

Properties of carbon nanotubes-calcium carbonate hybrid filled epoxy composites

Abstract

Carbon nanotubes (CNTs) have a great potential to be used as filler to enhance the mechanical properties of polymer composites due to excellent properties. However, CNTs have limitation of difficult to disperse in polymer matrix. The hybridization of CNTs and inorganic fillers can improve the dispersion and combine their properties in polymer composites. In the present work, the properties of the epoxy composites filled with carbon nanotube-calcium carbonate (CNTs-CaCO₃) hybrid, at various filler loading (i.e., 1-5 wt.%) were studied. The CNTs-CaCO₃ hybrid fillers were prepared by physically mixing (PHY) method and chemical vapor deposition (CVD) method. The tensile properties and hardness of both composites were investigated at different weight percentages of filler loading. The CNTs-CaCO₃ CVD hybrid composites showed higher tensile strength and hardness than the CNTs-CaCO₃ PHY hybrid composites. This increase was associated with the homogenous dispersion of CNT-CaCO₃ particle filler. The morphological studies of fracture surfaces after tensile test by means of SEM showed homogenous dispersion of CNTs-calcium carbonate CVD hybrid in epoxy matrix. The result shows that the CNTs-calcium carbonate CVD hybrid composites are capable in increasing tensile strength by up to 116.4%, giving a tensile modulus of 40.3%, and hardness value of 39.2% as compared to a pure epoxy.

Keywords

Calcium carbonate; Carbon nanotube; Epoxy; Hybrid