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Synthesis of nitrogen-doped reduced graphene oxide-multiwalled carbon nanotube composite on nickel foam as electrode for high-performance supercapacitor

Fook Yun Ban¹, Subramaniam Jayabal¹, Hong Ngee Lim², Hing Wah Lee³, Nay Ming Huang^{1*}

¹*Low Dimensional Materials Research Centre, Department of Physics, Faculty of Science, University of Malaya, 50603 Kuala Lumpur, Malaysia.*

²*Department of Chemistry, Faculty of Science & Functional Device Laboratory, Institute of Advanced Technology, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.*

³*Nanoelectronics Cluster, MIMOS Berhad, Technology Park Malaysia, Kuala Lumpur 57000, Malaysia.*

**Corresponding author E-mail: huangnayming@um.edu.my (Nay Ming Huang).*

Abstract

An electrode with nitrogen-doped reduced graphene oxide/multiwall carbon nanotubes deposited on nickel foam (N-rGO/MWCNTs/NF) was successfully prepared using a simple one-pot hydrothermal method. The N-rGO/MWCNTs/NF composite was fabricated as an electrode for supercapacitor application. The supercapacitive performance of the N-rGO/MWCNTs/NF electrode was studied using electrochemical impedance spectroscopy, cyclic voltammetry, and galvanostatic charge/discharge in a 6 M KOH electrolyte solution. The N-rGO/MWCNTs/NF electrode showed an enhanced capacitance compared to rGO/MWCNTs/NF, N-rGO/NF, N-MWCNTs/NF, and bare NF electrodes because of nitrogen atom doping and more accessibility of the electrolyte after the incorporation of MWCNTs between the graphene sheets. The N-rGO/MWCNTs/NF electrode showed a specific capacitance of 142.08 F g⁻¹ at a current density of 1 A g⁻¹ and cycling stability with 76.2% of its initial capacitance after 1000 charge/discharge cycles.

Keywords: Nitrogen atom, reduced graphene oxide, multi-walled carbon nanotubes, nickel foam, supercapacitor.

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