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Sorption, kinetic, thermodynamics and artificial neural network modelling of phenol and 3-amino-phenol in water on composite iron nano-adsorbent

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Abstract

Sorption, kinetic, thermodynamics and artificial neural network modelling of phenol and 3-amino-phenol in water on composite iron nano-adsorbent are described. The optimized conditions were 100 g/L conc., 40 min. contact time, 11 pH, 5 mg/10 mL nanoparticles amounts, and 298 K temperature. The data followed Langmuir, Freundlich, Temkin and Dubinin-Radushkevich models. The values of ΔG^0 (average value = $-7.14 \text{ kJ mol}^{-1}$ for phenol and 7.07 kJ mol^{-1} for amino-phenol), ΔH^0 (-4.92 kJ/mol for phenol and -4.00 kJ/mol for amino-phenol) and ΔS^0 ($-7.0 \times 10^{-3} \text{ kJ mol}^{-1} \text{ K}^{-1}$ for phenol and 6.89×10^{-3} for amino-phenol) confirmed spontaneous adsorption. The mechanism of sorption was through film diffusion. The maximum percent uptakes of phenol and *p*-amino-phenol and were 85.0 and 80.0%. The method is fast, economic and capable to work at natural water pH. Therefore, the presented method may be used for the removal of phenol and amino-phenol from any water source.

Keywords

Sorption Kinetic; Thermodynamics; Phenols; 3-Amino-phenol; Water; Mechanism; Neural network modelling.

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