Electrochimica Acta, vol. 212: 876-882

Graphene oxide-modified nickel (II) tetra-aminophthalocyanine nanocomposites for high-power symmetric pseudocapacitor

Makgopa K
Ejikeme PM
Ozoemena KI

ABSTRACT:

Pseudocapacitive properties of nickel (II) tetraaminophthalocyanine-modified graphene oxide sheets (GO/NiTAPc) composites have been studied. Microscopic and spectroscopic analysis of the GO/NiTAPc electrode material with its precursors (GO and NiTAPc) were examined using Field Emission Scanning Electron Microscopy (FESEM), High-Resolution Transmission Electron Microscopy (HRTEM), X-ray Diffraction (XRD) and UV-vis. Electrochemical properties of GO/NiTAPc composite, GO and NiTAPc electrode materials were examined using Cyclic Voltammetry (CV), Charge-Discharge (CD), and Electrochemical Impedance Spectroscopy (EIS), and are reported. A symmetrical device, fabricated with the Ni foam, of GO/NiTAPc composite showed a large specific capacitance (C(subsp)) of 163 F g(sup-1) and maximum specific energy density (Esp) of 3.6 Wh kg-1, which are much higher than those of its individual precursors of NiTAPc (60 F g(sup-1) and 1.3 Wh kg(sup-1) and GO (15 F g(sup-1) and 0.3 Wh kg(sup-1)) at 0.1 A g(sup-1). The GO/NiTAPc symmetric pseudocapacitor device showed high power density (P(subsp)) of 140.0 kW kg(sup-1) with superior retention of capacitance when subjected to a long-hour (50 h) voltage-holding test. This excellent energy storage performance of the composite materials is advantageous for the potential development of aqueous-based pseudocapacitors fabricated from metallophthalocyanine (MPc) complexes (N4-macrocyclic metal compounds) and their derivatives.