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Special Issue Reprint

# Carbon-Based Electrochemical Materials for Energy Storage

**Edited by: Huicong Xia**

This Special Issue focuses on the latest advancements in carbon-based electrochemical materials for energy storage, specifically highlighting their synthesis, performance, and applications. The primary impetus for this research stems from the escalating global demand for high-performance power sources across diverse technological sectors, ranging from portable electronics to electric vehicles and grid-scale storage. Furthermore, the global transition toward sustainable energy systems underscores the critical need for materials possessing enhanced energy storage and delivery capabilities to effectively integrate intermittent renewable sources such as solar and wind. Significant advances in nanoscience and nanotechnology have facilitated the development of novel energy storage architectures with improved efficiency and power density, specifically enabling next-generation batteries, supercapacitors, and fuel cells. Among the numerous materials under investigation for these demanding applications, carbon-based materials are distinguished due to their distinctive combination of inherent advantages. These include high natural abundance (enabling scalability), low cost, good biocompatibility and highly tunable electrochemical properties achievable through structural manipulation at the nanoscale. Consequently, carbon nanostructures such as graphene and carbon nanotubes are intensively studied as essential electrode components in various devices, demonstrating high specific capacity and superior long-term cycle stability.

