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USE OF D2EHPA-IMPREGNATED XAD7 RESIN FOR THE REMOVAL OF Cd(II) AND Zn(II) FROM AQUEOUS SOLUTIONS

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Abstract

The adsorption performance of a novel support for metal ions sorption and their removal from aqueous solutions was examined. The support is a new solvent-impregnated resin (SIR) which can be considered as an alternative adsorbent material capable of selective sorption. The adsorbent was prepared by impregnating di-(2-ethylhexyl)-phosphoric acid (D2EHPA) onto Amberlite XAD7 resin beads, by dry impregnation method. The interaction between XAD7 resin and D2EHPA was evaluated by FTIR spectroscopy. Batch sorption experiments were carried out for the removal of Zn(II) and Cd(II) from synthetic aqueous solutions using the impregnated resin. The influences of various experimental parameters like pH, initial concentration, contact time and the effect of temperature were evaluated. The optimum pH range was 4-8 for Cd(II) ions and 4-7 for Zn(II) ions. The equilibrium was reached after 30 min with an overall adsorption performance of ~85% for Cd^{2+} and ~96% for Zn^{2+}. The equilibrium adsorption data were well described by the Langmuir model. The values of the dimensional separation factor, R_L, indicated favorable adsorption. The maximum adsorption capacities of the XAD7-D2EHPA were ~5.0 mg Zn(II)/g and ~4.5 mg Cd(II)/g, respectively. The kinetics of the adsorption process was well explained and approximated by the pseudo-second-order kinetic model, and intra-particle diffusion was the rate-controlling step after rapid saturation of surface and big pores of XAD7-D2EHPA beads. The variation in the extent of adsorption with temperature was used to evaluate the thermodynamic parameters for the adsorption process. The values of ΔH^o and ΔG^o obtained demonstrated that the adsorption process was exothermic and spontaneous.

Key words: Amberlite XAD7, di-(2-ethylhexyl)-phosphoric acid, divalent metal ions, kinetic, solvent impregnated resin, sorption

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