Abstract

Bismuth iron manganese oxide (Bi_2O_3/Fe-Mn) nanocomposite has been found as a promising electrode material. The sol-gel/ultrasonic assisted coprecipitation method was used to synthesize Bi_2O_3/Fe-Mn nanocomposite. The effect of Mn concentration on the structural and electrochemical properties of Bi_2O_3/Fe-Mn nanocomposite materials has been analyzed. X-ray diffraction (XRD) and transmission electron microscopy (TEM) techniques were used to perform structural and morphological investigation. XRD analysis confirmed the formation of Bi_2O_3/Fe-Mn nanocomposite. TEM micrographs show that the surface morphology has shifted from a spherical shape to a rod-like structure. As synthesized Bi_2O_3/Fe-Mn nanocomposite was employed as an electrode material in supercapacitor applications. The electrochemical characteristics of electrodes were investigated using cyclic voltammetry (CV) and galvanometric charge discharge (GCD) techniques. Both CV and GCD measurements indicated that the Bi_2O_3/Fe-Mn nanocomposite has battery-like properties. The Bi_2O_3/Fe-Mn nanocomposite with a 30% Mn content exhibits excellent specific capacitance and energy density values of 664 F g^{-1} and 18 Wh kg^{-1}, respectively, at a current density of 0.35 A g^{-1} in an electrolyte of 6 M KOH. The performance of Bi_2O_3/Fe-Mn nanocomposite as an electrode material was found to be superior to that of commonly used Bi_2O_3-based composite materials. Because of its excellent electrochemical performance, this nanocomposite is a potential electrode material for energy storage device applications.