NUMBER 6

ReCosy News

Redox Phenomena Controlling Systems

Newsletter, November 2011

In this issue

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Introducing RECOSY

The Collaborative Project Redox Phenomena Controlling Systems (RECOSY) started in April 2008 and extends over 4 years. It falls within the EURATOM (European Atomic Energy Community) program and is implemented within the European Commission's 7th Framework Program. To this aim, the project set up a consortium of 32 Contractors and currently 6 Associated Groups. The consortium includes key European Research Institutes, Universities, National Waste Management Agencies and SMEs (small and medium enterprises) from 13 EURATOM signatory states, Russia, Japan, Korea, USA and one European Joint Research Centre.

There are topics and questions still not resolved within the redox phenomena controlling systems and where improved understanding can further contribute to acceptance of the Safety Case. From a top-down approach, the reliability of redox measurements for site characterization, redox disturbances by the near-field materials, changes induced by glaciation scenarios or the redox buffer capacity of host-rocks and the kinetics of response to redox perturbations are addressed. From a bottom-up approach, questions concerning the interpretation of mixed potentials, surface mediated reactions, redox states of actinides and long-lived fission products, the source term of spent nuclear fuel in the presence of corroding steel as well as the role of microbes and biofilms on the evolution of the redox state are tackled.

The key objectives of ReCosy are to provide (i) a better determination of the system redox conditions, (ii) understanding of relevant redox processes, and (iii) impact of these processes on the disposal Safety Case. For this purpose, scientific and technical objectives cover the understanding of redox buffer capacities, redox kinetics and the long-term redox evolution and the relevance of the redox impact on the radionuclide transport.

Coordinator: Marcus Altmaier (Karlsruhe Institute of Technology).
Scientific-Technical Secretariat: Lara Duro and Vanessa Montoya (Amphos 21)

6th Semi-Annual Newsletter

The main purpose of the Semi-Annual Newsletter is to inform the broader community on the progress of research carried out within the RECOSY project. The present Newsletter gives a brief overview of the project activities and progress during the project months 35-44 (February 2011- November 2011). It is available at the public project web page (www.ReCosy.eu). It is also distributed by e-mail to a list of recipients. It is furthermore encouraged to use printouts at different events such as workshops, meetings and conferences in order to inform potentially interested persons.

This Semi-Annual Newsletter is less detailed than the 3rd Annual Project Activity and Management Report, used for thorough information of project partners, the Commission and project reviewers

EDITORIAL

Dear Reader,

I have the pleasure to present the sixth issue of the RECOSY Newsletter. With this Newsletter, we would like to inform a wider audience on RECOSY's activities and achievements. The Coordinator of the project is the Karlsruhe Institute of Technology (KIT), Germany. The Coordination Team (CT) consists of two organizations, namely KIT-INE and Amphos 21. In addition to work program planning and project management, the CT is also implementing activities on training and education, and management and dissemination of knowledge. The Executive Committee (ExCom) consists of the WP leaders, ensuring adequate operation of the overall project.

The experimental program of the project finalized at the end of October, 2011.

The End-User Consultancy Group (EUCG) is established with three representatives from Waste Management Organizations (ANDRA, SKB, and ENRESA) and three organizations with National Regulatory Functions (GRS, HSK and SWRI). It advises in view of ensuring usefulness of the project work for application to the disposal Safety Case and review of scientific-technical reporting in this respect. Moreover, the project is open for additional organizations entering into formal cooperation and participation via *Associated Group agreement*.

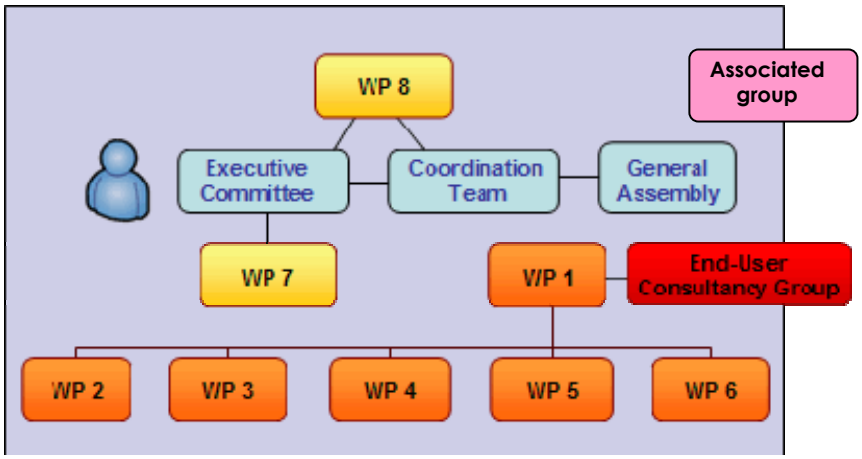
At this stage of the project, most of the research programme is finalized (end of October, 2011, according to the project schedule) and a wide range of results have been obtained. A detailed presentation of the results obtained within the project will be presented at the Final Workshop in Karlsruhe, Germany, 23rd-26th January 2012. The key objectives of ReCosy are to provide an improved interpretation of redox potential in all relevant host-rock systems to be used within European Safety Cases. In issue of the RECOSY Newsletter, we will inform you on major research topics and highlights from the project. Key activities on a project level since the last published Newsletter have been the 3rd Annual Workshop finalized in March 2011.

