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Adsorptive removal of 2,4-dinitrophenol using active carbon: kinetic and equilibrium modeling at solid–liquid interface

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ABSTRACT

Adsorption is found to be a feasible technique for the removal of even trace amounts 2,4-dinitrophenol (2,4-DNP) from aqueous phase using active carbon from rubber wood. Prior to adsorption studies, surface and physical properties of active carbon were determined using X-RD, FT-IR, and particle size analyzer. Batch adsorption experiments were carried out to optimize various conditions, such as solution pH, contact time, initial solute concentration, and adsorbent dose, for the effective removal of 2,4-DNP from aqueous phase. The favorable pH range for the adsorption process was found to be 2.0–5.0. The maximum adsorption of 99.9% (24.98 mg/g), 98.2% (49.10 mg/g) and 96.9% (96.89 mg/g) of 2,4-DNP onto active carbon was observed at pH 4.0 for different initial concentrations of 50, 100, and 200 mg/L, respectively. Kinetics and isotherm studies showed that the adsorptive removal process follows pseudo-second-order kinetics and Langmuir isotherm, respectively.

Keywords: Adsorption; Active carbon; Wastewater treatment; Kinetic parameters; Phenol

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