-economic importance, helping to improve the income of rural populations and to develop the economy of mountain areas. However, the primary use of the carob's pulp is generally limited in Morocco to animal feed. As a result, the current research suggests a novel pulp-based product designed for human consumption.

The main purpose of this work is to characterize a new formulated carob beverage and assess its physicochemical, biochemical, and sensory quality. Two formulas of carob beverages were prepared with two different sugar concentrations (formula A: 5 g/100 mL sugar; formula B: 10 g/100 mL sugar). Measurements of pH, titrable acidity, and Colour were performed to assess the physicochemical parameters. Total polyphenols and tannins contents were determined as important functional and biochemical parameters. Regarding sensory analysis, preference test, triangle test, hedonic test, and descriptive test, were evaluated. The Colour of the two formulations was dark red orange, as determined by Chromameter method. For formulae A and B, the titrable acidity was (1.450±0.025) g Citric Acid Equivalent (CAE) /L and (1.450±0.031) CAE g/L, respectively, and the Brix was (11.67±0.22) °Bx and (15.33±0.22) °Bx, respectively. The polyphenols content was (98.8±0.0019) mg Gallic Acid Equivalent (GAE) /100 mL for formula A and (97.7000±0.0017) mg GAE/100 mL for formula B. The tannin level was (24.500± 0.027) mg Catechin (CE)/100 mL and (25.400±0.017) mg CE/100 mL for the formula A and formula B samples, respectively. The sensory analysis tests revealed a distinct difference between the two formulae. In fact, the formula B was highly preferred compared to formula A, also the most prominent features in the drink were colour, smell, flavour, and sweetness.

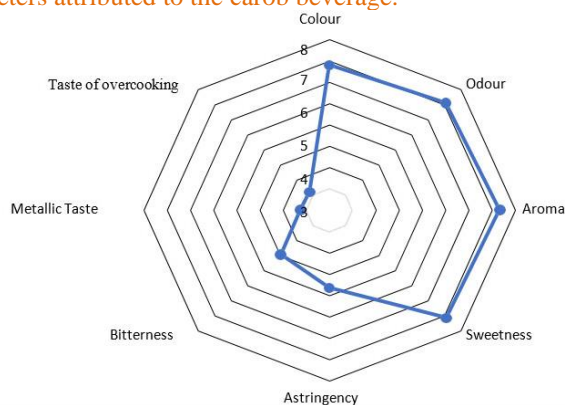
## Biography



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**Figure:** Medians of the scores of the sensory and appreciation parameters attributed to the carob beverage.



## Recent Publications

1. Elfazazi K., Harrak H., Achchoub M., & Benbati M. "Physicochemical criteria, bioactive compounds and sensory quality of Moroccan traditional carob drink." *Materials Today: Proceedings* 27 (2020): 3249-3253.
2. Mohammed B., Abdelhafid K., Abdelmajid H., Wiam B., Kaoutar E., & Hanane A. "Effect of Carob Pulp (*Ceratonia Siliqua* L.) on Fattening Performance, Carcass Characteristics and Meat Quality of Moroccan Breed Deroua Lambs." *Biosciences Biotechnology Research Asia* 2 (2021): 297.
3. Achchoub M., Azzouzi H., Elhaji L., Benbati M., Elfazazi K., Salmaoui S. Evaluation of Physicochemical, Functional and Sensory Properties of Carob Pulp Beverage (*Ceratonia Siliqua* L). *Biosci Biotech Res Asia* 2021;18(3).
4. Azzouzi, H., Elfazazi, K., Achchoub, M., Chafik, L., Jbilou, M., & Salmaoui, S. Effect of thermal pasteurization on the physicochemical stability and nutritional quality of Moroccan Valencia late orange juice. *International journal of engineering sciences & research technology*, (2018) 7(8), 277-283

# Assessment of total phenolic content and antioxidant activity potential of clementine extract obtained by microwave assisted extraction method

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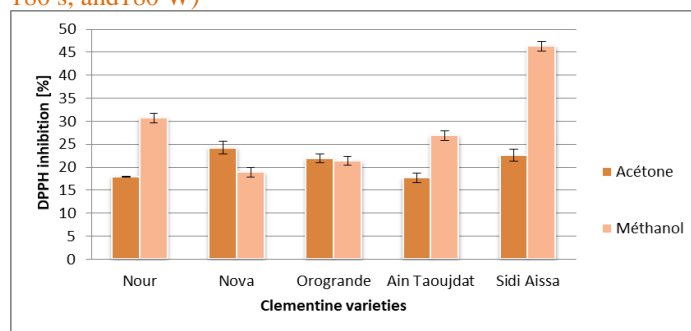
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## Abstract

Citrus peels are known as rich source of bioactive compounds. Therefore, the establishment of an appropriate and innovative extraction method is a major interest to the food processing industry. The aim of this work is to assess the total phenolic content (TPC) and antioxidant activity (AA) of peels extracts prepared from five Moroccan clementine varieties. Extracts were prepared with microwave-assisted extraction (MAE) technique using acetone and methanol solvents. The evaluation of the antioxidant activity was performed by DPPH and ABTS-free radical scavenging. The extraction conditions had significant effects on total phenolic content (TPC) and antioxidant activity (AA). In fact, the highest TPC amount of clementine varieties ( $730.850 \pm 0.004$  mg GAE/100g DM) was obtained with acetone solvent for the Sidi Aissa variety. Regarding antioxidant activity, results with DPPH method showed an important antiradical and antioxidant activities for Sidi Aissa variety with methanol solvent ( $46.30 \pm 1.01\%$ ). However, ABTS method showed a good antioxidant activity for Ain Taoujdat with methanol solvent ( $3.02$  mg/100g DM). This work provided to study the biochemical quality of Moroccan clementine extracts obtained by two microwave-assisted extraction processes in order to investigate further industrial potential uses in agro-food and pharmaceutical industries

**Figure:** Inhibition percentage % of extracts with microwave assisted extraction (methanol 80%, acetone 50%, m/v: 5g: 50ml, 180 s, and 180 W)



## Recent Publications

1. Azzouzi H, Elhajji L, Achchoub M, Benbati M, El-Fazazi K, Salmaoui S. Assessment of Total Phenolic Content and Antioxidant Activity Potential of Clementine Extract Obtained by Microwave Assisted Extraction Method. *Biosci Biotech Res Asia* 2021;18(4).
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3. Azzouzi, H., Elfazazi, K., Achchoub, M., Chafik, L., Jbilou, M., & Salmaoui, S. Effect of thermal pasteurization on the physicochemical stability and nutritional quality of Moroccan Valencia late orange juice. *International journal of engineering sciences & research technology*, (2018) 7(8), 277-283

## Biography



The author is a PhD student in fifth year specialized in the technological valorization of agricultural products, in the faculty of sciences and techniques Béni Mellal in convention with the national institute of agronomic research in Morocco. She has an article indexed thomsons reuters named: effect of thermal pasteurization on the physicochemical stability and nutritional quality of Moroccan Valencia late orange juice and web of science indexed articles named : Assessment of total phenolic content and antioxidant activity potential of clementine extract obtained by microwave assisted extraction method.

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## Antioxidant and antimicrobial activities of Carob leaves extracts (*Ceratonia Siliqua L.*) from female and male trees

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### Abstract

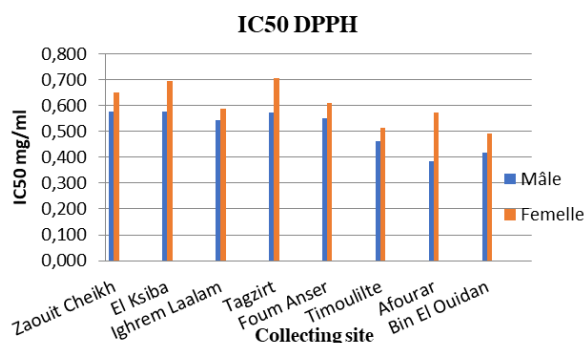
In recent years, there has been a great development in the field of research for new natural compounds for food preservation aimed at a partial or total replacement of currently popular antioxidant and antibacterial chemicals.

As a result, the ultimate goal of this study is to assess the chemical composition, the antioxidant, and the antimicrobial activities of Carob leaves extracts (*Ceratonia Siliqua L.*) from female and male trees.

Carob leaves were harvested from 8 sites in Beni Mellal-Khenifra areas. The aqueous extracts prepared from female and male carob leaves were characterized in terms of biochemical composition (total polyphenols, total flavonoids, condensed tannins), as well as antioxidant activity (DPPH and ABTS). The extract antimicrobial activity was assessed against (*Escherichia Coli 64*; *Escherichia Coli 76*; *Staphylococcus Aureus*; *Salmonella Typhi*; *Pseudomonas aerogenosa*; *Klebsiella*; *Listeria monocytogènes*). The results revealed that male extracts had higher polyphenol contents (110.442 mg EAG/g DM) than female extracts (97.9 mg EAG/g DM), while female extracts had higher flavonoid and condensed tannin contents (26.35 mg ER/g DM and 38.09 mg EC/g DM, respectively) than male extracts (18.19 mg ER/g DM and 22.62 mg EC/g DM, respectively). All the tested extracts present a remarkable antioxidant activity, with a significant variation in the IC50 values. Female extracts from Bin El Ouidane showed the highest activity for DPPH and ABTS (IC50 = 0.493 mg/ml; IC50 = 0.51 mg/ml, respectively), while male extracts from Afourer revealed the highest DPPH and ABTS values (IC50 = 0.572 mg/ml; IC50 = 0.33 mg/ml, respectively). In terms of antibacterial activity, extracts from female leaves were more effective than extracts from male leaves.

This study concluded that phenolic composition and antioxidant activity depend highly on the origin and sex of the carob tree. Female carob leaves exhibit a high antioxidant and antibacterial activity.

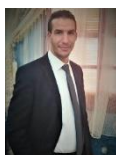
Figure: IC50 from DPPH test for all extracts of carob leaves



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- Elfazazi, K., Harrak, H., Achchoub, M., & Benbati, M. (2020). Physicochemical criteria, bioactive compounds and sensory quality of Moroccan traditional carob drink. *Materials Today: Proceedings*, 27, 3249-3253.
- Elfazazi, K., Jbilou, M., Assaidi, A., Benbati, M., & Harrak, H. (2017). Morphological and biochemical variability of Moroccan carob (*Ceratonia siliqua L.*) produced in Beni Mellal region. *Int. J. Pure App. Biosci*, 5(4), 14-21.
- Rtibi, K., Selmi, S., Grami, D., Amri, M., Eto, B., El-Benna, J., ... & Marzouki, L. (2017). Chemical constituents and pharmacological actions of carob pods and leaves (*Ceratonia siliqua L.*) on the gastrointestinal tract: A review. *Biomedicine & Pharmacotherapy*, 93, 522-528.
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### Biography



The author is a Phd student in his 1st year in the field of biochemical transformation and the technological valorization of agricultural products in the faculty of sciences and techniques Béni Mellal, in convention with the national institute of agronomic research of Morocco.

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## Essential oil of *Lavandula officinalis*: Antimicrobial activities against *Escherichia Coli*, *Salmonella Newport*

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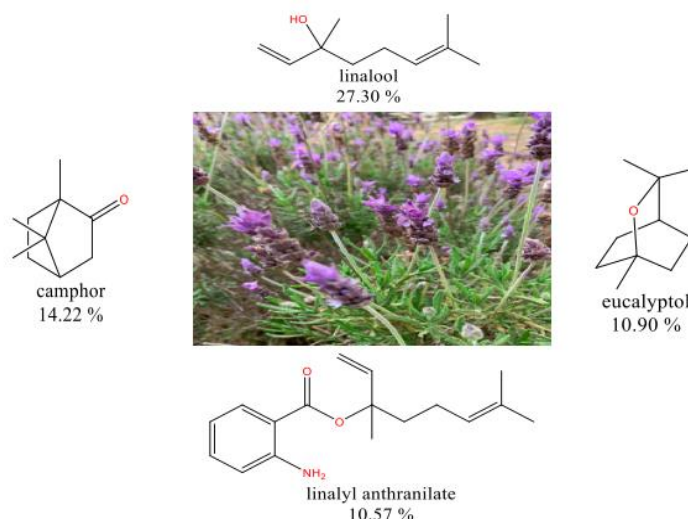
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### Abstract

Aromatic and medicinal plants are a source of several essential oils by their extraction, they have been known since ancient time for their numerous therapeutic properties [1]. *Lavandula officinalis* belongs to the Lamiaceae family specifically in the genus of Lavandula [2]. It was used in traditional medicine around the world for the treatment of several diseases such as remedies of various inflammatory disorders and as an analgesic [3] It was primary recommended for cold, flu, and cough and secondarily for gastrointestinal pain [4]. It's well-known for their several biological properties such as antibacterial, antifungal, and cosmetic effects [5]. The purpose of this study was to determine the chemical composition of essential oil of *Lavandula officinalis* from Morocco by GC-MS technique and assess the antibacterial effects against three pathogenic bacteria strains isolated from food origins (2 serotypes of *Escherichia Coli*, *Salmonella Newport*). Tests of sensitivity were carried out on a solid surface using wells methodology and confirmed using Disc Diffusion Method. Results showed that all strains were sensitive to *Lavandula officinalis* essential oil. Minimum inhibitory concentrations MICs were determined by the method of agar dilution. The *Lavandula officinalis* essential oil exhibited antibacterial activity against all strains giving MIC values of 88.7 µg/ml.

Fig. Major compounds of *Lavandula officinalis*



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### Acknowledgment

This work enters in Valorization PAM Project (CNRTS 2020-2023: VPMA 247/20).

### Biography



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# Assessment of cold storage impact on technological quality and bioactive compounds of three pomegranate varieties cultivated in Béni Mellal region in Morocco

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## Abstract

In Morocco, Beni Mellal region is considered as the first pomegranate producing area, contributing with more than 45% of the national production. Since pomegranate is a seasonal fruit, one of the common conservation technologies performed to extend its availability in the market is cold storage. However, pomegranate's valuable nutritional components and technological quality may be reduced during its storage. Thus, this study aims to assess the morphological, physicochemical, and biochemical stability of three pomegranates varieties (*Kingdom*, *Purple Queen* and *Smith*) during cold storage. Pomegranates fruits were collected from Béni Mellal region and immediately stored at 4°C. The morphological parameters (Weight, color attributes (L\*, a\*, b\*, c\* and h), the physicochemical parameters (weight, pH, titratable acidity and total soluble solids (TSS)), and bioactive compounds (total anthocyanins contents (TAC), and total phenolic contents (TPC)) were evaluated during 120 days of cold storage. The results revealed that the weight of all varieties decreased gradually during the storage period. Also, the pH values increased progressively for Kingdom and Purple Queen, while their TSS values decreased significantly. However, the pH values of Smith variety decreased remarkably while TSS values increased during cold storage. Regarding total phenolics contents and total anthocyanins, all varieties showed high losses in both bioactive compounds during storage. This study concludes that cold storage of pomegranate fruits has a significant influence on their chemical composition and overall quality. Therefore, more studies are needed to select the best storage conditions and treatments to extend the storage ability of pomegranate varieties.

