Issue 2, December 2012

Newsletter
CROCK (Crystalline ROCK retention processes) project

Dear readers,

We are pleased to present this second edition of the CP CROCK Newsletter. This publication aims to keep you informed of the developments and advances accomplished within the different project workpackages and, to inform you on future important events in which the CROCK project is involved.

CP CROCK was born to improve the undesired high uncertainty and the associated conservatism with respect to the radionuclide transport in the crystalline host-rock far-field around geological disposal of high-level radioactive wastes. The CP CROCK is formed by a team of professionals from multiple disciplines which allow the project to be undertaken in different areas (chemistry, geology, hydrogeology, geochemistry, physics, etc.) and on different scales (macro, micro and nano). National waste management organizations participate in the project contributing with co-funding to beneficiaries, infrastructures, knowledge and information. They also participate together with National Regulators to guidance with respect to application of the project to the disposal Safety Case. For a more concise description of the project origins and objectives the reader is referred to the project website (www.crockproject.eu).

This month the CP CROCK celebrates its successful second year and looks to the future. From now on we are moving forward to the last six months of the project which present a fascinating and fervent scenario.

Enjoy the reading!

The Coordination Team

Content

Further information can be found at the CROCK website:

www.crockproject.eu

Newsletter submitting organization:

Amphos 21
Passeig Garcia i Fària 49-51
E08019 Barcelona,

WP leader:

Thomas Rabung

KIT-INE

Recent Activities

Deliverable D1.2: "Characterization of experimental material" has recently been generated. This deliverable is complementary to the characterization already documented in Schäfer et al. (2012) and Holgersson (2012). Its main focus is the characterization of fractured drill cores by means of Computed Tomography (CT) in order to obtain geometrical information on the fractures. After obtaining CT datasets of each fracture, further preprocessing applying the meshing tool ICEMCFD© (Ansys) resulted in a 3D numerical mesh suitable for Navier-Stokes based flow simulations. Based on these results first conservative tracers (tritium has been applied in the experiments as nonreactive solute) tests have been carried out. A detailed analysis of the results and further experiments with a cocktail of radioactive tracers (e.g. ^{95}Tc, ^{152}Eu, ^{233}U, ^{137}Cs) are carried out at the moment and will be discussed in the Final Workshop.

WP1: Experimental material and characterization

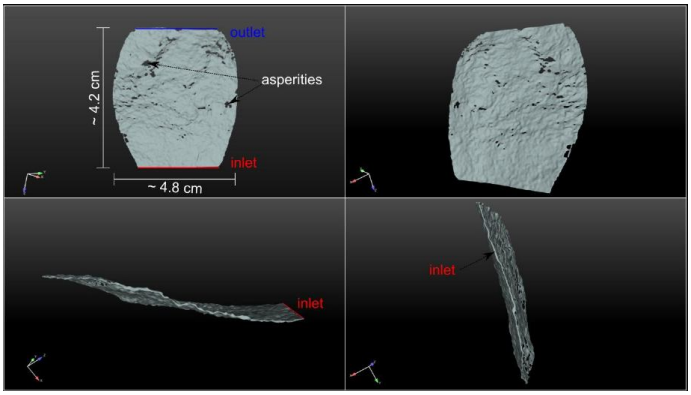
The organization and characterization of new crystalline rock samples from Äspö are the main objectives within this workpackage. The work of this workpackage started on January 2011 and finished by the end of 2012.

As detailed in the 1st Newsletter and documented in Deliverable D1.1: "Provision of new fracture bearing drill core samples obtained, handled, transported and stored under anoxic conditions, including first documentation", on May 2011 new crystalline rock drill core from Äspö were organized. These materials were distributed taking into account the needs of each beneficiary.

Crystalline rock drill core sealed in LD-PE bag and second confinement by Al bag, sampled at Äspö for the CP CROCK (Schäfer et al., 2012).

