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A "Green" Approach Utilizing Plant Oil Polyol towards Biodegradable Films

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Abstract—*Environmental concerns and energy conservations have beckoned us to utilize polymers occurring naturally or derived from natural resources such as starch, cellulose, chitosan, plant oils and others. To further improve their properties and performances, widen their applications, while retaining their biodegradable behavior, their modifications with nano-reinforcements forming organic-inorganic hybrids and composites, is being encouraged. Plant oil polyols are fatty acid esters with double bonds, and hydroxyl groups. Plant oil polyols are available naturally as Castor oil or Lesquerella oil and may also be obtained by chemical transformations, e.g., epoxidation and hydration, ozonolysis, hydroformylation and others. The present work describes plant oil polyol based nanocomposite [PON] for biodegradable films, by a "green" approach. PON was characterized using FT-IR spectroscopy, thermo gravimetric analysis (TGA), differential scanning calorimetry (DSC), optical microscopy (OM), transmission electron microscopy (TEM) and scanning electron microscopy (SEM). The morphology (OM, TEM, SEM study) of PON revealed the presence of nanosized inorganic reinforcements in plant oil derivative matrix. PON showed good biodegradation behavior due to the presence of plant oil polyol. PON showed good thermal stability (TGA) attributed to the inorganic reinforcements embedded in the matrix. It is envisaged that the said PON hold future prospects for application as greener, environmentally benign, non-toxic, biodegradable nanocomposites with application as packaging materials and wound dressings. PON are also foreseen as greener modifiers or "biodegradation inducers" when in combination with commercially available petro-based chemicals and non-biodegradable materials to expedite the (after-service-life) degradation of the latter.*

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