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Assessment of fish scales waste as a low cost and eco-friendly adsorbent for removal of an azo dye: Equilibrium, kinetic and thermodynamic studies

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Abstract

In this study, AB113 dye was successfully sequestered using a novel adsorbent made of mixed fish scales (MFS). The influence of adsorbent dosage, initial pH, temperature, initial concentration and contact time on the adsorption performance was investigated. The surface chemistry and morphology of the adsorbent were examined by FTIR, TGA and SEM. Amides, phosphate and carbonate groups were evidently responsible for the high affinity of MFS towards the dye. The adsorption equilibrium and kinetic were well described by Langmuir and pseudo-second-order models, respectively. The maximum adsorption capacities of MFS were 145.3-157.3 mg/g at 30-50°C. The adsorption of AB113 dye onto the adsorbent was exothermic and spontaneous as reflected by the negative enthalpy and Gibbs energy changes. The results support MFS as a potential adsorbent for AB113 dye removal.

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