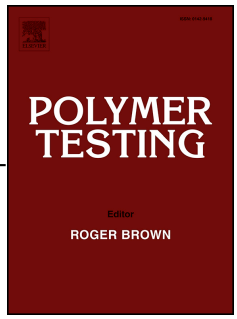

Statistical and experimental investigation on low density microcellular foaming of PLA-TPU/Cellulose nano-fiber bio -nanocomposites

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Statistical and experimental investigation on low density microcellular Foaming of PLA-TPU/Cellulose nano-fiber bio -Nanocomposites

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Abstract:

This study dedicates to foaming of biocompatible blends of polylactic acid and thermoplastic polyurethane reinforced with bio-degradable cellulose nanofibers. This research primarily was associated with fabrication of PLA-TPU nanocomposites using a low weight fraction of cellulose nanofibers as a biodegradable reinforcement. Microstructural and mechanical properties of fabricated nanocomposites were examined and diffractometry was utilized to verify formation of percolated nanocomposites. Microcellular foaming was then performed with CO_2 as a blowing agent. Central composite design was applied in designing the experiments to evaluate the effects of main operating variables consisting of saturation pressure and time, heating time and foaming temperature. The results demonstrated that high saturation pressure and time promoted low cell diameters (below 5µm) and high cell densities (above 10^9 cell/cm^3) due to the grown degree of crystallinity and higher PLA-TPU miscibility. Accordingly, adding TPU and CNF to the matrix create high crystalline foamed samples decorated with low bulk density.

Keywords: Cellulose nanofiber, Poly (lactic acid), Thermoplastic Polyurethane, Microcellular Foaming, bio-nanocomposite

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1. Introduction: