Accepted Manuscript

The effect of milled carbon fibre filler on electrical conductivity in highly conductive polymer composites

Nabilah Afiqah Mohd Radzuan, Mohd Yusuf Zakaria, Abu Bakar Sulong, Jaafar Sahari

PII: S1359-8368(16)30712-0

DOI: 10.1016/j.compositesb.2016.11.021

Reference: JCOMB 4709

To appear in: *Composites Part B*

Received Date: 16 May 2016

Revised Date: 7 October 2016

Accepted Date: 9 November 2016

Please cite this article as: Mohd Radzuan NA, Yusuf Zakaria M, Sulong AB, Sahari J, The effect of milled carbon fibre filler on electrical conductivity in highly conductive polymer composites, *Composites Part B* (2016), doi: 10.1016/j.compositesb.2016.11.021.

THE EFFECT OF MILLED CARBON FIBRE FILLER ON ELECTRICAL CONDUCTIVITY IN HIGHLY CONDUCTIVE POLYMER COMPOSITES

Nabilah Afiqah Mohd Radzuan[1*],Mohd Yusuf Zakaria[1,2], Abu Bakar Sulong[2],Jaafar Sahari[1,2]

[1] Fuel Cell Institute, Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor, Malaysia
[2] Department of Mechanical and Materials Engineering, Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor, Malaysia

Carbon based composites are extensively used in applications such as in polymer composite bipolar plates. This study was conducted to investigate the potential of both the use of milled carbon fibre as a conductive filler in a composite and the adaption of the General Effective Media (GEM) model to predict the electrical conductivity of the polymer composite produced. Polymer composites with various loading concentrations of the conductive filler with epoxy (EP) resin were developed using the compression moulding technique. Incorporating carbon nano tube (CNT) and carbon black (CB) as secondary fillers on carbon fibre (CF) reinforces epoxy composites aided in increasing the electrical conductivity of the composites. The addition of small amounts of CNT and CB as secondary fillers in hybrid systems increased the through-plane conductivity to 40.3 S/cm and 19.9 S/cm, respectively. The high aspect ratio and small size of the CNT filled the gaps between CF as primary filler so that there was a more conductive path. These phenomena increased the electrical conductivity of the CNT/CF/EP composites to a level higher than that of the CB/CF/EP composites. The flexural strength of CF/EP also improved from 64.37MPa to 80MPa and 70MPa by adding CNT and CB, respectively. The dispersion and conductive paths mechanism were also investigated using scanning electron microscopy (SEM).

* Dept. of Mechanical & Materials Engineering, Faculty Engineering & Built Environment, Universiti Kebangsaan Malaysia;
Tel. +603-89216678; Fax. +603-89259659;
E-mail address: sulongabubakar@gmail.com