I hope you will enjoy reading and welcome your feedback!

Mireia Grivé (info@recosy.eu)
Knowledge Management and Training RECOSY- Officer

Recosy's main areas of research

The scientific-technical work program is structured along six Research Technological Development workpackages (WP1-6). They cover near-field and far-field aspects as well as relevant host-rocks considered in Europe.



RECOSY organization

WP 1 deals with documentation on the overall project outcome for its implementation in the Safety Case. *WP2* focuses on development of redox determination methods. *WP3* focuses on redox response of defined and near-natural systems. *WP4* studies the redox reactions of radionuclides. *WP5* focuses on redox processes in radionuclide transport and *WP6* deals with the redox reactions affecting the spent fuel source-term. Specific workpackages on knowledge management, education and training (*WP7*) and administrative management issues (*WP8*) are also included in the project.

RESEARCH

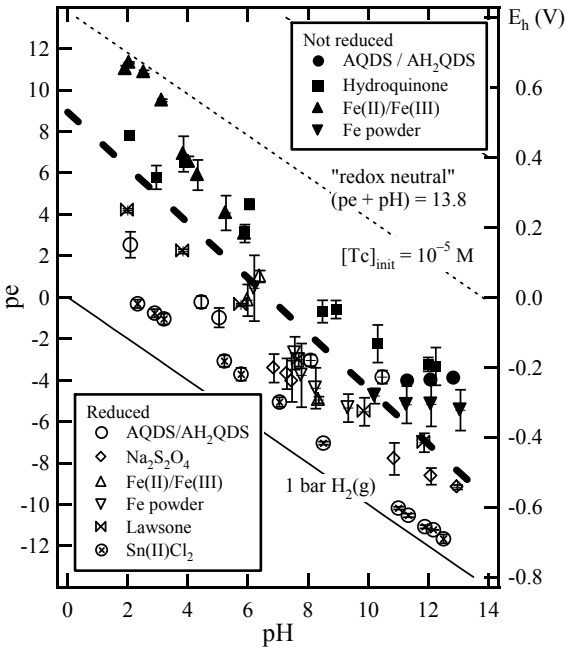
Research on Development of redox determination methods (WP2)

The objective of WP2 is the development and testing of redox determination methods using different type of electrodes as well as optodes (optical sensors) in order to provide a broad and solid scientific-technical basis for redox determination.

Originally the duration of WP2 was set to April 2010 but it was extended to October 2011 to give some of the partners the opportunity to continue working due to the interest generated during the project.

In this context the different participants of this workpackage were working on different issues:

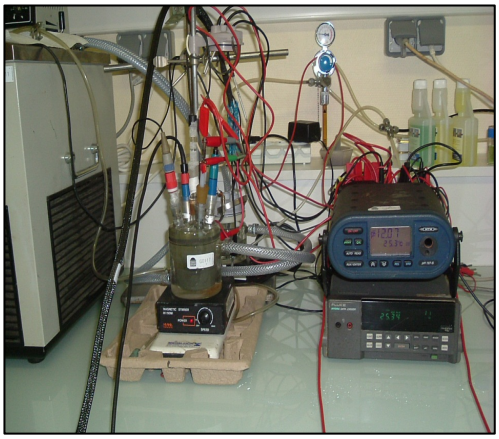
KIT-INE continued the investigation of neptunium and technetium redox chemistry and speciation in detail under different solution conditions. Main parameters of interest were the influence of the background electrolyte and the pH. The redox behaviour of Tc(VII), e.g. redox transformations to Tc(IV) in 0.1 M NaCl, was investigated in homogenous solutions and heterogeneous suspensions and analysed in terms of pH/Eh dependencies. The studies on Np chemistry were centred on solubility studies with pentavalent Np(V) in NaCl solutions performed in cooperation with **MSU**. Investigations in TMA-OH media to constrain the stability field of hexavalent Np(VI) under strongly alkaline conditions were performed in cooperation with **PSI**.



Investigation of of Tc(VII) reduction in 0.1 M NaCl/NaOH solutions.

