Synthesis of Porous CoO Nanorods @ N-doped Carbon as High-Performance Lithium Ion Battery Anode

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Construction of porous-structure and carbon coated transition metal oxides is essential for their use as lithium ion battery anodes. In this study, CoO nanorods @ N-doped carbon have been prepared via a synchronous carbonization/reduction of Co₃O₄ nanorods @ polypyrrole composite. XRD patterns suggest the pure-phase CoO can be obtained when the added amount of pyrrole reaches an amount of 180 μ L. SEM and TEM images show CoO with surface carbon layer can well inherit the porous nanorod structure of Co₃O₄ template, and partial nitrogen is doped into carbon backbone. As lithium ion battery anode, the optimal sample obtained at a pyrrole content of 270 μ L can deliver an initial discharge capacity of 923.9 mAh g⁻¹ with high Coulombic efficiency of 75.6% at 200 mA g⁻¹, and a capacity value of 841.6 mAh g⁻¹ can be kept after 100 cycles. Even at a high rate of 1000 mA g⁻¹, a stable discharge capacity of 570 mAh g⁻¹ can also be reached. These promising electrochemical performances may be attributed to the synergistic effect of porous structure and carbon coating.

Keywords: Synchronous carbonization/reduction; pyrrole content; CoO @ N-doped carbon; lithium ion battery anodes.

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