



Removal of iron and manganese from aqueous solution using some clay minerals collected from Saudi Arabia

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ABSTRACT

The existence of excessive concentrations of iron and manganese in water results in economic, technological and health problems. The adsorption characteristics of four clay minerals collected from different localities of Saudi Arabia, Osfan (OS1 and OS2) and Gholaa (GH1 and GH2), on the adsorption of Fe³⁺ and Mn⁷⁺ ions were investigated. The quantitative phase composition of the selected samples was calculated from their X-ray diffraction technique, while the chemical constitution was determined through X-ray fluorescence technique. The adsorption of Fe³⁺ onto different clays was complied with Langmuir isotherm ($R^2 = 0.9996, 0.9956, 0.9840$ and 0.9932 , respectively). OS1 and OS2 ($Q_{\max} = 6.872$ and 8.258 ; $1/b = 0.315$ and 0.296 , respectively) have higher adsorption capacity than GH1 and GH2 ($Q_{\max} = 2.109$ and 3.457 ; $1/b = 0.596$ and 0.465 , respectively). The adsorption of Fe³⁺ onto OS1, OS2, GH1 and GH2 clay minerals cannot be described by Freundlich isotherm model where $R^2 = 0.831, 0.92, 0.70$ and 0.52 , respectively. The mean adsorption energy recorded indicates that the sorption process is physisorption.

Keywords: Natural minerals; Adsorption; Heavy metals; Freundlich; Langmuir; Sorption capacity; Water treatment

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