

Removal of lead ion from aqueous solutions by adsorption onto phosphate-functionalized treated waste papers (PF-TWPs)

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ABSTRACT

Waste papers, although known as a potential global concern, could be used as an adsorbent for removal of lead ions from the aqueous medium, following some degrees of modifications. The present study deals with the adsorption of Pb(II) ion from aqueous solution by using phosphate-functionalized treated waste papers (PF-TWPs). Batch adsorption study was performed based on contact time, pH, adsorbent dose, and temperature. There was logical coordination of experimental data with Freundlich and Langmuir isotherms. The results of this study showed that the percentage of Pb(II) adsorption on the PF-TWPs increased with increasing pH of approximately 5.5, higher or lower pHs showed no remarkable variation in adsorption capacity. The kinetics analysis showed a substantial correlation between the experimental adsorption data with the pseudo-second-order model. Besides, thermodynamic studies were conducted to explore the adsorption of Pb(II) onto PF-TWPs, regarding the influence of temperature on this process. The spontaneity and endothermicity of the Pb(II) adsorption process were identified based on the negative free energy value and positive enthalpy change. The result of the present study showed that the PF-TWPs could be used as a cost-effective adsorbent for Pb(II) removal from industrial effluent.

Keywords: Low-cost adsorbent; Lead(II); Waste papers; Adsorption isotherms and kinetics

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