Forschungszentrum Karlsruhe
in der Helmholtz-Gemeinschaft

[1]Forschungszentrum Karlsruhe GmbH, Institut für Nukleare Entsorgung,
Postfach 36 40, 76021 Karlsruhe; [2]Forschungszentrum Rossendorf, Institut für Radiochemie, P.O. Box 510119, D-01314 Dresden, Germany; ROBL-CRG, European Synchroton Radiation Facility, BP 220, F-38043, Grenoble, France

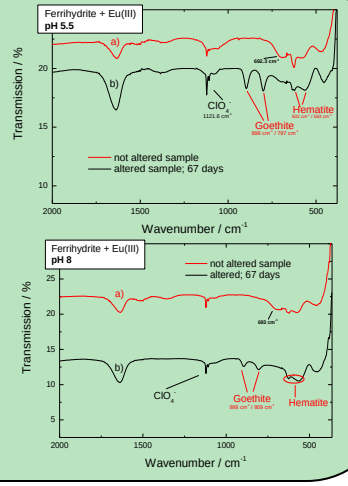
S. Stumpf[1]; Th. Stumpf[1]; Th. Fanghänel[1]; K. Dardenne[1]; C. Hennig[2]; R. Klenze[1]

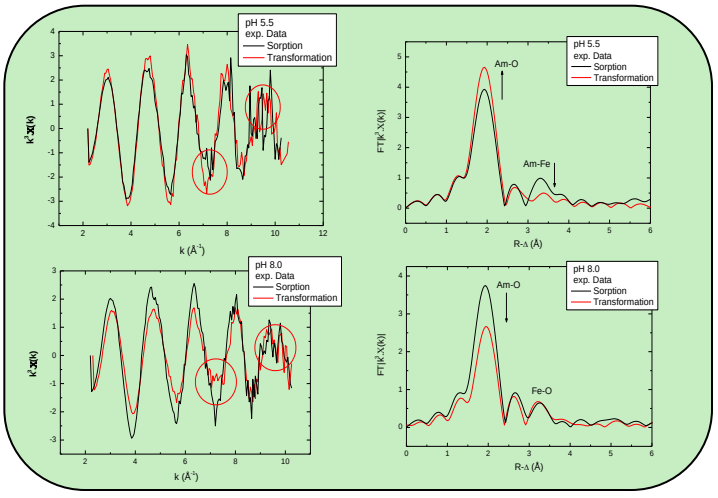
Sorption of Am(III) onto 6-line-Ferrihydrite and its Alteration Products: Investigations by EXAFS

Introduction

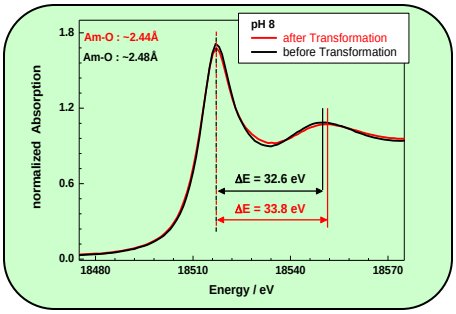
For the long-term performance assessment of nuclear waste repositories, knowledge concerning the interactions of actinide ions with mineral surfaces is imperative. The mobility of released radionuclides is strongly dependent on the sorption/desorption processes at mineral surfaces [1] and their incorporation into the mineral frame [3]. Hydrous iron oxides (ferrihydrite) are globally of great importance in the environment.
Upon heating pure ferrihydrite converts to crystalline goethite and hematite [4]. In the presence of di- or trivalent metal ions the transformation is affected leading to the promotion of one crystal formation over the other and incorporation of these ions [5,6]. This Study deals with the question if released Am(III) can be immobilized by sorption onto 6-line-ferrihydrite. Moreover it is studied what happens if ferrihydrite transforms to a more crystalline phase.

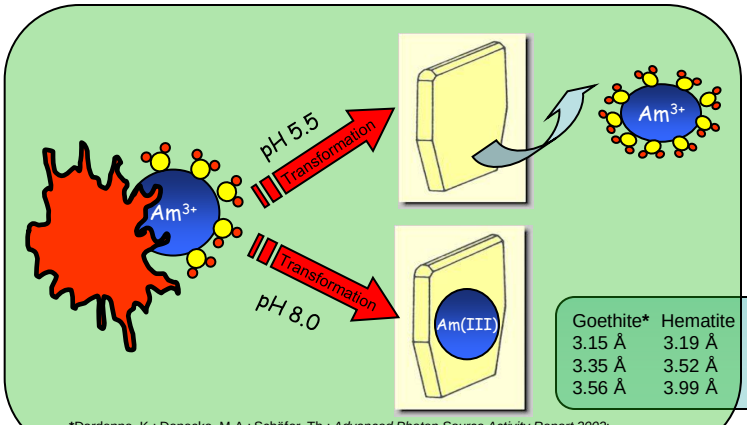
TRANSFORMATION





Sample	Shell	R [Å][a]	N[b]	σ^2 [Å^2][c]	ΔE_0 [eV][d,e]
Am/Ferrihydrite pH 5.5	Am-O	2.480(5)	6.3(9)	0.0084	-2.73[d]
	Am-Fe	3.70(2)	1.0*	0.0046	5.47[e]
Am/Ferrihydrite pH 8	Am-O	2.478(3)	6.1(5)	0.0086	-2.73[d]
	Am-Fe	3.69(2)	1.0*	0.0112	5.47[e]
Am/Goethite pH 5.5 transformed	Am-O Am-Fe	2.478(3) 3.75(3)	7.2(6) 0.3(1)	0.0079 0.0020*	-2.73[d] 5.47[e]
Am/Goethite pH 8 transformed	Am-O Am-Fe Am-Fe	2.466(4) 3.59(1) 3.32(1)	4.1(4) 4.4(8) 1.4(3)	0.0081 0.0200* 0.0108	-2.73[d] 2.28 2.28





Goethite*	Hematite	exp. Data
3.15 Å	3.19 Å	
3.35 Å	3.52 Å	3.32 Å
3.56 Å	3.99 Å	3.59 Å

*Dardenne, K.; Denecke, M.A.; Schäfer, Th.; *Advanced Photon Source Activity Report 2002*; ANL-03/21; December 2003

REFERENCES
[1] Stumpf, Th.; Bauer, A.; Coppin, F.; Kim, J. I. *Environ. Sci. Technol.* 2001, *35*, 3691-3694
[2] Spalding, B.P. *Environ. Sci. Technol.* 2001, *35*, 4327-4333
[4] Schwertmann, U.; Friedl, J.; Stanjek, H. *J. Colloid Interface Sci.* 1999, *209*, 215-223
[5] Lewis, D.G.; Schwertmann, U. *Clays and Clay Minerals* 1979, *27/3*, 195-200
[6] Schwertmann, U.; Schulze, D.G. *Clays and Clay Minerals*, 2000, *48/2*, 159-172

 silvia.stumpf@ine.fzk.de