



Adsorption of Direct Red 243 dye onto clay: kinetic study and isotherm analysis

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ABSTRACT

In this study, the adsorption of Direct Red 243 dye on clay was investigated in aqueous solutions. In batch adsorption experiments, the effects of initial pH, adsorbent dose, initial concentration, contact time, and temperature were investigated. X-ray diffraction, Fourier transform infrared spectroscopy, and surface area (S_{BET}) analysis were used to determine the properties of the clay. Scanning electron microscopy images of the clay were obtained before and after the adsorption of the dye. The Langmuir, Freundlich, Temkin, and Dubinin–Radushkevich isotherms were applied to the adsorption equilibrium, and the results indicated that the Langmuir isotherm gave the best fit to the data. The maximum adsorption capacity was 156.25 mg g^{-1} for Direct Red 243. The pseudo-first-order, pseudo-second-order, Elovich, and intra-particle diffusion models were applied to the data, and the kinetic data were best described by the pseudo-second-order model.

Keywords: Adsorption; Direct Red 243; Dyes; Clay; Isotherm; Kinetics
