



Specific sorption of radionuclides on the different mineral phases of crystalline rocks

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A final stage in the high level wastes (HLW) management is their deep geological disposal. The area called the “Eniseysky area” has been chosen as a proposed site for HLW final repository in Russia. This area is located in the exocontact zone of Nizhnekansky granitoid massif. Determination of sorption properties of the crystalline host rocks towards long-lived radionuclides is essential for the long-term safety assessment of future HLW repository. In this work we have investigated sorption properties of five rock samples drilled in the “Eniseysky” area in the range of depth 166 m – 477 m towards Cs(I), Ra(II), Am(III), Pu(IV), Np(V) and U(VI). Spatial distribution of sorbed radionuclides was analyzed using digital radiography (Cyclone Phosphor Storage system, PerkinElmer, with Imaging Plates) and minerals responsible for predominant radionuclides sorption were identified by SEM-EDX (Jeol JSM-6480LV with INCA Energy-350).

Contribution of different minerals in sorption of radionuclides was estimated quantitatively using OptiQuant software. We have developed an algorithm to determine the specific sorption properties of individual mineral phases towards radionuclides based on the combination of the digital radiography data and SEM-EDX analysis. The specific sorption efficiency (SSE) was determined by calculation of the fraction of sorbed radionuclide related to the selected mineral phase and the surface of this mineral phase. This rather simple approach can be used for estimation of the sorption properties of different rock samples using only their mineral composition.

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