A detailed characterization of the Äspö sampled materials was reported by Holgersson (2012) and Schäfer et al. (2012) in the proceedings of the 1st CP CROCK Workshop. Additional information regarding WP1 activities can also be found in the RTD presentations of the 1st Workshop (www.crockproject.eu/NewsAndEvents.aspx) and the S&T contribution by Petrov et al. (2012) in the 1st Workshop proceedings.

Finally it is noteworthy that Deliverable D1.2: "Characterization of experimental material", including the latest sample characterizations based on Computed Tomography (CT) techniques (bottom figure) has been generated and is available in the CP CROCK website (www.crockproject.eu).



Different views of the rendered fracture geometry as obtained by the CT dataset.

WP2: Radionuclide transport and sorption studies

WP leader:

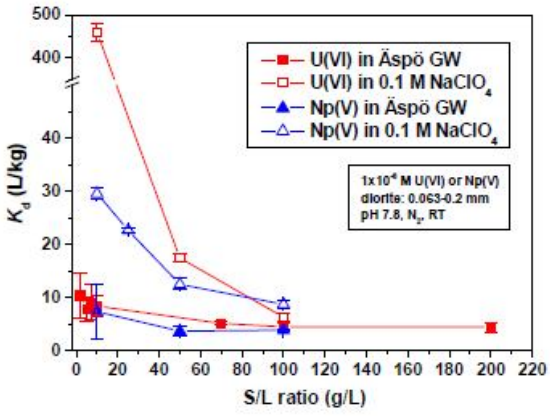
Tiziana Missana

CIEMAT

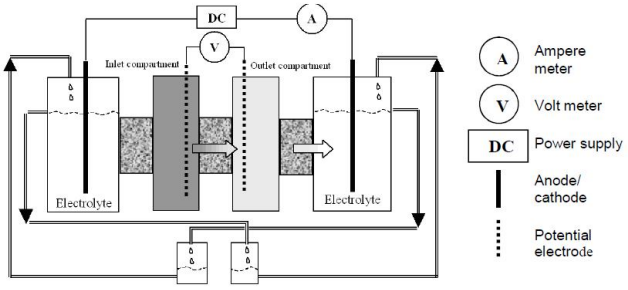
As its name indicates the aim of this workpackage is to study radionuclide sorption onto and transport within crystalline rocks. This workpackage will stand on-going until March 2013.

Main advances within this workpackage were presented in the 1st CP CROCK Workshop and are documented in the corresponding proceedings (Rabung et al., 2012) through several S&T contributions (Alonso et al., 2012; Missana and García-Gutiérrez, 2012; Petrov et al., 2012; Schmeide et al., 2012; Stage et al., 2012; Totskiy et al., 2012; Vecernik et al., 2012; Videnska et al., 2012). The workshop proceedings are available for the whole community in the CP CROCK website (www.crockproject.eu). As illustration of the work performed, below some results or experimental set-up descriptions documented in the workshop proceedings are shown.

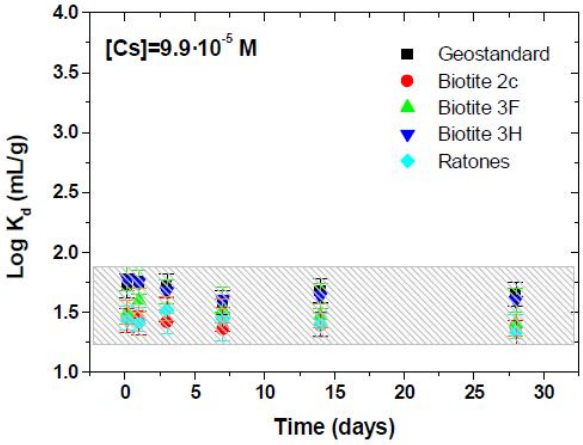
Latest advances and final conclusions will be further discussed in the Final CP CROCK Workshop to be held in Karlsruhe, Germany, on May 2013.



U(VI) and Np(V) sorption onto diorite in Äspö groundwater and 0.1 M $NaClO_4$ as a function of S//L ratio (Schmeide et al., 2012).



