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Design and synthesis of wool-like Co-Mg compound@$NiMoO_4$ nanosheet material for high performance supercapacitors

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Abstract: We have elaborated nanocomposite electrodes, which were designed and synthesized via facile hydrothermal with further annealing processes of $NiMoO_4$ nanosheets on cobalt and magnesium double hydroxide (DH) growing directly on Ni foam. The integrated electrode (the optimum hydrothermal time 6h) designed according to this structural pattern, had an excellent electrochemical performance along with a high areal-specific capacitance of 6.50 F cm^{-2} at 5 mA cm^{-2} and retained 56% at 60 mA cm^{-2}, the capacitance of the electrode material remained 74% after 5000 cycles at 40 mA cm^{-2}. The Co-Mg compound@$NiMoO_4$ and activated carbon were assembled into an asymmetric supercapacitor (Co-Mg compound@$NiMoO_4$//AC), which allowed the feasible voltage could reach 1.6V and a high energy density of 57 Wh kg^{-1} at the power density of 0.4 kW kg^{-1}. The Co-Mg compound@$NiMoO_4$//AC also showed significant cyclic stability with the capacitance retention of 87% after 5000 cycles.

Key words: transition metal oxides; nanocomposites; electrodes; supercapacitors

1. Introduction

Compared with fossil fuels, new energy sources are renewable and environmentally friendly, the development of new energy has become a potential solution for the energy crisis.[1-2] Supercapacitors, because of its high power density, fast charge and discharge rate and significant cycling life, have

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