Article Abstract

Title:	A variable order kinetic model to predict defluoridation of drinking water by electrocoagulation-electroflotation
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Abstract:	A kinetic study of defluoridation of drinking water was carried out using the electrocoagulation/ electroflotation process in two batch reactors of identical volume (20 L): a stirred tank reactor (STR) and an external-loop airlift reactor (ALR). When the evolution of fluoride content was independent of stirring speed, experimental results showed that the kinetics of fluoride removal could be modelled using a variable-order-kinetic (VOK) approach coupled with a Langmuir–Freundlich adsorption model in the STR. Conversely, when mixing was less efficient, which is the case in the ALR, experimental data could be fitted adequately only using a pseudo-first-order model. The variable order kinetic (VOK) model derived from the langmuir-freundlish equation was applied to determine the kinetics of fluoride removal reaction by electrocoagulation (EC). Synthetic solutions were employed to elucidate the effects of the initial fluoride concentration, the applied current and the initial acidity on the simulation results of the model. The proposed model successfully describes the fluoride removal in Airlift reactor in comparison with the experimental results. In this study two EC cells with the same capacity (V=20 L) were used to carry out fluoride removal with aluminum electrodes, the first is a stirred tank reactor (STR) the second is an airlift reactor (ALR). The comparison of energy consumption demonstrates that the (ALR) is advantageous for carrying out the defluoridation removal process.
Keywords:	Defluoridation, electrocoagulation (EC), variable order kinetics, stirred tank reactor, kinetics modeling.