Synthesis and characterization of ferrous oxide-polymer fiber nanocomposite hybrid adsorbents

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Hydrous metal oxides (Fe_2O_3, MnO, TiO_2, Al_2O_3, ZrO_2 and etc) are one of the most important groups of inorganic adsorbents for heavy metal and radionuclide ions. However they are synthesized as fine particles and suffer from further agglomeration. To overcome this technical drawback the fabrication of hybrid adsorbents by direct synthesis of metal oxide nanoparticles onto the surface of polymer matrix is proposed. Polymer matrix is modified by radiation-induced graft polymerization of a monomer with desired functional groups used as precursors of metal oxide nanoparticles with subsequent precipitation of these nanoparticles on the polymer surface. Variation of grafting degree, length and density of grafted chains allows to stabilize nanoparticles against their aggregation and to control their size.
Hydrous ferric oxides-polypropylene fiber nanocomposites were synthesized by using this technique. Coated fibers were analyzed by scanning electron microscopy, energy-dispersive X-ray spectroscopy, x-ray diffraction method. Fiber diameter was on the order of 20 μm, and the observed coating nanoparticles ranged from 20 to 80 nm.