

Electrical properties of graphene / CNT hybrid films

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Abstract

Graphene (G) and graphene oxide (GO)/carbon nanotubes (CNTs) hybrid films were fabricated as high performance electrode materials by a simple water solution casting method with different contents of single-wall CNT (SWCNT), multi wall CNT (MWCNT) and multi wall CNT with hydroxyl group (MWCNT-OH). The films with MWCNTs showed a layered, interconnected and well entangled structure at nano-scale. Such layer structures resulted in excellent surface finish and good mechanical properties. With increasing CNT contents, the capacitance of the G/MWCNT and GO/MWCNT films raised almost linearly and their resistance reduced. G/SWCNT and GO/SWCNT films did not form layered structures leading to a very low capacitance. The film length and thickness of the G/MWCNT and GO/MWCNT films have significant influences on the capacitance. As the length increased, the maximal capacitance and conductivity values decreased. However, both were found to be increased with increasing thickness. The maximal specific capacitance reached 130.68 F/g when the thickness of the G/ MWCNT hybrid thin film was 96 μm . It also showed a maximum conductivity of 44 S/cm in the 60wt% graphene/40wt% MWCNT film. On the other hand, nonlinear behaviour which could be quantum effect of capacitance during scanning with voltage was observed in the G/MWCNT and GO/MWCNT films.

References

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- [2] X. Sun, J. Jin, X. Wang, D. Cai, and M. Song, Conductive Behaviour and Self-Conductance Characteristic of Carbon Nanotubes/Functionalized Graphene Hybrid Films, *J Nanosci Nanotechnol.* 2011 11, 5075-82.

Figures

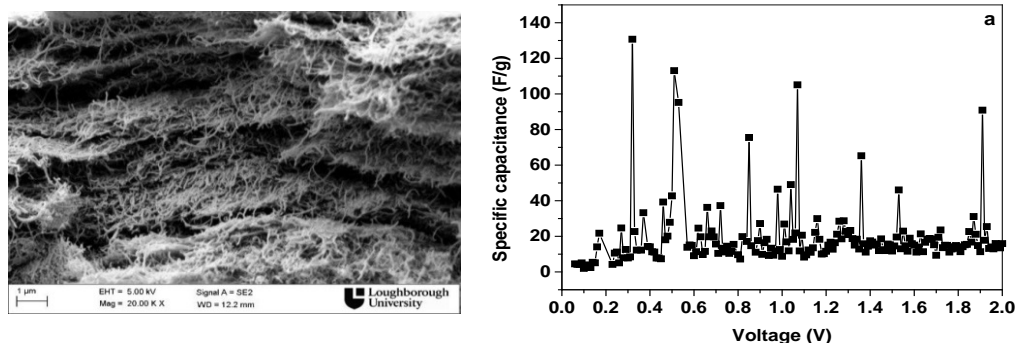


Figure1: a: cross sectional SEM images of GO(60wt%)/MWCNTs (40wt%) film(5 μm).b: Plot of capacitance versus scanning voltage of G (40wt %)/MWCNT (60 wt%) film at 50Hz.