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NiCo₂S₄/Co₃S₄ Heterogeneous Double-Shelled nanocages for high-performance electrochemical energy storage

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Abstract: zeolitic imidazolate framework-67 (ZIF-67)-derived yolk-shelled ZIF-67/Ni-Co layered double hydroxides were further vulcanized, forming heterogeneous double-shelled cage-in-cage NiCo₂S₄/Co₃S₄. As-synthesized double-shelled nanocages were characterized by XRD, SEM and TEM. As active materials for water-based electrochemical energy storage devices, NiCo₂S₄/Co₃S₄ showed relatively high discharge capacity and cycling stability, large current adaptability and reversibility. These could be due to the cage-in-cage hollow nanostructure and high electrochemical activity of transition metal sulfide.

Keywords: NiCo₂S₄/Co₃S₄; Nanocages; Microstructure; Energy storage and conversion

1. Introduction

Electrochemical Energy Storage Devices (EESDs) with higher specific capacity, faster charge-discharge rate and longer cycle life have attracted tremendous research interests for various applications. They can substitute for the fossil fuel energy as a rechargeable and environmentally friendly power sources including secondary batteries and electrochemical capacitors [1-3]. Recently, transition metal sulfides have been investigated as potential active materials for EESDs because they show higher electrical conductivity and richer redox

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