

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

TRIP REPORT

SUBJECT: Materials Research Society 2006 Fall Meeting
Project No. 20.06002.01.212; 20.06002.01.322
AI No. 06002.01.322.702

DATE/PLACE: November 27–December 1, 2006, Boston, Massachusetts

AUTHORS: L. Yang, Y.-M. Pan [Center for Nuclear Waste Regulatory Analyses (CNWRA)], and D. Dunn [Southwest Research Institute® (SwRI®)]

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AUTHORS: L. Yang, Y.-M. Pan (CNWRA), and D. Dunn (SwRI)

PERSONS PRESENT:

L. Yang, Y.-M. Pan (CNWRA), D. Dunn (SwRI), and about 6,000 representatives from various countries and organizations.

PURPOSE OF TRIP

The Materials Research Society 2006 Fall Meeting was held in Boston, Massachusetts. The Symposium on Scientific Basis for Nuclear Waste Management XXX was part of the meeting. The purpose of the trip was to attend the symposium and to present papers on issues related to the corrosion of waste package materials and the near-field environment. Another purpose was to facilitate contact with and gain information from the technical experts and peers who are working on high-level nuclear waste management in North America, Europe, and Asia. D. Dunn (SwRI) was one of the symposium organizers along with Dr. Christophe Poinsot from CEA (France) and Dr. Bruce Begg from ANSTO (Australia). In addition, Y.-M. Pan chaired a session of the symposium.

SUMMARY OF PERTINENT POINTS AND ACTIVITIES:

The Symposium on Scientific Basis for Nuclear Waste Management was comprised of a wide variety of technical topics in 12 subareas. There were 96 oral presentations in the four and half days of sessions and 36 posters in two evenings. The symposium attracted more than 200 international participants, including people from the United States, Canada, Japan, and many countries in Europe.

The authors of this trip report presented two NRC-funded papers and one paper funded by a focused internal research and development project at SwRI in well-attended sessions. The authors also had discussions with the international audience during and after the presentations.

The pertinent topics of the symposium are summarized next.

Spent Fuel

The presentations in this session cover topics of nuclear fuel corrosion, alteration behavior of high burnup spent fuel, radiolysis of UO_2 , and reactivity of UO_2 . David Shoemith (University of Western Ontario, Canada) presented a paper on the modeling of corrosion of spent nuclear fuel

inside failed containers. Although copper containers, proposed for repositories in Europe, are expected to have long lifetimes under reducing conditions, failure of the containers would eventually allow groundwater entry and the corrosion of both the fuel and the carbon steel liner to occur, producing complex redox conditions within the container. Dr. Shoesmith discussed the evolution of chemistry inside a failed container and its influence on the fuel corrosion process.

William Murphy (California State University, Chico, California) presented a paper titled "Hydrothermal Phase Relations Among Uranyl Minerals at the Nopal I Natural Analog Site." The study results are applicable to studying the isolation of nuclear wastes in the potential geologic repository at Yucca Mountain, Nevada. Dr. Murphy also presented thermodynamic data on the stability of the uranium minerals found at the Nopal I site.

Performance Assessment and Models

Timothy McCartin [U.S. Nuclear Regulatory Commission (NRC), Washington, DC] was an invited speaker and presented a paper titled "Regulatory Perspective on Implementation of a Dose Standard for a One-Million Year Compliance Period." Currently, the NRC is reviewing performance assessment models and techniques to assure they are consistent with recent U.S. Environmental Protection Agency-proposed requirements for one million years. Of particular interest are the performance assessment subsystem results that affect overall repository performance over very long time periods. As the performance assessment tools and techniques are revised, the NRC will be conducting sensitivity analyses to identify important parameters associated with estimating doses over very long time periods. These analyses will improve understanding of performance of the potential repository at Yucca Mountain. The presentation generated significant discussion and was generally well received.

Yi-Ming Pan (CNWRA) presented a paper based on work performed on a focused internal research and development project funded by SwRI titled "A Probabilistic-Micromechanical Methodology for Assessing Zirconium Alloy Cladding Failure." A set of micromechanical models for treating oxide cracking, blister cracking, and delayed hydride cracking in Zircaloy cladding was developed and incorporated in a computer model. Results obtained from the model calculations indicate that at temperatures below a critical temperature, the time to failure by delayed hydride cracking in Zr-2.5%Nb decreased with increasing cladding temperature. The developed computer model will be integrated into a computational methodology for assessing the probability of hydride-induced failure in Zircaloy cladding.

Bernd Grambow (SUBATECH, École des Mines de Nantes, Nantes, France) presented a paper titled "Nuclear Waste Package Performance in European Geological Disposal Concepts." The paper provided an overview of the European Commission suite of international programs dealing with waste form and engineered barrier performance, radionuclide migration, performance, and safety assessments. Some recent results from ongoing projects focused on basic understandings, more realistic representation of scale effects, and quantification of remaining uncertainties were presented.

Unfortunately, a paper coauthored by the Electrical Power Research Institute (EPRI) on the analysis of the maximum disposal capacity for commercial spent fuel at Yucca Mountain was not presented.

Containers and Engineered Barriers

Zack Qin and David Shoesmith (University of Western Ontario, Canada) presented a poster titled "Monte Carlo Simulations of the Degradation of the Engineered Barrier System in the Yucca Mountain Repository Using the EBSPA Code" during the Monday evening poster session. Their results showed that the engineered barriers system should not fail until 255,000 years under realistic conditions. Nancy Yang (Analytical Materials Science of Sandia National Laboratories, Livermore, California) presented a poster titled "The Effect of Temperature on Microstructure, Mechanical Properties, and Devitrification of Corrosion Resistant Fe-Cr-Mo-B-Containing Alloys." This work was in collaboration with Joseph Farmer, et al. at Lawrence Livermore National Laboratory (Livermore, California). The results showed that the as-received amorphous ribbons are extremely hard and have a uniform chemical composition. Kenneth Evans and Raul Rebak (Lawrence Livermore National Laboratory, Livermore, California) presented a poster titled "Repassivation Potential of Alloy 22 in Chloride plus Nitrate Solutions using the Potentiodynamic-Galvanostatic-Potentiostatic Method." The results obtained suggest that the values of the repassivation potentials are not strongly dependent on the test method used.

Joe Payer, an invited speaker from Case Western Reserve University, presented a paper titled "Perspectives on Localized Corrosion in Thin Layers of Particulate." The presentation addressed processes that must occur for the initiation and propagation of crevice corrosion under thin electrolyte layers. Several significant issues were identified including water chemistry and the relative cathodic and anodic areas. For a thin electrolyte, the available cathodic area may be insufficient to support crevice corrosion.

Joseph Farmer, et al. (Lawrence Livermore National Laboratory, Livermore, California) presented a paper titled "High-Performance Corrosion-Resistant Iron-Based Amorphous Metals: The Effects of Composition, Structure and Environment on Corrosion Resistance." The paper presented an overview of the efforts in the development of the amorphous alloys. This was followed by a presentation by Jor-shan Choi (Lawrence Livermore National Laboratory, Livermore, California), who discussed a potential protective coating for spent fuel containers and criticality control materials.

Raul Rebak (Lawrence Livermore National Laboratory, Livermore, California) presented a paper titled "Mechanisms of Inhibition of Crevice Corrosion in Alloy 22." The paper described the possible mechanisms for the inhibition of localized corrosion of Alloy 22 in chloride solutions by the addition of anions such as nitrate and sulfate.

Tiangan Lian, et al. (Lawrence Livermore National Laboratory, Livermore, California) presented a paper titled "Corrosion Resistance of Iron-based Structural Amorphous Metals." The corrosion behavior of SAM1651 was compared with nickel-based Alloy 22. Based on data obtained using electrochemical polarization measurements, SAM 1651 was shown to be more resistant to localized corrosion than Alloy 22 under several conditions tested.

Ricardo Mario Carranza, et al. (Department of Materials, CNEA, Buenos Aires, Argentina and Lawrence Livermore National Laboratory, Livermore, California) presented a paper titled "Oxide Film Aging on Alloy 22 in Halide Containing Solutions." The decreased corrosion rates of Alloy 22 with time in chloride and fluoride containing solutions were attributed to film aging as a result of defect annihilation.

Darrell Dunn (SwRI) presented a paper titled "Evolution of Chemistry and its Effects on the Corrosion of Engineered Barrier Materials." The composition of salt deposits on Alloy 22 surfaces obtained in tests where dilute solutions simulating neutral, alkaline, and calcium-chloride brines were reported. The salts of the neutral and alkaline brines contained soluble deposits which could produce anionic species that would act as inhibitors. Salt deposits from the calcium chloride brines contained only low concentrations of soluble nitrate salts and mostly insoluble carbonate and sulfate salts.

