



Evaluation of equilibrium, kinetic, and thermodynamic parameters for adsorption of Cd²⁺ ion and methyl red dye onto amorphous poly(azomethinethioamide) resin

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ABSTRACT

Batch adsorption studies were carried out for the removal of cadmium ion (Cd²⁺ ion) and methyl red (MR) from aqueous solutions using poly(azomethinethioamide) (PATA) resin which is having pendent chlorobenzylidene ring. PATA was characterized by FT-IR spectroscopy, NMR spectroscopy, transmission electron microscope (TEM), and scanning electron microscope (SEM) techniques. Parameters like pH, initial dye and metal ion concentration, adsorbent dose, and contact time have been studied. Maximum adsorption was observed at pH 6 for Cd²⁺ and at 7 for MR. Langmuir, Freundlich, Dubinin–Raduskevich (D–R), and Temkin adsorption models were applied to describe the equilibrium isotherms. The maximum monolayer adsorption capacities of Cd²⁺ ion and MR dye are found to be 100 and 90.9 mg/g, respectively. The adsorption of Cd²⁺ ion and MR follows second-order kinetics. The thermodynamics parameters such as ΔG° , ΔH° , and ΔS° were also evaluated. The adsorbed Cd²⁺ ion and MR were eluted by treatment with 0.2N HCl solutions, and the adsorption efficiency of the PATA was retained even after several cycles.

Keywords: Thioamides; Azomethine; Isotherm; Kinetics; Thermodynamics; Desorption

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