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| Title | Method | Objective | Outcome |
| Testing repeatability of Sr separation from cement matrix using ASRS | Cement digest in 8 M HNO3 is partitioned into aliquots with Sr-88 and Sr-85 added to make individual aliquots up to 5 mL. Sr-resin is used to separate Sr from matrix. Column washed with 8 M HNO3 to remove matrix element. Waste stored to asses Sr breakthrough during loading and washing. Sr eluted with 0.05 M HNO3. Flow rate of 1 mL/min used. Each 1 mL of eluate taken and measured. Measurement of Sr completed using Gamma spec and ICPMS. | To plot elution curves for Sr separation from cement at 1 mL/min and to assess repeatability. | Showed good repeatability with peak elution occurring at 8-9 mL and entire elution curve occurring 5-14 mL. Recoverys of ~100% achieved. |
| Testing flow rate changes on Sr separation | Cement digest partitioned as above, with Sr standards added. Column loading and washing steps kept at 1 mL/min, elution step completed at 1 mL/min intervals from 1 mL/min to 6 mL/min. All reagent concs kept the same at above. 1 mL increments of eluate kept to produce elution curves. Measurement on gamma and ICPMS.  Create 1 blank sample to assess isotope fractionation at different flow rates. | To establish prime flow rates for elution of Sr from Sr resin | Only 2 mL/min achieved on normal columns. 2 mL/min elution showed very similar elution curve to 1 mL/min, with peak elution at 7 mL and all Sr eluted by 12 mL. Flow rate tests to be completed on new kinesis columns as they will be able to facilitate the higher flow rates without leakages |
| Testing concrete mass changes on Sr separation efficiency | Cement digest partitioned into aliquots of varying cement concentration (diluted with 8 M HNO3) and have stable and active Sr added. Prime elution flow rate utilised and 1 mL increments of eluate kept for analysis. | To establish how Sr separation efficiency changes with increasing cement mass. | CaO present in 39% of the concrete (due to WDXRF analysis).  Sr-90 to be used as mass of Sr-85 is low and detection limits are close to values measured in samples |
| Testing load and washing stage at higher flow rate | Cement digest partitioned as above, with Sr standards added. Column loading and washing steps 1 mL/min intervals from 1 mL/min to 6 mL/min. Elution step completed at 1 mL/min intervals from 1 mL/min to 6 mL/min. All reagent concs kept the same at above. 1 mL increments of eluate kept to produce elution curves. Measurement on gamma and ICPMS.  Create 1 blank sample to assess isotope fractionation at different flow rates. | To establish whether higher flow rate of loading and wash stages induce breakthrough of Sr before elution steps |  |
| Radionuclide Interference testing at higher flow rates | Using a multiple element solution to mimic radionuclides present in nuclear waste (eg. Ag, Al, Ba, Ca, Cd, Ce, Cr, Cu, Eu, Fe, La, Mg, Mn, Mo, Na, Nd, Ni, Pd, Pr, Rh, Ru, Sm, Y, and Zr) and known Sr tracer to measure recoveries. | To establish whether the separation was affected by the presence of elements likely to be present in the types of solution produced during the process of waste characterisation. |  |
| Competition for space on Sr resin active sites | Adding increasing amounts of Pb until Sr separation efficiency is negatively affected. Pb2+ is the only ion with the correct coordination number that could compete for Sr resin active site due to its similar size. | To establish the maximum concentration of Pb that the system can cope with and the ideal flow rate for Sr separation. This Pb concentration could be established in the concrete by using WDXRF analysis before digestion and separation.  The only interference likely to be present that could impact the separation efficiency would be Pb. The ionic radii of the other elements that may be present as nitrate compounds are Hg, which would be present as 2+ ion and Eu as the 3+ ion, neither of which are close to Sr’s ionic radius. The only other ion that is close is Ag and separation from Ag using Sr resin is around 99% (Horwitz et al 1991) |  |