



PROGRAMME

Rock Laboratory Mont Terri, Switzerland

International Conference on the Performance of Engineered Barriers

Physical and Chemical Properties, Behaviour & Evolution

February 6-7, 2014
BGR, Hannover, Germany

Editors: A. Schäfers & S. Fahland
Organized by the PEBS project

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General Rapporteur: Irina Gaus – Nagra, Switzerland
Klaus Wieczorek – GRS, Germany

Day 1 – February 6, 2014	
	Welcome Words and Keynotes
09:00	Welcome <i>H.-J. Kümpel (BGR)</i>
09:10	Final Status of the Euratom FP7 Research and Training Programme in Radioactive Waste Geological Disposal and Outlook to the Future <i>C. Davies (EC)</i>
09:30	Implementing a Deep Geological Disposal System for Spent Nuclear Fuel in Sweden <i>P. Wikberg (SKB)</i>
	Overview on the Research Results of the PEBS Project <i>Chaired by S. Williams (NDA)</i>
10:00	PEBS Case 1 – Water Uptake in the Bentonite Buffer <i>J. C. Mayor, M. V. Villar, P.L. Martín, A. Gens (Cimne, UPC), M. Velasco</i>
10:20	PEBS Case 2 – EBS Performance at Temperatures above 100°C <i>I. Gaus (Nagra), K. Wieczorek, A. Gens, J. L. García-Siñeriz, T. Trick, U. Kuhlman, A. Dueck, M. V. Villar, O. Leupin, L. Johnson, O. Czaikowski, B. Garitte, K. Schuster, J. C. Mayor</i>
10:40	PEBS Case 3 – HM Evolution of the Buffer <i>P. Sellin (SKB), J. L. García-Siñeriz, A. Dueck, J.-C. Mayor, M. V. Villar, P. L. Martín, A. Gens, O. Kristensson, E. Alonso, I. Gaus</i>
11:00	PEBS Case 4 – Impact of the Geochemical Evolution of Bentonite Barriers on Repository Safety Functions <i>J. Cuevas (UAM), J. Samper, M. J. Turrero, K. Wieczorek</i>
11:20	Coffee break

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Day 1 – February 6, 2014		
	Large conference room	Conference room (A14)
	<p>New Insights from In-situ Experiments in Clay-rich Formations</p> <p><i>Chaired by I. Gaus (Nagra) & T. Fujita (JAEA)</i></p>	<p>Numerical Modelling of Thermo-Hydro-Mechanical-Chemical Processes</p> <p><i>Chaired by K. Wieczorek (GRS) & E. Hardin (SNL)</i></p>
11:40	<p>Outcome of the Dismantling of “EB” Experiment</p> <p><i>B. Palacios, J. L. García-Siñeriz (AITEMIN), J.C. Mayor</i></p>	<p>Numerical Study of Thermo-Hydro-Mechanical Coupling Behaviors of GMZ Bentonite</p> <p><i>S. Cao, Y.M. Liu, L. Chen, J. Xie (BRIUG), Y. Li, L. Ma</i></p>
12:00	<p>Geophysical Long-term Monitoring within the PEBS Project – HE-E- and EB-Experiment</p> <p><i>K. Schuster (BGR), M. Furche, F. Schulte, T. Tietz, C. Czora and S. Sanchez Herrero</i></p>	<p>About Vapour Diffusion during Bentonite Re-Saturation</p> <p><i>K.-P. Kröhn (GRS)</i></p>
12:20	<p>Sealing Materials Used in the HE-E Test: Thermo-hydro-mechanical Characterisation</p> <p><i>M. V. Villar (CIEMAT), P. Martín, R. Gómez-Espina, V. Gutiérrez-Rodrigo, J. Barcala</i></p>	<p>Model of Bentonite Swelling Solved as a Contact Problem</p> <p><i>I. Skarydova (University of Liberec), M. Hokr</i></p>