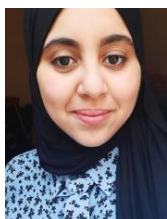
**Figure:** Image: Pomegranates fruits stored in the cold room



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1. Chafki, L., Elfazazi, K., Azzouzi, H., Achchoub, M., Fakhour, S., Benbati, M., ... & Elhansali, M. (2021). Physicochemical criteria, bioactive compounds of pomegranate peels (*punica granatum* l. sefri variety) cultivated in Beni Mellal, Morocco. *Plant Cell Biotechnology And Molecular Biology*, 315-322.
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## Biography



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## Determination of pyropheophytin a in extra virgin olive oils by HPLC method

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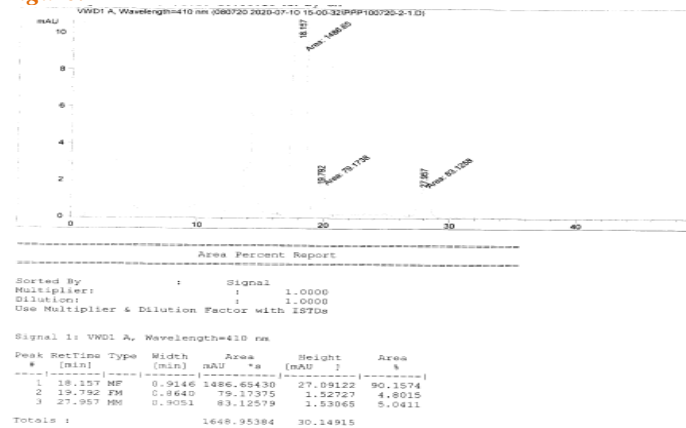
### Abstract

The orientations of the Moroccan agricultural policy, in particular the "Green Generation 2020-2030" Plan which consolidated a set of achievements of the Green Morocco Plan, have enabled the achievement of remarkable results in terms of growth and sustainability of the olive sector, through the development, promotion and marketing of extra virgin olive oils.

Consumer awareness is increasingly developed, and to meet the requirements of the international market, the Moroccan product must maintain its social and economic value and acquire competitive analytical and taste qualities allowing it to cross customs barriers while respecting the standards. of each destination.

The detection of the molecule pyropheophytin A (PPP) in extra virgin olive oils is very important to ensure that these oils have not undergone a heat treatment, which influences their qualities. To this end, we have developed in the laboratory scale a new chromatographic method to assess the quality using HPLC with a UV-Visible detector at a wavelength of 410 nm. The study is made on a series of eighteen samples of purified extra virgin olive oils from different regions of Morocco and Mediterranean countries that were analyzed by this technique. The results obtained indicate that almost all of the samples have a percentage of pyropheophytin a (ppp) not exceeding 17%.

Figure:



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### Biography



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## Impact of aromatization by *Thymus vulgaris* and *Rosmarinus Officinalis* L essential oil on virgin olive oil quality

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### Abstract

Many essential oils are used to improve the flavor and organoleptic profile in food industry. Furthermore, several studies show that they have powerful properties to capture free radicals. Thus, they were used to improve free radical scavenging activity.

Hence, the aim of this work is to evaluate the effect of aromatization by *Thymus vulgaris* and *Rosmarinus officinalis* L oils on the quality of virgin olive oil during storage.

Olives of *Moroccan Picholine* variety were harvested in a discontinuous system. Virgin olive oil obtained was flavored, by adding three different concentrations of *Thymus vulgaris* and *Rosmarinus officinalis* L essential oil, and stored at room temperature in opaque glass bottles during a period of ten months.

The evaluation of the quality (free fatty acids, peroxide value and spectrophotometric indices K232 and K270) was carried out every month.

The results obtained showed that the addition of the essential oils of *Thymus vulgaris* and *Rosmarinus officinalis* L have a significant effect on the quality of the virgin olive oil.

**Figure:** Storage of samples of flavored virgin olive oil and the control



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### Biography



LATIFI Hanane is a Phd student, at her third year, in Bio-process and Bio-interface laboratory in science and technology faculty of Beni Mellal and in the laboratory of Agro-food Sciences and Technologies, belonging to the Regional Agronomic Research Center of Tadla (CRRAT), National Institute of Agronomic Research (INRA) of Beni Mellal.

She received her engineering degree in Agri-food industry from the Agronomic and Veterinary Institute of Hassan II (IAV Hassan II), Rabat in 2017. She has authored several communications in various congress, her interest in Agri-food research pushes her to work hard and continuously on her theses

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## Rosemary Essential Oils: Chemical composition and Antimicrobial Activities

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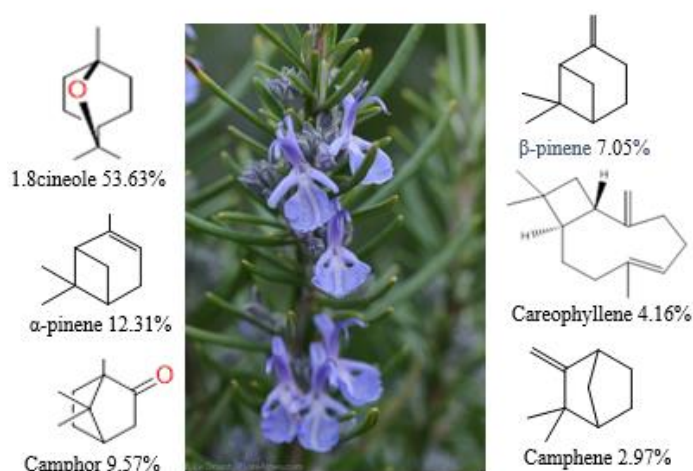
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<sup>3</sup>University Mohammed Premier, Faculty of Pluridisciplinary of Nador, Laboratory of Molecular Chemistry Materials and Environment (LCM2E), Nador, Morocco

### Abstract

The essential oil of *Rosmarinus Officinalis* (REO) from Taourirt, city located in the Eastern region of Morocco, has been extracted by steam distillation method in the cooperatives named “Belahssan”. The chemical composition of *Rosmarinus Officinalis* essential oil has been determined by gas chromatography coupled with mass spectrometry (GC/MS), in which cineole 53.63%,  $\alpha$ -pinene 12.31%, camphor 9.57%, and  $\beta$ -pinene 7.05% represent the major compounds [1]. Furthermore, antibacterial activity was evaluated on Two pathogenic bacteria strains isolated from food origins (*Escherichia Coli*, *Salmonella Newport*). Tests of sensitivity were carried out on a solid surface using wells methodology and confirmed using Disc Diffusion Method [2]. Results showed that *E. coli* and *S. Newport* strains were sensitive to Rosemary essential oils. Minimum inhibitory concentrations MICs were determined by the method of agar dilution [3]. The Rosemary essential oil exhibited antibacterial activity against *E. coli* and *S. Newport*, giving MIC values of 100  $\mu$ g/ml, 50  $\mu$ g/ml, respectively.

**Figure: 1.** The main compounds of essential oil of Rosemary (*Rosmarinus officinalis*)



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**Acknowledgments** The authors would like to thank (ANPMA/CNRST/UMP 2020-2023 Project (VPMA247/20).

### Biography



Imane OUALDI is a PhD student in 2nd year in the Laboratory of Applied Chemistry and Environment at the Faculty of Sciences, the University of Mohammed Premier, Oujda-Morocco. Under the direction of Professor Rachid TOUZANI. The main research work focuses on the valorization of aromatic and medicinal plants. Characterization of essential oils and biological applications (antioxidant antifungal and antibacterial).

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# Definitive screening design applied to cationic & anionic Adsorption dyes on Almond shells activated carbon: isotherm, kinetic and thermodynamic studies

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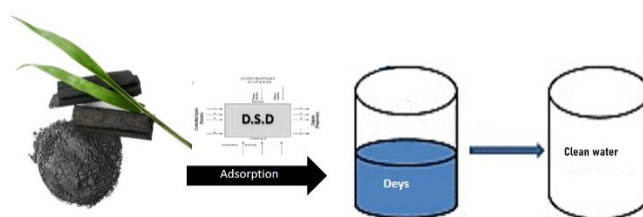
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## Abstract

Global concerns about dye-laden effluents have intensified over the years, because of their toxicities and resistance to biodegradability considered harmful to living organisms. For this reason, effective use of their eco-friendly, inexpensive and locally available adsorbent materials is steadily increasing. This study focuses on the potential use of an activated carbon made from Almond shells for the removal of the anionic and cationic dye such as, Malachite Green (MG) and Methyl Red (MR) respectively. The different factors influencing the adsorption process were screened and optimized in batch by the Definitive Screening Design methodology particularly: contact time, dose of adsorbent, initial concentration of pollutants, initial pH of the solution and temperature. The obtained results show that the percentage of dyes removal increases with the quantity of adsorbent and with the decrease of the dyes concentration. The optimal pH is slightly acid for the adsorption of MG and even acid for MR. The maximum dye was sequestered within the first 10 minutes at 25 °C. Isothermal modeling of the adsorption data over the concentration range of 0.4 to 200 mg/L fits more the Langmuir model for both dyes. Kinetic modeling reveals that the experimental data followed pseudo-second order for both dyes with good correlation. The positive  $\Delta S^\circ$  and negative  $\Delta H^\circ$  values indicate a spontaneous and exothermic adsorption process. The maximum removal of MG was 93.81 % and that of MR was 82.81 %. The characterization of activated carbon after adsorption by scanning electron microscopy, X-ray diffraction and infrared spectroscopy indicates that this material remains stable and effective. Activated carbon based on Almond shells seems to be interesting for the treatment of textile effluents.

Figure



## Recent Publications

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2. Hajji Nabih M., El Hajam M., Boulika H., Hassan M., Idrissi Kandri N., Hedfi A., Zerouale A., Boufahja F., sustainability. 13 (2021) 13905.
3. El Hajam M., Idrissi Kandri N., Zerouale A., J Mor. J. Chem. 7 (2019) 431-435.
4. El Hajam M., Idrissi Kandri N., Plavan G., Harrath A., Hedfi Lamjed M., Zerouale A., Boufahja F., J. King Saud Univ. Sci. 32 (2020) 2176–2189.

## Biography



Ph.D student in second year in chemistry of materials under the direction of Professor N.IDRISSE KANDRI in systems, signals and compounds laboratory at Faculty of Science and Techniques in Fes Morocco (SSCL-FST-USMBA). I am working on an environmental research subject, which aims to reduce the biomass waste which is abundant in our region and which is polluting the environment, by optimizing its valorization process using chemometrics.

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## Antibacterial activity of acetylated and non-acetylated clove bud Essential oils and their main compounds

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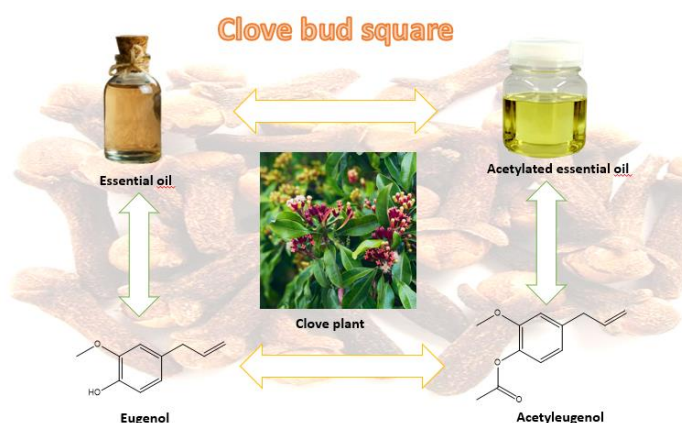
<sup>2</sup>Laboratory of Immunology & Biodiversity Faculty of Sciences Ain Chock, Hassan II University of Casablanca, Morocco

<sup>3</sup>Laboratory of Organic Synthesis and Physico-Molecular Chemistry, faculty of Sciences Semlalia Marrakech, Morocco.

### Abstract

Eugenol, a plant bioactive component, is frequently found in a variety of medicinal plants with well-defined functional attributes. The objective of this study was to evaluate essential oil (EO), acetylated essential oil, eugenol, and acetyleugenol as an antibacterial potential agent against three strains *Staphylococcus aureus* (SE), *Escherichia coli* (EC) and *Pseudomonas aeruginosa* (PA). Essential oil containing eugenol were extracted from buds of *Eugenia caryophyllata* commonly named clove (*Syzygium aromaticum* (L.) (Family Myrtaceae) by a simple hydrodistillation. The analysis of the essential oils using gas chromatography/mass spectrometry (GC/MS) shows that eugenol is the major constituent with 70.14% of it. The Eugenol was isolated from the EOs using chemical treatment. Afterwards, the EO and eugenol were converted to acetylated EO and acetyleugenol respectively using anhydride acetic. The result revealed that eugenol present an important activity against all the tested strains.

Figure



### Recent Publications

1. Abdou A., Idouarame S., Salah M., Nor N., Zahm S., El Makssoudi A., Mazoir N., Benharref A., Dari A., Jamal Eddine J., Blaghen M., Dakir M. *Lett Org Chem.* 19(2022).
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### Biography



Author has his expertise in organic and biological applications of synthesis molecules. My focus is based on the use of natural product to have application in health field. I warded a PhD in 2018 from the University of science Casablanca, Morocco. I published 3 papers until now.

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# Phytochemical Analysis of The Residues of *Opuntia Ficus Indica L* Seed Oil of Eastern Region of Morocco

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## Abstract

The cactus pear fruit (*Opuntia ficus-indica* L. Mill.) is a product that has been recognized for the health benefits that it can provide, and it has also drawn scientific interest for several years. Recently, industry has been focusing on the development of new products made from food by-products in order to reduce and take advantage of food wastes.

The objective of this study is to identify chemically the residues (Cakes oil) of *Opuntia ficus indica l* seed oil of eastern region of morocco. a mechanical extraction is used to obtained this oil residues then we used maceration for the analysis extraction. Various phytochemical assays were used to determine the qualitative chemical composition, which was subsequently characterized using GC-MS and HPLC-DAD, LC-MS/MS. According to GC-MS analyses, which allow the identification of tree major fatty acids, (linoleic acid, oleic acid and palmitic acid), linoleic acid is abundant (37.218%) for residues of OFI seed oil flowed by oleic acid with (27.169%). HPLC-DAD analysis allows the identification of tocopherols, with the  $\gamma$ -tocopherols is the major tocopherol for with  $310,01 \pm 6,66$  mg/Kg, the LC-MS/MS allow the identification of polyphenols and flavonoids, arbutin oleuropein and syringic acid are the abundant one with (22,59%, 17,35%, 16,72%) respectively.

**Keywords:** *Opuntia ficus indica* , Extraction, Fatty acids, tocopherols, polyphenols.

## Recent Publications

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## Biography



Author has her expertise in evaluation and passion in improving the bone and cement used in dental medicine. Her focus is based on the use of natural phosphate to have application in health field. She was awarded her PhD in 2017 from the University of Mohammed first Oujda Morocco.,

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## Antioxidant activities of *Cannabis Sativa L* seeds extracts from Morocco

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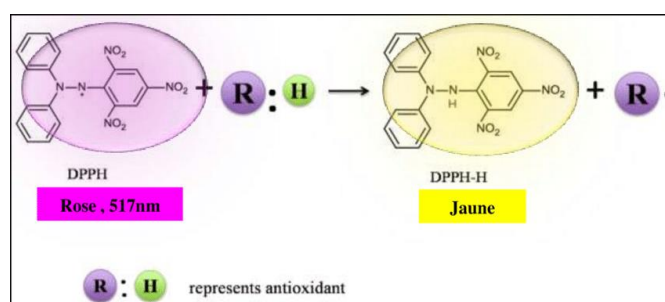
### Abstract

The term cannabis is derived from the Greek kannabis. It is one of the most ancient plants none to mankind: native to western and central Asia (Russia, China, India, Pakistan and Iran), it is thus a widespread plant, found in a variety of habitats and altitudes.

