

## CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

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### TRIP REPORT

**SUBJECT:** Attendance at the 104<sup>th</sup> Annual meeting & Exposition of the American Ceramic Society  
Charge Number 20.01402.571; AI Number 01402.571.025

**DATE/PLACE:** April 28–May 1, 2002, St. Louis, MO

**AUTHORS:** V. Jain  
Y.-M. Pan

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Y.-M. Pan

**PERSONS PRESENT:** V. Jain and Y.-M. Pan, CNWRA

#### **BACKGROUND AND PURPOSE OF TRIP:**

The 104<sup>th</sup> Annual meeting & Exposition of the American Ceramic Society was held April 28–May 1, 2002 in St. Louis, Missouri. Conference attracted about 2,000 delegates and more than 1,500 technical papers were presented.

Symposiums on Ceramic Science and Technology for the Nuclear Industry, and Science and Technology in Addressing Environmental Issues in the Ceramic Industry at the meeting were devoted to presentations and discussions on the environmental issues, recycling, air emissions, and nuclear waste management. The nuclear waste management symposium focused on high-level waste vitrification technology and melter disassembly, glass waste formulation and testing, Hanford tank waste treatment, durability testing and modeling, ceramic waste forms, and alternative waste forms and processes. Seventy papers were presented in the two symposia. The proceedings will be published as Ceramic Transactions by the American Ceramic Society.

Since several parallel sessions were held, the summary provided in this report is based on the authors' attendance at selected sessions and brief notes taken during presentations on topics relevant to the high-level waste program.

#### **SUMMARY OF PERTINENT POINTS:**

##### Presentations

The following papers co-authored by the CNWRA staff were presented at the Ceramic Science and Technology for the Nuclear Industry Symposium:

Modeling of the Fluid Chemistry Inside the Waste Package due to Waste Form and Waste Package Corrosion, authored by V. Jain and N. Sridhar.

Development of Sensors for Waste Package Testing and Monitoring in the Long-Term Repository Environments, authored by V. Jain, S. Brossia, D. Dunn, and L. Yang.

## Technical Papers

W. Ebert from Argonne National Laboratory presented an invited talk entitled Modeling High-Level Waste Glass Degradation in Performance Assessment Calculations. The presenter first reviewed the bounding model for borosilicate glass degradation and radionuclide release that was developed for use in Total System Performance Assessment—Site Recommendation calculations, and then discussed the mathematical formulation of the model and selection of parameter values to provide an upper bound for the dissolution rates of high-level waste glasses. It was claimed that the dissolution model used to evaluate site suitability provides a conservative bound for the Stage III rates which represent the dissolution rates in the presence of rate-affecting alteration phases. Additional modifications, such as probabilistic distributions of expected range of dissolution are considered to produce a more realistic model for use in license application.

P. Hrma from Pacific Northwest National Laboratory presented a paper entitled Waste Glass Corrosion: Some Open Questions. The paper discussed waste glass corrosion behavior based on the glass dissolution studies using Product Consistency Test and Vapor Hydration Test methods. Experimental results indicated that the dissolution rates measured by Vapor Hydration Test at 200 °C (392 °F) are much higher than those from Product Consistency Test at 90 °C (194 °F). In addition, a much higher activation energy of 93 KJ/mol was determined from the Vapor Hydration Test data, compared to those estimated from Product Consistency Test and single-pass flow through tests. The presentation concluded with some open questions related to waste glass corrosion, including what triggers Stage III in Product Consistency Test and can it be predicted, will high corrosion in Vapor Hydration Test be reached in repository, and how to translate closed system data to the repository system.

A. Buechele of Catholic University of America described the effect of H<sub>2</sub>O and D<sub>2</sub>O on waste glasses subjected to Vapor Hydration Test. Using results from Micro-Raman IR-Spectroscopy, he observed that there is a significant difference in the alteration layer thicknesses formed due to corrosion. However, he could not explain the source of such differences.

Y. Minot, CEA, France presented the results of a full-scale radioactive glass waste form leaching tests. He showed that a factor of 5 represents a realistic fracturation of glass block. This factor was obtained by analyzing fracture surfaces by electron tomography and comparing the data with initial reaction rate.

There were several papers that focused on high-level waste vitrification melter disassembly and their autopsy after completion of the high-level waste melting campaign. A. Jouan, CEA, France provided an overview of methods used by Cogema to dismantle used melter components while R. Palmer of West Valley Demonstration project discussed various aspects of West Valley melter disassembly. West Valley melter is planned for shutdown in CY 2002. D. Monts of Mississippi State University showed the development of imaging based inspection systems to analyze used melters. M. Smith of Savannah River Site gave a presentation on conceptual methods for the disposal of Defense Waste Processing Facility melter and its components. None of these presentation provided an assessment of final disposition of melter components.

The glass formation and testing session focused on current advances in glass waste form modeling. J. Vienna of Pacific Northwest National Laboratory discussed complexities involved in

modeling of the glass properties as a function of composition. A large number of glass components are required to obtain a reasonable fit between glass property and composition. Papers by P. Hrma discussed models for density and liquidus temperature. T. Besmann of Oak Ridge National Laboratory discussed modeling of thermodynamic properties of glass.

Session on Hanford tank waste treatment had a series of talks on current plans and continuing activities to support vitrification of the high-level and low-level waste. Studies are continuing to design glass compositions for high-sulfur waste streams, address compositional diversity of tank wastes, design melter enhancement to increase production rates. W. Weber gave a invited presentation on the modeling of radiation effects in actinide waste form. L. Hobbs of Massachusetts Institute of Technology gave a talk on modeling of amorphous structures using topological molecular dynamics approach.

#### American Ceramic Society Activities

V. Jain continued to serve as the Trustee for the Nuclear and Environmental Technology Division for a three-year term (2000–2003). In addition, the American Ceramic Society Board of Directors elected V. Jain to Chair the 2004 Annual Meeting of the American Ceramic Society and also elected as one of the five nominees for the Board of Directors for the term 2003–2006.

#### **CONCLUSIONS:**

The meeting was very useful in keeping current with the ongoing worldwide advancements in the waste form studies. The participation at the meeting was a good opportunity to gather information and generate discussion on the nuclear waste forms and processing technologies. Presentations of papers and activities in committees contribute to the visibility and recognition among peers.

#### **PROBLEMS ENCOUNTERED:**

None.

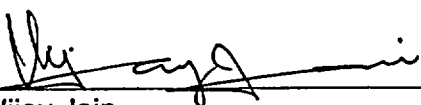
#### **PENDING ACTIONS:**

None.

#### **RECOMMENDATIONS:**

None.

#### **SIGNATURES:**

  
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Vijay Jain


Corrosion Science & Process Engineering, Element

5/13/02  
Date

  
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Yi Ming Pan  
Senior Research Engineer

5/10/02  
Date

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Budhi Sagar  
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