

Mechanical and physical properties of kenaf-reinforced poly(lactic acid) plasticized with epoxidized jatropha oil

ABSTRACT

Epoxidized jatropha oil (EJO) was investigated as a sustainable alternative to petrochemical-based plasticizers to reinforce the plastics, leading to increased ductility and toughness of kenaf-reinforced poly(lactic acid) (PLA). The EJO was melt-blended into kenaf-reinforced PLA at concentrations from 1 wt% to 5 wt%. The blends were then hot-pressed into sheets to characterize their mechanical and physical properties. Kenaf fibers were treated with 6% sodium hydroxide (NaOH), and the effects thereof on the composites' tensile, flexural, and impact properties, as well as their water absorption and density were studied. The impact strengths of the kenaf-reinforced PLA composites were improved with the addition of EJO up to 5 wt%, with a maximum over 10 times that of the neat PLA. The flexural strength and modulus increased 4% and 50%, respectively, for treated kenaf-reinforced PLA plasticized with EJO. This increase demonstrated the alkalization treatment's notable improvements to the composites' properties. Furthermore, analysis by scanning electron microscopy (SEM) of the composites' tensile fracture surfaces indicated better interaction/adhesion of the treated kenaf-reinforced PLA plasticized with EJO compared with the untreated composites. Compared to untreated 1 wt% EJO biocomposites, the treated 5 wt% EJO biocomposites reduced water absorption from 3.1% to 1.6% after 8 weeks of immersion.

Keyword: Polylactic acid; Kenaf; Epoxidized jatropha oil; Bio-sourced plasticizer; Environmentally friendly