Disposal Environments and Site Characteristics

Hideki Yoshikawa (Japan Atomic Energy Agency, Japan) presented a poster titled "Modeling Studies on Microbial Effects on Groundwater Chemistry." Yoshikawa and his coauthors developed a model to predict the microbial effect on the performance of the high-level radioactive waste repository system. Experimental measurement was also carried out from boreholes in the Horonobe underground research laboratory in Japan. The analyses showed that the activity of sulfate, reducing bacteria and methanogen bacteria was relatively high and that the concentration of methane that was originated by microbes and dissolved in groundwater was affected by the change in sulfate concentration.

Simcha Stroes-Gascoyne (Atomic Energy of Canada Limited, Canada) presented a paper titled "The Effects of Dry Density and Pore Water Salinity on the Physical and Microbiological Characteristics of Compacted 100 percent Bentonite." Stroes-Gascoyne and her coworkers used highly compacted, bentonite-based barriers that are being developed for use in the potential nuclear fuel waste repository system in Canada in the experiment. Their results suggest that microbial activity in the bulk of compacted 100-percent bentonite can be controlled as long as the emplaced bentonite has a dry density higher than 1.6 g/cm³ [100 lb/ft³], which ensures that the swelling pressure is high {> 2 MPa [290 psi]}, activity of water is low (< 0.96), and the average pore size is small {<0.02 μm [7.87 × 10⁻⁷ in]}. It was expressed that observations from several natural bentonite deposits corroborate their results. Therefore, they suggested that the swelling pressure and water activity may be used to limit the growth of microbes around the used containers.

Brian Marshall (U.S. Geological Survey, Colorado) presented a paper titled "Chemistry of Water Collected from an Unventilated Drift, Yucca Mountain, Nevada." Bulkheads were constructed to isolate part of the 2.7-km [1.7-m]-long enhanced characterization of the repository block cross drift from active ventilation. The bulkheads were closed, and active ventilation was stopped for periods up to 454 days. After opening the bulkheads, water puddles were observed on plastic sheets and on rubber conveyor belt surfaces; droplets of water and mold were observed on many surfaces of construction-related introduced materials. The puddles of water were sampled and analyzed for major and trace constituents. The author discussed the results including dissolved solids and pH and compared the values with those from ambient pore-water samples extracted from adjacent rock. It was found that the chemical composition of the puddle-water samples was dominated by sodium and chloride. Some of the chemical constituents measured in the puddle-water samples was traced to the interaction with construction-related materials.

John Walton (University of Texas at El Paso, Texas) discussed the migration of water vapor with condensation in the repository drift during the thermal period. He and his coauthors' simulation results from a coupled, in-rock and in-drift model predict that large quantities of water

will evaporate, which would lead to the accumulation of large quantities of minerals, including chloride from the pore water, during the thermal period. Their model results indicate that the predominant direction of vapor migration during the thermal period is from the rock into the drifts rather than away from the drift. The vapor moving into the warmer central section of the drift from the rocks will move further to the cooler edge sections and condense along the drift. The presence of large accumulations of chloride due to the net evaporation may present a challenging environment for Alloy 22.

Lietai Yang (CNWRA) made a presentation titled "Characterization of the Chemistry of NaCl-NaNO₃-KNO₃ Mixtures at Elevated Temperatures." This paper was coauthored with Roberto Pabalan (CNWRA) and Darrell Dunn (SwRI). The authors discussed the evolution of the chemistry of NaCl-NaNO₃-KNO₃ mixtures at elevated temperatures. The U.S. Department of Energy considers these mixtures to be the salt assemblages most likely to be deposited on the waste package surfaces within the potential repository at Yucca Mountain, Nevada, during the ventilation period. Studies have indicated that brines formed by the deliquescence of these salt mixtures could exist up to the highest temperatures predicted for the Yucca Mountain repository and may accelerate the corrosion of waste package materials. The authors conducted experiments at a temperature range of 130 to 180 °C [266 to 356 °F] in a glass vessel vented to the atmosphere, simulating the potential repository drift condition. The vapor phase venting out of the glass vessel was collected using a condenser, and the condensed phase was sampled periodically for measurements of pH and chemical composition. The preliminary results showed that the condensate had low pH, suggesting the NaCl-NaNO₃-KNO₃ salt mixture decomposed slowly to form acid gases.

Zell Peterman (U.S. Geological Survey, Colorado) presented the work on Geochemistry of Natural Components in the Near-Field Environment, Yucca Mountain, Nevada. The chemical compositions of dusts, seepage water, and pore water in and around the proposed drift environment were analyzed. It was reported that the soluble fractions of dust samples typically had NO₃⁻/Cl⁻ ratios between 1 and 10. Pore water extracted from core samples of the repository host rock had lower NO₃⁻/Cl⁻ ratios with an average value of 0.28. It was noted, however, that microbial activities in the core during storage may reduce the concentration of NO₃⁻ thus decreasing the NO₃⁻/Cl⁻ ratio.

The conference abstracts were published online and can be downloaded at http://www.mrs.org/s_mrs/doc.asp?CID=7201&DID=180146. A complete list of the conference papers is provided as an appendix of this trip report.

CONCLUSIONS:

The symposium provided an excellent opportunity to follow the recent developments in nuclear waste management in different countries and to make contacts with the technical experts involved in the nuclear repository programs. The papers presented by Lawrence Livermore National Laboratory on the corrosion-resistant characteristics and potential applications of the amorphous alloys as well as the effect of polarization techniques on the repassivation of Alloy 22 were of particular interest. It is recommended to closely follow the DOE's explanation on the low NO₃⁻-to-Cl⁻ ratio obtained from the pore water extracted from the core sample.

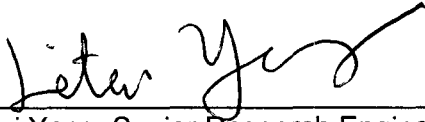
PROBLEMS ENCOUNTERED:

None.

PENDING ACTIONS:

None.


SIGNATURES:



Lietai Yang, Senior Research Engineer
Geological and Aerospace Materials

12/29/2006

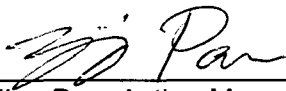
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Darrell Dunn, Principal Engineer
Environmental Performance of Materials

12/28/2006

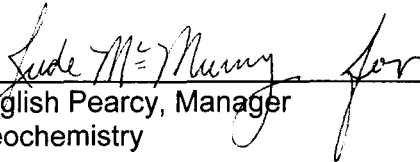
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Yi-Ming Pan, Acting Manager
Corrosion Science and Process Engineering

12/28/2006

Date

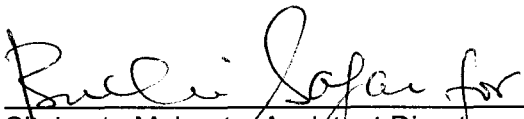


English Percy, Manager
Geochemistry

12/27/2006

Date

CONCURRENCE



Sitakanta Mohanty, Assistant Director
Engineering and Systems Assessment

12/22/2006

Date

Attachment

Appendix: Program of Symposium NN: Scientific Basis for Nuclear Waste Management XXX,
2006 Materials Research Society Fall Meeting.

LY:SM:jg



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Symposium NN: Scientific Basis for Nuclear Waste Management XXX

November 27 - December 1, 2006

Chairs

Darrell S. Dunn
Christophe Poinssot
Bruce Begg

Southwest Research Institute
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Australian Nuclear Science & Technology Organisation (ANSTO)



Symposium Support

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[Monday Sessions](#) | [Tuesday Sessions](#) | [Wednesday Sessions](#) | [Thursday Sessions](#)

* Invited paper

SESSION NN1: Spent Fuel

Chairs: William Murphy and Christophe Poinssot
Monday Morning, November 27, 2006
Constitution A (Sheraton)

8:30 AM *NN1.1

Corrosion of Nuclear Fuel Inside a Failed Copper Nuclear Waste Container. [David Shoesmith](#), Chemistry, University of Western Ontario, London, Ontario, Canada.

9:00 AM NN1.2

Alteration Behavior of High Burnup Spent Fuel in Salt Brine Under Hydrogen Overpressure and in Presence of Bromide. [Andreas Loida](#), Bernhard Kienzler and Volker Metz; Institut für Nukleare Entsorgung, Forschungszentrum Karlsruhe, Karlsruhe, Germany.

9:15 AM NN1.3

Chemical Effects at the Reaction Front in Corroding Spent Nuclear Fuel. [Jeffrey Fortner](#), A. Jeremy Kropf and James C. Cunnane; Chemical Engineering Division, Argonne National Laboratory, Argonne, Illinois.

9:30 AM NN1.4

Modeling the Distribution of Acidity within Nuclear Fuel (UO₂) Corrosion Product Deposits and Porous Sites. Woo-Jae Cheong, [Zack Qin](#), J. Clara Wren and David W. Shoesmith; The University of Western Ontario, London, Ontario, Canada.