Scheme of through-electromigration cell used by Vecernik et al. (2012) (Reproduced from Lögfren et al., 2009).



Sorption kinetics of Caesium onto the analysed biotites in low saline waters (Missana and García-Gutiérrez, 2012)

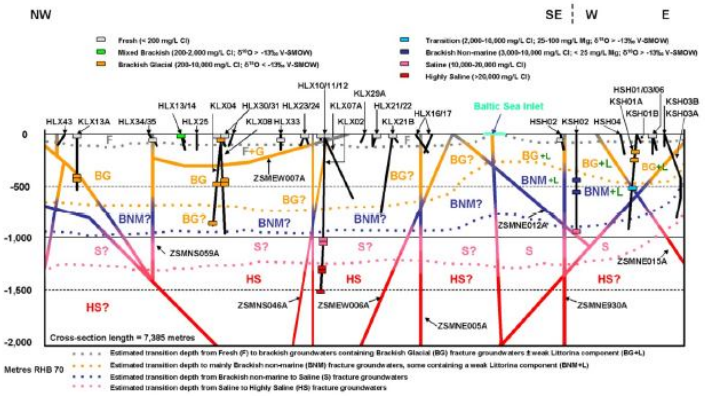
WP leader:

John Smellie

CONTERRA AB

WP3: Real system analysis

This workpackage will be active until March 2013 and it is focused on assessing the matrix diffusion process and studying the behavior of radionuclides in fractured crystalline rock.



Approximately NW-SE/W-E cross section through the Laxemar-Simpevarp area (Smellie, 2012).

Smellie (2012) presented a detailed description of the data supplied to the project beneficiaries in the proceedings of the 1st CP CROCK Workshop (Rabung et al., 2012). Additional information on the activities performed within this workpackage can be found through the RDT presentations presented in the same Workshop which are available in the CP CROCK website (www.crockproject.eu).

WP leader:

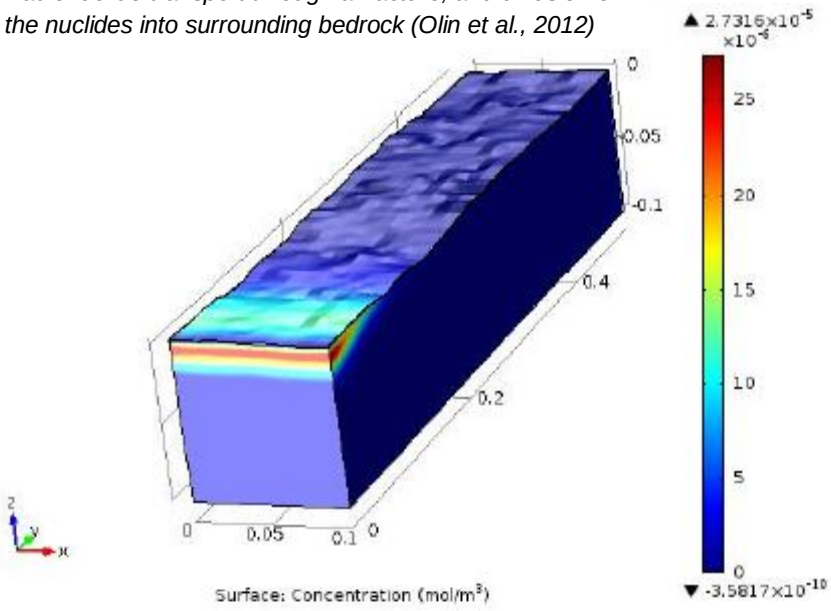
James Crawford

KEMAKTA

WP4: Conceptualization and modeling

As described in the 1st Newsletter, the overall objectives of this workpackge are to conceptualize and model radionuclide transport processes on fractured rock systems at different scales. The work within this workpackage will be extended until March 2013.

