Synthesis of Biocompatible Polymer/Fe_3O_4 Magnetic Nanocomposites in Supercritical Carbon Dioxide

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Poly(2-hydroxyethyl methacrylate)/Fe_3O_4 magnetic nano-composites were synthesized by radical dispersion polymerization in supercritical carbon dioxide ($scCO_2$). Fe_3O_4 nanoparticles were surface grafted by 3-(trimethoxysilyl) propyl methacrylate (MPS) in order to disperse well in CO_2. The silane coupling agent MPS, which provides a reactive C=C bond and can copolymerize with the monomer 2-hydroxyethyl methacrylate (HEMA). Transmission electron microcopy (TEM) measurement indicated that Fe_3O_4 were well dispersed in the polymer matrix. Thermogravimetric analysis (TGA) showed that the thermal stability of nanocomposites is higher than the neat polymer. The nanocomposites were also confirmed by FT-IR spectroscopy, UV-visibile spectroscopy (UV), X-ray diffraction (XRD) and X-ray photoelectron spectroscopy (XPS). Magnetic property of nanocomposites indicated that the composites are superparamagnetic. This new environmentally benign green synthetic route offers advantages of easy separation and resolves problems related to solvent removal. (Regional Technology Innovation Program (RT104-01-04) of MOCIE)