Sorption behavior of Np(V) onto different clays

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Bentonite was found to be a promising candidate for backfill material for nuclear waste repository due to its favorable chemical and physical properties under deep geological conditions with efficient radionuclide retention capacity. The sorption onto clay minerals plays an important role in immobilization/retention of radionuclides. The long term safety assessment of the future repository and the model of migration of radionuclides in the geosphere require a thorough knowledge of the sorption processes of actinides in the presence of different clay minerals under various physical and chemical conditions. At the same time natural clays often contain different admixture (calcite, iron and titanium oxide and others) that can influence on sorption process.

In this work sorption behavior of Np(V) onto suspended bentonite samples of different origin under varying experimental conditions of pH, time and ionic strength was studied. Various techniques, e.g. XRD, XRF, BET absorption, Mossbauer etc. were used to characterize clay minerals. Efforts have also been made to identify the role of different accessory minerals in the composite of clays which are responsible for Np(V) sorption. Thermodynamic modeling and speciation calculations for different species have been done for better understanding of experimental results.

Dependence of Np(V) sorption on pH, time and ionic strength was established. Alpha-track analysis was used for determination of local distribution of neptunium on clay. Speciation of Np(V) onto studied clays were found using X-ray absorption spectrometry.

Experimental data of Np(V) sorption onto studied clays samples were compared with simulated sorption curves using PHREEQC software and available in literature equilibrium constants. It was found that presence of iron and titania mineral strongly affects onto Np(V) sorption.

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