

Partitioning of fission products (Cs, Sr and I) into salt phases

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The Waste Isolation Pilot Project (WIPP) is a nuclear waste repository located in SE New Mexico, USA, and is situated in Permian-age evaporite deposits. Presently, the repository is hosting actinide-bearing waste and future disposal in similar sites may accept waste containing fission products (FPs). Should groundwater intrude such a repository and mobilize FPs, the transport of Cs, Sr and I may be limited by partitioning into salt phases, such as carnallite [KMgCl₃·6H₂O], langbeinite [K₂Mg₂(SO₄)₃], polyhalite [K₂Ca₂Mg(SO₄)₄·2H₂O], gypsum [CaSO₄·2H₂O], sylvite [KCl] and halite [NaCl]. We report experimentally determined partitioning of non-radioactive isotopes of Cs, Sr and I between salt phases and solution as a function of temperature and concentration of target elements.

Experiments will be carried out with well-characterized crystals at temperatures from 25 to 90°C. Saturated solutions will be allowed to evaporate and mineral growth commenced on “seed” crystals. Concentrations of Cs and Sr added to solution will be between 10 to 100 ppm and concentrations determined by ICP-MS. Solutions will also be doped with 100 to 500 ppm I and solution concentrations determined by UV/Vis methods. Concentrations of Cs, Sr and I in overgrowths on seed crystals will be determined by electron microprobe analysis (EMPA). In some cases, the concentrations of target elements may be too low to detect using EMPA, and additional analyses using secondary ion mass spectrometry (SIMS) will be sought.

Previous investigations [1] [2] have demonstrated the partitioning of Cs and other elements into salt phases and our work will be discussed in light of these previous results.

[1] Schock & Puchelt (1971) *Geochim. Cosmochim. Acta* **35**, 307-317. [2] Schock (1966) *Contrib. Mineral. and Petrol.* **13**, 161-180.