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Removal of Pb(II), Cd(II), Mn(II), and Zn(II) using iminodiacetate chelating resin by batch and fixed-bed column methods

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ABSTRACT

Chelating resin bearing iminodiacetate function was prepared through subsequent treatment of poly(acrylamide-co-N,N´-methylenebisacrylamide) by ethylenediamine and sodium chloroacetate, respectively. The prepared resins were characterized using Fourier transform infrared spectroscopy. The different factors affecting the metal ions adsorption of this chelating resin such as solution pH, metal ions concentration, contact time, and adsorption temperature were studied in batch method. The prepared chelating resin showed a significant uptake performance towards Pb(II), Zn(II), Mn(II), and Cd(II) ions. Sorption capacities were found to be 1.7, 1.5, 1.6, and 1.77 mmol/g resin for Pb(II), Zn(II), Mn(II), and Cd(II), respectively. Equilibrium data were analyzed using the Langmuir, Freundlich, and Temkin isotherms. The results showed that the adsorption process was well described by Langmuir isotherm model. The kinetic and thermodynamic parameters of the adsorption process were estimated. These data indicated that the adsorption process is spontaneous and followed the pseudo-second-order kinetics. Also, the removal of metal ions from aqueous solutions using iminodiacetate chelating resin in fixed-bed column was studied. Regeneration of chelating resin loaded with metal ions was successfully performed and the resin could be used repeatedly for five times with a small decrease in adsorption capacity.

Keywords: Chelating resin; Iminodiacetate; Polyacrylamide; Heavy metals

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