Modified TiO_2 Nanoparticles via Surface-Initiated Atom Transfer Radical Polymerization

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Water-soluble polymers such as poly(oxyethylene methacrylate) (POEM) and poly(styrene sulfonic acid) (PSSA) were grafted from TiO2 nanoparitlces via surface-initiated ATRP. First, chlorine modified TiO_2-Cl nanoparticles were synthesized by the reaction of -OH in TiO_2 with 2-chloropropionyl chloride (CPC), which was subsequently used as an initiator for graft polymerization. FT-IR, UV-vis spectroscopy showed that the polymer chains were successfully grafted from the surface of TiO_2 nanoparticles. The hydrophilically modified TiO_2 nanoparticles have a better dispersion in alcohol than unmodified ones, as revealed by TEM. It was also found that the polymer grafting did not alter the crystalline structure of the TiO_2 nanoparticles according to the XRD patterns. High-density arrays of TiO_2 nanoparticles with 30 - 40 nm size after calcinations at 550 °C were confirmed by XPS, UV-visible spectroscopy,WAXS,XPS,TGA also showed that the presence of TiO_2 nanoparticles improved the thermal stability of copolymer.

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