Potentiostatically deposited polypyrrole/graphene decorated nano-manganese oxide ternary film for supercapacitors

ABSTRACT

A simple method based on potentiostatic polymerization was developed for the preparation of ternary manganese oxide-based nanocomposite films. The ternary nanocomposites, which were characterized using x-ray diffraction spectroscopy and x-ray photoelectron spectroscopy, showed that the manganese oxide within the film consisted of MnO_2 and Mn_2O_3. Electrochemical measurements showed that the ternary nanocomposite electrode exhibited high specific capacitance (up to 320.6 F/g), which was attributed to the morphology of a polypyrrole/graphene/manganese-oxide (PPy/GR/MnOx) ternary nanocomposite. The experimental approach maximized the pseudocapacitive contribution from redox-active manganese oxide (MnOx) and polypyrrole (PPy), as well as the electrochemical double layer capacitive (EDLC) characteristic from graphene (GR) sheets. Long cyclic measurements indicated that the specific capacitance of the ternary nanocomposite film could retain 93% of its initial value over 1000 charge/discharge cycles, in the potential range of 0.2 to 0.7 V versus silver/silver chloride electrode (Ag/AgCl).

Keyword: Supercapacitor; Manganese oxide; Graphene; Polypyrrole