Adsorption of bromate from emergently polluted raw water using MIEX resin: equilibrium, kinetic, and thermodynamic modeling studies

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Received 3 March 2014; Accepted 19 August 2014

This study investigated the kinetics, equilibrium, and thermodynamics of bromate adsorbed on magnetic ion-exchange (MIEX) resin by batch experiments. The pseudo-second-order kinetic model could well describe the adsorption process, and the film diffusion controlled the whole adsorption rate. The Langmuir and Redlich–Peterson isotherm models fitted well the equilibrium data. High removal efficiency of bromate was observed at neutral pH. Other coexistent anions present in raw water affected negatively the removal of bromate significantly. The thermodynamic studies showed the adsorption was a spontaneous thermodynamically, endothermic, and entropy driving process. These analyses on the average free energy, activation energy of adsorption, and quantity changes of bromate and chloride ions in solution before and after adsorption demonstrated that the removal mechanism of bromate adsorbed on MIEX resin was an ion-exchange reaction. Results of the findings suggested that MIEX resin could be utilized effectively to remove bromate from emergently polluted raw water.

Keywords: MIEX resin; Bromate; Equilibrium; Kinetics; Thermodynamics

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