Its use by humans dates back to more than 5,000 years and it is one of the oldest sources of cure and textile fibers.

*Cannabis sativa L* a genus of the Cannabaceae family, has become a global plant due to its multiple bioactive compounds with a wide range of human health benefits. *Cannabis sativa* has been indicated for the treatment of pain, glaucoma, nausea, depression and neuralgia so it is marketed in different forms: candies, beer, lotions, cosmetic oils, it is a “miracle plant”. Therefore, in this study, in order to valorize cannabis (*sativa L*) seeds, we evaluated the antioxidant activity of a series of organic and aqueous extracts of the seeds of this plant in a locality of Morocco, in Ketama, at the foot of the marginalized and underdeveloped mountainous region of Rif. The ability of the tested cannabis (*sativa L*) seed extracts to scavenge free radicals, was evaluated on the DPPH-radical. The best DPPH- scavenging potential with the lowest IC<sub>50</sub> values showed the ethanolic cannabis seed extracts from Ketama, with 0.58 µg/mL. Compared with the reference compound ascorbic acid, with an IC<sub>50</sub> value of 0.11µg/ml, the ethanolic extract of *Cannabis (sativa L)* seeds exerted significantly lower antioxidant potential towards the DPPH-radical.

**Fig. 1.** Reaction mechanism of the DPPH- test between the radical species DPPH- and an antioxidant (RH)



**Fig. 2.** Quality control on feminized cannabis seeds



### Recent Publications

1. BEN NECIB R, Ph.D. thesis in molecular medicine Investigating the effects of whole hemp seed supplementation on the endocannabinoid microbiome axis and its implications for diet-induced obesity, Québec, Canada, 2021.
2. DIARRA L, Thesis Phytochemical study and antiradical activity of *Nicotiana tabacum L.* (Solanaceae) and *Cannabis sativa L.* (Cannabaceae), Feb. 8, 2021.
3. Roger G. Pertwee, Handbook of Cannabis, Institute of Medical Sciences, University of Aberdeen, UK, 2014.

### Biography



Author has her expertise in evaluation and passion in the search for new bioactive molecules from plants. Her focus is based on the use of aromatic and medicinal plants in different field. She is a PhD student in her second year at Laboratory of Advanced Materials and Process Engineering at the University Ibn Tofail, Kenitra in Morocco.

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# Posters



**HEALTH: BIOCHEMISTRY, NUTRITION AND PHARMACOLOGY**

## Importance of implementing an outsourced internal control system in the quality of biochemical results

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<sup>2</sup>Faculty of Medicine and Pharmacy of Oujda

### Abstract

Outsourced internal control (OIC) is a statistical process used to control and evaluate the analytical process that determines patient results. It is a quality control performed by several laboratories on the same batch of control samples compared to each other by periodic averaging. It allows an inter-laboratory comparison and an estimation of the accuracy and precision.

The use of external internal controls (OIC) is recommended for the good functioning of a laboratory. In our laboratory, the OIC covers and evaluates the analytical performance of serum and urine chemistry, immunoassay and cardiac markers.

The OIC is performed regularly, 03 times a week in our biochemistry laboratory of Mohammed VI University Hospital of Oujda, and sent to an external organization for statistical processing.

In an anonymous way, the external organization compares our data with those of other laboratories. Any discrepancy concerning fidelity or accuracy is a sign of adysfunction specific to the laboratory, which the cause must be identified and corrected, and its traceability and archiving ensured.

The central laboratory of the Mohammed VI University Hospital of Oujda is committed to a quality policy that includes a verification method process according to scope A, and an accreditation process. Our work will constitute a solid basis for the implementation of an accreditation procedure for the tests used in our laboratory.

Figure: Deming circle



### Recent Publications

1. BOUANAYA, Imane. *GESTION DU CONTROLE INTERNE DE LA QUALITE*. 2019. Thèse de doctorat.
2. AKROUCHI, Nassima, HAKEM, Sarah, et YAKOUBI, Tassadit. *CONTROLE INTERNE DE QUALITE DES LABORATOIRES DE BIOLOGIE MEDICALE (Application au laboratoire centrale unité Belloua CHU de Tizi-Ouzou)*. 2019.
3. ABULMAKARIM, Siham, BENBELLA, Amal, HARDIZI, Houyam, et al. *La détermination de la concentration spermatique : mise en place et validation d'un contrôle interne de qualité*. *Revue Francophone des Laboratoires*, 2018, vol. 2018, no 499, p. 19-26.

### Biography



Wissame Azizi, 26 years old, resident doctor in medical biology, holder of a doctoral degree in general medicine from the faculty of medicine and pharmacy of Oujda.

## Containment levels in medical laboratories

Hajar Zrouri<sup>1,2</sup>, AmjadIdrissi<sup>1,2</sup>, Mouad Harandou<sup>1,2</sup>, AbirYahyaoui<sup>1,2</sup>, YoussraSbibih<sup>1,2</sup>, WissamAzizi<sup>1,2</sup>,  
Oumayma Hamdani<sup>1,2</sup>, El-houcine Sebbar<sup>1,2</sup>, Mohammed Choukri<sup>1,2</sup>

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### Abstract

Biological agents are classified by regulation in infectious risk groups numbered from 1 to 4 (group 1: non-infectious agents). Orders set the list of biological agents classified in groups 2, 3 and 4. The regulations also provide for 3 levels of containment for the technical rooms of laboratories corresponding to infectious risk groups 2 to 4. In general, for an analysis laboratory, excluding microbiology activities, a containment level 2 must be provided. In some cases, such as the cultivation of group 3 biological agents, manipulations must be carried out in rooms at containment level 3.

The combination of the biohazard and the type of exposure is used to assess the biological risk. The laboratory must then apply containment measures adapted to the identified risk. The regulations provide for three

Systems containment levels numbered from 2 to 4, corresponding respectively to infectious risk groups 2 to 4. These containment measures are of an architectural type (presence of an airlock, filtration of the extracted air, etc.) and organizational type (equipment dedicated to the technical room, storage for protective clothing, cleaning of the premises, etc.). The objective of our work is to present the Containment Levels of medical biology laboratories.

The work carried out in the biological analysis rooms can involve microorganisms responsible for infections in humans. It is therefore necessary to consider that the biological agents handled belong at least to risk group 2. Biological laboratories must therefore comply with at least level 2 containment. If the risk assessment has shown that group 3 biological agents can be handled, containment level 3 should be used.

Figure: Biosafety Levels 1, 2, 3 and 4

| Biosafety Level        | BSL-1  | BSL-2  | BSL-3  | BSL-4  |
|------------------------|--|--|--|--|
| Description            | · No Containment<br>· Defined organisms<br>· Unlikely to cause disease       | · Containment<br>· Moderate Risk<br>· Disease of varying severity                            | · High Containment<br>· Aerosol Transmission<br>· Serious/Potentially lethal disease   | · Max Containment<br>· "Exotic," High-Risk Agents<br>· Life-threatening disease  |
| Sample Organisms       | E.Coli   | Influenza, HIV, Lyme Disease   | Tuberculosis   | Ebola Virus  |
| Pathogen Type          | Agents that present minimal potential hazard to personnel & the environment. | Agents associated with human disease & pose moderate hazards to personnel & the environment. | Indigenous or exotic agents, agents that present a potential for aerosol transmission, & agents causing serious or potentially lethal disease. | Dangerous & exotic agents that pose a high risk of aerosol-transmitted laboratory infections & life-threatening disease. |
| Autoclave Requirements | None   | None   | Pass-thru autoclave with Bioseal required in laboratory room.  | Pass-thru autoclave with Bioseal required in laboratory room.  |

### Recent Publications

1. TALLALI, Meriem. RISQUES INFECTIEUX DANS LES LABORATOIRES DE BIOLOGIE MEDICALE. 2019. *Thèse de doctorat.*
2. BENADERETTE, Serge. Déconfinement sous tension pour les laboratoires de biologie médicale. *Option/Bio, 2020, vol. 31, no 617, p. 1.*
3. BENADERETTE, Serge. Le protocole d'accord révisité pour atténuer les pertes des LBM. *Option/Bio, 2020, vol. 31, no 615, p. 1.*

### Biography



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# The importance of setting up an external quality evaluation system in the medical biology laboratory: Experience of the biochemistry laboratory of the Mohammed VI University Hospital of Oujda

Amjad Idrissi <sup>1,2</sup>, Abir Yahyaoui <sup>1,2</sup>, Oussama rahhab<sup>1,2</sup>, Youssra Sbibih <sup>1,2</sup>, Hajar Zrouri <sup>1,2</sup>, Omayama Hamdani <sup>1,2</sup>, Wissam Azizi <sup>1,2</sup>, Mouad Harandou<sup>1,2</sup>, El-houcine Sebbar <sup>1,2</sup>, Mohammed Choukri <sup>1,2</sup>

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<sup>2</sup>Faculty of Medicine and Pharmacy Oujda

## Abstract

The act of medical biology is part of a preventive, diagnostic, prognostic and therapeutic approach. The biologist is responsible for this act, which includes the entire analytical macro-process with all the pre-analytical, analytical and post-analytical stages, from the prescription to the validation and transmission of results. The NF EN ISO 15189 standard defines the general requirements concerning the quality and competence of medical laboratories and testing laboratories. This is why the search for quality must be an essential and constant preoccupation of the biologist and of all the laboratory personnel. The objective of our work is to show the importance of setting up an external quality evaluation system in the biochemistry laboratory of the Mohammed VI University Hospital of Oujda.

Our laboratory is registered in an external quality assessment program RIQAS which contains more than 45000 medical biology laboratories registered throughout the world. The results of our laboratory are evaluated by comparison with the consensus-based comparison average. The RIQAS program allows for the calculation of the accuracy of test results, which is an essential parameter in method verification. Participants are enrolled in a program based on parameters, methods, instruments, units, temperature and generation plate number. In case of unsatisfactory results, the probable causes of the deviations are investigated and corrective actions are taken. This program also allows the evaluation of the methods of dosage and the performances of our automats by comparison with the other brands used by the various laboratories registered in this program. The central laboratory of the CHU Mohammed VI of Oujda is committed to a quality policy that includes a method verification process according to scope A, and an accreditation process. This kind of study will constitute a solid basis for the implementation of an accreditation procedure of the tests used in our laboratory.

The objective of our work is to present the different actions carried out in the biochemistry laboratory of CHU Mohammed VI of Oujda for the implementation of an external quality control management system according to the ISO 15189 standard.

**Figure:**

| Paramètres à doser | Critères de performance RIQAS | Echantillons |       |       |       |       |       |       |       |      |       |       |       | INTERPRETATION :                          |
|--------------------|-------------------------------|--------------|-------|-------|-------|-------|-------|-------|-------|------|-------|-------|-------|---|
|                    |                               | 1            | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9    | 10    | 11    | 12    |   |
| Albumine           | SD                            | -0.30        | 0.47  | 0.48  | -0.18 | 0.30  | -0.01 | -0.05 | 0.02  | 0.10 | -0.5  | 0.76  | 0.94  | INTERPRETATION :<br>SDI :<br>%DEV<br>TS : |
|                    | NDV                           | 0.58         | 0.79  | 0.49  | -0.13 | 0.59  | 0.01  | -0.03 | 0.02  | 0.21 | -0.52 | 0.71  | 0.88  |   |
|                    | TS                            | 62           | 109   | 88    | 105   | 74    | 120   | 105   | 109   | 68   | 94    | 94    | 70    |   |
| Phosphate          | SD                            | -0.40        | 0.07  | 0.10  | 0.44  | -0.8  | 0.18  | -0.40 | 0.07  | 1.09 | 0.8   | 0.18  | -0.2  | INTERPRETATION :<br>SDI :<br>%DEV<br>TS : |
|                    | NDV                           | -1.7         | 3.2   | 3.4   | 1.7   | -3.1  | 0.7   | -1.7  | 0.3   | 3.2  | -3.1  | 1.1   | -0.8  |   |
|                    | TS                            | 108          | 96    | 86    | 107   | 81    | 120   | 108   | 100   | 44   | 97    | 100   | 120   |   |
| Potassium          | SD                            | -0.17        | 0.44  | -0.26 | -0.48 | -0.19 | 0.28  | -0.02 | 0.17  | 1.18 | 0.13  | -0.19 | 0.19  | INTERPRETATION :<br>SDI :<br>%DEV<br>TS : |
|                    | NDV                           | -0.7         | 1.3   | 0.7   | -0.2  | 0.9   | 0.8   | 0     | 0.8   | 1.2  | -0.57 | 0.3   | 0.1   |   |
|                    | TS                            | 65           | 100   | 100   | 72    | 100   | 100   | 100   | 96    | 80   | 95    | 100   | 100   |   |
| Urée               | SD                            | -0.36        | -0.28 | 0.12  | -0.30 | -0.35 | 0.61  | -0.40 | 0     | 1.11 | -0.4  | -0.81 | -0.18 | INTERPRETATION :<br>SDI :<br>%DEV<br>TS : |
|                    | NDV                           | -0.1         | -0.3  | 1     | -0.8  | -0.7  | 0.7   | -0    | 0.4   | 0.7  | -0.13 | -0.7  | -1.2  |   |
|                    | TS                            | 62           | 100   | 100   | 107   | 100   | 100   | 100   | 100   | 42   | 90    | 90    | 100   |   |
| Acide urique       | SD                            | -0.28        | 0.22  | -0.42 | -0.1  | -0.17 | 0.69  | 0.61  | -0.3  | 1.09 | 0.5   | -0.68 | -0.48 | INTERPRETATION :<br>SDI :<br>%DEV<br>TS : |
|                    | NDV                           | -0.7         | 1     | -2.8  | -0.5  | -0.7  | 1.1   | 1.8   | -0.8  | 0.1  | -0.17 | -0.1  | -0    |   |
|                    | TS                            | 61           | 100   | 62    | 100   | 100   | 88    | 90    | 60    | 40   | 97    | 88    | 100   |   |
| Protéine total     | SD                            | -0.30        | 0.14  | -0.18 | -0.30 | 0.14  | 0.10  | -0.30 | -0.10 | 1.11 | -0.76 | 0.14  | 0.18  | INTERPRETATION :<br>SDI :<br>%DEV<br>TS : |
|                    | NDV                           | -1.1         | 0.5   | -0.5  | -1.07 | 0.5   | 0.5   | -1.1  | 0.5   | 0.3  | -0.3  | 0.5   | 0.18  |   |
|                    | TS                            | 60           | 100   | 100   | 76    | 100   | 100   | 100   | 99    | 100  | 67    | 85    | 100   |   |

## Recent Publications

1. RANAIVOSOA, Miora Koloina, RAKOTOVAO-RAVAHATRA, Zafindrasoa Domoina, RANDRIAMAHAZO, Rakotomalala Toky, et al. External Evaluation of the Quality of the Four Emergency Biochemical Parameters in Antananarivo. *Journal of Biotechnology and Biomedicine*, 2020, vol. 3, no 1, p. 29-38.
2. BENANE, Nouredine, LASMI, Salah, et al. EVALUATION EXTERNE DE LA QUALITE AU LABORATOIRE DE BIOCHIMIE DU CHU TIZI OUZOU. 2019.
3. ASMAA, Morjan, MOHAMED, Omari, et NABIHA, Kamal. Etat des lieux de la biologie délocalisée au sein du Centre Hospitalier Universitaire Ibn Rochd de Casablanca. *International Journal of Innovation and Applied Studies*, 2021, vol. 34, no 1, p. 71-73.