9:45 AM NN1.5

Gamma-Radiolysis of NaCl Brine in the Presence of UO₂(s): Effects of Hydrogen and Bromide Volker Metz¹, Elke Bohnert¹, Kelm Manfred¹, Schild Dieter¹, Juergen Reinhardt² and Kienzler Bernhard¹; ¹Institute for Radioactive Waste Disposal, Research Center Karlsruhe, FZK-INE, Karlsruhe, Germany; ²Leibniz-Institut f. Oberflaechenmodifizierung, Leipzig, Germany.

10:00 AM BREAK

10:30 AM NN1.6

Reactivity of UO₂ in Solutions of Variable Bicarbonate: Results from Vertical Scanning Interferometry (VSI) Jonathan P. Icenhower¹, Michael D. Vinson², Andreas Luttge², Julia N. Glovack¹, Dawn M. Wellman¹ and Eric M. Pierce¹; ¹Applied Geology and Geochemistry, Pacific Northwest National Laboratory, Richland, Washington; ²Department of Earth Science, Rice University, Houston, Texas.

10:45 AM NN1.7

Dissolution Behaviour of UO₂ in Anoxic Conditions Comparison of Ca-bentonite and Boom Clay. Christelle Cachoir, Karel Lemmens and Thierry Menecart; SCK-CEN, Mol, Belgium.

11:00 AM NN1.8

Coffinite (USiO₄) Under Reducing and Oxidizing Conditions: Implications for Spent Nuclear Fuel (SNF) Disposal. Artur Piotr Deditius, Satoshi Utsonomiya and Rodney Ewing; Geological Sciences, University of Michigan, Ann Arbor, Michigan.

11:15 AM NN1.9

Thermodynamics of Formation of Soddyite ((UO₂)₂(SiO₄)(H₂O)₂). Lena Mazeina¹, Drew Gorman-Lewis², Jeremy B Fein², Jennifer Szymanowski², Peter Burns² and Alexandra Navrotsky¹; ¹Thermochemistry Facility, University of California at Davis, Davis, California; ²Civil Engineering and Geological Sciences, University of Notre Dame, Notre Dame, Indiana.

11:30 AM NN1.10

Hydrothermal Phase Relations Among Uranyl Minerals at the Nopal I Natural Analog Site. William M. Murphy, Geological and Environmental Sciences, California State University, Chico, Chico, California.

11:45 AM NN1.11

Influence of Temperature on the Corrosion of Uranium Dioxide Nuclear Fuel. Michael Broczkowski, Jamie Noel and David Shoesmith; Chemistry, The University of Western Ontario, London, Ontario, Canada.

SESSION NN2: Performance Assessment and Models

Chairs: David Shoesmith and Lietai Yang

Monday Afternoon, November 27, 2006

Constitution A (Sheraton)

1:30 PM *NN2.1

Regulatory Perspective on Implementation of a Dose Standard for a One-Million Year Compliance Period. Timothy J McCartin, U.S. Nuclear Regulatory Commission, Washington, District of Columbia.

2:00 PM NN2.2

Analysis of the Maximum Disposal Capacity for Commercial Spent Nuclear Fuel in a Yucca Mountain Repository. Michael John Apted¹, John Kessler², Frank Schwartz³, Wei Zhou¹, Fraser King⁴, John Kemeny⁵, Ben Ross⁶ and Alan Ross⁷; ¹Monitor Scientific LLC, Denver, Colorado; ²Electric Power Research Institute, Charlotte, North Carolina; ³Department of Geology, The Ohio State University, Columbus, Ohio; ⁴Integrity Corrosion Consulting Ltd., Calgary, Alberta, Canada; ⁵Department of Mining Engineering, University of Arizona, Tucson, Arizona; ⁶Disposal Safety Inc., Washington, District of Columbia; ⁷Alan Ross and Associates, San Jose, California.

2:15 PM NN2.3

A Probabilistic-Micromechanical Methodology for Assessing Zirconium Alloy Cladding Failure. Yi-Ming Pan¹, Kwai S. Chan², David S. Rihana² and Vijay Jain¹; ¹CNWSA-Southwest Research Institute, San Antonio, Texas; ²Southwest Research Institute, San Antonio, Texas.

2:30 PM BREAK

3:30 PM *NN2.4

Nuclear Waste Package Performance in European Geological Disposal Concepts. Bernd Grambow, SUBATECH, Ecole des Mines de Nantes, Nantes, France.

4:00 PM NN2.5

Modeling Primary Colloid Generation from Corroded Commercial Spent Nuclear Fuel. Edgar Buck¹, Richard S Wittman¹ and Christine T Stockman²; ¹Pacific Northwest National Laboratory, Richland, Washington; ²Sandia National Laboratories, Las Vegas, Nevada.

4:15 PM NN2.6

New Trends in the Field of Spent Nuclear Fuel Radionuclides Release in a Deep Geological Repository. Christophe Poinssot, Cécile Ferry and Arnaud Poulesquen; Nuclear Energy Division, Department of Physics and Chemistry, CEA, Gif sur Yvette, France.

4:30 PM NN2.7

The Brag and GM2003 Models for Glass Dissolution. Marc Aertsens¹ and Bernd Grambow²; ¹Waste&Disposal, SCKCEN, Mol, Belgium; ²Subatech, Nantes, France.

4:45 PM NN2.8

Microstructural Characterization of U Coprecipitated Phases Formed in bentonic-granitic Groundwater and under Anoxic Conditions. Javier Quinones¹, Eduardo Iglesias¹, Aurora Martinez Esparza² and Jose Maria Gomez de Salazar³; ¹Energy, Ciemat, Madrid, Spain; ²Enresa, Madrid, Spain; ³Materials Science, Universidad Complutense de Madrid, Madrid, Spain.

SESSION NN3: Poster Session: Spent Fuel, Corrosion and Waste Characterisation

Chairs: Darrell Dunn and Christophe Poinssot

Monday Evening, November 27, 2006

8:00 PM

Exhibition Hall D (Hynes)

NN3.1

Flowsheet Development for Dissolution and Disposition of Savannah River Site Legacy Plutonium and Uranium-Containing Materials. Ann E. Visser, Glen F. Kessinger and Robert A. Pierce; Actinide Technology Section, Savannah River National Laboratory, Aiken, South Carolina.

NN3.2

Chemical Equilibrium of the Dissolved Uranium in Groundwaters From a Spanish Uranium-ore Deposit. Antonio Garralon, Paloma Gomez, Maria Jesus Turrero, Belen Buil and Lorenzo Sanchez; Medio Ambiente, CIEMAT, Madrid, Madrid, Spain.

NN3.3

Assessment of the Radionuclide Release from the Near-Field Environment of a Spent Nuclear Fuel Geological Repository Arnaud Poulesquen, Jean Radwan, Christophe Poinssot and Cécile Ferry; Department of Physics and Chemistry, CEA Saclay, Gif-sur-Yvette, France.

NN3.4

Synthesis and Characterization of Quadruple-Bonded Technetium Dimers. Frederic m Poineau¹, Alfred P Sattelberger², Ken Czerwinski¹ and Steven D Conradson³; ¹Harry Reid Center for Environmental Studies, University of Nevada Las Vegas, Las Vegas, Nevada; ²Physical Sciences Directorate, Argonne National Laboratory, Argonne, Illinois; ³Materials Science and Technology Division, Los Alamos National Laboratory, Los Alamos, New Mexico.

NN3.5

Uranium Sequestration by Aluminum Phosphate Minerals in Unsaturated Soils. James L Jerden, Argonne National Laboratory, Argonne, Illinois.

NN3.6

Monte Carlo Simulations of the Degradation of the Engineered Barriers System in the Yucca Mountain Repository Using the EBSPA Code Zack Qin and David W. Shoesmith; The University of Western Ontario, London, Ontario, Canada.

NN3.7

Abstract Withdrawn

NN3.8

Transferred to NN2.3

NN3.9

Study of Susceptibility of Copper OFP to Corrosion in Presence of Chloride Ion and Simulated Underground Water. Ivan Escobar¹, Claudia Lamas¹, Lars Werme² and Virginia Oversby³; ¹Nuclear Materials, Chilean Commission for Nuclear Energy, Santiago, Chile; ²Svensk Kärnbränslehantering AB (SKB), Stockholm, Sweden; ³VMO Konsult, Stockholm, Sweden.

NN3.10

Synthesis and Performance of Fe-based Amorphous Alloys for Nuclear Waste Applications. Kjetil Hildal¹, John H. Perepezko¹ and Larry Kaufman²; ¹Materials Science and Engineering, University of Wisconsin-Madison, Madison, Wisconsin; ²CALPHAD Inc., Brookline, Massachusetts.

