Charge storage in the PANI-α-MnO_2polymer-nanocomposite system

Izwan Misnon, Izan; Jose, Rajan
[a] Nanostructured Renewable Energy Materials Laboratory, Faculty of Industrial Sciences and Technology, Universiti Malaysia Pahang, Kuantan, Pahang, 26300, Malaysia

ABSTRACT
Supercapacitors (SCs) store electrochemical energy with high specific power, faster charge response, and long cycle life at an electrode-electrolyte interface; however, with lower specific energy than commercial batteries. In this article, structural, morphological, surface and electrochemical properties of a polymer-nanocomposite in the PANI-α-MnO2 system has been systematically investigated. The α-MnO2was synthesized by molten salt methods and the polymeric composite was developed by in-situ polymerization. The materials were characterized by thermal analyses, X-ray and electron diffraction, FTIR spectroscopy, gas adsorption studies, scanning and transmission electron microscopy. The electrochemical properties of the materials before and after PANI modification are studied in 6 M KOH aqueous electrolyte employing cyclic voltammetry, galvanostatic charge-discharge cycling, and electrochemical impedance spectroscopy. A difference in charge storage mechanism from pseudocapacitive type to battery-type was observed upon PANI modification and the corresponding charge storage and charge kinetic parameters have been detailed.

KEYWORDS
Asymmetric supercapacitors; Battery-supercapacitor hybrids; Electrochemical charge storage; Electrochemical double layer capacitors; Energy storage materials

ACKNOWLEDGEMENTS

This work was supported by the Malaysian Ministry of Education under the Fundamental Research Grant Scheme, FRGS (RDU190142) and UMP Internal Grant (RDU192207).