Porous Co₃O₄/Si Composite Film with Interconnected Network Structure as Anode for Lithium-Ion Batteries

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Well-designed nanostructured composites are of great importance in the research field of electrode materials for lithium-ion batteries, because they can solve the problems of lithium-ion diffusion, electron transport and particle pulverization. In this work, a porous Co₃O₄/Si nanocomposite film with interconnected network structure, assembled by nanosheets growing perpendicular to the substrate, is designed and prepared as anode materials for lithium-ion batteries. The composite film is fabricated using chemical bath deposition plus radio-frequency magnetron sputtering. The film is characterized by means of scanning electron microscopy (SEM), transmission electron microscopy (TEM) and energy dispersive spectrometry (EDS). The electrochemical performance as lithium-ion anode materials is investigated by galvanostatic discharge-charge cycling and cyclic voltammetry (CV). The Co₃O₄/Si film delivers significantly enhanced electrochemical performance than the pure Co₃O₄ film. The enhancement is ascribed to the Si component in the composite, the interconnected network structure of the film, and the Si-coated Co₃O₄ structure of the nanosheet.

Keywords: Cobalt oxide; Silicon; Nanostructure; Anode materials; Lithium ion battery

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