NN3.11

Abstract Withdrawn

NN3.12

The Effect of Temperature on Microstructure, Mechanical Properties, and Devitrification of Corrosion Resistant Fe-Cr-Mo-B-Containing Alloys. Nancy Yang¹, Gene Lucadamo¹, Tom Headley¹, Joseph C. Farmer² and Dan Day²; ¹Analytical Materials Science, Sandia National Laboratories, Livermore, California; ²Lawrence Livermore National Laboratory, Livermore, California.

NN3.13

Repassivation Potential of Alloy 22 in Chloride plus Nitrate Solutions using the Potentiodynamic-Galvanostatic-Potentiostatic Method. Kenneth J. Evans and Raul B. Rebak; Lawrence Livermore National Laboratory, Livermore, California.

NN3.14

Salt Fog Testing Iron-Based Amorphous Alloys. Raul B. Rebak¹, Louis F. Aprigliano², S. Daniel Day¹, Jeffery J. Haslam¹ and Joseph C. Farmer¹; ¹Lawrence Livermore National Laboratory, Livermore, California; ²Naval Surface Warfare Center, West Bethesda, Maryland.

NN3.15

Corrosion Behavior of Carbon Steel in Compacted Bentonite under Gamma Ray Irradiation. Satoshi Iwasa, Masashi Haginuma, Shoichi Ono and Kazunori Suzuki; Institute of Research and Innovation, Kashiwa-shi, Chiba, Japan.

NN3.16

Computational Investigation of the Thermodynamics of Mixing in Rare-Earth Pyrochlore Minerals using First-Principles and Monte-Carlo Methods. Darius A Dixon^{1,2}, Udo Becker¹ and Rodney C. Ewing^{1,2,3}; ¹Geological Sciences, University of Michigan- Ann Arbor, Ann Arbor, Michigan; ²Materials Science and Engineering, University of Michigan- Ann Arbor, Ann Arbor, Michigan; ³Nuclear Engineering and Radiological Sciences, University of Michigan- Ann Arbor, Ann Arbor, Michigan.

NN3.17

Synthesis and Characterization of Technetium-Zirconium Alloys Waste Forms for the UREX+1 Process Ken Czerwinski^{1,2}, Frederic Poineau², Thomas Hartmann² and Gordon Jarvinen³; ¹Chemistry, University of Nevada, Las Vegas, Las Vegas, Nevada; ²UNLV-Harry Reid Center for Environmental Studies, Las Vegas, Nevada; ³Nuclear Materials Technology Division, Los Alamos National Laboratory, Los Alamos, New Mexico.

NN3.18

Characterization of Solids in Residual Wastes from Underground Storage Tanks at the Hanford Site, Washington, U.S.A. Kenneth M. Krupka, William J. Deutsch, H. Todd Schaef, Bruce W. Arey, Steve M. Heald, Michael J. Lindberg and Kirk J. Cantrell; Pacific Northwest National Laboratory, Richland, Washington.

NN3.19

European Laboratories for Actinide Research: the ACTINET Pooled Facilities H. Geckeis¹, D. Guillauneux², T. Wiss³, M. Coeck⁴, A. Scheinost⁵, G. Geipel⁵, A. Scheidegger⁶, Volker Metz¹ and P. Chaix²; ¹Institute for Radioactive Waste Disposal, Research Center Karlsruhe, FZK-INE, Karlsruhe, Germany; ²Commissariat a l'Energie Atomique, Paris, France; ³Institute for Transuranium Elements, Joint Research Centre, Karlsruhe, Germany; ⁴Centre D'Etude de l'Energie Nucleaire, SCK-CEN, Mol, Belgium; ⁵Institut fuer Radiochemie, Forschungszentrum Rossendorf, FZR-IRC, Dresden, Germany; ⁶Paul-Scherrer-Institut, Villigen, Switzerland.

NN3.20

Radiolysis and Ageing of C2-BTP in Cinnamaldehyde/hexanol Mixtures. Anna Fermvik, Christian Ekberg, Teodora Retegan and Gunnar Skarnemark; Nuclear Chemistry, Chalmers University of Technology, Gothenburg, Sweden.

NN3.21

Application of a Comprehensive Sensitivity Analysis Method on the Safety Assessment of TRU Waste Disposal in JAPAN. Takao Ohi¹, Hiroyasu Takase², Manabu Inagaki², Kiyoshi Oyamada³, Tomoyuki Sone¹, Morihiro Mihara¹, Takeshi Ebashi¹ and Kunihiro Nakajima⁴; ¹JAEA, Tokai-mura, Ibaraki-Ken, Japan; ²Quintessa K. K, Yokohama, Kanagawa-ken, Japan; ³JGC Corporation, Yokohama, Kanagawa-ken, Japan; ⁴NESI Inc., Tokai-mura, Ibaraki-ken, Japan.

SESSION NN4: Waste Forms for Plutonium and Ceramics for HLW
Chairs: Albert Aloy and Rod Ewing
Tuesday Morning, November 28, 2006
Constitution A (Sheraton)

8:30 AM *NN4.1

Development of Ceramic Waste Forms for High-Level Nuclear Waste over the Last 30 years. Eric R. Vance, ANSTO, Lucas Heights, New South Wales, Australia.

9:00 AM NN4.2

An Evaluation of Single Phase Ceramic Formulations for Plutonium Disposition. Martin Christopher Stennett¹, Neil C Hyatt¹, Ewan R Maddrell², Charlie R Scales², Francis R Livens³ and Matthew Gilbert³; ¹Engineering Materials, The University of Sheffield, Sheffield, South Yorkshire, United Kingdom; ²B170, Nexia Solutions Ltd., Seascale, Cumbria, United Kingdom; ³Chemistry, The University of Manchester, Manchester, Lancashire, United Kingdom.

9:15 AM NN4.3

Survey of Potential Glass Compositions for the Immobilisation of the UK's Separated Plutonium Stocks. Mike Harrison¹, Charlie R Scales¹, Paul A Bingham² and Russell J Hand²; ¹Nexia Solutions Ltd., Sellafeld, Seascale, Cumbria, United Kingdom; ²Immobilisation Science Laboratory, Sheffield University, Sheffield, United Kingdom.

9:30 AM NN4.4

Development of a Phosphate Ceramic as a Host for Halide-contaminated Plutonium Pyrochemical Reprocessing Wastes. Brian L. Metcalfe¹, Shirley K. Fong¹, Lee A. Gerrard¹, Ian W. Donald¹, Denis M. Strachan² and Randall D. Scheele²; ¹MSRD, AWE, Reading, Berkshire, United Kingdom; ²PNNL, Richland, Washington.

9:45 AM NN4.5

The Benefits of Tailored Glass-Ceramic Waste Forms to Lock up Problematic HLW. Bruce Begg, Arthur Day, Martin Stewart and Sam Moricca; ANSTO, Menai, New South Wales, Australia.

10:00 AM BREAK

10:30 AM NN4.6

A New Zirconolite Base Glass-Ceramic for The Immobilization of High Level Radioactive Waste. Mohsen Mahmoudysephehr¹, Vahak Marghussian¹, Jafar Javadpour¹, H. Kazemian² and M. R. Khani²; ¹Department of Materials Science, Iran University of Science & Technology, Tehran, Iran; ²Jaber Ibn Hayan Research Labs, Atomic Energy Organization of Iran, Tehran, Iran.

10:45 AM NN4.7

Effect of Stainless Steel Can/Glass-ceramic Interaction Layer on Aqueous Durability. Peter John McGlenn, Yingjie Zhang, Huijun Li and Tim E Payne; Institute of Materials & Engineering Science, Australian Nuclear Science & Technology Organisation, Lucas Heights, New South Wales, Australia.

11:00 AM NN4.8

Hydrothermal Methods as a New Way of Actinide Phosphate Preparation. Nicolas J Dacheux¹, Nicolas Clavier¹, Gilles Wallez² and Michel Quarton²; ¹Radiochemistry Group, Nuclear Physics Institute, Orsay, France; ²University Pierre et Marie Curie - Paris 6, Paris, France.

11:15 AM NN4.9

Na Release from Na₅Zr(PO₄)₃ -rich Ceramics. Melody Lyn Carter, E. R. Vance and John V. Hanna; ANSTO, Lucas Heights, New South Wales, Australia.

11:30 AM NN4.10

Rare Earth-Doped Murataite Ceramics. Sergey V Stefanovsky, Sergey V Yudintsev, Boris S Nikonov, Olga I Stefanovsky and Natalia S Mikhailenko; SIA Radon, Moscow, Russian Federation.

11:45 AM NN4.11

Synroc-D Type ceramics Produced by Hot Isostatic Pressing and Cold Crucible Melting for Immobilisation of (Al, U) Rich Nuclear Waste. Eric R. Vance, M. La Robina, H. Li and J. Davis; ANSTO, Lucas Heights, New South Wales, Australia.