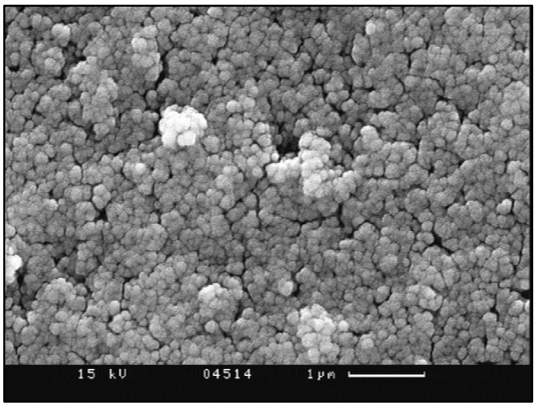
ARMINES continued with the study of selenium speciation at trace level in alkaline media using an optimized separation technique. The analytical approach was a speciation technique (ion chromatography) off line coupled with a very sensitive analytical technique (ICP-MS). Using optimized conditions in ionic chromatography the qualitative determination of the mononuclear species (HSe^-) was achieved. However, for the determination of polymeric Se-species further method developments / optimizations will be required.

BRGM completed the description of the Callovian-Oxfordian (COx) formation by investigating the redox (potential and reactivity) of its various mineral components. The main objective was to retrieve the electrochemical kinetics of the COx system in contact with different plausible redox perturbations. Particular equipment was purchased and methodology was developed and/or adapted for the investigation, including the design of various specific electrodes and the use of diverse electrochemical techniques. Material under investigation included massive and/or paste claystone rock samples (COx) as well as individual mineral contributors to the redox reactivity already identified in the media.



Hand-made pyrite electrode was used in different experiments.Photography from BRGM

Measurement of redox potential, pH and dissolved O_2 concentration by microsensors (Clark type) in biofilm samples grown at site 2200 A of Äspö HRL in Sweden were performed by **HZDR** (former FZD). Furthermore, calculation of the predominance fields of different uranium species in the pH-Eh diagram for the U-S-O-H-C system at 15°C by using the geochemical speciation code "Geochemist´s Workbench" v. 8.0.8 and the analytical data of the uranium contaminated groundwater sample were carried out.



SEM image of the solid used in Np(V) solubility experiments at 0.1M NaCl and pH 10.6 (Petrov et al. 2011, 3rd ReCosy Annual Workshop)

These experiments showed that the microbes of the biofilm battle the toxic effect of uranium. It was also found that a formation of U(VI) solid mineral may had been occurred in the biofilm.

In the last year **GRS** continued the UV/Vis-spectrophotometric measurements for studying the speciation of Fe(III) in saline solutions (NaCl, $MgCl_2$, and $CaCl_2$ brines) at pH=1-4 and at different temperatures (25, 40 and 60°C). Moreover, an improved thermodynamic model for iron speciation was developed to include the formation of hydroxo complexes in chloride media which included a method for the calculation of activity coefficients of Fe(III)-chloro and -hydroxo complexes.

TUG applied the CE-ICP-MS technique for the determination of iodine redox species in real groundwater samples.

UPPC performed novel fluorescence probes with nanosecond fluorescence decay times integrated in the experimental set up using MHz-modulation frequencies for the optical sensing. As a first chemical parameter, pH determination was integrated into the FOCS scheme. Furthermore, first experiments on FOCS-based chloride sensing were carried out. A novel luminescence probe for improved oxygen detection in the low ppb concentration range was also established.

An in-depth evaluation and interpretation of the results obtained during the interlaboratory comparison exercise was performed by **CNRS** in order to improve and optimize the redox determination schemes used by them. The results strongly underlined the requirement for a standardized protocol for potentiometric measurements. A bibliographic study on the operation principle of the electronic millivoltmeters was performed as well.

Finally, contribution of **LQC** was essentially advisory to various other partners on issues in which the principal investigator in LQC has direct experience.

WP leader: Dr. Michael Kumke (University of Postdam, Physical Chemistry)

Research on Redox response of defined and near-natural systems (WP3)

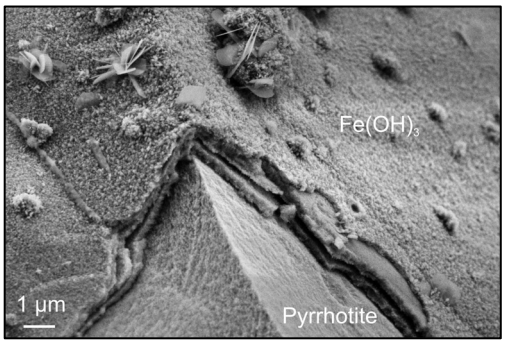
Experiments of consumption of dissolved oxygen by mineral as a function of time (Domènech et al., 2011, 3rd ReCosy Annual Workshop)

The objective of WP3 is to quantify and develop process understanding for redox buffer capacity and kinetics of response to redox perturbations of defined and near-natural systems. In the third year of the project, the WP3 work have been focused on (i) Field data, (ii) field samples, (iii) microbiology, (iv) sorption experiments, (v) redox experiments and (vi) conceptual modelling. Different participants have worked on:

KIT-INE determined the redox buffer capacity of different clay material and fracture filling material in collaboration with **CTM**. Other work performed by KIT-INE included the analysis of sorptive reduction of U(VI) on magnetite ($Fe(II)Fe(III)O_4$) nanoparticles. In this last work, fast reduction kinetics of uranyl on magnetite synthetic nanoparticles and the formation of U(IV) was observed by XPS and XAFS excluding univocally U(V) as stable reduction species.

