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Nitrogen-doped double-layer graphite supported CuCo_2S_4 electrode for high-performance asymmetric supercapacitors

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Abstract

CuCo_2S_4 synthesized on the nitrogen-doped double-layer graphite (NDG) inter-layer revealed more uniform and smaller size than synthesized directly on Ni foam. From electrochemical measurements, the specific capacitance of $\text{CuCo}_2\text{S}_4@\text{NDG}$ electrode was 1244 F g^{-1} at a current density of 50 A g^{-1} , which was twice higher than the $\text{CuCo}_2\text{S}_4@\text{Ni}$ electrode. In addition, the reduced graphene oxide (rGO) was used to assemble $\text{CuCo}_2\text{S}_4@\text{NDG}/\text{rGO}$ asymmetric supercapacitor, revealing a high energy density (58.4 W h kg^{-1}) for practical applications. Significantly, the NDG inter-layer improved the properties of asymmetric supercapacitor at high-rate and high energy density conditions effectively.

Keywords: Energy storage and conversion; Supercapacitor; CuCo_2S_4 ; Graphite; Inter-layer; Composite materials

1. Introduction

Although supercapacitors exhibit superior power density and long-term stability, their further applications are still limited by lower energy density than that of batteries. So far, numerous efforts have been devoted to enhance energy density [1,2], and these strategies were closely related to the properties of electrode materials [3-5]. However, seldom researches focus on the effect of inter-layer, which locate between the current collector and

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