

Mechanical and physical properties of kenaf-derived cellulose (KDC)-filled polylactic acid (PLA) composites

ABSTRACT

Kenaf-derived cellulose (KDC)-filled poly(lactic acid) (PLA) composites were prepared via melt blending and compression molding to improve the properties of PLA by introducing a natural cellulose that was chemically derived (chlorination and mercerization processes) from plant-based kenaf bast fibers. The effect of KDC content (0-60 wt.%) on the tensile elongation at the break point and during flexural and impact testing and on the water absorption and density of the composites was investigated, while the neat PLA polymer (without the addition of cellulose) served as a reference for the composites. The elongation at the break point of the composites was 9% on average, making it less elastic than the neat PLA. The flexural strength and modulus also increased by 36% and 54%, respectively. The impact strength of the composites was improved at KDC contents below 40 wt.%, but the impact strength was reduced above 40 wt.%. The composite containing the highest amount of KDC (60 wt.%) was denser than the neat PLA and had a water uptake of approximately 12%, which is notably low for a biocomposite system.

Keyword: Composite; Derived cellulose; Kenaf; Mechanical properties; Polylactic acid