

Enhancement of the physical, mechanical, and thermal properties of epoxy-based bamboo nanofiber nanocomposites

ABSTRACT

Epoxy-based nanocomposites were prepared by incorporating 0.3%, 0.5%, 0.7%, 1%, and 2% cellulose nanofibers (CNF) through a hand lay-up technique. The influence of the CNF as a reinforcement material on the morphology, and the physical, mechanical, and thermal properties of epoxy-based nanocomposites were investigated using scanning electron microscopy (SEM), density, void content, water absorption, tensile, flexural, impact strength, and thermogravimetric analyses. Compatibility between the nano-reinforcement and epoxy matrix was confirmed using SEM, which demonstrated that the CNF was homogeneously dispersed throughout the epoxy matrix. The mechanical properties were enhanced by increasing the CNF loading up to 1%. Moreover, the incorporation of CNF into the composites reduced the water uptake of the substrates in the water absorption test and resulted in a high thermal stability when exposed to a high temperature. Bamboo-CNF could be used as a potential reinforcement material to improve the properties of epoxy-based nanocomposites.

Keyword: Amboo fiber; High pressure; High-pressure subcritical; Enzymatic hydrolysis; Morphological characterization; Thermal properties