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	Large conference room	Conference room (A14)
12:40	<p>Bentonite Buffer Material Production and Emplacement during the Full-Scale Emplacement (FE) Experiment at the Mont Terri URL</p> <p><i>H. R. Müller (Nagra), B. Garitte, H. Weber, S. Köhler, M. Plötze</i></p>	<p>A Free Swelling Model of MX-80 Bentonite Implemented in Comsol</p> <p><i>V. Navarro, L. Asensio (Universidad de Castilla-La Mancha), Á. Yustres, J. Alonso, X. Pintado</i></p>
13:00	Lunch break, poster session and conference group photo	
14:30	<p>Investigating Gas Interaction in Laboratory and In-situ Experiments</p> <p><i>Chaired by P. Sellin (SKB) & J. Avis (Geofirma)</i></p>	<p>Long-term THCM Simulations of the Interactions of Compacted Bentonite in Contact with Concrete and Carbon Steel in a HLW Repository in Granite and Clay</p> <p><i>J. Samper (UDC), A. Mon, L. Montenegro, A. Naves</i></p>
	<p>Observations from Four Gas Injection Tests Conducted in a Full Scale KBS-3v Setup; The Large Scale Gas Injection Test (Lasgit) Conducted at the Äspö Hard Rock Laboratory, Sweden</p> <p><i>R.J.Cuss (BGS), J.F. Harrington, D.J. Noy, C.C. Graham, P. Sellin</i></p>	

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Day 1 – February 6, 2014		
	Large conference room	Conference room (A14)
14:50	Interaction between Gas and Bentonite Seals: Small Scale In-situ Test in the Meuse/Haute Marne Underground Research Laboratory <i>R. de La Vaissière (ANDRA), J. Talandier</i>	Numerical Modeling of Iron Corrosion and Interaction with Bentonite in Clay Formations <i>C. Hansmeier, G. Bracke (GRS), B. Reichert</i>
15:10	Hydro-mechanical Properties of Interfaces in Sealing Plugs Constructed of Bentonite-Block Assemblies <i>T. Popp, C. Rölke (IfG), K. Salzer</i>	Cement Behaviour in Plug Sealing Storage Galleries – Numerical Comparison <i>F. Wertz, P. Večerník, T. Černoušek (CVŘ)</i>
15:30	Coffee break	
15:50	Gas Injection and Swelling Tests on a Sand Bentonite Mixture: Investigation on the Effects of Pore Water Chemistry <i>D. Manca (EPFL-ENAC-LMS), A. Ferrari, L. Laloui</i>	Coupled Hydraulic-Mechanical-Chemical Modeling for Cement-Bentonite Barrier System (2) Mechanical Modeling of Bentonite Engineered Barrier in Consideration of Long Term Chemical Alteration <i>Y. Takayama, A. Iizuka (Kobe University), H. Ohwada, T. Ishii, I. Kobayashi</i>

Day 1 – February 6, 2014		
	Large conference room	Conference room (A14)
16:10	<p>New Insights from In-situ Experiments in Crystalline Host Rock</p> <p><i>Chaired by J. C. Mayor (ENRESA) & K. Birch (NWMO)</i></p>	<p>Improvements in Performance Prediction</p> <p><i>Chaired by L. Johnson (Nagra) & T. Popp (IfG)</i></p>
	<p>The Bentonite Rock Interaction Experiment</p> <p><i>M. Åkesson (Clay Technology), Å. Fransson, P. Vidstrand, A. Sjöland</i></p>	<p>FEPs and their Designation in the Technical Proof of a Geotechnical Barrier's Safety Function</p> <p><i>N. Müller-Hoeppe (DBE Technology)</i></p>
16:30	<p>FEBEX In Situ Test After 18 Years of Monitoring – Final Dismantling In 2015</p> <p><i>I. Gaus (Nagra), P.-L. Martin Martin, E. Thurner, M. Vahanen, S.-P. Teodori, F. Kober, J.-S. Kwon</i></p>	<p>Upscaling of Thermo-hydrologic Phenomena from the Emplacement Tunnel to the Repository Scale</p> <p><i>A. Papafotiou (INTERA Inc.), J. Ewing, R. Senger</i></p>
16:50	<p>Borehole Plugging Experiment in OL-KR24 in Olkiluoto</p> <p><i>T. Karvonen (Saanio & Riekkola Oy), J. Hansen</i></p>	<p>Uncertainty and Sensitivity Analysis for Large-scale Two-phase Fluid Flow Calculations</p> <p><i>I. Kock (GRS), S. Hotzel</i></p>

