

Dispersion characteristics of hydroxyl and carboxyl-functionalized multi-walled carbon nanotubes in polyester nanocomposites

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ABSTRACT

Multi-walled carbon nanotube (MWCNT) reinforced polyester-based composites were prepared by mixed blending in a solvent. Orthophthalic unsaturated polyester was blended individually with different types of non-functionalized and functionalized MWCNTs. Two types of functional groups: hydroxyl (-OH) and carboxyl (-COOH) were introduced with MWCNTs for the nanocomposites. The mechanical properties of the composites, like tensile, three-point bending and impact energy were evaluated. Fourier transform infrared spectroscopy was used for the functional group analysis. The dispersion characteristics of the samples were observed by transmission electron microscopy and field-emission electron microscopy. In addition, the thermal decomposition and melting behavior of the samples was assessed by differential scanning calorimetry and thermogravimetric analysis. The properties were varied due to the variation of the functional groups. The result analysis showed that the entangled agglomerations of hydroxyl-functionalized MWCNTs were destroyed to relatively smaller clusters. The hydroxyl-functionalized MWCNTs were more effective for homogeneous dispersion and contributed for better mechanical properties of the composites, compared to non-functionalized and carboxyl group-functionalized MWCNTs.

KEYWORDS:

blended composites; functionalization; multi-walled carbon nanotubes (MWCNTs); orthophthalic unsaturated polyester (OUPE); solution cast