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Ethylenediamine functionalized chelating resin for removal of Cu(II) and Cd(II) from aqueous solution

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ABSTRACT

A novel ethylenediamine chelating resin (PEDA-*g*-PS) was prepared by grafting poly(glycidyl methacrylate) onto the chloromethylated polystyrene beads via surface-initiated atom transfer radical polymerization (SI-ATRP), and followed by the ring-opening reaction of epoxy and amine groups. The resin was characterized by infrared spectroscopy, scanning electron microscopy and elemental analysis. The adsorption property for Cu(II) and Cd(II) on the resin was examined. By analyzing adsorption isotherm, adsorption kinetics and the influence of solution pH on the adsorption capacity, the adsorption of Cu(II) and Cd(II) on PEDA-*g*-PS resin was proved to be Langmuir single-layer adsorption model, and adsorption process conformed to pseudo-second-order kinetic equation. The maximum adsorption capacities for Cu(II) and Cd(II) could reach 1.19 and 1.95 mmol·g^{-1} at pH 3.0 by fitting Langmuir model. The adsorption of the Cu(II) and Cd(II) was hardly affected by common coexisting ions such as Na(I), K(I), Ca(II) and Mg(II), whereas they were slightly decreased when Fe(II) and Zn(II) coexisted in the solution, which illustrated the selective adsorption of Cu(II) and Cd(II) from wastewater. After ten adsorption–desorption cycles, the adsorption capacity of the resin did not change significantly, indicating that the resin exhibited excellent adsorption properties for heavy metal ions and excellent reusability.

Keywords: Chloromethylated polystyrene bead; Atom transfer radical polymerization; Adsorption; Heavy metal ion

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