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KINETICS AND ISOTHERM MODELING OF ADSORPTION OF RHODAMINE B DYE ONTO CHITOSAN SUPPORTED ZEROVALENT IRON NANOCOMPOSITE (C-nZVI)

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Abstract

The kinetics and isotherm modeling of adsorption of Rhodamine B (RhB) Dye onto chitosan supported zerovalent iron nanocomposite (C-nZVI) was successfully studied in a batch technique. The quantity adsorbed increased with increase in initial concentration from 49.33 mg – 242.37 mg for 200 ppm to 1000 ppm and high percentage removal efficiency (%RE) of 99.72% attained at 90 minutes contact time. Equilibrium data were analyzed by six isotherm models: Langmuir, Freundlich, Temkin, Dubinin-Kaganer-Raduskevich (DKR), Redlich-peterson and Halsey isotherm model. Equilibrium data best fitted to Freundlich isotherm supported by Halsey isotherm model. Langmuir monolayer adsorption capacity (256.41 mg/g) of C-nZVI obtained greater than most adsorbent reported for adsorption of RhB. The mean adsorption free energy, E per molecule evaluated from DKR model was less than 8 KJmol -1 indicating a physisorption mechanism. The kinetic data best fitted to pseudo second-order kinetic model as validated by sum of square error (SSE) statistical model and the mechanism controlled by pore dif usion. The study revealed the great potential of C-nZVI for ef ective removal of RhB dye. C-nZVI is therefore recommended for civic and industrial ef luents treatment.

Author Keywords

Chitosan-Iron Nanocomposite, Rhodamine B, Adsorption, Kinetics, Isotherm modeling

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