

## **Determining the speciation of radionuclides of high-level radioactive waste using different geochemical codes**

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The release and retention of radionuclides are depending on hydro- and geochemical processes in a repository for radioactive waste. These are simplified in long-term analyses for safety cases [1].

The source term for the release behaviour of radionuclides is based on the solubility limits of the chemical elements and does not consider always the specific oxidation state of the ion. A release rate depending on the radionuclide speciation of the source is considered rarely either.

Our aim is to improve the source term applied in long-term safety analysis. Therefore the speciation of radionuclides (actinides and fission products) from high-level radioactive waste in solution are calculated with the geochemical codes ChemApp and PHREEQC.

The geochemical simulations with ChemApp and PHREEQC will include the radionuclide speciation according to specific waste packages to improve the source term. Updated data for the waste packages will be used from german power companies. The geochemical simulations use the thermodynamic reference database THEREDA [2], which contains consistent thermodynamic data for radionuclides and is developed particularly to address geochemical problems in the field of the disposal of radioactive waste.

[1] Bracke & Fischer-Appelt (2015): Methodological approach to a safety analysis of radioactive waste disposal in rock salt: An example. *Prog. Nucl. Energy*, 84, 79-88. [2] Moog et al. (2015): Disposal of nuclear waste in host rock formations featuring high-saline solutions – Implementation of a thermodynamic reference database (THEREDA). *Applied Geochemistry*, 55, 72-84.