

REDUPP NEWSLETTER No. 5 March 2014

Latest News in Short

REDUPP final open workshop

The final meeting with REDUPP has been held in Stockholm, Sweden, 18-21 February. See overleaf for a short report from the meeting. In conjunction with this meeting, which was arranged as an open conference, the 9th and final REDUPP lecture was given by Professor Rodney C. Ewing, Stanford University. The title of his much appreciated lecture was *"The Simplicity and Complexity of the Fluorite Structure"*.

Third and Final Report soon available

The Final Report of the REDUPP project is at the time of writing being prepared as a Posiva Working Report. It will soon be available both at www.skb.se/REDUPP and at www.posiva.fi

REDUPP at Euradwaste'13

In October 2013, the achievements of more than 20 Euratom FP7 research projects in the area of radioactive waste were presented at the Euradwaste conference. REDUPP was represented by Lena Z Evins and Neil C Hyatt. One oral presentation, giving an overview of our results, was given, and two posters were presented.

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

General Progress

This newsletter is the final one, since the REDUPP project is now being wrapped up and officially finished on March 31. The final conference was a success, and we are ready to submit the final deliverables in the coming days. So far, the REDUPP project has produced 6 peer-reviewed manuscripts, and two more are to be submitted to journals before the end of March. Our publication on fabrication of CeO₂ fuel analogues, Stennett et al., Journal of Nuclear Materials, 432 (2013) 182, was ranked in the top ten "hot articles", published in the Journal of Nuclear Materials in Oct-Dec 2013.

We initiated this project with two overall aims: 1) to reduce some remaining uncertainties regarding spent nuclear dissolution 2) to provide training opportunities for young researchers. Now, at the end of the project, we can observe that we have managed to fulfil these aims. The hypotheses posed have been tested, and results point toward effects of both surface characteristics and natural groundwaters on measured dissolution rates. In addition, three young researchers have been directly involved in the project, and a handful of additional early-career researchers and students have been assisting the work. The appreciated REDUPP Lecture Series brought training to project members as well as externally, providing opportunities also for outreach and collaboration.

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Short report: The REDUPP Final Meeting and Open Workshop, Stockholm, February 2014

The Third and Final Annual Meeting of the REDUPP project, held in Stockholm, 18-21 February 2014 was arranged as an open conference and attracted ca. 60 attendants. The theme of the conference was “Surface reactivity and dissolution of spent nuclear fuel materials”.

The conference started with an informal ice-breaker on Tuesday 18 February at the SKB office. One day of the conference was devoted to REDUPP, and the final results of the different work packages were presented. Sample preparation was presented by Martin Stennett (WP1). The CeO₂ dissolution studies (WP2), presented by Claire Corkhill indicated a quantifiable relationship between defect sites and dissolution rates. HR-ICP-MS data for ThO₂ and UO₂ dissolution tests were presented by Emmi Myllykylä and Kaija Ollila (WP3 & 4). These data show that fluid composition and surface characteristics (e.g. surface area) affects the solubility and dissolution rates of these materials. In WP5, presented by Emmi and Claire, post-dissolution characterisation has revealed the importance of grain boundaries, crystallographic orientation, and defects induced during sample preparation. Modelling work using Ab Initio Molecular Dynamics (WP6), described by Pablo Maldonado, has allowed the description of reactions between water and various UO₂ surfaces. With the use of atomistic thermodynamics, it can be concluded that dissociative chemisorption of water will always occur at room temperature and atmospheric pressure (see Fig 1.).

Rod Ewing (Stanford University) gave a lecture on the “Simplicity and Complexity of the Fluorite structure”.

It provided insight into the characteristics of a range of different materials studied in nuclear waste management. The day ended with the first part of a panel discussion (which was concluded on the final day).

The following two days were devoted to the open sessions on surface reactivity and dissolution. In addition to the Keynote speakers, Nicolas Dacheux (ICSM, Marcoule), Andreas Lüttge (MARUM, Bremen University) and Mats Jonsson (KTH), 21 presentations were given. The abstracts will be available as an Appendix to the Final REDUPP report. The subjects varied from dissolution of high-burnup nuclear fuel to the surface chemistry of metal oxides. It was a couple of very interesting days with good possibilities for discussion.

The conference dinner was held at Nalen in Stockholm city, a locality with a rich history in Swedish dancing and music, and for the particular room of the REDUPP dinner, boxing(!). Overall, all participants seemed content with the event, and pleased to have visited Stockholm and SKB. It was a good “Grand Finale” to the REDUPP project!

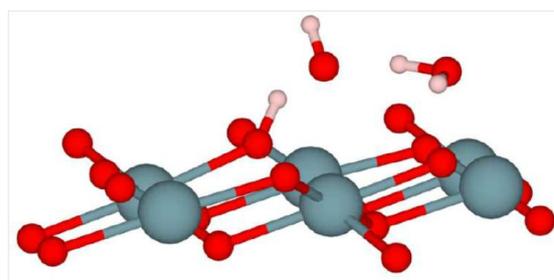


Figure 1. Molecular adsorption and dissociative adsorption of water on the UO₂ (111) surface. Modelled water coverage corresponds to 0.5 monolayers.

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