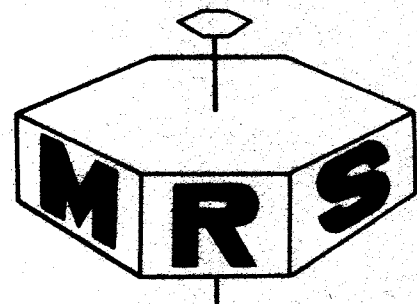


**THE  
MATERIALS  
RESEARCH  
SOCIETY**

**1979  
Annual  
Meeting**

**November 26-30  
Hyatt Regency Cambridge  
Cambridge, Massachusetts**



**PROGRAM  
&  
Registration Information**

**MATERIALS RESEARCH SOCIETY  
300 North 33rd Street, Room 200  
University Park, PA 16802**

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SYMPOSIUM A  
**LASER AND ELECTRON BEAM  
PROCESSING OF MATERIALS**

CO-CHAIRMEN

**C.W. White**  
Oak Ridge National  
Laboratory

**P.S. Peercy**  
Sandia Laboratories

**I. Fundamental Mechanisms**

Chairman: **J.W. Corbett**, SUNY/Albany

November 27, 1979  
Tuesday Morning

*Invited Talks*

- 8:30 — "Coupling of Energy Beams to Solids," **M. VON ALLMEN**, Caltech and University of Berne, Switzerland
- 9:00 — "Comparison of Liquid and Solid Phase Epitaxy," **W.L. Brown**, Bell Labs
- 9:30 — "Macroscopic Theory of Pulsed Laser Annealing," **R.F. Wood**, Oak Ridge National Laboratory

*Contributed Papers*

- 10:00 — "Evidence for and Nature of a Non-thermal Mechanism of Pulsed Laser Annealing of Semiconductors," **J.A. VAN VECHTEN**, IBM
- 10:15 — "Plasma Bottlenecks, Dynamics of Laser-Induced Plasmas," **E. YOFFA**, IBM
- 10:30 — "Effect of Free Carrier Absorption on the Depth of Melting During Pulsed Laser Irradiation," **J. NARAYAN** and **C.W. WHITE**, Oak Ridge National Laboratory
- 10:45 — "Raman Measurements of Temperature during CW and Pulsed Laser Heating of Silicon," **A. COMPAAN** and **H.W. LO**, Kansas State University
- 11:00 — "Segregation at High Growth Velocities," **S.S. LAU** and **M. VON ALLMEN**, Caltech
- 11:15 — "Surface Segregation in Laser Annealing of Ion Implanted Silicon," **C.W. WHITE**, **S.R. WILSON**, **B.R. APPLETON** and **J. NARAYAN**, Oak Ridge National Laboratory
- 11:30 — "Surface Accumulation of Impurities after Laser Induced Melting," **P. BAERI** and **M.G. GRIMALDI**, Istituto di Struttura della Materia, Catania, Italy
- 11:45 — "Segregation Effects in Laser Annealing of Ion Implanted Silicon," **D. HOONHOUT** and **F.W. SARIS**, FOM Institute, the Netherlands
- 12:00 — LUNCH

## II. Annealing and Recrystallization

Chairman: B.R. Appleton, ORNL

Tuesday Afternoon

### Invited Talks

- 1:30 — "Rapid Solidification," J.W. CAHN, S.R. CORIELL and W.J. BOETTINGER, National Bureau of Standards  
2:00 — "Laser Induced Reversible Order-Disorder Transitions in Silicon," R. TSU, R.T. HODGSON, J.E. BAGLIN and T.Y. TAN, IBM