## Biography



Amjad IDRISSE, resident in medical biology at Mohammed VI University Hospital Oujda, holder of a doctoral degree in general medicine, Faculty of Medicine and Pharmacy Oujda.

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## Establishment of an analytical toxicology unit in the biochemistry laboratory of University hospital Mohammed VI of Oujda

Omayama Hamdani <sup>1,2</sup>, Amjad Idrissi <sup>1,2</sup>, Mouad Harandou <sup>1,2</sup>, Abir Yahyaoui <sup>1,2</sup>, Yousra Sbilih <sup>1,2</sup>, Wissam Azizi <sup>1,2</sup>, Hajar Zrouri <sup>1,2</sup>, El-houcine Sebbar <sup>1,2</sup>, Mohammed Choukri <sup>1,2</sup>

<sup>1</sup>Biochemistry laboratory, CHU Mohammed VI of Oujda

<sup>2</sup>Faculty of Medicine and Pharmacy of Oujda

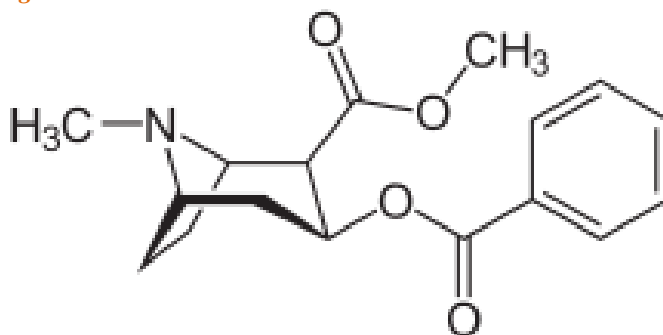
### Abstract

The objective of our work is to present the project of Implementation of a unit of analytical toxicology in the laboratory of biochemistry of university hospital Mohammed VI of Oujda. Our project will have a great positive impact on the health of Eastern Morocco, by the installation of the first unit of analytical toxicology in Eastern Morocco, the improvement of the assumption of responsibility of intoxications. The promotion of analytical toxicology in hospitals in the Oriental region, and the need for the establishment of a unit of analytical toxicology in the Oriental region which represents a border region characterized by the rise in the traffic of psychotropic drugs, and which still represents an important crossing for the movement of sub-Saharan immigration to Europe. Our project is conducted in collaboration with the psychiatric hospital of university hospital Mohammed VI of Oujda.

Analytical techniques have made tremendous progress in less than a century with the advent of separative methods. Each toxicology laboratory develops its own techniques which must be rapid and relevant, and the analytical result is interpreted on the basis of a dialogue between the clinician and the analyst. Therefore, the laboratory must be part of a hospital structure or be close to it in order to ensure a good collaboration between the laboratory and the requesting service [1-3].

Our project will participate in the improvement of the diagnostic and therapeutic approach and in the evaluation of the prognosis of acute and chronic intoxications.

Figure: Cocaine molecule



### Recent Publications

1. Goullé JP, Saussereau E, Lacroix C. Analyse toxicologique en urgence. In : Danel V et Mégarbane B. Urgences toxicologiques de l'adulte. Rueil-Malmaison. Arnette 2009 : 32-37.
2. Flanagan R J, Braithwaite R A, Brown S S, Widdop B , Wolff F A. Basic analytical toxicology. WHO ; 1997.
3. Deveaux M. Alcool éthylique. In Kintz P. Traité de toxicologie médico-judiciaire. 2ème ed Elsevier Masson 2012.

### Biography



OUMAYMA HAMDANI ,25 years old, resident doctor in medical biology ,holder of a doctoral degree in general medicine from the faculty of medicine and pharmacy of oujda.

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## Treatment of pharmaceutical effluents by sonochemistry

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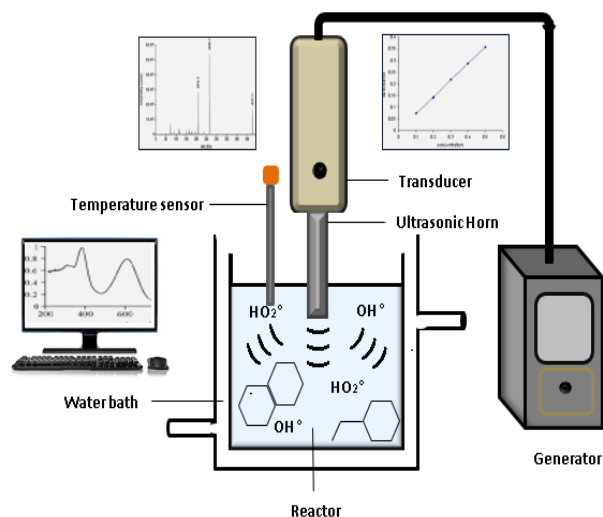
### Abstract

Wastewater containing pharmaceutical substances (antibiotic molecules, cytostatic molecules...) is usually released directly into nearby sewers, rivers, ponds or lagoons. This wastewater disposal can damage the quality of the receiving water, the aquatic ecosystem and the biodiversity of the environment. The presence of these substances in water, even at low concentrations, is undesirable. In addition, they can affect human and aquatic life. Traditional techniques are unable to remove these pollutants, like coagulation, flocculation, photo catalysis, adsorption etc...However, the employment of advanced oxidation process has proved to be an effective substitute, particularly in recent decades.

In this study, a green approach relying primarily on the generation of hydroxyl radicals as an enhanced oxidation process using ultrasonic technique has been developed for the degradation of hazardous components found in pharmaceutical effluents. The experiments are done in synthetic solution containing antibiotic molecule.

The optimal rate of degradation was determined by examining several variables such as ultrasonic power, Sonolyse time, pH, temperature, and inorganic catalytic activity. The obtained results will be presented and discussed.

Figure:



### Recent Publications

### Biography



SANDAOU I Meriem, Phd student at University Hassan II, Faculty of sciences Ain Chock, Casablanca, department of chemistry, her main field of focus is based mainly on the treatment of industrial effluents using advanced processes particularly ultrasonic process.

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**WATER, SOIL, AIR, AGRICULTURE AND ENVIRONMENTAL ANALYSIS**





# Kinetics, thermodynamics, equilibrium, surface modelling, and atomic absorption analysis of selective Cu(II) removal from aqueous solutions and rivers water using silica-2-(pyridin-2-ylmethoxy)ethan-1-ol hybrid material

R. Othmane<sup>1</sup>, S. Rafik<sup>1</sup>, T. said<sup>1</sup>

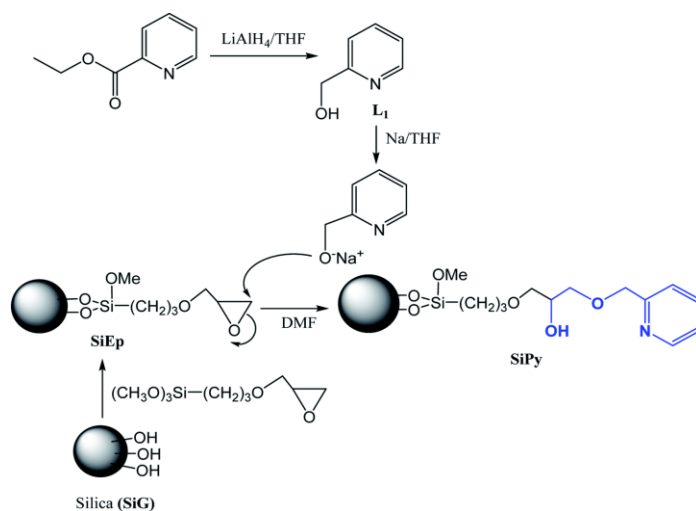
<sup>1</sup>Laboratory of Organic Synthesis, Extraction and Valorization, Faculty of Sciences Ain Chock, Hassan II University, BP: 5366, Casablanca, Morocco.

## Abstract

A new sustainable and environmentally friendly hybrid adsorbent based on silica functionalized with pyridine-2-ylmethanol was successfully synthesized and applied for the removal of heavy metal ions from an aqueous media. The hybrid material has been synthesized and characterized by Elemental analysis spectrophotometer, Fourier Transform Infra-Red spectroscopy (FTIR), Scanning Electron Microscopy (SEM), Thermogravimetric analysis (TGA), and specific surface area analysis were used to characterize the structure and morphology of the hybrid material. Cu(II), Zn(II), Cd(II) and Pb(II) were the heavy metal ions selected to evaluate our novel hybrid adsorbent. Under the optimized conditions ( $t = 25\text{min}$ ,  $\text{pH} = 6$ , and  $T = 25\text{ }^\circ\text{C}$ ), the adsorbent displayed a good adsorption capacity of 90.25, 75.38, 55.23, and 35.15 mg/g for Cu(II), Zn(II), Cd(II), and Pb(II), respectively, with a great reusability after five adsorption-desorption cycles.

The kinetic studies showed that the sorption of the heavy metal ions can be described by a pseudo-second order model. The isotherm of sorption was found to be in agreement with Langmuir model. Computational chemistry was used to study the sorption mechanism. The results revealed that the O-hydroxy, N-pyridine and ether O-atoms play a major role in the capture of different heavy metal ions.

Figure:



## Recent Publications

1. Camilo. Z.L., Daniel. N.B., Freddy. F., Ezequiel. Z.L., *Environ. Technol. Innovation*, 22(2021) 101504.
2. Said. T., Othmane. R., Smail. R., Rafik. S., Yann. G., *Molecules*, 26 (2021) 5164.
3. Said. T., Smail. R., Mohamed. E.M., Zouhair. L., Marilena. F., Yann. G., *ACS Omega*, 5(2020) 17324–17336.

## Biography



Roby Othmane: PhD student in chemistry at University Hassan II was Started his PhD in 2020. It specializes in the synthesis of heterocycles as well as their use in various sectors. Recently he published 3 papers. his H-index is 2 on Scopus.

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# Mapping the risk of flooding of the national road N °2 at the crossing of the wadi Tamdmadt north of the city of Bni Drar

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<sup>1</sup>Laboratory of Modeling and Scientific Computation (LMCS), National School of Applied Sciences of Oujda, Mohamed 1st University, 60000, Morocco.

## Abstract

Floods have a significant impact on transport infrastructure, especially the road. The present study aims to assess the risk of flooding of the national road N2 at the crossing of the wadi Tamdmadt north of the city of Bni Drar. The hydrological study is conducted by the Soil Conservation Service (SCS) method using the Hec Hms software based on land use and rainfall data from the reference station. The IBER software, based on the two-dimensional equations of Saint Venant governing the free surface flow, is used for the hydraulic simulation.

The results obtained allow the elaboration of a flood risk map in the study area. This study aims to help the local authorities in the prevention of the flood risk and the consideration of the necessary protection actions.

Figure:



## Recent Publications

1. Zahaf Toufik, Ijfiri Rachid, Boushaba Farid, Mimoun Chourak. Risk of flooding of the national road N ° 6 at the right of crossing the wadi Asla in the region of Taourirt
2. Ijfiri Rachid , Boushaba Farid , Mimoun Chourak , Zahaf Toufik, Implementation of geospatial interpolation methods in flood hazard mapping
3. F. Boushaba, A. Grari, M. Chourak, Y. Regad, and B. Elkihel, Numerical simulation of the flood risk of the deviation hydraulic structure at Saïdia\_North-East Morocco (2020).

## Biography



The author is interested in research on the axis of the impact of the mapping of the risks of flooding of the road network by highlighting the contribution of GIS. He started his PhD in 2019 at Mohammed Premier University in Morocco. He published his first communication in the fourth edition of ICMES2020.

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# Simultaneous assessment of raw pollution and municipal WWTP performances: Case study of Kenitra city, Morocco

Redouane Elharbili<sup>1</sup>, Tawfik El Moussaoui<sup>1</sup>, Khalid El Ass<sup>1</sup>, Mohamed Oussama Belloulid<sup>2</sup>

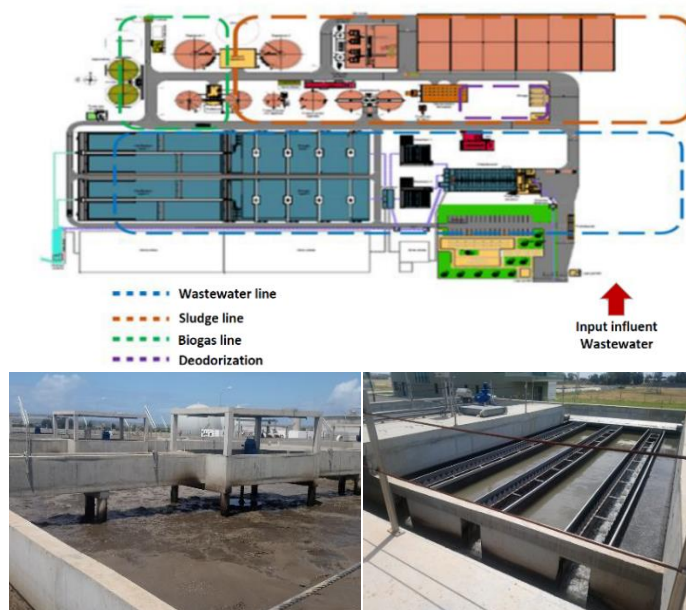
<sup>1</sup> Laboratory of Environmental Metrology, Department of Mines, Mines School of Rabat, Ave Hadj Ahmed Cherkaoui – BP 753, Agdal, Rabat, Morocco

<sup>2</sup> WWF North Africa, Living Planet Morocco, 281, bd Moulay Youssef. Résidence Azur 3. 3ème étage, Casablanca, Morocco

## Abstract

Past few decades, Morocco has experienced strong growth in its urban population and a proliferation of peripheral areas. With population growth and rapid urbanization, wastewater production in Morocco is continuously increasing. Indeed, according Moroccan National Program of Sanitation and Wastewater Treatment (PNA), in 2013 is estimated at about 750 million m<sup>3</sup>; 48% of these waters are discharged into the rivers or applied to land, the rest is discharged into the sea without any treatment. The pollutant load from wastewater is estimated at around 131 715 tons of organic load, 42 131 tons of nitrogen and 6 230 tons of phosphorus. Considering environmental degradation and water scarcity several management approach have been investigated aimed mainly on treatment and valorisation. To protect receiving natural systems and prevent ecosystem contamination wastewater must be treated in order to respect standards discharge or reuse. In this optic, the present work aims to investigate physicochemical and bacteriological proprieties of raw municipal wastewater, case study of Kenitra city, as well as WWTP process loadings and performances during the review period, through the assessment of raw input wastewater as well as spatiotemporal variations of the main wastewater physicochemical parameters such as organic loads (TSS, COD and BOD<sub>5</sub>), hydraulic loads (flow rate), nutrients (nitrogen and phosphorus) and microbiological proprieties along its treatment levels with reference to its design criteria and Moroccan permits discharge limits.

