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## KINETICS AND ISOTHERM ANALYSIS OF Cd<sup>2+</sup> REMOVAL FROM AQUEOUS SOLUTIONS BY ION EXCHANGE PROCESS

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### Abstract

In the present study, Dowex HCR-S/H, cationic resin was used as a resin for the removal of cadmium from aqueous solutions. The experiments were carried out in a batch vessel. Subsequent experiments were performed as a function of initial solution pH, resin dosage, agitation time, initial Cd<sup>2+</sup> concentration, solution temperature and agitation speed. Ion exchange rate increased with the increase in initial cadmium concentration, stirring speed and temperature. The Langmuir, Freundlich, Elovich, Temkin, Khan, Sips, Toth, Koble-Corrigan and the Radke-Prausnitz isotherm models were tested for their applicability. It was found that the Sips equation appears to fit the equilibrium data. The ion exchange data obtained at various temperatures were applied to pseudo first-order, pseudo second-order, intra-particle diffusion and Elovich models. Pseudo-second-order rate equation was able to provide realistic description of ion exchange kinetics. Intra-particle diffusion process was identified as the main mechanism controlling the rate of the metal exchange. Thermodynamic activation parameters such as  $\Delta G^*$ ,  $\Delta S^*$  and  $\Delta H^*$  of the ion exchange of Cd<sup>2+</sup> on Dowex HCR-S/H cationic resin were also calculated.

*Key words:* cadmium, dowex HCR-S/H, ion exchange, isotherm, removal

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