Radionuclide transport through a fracture, and diffusion of the nuclides into surrounding bedrock (Olin et al., 2012)



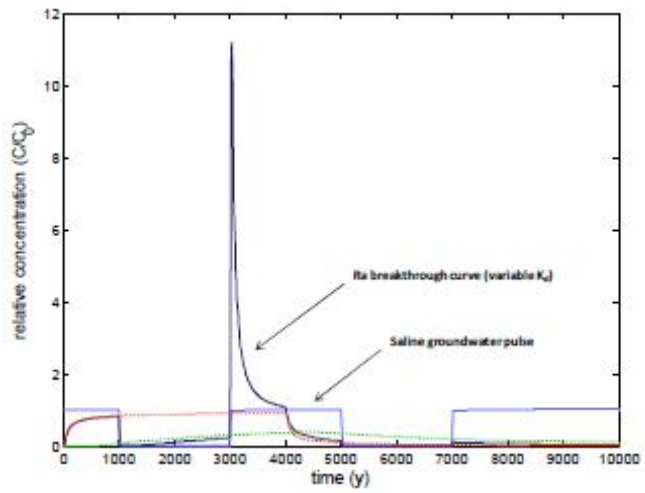
Up to now main results obtained in the frame of this workpackage have been documented in the proceedings of the 1st CP CROCK Workshop (Rabung et al., 2012) through two different S&T contributions (Crawford, 2012; Olin et al., 2012). As example, preliminary radionuclide transport results published by Olin et al. (2012) are shown in the left figure. Additional information can be found through the RDT presentations available in the CP CROCK website (www.crockproject.eu).

Final results and conclusions will be discussed in the Final CP CROCK Workshop to be held in Karlsruhe, Germany, on May 2013.

WP5: Application to the safety case

The objective of this WorkPackage (WP) is to apply the outcome of other worpackages to the Safety Assessment, thereby decreasing the Performance Assessment (PA) uncertainty and providing improvements for future site characterizations. The work of this WP will be extended up to March 2013.

Preliminary results obtained within this workpackage were presented through S&T contributions (Crawford, 2012; Nordman, 2012; Trinchero et al., 2012) in the1st CP CROCK Workshop proceedings (Rabung et al., 2012) and in the Workshop presentations available in the project website (www.crockproject.eu). For illustrative purposes below are shown some of the results reported by Crawford (2012).



Breakthrough characteristic (dark blue curve) for Ra^{2+} migration with inverted groundwater chemistry (Crawford, 2012).

Recently Deliverable D5.2. "Results of the benchmark exercise" has been generated. This benchmark exercise aims at assessing the potential release of a set of radionuclides at repository depth and the related migration and discharge at the surface. Within this exercise Amphos 21 provide an integrated "overview" of the fracture-matrix interaction processes, the modeling work of KEMAKTA focused on the evaluation of the matrix retardation processes while the focal point of VTT provide effective sorption properties based on the results of the molecular models in WP4.

An exhaustive discussion on the different modeling results obtained by the different beneficiaries will be presented in the Final CP CROCK Workshop. In this sense, a joint S&T contribution with a detailed comparison of the different modeling results will be prepared.

WP leader:

Jorge Molinero

Amphos 21

Recent Activities

Deliverable D5.2 has recently been generated. The conceptual model of this exercise assumes the release of a set of radionuclides from a number of deposition holes located in a deep geological repository.

Amphos 21 is using the methodology called FASTREACT (FrAmework for Stochastic REACtive Transport) for running this benchmark exercise. Three radionuclides (Sr, Cs, U) and a conservative tracer (HTO) have been selected for these calculations.

KEMAKTA is using a fully coupled reactive transport code in an attempt to reproduce the results already obtained using the simplified decoupled major ion chemistry approximation modeling approach for solutes Sr^{2+}, Cs^{+}, Ra^{2+} documented in Crawford (2012),

VTT benchmarking simulations are carried out using a Performance Assessment (PA) migration model (FTRANS, GoldSim or MARFA). Simulations of the radionuclide migration is repeated for alternative upscaled Kd's representing the bounding geochemical conditions along the flow paths.