Figure: WWTP diagram flow



## Recent Publications

## Biography



**Redouane Elharbili** currently a PhD Student at Mines School of Rabat (Ecole Nationale Supérieure des Mines de Rabat ENSMR (Ex. ENIM)). He is particularly interested in biotechnologies for wastewater treatment and WWTP modelling and optimization. He received his specialized Master's degree in Sanitation Engineering and Environmental Management from FSSM, UCA, Marrakech

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# Corrosion inhibition of tool steel (H13) in 1 M HCl medium by pine essential oil

Jihane Serbout<sup>1</sup>, Imane Oualdi<sup>1</sup>, Anouar El Magri<sup>2</sup>, Sébastien Vaudreuil<sup>2</sup>, Rachid Touzani<sup>1</sup>, Belkheir Hammouti<sup>1</sup>

<sup>1</sup>Mohammed Premier University, Faculty of Science, Applied Chemistry and Environment Laboratory (LCAE), Oujda-Morocco.  
<sup>2</sup>EuroMed University of Fes, Morocco.

## Abstract

The damage by corrosion generates not only high cost for inspection, repairing and replacement, but in addition these constitute a public risk, thus the necessity of developing novel substances that behave like corrosion inhibitors especially in acid media. There always exists a need for developing new corrosion inhibitors. Acid solutions are widely used in industry such as acid pickling of iron and steel, chemical cleaning and processing, ore production and oil well acidification. The use of hydrochloric acid in pickling of metals, acidization of oil wells and cleaning of scales is more economical, efficient and trouble free, compared to other mineral acids. There are many methods available to protect metal structures and reduce corrosion rate. The use of inhibitors is one of the best techniques that guarantees this protection in highly corrosive environments such as hydrochloric acid. In addition, essential oils have become a source of ecological inhibitors. Which ensures high efficiency at a reduced price. This type of inhibitor is except for compounds toxic, heavy metals and moreover biodegradable. The corrosion inhibition of tool steel (13H) by pine essential oil in hydrochloric acid (1M) was studied by weight loss measurements, electrochemical polarization and electrochemical impedance spectroscopy. The effect of time, temperature effects and inhibitor concentration effects are studied.

The result obtained shows that the corrosion rate increases with the increase in immersion time and temperature and that it is decreased with the increase in inhibitor concentration.

Figure: Pine tree



## Recent Publications

1. Merimi I., Touzani R., Aouniti A., Chetouani A., Hammouti B., Int. J. Corros. Scale Inhib, 9(4) (2020) 1237-1260
2. Arrousse N., Salim R., Kaddouri Y., Zahri D., El Hajjaji F., Touzani R., Jodeh S., Arabian Journal of Chemistry, 13(7), (2020) 5949-5965.
3. Khattabi M., Benhiba F., Tabti S., Djedouani A., El Assyry A., Touzani R., Zarrouk A., Journal of Molecular Structure, 1196 (2019) 231-244.

**Acknowledgment:** This work enters in Valorization PAM Project (CNRTS / UMP/ AMPA 2020-2023: VPMA 247/20).

## Biography



Jihane SERBOUT PhD student in second year, Applied Chemistry and Environment Laboratory (LCAE) at Mohammed Premier University, Faculty of Sciences, Oujda-Morocco. Under the direction of Professor Belkheir HAMMOUTI. My focus is based on the use of essential oils as green corrosion inhibitors, I have a published review in the field of corrosion.

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# Exploring the corrosion inhibition mechanism of novel thiazolidinediones for N80 steel in 15 wt.% HCl solution: Insights from experimental and first-principles DFT investigations

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Hassane Lgaz<sup>5\*</sup>, Han-seung Lee<sup>6</sup>, Rachid Salghi<sup>1\*</sup>

<sup>1</sup>Laboratory of Applied Chemistry and Environment, ENSA, University Ibn Zohr, PO Box 1136, Agadir, Morocco.

<sup>2</sup>Equipe de Chimie des Plantes et de Synthèse Organique et Bioorganique, URAC23, Faculty of Science, B.P. 1014, Geophysics, Natural Patrimony and Green Chemistry (GEOPAC) Research Center, Mohammed V University in Rabat, Morocco.

<sup>3</sup>Laboratory of Analytical Chemistry and Bromatology, Faculty of Medicine and Pharmacy, Mohamed V University in Rabat, Morocco.

<sup>4</sup>Department of Chemical and Biochemical Sciences - Green Process Engineering (CBS-GPE), Mohammed VI Polytechnic University (UM6P), Ben Guerir, Morocco.

<sup>5</sup>Innovative Durable Building and Infrastructure Research Center, Center for Creative Convergence Education, Hanyang University ERICA, 55 Hanyangdaehak-ro, Sangrok-gu, Ansan-si, Gyeonggi-do, 15588, Korea.

<sup>6</sup>Department of Architectural Engineering, Hanyang University-ERICA, 1271 Sa 3-dong, Sangrok-gu, Ansan 426791, Republic of Korea.

## Abstract

In the present work, we represent two thiazolidinediones, namely (Z)-5-benzylidene-thiazolidine-2,4-dione (TZD-1) and (Z)-5-(4-fluorobenzylidene)thiazolidine-2,4-dione (TZD-2) as corrosion inhibitors for N80 steel corrosion in 15 wt.% HCl solution. Experimental assessments were conducted using electrochemical and morphological characterization techniques. Besides, first-principles Density Functional Theory (DFT) calculations were used for modeling inhibitor-iron interactions. Experimental results indicated that investigated inhibitors can significantly prevent corrosion of N80 steel, reaching a maximum performance of 88% and 91% at  $5 \times 10^{-3}$  mol/L of TZD-1 and TZD-2, respectively. EIS tests suggested that inhibitor

molecules inhibit corrosion reactions through adsorption on the steel surface, which was found to obey the Langmuir adsorption isotherm model. On the other hand, the morphological analysis showed a well-distinguished difference between unprotected and protected steel surfaces as a result of inhibitors' addition to HCl. DFTB calculations indicated that inhibitors' molecules form covalent bonds with iron atoms through charge transfer. The adsorption energies computed from DFTB calculations successfully predicted the experimental inhibition performance.

**Keywords:** Corrosion inhibition; N80 steel; DFTB; Thiazolidinedione; SEM.

## Biography



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# Anti-corrosion activity of a green inhibitor based on a Moroccan medicinal plant as an environmentally friendly corrosion inhibitor for carbon steel in 1M HCl and 0.5M H<sub>2</sub>SO<sub>4</sub>: Phytochemical screening, FT-IR, SEM-EDX, Synergetic effect and electrochemical evaluations

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## Abstract

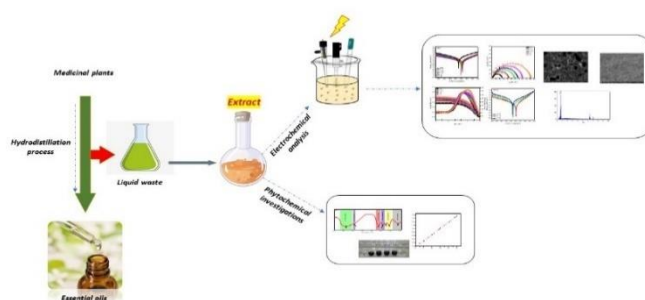
Corrosion is well recognized amongst the utmost severe phenomena that can imperil most metals in various environments. Given the intensive usage of metals, whether for industrial or domestic purposes, corrosion impacts strongly several sectors, of which safety, economy and the environment remain the most affected to it.

In the event of that, several research programs have been focused on the development of novel organic corrosion inhibitor to prevent such nuisance, and the interest towards developing green inhibitor is expanding year after year.

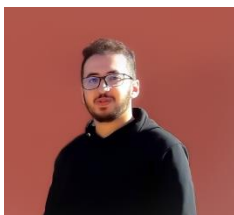
In the present work, the anti-corrosion activity of a green extract based on a Moroccan plant were examined according to electrochemical measurements in 1M HCl and 0.5M H<sub>2</sub>SO<sub>4</sub>. Phytochemical screening, total polyphenols contents, total flavonoids contents and FT-IR analysis was performed to the aqueous extract of the plant in subject to identify the numerous secondary metabolites presented on the green inhibitor.

Potentiodynamic and electrochemical impedance spectroscopy analysis were performed to assess the inhibitory tendency of the green inhibitor in both 1M HCl and 0.5M H<sub>2</sub>SO<sub>4</sub> at different range of temperature varying from 293°K to 313°K. Synergistic behavior was also examined by potassium iodide in both media. Finally, surface comparative characterization using SEM-EDX techniques were operated to investigate the carbon steel surface in absence and presence of the Moroccan plant aqueous extract.

Figure



## Biography



Rachid KELLAL is currently a PhD student at university Hassan 2 of Casablanca faculty of sciences Ain Chok in the chemistry, his research project focuses generally on the corrosion prevention of alloys by adopting green methodological approach using plant extract derived from the Hydrodistillation process waste of several Moroccan aromatic and medicinal plants.

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## Study on Microplastics contamination in water and sediment of marine environment using extraction methods and FTIR analysis

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<sup>1</sup>Laboratory of Applied Chemistry and Environment, ENSA, University Ibn Zohr, PO Box 1136, Agadir, Morocco.

<sup>2</sup>Department of Chemistry, School of Physical Sciences building, the Federal University of Akura(FUTA), Ondo state, Nigeria.

<sup>3</sup>Innovative Durable Building and Infrastructure Research Center, Center for Creative Convergence Education, Hanyang University ERICA, 55 Hanyangdaehak-ro, Sangrok-gu, Ansan-si, Gyeonggi-do, 15588, Korea.

### Abstract

Microplastic-based pollution resulting from industrialization and macroplastics waste has been increasingly raised in the marine ecosystem in the last two decades. In an attempt to mitigate the Atlantic Ocean pollution from contaminated microplastic, we investigated in this study the amount, shape types and colors of microplastic pollutants in the marine environment. we collected five samples of sediment and water from different marine sampling sites of Agadir beach in Morocco (Atlantic Ocean). Results revealed that most abundant type was fragments followed by presence of fibers, beads, pellets, films and Nylons, however in the colors classification we found that the majority of microplastics are with transparent, white or yellow color. The Fourier Transform Infrared (FTIR) spectroscopy was applied on all the samples

to consolidate Our previous findings in the filtration and classification phase.

It is noteworthy that the department of chemistry of the School of Physical Sciences building in the Federal University of Akura in Nigeria will investigate the presence of organic contaminants such as phenolics, phthalates and polybrominated diphenyl ethers (PBDEs) in the five marine samples (water and sediment) to establish an overall view about the ocean pollution situation.

**Keywords:** Microplastics, marine water, sediment, contaminants, FTIR.

**Acknowledgments:** The authors would like to thank the JENNIFER WARD OPPENHEIMER (JWO) FUNDED REASEARCH PROJECT (2022-2024) for supporting this work.

### Biography



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# Insights into the corrosion inhibition property of novel hydrazone compounds for N80 steel in 15 wt.% HCl solution: Experimental and theoretical approaches

Badr El-Haitout<sup>1</sup>, Abdelkarim Ait mansour<sup>1</sup>, Mustafa Raji Al-Hadeethi<sup>2</sup>, Hassane Lgaz<sup>3\*</sup>, Han-seung Lee<sup>4</sup>,  
Rachid Salghi<sup>1\*</sup>

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## Abstract

The present work reports the corrosion inhibition property of two hydrazone derivatives derived from Ibuprofen, namely (R)-2-(4-isobutylphenyl)-N'-((1E,2E)-3-phenylallylidene) propanehydrazide (IPP) and (R)-N'-cyclohexylidene-2-(4-isobutylphenyl) propanehydrazide (CIP) for N80 steel corrosion in 15 wt.% HCl solution. Weight loss measurements, potentiodynamic polarization and electrochemical impedance spectroscopy were performed to evaluate the corrosion inhibition performance of investigated hydrazones. The surface morphology of the N80 steel was analyzed using a scanning electron microscope (SEM). In addition, comprehensive computational calculations were conducted to investigate, on one hand, the electronic and chemical reactivity of investigated

inhibitors, and on the other hand, to evaluate their adsorption characteristics on the steel surface, aiming to propose a more accurate corrosion inhibition mechanism. Results showed that both hydrazones acted as effective mixed-type inhibitors, protecting the N80 steel in 15% HCl at 303K. Inhibition efficiencies of 96% and 95.0% were obtained at 303K and optimum concentrations of IPP and CIP, respectively. FE-SEM results proved the formation of a preventive layer on the N80 steel surface against acid corrosion. The adsorption energies computed from DFTB calculations successfully predicted the experimental inhibition performance.

**Keywords:** Corrosion inhibition; N80 steel; DFTB; Hydrazone; SEM.

## Biography



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**GREEN ENERGY, RENEWABLE, STORAGE AND SUSTAINABLE DEVELOPMENT**

**ARTIFICIAL INTELLIGENCE, MACHINE LEARNING, ELECTRICAL ENGINEERING AND  
SIMULATION**

## Reproduction Study on Squid « *Loligo Vulgaris* Lamarck, 1798 » in the Moroccan Southern Region of the Atlantic (Cape Boujdor – Cape Blanc)

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<sup>2</sup>Institut National de Recherche Halieutique, Casablanca.

### Abstract

This paper focuses on the study of squid reproduction *Loligo vulgaris* (Lamarck, 1799) at the Atlantic southern waters of Morocco (Saharan bank) by using data obtained from bottom trawls surveys performed on board of the National Institute research vessel during the period 2000-2014 (springs and autumns seasons).

Results show a marked seasonal periodicity and an irregularity of the spawning periods. The analysis of the biological parameters of the squid revealed differences which were noted both in the intensity of the spawning rate per season and in the size at first sexual maturity of both sexes. This variability in size and seasonality of maturity might be explained by a function of growth plasticity (Boyle and Boletzky, 1996).

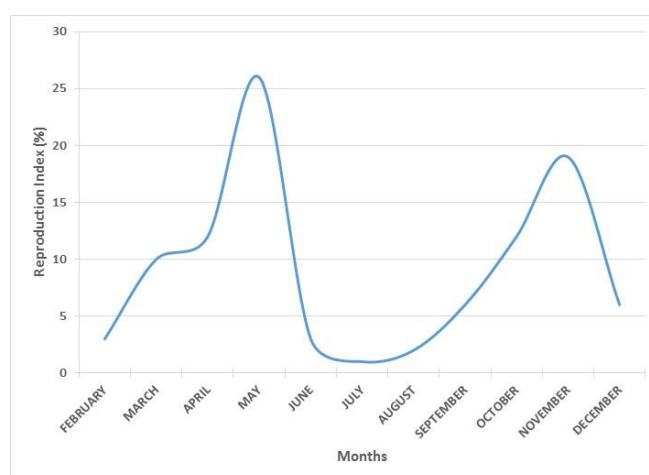
The species shows a positive allometric growth. It was also noted that male individuals of the squid show an earlier sexual maturity compared to female individuals, and those during the spring season. On the other hand, this reproduction pattern is reversed during the fall season during which the size of mature females becomes smaller than those of males.

The species of *Loligo vulgaris* has a life cycle characterized by a strong seasonality of reproduction (the main peak occurs in spring and secondary in autumn season). The period of intense activity (main spawning) lasts from March to May. The period of less intensity (secondary spawning) is observed during September-November period.

Indeed, the squid species has a variable life cycle, which results in differences in size or age at sexual maturity, due to the presence of a prolonged periods of reproduction.

Sex ratio and the dorsal mantle length-body weight relationship were determined.

