Thermal, physical and mechanical properties of polybutylene succinate/kenaf core fibers composites reinforced with esterified lignin

ABSTRACT

In this study, Kraft lignin was esterified with phthalic anhydride and was served as reinforcing filler for poly(butylene succinate) (PBS). Composites with different ratios of PBS, lignin (L), modified lignin (ML) and kenaf core fibers (KCF) were fabricated using a compounding method. The fabricated PBS composites and its counterparts were tested for thermal, physical and mechanical properties. Weight percent gain of 4.5% after lignin modification and the FTIR spectra has confirmed the occurrence of an esterification reaction. Better thermo-mechanical properties were observed in the PBS composites reinforced with modified lignin and KCF, as higher storage modulus and loss modulus were recorded using dynamic mechanical analysis. The density of the composites fabricated ranged from 1.26 to 1.43 g/cm^3. Water absorption of the composites with the addition of modified lignin is higher than that of composites with unmodified lignin. Pure PBS exhibited the highest tensile strength of 18.62 MPa. Incorporation of lignin and KCF into PBS resulted in different extents of reduction in tensile strength (15.78 to 18.60 MPa). However, PBS composite reinforced with modified lignin exhibited better tensile and flexural strength compared to its unmodified lignin counterpart. PBS composite reinforced with 30 wt% ML and 20 wt% KCF had the highest Izod impact, as fibers could diverge the cracking propagation of the matrix. The thermal conductivity value of the composites ranged from 0.0903 to 0.0983 W/mK, showing great potential as a heat insulator.

Keyword: Poly (butylene succinate); Kenaf core fibres; Lignin; Mechanical properties; Phthalic anhydride; Thermal behaviour; Thermal conductivity