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Removal of phenol and lead from synthetic wastewater by adsorption onto granular activated carbon in fixed bed adsorbers: prediction of breakthrough curves

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ABSTRACT

The adsorption of phenol and lead (II) onto granular activated carbon (GAC) in single and binary system has been studied using fixed bed adsorber. A general rate multi-component model has been utilized to predict the fixed bed breakthrough curves for dual-component system. This model considers both external and internal mass transfer resistances as well as axial dispersion with non-liner multi-component isotherm. The effect of important parameters, such as flow rate, bed height and initial concentration on the behavior of breakthrough curves have been studied. The equilibrium isotherm model parameters such as isotherm model constants, pore diffusion coefficients (D_p) were obtained from batch experiments, while the external mass transfer coefficients and axial dispersion (k_f, D_z) were calculated from empirical correlations. The results show that the general rate model was found suitable for describing the adsorption process of the dynamic behavior of the GAC adsorber column.

Keywords: Adsorption; GAC; Phenol; Lead; Langmuir isotherm model; Fixed bed

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