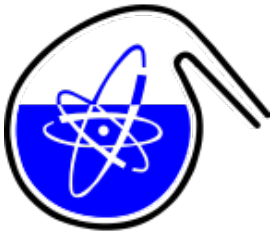

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Stability & Physico-Chemical Characterisation of Reconditioned Waste Form Relevant to Radioactive Wastes

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Stability & Physico-Chemical Characterisation of Reconditioned Waste Form Relevant to Radioactive Wastes
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Nuclear power plants use ion exchange resins to remove radioactive contaminants present in the process waters. At certain intervals, spent ion exchange resins are replaced with fresh resin and the now active, spent resins are typically immobilized and disposed of. VTT, Finland, has developed a process to treat spent resins that significantly reduces the volume of resin to be disposed of and enables more efficient immobilization prior to disposal. Here, a tailored gasification process ashes the used resin and the residue is geopolymerized and prepared for storage. The geopolymerized resin residue will be stored in a Low and Intermediate Level Waste (LILW) disposal in a geological repository ~100 m below the surface in crystalline bedrock. During storage, the space surrounding the solidified waste packages will be backfilled with cement; and any passing waters will therefore be in equilibrium with this resulting in a high pH (~12), Ca rich solution which could act as a leachate potentially mobilizing the geopolymerized radionuclides.
In order to better comprehend radionuclide stability in the geopolymer, we conduct laboratory-scale leaching experiments relevant for Finnish LILW disposal. Aqueous analyses assess changes in solution geochemistry and the potential for colloid formation. Here, we follow the geochemical behaviour of key leachant and geopolymer components such as Ca, Al and Si; we also assess the potential for radionuclide mobilization using stable isotopes as analogues for radionuclides of interest (59Ni, 60Co and 137Cs). Following on-going short-term (30 & 90 day) and long-terms (1 & 2 year) leaching experiments we sacrifice samples to characterize waste element speciation within and across the leaching zone of the waste form.
As a result of these experiments, we expect to have a comprehensive understanding of this wasteform performance and ability to retain contaminant elements specifically targeting radioactive waste speciation in both short- & long-term behaviour. These data will demonstrate the reliability of the novel geopolymer and may be used to inform the safety case for the long-term storage of LILW.

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