

MWCNTs/metal (Ni, Co, Fe) oxide nanocomposite as potential material for supercapacitors application in acidic and neutral media

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Abstract

Supercapacitive properties of synthesised metal oxides nanoparticles (MO where M = Ni, Co, Fe) integrated with multi-wall carbon nanotubes (MWCNT) on basal plane pyrolytic graphite electrode (BPPGE) were investigated. Successful modification of the electrode with the MWCNT-MO nanocomposite was confirmed with spectroscopic and microscopic techniques. Supercapacitive properties of the modified electrodes in sulphuric acid (H₂SO₄) and sodium sulphate (Na₂SO₄) electrolytes were investigated using cyclic voltammetry, electrochemical impedance spectroscopy and galvanostatic constant current charge–discharge (CD) techniques. The specific capacitance values followed similar trend with that of the cyclic voltammetry and the electrochemical impedance experiments and are slightly lower than values obtained using the galvanostatic charge–discharge cycling. MWCNT-NiO based electrode gave best specific capacitance of 433.8 mF cm⁻² (ca 2,119 Fg⁻¹) in H₂SO₄. The electrode exhibited high electrochemical reproducibility with no significant changes over 1,000 cyclic voltammetry cycles.