



7th INTERNATIONAL WORKSHOP ADVANCES IN CLEANER PRODUCTION

“CLEANER PRODUCTION FOR ACHIEVING SUSTAINABLE DEVELOPMENT GOALS”

Development of Biosorbents from Canola Biomass to Pb²⁺ Removal

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Abstract

The quality of water is a subject that has been discussed a lot nowadays, mainly regarding the removal of various contaminants of this environmental compartment. Since the importance of this resource it was included into the global objectives of the UN sustainable development - which aiming to asseguarate the sustainable disponibility and management of the water. In this context, the objective of this work was to evaluate the potential of Pb²⁺ removal of waters through solid waste (pie) of hybrid Hyola 411 canola by adsorption process. In this study four adsorbents were developed, being them: C. *in natura*, which was the precursor of the modified adsorbents (C. H₂O₂, C. H₂SO₄ e C. NaOH). These adsorbents were characterized by MEV, FT-IR, pH_{PZC}, TG/DTG, BET and BJH. It was also realized studies relating the possible interaction between the pH of the Pb²⁺ solution and adsorbent masses, as well as the kinetic (through linear models of pseudo-first order, pseudo-second order, Elovich and intraparticle diffusion) and adsorption equilibrium studies (through linear models of Langmuir, Freundlich and Dubinin-Radushkevich), and some thermodynamic parameters (ΔG , ΔH and ΔS). The obtained results for pseudo-second order suggest the chemical adsorption of Pb²⁺ (Ho & McKay 1999). It was observed a good adjustment for the models of Langmuir and Freundlich suggesting adsorption in mono and in multilayers. The highest values of Q_m and K_f were obtained for C. NaOH. Good adjustment was also observed for D-R with C. NaOH exhibiting value of E > 8, suggesting chemisorption of Pb²⁺. According to the results obtained for thermodynamic studies C. H₂O₂ was the exception among the modifications, showing positive values of ΔH suggesting an endothermic system. The other adsorbents exhibited $\Delta H < 0$, i.e., exothermic systems. The values of $\Delta G < 0$ indicate the occurrence of spontaneous adsorption of Pb²⁺. The positive values of ΔS illustrate the increase of disorder and randomness of the solid/solution interface, suggesting the irreversibility of the reaction. In this way, it is concluded that the modified canola with NaOH presents great potential for use in the removal of Pb²⁺ with increase of 2,6 times in the adsorption capacity, representing an excellent environmental and economic alternative for the removal of this toxic element from the environment. The use of these renewable adsorbents can contribute significantly in water treatment systems, besides being a new and important destination for canola agroindustry wastes, thus helping in the development of a sustainable society.

Keywords: modified adsorbents, toxic metals, contamination, sorption.

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