Tc(VII) IMMOBILIZATION ON GRANITIC ROCKS FROM ÄSPÖ (SWEDEN) AND NIZHNEKANSKY MASSIF (RUSSIA)

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Technetium-99 is one of the main long-lived component of spent nuclear fuel (SNF) with a half-life of $2.14 \cdot 10^5$years and a fission yield of *ca.* 6%, which possesses high mobility under oxidizing and low solubility under reducing conditions. Information on Tc behaviour under conditions similar to the host rocks media around underground nuclear waste repositories is necessary for disposal design.

Crystalline rock materials from two different sites are investigated within this work. The 1st material was obtained from Äspö Hard Rock Laboratory (HRL) during the European project CROCK. It is a generic underground research laboratory (URL) for inter alia in-situ studies of processes in crystalline formations concerning deep geological disposal of spent nuclear fuel. Drilling of the cores were performed under anoxic conditions to preserve natural underground conditions. Part of Äspö diorite (ÄD) was artificially oxidized to compare with original sample. The 2nd type of rock materials is from the Nyzhnekansky (NK) granitoid massif, the prospective site of nuclear waste and SNF final geological disposal. This sample was drilled without special precautions and it is partially oxidized.

It was found, that Tc(VII) immobilization on the crystalline rocks is strongly dependent on sample preservation conditions – sorption values on ÄD are approx. 2 times higher for unoxidized material in comparison with oxidized one. This results can be explained by Tc(VII) reduction to the insoluble Tc(IV) oxide by the ferrous iron pool available in the ÄD. Tc(VII) reduction was proved by XPS and XANES analyses of granite surface after sorption. R_s values for the both oxidized ÄD and NK materials are almost similar. Formation of the colloidal phase was not detected under groundwater conditions used.

Migration study is performed on the unoxidized ÄD core with natural fracture. Injections of HTO and ^{36}Cl show long tailing due to channeling and absence of anion exclusion. Tc migration is investigated using ^{95m}Tc isotope with concentration of ~ 10^{-11} M. Tc recovery is inversely dependent on residence time in agreement with batch sorption studies, but long contact time requires stop-flow experiments, which are being performed now.