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# REMOVAL OF PHOSPHORUS BY ION-EXCHANGE RESINS: EQUILIBRIUM, KINETIC AND THERMODYNAMIC STUDIES

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## Abstract

The removal of phosphorus by strongly basic anion exchanger was investigated. Removal efficiency increased with contact time, resin mass and initial solute concentration, while temperature showed a reverse effect. Equilibrium data were best fitted onto Langmuir isotherm model ($R^2$>0.99). Maximum sorption capacity of the resin was 66.22 mg/g, namely significantly higher the values reported in the literature. The Freundlich parameter ($n$ = 4.3) and the Langmuir separation factor ($R_L$ = 0.067-0.028) showed that the considered system obeyed to favorable sorption process. The high $K_f$ Freundlich parameter value indicated a high affinity of phosphorus onto the adsorbent. The Temkin isotherm parameters showed high adsorption heat ($b_1$=327.83 kJ/mol) and high maximum bonding energy ($k_t$=1215.8 L/g). Experimental kinetic data was best described by pseudo-second order kinetic model. External mass transfer resistance increased at low initial phosphorus concentrations. Film diffusion was the rate-controlling step, instead of intraparticle diffusion. Thermodynamic experiments indicated that the considered system was exothermic and thermodynamically spontaneous.

*Key words:* adsorption, equilibrium study, kinetic study, phosphorus removal, thermodynamic study

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