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## DETERMINATION OF EQUILIBRIUM, KINETIC AND THERMODYNAMIC PARAMETERS OF ACID RED 88 ADSORPTION ONTO MONTMORILLONITIC CLAY

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### Abstract

The aim of this study is to evaluate adsorption kinetics, isotherms and thermodynamic parameters of anionic textile dye (Acid Red 88) onto montmorillonitic clay from aqueous solutions. The parameters of pH, initial dye concentrations, temperature, and the adsorbent dosage were investigated experimentally. Four kinetic models including pseudo-second order, pseudo-n<sup>th</sup> order, Bangham's equation and double exponential equation (DEE) were selected to follow the adsorption process. The dynamic data were fitted the DEE well and also followed the pseudo-n<sup>th</sup> order model. The adsorption data obtained were well described by the Langmuir isotherm model. The maximum adsorption capacity was found to be 588 mg/g at 20 °C. Thermodynamic parameters such as activation energy ( $E_a$ ), Gibbs free energy ( $\Delta G^0$ ), enthalpy ( $\Delta H^0$ ) and entropy ( $\Delta S^0$ ) were also evaluated. The negative value of change in Gibbs free energy indicates that adsorption of AR88 on montmorillonitic clay is spontaneous. The anionic dye molecules can be adsorbed on montmorillonitic clay particles, even when their surface charge (or zeta potential) is negative. Interactions leading to adsorption of anionic dyes (AR88) onto the clay may cause from the following mechanisms: hydrogen bonding, electrostatic interaction, hydrophobic interaction, anion exchange and dye-dye interactions. The results show that montmorillonitic clay could be employed as low-cost material for the removal of acid dyes from textile effluents.

*Key words:* acid red 88, adsorption, isotherms, montmorillonitic clay, thermodynamics

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