



Removal of cadmium(II) ion from wastewater by using Lebanese *Prunus avium* stem as adsorbents

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ABSTRACT

The objective of this study was to investigate the possibility of using Lebanese *Prunus avium* stems as an alternative adsorbent for the removal of cadmium(II) ions from aqueous solutions. Different parameters such as the effect of initial metal ion concentration, pH, adsorbent dose and contact time were studied. Maximum adsorption capacity (90%) of Cd(II) ions was obtained at pH 10 with an initial Cd(II) concentration 150 mg/L after 1 h and at 25°C. Fourier transform infrared analysis pointed out the involvement of amine ($-NH_2$) and carboxylic ($-COOH$) groups in the adsorption process. The adsorption isotherm was better described by a Freundlich model rather than a Langmuir model. The paper discusses the thermodynamic parameters of the adsorption (the Gibbs free energy, entropy and enthalpy). Our results demonstrated that the adsorption process was spontaneous and exothermic under natural conditions. When the temperature decreases from 333 to 298 K, the standard free energy ΔG^0 decreases thus indicating a spontaneous adsorption with an exothermic process $\Delta H^0 < 0$. Based on these results, it can be concluded that the stems of *Prunus avium* are effective as an alternative adsorbent for toxic Cd(II) ion remediation in waste water.

Keywords: *Prunus avium*; Cadmium(II); Adsorption; Langmuir and Freundlich isotherm models; Thermodynamics

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