

Use Process Ring-Opening Polymerization to Melt Processing of Cellulose Nanowhisker from Coconut Husk Fibers-Filled Polylactide-Based Nanocomposites

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Abstract : In the present work, cellulose nanowhiskers (CNW) extracted from coconut husk fibers, were incorporated in polylactide (PLA)-based composites. Prior to the blending, PLA chains were chemically grafted on the surface of CNW to enhance the compatibilization between CNW and the hydrophobic polyester matrix. Ring-opening polymerization of L-lactide was initiated from the hydroxyl groups available at the CNW surface to yield CNW-g-PLA nanohybrids. PLA-based nanocomposites were prepared by melt blending to ensure a green concept of the study thereby limiting the use of organic solvents. The influence of PLA-grafted cellulose nanoparticles on the mechanical and thermal properties of the ensuing nanocomposites was deeply investigated. The thermal behavior and mechanical properties of the nanocomposites were determined using differential scanning calorimetry (DSC) and dynamical mechanical and thermal analysis (DMTA), respectively. In theory, evidenced that the chemical grafting of CNW enhances their compatibility with the polymeric matrix and thus improves the final properties of the nanocomposites. Large modification of the crystalline properties such as the crystallization half-time was evidenced according to the nature of the PLA matrix and the content of nanofillers.

Keywords : cellulose nanowhiskers, nanocomposites, coconut husk fiber, ring opening polymerization

Conference Title : ICAMST 2016 : International Conference on Advanced Materials Science and Technology

Conference Location : Venice, Italy

Conference Dates : April 11-12, 2016