**Figure:** Monthly evolution of the squid's average reproduction index



### Recent Publications

1. A.Dridi ; A.Srairi ; A.Boumaaz ; J.Bensbai ; A.Benmhamed ; D.Belghiti.  
*Study of the reproductive phase in the common octopus in the South Atlantic zone 2019.*
2. A.Srairi ; A.Dridi ; A.Benmhammed ; D.Belghiti  
*Study of the reproduction of the squid "Loligo vulgaris Lamarck, 1798 in the south Atlantic zone, 2019.*
3. L.Mouzgui ; H.Zidane ; N. Rezzoum ; A. Srairi ; A.Dridi ; M.Malouli ; N. Charouki ; A.Errhif
4. *Reference State of the Biodiversity of Coastal Resources of the Moroccan Mediterranean region between Fnideq and Saïdiaa.*

### Biography



I am Ali SRAIRI. I have an expertise in direct assessment of the main stocks in Moroccan waters through trawl surveys, as well as indirect assessment of the main national fisheries through biological sampling (BSS). During my career, I was able to participate in various projects at the national and international levels. For example, I had the honor of being the National Coordinator of the FAO-IGS ATL SUD Project (1995-1997) and of the Medits project in the Mediterranean area of Morocco (1999-2001). My publications amount to 20. The most recent ones date from 2019 and concern the reproduction of squid.

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**INNOVATIVE DEVICES, CHEMISTRY AND MATERIAL PHYSICS**

# FT-Raman and Fourier Transform Infrared spectroscopy (FTIR) investigation of hardwood lignin: identification of guaiacyl and syringyl units

Somia Fellak<sup>1</sup>, Mourad Rafik<sup>2</sup> and Abdelhadi El Hassani<sup>1</sup>

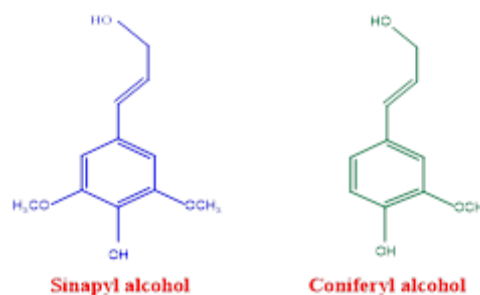
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## Abstract

FT-Raman and FTIR spectroscopy were used in this work as useful techniques for characterizing lignin and identifying the functional groups present in a particular hardwood sample. Three hardwood samples originated from south Morocco were analyzed. The results obtained by means of FT-Raman and FTIR spectroscopy indicate that hardwood lignin fraction was characterized by the presence of the two basic monomer types; coniferyl and sinapyl alcohols that form guaiacyl (1,3,4-trisubstituted aromatic) and syringyl (1,2,3,5-tetrasubstituted aromatic) (Figure 1). Raman analysis show the detection of bands at 2934, 1657, 1597, 1327 and 1267  $\text{cm}^{-1}$  attributed to aliphatic and aromatic C-H stretches, C=C stretching of guaiacyl,  $\nu(\text{C}=\text{C})_{\text{ar}}$  skeletal vibration typical for guaiacyl and syringyl, C-O vibration in syringyl derivatives and  $\nu \text{C}_{\text{ar}}\text{-O-CH}_3$  and/or  $\text{C}_{\text{ar}}\text{-OH}$  ether function, respectively<sup>1,2</sup>. FTIR analysis allowed characterizing hardwood lignin by bands at 3325, 2875, 2920, 1595, 1505, 1457, 1268, 1230, 1153, 1112, 1031 and 834  $\text{cm}^{-1}$ . The latest was attributed to the  $\gamma \text{C-H}_{\text{ar}}$  out of plane bending of 1,3,4,5-tetrasubstituted aromatic. The guaiacyl/syringyl (G/S) matrix was identified by the bands of  $\nu \text{C}=\text{C}_{\text{ar}}$  of skeletal vibration in phenolic ring (1595 and 1505  $\text{cm}^{-1}$ ) and  $\nu \text{C}_{\text{ar}}\text{-O}$  of aromatic methoxyl group (1268 and 1230  $\text{cm}^{-1}$ )<sup>3,4</sup>.

Figure: Structure of sinapyl (Syringyl) and coniferyl alcohols (guaiacyl) in hardwood lignins



## Recent Publications

1. S.Durmaz and Ö. Özgenç, *Vib. Spectrosc.* 85 (2016) 202–207
2. S. Fellak and A. Boukir, *MATEC Web Conf.* 191 (2018) 00014
3. W. Liu, C. Hu, W. Zhang, Z. Liu, J. Shu and J. Gu, *Prog. Org. Coatings.* 148 (2020) 105833
4. V. Sharma, J. Yadav, R. Kumar, D. Tesarova, A. Ekielski and P. K. Mishra, *Vib. Spectrosc.* 110 (2020) 103097.

## Biography



Dr. Somia FELLAK is a Ph.D. researcher who has been extensively involved in materials sciences. She obtained her Ph.D in Sciences and Engineering of Materials and Process from Sidi Mohammed Ben Abdellah University, Morocco, in December 2020. She had an extensive research experience in material characterization and the study of their chemical, mechanical, elemental and morphological properties using vibrational spectroscopy, molecular spectrometry, microscopy and spectrophotometry. The strong experience that she gained in the survey of effect of degradation processes on the material's structure will be carried on the research of new materials for reversible conservation-restoration and exhibiting good stability for the studied works.

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# Reinforcement and disinfection of heritage textile materials. Characteristic and kinetic study

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## Abstract

We have a real need to preserve our heritage, of which we must be proud. The cultural heritage for all nations is the basis on which they can build their status and their future. It is identified and measured by its value, its progress, its identity and its memory.

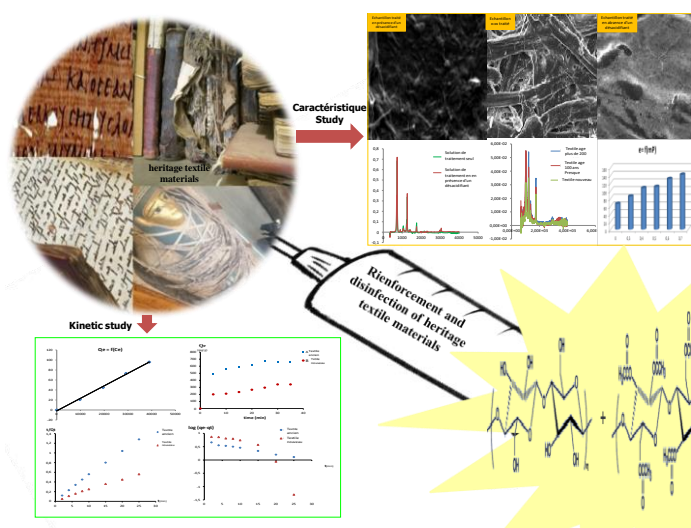
Among the cultural heritage of a textile nature, we find manuscripts, paintings, plans... Even the heritage mummy shrouds. At the time, textiles were generally obtained from plants (cellulosic fibers), which keep perfectly and resist conventional deterioration. However, they are easily attacked by insects and biological agents. Over time, the textile material that constitutes a great heritage, dissolves, disappears, deteriorates and thus becomes vulnerable. Therefore, it is necessary to develop restoration methods to safeguard these precious objects that are part of our cultural memory.

Our research work consists of carrying out studies relating to the insertion of a polymer and an effective antibacterial-antifungal agent in the matrix of old textile materials according to the impregnation technique.

Characterizations by scanning electron microscopy (SEM), infrared spectroscopy (FTIR) and Young's modulus (MY) are very satisfactory and promising, as well as the tests of antibacterial (antifungal) activity which are encouraging.

The kinetic studies carried out for the identification of optimal experimental conditions and the elucidation of the insertion mechanism are also more convincing.

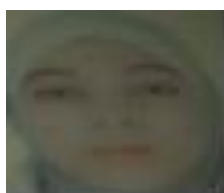
Figure:



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1. Li, M. Assumption on construction of a multi-layered preservation system for chinese ancient books. *Library Journal*, 28(3) (2009), 14–19.
2. C. Federici, P. Mufano, M.S. Storace, *Sci. Technol. Cultural Heritage*. 5 (1996) 37–47.
3. L. Laguardia, E. Vassallo, F. Cappitelli, E. Mesto, A. Cremona, C. Sorlini, G. Bonizzoni, *Appl. Surf. Sci.* 252 (2005) 1159–1166.
4. E Rivalier, S Seydel - *Annales de Parasitologie Humaine*, 1932 - [parasite-journal.org](http://parasite-journal.org)
5. C. Federici, P. Mufano, M.S. Storace, *Sci. Technol. Cultural Heritage*. 5 (1996) 37–47.

## Biography



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Holder of training certificates in the processing of heritage manuscripts on behalf of the BNRM and the BUMS. And certificates in different fields also in physico-chemical and biological laboratories.

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**NANOSCIENCE, ORGANIC AND INORGANIC ADVANCED MATERIALS**

# Sulphate-substituted Tricalcium Phosphate $\beta$ -TCP-S: Effect of $\text{SiO}_4^{2-}$ insertion and microwave conditions

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<sup>2</sup> Advanced Materials and Process Engineering Laboratory, Faculty of Sciences, Ibn Tofail University, Kenitra, Morocco.

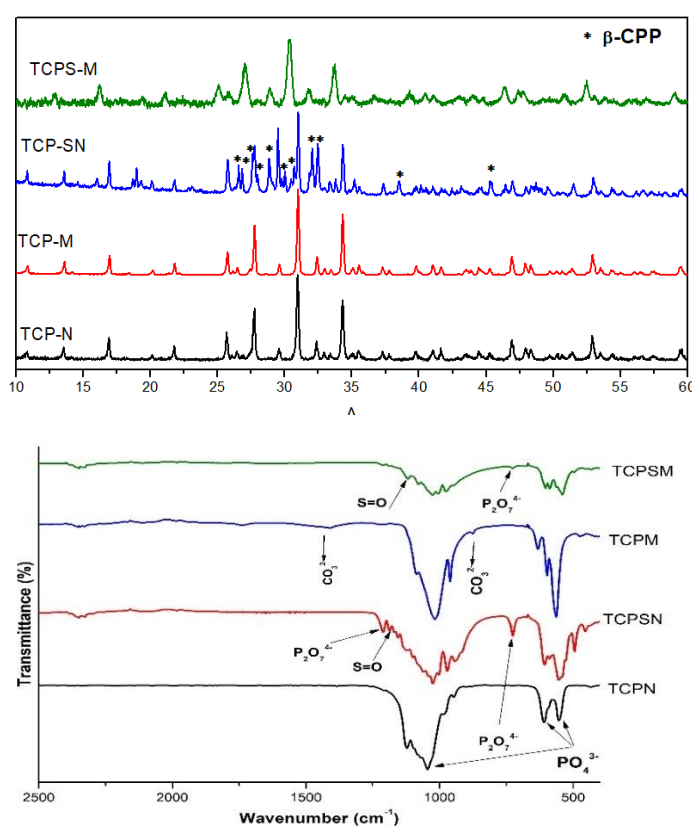
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## Abstract

Tricalcium phosphate  $\beta$ -TCP, with the chemical formula  $\text{Ca}_2(\text{PO}_4)_3$ , is one of the main bioceramics used in orthopaedics and dentistry due to its chemical formula close to that of the mineral phase of bone tissue. However, the low bioactivity and resorbability of  $\beta$ -TCP in the physiological environment limits its use. The substitution of certain ions in the apatite structure seems to play an important role in further improving the biological behaviour and of course its bioactivity.

The main purpose of the present study is to use a microwave-assisted wet chemical technique to prepare practically pure  $\beta$ -TCP and sulphate substituted  $\beta$ -TCP (TCPS) with a defined sulphate content, and to evaluate how Sulphate ions and microwave conditions affect crystallite size, crystallinity and lattice parameters of  $\beta$ -TCP. The XRD and FTIR results showed that the insertion of  $\text{SO}_4^{2-}$  group at  $\text{PO}_4^{3-}$  sites, without microwave treatment, decreases the crystallinity of  $\beta$ -TCP samples and promotes the growth of calcium pyrophosphate  $\beta$ -CPP as a secondary phase. Our results showed also that wet chemical preparation combined with microwave treatment for TCPS-M led to a decrease of peak intensity, crystallite size average, and as well as the peak broadening, confirming the decrease of degree of crystallinity. Besides, we noted a slight shift of XRD peaks towards lower diffraction angle, which could be explained by the replacement of  $\text{PO}_4^{3-}$  ions, with smaller anionic radius of 0.238nm, by  $\text{SO}_4^{2-}$  ions with larger anionic radius of 0.258nm. The FTIR analysis revealed the presence carbonates groups and confirms the formation of  $\beta$ -CPP as secondary phase for sulphate substituted  $\beta$ -TCP. According to ICP-AES and EDS results, the calculated molar ratio Ca/P is quite similar. Furthermore, MEB micrograph of  $\text{SO}_4^{2-}$  substituted  $\beta$ -TCP demonstrates the deposition of  $\beta$ -CPP on  $\beta$ -TCP surface, supporting the XRD and FTIR results.

Figure:



## Recent Publications

## Biography



Ahmed El Yacoubi is a Professor Assistant of Inorganic Chemistry at Mohamed First University. He received his Ph.D in fundamental chemistry from Ibn Tofail University in 2018 under the supervision of Professor Brahim Chafik El Idrissi. He joined the department of chemistry at Mohamed First University after two years as an assistant professor. His research is situated in the field of synthesis and characterization of new calcium phosphate materials and cements, with a special focus on photocatalytic and antimicrobial performance. Recently, his research focused on photocatalysis-based semi-conductors.

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# Determination of the mechanical properties of single calcium alginate microcapsules loaded gallic acid

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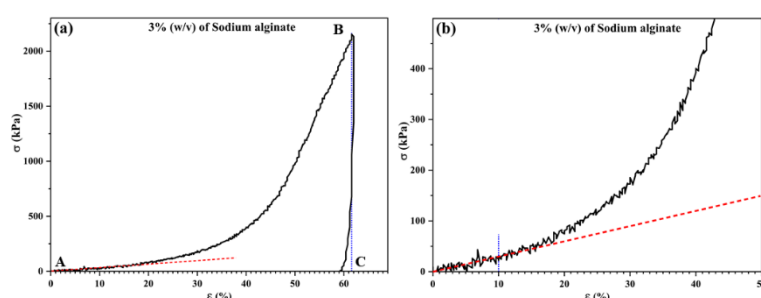
<sup>2</sup>Laboratory of Theoretical Physics, Particles Modeling and Energetic, URAC 07, Faculty of Science, University Mohammed Premier Oujda, Morocco.

## Abstract

The mechanical properties of biocompatible microparticles including calcium alginate microbeads loaded gallic acid were determined by a micromanipulation technique using a Brookfield Texture Analyzers. Single calcium alginate microbeads of a regular size distribution with a mean diameter in the range of 700–750  $\mu\text{m}$  prepared by the ionotropic gelation technique were compressed to rupture with a constant speed of  $0.5 \text{ mm}\cdot\text{s}^{-1}$ . The corresponding force imposed on them was measured simultaneously by a force transducer. Results showed that the force imposed on these particles increased when they were compressed, but relaxed significantly when they were ruptured and the increasing alginate concentration led to the improvement of mechanical strength (microcapsules). The exploitation of the linear character of the stresses and deformation allowed us to calculate the creep function. Calculations show that the microbeads are subjected to delayed elasticity (or entropy elasticity) governed by the Kelvin-Voigt analog model. This model is then confronted with the experiment and allowed us to find the modulus of Young of the microbeads which is in agreement with our direct experimental measurements as well as the determination of the delay time and viscosity for a concentration of (3%, w/v).