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17:10	Findings from the Retrieval of the Outer Section of Prototype Repository at Äspö Hard Rock Laboratory <i>L.-E. Johannesson (Clay Technology), P. Grahm, A. Sjöland, J. Hansen</i>	Probabilistic Performance Assessment of Repository and Geosphere Attributes Using a Detailed Three-Dimensional Groundwater Flow and Transport Model <i>J. Avis (Geofirma Engineering), M. Gobien</i>
17:30	Discussion	Discussion
18:30	Conference dinner <i>(Buses depart at 17:50 from BGR)</i>	

Day 2 – February 7, 2014		
	Large conference room	Conference room (A14)
	<p>New Insights from Laboratory Experiments</p> <p><i>Chaired by M. V. Villar (CIEMAT) & K.-H. Lux (TU Clausthal)</i></p>	<p>Design and Construction of Engineered Barriers</p> <p><i>Chaired by J. L. García-Siñeriz (Aitemin) & G. Armand (Andra)</i></p>
08:30	<p>THMC China-Mock-Up Test about the Buffer Material for HLW Disposal in China</p> <p><i>Y.M. Liu (BRIUG), J. Wang, S.F. Cao, J.L. Xie, L.K. Ma, X.G. Zhao, L. Chen, Y.W. Li</i></p>	<p>A General Overview of DOPAS Project and First Year Achievements for Full-scale Demonstration of Plugs and Seals</p> <p><i>J. Hansen (Posiva)</i></p>
08:50	<p>Temporal Evolution of the Fe/ FEBEX Bentonite System under Simultaneous Hydration and Heating – Results up to Seven Years</p> <p><i>E. Torres (CIEMAT), M. J. Turrero, A. Escribano, R. Fernández, A. Ruíz, J. Cuevas</i></p>	<p>Engineered Barrier System Design for the NWMO Mark II Used Fuel Container</p> <p><i>K. Birch (NWMO), A. Murchison, M. Mielcarek, D. Marinceu, C. Hatton</i></p>
09:10	<p>An Experimental Approach to Study the Long-term Alteration of Compacted Bentonite Affected by Cement Degradation and Iron Corrosion Products</p> <p><i>J. Cuevas (UAM), R. Fernández, E. Torres, A. Escribano, A. I. Ruiz, M. Regadío, M. J. Turrero</i></p>	<p>Plan of Full-scale Experiment on Engineered Barrier System in Horonobe Underground Research Laboratory</p> <p><i>T. Fujita (JAEA), M. Nakayama, K. Tanai, Y. Sugita</i></p>

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09:30	<p>“Clay/Iron-Interaction”- Experiments on a Series of Bentonites</p> <p><i>H.-J. Herbert, J. Kasbohm (GeoEncon), N. Tan, L. Meyer, H. Thi Minh Thao, M. Xie</i></p>	<p>Design and Construction of a Large-scale Sand-bentonite Seal in in the Meuse/Haute Marne Underground Research Laboratory: NSC Experiment</p> <p><i>R. de La Vaissière (ANDRA), N. Conil, J. Morel, F. Leveau, C. Gatabin, J.L. Garcia-Sineriz, H. Habos, M. Rey, M. Piedevache, B. Helminger, C. Balland</i></p>
09:50	<p>Mineralogical Characterization of all Samples of the Second ABM-package and Implications for the Identification of Suitable and Less Suitable Buffer Materials</p> <p><i>S. Kaufhold (BGR), R. Dohrmann</i></p>	<p>Preliminary Safety Analysis Gorleben – Design of a Bentonite Shaft Sealing Element</p> <p><i>M. Breustedt (DBE Technology), N. Müller-Hoeppe</i></p>
10:10	<p>An Insight into the Water Retention Behaviour of MX-80 Granular Bentonite</p> <p><i>A. Seiphoori (EPFL-ENAC-LMS), A. Ferrari, L. Laloui</i></p>	<p>New Progress In Crushed Salt Compaction For Shaft Sealing Elements</p> <p><i>U. Glaubach (TU Freiberg), M. Hofmann, M. Gruner, W. Kudla</i></p>
10:30	Coffee break	

