Biosorption of lead ions (Pb$^{2+}$) from simulated wastewater using residual biomass of microalgae

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**ABSTRACT**

Presence of different heavy metals in the industrial effluents poses a great problem to the researchers/technologist dealing with environmental pollution. The present study investigates the suitability of the residual biomass of green algae *Phormidium* sp.—a microalgal strain meant for biodiesel production to remove lead (Pb$^{2+}$) ions from aqueous solution in both batch type stirred system and a semi-batch-packed bed adsorber. The influences of adsorbent dosage, temperature, pH, contact time, and initial metal ion concentration of solution on biosorption have been investigated. The biosorption equilibrium has been established in 40 min. Thermodynamic, kinetic, and isotherm studies have been carried out for the biosorption of Pb$^{2+}$ ions on *Phormidium* sp. The values of mean enthalpy ($\Delta H$) and the mean entropy ($\Delta S$) have been determined to be $-22.75 \text{kJ/mol}$ and $85.24 \text{J/mol K}$, respectively. The value of Gibbs free energy, $\Delta G$, has been observed to decrease with increasing temperature. The maximum removal efficiency of Pb$^{2+}$ on *Phormidium* sp. at equilibrium has been observed to be 92.2% at pH 5.0, initial Pb$^{2+}$ concentration of 10 mg/L, and an adsorbent dosage of 4 g/L. Experimental breakthrough curves obtained using different flow rate (2–4.5 mL/min), initial concentration (10–30 mg/L), and bed heights (0.1–0.2 cm) have been analyzed.

**Keywords:** Microalgal strain; Thermodynamics; Kinetics; Isotherm; Breakthrough curves

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