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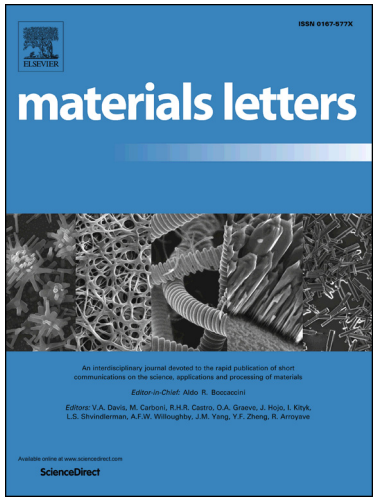

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$NiCo_2S_4/Co_3S_4$ Heterogeneous Double-Shelled nanocages for high-performance electrochemical energy storage

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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 $NiCo_2S_4/Co_3S_4$. As-synthesized double-shelled nanocages were characterized by XRD, SEM and TEM. As active materials for water-based electrochemical energy storage devices, $NiCo_2S_4/Co_3S_4$ 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: $NiCo_2S_4/Co_3S_4$; 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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