



Simulation of indigo carmine dye adsorption on polymer doped sawdust in fixed-bed systems

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ABSTRACT

This research analyzes the potential use of polyaniline doped sawdust (PANI/SD) as a low-cost adsorbent to remove indigo carmine (IC) from aqueous solutions in a continuous fixed-bed system. The effects of inlet dye flow rate, concentration and bed height on the breakthrough characteristics of the adsorption system were determined. The breakthrough time and saturation time increased with decreases in the flow rate and the inlet concentration. The same effect was shown when the bed depth was increased. The average bed adsorption capacity q_0 was 80.24 mg/g. The adsorption data were fitted to four well-established fixed-bed adsorption models: the Thomas, the Yoon–Nelson, the Adams–Bohart model and the bed-depth service time models (BDST). The results conformed to the Thomas and Yoon–Nelson models, with coefficients of correlation (R^2) ≥ 0.97 under different conditions. The breakthrough time and exhaustion time values predicted with the BDST model under different conditions agreed with the experimental values. PANI/SD was shown to be a suitable adsorbent for the adsorption of indigo carmine using a fixed-bed adsorption column.

Keywords: Adsorption; Dye; Sawdust; Fixed bed

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