

Development of Nanocomposite from Poly (Lactic Acid) Plasticised Epoxidised Jatropha Oil and Nanocrystalline Cellulose

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Abstract : The primary objective of this work was to develop fully nanocomposite material based on poly(lactic acid), epoxidised jatropha oil (EJO) and nanocrystalline cellulose. EJO was investigated as a sustainable alternative to petrochemical-based plasticizers to reinforce the ductility and toughness of plastics, in this case, nanocellulose/poly(lactic acid) (PLA). The EJO was melt blended into nanocellulose/PLA at concentrations from 1 wt% to 5 wt%. The blends were then hot-pressed into sheets to characterize their mechanical and physical properties. Microcrystalline cellulose had been converted to nanocrystalline cellulose by acid mercerisation technique and the effects thereof on the composites' tensile, flexural, and impact properties, as well as their water absorption and density, were studied. The impact strengths of the nanocomposites were improved with the addition of NCC up to 0.5 wt%, with a maximum over 10 times that of the neat PLA. The flexural strength and modulus increased 4% and 50%, respectively, for NCC/PLA plasticized with EJO. This increase demonstrated the nanocrystalline cellulose addition gave notable improvements to the composites' properties. Furthermore, analysis by scanning electron microscopy (SEM) of the nanocomposites' tensile fracture surfaces indicated better interaction adhesion of the NCC/PLA plasticized with EJO compared with the PLA/EJO composites.

Keywords : nanocrystalline cellulose, nanocomposite, poly (lactic acid), epoxidised jatropha oil

Conference Title : ICNN 2019 : International Conference on Nanoscience and Nanotechnology

Conference Location : Toronto, Canada

Conference Dates : June 17-18, 2019