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Removal of uranium (VI) from aqueous solution by amidoxime functionalized superparamagnetic polymer microspheres prepared by a controlled radical polymerization in the presence of DPE

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Abstract

A novel magnetic sorbent (AO-Fe_3O_4/P(GMA-AA-MMA) was prepared by grafting amidoxime groups onto the surface of superparamagnetic polymer microspheres prepared by a novel controlled radical polymerization technology named DPE method based on 1,1-diphenylethylene (DPE) as radical controlling agent, and characterized by Fourier transform infrared (FTIR), Transmission electron microscopy (TEM), X-ray photoelectron spectra (XPS) and Vibrating sample magnetometer (VSM). The synthesized magnetic sorbent was applied to adsorb uranium (VI) from aqueous solutions and could be easily separated by an external magnetic field. Effect of pH, contact time, temperature, and initial U (VI) concentration on adsorption of U (VI) were investigated. An optimum sorption capacity of 200.5 mg g^{-1} was obtained under the current experimental condition. The sorption of U (VI) on the magnetic sorbent obeyed the Langmuir model, and was mainly attributed to surface complexation via the coordination of U (VI) ions with amidoxime groups. Meanwhile, AO-Fe_3O_4/P (GMA-AA-MMA could also selectively adsorb U (VI) in aqueous solution containing co-existing ions efficiently. Furthermore, The desorption studies showed AO- Fe_3O_4/P(GMA-AA-MMA) could be used repeatedly and sorption capacity did not have any noticeable loss after five cycles.