Comparative evaluation of nitrate adsorption from aqueous solutions using green and red local montmorillonite adsorbents

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ABSTRACT

Nitrate has been identified as a major pollutant in water resources. In this study, two new adsorbents, namely, red local montmorillonite (RLM) and green local montmorillonite (GLM)were used as adsorbents, and their characteristics and performance in nitrate adsorption has been investigated. The most important factors in the adsorption process such as initial pH, adsorbent dosage, contact time and initial concentration of nitrate were investigated. Also, EDAX, BET, SEM and FTIR techniques were used to determine adsorbent characteristics. The results showed that the highest nitrate adsorption for both adsorbents obtained at low pH values,and removal efficiency increased by increasing the dosage and contact time and decreased by increasing the initial concentration of nitrate. EDAX technique showed that the amount of MgO in GLM and RLM were 2.6% and 1.4% respectively, indicating a double amount of MgO in GLM structure. MgO can have a very important role in nitrate adsorption but BET technique showed that the specific surface area of RLM is more than GLM. Overall results showed that the adsorption capacities of GLM and RLM were relatively high and the values were 89.2 and 87.7 mg/g, respectively. High adsorption capacity can nominate two new adsorbents for nitrate adsorption. Adsorption process followed the Langmuir isotherm and the experimental data followed the pseudo second-order kinetic. Also, the results of thermodynamic experiments showed that the adsorbing reaction for both adsorbents was exothermic and they occurred spontaneously.

Keywords: Adsorption; Water; Montmorillonite; Nitrate

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