

Cadmium (II) Adsorption from Aqueous Solutions Using Onion Skins

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Abstract

Abstract The potential of onion skins for removal of aqueous Cd(II) was investigated. Onion skin powder was chemically modified using thioglycolic acid to develop a suitable, low-cost, and efficient adsorbent for the removal of Cd(II) from aqueous solutions. Influences of temperature, contact time, initial concentration of Cd(II), adsorbent dosage, and pH on the removal of Cd(II) were probed. Optimal adsorption conditions were found at pH 5 and 4, and at 60- and 30-min equilibrium time for the modified and native onion skins, respectively. The equilibrium process was well described by the Freundlich isotherm model. The maximum Cd(II) adsorption capacities, from the Langmuir model, are 17.86 mg/g (modified) and 21.28 mg/g (native). The adsorption process followed the mechanism of physisorption. Pseudo second-order rate equation fitted the kinetic data better than the pseudo first-order rate equation for the two adsorbents. Thermodynamic parameters, such as standard free energy change (ΔG°), standard enthalpy change (ΔH°), and standard entropy change (ΔS°), were calculated for adsorption experimental studies. The results showed that the adsorption of Cd(II) on native/unmodified and modified onion skins was a feasible process and exothermic under the studied conditions. The Cd(II) adsorbed was efficiently desorbed from adsorbent using 0.3 M HCl.

Keywords : Adsorption . Onion skins . Isotherms . Thermodynamics . Desorption

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