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# Sorption of hexavalent chromium metal onto Amberlite IRA 410 – equilibrium isotherms and kinetic studies

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**ABSTRACT**

The removal of chromium (VI) from aqueous solution by a strong anion exchanger Amberlite IRA 410 was studied. Batch mode experiments were conducted to study the effect of the initial concentration of Cr (VI) and the equilibrium isotherms. The sorption process of chromium (VI) was tested with Freundlich, Langmuir and Khan models, and the results showed that sorption behaviour of chromium (VI) followed a Langmuir isotherm, namely a monolayer sorption onto the resin surface. The sorption capacity was determined to be 153.8 mg/g. Elovich, Ritchie and the pseudo-second order models were tested to represent kinetic data and the equation parameter values were evaluated. It was found that the sorption kinetics followed a pseudo-second order model in the concentration range 0–100 mg/l, while above 100 mg/l the Ritchie model matched experimental kinetic data. In addition, the capacity of sorption increased for increasing initial Cr(VI) concentration. The thermodynamic parameters for the sorption process have been evaluated. The entropy change $\Delta S$ was found to be 318.4 J/K/mol, the heat of adsorption (enthalpy change) $\Delta H$ was 85.2 kJ/mol indicating the endothermic nature of the adsorption process, and a decrease of the Gibbs free energy ($\Delta G$) for increasing temperatures indicated the spontaneous nature of the process.

*Keywords:* Sorption; Anion exchanger; Sorption isotherms; Batch kinetics; Kinetic models; Diffusion; Mass transfer coefficient

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