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REMOVAL OF CRYSTAL VIOLET DYE WITH AN INNOVATIVE BIOSORBENT (*Equisetum ramosissimum* Desf.)

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Abstract

In this work, *Equisetum ramosissimum* Desf. is used as a biosorbent to test the adsorption of the dye crystal violet. The effects of initial dye concentration, duration, temperature, pH, point of zero charge pHpzc, and adsorbent dose were studied. The isotherm equations for Langmuir, Freundlich, Temin, Sips, Toth, and Khan were modified using the results of the experimental experiments. The adsorption isotherm data showed the best agreement with Langmuir, one of the 2-parameter isotherm models, and Sips, one of the three-parameter isotherm models. With an adsorption capacity of 17.27 mg/g, *Equisetum ramosissimum* Desf. showed good efficacy in removing Crystal Violet from an aqueous solution. When the adsorption kinetics were looked at, the so-called second-order kinetic model fit the data the best. This suggests that chemical sorption may be the phase that limits the rate of adsorption. The adsorption isotherms obtained at different temperatures were used to calculate the Gibbs free energy (ΔG^*), enthalpy (ΔH^*), and entropy (ΔS^*) of adsorption. The reported positive ΔG^* values indicate that spontaneous adsorption does not occur. We also looked into thermodynamic factors. For 10 g/L of adsorbent, 150 rpm mixing speed, 100 mg/L of starting dye concentration, and 6.2 pH, the activation energy (Ea) was 11.209 kJ/mol. On the other hand, the entropy change (ΔS^*) was 0.111 kJ/mol, while the enthalpy change (ΔH^*) was 40.434 kJ/mol. The findings of this investigation demonstrated that biosorbents derived from *Equisetum ramosissimum* Desf. may be employed as an effective and acceptable adsorbent in the removal of Crystal Violet dye from an aqueous solution.

Key words: activation parameters, biosorption, *Equisetum ramosissimum* Desf., pseudo-second-order equation, sips isotherm

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