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Comparative study of graphene nanoparticle and multiwall carbon nanotube filled epoxy nanocomposites based on mechanical, thermal and dielectric properties

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Abstract

Nano-sized carbons, such as graphene nanoparticle (GNP) and multiwall carbon nanotube (MWCNT), have attracted a great deal of attention due to their extraordinary intrinsic properties. Extensive research has been done on each carbon material for epoxy nanocomposites but only a few have ventured into a comparison study. In this paper, the effect of GNP and MWCNT, at various filler loadings, on the mechanical, thermal and dielectric properties of epoxy nanocomposites have been investigated. The experimental results demonstrate that GNP filled epoxy nanocomposites showed higher thermal and dielectric properties, but slightly lower mechanical properties compared to the MWCNT filled epoxy nanocomposites. The tensile strength, flexural strength, thermal conductivity and dielectric constant of GNP filled epoxy nanocomposites improved up to 11%, 17%, 126%, and 171% respectively, and MWCNT filled epoxy nanocomposites improved up to 26%, 29%, 60%, and 73% respectively.

Keywords: Graphene; Carbon nanotubes; Polymer-matrix composites (PMCs); Epoxy nanocomposites