

The Use of Thermally Modified Diatomite to Remove Lead Ions

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Abstract : To better understand the application of diatomite as an adsorbent for the removal of Pb²⁺ from heavy metal-contaminated water, in this paper, diatomite was used to adsorb Pb²⁺ from aqueous solution under various conditions. The intrinsic exchange properties were further improved by heating the raw diatomite with fluxing agent at different temperatures and modification with manganese oxides. It is evident that the mass of the adsorbed Pb²⁺ generally increases after thermal treatment and modification with manganese oxides. The adsorption characteristics of lead on diatomite were studied at pH range of 2.5-12. The favourable pH range was found to be 7.5-8.5. The thermodynamic parameters (i.e., ΔH° , ΔG° , ΔS°) were evaluated from the temperature dependent adsorption isotherms. The results indicated that the adsorption process of Pb²⁺ on diatomite was spontaneous, endothermic and physical in nature. The equilibrium data have been analyzed using Langmuir and Freundlich isotherm. The Langmuir isotherm was demonstrated to provide the best correlation for the adsorption of lead onto diatomite. The kinetics was studied using Pseudo- first and second-order model on the adsorption of lead onto diatomite. The results give best fit in second-order studies and it can be concluded that the adsorption of lead onto diatomite is second order reaction.

Keywords : thermally modified, diatomite, adsorption, lead

Conference Title : ICCBPE 2016 : International Conference on Chemical, Biochemical and Process Engineering

Conference Location : Singapore, Singapore

Conference Dates : January 07-08, 2016