

VESPA II project: Behavior of long-lived fission and activation products in the near-field of a repository for nuclear waste and possibilities of their retention

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The German project VESPA II (www.vespa2.grs.de) aims at studying the chemical properties of fission (FPs) and activation products (APs), ¹³⁷Cs, ¹²⁹I, ⁹⁹Tc, and ⁷⁹Se, as well as their transport behavior under conditions of near-field of a nuclear waste repository. This knowledge is mandatory for a safe and reliable long-term assessment of high-level radioactive waste disposal avoiding conservative assumptions.

The work performed within VESPA II provides for the necessary links between important aspects of the management of FPs and APs in deep geological repositories. In particular, we investigate: (1) the source term, evaluating e.g. ¹²⁹I inventory together with the instant release fraction and its speciation; (2) the effect of geochemical conditions in the near-field, i.e. T, p, Eh and pH, on the processes of surface redox-mediation and secondary mineral phases formation; (3) the solution chemistry, determining stable solubility products, complex formation and activity coefficients of Tc(IV) in presence of anions, Tc(VII) in presence of cations, Se(-II) under acidic conditions and Se(IV), Se(0), Cs(I), I(-I) at elevated temperature; and (4) the retention behavior of I, Se and Tc on layered double hydroxides (LDH), Fe-corrosion phases and on calcite. Finally, safety analysis calculations will link obtained results and provide for an improved confidence in the risk assessment predictions.

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