WP leader:

Andrés Idiart

Amphos 21

WP6: Documentation

The work of this workpackage will last until the end of the project on June 2013. The overall objective of this workpackage is to document the State-of-the-Art.

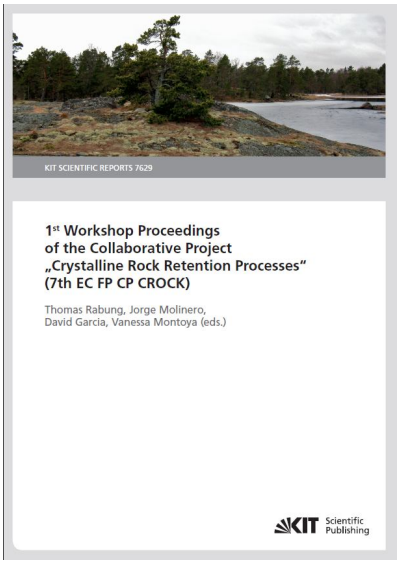
Latest activities within this workpackage have been documented as a S&T contribution (Idiart et al., 2012) in the 1st CP CROCK Workshop Proceedings (Rabung et al., 2012). Based on that work Deliverable D6.1: "Review of existing conceptual models for the description of radionuclide transport and retention processes within crystalline rock environments" has been properly updated.

As detailed in those works, two questionnaires have been distributed to all beneficiaries to collect information on how retention processes are considered in recent Performance Assessments (PAs). The results of the survey and a discussion will be published by the end of the project. Additionally a brief description of how different processes (groundwater flow, matrix diffusion, sorption onto mineral surfaces, generation of gases, microbial activity, colloid-facilitated transport, geochemistry) affecting transport and retention of radionuclides in the geosphere are considered in recent PAs was presented. More information about the work performed in the frame of this workpackage can be found in the project website (www.crockproject.eu).

WP leader:

David García

Amphos 21



1st CP CROCK Workshop Proceedings front page

WP7: Knowledge management, dissemination and training

The main activities within this WorkPackage (WP) are to help the communication and dissemination of knowledge generated within the project. Also an important activity is the organization of the different project Workshops.

The latest important activity that have been completed is the production and edition of the 1st CP CROCK Workshop Proceedings. The proceedings includes a brief summary of the main activities developed within each WP as well as several S&T contributions (reviewed by the End-User Group (EUG)). Proceedings have been edited as a KIT Report (KIT Scientific Report 7629), being available for the whole community in the project website (www.crockproject.eu). The front page of the 1st CP CROCK Workshop Proceedings is shown on the left.

It should be mentioned that on September 2012 the project poster was presented in the EuCheMS International Conference on Nuclear and Radiochemistry (NRC-8), held in Como (Italy). Furthermore, on October 2012 the project poster was also presented in the EURATOM disposal program DISSemination (EURADISS) workshop, held in Montpellier (France). Finally recall that the organization of the Final CP CROCK workshop is on-going.

Final Workshop of the CP CROCK will be held in ***Karlsruhe***, Germany

14th-16th May, 2013

Organized by

Karlsruher Institut für Technologie

Events

The *Final CP CROCK Workshop* will be held in Karlsruhe (Germany), in May 2013. The workshop will be organized by KIT-INE (www.ine.kit.edu). Detailed information on the Final Workshop organization will be provided in the project website (www.crockproject.eu).

May 2013

Mon	Tue	Wed	Thu	Fri	Sat	Sun
		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		

Beneficiaries:

KIT Karlsruher Institut für Technologie · AMPHOS 21 · Ciemat · Helmholtz Zentrum Dresden Rossendorf · UJV · МГУ имени М.В. Ломоносова · VTT · Kemakta Konsult AB · CONTERRA AB

EUG members:

SKB Svensk Kärnbränslehantering AB · STUK · POSIVA · Strål säkerhets myndigheten · SURAO Radioactive Waste Repository Authority