# 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 incertitude 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.

### References

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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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