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Synthesis and Characterization of Lactic Acid Grafted TiO2 Nanocomposites

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Abstract : The aim of this project was to synthesize and analyze Polylactic acid-grafted TiO2 nanocomposite. When dispersed at the nanoscale TiO2 can behave as see through transparent UV filters and thermomechanical materials. The synthesis plan involved three stages. First, dispersion of TiO2 white powder in water/ethanol solvent system. Second grafting TiO2 surface by oligomers of lactic acid aimed at changing its surface features. Third polymerization of lactic acid monomer with grafted TiO2 in the presence of anhydrous stannous chloride as a catalyst. Polylactic acid grafted-TiO2 nanocomposite was synthesized by melt polycondensation in situ of lactic acid onto titanium oxide (TiO2) nanoparticles surface. The product was characterized by TGA, DSC, FTIR, and UV analysis and degradation observation. An idea regarding bonds between the grafting polymer and surface modified titanium oxide nanoparticles. Characteristics peaks of Ti–carbonyl bond, the related intensities of the Fourier transmission absorption peaks of graft composite, the melt and decomposition behavior stages of Polylactic acid-grafted TiO2 nanocomposite convinced that oligomers of polylactic acid were chemically bonded on the surface of TiO2 nanoparticles. Through grafting polylactic acid, the Polylactic acid grafted -TiO2 sample shown good absorption in UV region and degradation behavior under normal atmospheric conditions. Regaining transparency of degraded white opaque Polylactic acid-grafted TiO2 nanocomposite on heating was another character. Polylactic acid-grafted TiO2 nanocomposite will be a potential candidate in future for biomedical, UV shielding and environment friendly material.

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