

Enhancement of mechanical and dynamic mechanical properties of hydrophilic nanoclay reinforced polylactic acid/polycaprolactone/oil palm mesocarp fiber hybrid composites

ABSTRACT

In previous studies, the effect of the addition of 1 wt% hydrophilic nanoclay on polylactic acid (PLA)/polycaprolactone (PCL)/oil palm mesocarp fiber (OPMF) biocomposites was investigated by tensile properties, thermogravimetric analysis (TGA), and scanning electron microscopy (SEM). The current studies focus on the effect of addition of 1 wt% hydrophilic nanoclay on mechanical (flexural and impact properties) and dynamic mechanical properties of composites. The composites were characterized by the Fourier transform infrared spectroscopy (FTIR) and dynamic mechanical analysis (DMA). FTIR spectra show that peak shifting occurs when 1 wt% hydrophilic nanoclay was added to composites. The addition of 1 wt% hydrophilic nanoclay successfully improves the flexural properties and impact resistance of the biocomposites. The storage modulus of biocomposites was decreased when nanoclay was added which indicates that the stiffness of biocomposites was reduced. The loss modulus curve shows that the addition of nanoclay shift two tg in composites become closer to each other which indicates that the incorporation of nanoclay slightly compatibilizes the biocomposites. $\tan \delta$ indicated that hybrid composites dissipate less energy compared to biocomposites indicate that addition of clay to biocomposites improves fiber/matrix adhesion. Water sorption test shows that the addition of nanoclay enhances water resistance of composites.

Keyword: Hydrophilic nanoclay; Mechanical (flexural and impact properties); Dynamic mechanical properties of composites; Fourier transform infrared spectroscopy (FTIR); Dynamic mechanical analysis (DMA)