SESSION NN5: Spent Fuel
Chairs: Cecile Ferry and Lars Werme
Tuesday Afternoon, November 28, 2006
Constitution A (Sheraton)

1:30 PM NN5.1

Effect of Helium Accumulation on the Spent Fuel Microstructure. Ferry Cecile¹, Piron Jean-Paul² and Stout Ray³; ¹Department of physico-chemistry, CEA Saclay, Gif-sur-Yvette, France; ²Department of Fuel Studies, CEA, Cadarache, France; ³Rho Beta Sigma Affairs, Livermore, California.

1:45 PM NN5.2

Thermal Diffusion of Helium in UO₂. Guillaume Martin¹, Pierre Desgardin¹, Thierry Sauvage¹, Gaelle Carlot², Philippe Garcia², Hicham Khodja³ and Marie-France Barthe¹; ¹CNRS / CERI, Orleans, France; ²CEA Cadarache / LLCC, St Paul Lez Durance, France; ³CEA Saclay / LPS, Gif sur Yvette, France.

2:00 PM NN5.3

Chlorine Diffusion in UO₂ : Thermal Effects versus Radiation Enhanced Effects. Yves Pison¹, Nelly Toulhoat¹, Nathalie Moncoffre¹, Nicolas Bererd¹, Henri Jaffrezic¹, Louis Raimbault², Andre Scheidegger³ and Farncois Farges⁴; ¹CNRS/IN2P3 Universite Claude Bernard Lyon 1, Institut de Physique Nucleaire de Lyon, Villeurbanne, France; ²Centre d'Informatique Geologique, Ecole des Mines de Paris, Fontainebleau, France; ³Nuclear Energy and Safety Department Laboratory for Waste Management, Paul Scherrer Institut, Villigen, Switzerland; ⁴Laboratoire des Geomateriaux, Université de Marne la Vallée, Champs sur Marne, France.

2:15 PM NN5.4

Modelling of Spent Fuel Oxidation at Low Temperature Arnaud Poulesquen¹, Lionel Desgranges² and Cécile Ferry¹; ¹Department of Physics and Chemistry, CEA Saclay, Gif-sur-Yvette, France; ²Department of Fuel studies, CEA Cadarache, Saint Paul Lez Durance, France.

2:30 PM NN5.5

Computational Investigation of the Formation of Hyperstoichiometric Uranium Dioxide (UO_{2+x}). Frances Skomurski¹, Rodney Ewing^{1,2,3} and Udo Becker¹; ¹Geological Sciences, University of Michigan, Ann Arbor, Michigan; ²Materials Science and Engineering, University of

Michigan, Ann Arbor, Michigan; ³Nuclear Engineering and Radiological Sciences, University of Michigan, Ann Arbor, Michigan.

2:45 PM NN5.6

Physical and Chemical Processes Inside Stored Spent Core of Naval Reactors with Lead-Bismuth Coolant Sviatoslav V. Ignatiev, Vladimir A. Chernov, Dmitry V. Pankratov, Ivan E. Somov, Vladimir Ya. Sukhonosov and Alexey N. Zabudko; Dept. of Special Nuclear Power Units, Institute for Physics and Power Engineering (IPPE), Obninsk, Kaluga Region, Russian Federation.

3:00 PM BREAK

SESSION NN6: Glass Characterization and Leaching

Chairs: Neil Hyatt and Carol Jantzen
Tuesday Afternoon, November 28, 2006
Constitution A (Sheraton)

3:30 PM NN6.1

EELS Spectrum Imaging and Tomography Studies of Simulated Nuclear Waste Glasses. Guang Yang, Günter Möbus and Russell Hand; Engineering Materials, University of Sheffield, Sheffield, South Yorkshire, United Kingdom.

3:45 PM NN6.2

Experimental Study and Monte Carlo Modeling of Calcium Borosilicate Glasses Leaching. Mehdi Arab¹, Celine Cailleteau¹, Frederic Angeli¹ and François Devreux²; ¹CEA/DEN/DTCD/SECM/Laboratoire d'étude du comportement à long terme des matériaux de conditionnement, CEA, Bagnols sur Ceze, France; ²Laboratoire de Physique de la Matière Condensée, CNRS & Ecole Polytechnique, Palaiseau, France.

4:00 PM NN6.3

Tc and Re Behavior in Borosilicate Waste Glass Vapor Hydration Tests. David A. McKeown¹, Andrew C. Buechele¹, Wayne W. Lukens², David K. Shuh² and Ian L. Pegg¹; ¹Vitreous State Laboratory, Catholic University, Washington, District of Columbia; ²Chemical Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, California.

4:15 PM NN6.4

Dissimilar Behavior of Technetium and its Non-radioactive Surrogate Rhenium in Waste Glasses. Wayne Lukens¹, David McKeown², Andrew Buechele², Ian Pegg² and David Shuh¹; ¹Chemical Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, California; ²Vitreous State Laboratory, The Catholic University of America, Washington, District of Columbia.

SESSION NN7: Historical Perspectives and Future Trends

Chairs: Bruce Begg and Darrell Dunn
Tuesday Evening, November 28, 2006
Constitution A (Sheraton)

7:00 PM *NN7.1

What Has Changed in Thirty Years? Rodney C. Ewing, Geological Sciences, University of Michigan, Ann Arbor, Michigan.

7:30 PM *NN7.2

Nuclear Waste Disposal in Deep Geological Formations: What are the Major Remaining Scientific Issues? Pierre Toulhoat, Institut des Sciences Analytiques, Université Lyon1, Villeurbanne, France.

8:00 PM *NN7.3

A Science-Based Approach to Understanding Waste Form Durability in Open and Closed Nuclear Fuel Cycles. Mark T. Peters¹ and Rodney C. Ewing²; ¹Applied Science and Technology, Argonne National Laboratory, Argonne, Illinois; ²Department of Geological Sciences, The University of Michigan, Ann Arbor, Michigan.

8:30 PM *NN7.4

Expansion of Nuclear Energy and the Impact on Nuclear Waste Management Issues. Allison Macfarlane, Science, Technology & Society, MIT, Cambridge, Massachusetts.

SESSION NN8: Containers and Engineered Barriers

Chairs: Yi Ming Pan and Raul Rebak
Wednesday Morning, November 29, 2006
Constitution A (Sheraton)

8:30 AM *NN8.1

Processes Contributing to the Stifling and Arrest of Localized Corrosion. Joe H Payer, Materials Science and Engineering, Case Western Reserve University, Cleveland, Ohio.

9:00 AM NN8.2

Application of Neutron-Absorbing Structural-Amorphous metal (SAM) Coatings for Spent Nuclear Fuel (SNF) Container to Enhance Criticality Safety Controls. Jor-Shan Choi, Energy and Environment, Lawrence Livermore National Laboratory, Livermore, California; McClellan Nuclear Radiation Center, University of California at Davis, McClellan, California; Research Department, The Nanosteel Company,

Idaho Falls, Idaho; Sales Department, Plasma Technology Inc., Torrance, California.

9:15 AM NN8.3

High-Performance Corrosion-Resistant Iron-Based Amorphous Metals: The Effects of Composition, Structure and Environment on Corrosion Resistance. Joseph Collin Farmer^{1,2,3}, Jor-Shan Choi^{1,2}, Jeffrey J Haslam^{1,2,4}, Tiangan Lian^{1,2,3}, Sumner Daniel Day^{1,2,3}, Nancy Yang⁵, Craig A Blue⁶, William H Peter⁶, Robert Bayles⁷, Joe Payer¹¹, John J Lewandowski¹¹, John H Perepezko¹⁰, Kjetil Hildal¹⁰, Enrique J Lavernia⁸, Leonardo Ajdelsztajn⁸, Olivia A Graeve⁹, Daniel J Branagan¹², M. Brad Beardsley¹³, Louis F Aprigliano¹⁴, Lawrence Kaufman¹⁵ and Jay E Boudreau¹⁶; ¹Nuclear Science & Systems Engineering Program, Lawrence Livermore National Laboratory, Livermore, California; ²Energy & Environment Directorate, Lawrence Livermore National Laboratory, Livermore, California; ³Chemistry & Materials Science Directorate, Lawrence Livermore National Laboratory, Livermore, California; ⁴Engineering Directorate, Lawrence Livermore National Laboratory, Livermore, California; ⁵Materials Science, Sandia National Laboratory, Livermore, California; ⁶Materials Science, Oak Ridge National Laboratory, Oak Ridge, Tennessee; ⁷Materials Science, Naval Research Laboratory, Washington, District of Columbia; ⁸Materials Science, University of California Davis, Davis, California; ⁹Materials Science, University of Nevada Reno, Reno, Nevada; ¹⁰Materials Science, University of Wisconsin Madison, Madison, Wisconsin; ¹¹Materials Science, Case Western Reserve University, Cleveland, Ohio; ¹²Institute of Nanomaterials Research & Development, The NanoSteel Company, Idaho Falls, Idaho; ¹³Advanced Materials Technology, Caterpillar Incorporated, Peoria, Illinois; ¹⁴Consulting, SAINC, Arlington, Virginia; ¹⁵Consulting, CALPHAD, Brookline, Massachusetts; ¹⁶Consulting, BLE, Los Alamos, New Mexico.

