conferenceseries.com

J Material Sci Eng 2017, 6:3 (Suppl)
DOI: 10.4172/2169-0022-C1-065

Electrochemical co-deposition of PPy-MnO_2 nanocomposite thin film electrodes for supercapacitors: Effects of different deposition parameters on the specific capacitance of the electrode materials

Jennet R Rabo, Florentino C Sumera and Marlon T Conato
University of the Philippines, Philippines

Supercapacitors are one of the most promising energy storage devices due to their higher power density, fast charging and discharging rate, long cycle life, low manufacturing cost and intrinsic safety. These properties are dependent on the electrode materials used. Transition metal oxide has been used as electrode materials due to their higher capacitance however they have poor electrical conductivity and poor structural properties. To compensate these drawbacks, conducting polymers were embedded to metal oxide to form composite nanostructured electrodes. In this paper, electrodes were prepared based on polypyrrole (PPy) and manganese dioxide (MnO2) by electrochemical do-deposition process. The effects of the different electrochemical deposition parameters on the morphological and electrochemical properties of the electrode materials were determined using Scanning Electron Microscopy (SEM), Cyclic Voltammetry (CV) and Electrochemical Impedance Spectroscopy (EIS). The structural properties were determined using X-ray Diffraction Analysis (XRD) and Fourier Transform Infrared Spectroscopy (FTIR) and the relative surface roughness was obtained using Atomic Force Microscopy (AFM). PPy-MnO2 nanocomposite thin films were electrochemically co-deposited using potentiodynamic, potentiostatic, and galvanostatic deposition techniques. Galvanostatic deposition method of about 1 mA/cm2 current density for 5-minute deposition time has allowed the deposition of electrode with the highest capacitance value of about 190 F/g with γ-MnO2 crystal polymorph on the electrochemically co-deposited PPy-MnO2 nanocomposite thin films. At the same time, the presence of PPy and MnO2 components on the nanocomposite thin films were confirmed also through FTIR analysis. The granular and porous structure was observed using SEM images. The morphological properties correspond to the obtained specific capacitance of the individual electrodes were confirmed using CV measurement. Figure 1 shows the CV of the nanocomposite electrodes at various scan rates.

rabojennet@gmail.com
jennet_rabo@yahoo.com