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Review

Biosorption of Lead (II) and Chromium (VI) Onto *Tarminalia Catappa* L. Leaves: A Comparative Evaluation

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ABSTRACT

A comparative evaluation to test the ability of Tarminalia catappa L. leaves to biosorb lead (II) and chromium (VI) was investigated. The biosorbent was characterized by FTIR and SEM before and after biosorption. The batch experiments were performed in order to optimize the various parameters such as solution pH, biosorbent dose, initial metal concentration, contact time and temperature. Equilibrium data were well described by typical Langmuir, Freundlich, Dubinin-Kaganer-Redushkevich (DKR) and Temkin adsorption isotherm models. Langmuir adsorption isotherm model provided a better fit with the experimental data for both lead (II) and chromium (VI). The maximum biosorption capacity of lead (II) and chromium (VI) which was determined from Langmuir adsorption isotherm was found to be 50.00 mg g^{-1} and 44.05 mg g^{1} respectively. Furthermore, a detailed analysis has been conducted by testing simple chemical reaction kinetic models such as pseudo-first-order, pseudo-second-order, Elovich and Weber & Morris intra-particle diffusion. Predictions based on the so-called pseudo-second-order kinetic model was found in satisfactory accordance with experimental data for both lead (II) and chromium (VI), which suggests that biosorption is chemical sorption controlled. Thermodynamic study revealed that the biosorption process was spontaneous, endothermic and increasing randomness of the solid solution interfaces. The Tarminalia catappa L. leaves was found to remove lead (II) and chromium (VI) effective from aqueous solutions with uptake and selectivity in the order of lead (II) > chromium (VI). The whole study showed that the Tarminalia catappa L. leaves tested can be very promising for the removal of lead (II) and chromium (VI) in industrial wastewater.

Keywords: Biosorption, Lead (II), Chromium (VI), Comparative evaluation, Tarminalia catappa L. leaves, FTIR, SEM, Adsorption isotherms, Adsorption kinetics, Thermodynamic study.