



Silicate Glass Corrosion Mechanism revisited

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Understanding the mechanism(s) of aqueous corrosion of nuclear waste borosilicate glasses is essential to predict their long-term aqueous durability in a geologic repository. Several observations have been made with compositionally different silicate glasses that cannot be explained by any of the established glass corrosion models. These models are based on diffusion-controlled ion exchange and subsequent structural reorganisation of a leached, hydrated residual glass, leaving behind a so-called gel layer. In fact, the common observation of lamellar to more complex pattern formation observed in experiment and nature, the porous structure of the corrosion layer, an atomically sharp boundary between the corrosion zone and the underlying pristine glass, as well as results of novel isotope tracer and in situ, real time experiments rather support an interface-coupled glass dissolution-silica reprecipitation model. In this model, the congruent dissolution of the glass is coupled in space and time to the precipitation and growth of amorphous silica at an inwardly moving reaction front. We suggest that these coupled processes have to be considered to realistically model the long-term performance of silicate glasses in aqueous environments.