



Contribution ID : 25

Type : **Oral Presentation**

Towards understanding the dissolution of vitrified nuclear waste in a cementitious geological disposal facility

Tuesday, 31 October 2017 11:00 (30)

Under the generic scenario envisaged for the geological disposal of vitrified UK high- and intermediate-level waste glass (HLW and ILW, respectively), high pH environments, formed through degradation of the cementitious engineered barrier, are expected to dominate the ground water chemistry thousands of years into the future. We highlight the main findings of a number of recent and ongoing studies that aim to evaluate and understand how cementitious groundwater compositions influence the dissolution rate of vitrified wasteforms, including: simulant UK HLW; the International Simple Glass; natural basaltic glass and glasses designed for ILW. Briefly, we discuss results detailing the mechanisms of alteration layer formation in Ca-rich systems; we describe the influence of idealised cement leachate solutions on ion-exchange processes during the initial stages of dissolution; and we review the application of single-pass flow-through methods to derive the fundamental parameters necessary to model the dissolution kinetics of vitrified waste.

Summary

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Session Classification : Glass Wasteforms

Track Classification : National and international collaborative waste management programs