BRGM worked on the development or adaptation of existing and new electrode methods for redox determination. This work included the design of natural or modified argillite and pyrite electrodes and the use of electrochemical methods. Different electrodes were tested on different laboratory systems which included clay paste as well as different redox relevant minerals found in natural clays (i.e. pyrite).

CTM was focused their work on evaluating the oxygen scavenger of four different minerals: two natural iron sulphides, pyrrhotite and pyrite, and two fracture filling materials from Äspö and Grimsel. Experiments were performed with an initial oxygen concentration of 10^{-3} M in 0.1M $NaClO_4$ media. Dissolved oxygen was continuously monitored by optical sensor. pH and redox potential were continuously monitored with combined pH, Au and Pt electrodes. Changes in the chemical aqueous composition and mineral changes have been characterized, the later by SEM, EDX, XPS and XRD.



$Fe(OH)_3$ layers precipitated on pyrrhotite surface (Arcos et al., submitted)

AMPHOS evaluated the results of the work performed by **CTM** together with available results in the literature in order to develop a model that considered the main dynamics of the redox mechanisms on FeOOH/Fe(II), Fe-S/S(VI) and Fe(II)-clay/FeOOH systems. Measured data indicate that pyrrhotite dissolution is faster than that of pyrite but generates less acidity. Experimental data showed that oxidation rates of both minerals were equivalent under the studied conditions. This fact gives a new opportunity to quantify the reductive buffering capacity of pyrrhotite, for which no kinetic rate law has been still established.

TUG finished the development of a method for the identification of iodine species with IC-ICP-MS. The method was applied for the investigation of the system kaolinite/iodine concerning iodine redox and sorption processes.

GEOPOINT delivered data to **UNIZAR** for evaluation and cooperation concerning the Swedish site-specific data for the role of the sulphur system in determining the redox state of real site crystalline rock systems.

UNIZAR compiled the information provided by **GEOPOINT** in order to produce an integrated conceptual model for these systems. The obtained results suggested that the redox features were fully consistent with the existence of bacterial sulphate reduction. Moreover, the existence of equilibrium situations with respect to ferrous iron monosulphides also indicated the presence of a source of dissolved Fe(II).

In situ circulations with flow cells for biofilm formation on crushed rock, with groundwater from -450 m (Photography from MICANS)

CNRS studied the reactivity of: a) U(VI) with Fe(II) in presence of Fe-free clays under CO_2-free, anoxic conditions and B) Pyrite (FeS_2) with selenium(IV). Moreover, it was performed voltametric and spectroscopic characterization of Cox and Boda clays in which solution aliquots were sampled during the conditioning and analyzed by ICP-AES, ion chromatography and UV-visible spectroscopy.

II-HAS studied samples of different origin to reveal the crucial processes in determining the accessibility of ferric/ferrous ions to redox partners in various clay minerals of Boda Claystone at various redox (Eh – pH) conditions.

In the last year, **MICANS** investigated the relations between Eh and microorganisms growing with different electron donors (lactate or hydrogen) and electron acceptors (nitrate or sulphate). Modelling of the microbial processes was initiated with a program denoted Microbe. This experiment aimed to understand redox buffering capacity of microbial ecosystems. The presence and activity of microorganisms consequently have a great influence on Eh in natural water systems.

WP leader: Dr. Laurent Charlet (Centre National de la Recherche Scientifique)

In the nuclear waste repository research tunnel ONKALO (Finland) massive biofilms are growing in a fracture zone. (Krawczyk-Bärsch et al. 2011, 3rd ReCosy Annual Workshop)

Research on redox reactions of radionuclides (WP4)

The goal of the activities within this workpackage is to provide fundamental process understanding of the redox behaviour of radionuclides, including the question of equilibrium / disequilibrium with the system redox conditions. The activities within this workpackage can broadly be divided in four main topics: (1) Interactions of radionuclides with pyrite, (2) Interactions of radionuclides with far-field solids, (3) Redox processes under hyperalkaline conditions, (4) Redox behaviour under microbial processes.

CNRS performed voltammetric and dielectric characterization of pyrite particles after reaction with iodine, iodate, selenite and selenate. Both, analysis of the liquid phase (ICP-AES, ion chromatography, UV-visible spectroscopy) and of the solid phase after reaction (voltammetry, impedancemetric and XPS) were performed.

KIT-INE performed batch-type sorption experiments with Opalinus clay and Callovo-Oxfordian argillite on Tc(VII), Np(V) and Pu(V). The batch experiments were performed at pH 7.6 for OPA and pH 7.2 for COx under argon atmosphere and room temperature. EXAFS and XPS studies of the OPA and COx sorbed with Np, Pu, and Tc were also performed.

