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EFFECT OF CLAYEY GROUNDWATER ON THE DISSOLUTION RATE OF SON68 SIMULATED NUCLEAR WASTE GLASS AT 70 °C

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Abstract

To predict the long-term behavior of high-level radioactive waste glass, it is necessary to study aqueous dissolution of the glass matrix under geological repository conditions. The present article focuses on SON68 (an inactive surrogate of the R7T7 glass) glass alteration in synthetic clayey groundwater at 70 °C. Experiments in deionized water as reference were also performed in the same conditions. Results are in agreement with those of previous studies showing that magnesium present in the solution is responsible for higher glass alteration. This effect is transient and pH-dependent: Once all the magnesium is consumed, the glass alteration rate diminishes. Precipitation of magnesium silicate of the smectite group seems to be the main factor for the increased glass alteration. A pH threshold of 7.5 – 7.8 was found, above which precipitation of these magnesium silicates at 70 °C is possible. TEM observations reveal that magnesium silicates grow at the expense of the passivating gel, which partly dissolves, forming large pores which increase mass transfer between the reacting glass surface and the bulk solution.