Construction of hierarchical nanoporous $CuCo_2V_2O_8$ hollow spheres as a novel electrode material for high-performance asymmetric supercapacitors

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Abstract

Design of novel and efficient materials is a crucial requirement to develop supercapacitor electrodes for the production of green and renewable energy storage systems. In this study, for the first time, highly porous quaternary $CuCo_2V_2O_8$ hollow spheres are fabricated by a two-step self-templating method. Copper-cobalt-vanadate microspheres are first synthesized via a facile anion-exchange process between the glycerate (in Cu-Co-glycerate) and VO_3^- ions. Afterward, the copper-cobalt-vanadate microspheres are converted into hierarchical $CuCo_2V_2O_8$ hollow spheres through an annealing treatment the air. In virtue of the structural advantages, the as-prepared material revealed outstanding electrochemical properties as a high-performance electrode for supercapacitor (SCs) with a specific capacity of 799.8 C g^{-1} at 2 A g^{-1} (222.1 mAh g^{-1} at 6 mA cm^{-2}), remarkable cycle stability (96.5% capacitance retention over 7000 cycles), superior rate capability around 60.65% capacitance retention at 50 A g^{-1}.

Keywords

Nanoporous hollow spheres
Ternary transition metal oxides
Energy density
Asymmetric supercapacitors
Cycling stability