

α -MnO₂ nanorod/onion-like carbon composite cathode material for aqueous zinc-ion battery

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Abstract:

Onion-like carbon (OLC) integrated α -MnO₂ nanorods (α -MnO₂/OLC) composite has been studied as a viable cathode material for potential development of high-performance zinc-ion batteries (ZIBs). XRD results revealed the tetragonal phase of the α -MnO₂ materials, and the FE-SEM and HR-TEM images show nano-sized rod-shaped morphology with an average diameter of 30 nm. The BET surface area of the α -MnO₂/OLC composite was almost 6 times (247.22m²/g) higher than that of the pristine (42.48m²/g) material and the thermogravimetric investigation was exposed 50% of MnO₂ and 50% OLC is presented in the composite. The electrochemical performance of the cells was evaluated by galvanostatic cycling (GC), cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS) using 1M ZnSO₄ plus 0.1M MnSO₄ additive as electrolyte and Zn foil as the anode. Cycling results indicate that α -MnO₂/OLC composite exhibits a stable and high reversible capacity of 168 mAh g⁻¹ (93% capacity retention) compared to the α -MnO₂ material with a capacity of 104 mAh g⁻¹ (81% capacity retention) after 100 cycles.