

## **Assessing FES Density and Dissolution-independent Nitrate Desorption in Hyperalkaline Weathered Hanford Sediment**

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The Department of Energy's Hanford Site poses the largest environmental cleanup project in the U.S. due to the complexity and extent of radioactive contamination. A main thrust in evaluating potential remediation solutions is the development of accurate reactive-transport models. Existing models that have been applied to the Hanford Site contamination do not adequately address the impact of *de novo* mineral formation generated by contact of the hyperalkaline (pH >13) waste with sediments in the "near field" (close to the contaminant source). These minerals, such as NO<sub>3</sub>-feldspathoids, are known to sequester Cs and Sr and could serve as a potential long-term dissolution source should they ever be exposed to less alkaline pore waters. Thus, both mineral dissolution and ion exchange dynamics must be considered to accurately forecast the stability of waste-impacted sediments. The overall goal of my research is to use experimental methods to understand the mechanism of Cs desorption from hyperalkaline weathered Hanford sediments. Specifically, this involves: (1) conducting a very long-term (three month) leaching to determine if Cs desorption from the NO<sub>3</sub>-feldspathoids can occur without feldspathoids dissolution; and (2) directly measuring the number (or density) of frayed-edge sites (FES) available for Cs sorption using multiple methods. Our results show that Cs can be released from the feldspathoids without any mineral dissolution and that the deKoning et al (2007) method likely overpredicts FES density. Future work aims to further constrain the FES density on all reacted sediments using column-based experiments and transmission electron microscopy.

### **References**

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- Kogure T. and Murakami T. (1996) Direct identification of biotite/vermiculite layers in hydrobiotite using high-resolution TEM. *Mineralogical Journal* 18, 131-137.
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