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The Study of Supercapacitive Stability of MnO_2/MWCNT Nanocomposite Electrodes by Fast Fourier Transformation Continues Cyclic Voltammetry

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In this work, the nanostructured MnO_2 was uniformly coated on the multi-walled carbon nanotube (MWCNT) by a sonochemical method, and the effect of MWCNT amount on the supercapacitive performance of the nanocomposites were investigated. The structure and morphology of the nanocomposites were characterized by X-ray diffraction (XRD), thermogravimetric analysis (TGA), transition electron microscopy (TEM) and scanning electron microscopy (SEM). Also, the specific capacitances (SCs) of the MWCNT/MnO_2 electrodes were studied by cyclic voltammetry (CV). The result shows that the loading the nanocomposite with of MnO_2 was 65 wt. %, the electrode has a high SC of 394 F g^{-1} (at scan rate of 2 mV s^{-1} in a 0.5 M Na_2SO_4) indicating a better performance than that of pristine MnO_2 electrodes (289 F g^{-1} at scan rate of 2 mV s^{-1}). Fast Fourier transformation continuous cyclic voltammetry (FFTCCV) technique was used to study stability and separation of charge and discharge curves of the nanocomposite electrodes, over a large number of cycles (at scan rates 200 mV s^{-1}). The results indicated SC that the capacitance of the composite electrode decreases only 3.2% of initial capacitance, after 4000 cycles. Therefore, the prepared composite could be potential electrode materials for supercapacitors.

Keywords: Supercapacitors, Continuous cyclic voltammetry, nanocomposite, MnO_2 nanostructures, Carbon nanotube, Sonochemistry

FULL TEXT