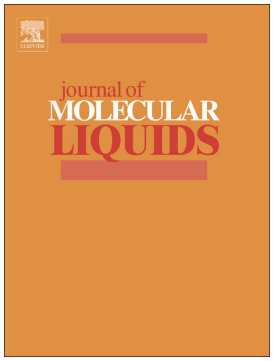

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Mechanism analysis of tartrazine biosorption onto masau stones; a low cost by-product from semi-arid regions

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Abstract

The removal of tartrazine from aqueous solutions using masau stone (MS) as a novel low-cost biosorbent was investigated. The impact of several influential parameters such as; initial pH, contact time, initial concentration and temperature on the biosorption process of tartrazine was studied and optimized. The mechanisms of tartrazine removal by the MS biosorbent and their kinetics and isotherm studies are also presented. It was observed that the efficiency of the removal of tartrazine depends on the pH of the solution and the maximum efficiency (approx. 87% at C_o = 100) was found at pH 2. Kinetic studies were well suited and found to be in good agreement with the pseudo-second order model. The biosorption equilibrium data was adequately described by the Langmuir isotherm model at 20 °C and 30 °C. High temperatures seem to promote multilayer biosorption as the tartrazine experimental data best fits both Freundlich and Redlich-Peterson isotherms (R^2 = 0.996 for both). The maximum biosorption capacities of tartrazine were between; 0.096 mmol/g (51.3 mg/g) at 20 °C and 0.126 mmol/g (65.1 mg/g) at 60 °C. The thermodynamic parameters obtained indicated a positive and low value of ΔH°, suggesting an endothermic and physical nature process with biosorption mechanisms related to H-bonds, van der Waals and electrostatic interactions. The results clearly indicated that masau stone would be a suitable biosorbent for the anionic dye, tartrazine, from contaminated wastewater under specific conditions.

Keywords: *Azo Dye; Tartrazine; Masau Biomass; By-Products; Biosorption; Wastewater treatment.*

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