CTH investigated the U(IV)/U(VI) and Np(IV)/Np(V) redox state in Äspö synthetic groundwater, with and without Fe(II)/Fe(III) redox buffering and, with and without Äspö rock material present, using the solvent extraction redox state separation method developed within the project.

Partition of radionuclides between solid and solution phases in humic/quartz ternary was studied

UMANCH studied the partition of radionuclides between solid and solution phase in humic/quartz sand ternary systems. A simple mathematical model was developed to predict the behaviour of both metal ion and humic acid. The model performs well in predicting the partition of the humic and that of the metal ions in the systems that show simpler ternary behaviour.

ULOUGH studied the effect of EDTA and picolinate on technetium redox state.

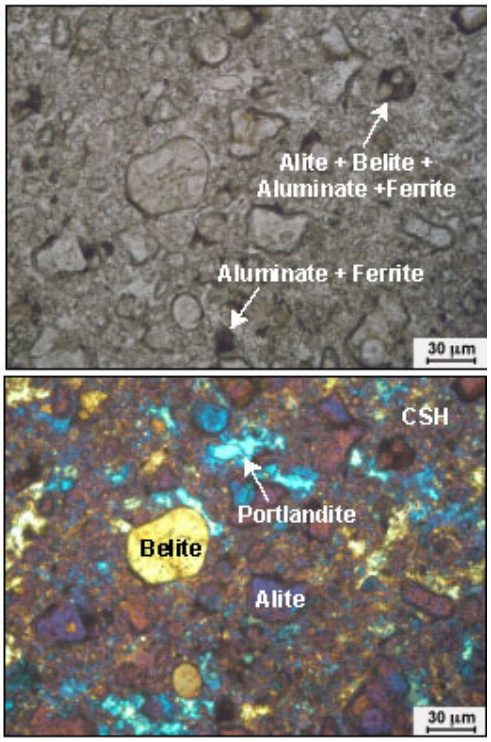
During the last year **AMPHOS** studied the solubility of UO_2(am) in presence of Na-dithionite under alkaline conditions. Experiments were performed on batch reactor inside a glove box under N_2(g) atmosphere at initial pH of 10, 11 and 12, at ionic strengths of 0.1 M ($NaClO_4$) and using two different dithionite concentrations (0.001 and 0.01 M). In-situ measurements of pH and Eh and analysis of total uranium concentration in solution at different reaction times were performed.

PSI continued the Np solubility studies in collaboration with **KIT–INE**. Moreover, they worked on the Np(IV/V/VI) sorption studies on C–S–H phases with varying C:S ratios in the pH range between 10.0 and 13.3. Dithionite was used as a reducing agent to stabilize Np(IV) whereas hypochlorite was applied to stabilize Np(VI) in the C–S–H suspensions. In addition X-ray absorption spectroscopy investigations were carried out with the aim to obtain a mechanistic understanding of the sorption of Np(IV) on C–S–H phases and hardened cement paste (HCP).

FTMC developed a method to determine iron(II) produced during biological Fe(III) reduction. The Mössbauer spectroscopy or UV/VIS spectroscopy were used to determine the Fe(II)/Fe(III) redox couple. Moreover, they explored the interactions of Tc with iron-bearing minerals (hematite and wüstite/magnetite). The ability of microorganisms to participate in sorption process of Tc(VII) onto hematite was investigated by batch experiments.

HZDR performed electrochemical microsensor studies of redox potential, pH and oxygen within biofilms growing in the nuclear waste repository research tunnel ONKALO (Finland) before and after the addition of uranium to the fracture water in an experimental setup. The results of the microsensor measurements clearly demonstrate that the geochemistry inside a biofilm is totally different compared to the surrounding water/environment.

WP leader: Dr. Jan Tits (Paul Scherrer Institute)



Sulfate-resisting cement: CEM I 52.5 N HTS (Lothenbach and Wieland, C&CR 2006)

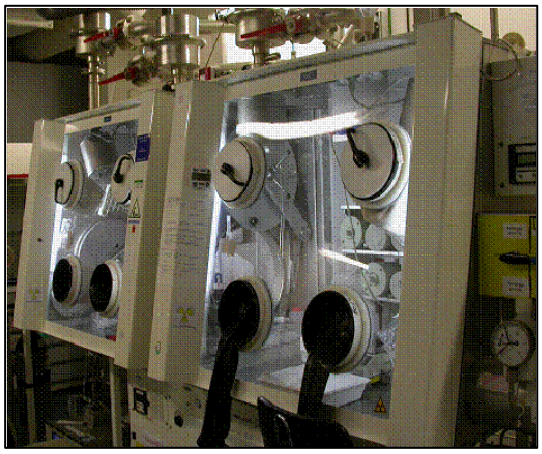
Research on Redox processes in radionuclide transport (WP5)

The goal of the activities within this work package is to study the behaviour of redox-active radionuclides Tc, Np, U, Pu, I and Se with the aim to determine the redox impact on their transport through crystalline rocks, clay rocks and contaminated systems.

