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(57) Abstract :
The proposed invention relates to advanced capacitive electrode materials developed through the innovative synthesis of magnesium oxide (MgO)-carbon nanocomposites. The invention leverages the unique properties of MgO and carbon materials, such as graphene and carbon nanotubes, to enhance the electrochemical performance of supercapacitors. The synthesis methods, including sol-gel processes, hydrothermal synthesis, and chemical vapor deposition, allow for precise control over nanoparticle size, morphology, and distribution, resulting in a uniform and highly efficient composite. This environmentally friendly approach emphasizes sustainability by minimizing hazardous chemicals and energy consumption. The versatile MgO-carbon nanocomposite is applicable in various energy storage and conversion devices, including lithium-ion batteries and fuel cells, offering significant improvements in energy and power densities, stability, and efficiency. This invention paves the way for the integration of high-performance, sustainable energy storage solutions across multiple sectors.

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