Abstract

Cobalt oxide/titanium dioxide/activated carbon ($Co_3O_4/TiO_2/Ac$) composite was synthesized using simple sol-gel method before annealing at 300 °C. Fish bladder derived porous carbon used for the composite was synthesized by pyrolysis followed by chemical activation. Both scanning electron microscopy (SEM) and X-ray diffraction displayed Co_3O_4 and TiO_2 phases well embedded onto the carbon matrices. Cyclic voltammetry in 6 M KOH electrolyte demonstrated that the composite has an excellent specific capacity of 946 Fg^{-1} for $Co_3O_4/TiO_2/Ac$ as compared to Co_3O_4/Ac, TiO_2/Ac, and Ac with specific capacitances of 845, 340, and 308 $F\,g^{-1}$, respectively at 5 mVs^{-1}. Impedance spectroscopy reveals that the composite has good capacitive behavior with a series resistance of 0.6 Ω. Besides, $Co_3O_4/TiO_2/Ac$ maintains 89.7% of the initial capacitance after 2000 cycles. This study shows that the synergistic effect of the metal oxides and the carbon in the composite can enhance capacitance for practical supercapacitor applications.