**Keywords:** alginate microcapsules; gallic acid; mechanical properties; Voigt's model; Elastic modulus.

**Figure:** Typical constraint-deformation rate relationship for the compression of a single calcium alginate beads to rupture for a concentration of 3% (w/v) of sodium alginate (a), zoom of the linear part (b).



## Recent Publications

1. **Kamal Essifi, Abdourahim Hammani, Doha Berraouan, Ali El Bachiri, Marie-Laure Fauconnier, Abdesselam Tahani.** *Materials Chemistry and Physics* (2021).
2. **Kamal Essifi, Mohamed Brahmi, Doha Berraouan, Abderrahim Ed-Daoui, Ali El Bachiri, Marie-Laure Fauconnier, and Abdesselam Tahani.** *Journal of Chemistry* (2021).
3. **Kamal Essifi, Mohammed Lakrat, Doha Berraouan, Marie-Laure Fauconnier, Ali El Bachiri, Abdesselam Tahani.** *Polymer Bulletin* (2020).
4. **K. Essifi, A. Ed-Daoui, D. Berraouan, M. Benelmostafa, M. Dahmani, A. Tahani.** *Materials Today: Proceedings* (2020).
5. **Kamal Essifi, Mohammed Nor, Doha Berraouan, El Houssien Akichouh, Ali El Bachiri, Allal Challioui, Abdesselam Tahani.** *Moroccan Journal of Chemistry, Vol 9, No 1* (2021).

## Acknowledgement

This work was supported by the MESRSFC and CNRST (Morocco) under grant No. PPR 15-17, and UMP under grant No. PARA1-2019. The authors are also thankful to the Professor Abdelmonaem Talhaoui, Head of Department of Chemistry, Faculty of Sciences, Mohammed first University, Oujda, Morocco, for managing Department of analysis.

## Biography



**Kamal Essifi** is a PhD student at faculty of Sciences, Mohammed 1<sup>st</sup> University, Oujda. Kamal does research in microencapsulation by the organic, inorganic and hybrids biomaterials. Their current project is “Microcapsules of Hydrogels of Natural Substances: Relationship Structure Properties and Applications”.

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# Ultrasound-assisted synthesis of new 4-dimethylaminopyridinium-based ionic liquids and/or salts, characterization, in silico approaches and antimicrobial evaluation

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<sup>2</sup>Microbiology Department, Faculty of Science, Ain Shams University, Cairo, 11566, Egypt.

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<sup>4</sup>Department of Chemistry, Taibah University, 30002, Al-Madina Al-Mounawara, Saudi Arabia.

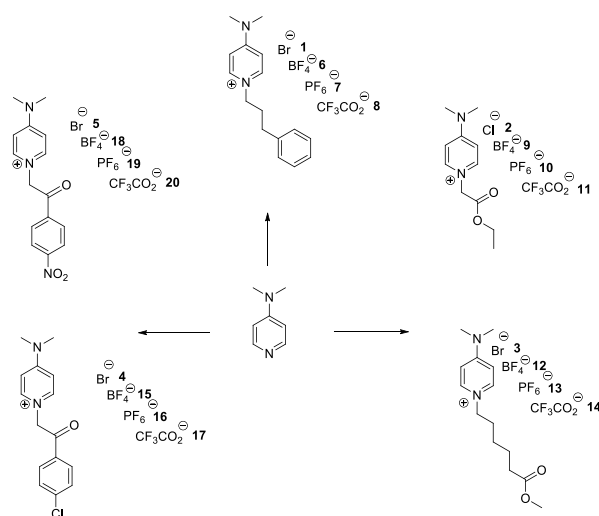
<sup>5</sup>Laboratory of Applied Chemistry and Environment (LCAE), Department of Chemistry, Faculty of Science. Mohammed Premier University, BP717, 60000 Oujda, Morocco.

## Abstract

An eco-friendly ultrasound-assisted procedure for the preparation of twenty functionalized pyridinium ionic liquids (ILs) 1-20 is described. The characterization of the newly compounds is confirmed by <sup>1</sup>H NMR, <sup>13</sup>C NMR, <sup>11</sup>B NMR, <sup>19</sup>F NMR, <sup>31</sup>P NMR and mass analysis. All synthesized compounds were screened for some applications, namely, antimicrobial activity and the results are very promising. Preliminary structure activity relationship (SAR) studies have been performed to identify the relation between molecular structure and activity. In silico Analysis of ionic liquids and/or salts was carried out based on ADME, Lipinski rule, drug likeness, toxicity profiles and other physico-chemical properties. All compounds were safe in toxicity profile and computed LD50 values were in accepted range (2.59–2.85 mol/kg). In silico data has revealed that all ionic liquids and/or salts were in good agreement in term of bioavailability.

**Keywords:** Green procedure; ionic liquids; ultrasound irradiation; antimicrobial activity; *in silico* Prediction.

Figure



## Recent Publications

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2. M. Galai a, M. Rbaa b,\* , H. Serrar b, M. Ouakki b, A. Ech-chebab a, Ashraf S. Abousalem .E. Ech-chihbi e, K. Dahmani b, S. Boukhris b, A. Zarrouk f, M. EbnTouhami S-Thiazine as effective inhibitor of mild steel corrosion in HCl solution Synthesis, experimental, theoretical and surface assessment Colloids and Surfaces A: Physicochemical and Engineering Aspects 613 (2021) 126127.
3. K.Berramia A.Ech-chebab M.Galai A.Ejbouh S.Hassi H.Benqlilou B.Ouaki M.Ebn Evaluation of fly ash effect on the durability of prestressed concrete cylindrical pipe in aggressive soil by electrochemical method Chemical Data Collections Volume 32, April 2021, 100656.

## Biography



# Eco-friendly composites based on Biopolymers and Moroccan Clay for wastewater treatment

Leila Azaryouh<sup>1,2,3</sup>, Zineb Kassab<sup>1</sup>, Adil Aboulkas<sup>3</sup> Mounir El Achaby<sup>1</sup>, Khalid Draoui<sup>2</sup>

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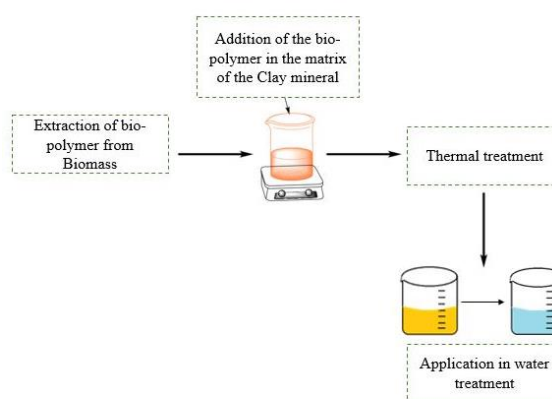
<sup>2</sup>Laboratory of Materials and Interfacial Systems, Faculty of Sciences Tétouan, University Abdelmalek Essaadi (UAE), P.B. 2121, 93000 Tétouan, Morocco.

<sup>3</sup>Equipe des Procédés Chimiques et Matériaux Appliqués (EPCMA), Faculté polydisciplinaire de Béni-Mellal, Université Sultan Moulay Slimane, BP 592, 23000 Béni-Mellal, Morocco.

## Abstract

Water is a vital resource for the global economy and human development. Agriculture and industries release many persistent pollutants and contaminants into water systems. This not only affects water quality but also represents a serious threat to the environment and the aquatic life. Several techniques are used to eliminate contaminants from wastewater. Composites recently have attracted the attention of researchers to remove organic and inorganic pollutants from aqueous medium by adsorption. A composite material is a combination of two materials with different physical and chemical properties. When they are combined, they fabricate a new material, which is intended to improve the performance of the starting material. The purpose of this work is to provide an overview of the synthesized composite that gathers the valorization of two natural resources: biopolymer and clay minerals sampled in Tetouan region. The functionalization will allow conferring to the raw clay interesting characteristics in order to improve its performances towards the adsorption of the dyes from aqueous medium. This contribution will summarize the materials characterization achieved by: XRD, XRF, FTIR, BET, SEM..... The clay is essentially composed by illite, kaolinite, quartz and carbonate. The study showed that the adsorption capacity of the composite toward methyl orange was about 150.52 mg/g while the raw clay present à low adsorption performance (33.98 mg/g). Therefore, the fabricated composite is very useful for the remediation of dyes from polluted water.

Figure:



## Recent Publications

1. I. Ayouch, I. Barrak, Z. Kassab, M. El Achaby, A. Barhoun, K. Draoui, Improved recovery of cadmium from aqueous medium by alginate composite beads filled by bentonite and phosphate washing sludge, *Colloids Surfaces A Physicochem. Eng. Asp.* 604 (2020)
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## Biography



First year PhD student at the Polydisciplinary Faculty of Sultan Moulay Slimane University, Graduated with a Master degree specialized in Industrial Chemistry at Abdelmalek Essaadi University, Completed the end-of-study internship at the MSN department at Mohammed VI Polytechnic University. Worked on the extraction of bio-polymers and the synthesis of composites for wastewater treatment.

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**NATURAL PRODUCTS AND THEIR BIOTECHNOLOGICAL APPLICATIONS**

# Cartography and chemical profiling of rosemary essential oil in Eastern High Atlas Mountains, Morocco

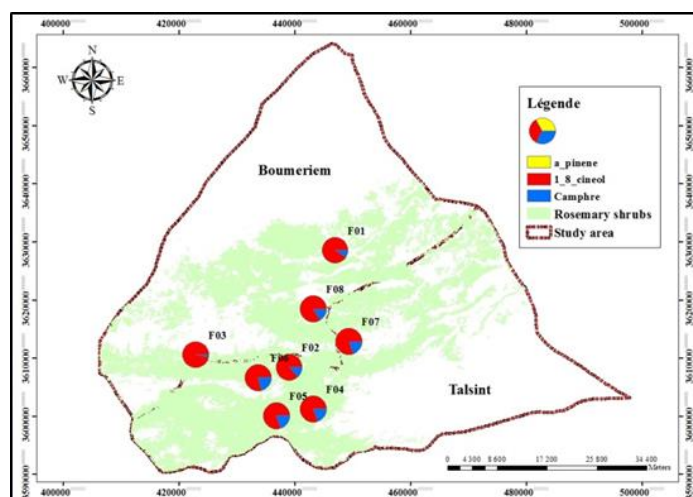
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## Abstract

*Rosmarinus officinalis* is a shrub grown spontaneously in Mediterranean basin. It has a large use in pharmaceutical industry due to their bioactive molecules within their essential oils and crude extracts [1]. This plant covers huge areas in Morocco and offers considerable incomes to the local cooperatives, particularly in the Eastern High Atlas Mountains [2]. However, lack of accurate data about the distribution range and the geographic chemical variability are impediments to decision makers to set a sustainable management plan and effective marketing strategies for rosemary products. Thus, the aim of this study is to delineate rosemary land cover in this region with focus on the chemical variability of its essential oil. In that respect, two Sentinel 2A L2A satellite images were mosaicked, georeferenced and clipped to the study area, which concerns the collectivities of Boumeriem and Talsint (Oriental, Morocco). Then, the images were assessed with an object based approach through segmentation and binary classification (rosemary's shrubs; other land) that were processed respectively by the multi-resolution and random forest algorithms, incorporated in ecogition v8.8 software [3]. Training and validating data were collected through fieldworks. For the chemical characterization, rosemary leaves were harvested from different locations in the study area, and extracted with Clevenger apparatus [4]. The obtained essential oils underwent later Gas chromatography-mass spectrometry analysis for the chemical identification. As regards cartography, the obtained map (figure 1) have shown that the rosemary shrubs cover 60 643 ha and 75 800 ha respectively for Boumeriem and Talsint collectivities. For the chemical composition, all samples showed high content of 1,8-cineole (50.60-64.27%), whereas Camphor and  $\alpha$ -Pinene relative concentration didn't exceed 14.12% and 9.02%, respectively.

**Figure:** Chemical variability of rosemary's essential oil within the collectivities of Boumeriem and Talsint (Oriental, Morocco)



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1. Souza T. F., Magalhães M., Torres V. V., D'Elia E., Int. J. Electrochem Sci. 10 (2015) 22.
2. Mohd H. H., Mohammed J. K., J Phy. Sci. 21 (2010) 1.
3. ElHajjaji F., Greche H., Taleb M., Chetouani A., Aouniti A., Hammouti B., J. Mater. Environ. Sci. 7 (2) (2016) 566-578.
4. Bouknana D., Hammouti B., Messali M., Aouniti A., Sbaa M., Port. Electrochim. Acta, 32 (2014) 1-19.
5. Ali A.I., Megahed H.E., El-Etre M.A., Ismail M.N., J. Mater. Environ. Sci. 5 (2014) 923-930.

## Biography



Sabbahi Monsif has his expertise in crops valorization, particularly aromatic and medicinal plants, and passion in improving new uses for biomolecules extracted from natural products. His focus is based on the use of eco-friendly products to have application in health and food field. He was awarded his Engineer degree, specialized in wood and forest product technology in 2011 from the National School of Forest Engineers, Morocco. He is preparing his PHD degree in chemistry department at the University Mohammed 1<sup>st</sup> in Oujda since 2016.

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## Assessment of physical and physicochemical characteristics of mesocarp and peel of ten Moroccan pomegranate cultivars (*Punica granatum* L.)

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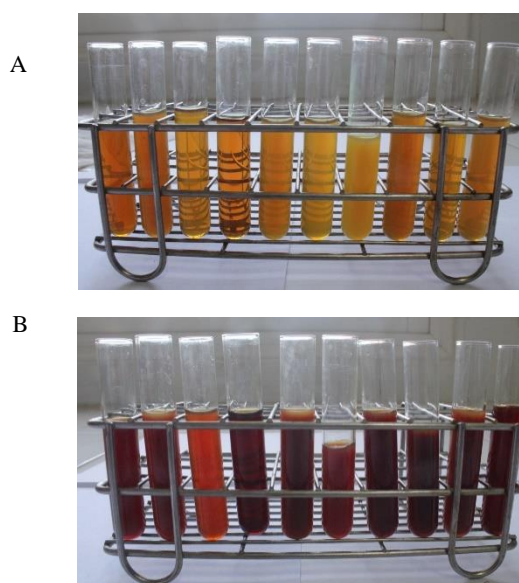
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### Abstract

The mesocarp and the pericarp (peel) of pomegranate (*Punica granatum* L.) constitute a relevant by-product for their richness in bioactive compounds beneficial to human health. In order to valorize this resource, this study aimed to evaluate and to compare the characteristics of the mesocarp and the peel of ten pomegranate cultivars grown in three regions of central Morocco. Physical criteria (yield and color parameters of the CIELAB system), physicochemical characteristics (humidity, pH, Brix, ash content and mineral composition) were determined in pomegranate mesocarp and peel. Results showed significant differences between cultivars. The yields of mesocarp and peel varied between 29.04 % for the cultivar ‘Sefri of Sidi Abdellah’ and 47.60 % for the cultivar ‘Lhamdha’. The cultivar ‘Lahmar’ showed the least saturated mesocarp and peel color (chroma C\* of 33.03 and 32.35, respectively), while the cultivars ‘Lhamdha’ and ‘Sefri of Ouled Abdellah’ presented the most saturated colors with C\* values exceeding 75. In terms of physicochemical characteristics, the sour cultivar ‘Lhamdha’ showed the lowest pH values (3.07 for the mesocarp and 3.49 for the peel) as well as high Brix values (22.10 °Bx for the mesocarp and 28.30 °Bx for the peel). The humidity varied between 74.92 % and 85.25 % for the mesocarp and 61.45 % and 78.85 % for the peel. Pomegranate peel was rich in ash (0.55-1.14 %) compared to the mesocarp (0.35-0.81 %). The cultivar ‘Bzeq Tir’ presented the lowest humidity for the mesocarp and the peel and the highest ash and mineral contents, especially potassium, calcium and barium for its mesocarp. Thus, the studied pomegranate cultivars have shown interesting physical and physicochemical characteristics and a large diversity confirming the problem of homonymy or synonymy in the name of the “Sefri” pomegranate cultivars.