### Contributed Papers

- 2:30 — "Picosecond Laser Pulse Induced Melting and Resolidification Morphology on Silicon," P.L. LIU, R. YEN, N. BLOEMBERGEN, and R.T. HODGSON, Harvard University  
2:45 — "Dynamic Behavior of psec-Pulsed Laser Annealing in Ion Implanted Silicon," M. MURAKAMI, M. KAWAE, K. GAMO, S. NAMBA and Y. AOYAGI, Osaka Univ., Japan  
3:00 — "Super Saturated Alloys of Group III and Group V Dopants in Silicon Formed by Ion Implantation and Laser Annealing," C.W. WHITE, S.R. WILSON, B.R. APPLETON and F.W. YOUNG, JR., Oak Ridge National Laboratory  
3:15 — "Limit of Electrically Active As in Ion-Implanted Pulsed Laser Annealed Si," J.E. BAGLIN, M.Y. TSAI, F.F. MOREHEAD and R. TSU, IBM  
3:30 — "Impurity Capture During Crystallization by Laser Annealing," G.H. GILMER, H.J. LEAMY and K.A. JACKSON, Bell Labs  
3:45 — "An Analysis of Explosive Crystallization of Amorphous Layers," G.H. GILMER and H.J. LEAMY, Bell Labs  
4:00 — "Silicon Surface Structure and Surface Impurities After Pulsed Laser Annealing," D.M. ZEHNER, G.W. OWNBY and C.W. WHITE, Oak Ridge National Laboratory  
4:15 — "Formation of Materials by Transient Process Reactions," A.R. KIRKPATRICK, SPIRE Corp.  
4:30 — "Pulse Electron Beam Liquid Epitaxy," A. GREENWALD and J. COMER, SPIRE Corp.  
4:45 — "Photoacoustic Detection Methods for Characterizing Laser Irradiation and Recrystallization of Semiconductors," J.F. McCLELLAND and R.N. KNISELEY, Ames Laboratory  
5:00 — "Diagnostics of Laser Annealed Semiconductor Material Using Photo-acoustic, Related Optical, and Rutherford Backscattering Techniques," R.A. McFARLANE, H.L. DUNLAP, L.D. HESS and G.L. OLSON, Hughes Research Labs  
5:15 — "Laser Crystallization Front Dynamics of Amorphous Semiconductor Films," H.J. ZEIGER, J.C.C. FAN, R. CHAPMAN, and R. GALE, Lincoln Labs

### III. Elemental Semiconductors

Chairman: To be announced

November 28, 1979  
Wednesday Morning

#### Invited Talks

- 8:30 — "Laser Pulse Effects on Implanted Impurities," **G. FOTI**, Instituto di Struttura della Materia, Catania, Italy

#### Contributed Papers

- 9:00 — "Electrical Activation of Phosphorous in Implanted Silicon Layers by Nanosecond Laser Annealing," **I.B. KHAIBULLIN, R.M. BAYAZITOV, E.I. SHTYRKOV, M.M. ZARIPOV, and R.V. AGANOV**, Kazan Physikal-Technical Institute, USSR
- 9:15 — "Laser Annealing of High Dose  $P^+$ ,  $As^+$ ,  $B^+$ ,  $O^+$  and  $C^+$  Implanted Si," **M. TAMURA**, Hitachi Central Research Laboratory, Japan
- 9:30 — "Complex Refractive Index of the Ion Implanted, Laser Annealed Surface Layer of Silicon," **H. ENGSTROM**, Oak Ridge National Laboratory
- 9:45 — "Post Illumination Annealing of Defects in Laser Processed Si," **J.L. BENTON, C.J. DOHERTY, L.C. KIMMERLING, H.J. LEAMY**, Bell Labs and **G.K. CELLER**, Western Electric ERC
- 10:00 — "Characterization of Silicon Layers Implanted by Low Speed Molecular Ions and Annealed by a Pulsed Laser," **J.C. MULLER, P. SIFFERT**, CRN Phase, Strasbourg, France and **J. MICHEL** and **E. FABRE**, LEP, France
- 10:15 — "Physical Properties of Ion-Implanted SEM-Annealed Silicon," **J.L. REGOLINI** and **N.M. JOHNSON**, Xerox Palo Alto Research Center and **T.W. SIGMON** and **J.F. GIBBONS**, Stanford Electronics Laboratory
- 10:30 — "Scanning CW-Laser-Induced Crystallization of Silicon on Amorphous Substrates," **D.K. BIEGELSEN** and **N.M. JOHNSON**, Xerox Palo Alto Research Center
- 10:45 — "CW Laser Annealing of Ion Implanted Polycrystalline Silicon Films," **G.L. OLSON, L.D. HESS, Y. MA** and **G. YARON**, Hughes Research Labs
- 11:00 — "Laser Annealed Polycrystalline Silicon Characteristics," **Y. WADA, M. TAMURA** and **T. TOKUYAMA**, Hitachi Central Research Labs, Japan
- 11:15 — "Lattice Location of Arsenic in Laser Annealed Silicon," **WEI-KAN CHU**, IBM Data Systems Division
- 11:30 — "Characterization of Dopant and Impurity Redistribution after Transient Annealing," **C.A. EVANS, JR.** and **V.R. DeLINE**, Charles Evans and Associates
- 11:45 — "Laser Annealing of Semiconductors," **M. BER-TOLOTTI, L. STAGNI, G. VITALI** and **V.E. SPEAR**, Universita di Roma, Italy
- 12:00 — "Characterization of Implanted Layers after Laser and Electron Beam Annealing," **G.G. BENTINI, R. GALLONI** and **F. ZIGNANI**, Laboratorio LAMEL-CNR, Italy

