

Potato peels as promising low-cost adsorbent for the removal of lead, cadmium, chromium and copper from wastewater

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ABSTRACT

Toxic metals contamination of wastewater is of special concern due to their toxic and non-biodegradable nature. Thus, low-cost adsorbents have recently been given great attention for the treatment of wastewater. The main aim of this work is to characterize and evaluate the effectiveness and sustainability of potato peels as adsorbent for Pb(II), Cr(III), Cd(II) and Cu(II) removal from wastewater. The effects of contact time, pH, adsorbent dosage, particle size, initial concentrations, temperature, kinetics, adsorption isotherm modeling, thermodynamics and reusability studies on Pb(II), Cr(III), Cd(II) and Cu(II) removal were studied. The quantities of Pb(II), Cr(III), Cd(II) and Cu(II) removed increased with decreasing initial concentration of the metal ions. The removal efficiency was increased by increasing the dosage of adsorbent and decreasing the particle size. The percentage removals of the toxic metals were also increased slightly by increasing the solution temperature. Pb(II), Cu(II) and Cr(III) were found to be highly adsorbed at pH 4 and Cd(II) was highly adsorbed at pH 6. The Langmuir isotherm model fits the adsorption of Cu(II), Cr(III) and Pb(II), and the Freundlich isotherm model fits for Cd(II). The pseudo-second-order kinetics model fits the adsorption of Cd(II), Pb(II), Cr(III) and Cu(II) onto potato peels. The results of thermodynamic data showed that the adsorption of Pb(II), Cr(III), Co(II) and Cd(II) was a non-spontaneous and endothermic process. Generally, the study indicates that potato peels adsorbent may be economic reusable and effective alternative low-cost adsorbent for Cd(II), Pb(II), Cu(II) and Cr(III) removal from wastewater.

Keywords: Toxic metals; Wastewater treatment; Potato peels; Batch adsorption; Waste management

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