

Enhancement of mechanical and thermal properties of polylactic acid/polycaprolactone blends by hydrophilic nanoclay.

ABSTRACT

The effects of hydrophilic nanoclay, Nanomer PGV, on mechanical properties of Polylactic Acid (PLA)/Polycaprolactone (PCL) blends were investigated and compared with hydrophobic clay, Montmorillonite K10. The PLA/PCL/clay composites were prepared by melt intercalation technique and the composites were characterized by X-ray Diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR), Thermogravimetric Analysis (TGA), Dynamic Mechanical Analysis (DMA), Scanning Electron Microscopy (SEM), and Transmission Electron Microscopy (TEM). FTIR spectra indicated that formation of hydrogen bond between hydrophilic clay with the matrix. XRD results show that shifting of basal spacing when clay incorporated into polymer matrix. TEM micrographs reveal the formation of agglomerate in the composites. Based on mechanical properties results, addition of clay Nanomer PGV significantly enhances the flexibility of PLA/PCL blends about 136.26%. TGA showed that the presence of clay improve thermal stability of blends. DMA show the addition of clay increase storage modulus and the presence of clay Nanomer PGV slightly shift two of blends become closer suggest that the presence of clay slightly compatibilizer the PLA/PCL blends. SEM micrographs revealed that presence of Nanomer PGV in blends influence the miscibility of the blends. The PLA/PCL blends become more homogeneous and consist of single phase morphology.

Keyword: Polylactic acid; Nanoclay; Polycaprolactone.