Thermal stability and dynamic mechanical analysis of benzoylation treated sugar palm/kenaf fiber reinforced polypropylene hybrid composites

ABSTRACT

This research was performed to evaluate the mechanical and thermal properties of sugar palm fiber (SPF)- and kenaf fiber (KF)-reinforced polypropylene (PP) composites. Sugar palm/kenaf was successfully treated by benzoylation treatment. The hybridized bio-composites (PP/SPF/KF) were fabricated with overall 10 weight percentage (wt%) relatively with three different fibers ratios between sugar palm-treated and kenaf-treated (7:3, 5:5, 3:7) and vice versa. The investigations of thermal stability were then carried out by using diffraction scanning calorimetry (DSC) and thermogravimetry analysis (TGA). The result of a flammability test showed that the treated hybrid composite (PP/SPF/KF) was the specimen that exhibited the best flammability properties, having the lowest average burning rate of 28 mm/min. The stiffness storage modulus (E'), loss modulus (E"), and damping factor (Tan δ) were examined by using dynamic mechanical analysis (DMA). The hybrid composite with the best ratio (PP/SPF/KF), T-SP5K5, showed a loss modulus (E") of 86.2 MPa and a damping factor of 0.058. In addition, thermomechanical analysis (TMA) of the studies of the dimension coefficient (μm) against temperature were successfully recorded, with T-SP5K5 achieving the highest dimensional coefficient of 30.11 μm at 105 ◦C.

Keyword: Biocomposites; Kenaf; Sugar palm; Thermal; Dynamic mechanical analysis; Benzoylation