PREPARATION AND CHARACTERIZATION OF FLAME RETARDED NATURAL FIBRE REINFORCED BIOPOLYMER BLENDS

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ABSTRACT

Polybutylene succinate/poly ϵ-caprolactone (PBS/PCL) biopolymer blends at ratios 30/70, 50/50 and 70/30 w/w, filled with short untreated and alkali treated sisal fibre (5 and 10 wt%) were investigated. Polycarbonate encapsulated multi-walled carbon nanotubes (PC-enc-MWCNTs) (1, 3, 7 wt%) were introduced to the biopolymers/sisal fibre blends composites as a flame retardant material. The preparation of these samples were carried out under compressed air at 160 °C, at a speed of 100 rpm for 10 minutes by using 7g capacity, twin screw MiniLab HAAKE Rheomex CTW5 micro compounder. The resulted samples were then compression moulded at the same temperature for 5 minutes under a pressure of 50 bar using a hydraulic melt press, for property testing on different techniques.

The synergistic effect of the treated and untreated SF with or without PC-enc-MWCNTs on the prepared biocomposites was studied. Scanning electron microscopy (SEM), transmission electron microscopy (TEM), contact angle measurements (Sissle drop method) and Melt flow tester were used to study the morphology, localization and the dispersion of sisal fibre and PC-enc-MWCNTs in the bioblends and biocomposites. Thermogravimetric analysis (TGA) and TGA-Fourier transform infrared spectroscopy (FTIR) were used to investigate the thermal stability, thermal degradation and the release of volatile compounds in the bioblends and biocomposites at different temperatures. Thermal conductivity measurements were performed using a thermal conductivity test. The mechanical and thermomechanical properties of the bioblends and biocomposites were investigated using tensile test and dynamic mechanical analysis (DMA).