

Influence of multiwalled carbon nanotubes on the processing behavior of epoxy powder compositions and on the mechanical properties of their fiber reinforced composites

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Abstract

© 2015 Society of Plastics Engineers. This study reports the preparation of advanced carbon fiber composites with a nanocomposite matrix prepared by dispersing multiwall carbon nanotubes (CNTs) in a powder type epoxy oligomer with two different processing techniques (1) master batch dilution technique and (2) direct mixing (with the help of twin-screw extruder in both cases). The master batch technique shows a better efficiency for the dispersion of the CNTs aggregates. The rheological results demonstrate that the incorporation of the CNTs into the epoxy oligomer leads, as expected, to a marked increase in the viscosity and of the presence of a yield stress point that also depends on the processing technique adopted. Carbon fiber (CFRP) and glass fiber (GFRP) composite materials were produced by electrostatic spraying of the epoxy matrix formulations on the carbon and glass fabric, respectively, followed by calendaring and mold pressing. The mechanical properties of the obtained epoxy/CNT-matrix composite materials, such as interlaminar fracture toughness, flexural strength, shear storage and loss moduli are discussed in terms of the processing techniques and fabric material. The incorporation of 1 wt% CNTs in the epoxy matrix results in a relevant increase of the fracture toughness, flexural strength and modulus of both CFRP and GFRP.

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