

***In situ* U ReflEXAFS from single crystal mineral surfaces**

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Understanding radionuclide-mineral interactions is important in management of the nuclear legacy and in the safety case for a geological disposal facility where predictions of radionuclide behaviour are needed over decades to hundreds of thousands of years. In natural and engineered environments, radionuclide transport paths will depend on the interaction between radionuclide species in solution such as (UO₂²⁺)_{aq} and the surfaces present.

Achieving a mechanistic understanding of these surface interactions allows non-equilibrium and kinetic considerations to be taken into account and takes us beyond a simple partition (K_D) approach to these systems such that model predictions are underpinned. Bulk EXAFS provides information on adsorbates, but gives an average and usually static picture. To achieve a better understanding of the evolution of the system, a dynamic approach, which isolates the surface species on a particular crystal face, is often required. We have developed *in situ* fluorescence ReflEXAFS set-up on the I18 beamline at the Diamond Light Source as part of the EPSRC/NDA sponsored AMASS consortium. To date we have been able to monitor uranium and stable strontium surface sorption from a flowing solution on to a single crystal surface over a period of a few hours. The supernatant solution can then be rinsed out and the surface radionuclide species identified by XAFS.

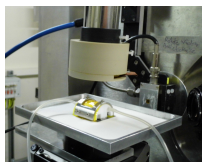


Figure 1. Photograph of the *in situ* cell on I18

In our initial active material experiments we have studied the sorption of uranyl species under nuclear legacy relevant conditions on to representative crystals. These are model surfaces for the iron- and magnesium-oxide components of the system. At concentrations in solution below saturation we see the formation of uranyl carbonate species indicating that these surfaces enhance the precipitation of uranium under these conditions.