KIT-INE performed column migration and batch-type experiments and thermodynamic calculations to study reduction kinetics of Tc(VII), U(VI) and Np(V) in natural groundwater from the Grimsel Test Site (GTS, Switzerland) in presence of fracture filling material simulating glacial melt water intrusion. Batch sorption-reduction data was compared with distribution coefficients re-calculated from column migration studies. The full 3D geometry reconstruction and connected porosity through computer tomography (CT) data were used to facilitate interpretation.

Analysis of fracture surface material from Olkiluoto groundwater was studied

CEA made diffusion experiment with U(VI) and two long-lived fission products Se(IV,VI) and I(-I) following their transport through Callovo-Oxfordian (COx) clayey samples. Diffusion and batch experiments were performed in a N_2/CO_2 glove-box in physico-chemical conditions as close as possible to those prevailing in situ.



Diffusion and batch experiments were performed in a N_2/CO_2 glove-box (Photography from CEA)

UH analysed fracture surface material (mainly calcite, kaolinite, chlorite and clays) from Olkiluoto groundwater infiltration area (0-120 m) for U series disequilibrium by spectrometry. Special attention was focused on outcrop samples because they represented the most oxidized part of the redox-front. Development of interpretation of infiltration induced redox impact in crystalline bedrock using natural U decay series disequilibrium analysis were carried out.

II-HAS performed diffusion measurements in redox gradients created in clay rock cell design to study reduction driven retention of U in a clay rock. A special cell was constructed where a redox gradient was established by different redox conditions in the respective ends. Post-mortem analysis, including Laser Ablation ICP-AES was used to monitor U distribution in the longitudinal cross-section. Fe^{2+}/Fe^{3+} ratio was also analysed to see whether it can be correlated with sorption of U.

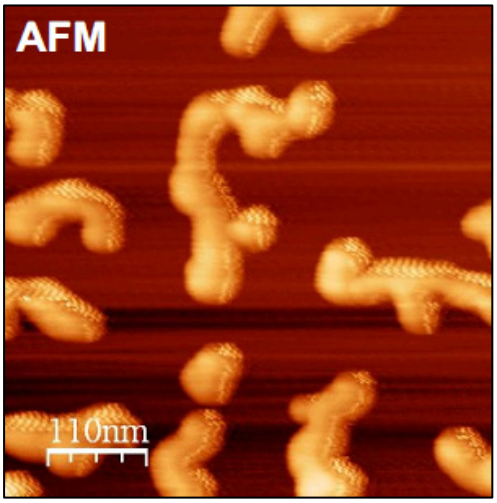
UCYPRUS correlated the redox conditions with the distribution and mobility of U using U(VI)/U(IV) ratio and data of the S(VI)/S(II) system. Samples used in the experiments were collected directly from the phosphogypsum stack and from fluids from three different sub-areas. The solid samples were investigated by TGA, XRF and XRD regarding their water content and composition.

MSU investigated actinide speciation in samples collected at the Mayak site by the combination of alpha track analysis, SEM-EDX and various synchrotron based methods with microfocusing beam, i.e. μ-XAFS, μ-XRF.

WP leader: Dr. Juhani Suksi (University of Helsinki)

Research on Redox reactions affecting the spent fuel source-term (WP6)

A set of investigations has been conducted with the aim of getting better insight into redox processes determining spent fuel and iron canister corrosion.



Magnetite characterisation (PhD thesis Florian Huber)

KIT-INE characterised the magnetite present during 10 years corrosion together with high burnup spent fuel in 5 M NaCl solution using XRD and Raman spectroscopy. Dissolution experiments of the magnetite were carried out and the evolving gas was analysed to identify carbon/CO_2 impurities of this material. The distribution of released radionuclides between the solution, the vessel wall and upon the magnetite was investigated by stripping of the vessel with HNO_3 and dissolution of the magnetite using HCl and subsequent radiochemical analyses of the remaining acids.

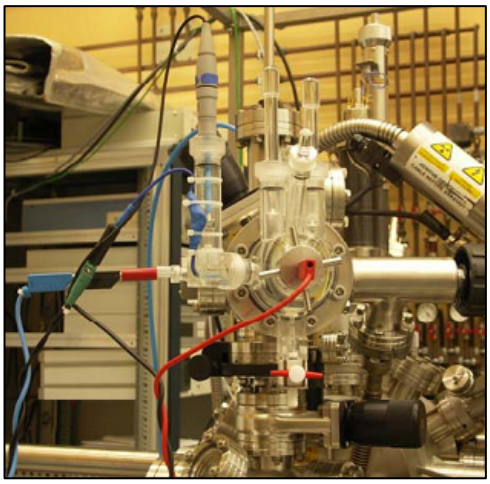
JRC-ITU produced UO_2-Pd films with varying Pd concentration and UO_2/Mo, UO_2/MoO_2, UO_2/MoO_{2+x} films. These films were investigated in situ under air, Ar and Ar/H_2 to measure electrochemical properties. Further studies of the galvanic coupling of UO_{2+x} with iron have been carried out. The high burn-up UO_2 fuel corrosion experiment in presence of H_2 was continued and the complete elemental analysis, including the natural redox-sensitive elements, of the leachates from the experimental period was finished.

