

## REDUPP NEWSLETTER No. 2 June 2012

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### **Latest News in Short**

#### **First Annual Meeting in Stockholm**

The REDUPP project held its first Annual meeting in Stockholm April 26-27 2012. It was attended by all project members and members of the Scientific Advisory Board. A short report is given in this newsletter (see overleaf).

#### **Lecture Series started**

In conjunction with the first Annual Meeting, the REDUPP lecture Series started with Virginia Oversby giving the first lecture entitled: "Spent fuel dissolution under repository conditions - why laboratory measurements always overestimate". The lecture was held at KTH in Stockholm and was attended by project members and 15 project-external people, of which 10 were PhD students.

#### **Sheffield - Japan collaboration**

Sheffield University has been awarded a grant from the Japan Society for the Promotion of Science, which has allowed Claire Corkhill to visit Kyushu University. A press release regarding this collaboration has resulted in the reporting of Sheffield-Japanese links in *The Star*, a Sheffield local newspaper. These international links are forged following a UK-Japan meeting where UK Prime Minister David Cameron announced an agreement to advance nuclear research collaboration.

### **General Progress**

Since the last newsletter, the first two Milestones have been reached: Samples are made and delivered, and the First Annual Meeting has taken place. The dissolution studies have started, and there is significant progress in the *ab initio* modelling work. The first workshop in September 2012 proved fruitful with regards to collaborations which has aided the progress.

The REDUPP project has been presented at the Spent Fuel Workshop (Avignon, April 2012), where Lena presented the REDUPP project as a whole and Kaija presented Work package 4 (UO<sub>2</sub> dissolution in natural groundwater). Pablo has presented the *ab initio* work at the E-MRS (Strasbourg, May 2012). Claire has been to Japan learning the micro-channel flow-through method and is planning to go to Goldschmidt (Montréal, June 2012) to present her work on CeO<sub>2</sub>. Emmi has visited CEA in Paris for a few days, learning more about HR-ICP-MS.

At the time of writing this, the first annual report is being printed, and the Sheffield group has submitted a paper on the preparation, characterisation and dissolution of cerium dioxide to Journal of Nuclear Materials.

See [www.skb.se/REDUPP](http://www.skb.se/REDUPP) for more information on the project.

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## Short report: The First Annual Meeting, Stockholm, April 2012

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The first annual meeting of the REDUPP project was attended by members of the REDUPP project group and Scientific Advisory Board, as well as a few external people including three students.

Martin Stennett (USFD) presented sample preparation and characterisation. The focus was on the work on CeO<sub>2</sub>: Cerium oxalate decomposition, XRD of decomposed oxalate, pellet formation and densification and effects of different temperatures. Surface characterisation involved SEM, EBSD and XAS.

Claire Corkhill and Dan Bailey (USFD) presented CeO<sub>2</sub> dissolution studies. Preliminary results from batch leach test of powders of CeO<sub>2</sub> indicate that the leach rate is temperature and pH dependant, as expected. At alkaline pH, the amount of material in solution appears to go down after ~40 days, indicating precipitation.

The dissolution tests of CeO<sub>2</sub> monolith samples show that the rate of dissolution is, apart from temperature, the rate is also affected by surface condition: Polished samples were compared with thermally annealed samples, and it could be concluded that polished samples are more prone to grain boundary dissolution (Figure 1).

Since ThO<sub>2</sub> is difficult to work with, Emmi Myllykylä (VTT) has performed some pre-tests designed to optimise the experimental conditions. These dissolution tests involve different SA/V ratios in two simplified synthetic groundwaters: one with and one without carbonate. Even though the data without carbonate was mainly below the achieved detection limit of the instrument ( $10^{-13}$  to  $10^{-12}$  mol/L), the data from solutions with

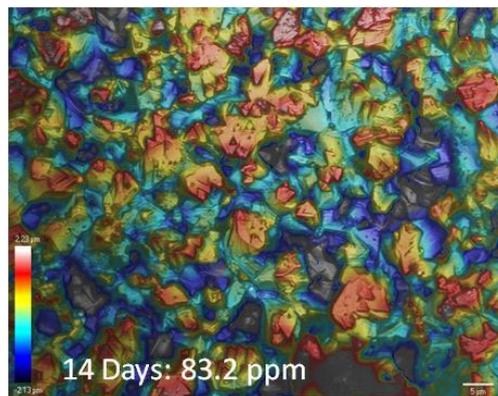


Figure 1. Optical Profilometry of polished CeO<sub>2</sub> monolith after 14 days at 150 °C in 2M HCl.

carbonate was measured more reliably and indicated a trend of increasing concentration with time.

Kaija Ollila (VTT) presented the first preliminary results from dissolution of alpha-doped UO<sub>2</sub> in the water samples from Olkiluoto. No difference between samples of different alpha-doping level is seen. Between ~30 and 70 days the concentration of <sup>238</sup>U in solution is ca  $3 \cdot 10^{-11}$  mol/L. The concentration of <sup>238</sup>U was calculated from isotope dilution and these results indicate that concentrations of <sup>238</sup>U are slowly rising with time.

The *ab initio* study on the CaF<sub>2</sub> and CeO<sub>2</sub> materials was presented by Pablo Maldonado (UU). The study in collaboration with José Godinho (Stockholm University) has revealed that any surface of the fluorite structure can be described using the information from two reference planes and a step. A linear relationship is found between all planes and their reference planes and this method can describe most surface steps with only reference planes.

The last part of the meeting was devoted to group discussions about collaborations and the goal of joint publications.

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