

Physical properties of bio-polyurethane nanocomposites with castor oil and cellulose nanocrystals

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Polyurethane (PU) is very widely used and interest to use biomaterials in synthesizing a PU system has been growing. In this study, castor oil with hydroxyl groups per molecule and a petroleum-based polypropylene glycol were mixed at different ratios and cured after mixing hexamethylene diisocyanate at different stoichiometric ratios. Bio-PU nanocomposites were prepared by incorporating cellulose nanocrystals (CNCs) up to 0.8 phr to the PU system with best tensile properties (CO/PPG=2/1, NCO/OH=1.2). The polymerization rate for each PU and nanocomposite system was investigated by monitoring viscosity rise during curing. FTIR spectra showed that there are hydrogen bonds between urethane groups and hydroxyl groups of CNC suggesting compatibility between the PU matrix and CNCs. The bio-PU nanocomposite with 0.4 phr of CNCs showed best tensile properties.