REDUPP NEWSLETTER No. 4 May 2013

Latest News in Short

Second Annual Report available

The Second Annual Report of the REDUPP project is being printed as Posiva Working Report 2013-15, available at the Posiva web page: *www.posiva.fi*

Lectures #4 to #8

On May 7, in conjunction with the 2nd Annual Meeting, held in Sheffield (see overleaf) the REDUPP Lecture Series continued with five (!) lectures:

*Joaquin Cobos Sabaté, Ciemat: *Studies on spent fuel stability during repository conditions*

*Thomas Gouder, ITU: *Surface science investigations of spent fuel corrosion processes*

*Mark Read, University of Birmingham: *Computational modelling of the bulk and surface chemistry of nuclear fuel materials*

*Jonathan Icenhower, LBNL: *Determining glass dissolution rates using interferometry and the role of uncertainties associated with surface area*

*Thorsten Geisler, University of Bonn: *An alternative model for silicate glass corrosion*

The Lectures were attended by project members and ca 30 project-external people, mainly from the University of Sheffield.

General Progress

The project is now in the second reporting period. The milestones have been reached: Second Annual Meeting has been held, and interim results were presented. The Second Annual Meeting was held in Sheffield, UK, in May 2013. A short report from the meeting is given overleaf.

In October 2012, Lena and Neil represented the REDUPP project at the Lena Z Evins and Neil Hyatt EURADISS meeting, held in Montpellier. The Proceedings from this meeting is now available. The REDUPP project was also presented at The MRS meeting in Boston in November, with a presentation from Claire on results from WP2. In October this year, Lena and Neil will attend the EURADWASTE conference in Vilnius, Lithuania, to present REDUPP.

Since 2012, three papers have been published: Stennett et al, Journal of Nuclear Materials, Journal of Nuclear Materials 432 (2013) 182–188; Corkhill et al., Mater. Res. Soc. Symp. Proc. Vol. 1518, DOI: 1 1557/op 2013.90; Maldonado et al, J. Phys. Chem. C 2013, 117, 6639−6650. In addition, a project profile is published in the June issue of Science & Technology Pan European Networks.

See www.skb.se/REDUPP for more information on the project.

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Short report: The Second Annual Meeting, Sheffield, May 2013

The Second Annual Meeting of the REDUPP project, held in Sheffield, 8 May 2013 was attended by project participants, SAB, guests and lecturers associated with the project; in total 18 participants.

Kaija Ollila presented the latest results from the WP4 experiments with alpha-doped UO_2 in natural groundwater. Two different ground waters were presented, one brackish and one saline. Dissolution in brackish water has been going on for 250 days now, and the test with SA/V 12.5m^{-1} indicate a slightly higher dissolution rate for 10% alpha-doped UO2, than the rest of the samples. Preliminary results of the saline water do not show this increase. The reason for the slight increase is under discussion.

Emmi Myllykylä presented the progress concerning ThO_2 (WP 3) and in addition presented work by Tiina Lavonen (also VTT) on solubility and natural weathering of ThO_2. The pre-tests are finished and the current test series involve smaller fragments. The fragment size of 80-160 µm was achieved with the SelFrag method, which uses high voltage pulse power. This causes predominant fracturing along grain boundaries. The new test series are investigating the influence of fragment size, the leaching history of the samples, and effect of pH on solubility (using a Th-229 tracer).

José Godinho (Stockholm University) presented his work on surface effects on dissolution of CaF_2, this time with an emphasis on natural fluorite. Studies encompassed both long term studies (ca 4-5 months) and studies of the first minutes of dissolution, in a fluid cell AFM.

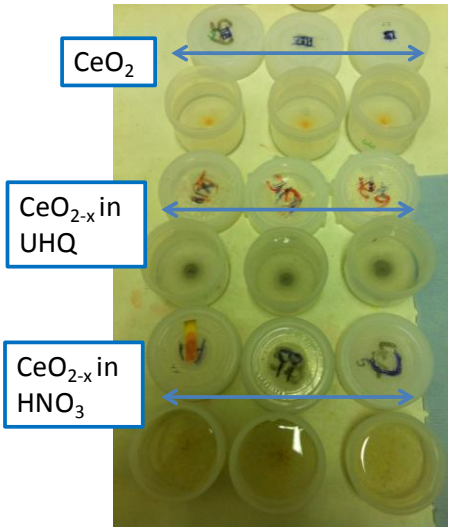

Figure 1. Dissolution set-up of non-stoichiometric CeO_{2-x}.

Claire Corkhill presented the work on CeO_2 dissolution (WP2) as well as post-test characterisation of the samples (WP5), where the experiments explored the following three aspects: CeO_2 particle dissolution, grain boundary and step-edge dissolution and effect of non-stoichiometry on the dissolution of CeO_2 (Fig. 1). It was observed that dissolution of CeO_{2-x} is 3 orders of magnitude greater than CeO_2, and that step edges in CeO_2 are similar to those found in UO_2. This triggers the question of a link between non-stoichiometry, step edge type and crystallographic orientation.

Pablo Maldonado presented *Ab initio* modelling of fluorite surfaces (WP 6). The recently published results were presented, together with ongoing work on water adsorption and dissociation on surfaces. *Ab initio* molecular dynamics (AIMD) has shown that the H_2O dissociation process on the CeO_2 surface is virtually barrierless, and the same has been found for UO_2. Adsorption at steps were shown to be favourable, and this was accompanied with a modification of the morphology.

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