

Characterization of plant nanofiber-reinforced epoxy composites

ABSTRACT

In the present study, oil palm empty fruit bunch (OPEFB) fibers were taken from a 25-year-old oil palm tree. The cellulosic nanofiber (CNF) was isolated from the OPEFB using a chemo-mechanical process and utilized as reinforcement in an epoxy matrix. Various CNF loading percentages (0 to 0.75%) were applied in the epoxy matrix to explore the potential of using OPEFB-CNF as reinforcement. The morphological, mechanical, physical, and thermal characteristics of the OPEFB nanofiber-reinforced epoxy composites were evaluated. Results showed that the 0.25% and 0.5% CNF loadings were homogeneously distributed and well-dispersed in the composite matrix. Conversely, agglomeration was detected in the matrix with 0.75% CNF loading. Determination of the water absorption behavior of CNF-reinforced epoxy composites at various loadings revealed that the physical properties of the composites increased with reinforcement loading. Furthermore, the analyses of the mechanical and thermal properties of the CNF-reinforced composites revealed that the incorporation of OPEFB-CNF enhanced the mechanical performance and thermal stability up to 0.5% loading.

Keyword: Epoxy; Plant fiber; Nanofiber; Nanocomposite; Mechanical properties; Thermal properties