**Evaluation of biosorption of copper ions onto pinion shell**

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**ABSTRACT**

Biosorption of Cu(II) by pinion shell (PS) was investigated in batch and packed-bed systems. The biosorbent was characterized by elemental analysis, potentiometric titrations, surface area and pore size distribution, and Fourier transform infrared (FTIR) analyses. Potentiometric titrations and FTIR spectroscopy indicated the presence of functional groups in the PS, some of which were involved in the sorption process. Batch adsorption experiments were carried out as a function of solution pH, particle size, biosorbent dosage, contact time, and initial metal ion concentration. The rate of the biosorption process followed pseudo-second-order kinetics, while the sorption equilibrium data well fitted to the Langmuir and Freundlich isotherm models. The maximum monolayer Cu(II) biosorption capacity was 4.29 mg/g at 25°C. Finally, the dynamic biosorption studies were carried out using a packed-bed column and the main column parameters were determined. The present study suggests that the PS can be used as a potential, alternative, low-cost biosorbent for the removal of Cu(II) ions from aqueous media.

**Keywords:** Biosorption; Pinion shell; Copper; Equilibrium; Kinetics; Agricultural waste