

Study of uranium sorption by bentonite.

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The concept of geological disposal in Ukraine is similar to that considered in other countries, being based on a system of multiple barriers consisting of the geological environment and the EBS. Bentonite clays are considered an important component for EBS due to properties: a marked swelling and the high sorption characteristics. Since uranium is an important nuclide in the radioactive waste management, the prediction of its sorption behavior is one of the major tasks in safety assessments. The aim of this study is to analyze the differences in sorption behavior of uranium onto bentonite clays.

Uranium sorption was studied on bentonite clay from Cherkasy deposit of bentonite and *palygorscite* clays (Ukraine). Sorption investigation was carried under medium pH equal 2.0 and 8.0 and ionic force of disperse medium $\text{Ca}(\text{ClO}_4)_2 - 10^{-3} \div 10^{-1}$ M/l, and under uranium concentration up to 10^{-4} M/l.

Analysis of obtained sorption isotherms showed that under uranium concentration in the equilibrium solution below 10^{-5} M/l its sorption by bentonite has linear character and can be described by Freundlich isotherm. But under higher concentrations uranium sorption sharply increases and cannot be further described neither Freundlich equation nor *Langmore* one.

Tacking into account, that in electrolyte solution negatively charged clay particles have double electrical layer, analogous to liophobic colloids, we suppose that sorption of uranium on bentonite clay in electrolyte-containing medium and under low uranium concentrations (up to 10^{-5} M/l) is determined by processes of nucleophilic exchange of positively charged uranium ions with ions of clay particle diffuse layer. When the uranium concentration in disperse medium is higher than 10^{-5} M/l, increased uranium sorption by clay is determined, possibly, by partial changes in structure and composition of clay particle anti-ion layer due to introduction in this layer of positively charged uranium complexes. In this case uranium-clay bonding occurs not only due to electrovalence interaction of positively charged uranium ions with negatively charged centers, which are located on the surface of clay particles, but also due to formation of complex coordination bonds between uranium and active centers of clay matrix.