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	Large conference room	Conference room (A14)
10:50	<p>Geochemical Investigation in an Effort to Increase Bentonite Barrier's Thermal Load Capacity to Accommodate 32-PWR Dual Purpose Canisters</p> <p><i>M. Cheshire (Los Alamos National Laboratory), E. Hardin, F. Caporuscio, C. Jove-Colon, M. K. McCarney</i></p>	<p>Numerical Modelling of In-situ Experiments</p> <p><i>Chaired by A. Gens (Cimne) & J. Stahlmann (TU BS)</i></p> <hr/> <p>Inverse Modeling of the FEBEX-in-situ Heating Experiment: Parameter Estimation, Extrapolation and Predictive Uncertainty Analysis</p> <p><i>U. Kuhlmann (TK Consult), I. Gaus</i></p>
11:10	<p>Investigation of the Thermal Stability of Materials to be Used in a High-Level Nuclear Waste Repository</p> <p><i>H.-J. Engelhardt (DBE Technology), L. von Borstel, T. Schirmer</i></p>	<p>Modeling Of The SEALEX In-situ Experiments-Performance Tests of Repository Seals</p> <p><i>N. Mokni (IRSN), J-D. Barnichon</i></p>
11:30	<p>Alteration of Hydromechanical Behaviour of a Compacted Clay Submitted to an Alkaline Fluid Circulation</p> <p><i>O. Cuisinier (LEMTA), F. Masrouri, D. Deneele, N. Conil</i></p>	<p>Scoping Computations for the Full-Scale Emplacement (FE) Experiment at the Mont Terri Underground Research Laboratory</p> <p><i>B. Garitte (Nagra), H. R. Müller, T. Vogt, T. Vietor, K. Thatcher, R. Senger</i></p>

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11:50	<p>Direct Observation of Waterglass Impregnation of Fractured Salt Rock with Positron Emission Tomography</p> <p><i>L. Bittner, J. Kulenkampff (Helmholtz-Zentrum Dresden Rossendorf), M. Gründig, J. Lippmann-Pipke, F. Enzmann</i></p>	<p>The Enhanced Sealing Project: Monitoring of a Full-Scale Composite Shaft Seal from 2009-2013, and Related Hydro-Mechanical Numerical Modelling</p> <p><i>D. Priyanto (AECL), D. Dixon, S. Stroes-Gascoyne, R. Farhoud, P. Korkeakoski, B. Nyblad, J. Villagran</i></p>
12:20	<p>Panel discussion</p> <ul style="list-style-type: none"> • What are the key remaining scientific-technical questions for engineered barriers? • How can programmes in early phases of development become involved in T&E, joint R&D, joint use of facilities and involvement in URL investigations? • How can activities contribute to common views across the EU on regulatory expectations, regulator methodologies, as well as review and assessment criteria? • How can activities contribute to clarity and thus to acceptance by stakeholders beyond the expert community and interest groups or organizations? <p><i>Chaired by P. Wikberg (SKB, Sweden)</i></p> <p><i>D. Diaconu (INR, Romania), K. Koskinen (Posiva, Finland), K.-J. Röhlig (Clausthal University, Germany), N. Müller-Hoeppe (DBE, Germany), Frédéric Bernier (FANC, Belgium)</i></p>	
13:30	<p>Concluding words</p> <p><i>V. Bräuer (BGR)</i></p>	
13:45	<p>Lunch</p>	

