

# CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

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## TRIP REPORT

**SUBJECT:** Gordon Research Conference on Chemistry and Physics of Cement-Based Materials  
20-5708-563

**DATE/PLACE:** July 28-August 2, 1996  
Plymouth State College  
Plymouth, New Hampshire

**AUTHOR:** R.T. Pabalan

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**AUTHOR:** R.T. Pabalan

**PERSON(S) PRESENT:** R.T. Pabalan

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

The purpose of the trip was to participate in the Conference on Chemistry and Physics of Cement-Based Materials to obtain information regarding long-term stability of cementitious materials and cement/water interactions which was useful in the Center for Nuclear Waste Regulatory (CNWRA) activities studying the evolution of the near-field environment due to interactions with cementitious materials. The conference is one of one-hundred and fifty Gordon Research Conferences being held in 1996. In addition, it was intended for the author of this report to have initial discussions with Professor F. Glasser (University of Aberdeen, Scotland), a CNWRA consultant, regarding his work for the CNWRA.

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

The conference comprised four and one-half days of morning and evening sessions on a variety of topics relevant to the physics and chemistry of cementitious materials including:

- Processing Science and Rheology
- Hydration Processes and Structure of Hydration Products
- Simulation of Hydration and Microstructure Development
- Microscopy/Microanalysis of Cement Phases
- Pore Structure/Surface Area Measurements of Cement Materials
- New Analytical Techniques Applied to Cementitious Materials
- Creating Novel Materials
- Transport Properties
- Long-Term Chemical Stability of Cementitious Materials

Professor F. Glasser was the speaker for the last topic. A copy of the conference program is attached. In addition, an informal discussion session was led by Professor Glasser on issues related to long-term chemical stability of cementitious materials. This session was attended mostly by investigators interested in the use of chemical models to predict cement degradation and cement/water interactions in nuclear waste repositories. Discussion focused on models, codes, and thermodynamic data for cement phases. The author of this report also discussed the use of the code, SIMUL, for simulating cement/water interactions developed by Eric Reardon (University of Waterloo), with John Westall (Oregon State University). The CNWRA copy of SIMUL was provided several months ago by J. Westall.

The author of this report also had a separate discussion with Professor Glasser regarding his work for the CNWRA. Professor Glasser provided written comments on the near-field hypotheses report, initial recommendations with respect to important areas of future work, and a copy of the thermodynamic database his group uses in their modeling of cement/water interactions. The database is part of a progress report which is still under review by the UK HMIP. It is the intention of the author of this report to incorporate the thermodynamic data into the EQ3/6 database for use in the near-field KTI.

The Gordon Research Conferences require that material presented at the meetings cannot be cited or referred to without the express permission of the speakers. No meeting proceedings is published.

## **CONCLUSIONS**

The conference was very well attended and included papers potentially useful in the CNWRA work in cementitious materials. The format of the conference provided ample opportunity for the author of this report to have technical discussions with various investigators in cement science, including those in nuclear waste programs in the U.S. and in Europe. Insights into important areas of research relevant to modeling the near-field environment of nuclear waste repositories were gained from the formal presentations and from informal discussions with conference participants.

## **PROBLEMS ENCOUNTERED:**

None

## **PENDING ACTIONS:**

None

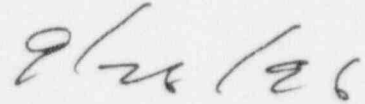
## **RECOMMENDATIONS**

Incorporation of thermodynamic data provided by Professor F. Glasser into EQ3 should be done to permit evaluation of cement/water interactions.

**SIGNATURES:**



Roberto T. Pabalan  
Senior Research Scientist

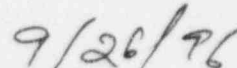


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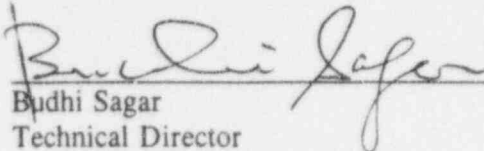
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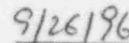
Narasi Sridhar, Manager  
Engineered Barrier Systems  
& Waste Solidification Systems



Date



Budhi Sagar  
Technical Director



Date

## FINAL SCHEDULE

Leader: Brent Heuser (USA)  
Speaker: Dick Livingston (USA)

**Session 7. Creating Novel Materials**

(Wed. eve)                      Leader:       Francis Young (USA)  
   Speaker:       E. Ishida (Japan)

**Session 8. Scientific-Basis of Durability**

(Thurs. am) A.    Transport Properties  
   Leader:       Tom Mason (USA)  
   Speaker:       Larry Schwartz (USA)

B.    Long Term Chemical Stability  
   Leader:       Della Roy (USA)  
   Speaker:       Fred Glasser (UK)

**Session 9. Keynote speaker: Russell Alexander (Switzerland)**

(Thurs. eve)  
   "Hyenas and Claymores, Scorpions, and Kalashnikovs:  
   The Problems of Studying Cement in the Field."

General Discussion