NRI measured the Eh and pH in various corrosion systems in an anaerobic glove box. The extent of corrosion was determined by measuring the amount of hydrogen evolution. The nature of corrosion products layers formed on carbon steel was measured by various methods, such as X-ray diffraction, Raman Spectroscopy and ECS electron spectroscopy.

Studsvik collaborated with **ITU** and **SKB** to find a method to prepare nitrate free Pu(VI) solution. The autoclave to study mechanisms of the hydrogen influence on radionuclide migration by D/H isotope exchange method was set-up and sampling, analysis, and data evaluation was performed.

KTH studied the redox reactivity of UO_2 pellets doped with Y_2O_3 and Pd as well as SIMFUEL. The kinetics of H_2O_2 consumption, hydroxyl radical production and uranium dissolution was monitored in a number of experiments. In addition, radiation chemical studies of the same materials were performed.

WP leader: Dr. Detlef Wegen (Joint Research Centre- Institute for Transuranium elements)



Experiments with new developed electrochemical cell for thin film applications (Photography from JRC-ITU)

HARMONIZATION OF WORK PROGRAM AND IMPLICATIONS OF REDOX FOR THE SAFETY CASE (WP1)

The overall objectives of this workpackage are related to provide structures and regular up-dating of the overall project outcome. One of the objectives of this workpackage is the harmonization of the work program and to show the relevance of the redox processes in the Safety Case. To this aim, the safety case that was selected from the beginning of the project was that for the ANDRA B2 cell. The medium activity long lived waste at ANDRA is the B2 waste, which is a result of the treatment of radionuclides with compounds such as nitrate and sulphate and high content of bitumen. The outcome of this treatment is a waste presenting nitric acid and generally oxidising conditions. This can affect the mobility of radionuclides.

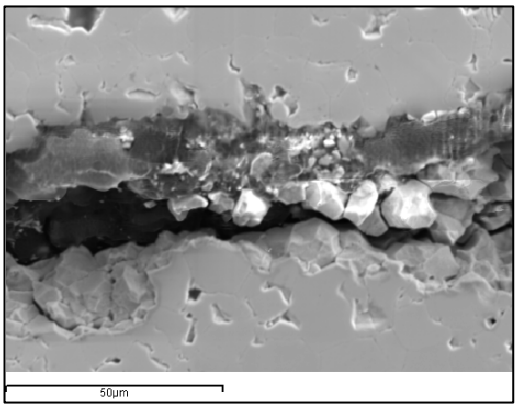
The safety case selected from the beginning of the project was the ANDRA B2 cell.

One of the main issues of concern is how the oxidising conditions developed within this type of cells might affect the mobility of radionuclides.

Hence, redox processes play an important role in the safety case of B-type wastes. According to the modelling results of the release of nitrate from this type of cells, very high nitrate concentrations can build up in the vicinity of the wastes. H_2 gas generation is also predicted to occur. Redox processes are, thus, very relevant for the understanding of the evolution of these materials.

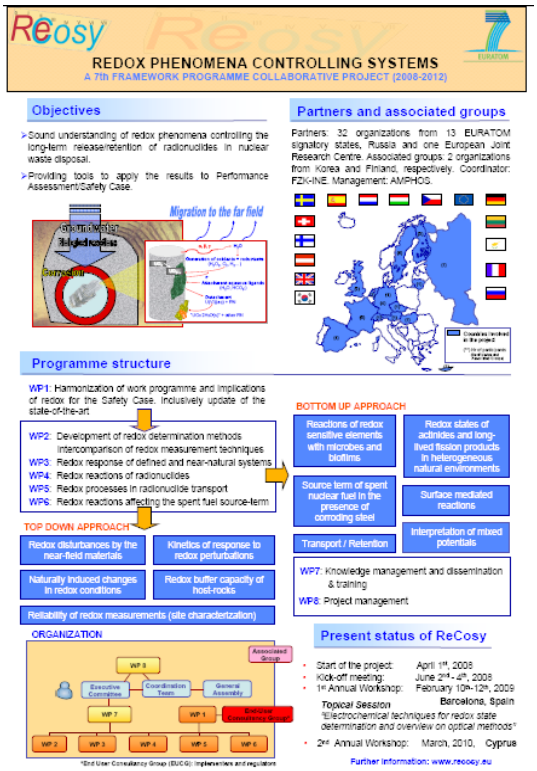
During last year, it was agreed that a paper will be prepared and submitted to Nuclear Technology by the end of the project showing the implications of the work within Recosy in the safety case.

WP leader: Dr. Lara Duro (Amphos 21)



Fe(III) precipitation in cracks. Cui et al. 2011, 3rd ReCosy Annual Workshop)

KNOWLEDGE MANAGEMENT AND TRAINING (WP7)



The WP7 addresses the internal and external training as well as knowledge management for the RECOSY project.

