

Enhancing Iodine retention in cementitious waste forms with silver getters

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One radionuclide of concern in nuclear waste is Iodine-129 (¹²⁹I), due to its long half-life ($1.57 \cdot 10^7$ years) and high environmental mobility upon disposal [1]. In addition, ¹²⁹I can be volatile in high-temperature immobilization processes (e.g., vitrification). A possible pathway for immobilisation of these type of wastes to avoid volatilisation is ambient-temperature formed materials such as cementitious waste forms (CWF). These materials generate low heat during hydration and can be tailored for certain properties through the addition of supplementary cementitious materials (SCM). I-129 can be encapsulate into some mineral phases formed in the CWF, dependent on its speciation [2, 3]. However, other species of I may not incorporate into the CWF mineral phases and the addition of immobilising agents or “getters”, selectively binding the contaminant (e.g. I), may be required for improved binding [4, 5].

This work focuses on the behaviour of I-129 within two CWFs candidates (a fly ash (FA) containing formulation known as Cast Stone (CS) and a neutral salt activated slag geopolymer (GP) [6]) to liquid I-containing wastes in the presence of silver containing getters. Leach tests according to EPA 1315 standard highlight the efficiency of silver getters to immobilise I-129, even at alkaline pH and coupled with materials characterization point to the controlling mechanisms of the getter within the CWF.

References

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