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Synthesis of 2-phenoxyethanol/formaldehyde copolymer beads by dispersion polycondensation and their adsorption properties for copper ions after polyamine modification

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ABSTRACT

Two kinds of novel chelating resins were prepared by surface modification of 2-phenoxyethanol/formaldehyde copolymer beads (PB) with ethylenediamine (EA) and diethylenetriamine (DEA) (denoted as PB-EA and PB-DEA, respectively). The obtained resins were characterized by infrared spectra, scanning electron microscopy (SEM), and elemental analysis to demonstrate successful surface modification. The adsorption properties of the resins for metal ions are investigated. The results showed that the resins have higher adsorption capacities for Cu(II) than other metal ions such as Pb(II), Hg(II), Ag(I), Ni(II), Zn(II), Co(II), and Cr(III), with the maximum adsorption capacities of 0.15 mmol/g for PB-EA and 0.18 mmol/g for PB-DEA. Furthermore, the adsorption mechanism was studied in details. The adsorption processes of the resins for Cu(II) are governed by a film diffusion mechanism and follow the pseudo-first-order model well. The Langmuir model fits the equilibrium data better than the Freundlich isotherm. The adsorbed Cu(II) can be effectively desorbed with 1 M HNO_3 solution, and the resins can be used more than five adsorption–desorption cycles.

Keywords: Ethylene polyamine; 2-Phenoxyethanol/formaldehyde copolymer beads; Chelating resin; Adsorption; Copper

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