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Equilibrium and kinetics studies of 2,4,5-trichlorophenol adsorption onto organophilic-bentonite

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ABSTRACT

The adsorption of 2,4,5-trichlorophenol (2,4,5-TCP) from aqueous solutions onto the crude bentonite modified with hexadecyltrimethylammonium-bromide (HDTMAB) have been studied. The parameters that affect the 2,4,5-TCP adsorption onto modified bentonite (BHDTMA), such as contact time, solution pH, and temperature have been investigated and optimized conditions determined. Three kinetic models have been evaluated in order to attempt to fit the experimental data, namely the pseudo-first order, the pseudo-second-order and the intraparticle model. The results show that the pseudo-second-order kinetic model generates the best agreement with the experimental data for the adsorption system. Adsorption equilibrium data of 2,4,5-TCP on BHDTMA were analyzed by Langmuir, Freundlich and Langmuir-Freundlich isotherm models. The results indicate that the Langmuir-Freundlich model provides the best correlation of experimental data. The maximum capacity of BHDTMA at 293 K was founded around 72 mg/g. The thermodynamic parameters such as a free energy, enthalpy and entropy of adsorption was calculated. The negative values of ΔG° and ΔH° indicate the spontaneous and exothermic nature of the process.

Keywords: Adsorption; Bentonite; Organophilic-bentonite; 2,4,5-Trichlorophenol; Kinetics; Thermodynamic

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