

Heavy metal retention on modified montmorillonite

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The efficacy of un-calcined sodium exchanged (Na-MMT) and acid modified montmorillonite (A-MMT) has been investigated for adsorptive removal of heavy metals from aqueous solution. Physico-chemical parameters such as pH, initial metal ion concentration, and equilibrium contact time were studied in a series of batch adsorption experiments. The equilibrium time of contact for both adsorbents was about 230 min using Ni²⁺ as a representative of the heavy metal cationic species. The Redlich-Peterson model best described the equilibrium sorption of Ni²⁺ onto Na-MMT and the Dubinin-Radushkevich model was the best model in predicting the equilibrium sorption of Ni²⁺ onto A-MMT. The kinetics of Ni²⁺ uptake by Na-MMT and A-MMT followed the pseudo-second-order chemisorption mechanism. Sorption of Ni²⁺ onto Na-MMT and A-MMT was spontaneous and endothermic in nature. The desorption studies present the repeatability use of the spent adsorbents and in a real wastewater application, Na-MMT and A-MMT have adsorptive capabilities for effective removal of heavy metals in industrial effluents.