Nanoporous NiO Derived from Ni–C Fibers: A Facile Route for High-Performance Energy and Catalysis Applications

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Abstract :

Nanoporous nickel oxide (NiO) has emerged as a promising material for energy storage, catalysis, and sensing applications due to its high surface area, interconnected porous network, and enhanced electrochemical properties. This work presents a straightforward synthesis approach using nickel–carbon (Ni–C) fibers as a precursor to fabricate nanoporous NiO. The Ni–C fibers ensure uniform nickel coating on carbon fibers, while the carbon acts as a sacrificial template during thermal oxidation, leading to the formation of a well-defined porous NiO structure. This method offers a facile and scalable route to engineer NiO architectures with tunable porosity and surface characteristics. The resulting nanoporous NiO demonstrates excellent electrochemical performance, making it a strong candidate for applications in supercapacitors, lithium-ion batteries, and catalytic processes. Our findings highlight the potential of this synthesis strategy in advancing nanomaterial design for next-generation energy and environmental technologies.

Key Words: Nanoporous NiO, nickel–carbon fibers, template synthesis, energy storage, catalysis, gas sensors, electrochemical performance, porous materials.