**Figure:** Extracts of ground, centrifuged and filtered mesocarps and peels of the ten Moroccan pomegranate cultivars. A: Mesocarp, B: Peel.



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1. Tozzi F., Núñez-Gomez D., Legua P., Del Bubba M., Giordani E., Melgarejo P., *Sci. Hortic.* 291 (2022) 1-7.
2. Chafki L., Elfazazi K., Azzouzi H., Achchoub M., Fakhour S., Benbati M., Haddioui A. and Elhansali M., *Plant Cell Biotechnol. Mol. Biol.* 22 (2021) 315-322.
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### Biography



Sarah Loukhmas has her expertise in industry, quality and safety of foods. She actually focuses in the promotion of local products, especially pomegranate. She received her PhD in 2020 from the Hassan II Casablanca University, Faculty of Science and Techniques, Mohammedia, Morocco, in collaboration with the National Institute of Agricultural Research, Regional Center of Agricultural Research of Marrakesh (INRA - Morocco). She published three papers indexed Scopus and Thomson Reuters.

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# Plant essential oil as a safe corrosion inhibitor for copper in 0.5M H<sub>2</sub>SO

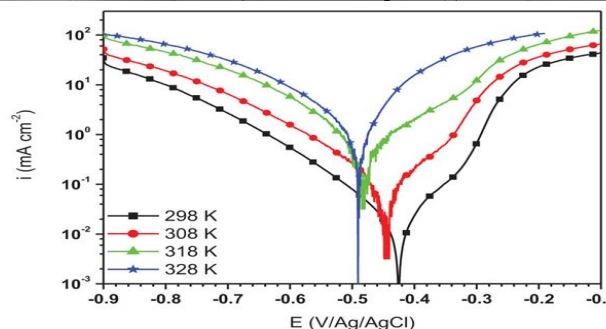
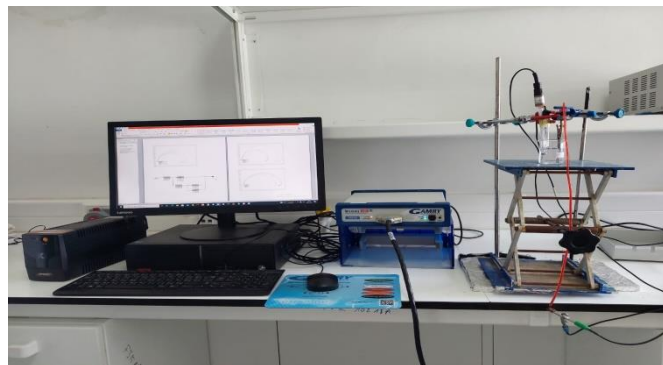
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## Abstract

Corrosion is the deterioration of a metal which is caused by its interaction with other substances within the same environment. The serious consequences of the corrosion process have become a problem of a worldwide significance mostly in industrial chemistry. Among the existing metals, copper is considered to be a good resistant metal in a wide variety of environments. As inhibitors, organic substances containing polar functions with nitrogen, sulphur, and/or oxygen in the conjugated system have been reported to exhibit good inhibiting properties, however natural products such as essential oils are preferred and are used as green corrosion inhibitors, they are biodegradable, nontoxic, ecologically acceptable and renewable. They are the most suitable in terms of their safe impact on the environment. These numerous advantages are the main factors that led to the evaluation of the inhibition effectiveness by using different concentrations with and without essential oil for corrosion of copper in sulfuric acid. The results obtained from weight loss, electrochemical impedance spectroscopy (EIS) and scanning electron microscopy (SEM) show a high corrosion resistance performance; the rate of copper corrosion decreases by decreasing the concentrations of essential oil.

Figure:



## Recent Publications

1. Tan B, Zhang S, Qiang Y, Li W, Liu H, Xu C, Chen S (2019)
2. M.A. Quraishi and J. Rawat, Mater. Chem. Phys., 2001, 70, 95–99..
3. Qiang Y, Zhang S, Xu S, Li W (2016)

## Biography



Rim Sayed is interested in the inhibition of copper by essential oil in sulfuric acid as a safe corrosion inhibitor. She was registered for a PhD in 2020, Faculty of Sciences of Kénitra, University IbnTofail, and Morocco.

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## Ethnobotanical study of medicinal plants used in the treatment of dermal diseases and skin care

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<sup>3</sup>Laboratory of molecular chemistry, Materials and Environment (LMCME) Department of Chemistry Faculty multidisciplinary Nador, Mohamed 1st University, P .B 300, Nador 62700, Morocco.

### Abstract

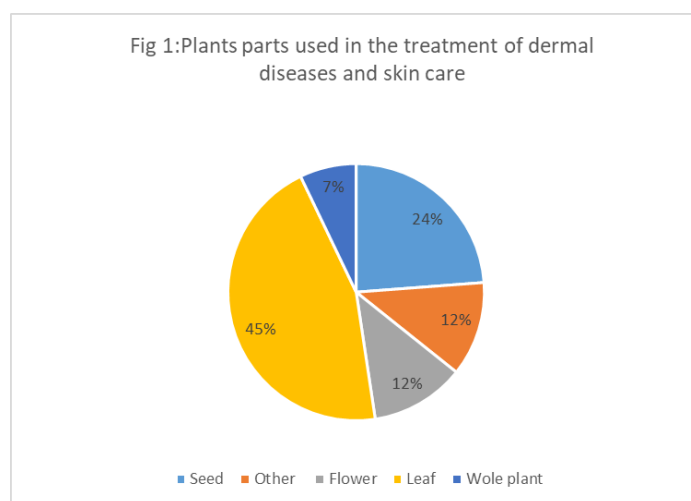
**Introduction:** In northern Morocco, the use of medicinal plants remains an important part of people's healing. However, their knowledge of plants species is poorly documented. The purpose of this survey was to document the use of medicinal plants for treatment of dermal diseases and skin care by local population in Al Hoceima province.

**Methods:** The ethnobotanical survey was conducted with 175 informants, using face-to-face interviews semi-structured.

**Results:** Thirty-two species belonging to 19 families were cited by informants. Lamiaceae family was the most cited. *Cannabis sativa* L. *Dittrichia viscosa* (L.) Greuter and *Daphne gnidium* L. were the most prescribed species. The most recommended part of the plant is the leaves followed by the seeds and then the flowers. The recommended plants are frequently prepared in the form of a poultice and applied to the skin directly since the common mode of administration is external.

**Conclusion:** The survey serves as a reference for future surveys of medicinal plants and ethnobotanical knowledge in the study area.

### Figure:



### Recent Publications

### Biography



Author has her expertise in ethnobotany and pharmacology. Her focus is based on the use of natural product to have application in health field. from the Abdelmalek Essaadi University, Morocco.

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## Development and characterization of commercial Moroccan nanoclays

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### Abstract

Sodium Bentonite (SB) from Bentonil®Gadorplus is a sodic clay used in slurry making for different applications as soil improvement, waterproofing, vertical drilling, conventional special foundations.

A clay sample from SV, Bentonil®Gadorplus was characterized and modified by successive process for different time intervals.

The non-plastic clay fraction as quartz, iron oxide and organic matter and the heavy impurities in the clay water suspension were eliminated in various steps.

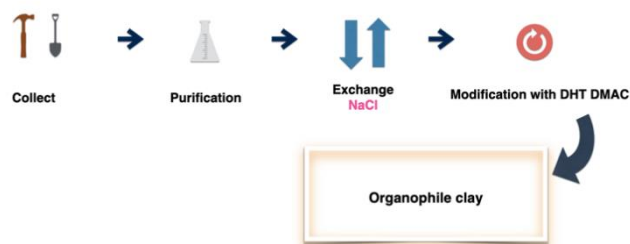
The organic, matter and calcium carbonate were removed by acidic treatment using hydrochloric acid 37% 5M . The purified clay underwent a sodic treatment with sodium chloride 0.2M to obtain a homosodic clay.

Finally, the homosodic clay was modified with a commercial surfactant DHT DMAC(dehydrogenated tallow dimethyl ammonium chloride) with isopropanol through cycles.

The cation exchange capacities of original, exchanged and modified clays were determined by CuEDA complex method. The cation exchange capacity is found to enhance from 10 to 92.15 meq/100mg.

The organophilisation of exchanged clay was carried out by intercalation with DHT DMAC. The XRD analysis showed enhancement of basal spacing from 12°A to 20°A.

Figure: Modification of clay steps



### Recent Publications

1. Seung Mok Lee, Diwakar Tiwari, Organo and inorgano-organo-modified clays in the remediation of aqueous solutions: An overview, Applied Clay Science, Volumes 59–60, 2012,
2. Soliman MA, Rashad GM, Mahmoud MR. Organo-modification of montmorillonite for enhancing the adsorption efficiency of cobalt radionuclides from aqueous solutions. Environ SciPollutRes Int. 2019 Apr;26(10)
3. KokouAnoukou, Ali Zaoui, FahmiZaïri, Moussa Nait-Abdelaziz, Jean-Michel Gloaguen. Structural and thermodynamics properties of organo-modified montmorillonite clay. Physica E: Low-dimensional Systems and Nanostructures, Elsevier, 2014, 65, pp.56-60.

### Biography



Doha has her expertise in purification and modification of natural materials such as clays and polymers and physico-chemistry filed. She was awarded her PhD in 2021 from the University of Mohammed First.

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# Comparison of the physico-chemical characteristics of three strawberry varieties of strawberries from different regions in Morocco

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## Abstract

Strawberries are red fruits, low in calories, by their contribution in organoleptic and nutritional qualities, they are very appreciated by the consumer in Morocco. The composition of strawberries varies according to the season, cultivation techniques, harvesting periods, conservation and the cultivated region.

Our study consists in the comparison of the organoleptic, physicochemical characteristics of three varieties of strawberries cultivated in three different regions Larache, Benslimane and Moulay Bouselham. The titratable acidity content was determined by titrimetry. The contents of Magnesium, Calcium, Chloride, Glucose and polyphenols contained in the strawberry juices were determined by spectrophotometric method. The Brix content was determined by refraction analysis in the strawberry juices. Fluoride content was determined by the potentiometric method.

The results reveal Magnesium, Calcium, Chloride and Fluoride levels respectively between 19.4 mg /100g and 34 mg/100g, 13.5 mg/100g and 48.1 mg/100g, 82 mg/ 100 g and 1609.38 mg/100 g, 0.36 mg/l and 0.45 mg/l in the different strawberries studied.

The Brix levels ranged from 0.6 % to 1.3 %. Glucose level is between 1.35 g/100g and 2.45 g/100g. The total polyphenol content is between 61.1mg/100g and 151 mg/100g. The physicochemical results of the three strawberry varieties show that they are sweet and sour in nature, rich in polyphenols and minerals. The variety of strawberry of Moulay Bouselham origin presents contents of Magnesium, Calcium, Chloride, Glucose, Brix, polyphenols superior to those of the varieties of Larache and Benslimane.

These results allow to classify strawberry varieties according to their nutritional qualities and to bring selection criteria according to their sweetness, aspect, variety of strawberry for the consumer.

**Table: Results of physicochemical and mineral analyses of the three strawberry varieties in Morocco**

|                                 | Strawberry of Larach | Strawberry of benslimane | Strawberry of Larach |
|---------------------------------|----------------------|--------------------------|----------------------|
| PH                              | 3.6                  | 3.01                     | 3.06                 |
| Titratable acidity in Meq /100g | 0.36                 | 0.343                    | 0.67                 |
| Brix en %                       | 0.6                  | 0.7                      | 1.3                  |
| Conductivity in ms/cm           | 1.07                 | 0.98                     | 0.86                 |
| Magnesium content in mg /100g   | 19.4                 | 29                       | 34                   |
| Calcium content in mg /100g     | 13.5                 | 43.2                     | 48.1                 |
| Chloride content in mg /100g    | 82                   | 1443.80                  | 1609.38              |
| Glucose content in g /100g      | 1.35                 | 1.2                      | 2.45                 |
| Total Polyphénol in mg /100g    | 62.1                 | 86.6                     | 151                  |

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2. Athamena, I. Chalgheml, A. Kassah-Laouar, S. Laroui 3 et S. Khebri. (2010). Lebanese Science Journal, Vol. 11, No. 1
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5. Rodas C.L., Pereira S.I., Toledo-Coelho V.A., Guimaraes-Ferreira D.M., De Souza R.J., Ciuedes de Carvalho J. (2013). MESTA (Chile). 31: 53-58.

## Biography



Sadik Hasnaa student researcher in second year at the faculty of medicine and pharmacy of the university mohamed 5 in rabat he works on the antioxidant activity of the red fruits concerning the communications and publications made since the beginning of this thesis a first poster in béni mellal: 1st international conference: SUSTAINABLE AGRICULTURE: TOOLS AND INNOVATIONS

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# LC-MS Characterization of Moroccan Aromatic and Medicinal Plants and Their Investigations against *Dactylopius Opuntiae* (Cockerell) Under Laboratory and Greenhouse Conditions

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## Abstract

The wild cochineal *Dactylopius opuntiae* (Cockerell) (Hemiptera: Dactylopiidae) is the major insect pest of the prickly pear *Opuntia ficus-indica* (L.) in Morocco, which has caused enormous socio-economic and environmental losses to this crop in recent years. This study aimed to investigate the insecticidal potential of six aqueous (100% water), and methanolic (20/80 (v/v) MeOH/H<sub>2</sub>O) extracts obtained from aromatic and medicinal plants growing in arid and semi-arid regions of Morocco to control nymphs and adult females of *D. opuntiae*, under laboratory and greenhouse conditions. Under laboratory conditions, the aqueous extracts of *Atriplex halimus* at 5% caused significant mortality in nymphs with 71% four days after application and 88% on adult females of *D. opuntiae* 8 days post-treatment. Under greenhouse conditions, the aqueous extract of *A. halimus* combined with black soap at 10 g/L showed the highest mortality rate of nymphs with 100%, 4 days after application.

The adult females' mortality increased significantly to reach 83.75%, 14 days after the second application of *A. halimus* aqueous extract at 5%. Phytochemical analysis of the water extract of *A. halimus* revealed a high content of saponins (24.09 ± 0.71 mg SSE/g DW) compared to other plant extracts, which was confirmed by LC-MS characterization that showed the presence of 36 triterpenoid saponin compounds (derived from oleic-12-en-28-oic acid), in addition to phytoecdysones, simple carboxylic acids, and flavonoids. These findings showed that using the aqueous extract of *A. halimus* as a biological pesticide could be incorporated into the management package to control the wild cochineal as a safe alternative to chemical insecticides.

**Keywords:** *Dactylopius opuntiae*, *Opuntia ficus-indica* L., Plant Extracts, Toxicity, *Atriplex halimus*, Saponins.

## Biography



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