

Advancements in Carbon-Doped Heteroatom Materials for Energy Storage and Environmental Remediation

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Abstract

In this presentation, I will delve into recent advancements in carbon-doped heteroatom materials, which are transforming the landscape of energy storage and environmental remediation. We will begin by discussing the synthesis and exceptional performance of phosphorus/nitrogen co-doped reduced graphene oxide (PN-rGO). Through a one-step pyrolysis process involving functionalized graphene oxide, PN-rGO demonstrates remarkable electrochemical properties, making it a top contender for supercapacitor electrodes. Next, we will explore the innovative synthesis and functionalization of 2D and 3D imine-based covalent organic frameworks (COFs). A key highlight is the development of a core-shell magnetic imine-linked COF, which has shown high efficiency in removing heavy metals from wastewater. The use of heteropoly acid catalysts has significantly optimized the synthesis process, yielding COFs with improved crystallinity and potential applications in supercapacitors. Finally, we will examine the design and synthesis of core-shell magnetic mesoporous organic networks (MONs), enhanced with Pd and Cu nanoparticles. These MONs are being evaluated for their catalytic effectiveness in CO₂ fixation and cross-coupling reactions, aiming to tackle pressing environmental issues.

Biography



Mohamed Siaj received his Ph.D. in Chemistry at Laval University, Quebec, Canada. Following postdoctoral training at Columbia University, New York, USA. Siaj is holding the rank of full professor since 2018 at universit  de Quebec   Montr al, Chemistry Department. He is the holder of the Canada Research Chair in 2D-Materials for Bio and Chemical Sensing (2016-2026). Since 2017, he is the director of the institutional nanomaterials and energy research center (NanoQAM). He is the director of the Quebec Centre for Advanced Materials (QCAM), since 2023. QCAM is an FRQNT (Fonds de recherche du Qu bec – Nature et Technologies) funded strategic cluster. Siaj’s group activities focus on the growth, synthesis, processing and characterization of advanced nanostructured electroactive materials and their integration into the chemical and biosensors. Siaj’s research activities generated a total of +120 peer-reviewed articles in prestigious international journals. He has given over +80 talks worldwide, including 45 as invited talks and 19 as keynotes.

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