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Kinetics and adsorption isotherm for the removal of fluoride and chromium (VI) from wastewater by electrocoagulation

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ABSTRACT

In this work, the removal of fluoride and Cr(VI) by electrogenerated coagulants is studied in single and binary systems. The effects of initial pH, current intensity and initial concentration on fluoride and hexavalent chromium removal were investigated. The results showed that an optimum removal was achieved at an initial pH of 3.0. Removal efficiencies of 96.7% and 97.4% were achieved for fluoride and Cr(VI) respectively at that pH. Adsorption kinetics showed that the first order rate expression fitted the adsorption kinetics for both fluoride and Cr(VI). The equilibrium isotherm was analyzed by Langmuir and Freundlich isotherm models. The characteristic parameters for each isotherm were determined. The Freundlich adsorption isotherm was found to fit well the equilibrium data for both fluoride and Cr(VI) adsorptions. Kinetics of adsorption of the two pollutants onto aluminium hydroxides in binary system at different ratios (r = [Cr]/[F^-]) showed that the presence of one of the pollutants can influence strongly the absorption of other which confirms the antagonistic effect during the adsorption. The temperature studies showed that adsorption was endothermic and spontaneous nature for both pollutants.

Keywords: Fluoride; Chromium (VI); Electrocoagulation; Kinetics; Adsorption isotherm modeling; Competition

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