

Sorption Characteristic of Uranium onto Mullite

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Mullite is researched and used widely in electronic, optical, and high-temperature structural applications[1]. Radionuclide migration, such as the migration of uranium, is an ongoing concern in environmental research[2]. In this paper, the effect of pH, adsorbent dosage, contact time and initial U(VI) concentration on U(VI) sorption onto mullite was investigated using batch techniques. The thermodynamic investigation shows information about inherent energetic changes connected with sorption[3]. The values of ΔS and ΔH can be obtained from intercept of the linear plot of $\ln K_d$ versus $1/T$ and the slope. Analyzing the experimental data at different temperatures with variation of initial concentration of U(VI), the thermodynamic parameters can be calculated.

The results show that the values of ΔH and ΔS under the experimental conditions are positive, and the values of ΔG are negative. This indicated that the sorption is an endothermic and spontaneous nature of sorption process. The adsorption isotherm, adsorption kinetics and thermodynamic characteristics also were investigated. Freundlich isotherm model can describe the sorption data well, suggesting that the sorption of U(VI) onto mullite is probably the multilayer sorption process. The E value obtained from D-R model was 12.91, suggesting that the type of U(VI) sorption onto mullite is chemical process. The pseudo-second-order model can describe the sorption kinetics of U(VI) sorption onto mullite successfully, indicating the adsorption rate is mainly controlled by chemical adsorption.

Results achieved from this study are expected to help understand the migration of uranium in silicate minerals better.

References

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