Poster Session

New Insights from In-situ Experiments in Clay-rich Formations	
P01	<p>Geochemical Outcome of the Dismantling of “EB” Experiment</p> <p><i>A.M. Fernández (CIEMAT), D.M. Sánchez-Ledesma, M.Sánchez, P. Galán, L. Gutierrez-Nebot, A. Melón</i></p>
P02	<p>Thermo-hydro-mechanical Characterisation of Samples Retrieved from the EB Test</p> <p><i>M. V. Villar (CIEMAT), R. Campos, I. Barrios, L. Gutiérrez-Nebot</i></p>
New Insights from Laboratory Experiments	
P03	<p>Thermo-hydro-mechanical Behaviour of Unsaturated Buffer Materials: A Column-type Approach</p> <p><i>T. Schanz, L. Nguyen-Tuan (Ruhr-Universität Bochum), W. Baille, S. Tripathy, M. Datcheva</i></p>
P04	<p>Bentonite Buffer Material Saturating Simulation by Geotechnical Centrifuge</p> <p><i>T. Mori (Obayashi Co.), H. Komine</i></p>
P05	<p>“Rate of Alteration”-Experiments on a Series of Bentonites</p> <p><i>N. T. Lan, J. Kasbohm (GeoENcon), H.-J. Herbert, H. Thi Minh Thao</i></p>
P06	<p>EMDD and the Effect of Salinity on Bentonite Properties</p> <p><i>G. Grégoire, K. Birch (NWMO), P. Gierszewski</i></p>
P07	<p>On the Electromagnetic Material Properties of Callovo-Oxfordian Clay Rock</p> <p><i>N. Wagner (Bauhaus-University Weimar), T. Bore, J.-C. Robinet, D. Coelho, F. Taillade, S. Delepine-Lesoille</i></p>

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Poster Session	
P08	Investigations of Excavated Claystone as Backfill/Seal Material <i><u>C.-L. Zhang</u> (GRS)</i>
P09	Geochemical Behaviour and Stability of the Czech B75 Bentonite during Interaction with Water at 90 °C <i><u>P. Filipská</u> (Masaryk University), J. Zeman, D. Všíanský, M. Honty</i>
P10	Slovak Candidate Bentonites for the Engineered Barriers: Review of Past & Ongoing Research at the Comenius University in Bratislava <i><u>R. Adamcova</u> (Comenius University Bratislava), M. Galambos, O. Roszkopfova, A. Krajnak</i>
Numerical Modelling of Thermo-Hydro-Mechanical-Chemical Processes	
P11	Coupled THC(m) Models of Compacted Bentonite <i><u>J. Samper</u> (UDC), A. Naves, L. Montenegro, A. Mon, B. Pisani</i>
P12	Long-term THC Simulations of the Interactions of Corrosion Products and Compacted Bentonite in a HLW Repository in Granite <i><u>J. Samper</u> (UDC), A. Naves, L. Montenegro, A. Mon</i>
P13	Numerical THC Models of Bentonite Heating and Hydration Tests to Study the Interactions of Compacted Bentonite with Concrete and Carbon Steel <i><u>J. Samper</u> (UDC), A. Mon, L. Montenegro, J. Cuevas, R. Fernández, M. J. Turrero, E. Torres, A. Naves</i>
P14	Coupled Hydraulic-mechanical-chemical Modelling for Cement-Bentonite Barrier System (1) Purpose and Issues of the Study <i><u>H. Owada</u> (RWMC), T. Ishii, I. Kobayashi, M. Takazawa, K. Yamaguchi, Y. Tajayama, A. Iizuka</i>

Poster Session

	Design and Construction of Engineered Barriers
P15	<p>Robust Natural Barriers: Parallel between CO₂ Geological Storage Oil & Gas Production and Radioactive Waste Disposal</p> <p><i>M. Loizzo, C. Vivalda (Vivalda Scientific Services)</i></p>
P16	<p>New Development of a Combined Abutment and Sealing Assembly Made of Bitumen and Gravel</p> <p><i>U. Glaubach, M. Hofmann, T. Teichert, W. Kudla (TU Freiberg)</i></p>
P17	<p>Application of SHOTCLAY Method to Construction of Backfill and Clay Plug</p> <p><i>I. Kobayashi, K. Suzuki (RWMC), J. Eto, H. Asano</i></p>

