Thermo-Mechanical Properties of Glass Fiber and Functionalized Multi-Walled Carbon Nanotubes Filled Polyester Composites

M.R. Islam[1], M.D.H. Beg[2]
[1]Malaysian Institute of Chemical and Bioengineering Technology, University of Kuala Lumpur, Bandar Alor Gajah, Melaka 78000, Malaysia
[2]Faculty of Chemical and Natural Resources Engineering, Universiti Malaysia Pahang, Leburaya Tun Razak, Gambang, Pahang 26300, Malaysia

ABSTRACT

Glass fiber (GF) and hydroxyl-functionalized multi-walled carbon nanotubes (MWCNTs)-reinforced polyester-based composites were prepared by solution casting technique. Unsaturated polyester (UPE) was mixed separately with a fixed amount (0.5 wt%) of hydroxyl-functionalized MWCNTs and GF (5.0 wt%). Multi-walled carbon nanotubes (MWCNTs) were functionalized with hydroxyl functional group (-OH) prior to the fabrication of the composites. The structural properties were evaluated by Fourier transform infrared spectroscopy. The mechanical properties of the composites, like tensile strength, tensile modulus, flexural strength, flexural modulus, and impact strength were also evaluated. The surface of the samples was observed by the field-emission electron microscopy. In addition, the thermal stability was assessed by thermogravimetric analysis and differential scanning calorimetry. The dynamic thermal mechanical analysis was also performed to assess the performance of the composites at elevated temperature. A comparative analysis of the composites prepared with GF and hydroxyl-functionalized MWCNTs was described. Result analysis showed that hydroxyl functional group-based MWCNTs is more effective for improving the properties of the composites, compared to the others.

Keywords: Glass fiber (GF); hydroxyl-functionalized multi-walled carbon nanotubes (MWCNTs); Polyester composites