Geophysical Research Abstracts,
Vol. 11, EGU2009-5548, 2009
EGU General Assembly 2009

Using focused hard X-rays for investigations of nuclear waste repository analogs

M.A. Denecke

Forschungszentrum Karlsruhe, Institut für Nukleare Entsorgung, Karlsruhe, Germany (melissa.denecke@ine.fzk.de, +49-7247-823927)

Micro-focused synchrotron radiation techniques to investigate determinant processes in actinide element transport in geological media are becoming an increasingly used tool in nuclear waste disposal research. There are a number of reasons for this but primarily they are driven by the need to characterize radionuclide speciation localized in components of heterogeneous natural systems. The advantage of using X-rays is that in situ investigations are possible, due to elimination of a vacuum requirement, no need for invasive sample preparation, and the high penetration capability of X-rays. The ultimate goal of such studies is to advance development of reliable predictive models for radionuclide transport processes at varying spatial and temporal scales, with a reliable estimate of uncertainty. This information is necessary for designing safe nuclear disposal concepts by assessing potential hazards associated with any radioactive contamination release.

Examples using μ-XRF, μ-XAFS, and μ-XRD, partly in confocal geometry, to characterize what are referred to as natural analogs, in this case clayey sediments rich in uranium [1-4], will be presented. Natural analogs are considered to mimic repository geochemical and geological conditions on a geological time scale and knowledge gained from their study can be used to span the long time scales in a top down approach for predicting repository radiological safety.

[1] M.A. Denecke, W. De Nolf, K. Janssens, B. Brendebach, A. Rothkirch, G. Falkenberg, U. Noseck, Spectrochim. Acta B 63, 484-492 (2008).

[2] M.A. Denecke, A. Somogyi, K. Janssens, R. Simon, K. Dardenne, U. Noseck, Microscopy Microanal. 13(3), 165-172 (2007).

[3] M.A. Denecke, K. Janssens, K. Proost, J. Rothe, U. Noseck, Environ. Sci. Technol. 39(7), 2049-2058 (2005).

[4] P. Michel, M.A. Denecke, T. Schäfer, B. Brendebach, K. Dardenne, J. Rothe, T. Vitova, F. Huber, K. Rickers, M. Elie, G. Buckau, Proceedings to the 5th Nuclear Energy Agency (NEA) Workshop on Speciation, Techniques, and Facilities for Radioactive Materials at Synchrotron Light Sources (Actinide-XAS-2008), Soleil, France.