World Academy of Science, Engineering and Technology
International Journal of Environmental and Ecological Engineering
Vol:10, No:07, 2016

Removal of Lead from Aqueous Solutions by Biosorption on Pomegranate Skin: Kinetics, Equilibrium and Thermodynamics

Authors : Y. Laidani, G. Henini, S. Hanini, A. Labbaci, F. Souahi

Abstract : In this study, pomegranate skin, a material suitable for the conditions in Algeria, was chosen as adsorbent material for removal of lead in an aqueous solution. Biosorption studies were carried out under various parameters such as mass adsorbent particle, pH, contact time, the initial concentration of metal, and temperature. The experimental results show that the percentage of biosorption increases with an increase in the biosorbent mass (0.25 g, 0.035 mg/g; 1.25 g, 0.096 mg/g). The maximum biosorption occurred at pH value of 8 for the lead. The equilibrium uptake was increased with an increase in the initial concentration of metal in solution (Co = 4 mg/L, q_t = 1.2 mg/g). Biosorption kinetic data were properly fitted with the pseudo-second-order kinetic model. The best fit was obtained by the Langmuir model with high correlation coefficients (R² > 0.995) and a maximum monolayer adsorption capacity of 0.85 mg/g for lead. The adsorption of the lead was exothermic in nature (ΔH° = -17.833 kJ/mol for Pb (II). The reaction was accompanied by a decrease in entropy (ΔS° = -0.056 kJ/K. mol). The Gibbs energy (ΔG°) increased from -1.458 to -0.305 kJ/mol, respectively for Pb (II) when the temperature was increased from 293 to 313 K.

Keywords : biosorption, Pb (+II), pomegranate skin, wastewater
Conference Title : ICEBESE 2016 : International Conference on Environmental, Biological, Ecological Sciences and Engineering
Conference Location : Istanbul, Türkiye
Conference Dates : July 21-22, 2016