9:30 AM NN8.4

Mechanisms of Inhibition of Crevice Corrosion in Alloy 22. Raul B. Rebak, Lawrence Livermore National Laboratory, Livermore, California.

9:45 AM NN8.5

A Review of 25 years of Corrosion Studies on HLW Container Materials at the CEA. Max Helie, DPC/SCCME, French Atomic Energy Commission, Gif sur Yvette, France.

10:00 AM BREAK

10:30 AM NN8.6

Comparison between welding experiment and Finite Element Modelling in Friction Stir Welding of Copper joints. Therese Kallgren, Lai-Zhe Jin and Rolf Sandström; Department of Materials Science and Engineering, Royal Institute of Technology, Stockholm, Sweden.

10:45 AM NN8.7

Corrosion Resistance of Iron-based Structural Amorphous Metals. Tiangan Lian, Summer D. Day and Joe C. Farmer; Chemistry and Materials Science, Lawrence Livermore National Laboratory, Livermore, California.

11:00 AM NN8.8

Cermet Spent Nuclear Fuel Casks and Waste Packages. Charles Forsberg and Leslie Dole; Nuclear Science and Technology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

11:15 AM NN8.9

Oxide Film Aging on Alloy 22 in Halide Containing Solutions. Ricardo Mario Carranza¹, Martín A. Rodríguez¹ and Raúl B. Rebak²; ¹Dpt. Materiales, CNEA, San Martín, Buenos Aires, Argentina; ²Corrosion Group, LLNL, Livermore, California.

11:30 AM NN8.10

Evolution of Chemistry and Its Effects on the Corrosion of Engineered Barrier Materials. Darrell Dunn², Yi-Ming Pan¹, Xihua He¹, Lietai Yang¹ and Roberto Pabalan¹; ¹Center for Nuclear Waste Regulatory Analyses, San Antonio, Texas; ²Southwest Research Institute, San Antonio, Texas.

11:45 AM NN8.11

The Influence of Pre-oxidation on the Corrosion of Copper Nuclear Waste Canisters in Aqueous Anoxic Sulphide Solutions. Jared Smith, Zack Qin and David Shoesmith; Chemistry, University of Western Ontario, London, Ontario, Canada.

SESSION NN9: Waste Form Radiation Damage and Dissolution
Chairs: Melody Carter and Eric Vance
Wednesday Afternoon, November 29, 2006
Constitution A (Sheraton)

1:30 PM NN9.1

Simulations of Fluorite Related Ceramics for use as Waste Forms: $A_2B_2O_7$ Pyrochlore and $A_4B_3O_{12}$ δ -phase. Antony R Cleave¹, Robin W. Grimes¹ and Kurt E. Sickafus²; ¹Materials Department, Imperial College, London, United Kingdom; ²Materials Science and Technology Division, Los Alamos National Laboratory, Los Alamos, New Mexico.

1:45 PM NN9.2

Radiation Tolerance of $A_2B_2O_7$ Materials - A Question of Bonding. Karl R Whittle¹, Gregory R Lumpkin², Katherine L Smith², Mark G Blackford³, Nestor Zaluzec² and Elizabeth J Harvey⁴; ¹Engineering Materials, University of Sheffield, Sheffield, United Kingdom; ²Institute of

Materials and Engineering Science, Australian Nuclear Science and Technology Organisation, Sydney, New South Wales, Australia; ³Materials Science Division, Argonne National Laboratory, Chicago, Illinois; ⁴Department of Earth Sciences, University of Cambridge, Cambridge, United Kingdom.

2:00 PM NN9.3

Damage Accumulation in Au-irradiated $\text{Sr}_2\text{Nd}_8(\text{SiO}_4)_6\text{O}_2$ Yanwen Zhang¹, In-Tae Bae¹, William J. Weber¹ and Mikio Higuchi²; ¹Pacific Northwest National Laboratory, Richland, Washington; ²Graduate School of Engineering, Hokkaido University, Sapporo 060-8628, Japan.

2:15 PM NN9.4

Enhancement of Zirconolite Dissolution Due to Water Radiolysis. Magaly Tribet¹, Nelly Toulhoat¹, Nathalie Moncoffre¹, Pierre Toulhoat², Christophe Jegou³, Catherine Corbel⁴, Florence Bart³ and Isabelle Bardez³; ¹CNRS/IN2P3 Université Claude Bernard Lyon 1, Institut de Physique Nucleaire de Lyon, 69622 Villeurbanne cedex, France; ²Université Claude Bernard Lyon 1, CNRS/ISA, 69622 Villeurbanne cedex, France; ³CEA/DEN/DTCD/SECM, BP 17171 30207 Bagnols sur Ceze cedex, France; ⁴CEA/DSM/DRECAM/LSI, Ecole Polytechnique, 91128 Palaiseau, France.

2:30 PM NN9.5

Abstract Withdrawn

2:45 PM NN9.6

Kinetic and Thermodynamic Study of the Chemistry of Neoformed Phases during the Dissolution of Phosphate Based Ceramics. Erwan du Fou de Kerdaniel¹, Nicolas Dacheux¹, Nicolas Clavier¹ and Renaud Podor²; ¹Insitut de Physique Nucléaire d'Orsay, Orsay, France; ²LCSM, Vandoeuvre lès Nancy, France.

3:00 PM BREAK

SESSION NN10: Waste Forms for LLW and ILW
Chairs: Melody Carter and Eric Vance
Wednesday Afternoon, November 29, 2006
Constitution A (Sheraton)

3:30 PM NN10.1

Geopolymers as Candidates for Low/Intermediate Level Highly Alkaline Waste. D. S. Perera, Eric R. Vance, S. Kiyama, Z. Aly and P. Yee; ANSTO, Lucas Heights, New South Wales, Australia.

3:45 PM NN10.2

Pretreatment of Tc-Containing Waste and Its Effect on Tc-99 Leaching from Grouts Albert S. Aloy¹, Elena N. Kovarskaya¹, John Harbour², Christine Langton² and Bill Holtzscheiter²; ¹Khlopin Radium Institute, Saint Petersburg, Russian Federation; ²Savannah River National Laboratory, Aiken, South Carolina.

4:00 PM NN10.3

Frequency Characteristics of Acoustic Emission in Cementitious Wasteforms with Encapsulated Al. Lyubka Miroslavova Spasova and Michael Ojovan; Immobilisation Science Laboratory, Engineering Materials, University of Sheffield, Sheffield, United Kingdom.

4:15 PM NN10.4

Fluidized Bed Steam Reformed (FBSR) Mineral Waste Forms: Characterization and Durability Testing. Carol M. Jantzen¹, James C. Marra¹, John M. Pareizs¹ and Troy H. Lorier²; ¹Savannah River National Laboratory, Aiken, South Carolina; ²Savannah River Site, Aiken, South Carolina.

4:30 PM NN10.5

Dissolution Testing of a Metallic Waste Form in Chloride Brine. Dawn E. Janney, Argonne National Laboratory--West (current affiliation: Idaho National Laboratory), Idaho Falls, Idaho.

4:45 PM NN10.6

Characterisation and Durability of Plasma Vitrified Simulant Plutonium Contaminated Waste Material. Neil C. Hyatt¹, Suzy Morgan¹ and Charlie Scales²; ¹Department of Engineering Materials, The University of Sheffield, Sheffield, United Kingdom; ²Nexia Solutions Ltd., Sellafield, United Kingdom.

SESSION NN11: Poster Session: Waste Forms, Radionuclides and Disposal
Chairs: Bruce Begg and Darrell Dunn
Wednesday Evening, November 29, 2006
8:00 PM
Exhibition Hall D (Hynes)

NN11.1

Simulation of Self-irradiation of High-sodium Content Nuclear Waste Glasses. Michael I. Ojovan¹, Olga G. Batyukhnova², William (Bill) E. Lee³ and Alexey S. Pankov¹; ¹Immobilisation Science Laboratory, Department of Engineering Materials, University of Sheffield, Sheffield,

South Yorkshire, United Kingdom; ²Educational Department, Scientific and Industrial Association "Radon", Moscow, Russian Federation; ³Department of Materials, Imperial College, London, United Kingdom.

