



“Gheorghe Asachi” Technical University of Iasi, Romania



THE EQUILIBRIUM AND KINETICS STUDIES OF CRYSTAL VIOLET ADSORPTION ONTO MONTMORILLONITE

Feza Geyikçi

Ondokuz Mayıs University, Faculty of Engineering, Department of Chemical Engineering, 55139 Kurupelit, Samsun, Turkey
E-mail: fezag@omu.edu.tr; Phone: + 90 362 312 19 19 / 1343; Fax: + 90 362 457 60 35

Abstract

In this study, the removal of crystal violet from aqueous solutions using natural clay (from Bafra of Turkey) was described. Experiments were carried out as function of contact time, adsorbent dosage, initial concentration, pH and temperature. The chemical composition of the natural clay was analyzed by X-ray fluorescence spectrometry (XRF).

The Langmuir, Freundlich and Temkin adsorption models were applied to describe the equilibrium isotherms. The adsorption isotherms data were correlated with the Langmuir equation and the Langmuir constant K_L (1.0 L/g) was calculated. The Langmuir monolayer adsorption capacity of montmorillonite was determined to be 500 mg/g at 295 K. The R^2 (regression coefficient) value was obtained as 0.961 for crystal violet. The adsorption kinetic data of the crystal violet onto natural clay were fitted well by pseudo-second order model. The thermodynamic parameters such as the standard free energy (ΔG°), standard enthalpy (ΔH°) and standard entropy (ΔS°) were evaluated. The spontaneity of the adsorption process is established by decrease in ΔG° , which varied from (- 9.43) to (- 28.68) kJ/mol in the temperature range of 293-353 K.

Key words: adsorption, Crystal Violet, isotherm, kinetics models, thermodynamics

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