

Removal of Copper from Aqueous Solution Using Chemically Treated Potato (*Solanum tuberosum*) Leaf Powder

Abstract

The present investigation describes the use of an agricultural waste; leaves powder derived from a specially cultivated *Solanum tuberosum* (potato) plant, as an adsorbent for copper removal from aqueous solutions. Batch experiments were performed based on parameters, such as pH at point of zero charge, pH, dosage, contact time, initial metal concentration, and temperature to study their effects on the removal capacity of copper from aqueous solutions. The kinetic data fitted well to the pseudo-second order model, with a calculated adsorption capacity (q_e) value (23.70 mg g⁻¹) close to the experimental (q_e) value (24.60 mg g⁻¹). The adsorption data conformed best to the Langmuir isotherm as revealed by a lower non-linear Chi-square (χ^2) value of 0.25 and a higher correlation value of 0.991 when compared to the Freundlich isotherm with a higher χ^2 value of 0.78 and a lower correlation value of 0.985. The maximum adsorption capacity for the leaves powder was 42.74 mg g⁻¹. The thermodynamic parameters (ΔG° , ΔS° , and ΔH°) showed that adsorption was feasible, spontaneous and endothermic. Fourier transform infrared (FTIR) spectroscopy confirmed the involvement of OH, NH, and CH of carboxylic acids and amino acids on the removal of copper from aqueous solutions. The results obtained in the present study indicated that *S. tuberosum* leaves powder can be used effectively to remove copper ions from aqueous solutions.