NN11.2

Porous Glass-ceramics Matrix for Strip Solution with Cs-137 Solidification. Albert S. Aloy¹, Alexander V. Strelnikov¹, Vyacheslav M. Esimantovsky¹ and Tatyana A. Vereshchagina²; ¹Khlopin Radium Institute, Saint Petersburg, Russian Federation; ²Institute of Chemistry RAS, Krasnoyarsk, Russian Federation.

NN11.3

Characterization of a Ceramic Waste Form. Dawn E. Janney¹, William L. Ebert² and Kenneth J. Bateman¹; ¹Argonne National Laboratory--West (current affiliation: Idaho National Laboratory), Idaho Falls, Idaho; ²Argonne National Laboratory, Argonne, Illinois.

NN11.4

Phase Relations and Elemental Distribution Among Co-Existing Phases in the Ceramics of the Pseudobinary System CaZrTi₂O₇-LnAlO₃ (Ln - Nd, Sm). Sergey V Stefanovsky¹, Natalia S Mikhailenko^{1,2} and Alexander V Ochkin²; ¹SIA Radon, Moscow, Russian Federation; ²D.Mendeleev University of Chemical Technology, Moscow, Russian Federation.

NN11.5

Partitioning and Leaching Behaviour of Actinides and Rare Earth Elements in a Zirconolite-bearing Hydrothermal Vein System. Tim Payne¹, Reto Giere², Greg Lumpkin¹, Kaye Hart¹ and Peter McGlenn¹; ¹ANSTO, Sydney, New South Wales, Australia; ²Mineralogisch-Geochemisches Institut, Albert-Ludwigs-Universität, Freiburg, Germany.

NN11.6

Rare Earth Elements: A Tool for Understanding the Behaviour of Trivalent Actinides in the Geosphere. Belen Buil, Paloma Gómez, Antonio Garralón and Maria Jesus Turrero; Medio Ambiente. División del Almacenamiento Geológico, CIEMAT, Madrid, Spain.

NN11.7

Migration Behavior of Plutonium in Compacted Bentonite Under Reducing Condition Using Electromigration. Kazuya Idemitsu¹, Y. Yamasaki¹, Y. Inagaki¹, T. Arima¹, N. S. Afsarun¹, T. Mitsugashira², M. Hara² and Y. Suzuki²; ¹Applied Quantum Physics and Nuclear Engineering, Kyushu university, Fukuoka, Japan; ²Institute for Materials Research, Tohoku university, Ooarai, Japan.

NN11.8

Cesium Sorption Rate on Non-crushed Rock Measured by the New Apparatus Adopting Micro-channel Reactor Concept. Keita Okuyama¹, Kenji Noshita¹, Akira Sasahira¹ and Toshiaki Ohe²; ¹Power & Industrial Systems R & D Laboratory, Hitachi, Ltd., Hitachi, Japan; ²Energy Science & Engineering Departmen, School of Engineering, Tokai University, Hiratsuka, Japan.

NN11.9

Study of Neodymium Solubility in WIPP Brine. Marian Borkowski, Jean-Francois Lucchini, Michael Richmann and Donald Reed; Earth and Environmental Science, Los Alamos National Laboratory - Carlsbad Operations, Carlsbad, New Mexico.

NN11.10

A Study of Surfactant Modified Clinoptilolite for the Adsorption of Anionic Radionuclides. Teresa Fernandes and Neil C. Hyatt; Department of Engineering Materials, The University of Sheffield, Sheffield, United Kingdom.

NN11.11

Determination of Matrix Diffusion Properties of Granitic Rock Pirkko Holta¹, Antti Poteri², Marja Siitari-Kauppi¹, Jarkko Kyllonen¹ and Nina Huittinen¹; ¹Laboratory of Radiochemistry, University of Helsinki, Helsinki, Finland; ²Nuclear Energy, VTT Processes, Espoo, Finland.

NN11.12

Sorption and Diffusion of Cs and HTO in Compacted Bentonite Saturated with Saline Water at High Temperature. Satoru Suzuki and Kazunori Suzuki; Institute of Research and Innovation, Kashiwa, Japan.

NN11.13

IP FUNMIG: The European Far-field Project Kienzler Bernhard and Volker Metz; Institute for Radioactive Waste Disposal, Research Center Karlsruhe, FZK-INE, Karlsruhe, Germany.

NN11.14

Geochemical Processes at the Carbon steel/bentonite Interface in Repository Conditions. Elena Torres, Maria Jesus Turrero and Pedro Luis Martin; Environmental department, CIEMAT, Madrid, Madrid, Spain.

NN11.15

Modeling Studies on Microbial Effects on Groundwater Chemistry. Yoshikatsu Tochigi, Hideki Yoshikawa and Mikazu Yui; Japan Atomic Energy Agency, Tokai-Mura, IBARAKI-ken, Japan.

NN11.16

Permeability Change of Packed Bed with an Crystalline Silicate Mineral by Highly Alkaline Plume Hideo Usui¹, Yuichi Niibori¹, Osamu

Tochiyama² and Hitoshi Mimura¹; ¹Graduate School of Engineering, Tohoku University, Sendai, Japan; ²Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, Sendai, Japan.

NN11.17

Dissolution Kinetics of Yucca Mountain Rhyolite Determined in Single-Pass Flow-Through (SPFT) Experiments Jonathan P. Icenhower, Lunde Rhianna Reed and Elsa A Rodriguez; Applied Geology and Geochemistry, Pacific Northwest National Laboratory, Richland, Washington.

NN11.18

Characterising Low Permeable Granitic Rock from Micro to Centimetric Scales: X-ray Microcomputer Tomography, Confocal Laser Microscopy and 14C-PMMA Method. Tomi Lähdemäki¹, Maarit Kelokaski¹, Marja Siitari-Kauppi¹, Markko Myllys², Ari Jämsperg², Jussi Timonen², Felix Mateos³ and Modesto Montoto³; ¹department of chemistry, university of helsinki, University of Helsinki, Finland; ²Department of Physics, University of Jyväskylä, 40351 Jyväskylä, Finland; ³Department of Geology, University of Oviedo, Oviedo, Spain.

NN11.19

State of a Bentonite Barrier after 8 Years of Heating and Hydration in the Laboratory. Maria Victoria Villar¹, Ana M. Fernández¹, Roberto Gómez¹, José F. Barrenechea², F. Javier Luque² and Pedro L. Martín¹; ¹Engineered and Geological Barriers, CIEMAT, Madrid, Spain; ²Cristalography and Mineralogy, UCM, Madrid, Spain.

NN11.20

Determination of Granites Mineral Specific Porosities by PMMA Method and FESEM/EDAX. Marja Siitari-Kauppi¹, Laura Penttinen¹, Anumaija Leskinen¹, Ursula Alonso², Tiziana Missana², Miguel Garcia² and Alessandro Patelli³; ¹department of chemistry, university of helsinki, University of Helsinki, Finland; ²Ciemat, Madrid, Spain; ³CIVEN, Venezia, Italy.

NN11.21

Experimental Approach to Study the Colloid Generation from the Bentonite Barrier to Quantify the Source Term and to Assess its Relevance on the Radionuclide Migration. Ursula Alonso, Tiziana Missana and Miguel Garcia-Gutierrez; Environmental, CIEMAT, Madrid, Spain.

SESSION NN12: Radionuclides
Chairs: Bernd Grambow and Ignasi Puigdomenech
Thursday Morning, November 30, 2006
Constitution A (Sheraton)

8:30 AM NN12.1

Neptunium Dioxide Precipitation Kinetics in Aqueous Solutions. Amanda Johnsen¹, Kevin Roberts² and Stanley Prussin¹; ¹Department of Nuclear Engineering, University of California, Berkeley, Berkeley, California; ²Chemical Biology and Nuclear Science Division, Lawrence Livermore National Laboratory, Livermore, California.

8:45 AM NN12.2

Hydrothermal Synthesis and Structure of Np₂O₅. Tori Z. Forbes¹, Peter C. Burns^{1,2}, L. Soderholm^{1,2} and S. Skanthakumar²; ¹Civil Engineering and Geological Sciences, University of Notre Dame, Notre Dame, Indiana; ²Chemistry Division, Argonne National Laboratory, Argonne, Illinois.

9:00 AM NN12.3

Np Incorporation into Uranyl Alteration Phases: A Quantum Mechanical Approach. Lindsay C. Shuller¹, Rodney C. Ewing^{1,2} and Udo Becker²; ¹Materials Science and Engineering, University of Michigan, Ann Arbor, Michigan; ²Geological Sciences, University of Michigan, Ann Arbor, Michigan.

9:15 AM NN12.4

Surface Complexation of Neptunium(V) with Goethite. James L Jerden and A. Jeremy Kropf; Argonne National Laboratory, Argonne, Illinois.

