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RGO nanosheet wrapped β-phase $NiCu_2S$ nanorods for advanced supercapacitor applications

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Abstract

A new integration strategy of transition metal sulfide with carbon-based materials is used to boost its catalytic property and electrochemical performances in supercapacitor application. Herein, crystalline reduced graphene oxide (rGO) wrapped ternary metal sulfide nanorod composites with different rGO ratios are synthesized using hydrothermal technique and are compared for their physical, chemical, and electrochemical performances. It is found that their properties are tuned by the weight ratios of rGO. The electrochemical investigations reveal that β-$NiCu_2S$/rGO nanocomposite electrode with 0.15 wt.% of rGO is found to possess maximum specific capacitance of 1583 F g^{-1} at current density of 15 mA g^{-1} in aqueous electrolyte medium. The same electrode shows excellent cycling stability with capacitance retention of 89% after 5000 charging/discharging cycles. The reproducibility test performed on $NiCu_2S$/rGO nanocomposite electrode with 0.15 wt.% of rGO indicates that it has high reproducible capacitive response and rate capability. Thus, the present work demonstrates that the β-$NiCu_2S$/rGO nanocomposite can serve as a potential electrode material for developing supercapacitor energy storage system.

Keywords: Electrochemical behavior; Energy storage; Hydrothermal; Reduced graphene oxide; Supercapacitor; Ternary metal sulfide.

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