



## **Uptake of selenate by degraded cement**

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The interaction of radionuclides with concrete and cement phases is an issue of major interest in waste management since these materials are key barriers for both, ILW and HLW disposal concepts.

In this paper, we will present a case study focused on the uptake of selenium species by

1. degraded cement in contact with aged cement pore water, and
2. by hardened cement paste (HCP)

Preliminary kinetic experiments indicate that relatively long times ( $>15$  days) are necessary to reach sorption equilibrium between selenium and degraded cement. Rd values have been obtained from batch experiments under constant  $[Se]_0$  and increasing S/L, as well as under constant S/L and increasing  $[Se]_0$ .

According to the literature, different approaches have been considered to explain the observed results and will be presented in the talk: sorption isotherms, simple surface complexation models based on non-specific interactions selenium–cement surface, or sulphate-selenate exchange in the ettringite phases of the cement. This work explains the observed experimental results by means of one ion-exchange model although possible solid-solution formation with Aft solid phases will be considered in further steps.

In addition to the batch experiments, a dynamic experiment has been performed in a continuous flow-through system with a column packed with degraded cement. Selenium presents a considerable retardation with respect to the tracer, as a result of its sorption onto the cement phases. The distribution ratios calculated from dynamic experiments are similar to those previously calculated from batch experiments at short contact times.