

Bioremoval of Malachite Green Dye from Aqueous Solution Using Marine Algae: Isotherm, Kinetic and Mechanistic Study

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Abstract : This study reports the removal of Malachite Green (MG) from simulated wastewater by using marine macro algae *Ulva lactuca*. Batch biosorption experiments were carried out to determine the biosorption capacity. The biosorption capacity was found to be maximum at pH 10. The effect of various other operation parameters such as biosorbent dosage, initial dye concentration, contact time and agitation was also investigated. The equilibrium attained at 120 min with 0.1 g/L of biosorbent. The isotherm experimental data fitted well with Langmuir Model with R^2 value of 0.994. The maximum Langmuir biosorption capacity was found to be 76.92 mg/g. Further, Langmuir separation factor RL value was found to be 0.004. Therefore, the adsorption is favorable. The biosorption kinetics of MG was found to follow pseudo second-order kinetic model. The mechanistic study revealed that the biosorption of malachite onto *Ulva lactuca* was controlled by film diffusion. The solute transfer in a solid-liquid adsorption process is characterized by the film diffusion and/or particle diffusion. Thermodynamic study shows ΔG° is negative indicates the feasibility and spontaneous nature for the biosorption of malachite green. The biosorbent was characterized using Scanning Electron Microscopy, Fourier Transform Infrared Spectroscopy, and elemental analysis (CHNS: Carbon, Hydrogen, Nitrogen, Sulphur). This study showed that *Ulva lactuca* can be used as promising biosorbent for the removal of MG from wastewater.

Keywords : biosorption, *Ulva lactuca*, wastewater, malachite green, isotherm, kinetics

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