Hierarchically Flower-Like Cobalt Oxide@Doped-Sn Carbon Nanofiber with Core-Shell structure as Anodes for Lithium Ion Battery

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Coaxial core-shell hierarchical flower-like cobalt oxide@doped-Sn carbon nanofiber (Co₃O₄@Sn-CNF) prepared by loading Co₃O₄ shells on Sn-CNF that were synthesized via electrostatic spinning and subsequently thermally treated by electrophoretic deposition were used as the anode material for lithium-ion batteries in this paper. The Co₃O₄ shells were not solid but flower-like, provided abundant inner space, facilitated the transfer of lithium ions and electrons and the contact with the electrolyte via the increase in space, increased the electrochemical reaction sites, and improved the electrochemical performance. After the initial discharge specific capacity of 1519 mAh g⁻¹, the discharge specific capacity of the Co₃O₄@Sn-CNF reached 1000 mAh g⁻¹ without an obvious capacity decay, and the coulombic efficiency reached 98.6%, indicating the excellent cycle stability of this material. In addition, a specific capacity recovery of 90% demonstrated a remarkable rate performance. The improvement in the electrochemical performance was due to the introduction of the Sn-CNF, which had a good electroconductivity and mitigated the volume deformation due to the elastic deformation of the CNF, in addition to the unique and firm structure.

Keywords: core-shell structure, cobalt oxide, doped-Sn, carbon nanofiber, lithium ion battery.

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