The effects of colloidal silica based grouts on Sr and Cs speciation

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During Australia's short-lived nuclear energy research program, radioactive wastes were disposed of (1960 – 1968) in unlined trenches in low permeability clays at the Little Forest Legacy Site (LFLS, in New South Wales, Australia). These trenches contain complex wastes, including radioactive contaminants, steel, plastics and organic materials (e.g. clothing and paper), and soil materials from the backfill [1]. Contaminants identified in historical records include: relatively short-lived fission products (e.g. Sr-90, Cs-137), long-lived actinides (e.g. Pu, U and Th), and non-radioactive, toxic elements (e.g. Be) [1]. At the LFLS in the soil, groundwater and surface runoff, low levels of radioactivity (e.g. from Tritium, Cs, Sr, Pu) have been detected [2, 3]; thus a long-term management strategy is required. Due to the possibility of spreading contaminants during excavation of the waste trenches prior to reconditioning for further disposal, in-situ immobilization of radioactive toxic wastes is being considered. Several options have been proposed for the in-situ immobilizion of radioactive wastes, including encapsulating the wastes in colloidal silica grout [4]. Because of its low viscosity, non-toxic property, and high control over the gelling time (through varying accelerant (e.g. KCl, NaCl, $CaCl_2$) and concentration [5]) colloidal silica appears suitable for in-situ waste encapsulation [5]. The main drawback is that after gelling ~33% is solid and the rest is interstitial water (including elevated accelerant concentrations) through which radionuclides could potentially diffuse. We will present results on the interactions of radionuclides (Sr and Cs) with soil and waste materials and mixtures of these materials to represent the LFLS, including the effects of colloidal silica and different types of accelerant on these interactions.

References

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