A public web site was established within the project (www.recosy.eu). At this site, information about the project and the project activities are made available to the broad community. A project internal Intranet site were established where non-public documents and reports are kept.

The generic poster has been presented at different occasions, including Euradwaste'08 (Luxembourg), Migration'09 (Washington, USA), Migration 11 (Beijing, China), ICEM 2009 (Liverpool, UK), ICEM 2011 (Reims, France).

The Annual Project Workshops are important elements in the documentation and dissemination of the project outcome. The Annual Project Workshop Proceedings are comprehensive public reports with the key scientific-technical outcome. Proceedings with the scientific-technical outcome of the first project year are published as report FZKA 7466, the second annual proceedings as KIT-SR 7557 report and the third as KIT-SR 7603 (in print).

Dissemination of more detailed results are done through peer reviewed scientific journal papers, books, reports, proceedings of various conferences and workshops, PhD thesis, etc. Presentations at different occasions of detailed project work meetings and results or the overall project is also a key contributor to dissemination. The dissemination of the project is being very effective (i.e. 24 scientific journal papers, 8 technical reports or book chapters, oral presentations and posters at 35 international occasions in Europe, Japan, USA, Canada and Russia).

6 training mobility measures have been agreed upon and are presently under implementation

There are 28 PhD students and young researchers involved in the project, and 15 post-docs. TRAINING resources included in RECOSY are used for training-on-the-job of young researchers by project internal mobility measures. The measures are aiming for a maximum period of about three months where travel costs for the stay at another organization (or organizations) are covered. Partners or Associated groups applied through the Coordination Team for such training measures.

Six training mobility measures were agreed upon and were running until the end of experimental work and currently summarized.

Other network used as important training tool for the ReCosy partners is the project ACTINET I3 (www.actinet-i3.eu)

WP leader: Dr. Mireia Grivé (Amphos 21)

RECOSY WEBPAGE: www.recosy.eu

EVENTS

RECOSY 3rd Annual Workshop (21st-24th March 2011, France)

The 3rd Annual Project Workshop was held in Balaruc-les-Bains - Sète - Languedoc Roussillon (France) (21st to 24th March 2011) hosted by SUBATECH. In association with this event, meetings of the different project consortium bodies (Executive Committee, General Assembly, End-User Consultancy Group) also took place.

In total 65 persons attended, including: beneficiary partners (27 out of 32 partners involved in the project), associated groups (STUK, KAIST, BGS, LANL and IRSN), EUCG's members and external participants (NDA, ETH and La Traube University from UK, Switzerland and Australia, respectively).

The main purpose of the Workshop was to communicate and discuss the scientific-technical outcome of the third project year in the form of oral presentations around the project, two poster sessions, and the topical session. A total of 33 presentations and 26 posters were included in the programme.

During the workshop a specific Topical Session focused on "Electrochemistry and Redox Processes", was organized by KIT-INE and AMPHOS. The scientific-technical outcome of the third project year is documented, reviewed by the EUCG and disseminated in the form of workshop proceedings (KIT report, KIT-SR 7603, in print).

RECOSY 3rd Annual Workshop (21st - 24th March 2011), Balaruc-les-Bains - Sète - Languedoc Roussillon (France)

RECOSY Final Workshop (23rd-26th January 2012, Karlsruhe, Germany)

The Final Project Workshop is under preparation. It will be held in Karlsruhe, Germany at the Akademie hotel (23rd to 26th January 2012) and organized by KIT-INE.

The Final Workshop will give to the project internal and external participants an overview of the major achievements within the project. It will also provide important decisions before the closure of the project (31st March, 2012). Meetings of the Executive Committee, the General Assembly and the End-User Consultancy Group will be held within the context of the Workshop

Presentations included in the program will be mainly based in R&D work development within the project. The Topical Session will be entitled "Integration of Redox Processes in the Safety Case" and it will be based in different talks presented by invited speakers. Poster sessions will be held in two different sessions.

Registration to the Workshop is open. The flyer with the main information on the workshop has been distributed among the project partners and uploaded to the internet website soon, which will be accessible for any interested party (www. ReCosy.eu). All project partners are encouraged to help in dissemination with respect to the workshop, as well as encourage external groups to participate. This workshop is the last joint project meeting before preparation of the final reporting and for this reason a significant participation is expected from ReCosy beneficiaries and associated groups.

Electronic brochure informing on the Final Workshop will be available soon in the RECOSY WEB page

RECOSY Final Workshop (23rd-26th January 2012), Karlsruhe (Germany)

Key event schedule

Below are given key events of RECOSY project that are open to external participation.

Final Annual Project Workshop

January, 23rd-26th, 2012, Karlsruhe, Germany

JANUARY 2012						
Mo	Tu	We	Th	Fr	Sa	Su
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

RECOSY PARTNERS