9:30 AM NN12.5

Sorption of Neptunium(V) to Synthetic Boehmite: Effect of pH and Ionic Strength. Brian A Powell^{1,2} and Linfeng Rao¹; ¹Lawrence Berkeley National Laboratory, Berkeley, California; ²Lawrence Livermore National Laboratory, Livermore, California.

9:45 AM NN12.6

Surface Speciation of Uranyl(VI) on Gibbsite: A Combined Spectroscopic Approach. Thuro Arnold, Andreas C Scheinost, Nils Baumann and Vinzenz Brendler; FZ Rossendorf, Dresden, Germany.

10:00 AM BREAK

10:30 AM NN12.7

Retention of Selenium (IV) on Corrosion Products of Metallic Surcontainers in Underground Radwaste Repository Conditions. Influence of Dissolved Silicates. Norbert Jordan, Laboratory of Radiochemistry Analytical Sciences and Environment, Nice, France.

10:45 AM NN12.8

New Synthesis Route and Characterization of Siderite (FeCO₃) and Coprecipitation of 99Tc. Isabelle Llorens^{1,2}, Massoud Fattahi¹, Philippe Deniard², Stéphane Jobic² and Philippe Moisy³; ¹Laboratoire Subatech, Nantes cedex 3, France; ²Institut des Matériaux de Nantes, Nantes, France; ³CEA Valrho, Bagnols sur Cèze, France.

11:00 AM NN12.9

Perrhenate and Pertechnetate Behavior on Iron and Sulfur-Bearing Compounds. B. Elizabeth Anderson¹, U. Becker¹, K. B. Helean² and R. C. Ewing^{1,3,4}; ¹Geological Sciences, University of Michigan, Ann Arbor, Michigan; ²Sandia National Laboratories, Albuquerque, New Mexico; ³Material Science, University of Michigan, Ann Arbor, Michigan; ⁴Nuclear Engineering, University of Michigan, Ann Arbor, Michigan.

11:15 AM NN12.10
Abstract Withdrawn

11:30 AM NN12.11

Fractional Sorption of Plutonium and Americium in Soil from a Particulate Source Richard Gostic¹, Julie M Gostic¹, Nick Smith¹, Thomas Hartmann² and Kenneth Czerwinski³; ¹Radiochemistry PhD Program, University of Nevada Las Vegas, Las Vegas, Nevada; ²Harry Reid Center for Environmental Studies, University of Nevada Las Vegas, Las Vegas, Nevada; ³Chemistry, University of Nevada Las Vegas, Las Vegas, Nevada.

11:45 AM NN12.12

Aqueous Dissolution of Silver Iodide and Associated Iodine Release under Reducing Conditions with Sulfide. Yaohiro Inagaki¹, T. Imamura¹, K. Idemitsu¹, T. Arima¹, O. Kato², H. Asano³ and T. Nishimura³; ¹Applied Quantum Physics & Nuclear Engineering, Kyushu University, Fukuoka, Japan; ²Kobe Steel Ltd., Kobe, Japan; ³RWMC, Tokyo, Japan.

SESSION NN13: Disposal Environments and Site Characteristics
Chairs: Simcha Stroes-Gascopyne and John Walton
Thursday Afternoon, November 30, 2006
Constitution A (Sheraton)

1:30 PM *NN13.1

The Geological Research in France - The Dossier 2005 Argile. Frederic Plas and Jacques Wendling; Scientific Department, Andra, Chatenay Malabry, France.

2:00 PM NN13.2

The Effects of Dry Density and Pore Water Salinity on the Physical and Microbiological Characteristics of Compacted 100% Bentonite. Simcha Stroes-Gascopyne¹, Connie J. Hamon¹, David A. Dixon², Clifford L. Kohle² and Peter Maak³; ¹EB&AB, Atomic Energy of Canada Limited, Pinawa, Manitoba, Canada; ²GSEB, Atomic Energy of Canada Limited, Pinawa, Manitoba, Canada; ³Ontario Power Generation, Toronto, Ontario, Canada.

2:15 PM NN13.3

Chemistry of Water Collected from an Unventilated Drift, Yucca Mountain, Nevada. Brian D Marshall¹, Thomas A. Oliver² and Zell E. Peterman¹; ¹WRD/YMPB, U.S. Geological Survey, Denver, Colorado; ²S.M. Stoller Corp., c/o U.S. Geological Survey, Denver, Colorado.

2:30 PM NN13.4
Abstract Withdrawn

2:45 PM NN13.5

Coupling Hydrological and Geochemical Simulations to Track the Spatial Heterogeneity and the Chemical Evolution of the Groundwater Systems at Two Candidate Repository Sites in Sweden. María José Gimeno², Javier B. Gómez², Luis Francisco Auqué² and Ignasi Puigdomenech¹; ¹Safety and Science, Swedish Nuclear Fuel & Waste Management Co (SKB), Stockholm, Sweden; ²Depto. Ciencias de la Tierra, Universidad de Zaragoza, Zaragoza, Sweden.

3:00 PM BREAK

3:30 PM NN13.6

Corrosive Accumulations and Concentration Variations in a Hot Repository. George Danko², John Walton¹ and Davood Bahrami²; ¹Env. Science and Engr., UTEP, El Paso, Texas; ²Univ. Nevada Reno, Reno, Nevada.

3:45 PM NN13.7

Characterization of the Chemistry of NaCl-NaNO₃-KNO₃ Mixtures at Elevated Temperatures. Lietai Yang¹, Roberto Pabalan¹, Darrell Dunn² and Aladar Csontos³; ¹CNWSA, SwRI, San Antonio, Texas; ²Mechanical and Materials Engineering, SwRI, San Antonio, Texas; ³U.S. Nuclear Regulatory Commission, Washington, District of Columbia.

4:00 PM NN13.8
Abstract Withdrawn

4:15 PM NN13.9

Measurements of Eh and pH in Compacted MX-80 Bentonite. Torbjorn Carlsson and Arto Muurinen; Nuclear Energy, VTT Technical Research Centre of Finland, Espoo, Finland.

4:30 PM NN13.10

Geochemistry of Natural Components in the Near-Field Environment, Yucca Mountain, Nevada. Zell E Peterman¹ and Thomas A Oliver²; ¹Yucca Mountain Project Branch, U.S. Geological Survey, Denver, Colorado; ²S.M. Stoller Corporation, Denver, Colorado.

4:45 PM NN13.11

Specialized Disposal Sites for Different Reprocessing Plant Wastes. Charles Forsberg¹ and Michael Driscoll²; ¹Nuclear Science and Technology, Oak Ridge National Laboratory, Oak Ridge, Tennessee; ²Nuclear Science and Engineering, Massachusetts Institute of Technology, Cambridge, Massachusetts.

SESSION NN14: Partitioning and Transmutation
Chairs: Jeffrey Fortner and Tim McCartin
Friday Morning, December 1, 2006
Constitution A (Sheraton)

8:30 AM *NN14.1

Status of the French Research on Partitioning and Transmutation Dominique Michel Warin, CEA, Gif sur Yvette, France.

9:00 AM *NN14.2

Transmutation and the Global Nuclear Energy Partnership. James Bresee, Office of the Assistant Secretary for Nuclear Energy, U. S. Department of Energy, Washington, District of Columbia.

9:30 AM NN14.3

Fundamental Chemistry of Uranium in Extraction for use in Enhanced Separations and Proliferation Resistance. Ken Czerwinski^{1,2,3}, Amber Wright², Nick Smith², Lena Wright³ and Gary Cerefice³; ¹Chemistry, University of Nevada, Las Vegas, Las Vegas, Nevada; ²Radiochemistry Program, University of Nevada, Las Vegas, Las Vegas, Nevada; ³Harry Reid Center, University of Nevada, Las Vegas, Las Vegas, Nevada.

9:45 AM NN14.4

Strategies for Reprocessing of MgO-Pyrochlore Ceric Composite Fuel for Light Water Reactors. Peng Xu¹, Samantha Yates¹, Juan C. Nino¹ and James S. Tulenko²; ¹Materials Science and Engineering, University of Florida, Gainesville, Florida; ²Nuclear and Radiological Engineering, University of Florida, Gainesville, Florida.

10:00 AM BREAK**10:30 AM NN14.5**

The Effect of Diluents on Extraction of Actinides and Lanthanides. Teodora Valeria Retegan, Christian Ekberg, Anna Fermvik and Gunnar Skarnemark; Nuclear Chemistry, Chalmers University of Technology, Gothenburg, Sweden.

10:45 AM NN14.6

Synthesis and Characterization of Novel Reactor Fuels. Ken Czerwinski^{1,2}, Kiel Holliday², G. W. Chinthaka Silva² and Thomas Hartmann²; ¹Chemistry, University of Nevada, Las Vegas, Las Vegas, Nevada; ²Harry Reid Center, University of Nevada, Las Vegas, Las Vegas, Nevada.



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