12:15 — "e Beam Annealing of As Implanted Si in Windows Defined by Oxide," J.M. LEAS, P.J. SMITH, A. NAGARAJAN and A. LEIGHTON, IBM Data Systems Division

12:30 — LUNCH

## IV. Thin Films, Deposited Layers and Contacts

Chairman: R.T. Young,  
Oak Ridge National Laboratory

Wednesday Afternoon

### Invited Talks

2:00 — "Laser and Ion Beam Induced Reactions," S.S. LAU, J.W. MAYER and M. VON ALLMEN, Caltech

2:30 — "Overview of Ohmic Contact Formation on Compound Semiconductors by Laser Annealing," G. ECKHARDT, Hughes Research Labs

### Contributed Papers

3:00 — "Laser Annealing Fabrication of Ohmic Contact to p-Type InP," Z.L. LIAU, N.L. DeMEO and J.P. DONNELLY, Lincoln Labs

3:15 — "Structure of Laser Produced Silicide Layers," M. VON ALLMEN and S.S. LAU, Caltech, T.T. SHENG, Bell Labs and M. WITTMER, BBC, Baden, Switzerland

3:30 — "CW Laser-Induced Reactions for Silicide Formation," T. SHIBATA, T.W. SIGMON and J.F. GIBBONS, Stanford Electronics Laboratory

3:45 — "Silicide Formation by Pulsed, CO<sub>2</sub> Laser Processing," C.J. DOHERTY, K.C.R. CHIU, J.M. POATE, and H.J. LEAMY, Bell Labs

4:00 — "CW Laser Annealing Studies of Deposited Silicon Films," L.D. HESS, G.L. OLSON, J.A. ROTH, Hughes Research Labs and M. VON ALLMEN, Caltech

4:15 — "P-N Junctions Produced by Pulse Annealing of Deposited Layers," M. MAENPAA, S.S. LAU, M. VON ALLMEN, I. GOLECKI, M.-A. NICOLET, Caltech and J. MINNUCCI, SPIRE Corp.

4:30 — "Characteristics of p<sup>+</sup>n Alloy Junctions Produced by Single Laser Pulses," H.G. PARKS, G.E. Research and Development and K. ROSE, RPI

4:45 — "Ge-Si Heterostructure Formation by Laser Processing," H.J. LEAMY, C.J. DOHERTY, J.M. POATE, T.T. SHENG, Bell Labs and G.K. CELLER, Western Electric ERC

5:00 — "Metal-Semiconductor Interfaces by Pulsed Electron Beam Processing," P. YOUNGER, A. MELAS, J. MINNUCCI, A. KIRKPATRICK, and A. GREENWALD, SPIRE Corp. and M. MAENPAA, Caltech

5:15 — "Pulsed Electron Beam Alloying of AuGe/Pt Ohmic Contacts to GaAs," J.L. TANDON and B.M. WELCH, Rockwell International Electronics Research Center

5:30 — "Laser Annealed Implants and Thin Films on III-V Semiconductors," **P.A. BARNES, H.J. LEAMY, and J.M. POATE**, Bell Labs and **G.K. CELLER**, Western Electric ERC

6:00 — DINNER

## V. Compound Semiconductors

Chairman: **P.A. Barnes**,  
Bell Labs

Wednesday Evening

### Invited Talks

7:30 — "Laser Annealing in Compound Semiconductors," **F.H. EISEN**, Rockwell International Electronics Research Center

### Contributed Papers

8:00 — "Annealing of Implanted Layers in Compound Semiconductors by Localized Beam Heating Techniques," **C.L. ANDERSON, H.L. DUNLAP, L.D. HESS, R.A. McFARLANE, G.L. OLSON** and **K.V. VAIDYANATHAN**, Hughes Research Labs

8:15 — "Laser Annealing of Implanted Acceptor Ions in GaAs," **KULAR, SEALY, BADAWI**, and **STEPHENS**, University of Surrey, UK

8:30 — "Annealing of Ion-Implanted GaAs with Pulsed Ruby Laser," **S.G. LIU, C.P. WU** and **C.W. MAGEE**, RCA Labs

8:45 — "Laser Annealing Effects in Ion-Implanted GaAs," **K. GAMO, K. MURAKAMI, Y. YUBA, A.H. ORABY** and **S. NAMBA**, Osaka University, Japan

9:00 — "Transient Annealing of GaAs by Electron and Laser Beams," **I. GOLECKI, M.-A. NICOLET**, Caltech, **J.L. TANDON**, Rockwell International Electronics Research Center, and **D.K. SADANA**, Lawrence Berkeley Laboratory

9:15 — "Pulsed E-beam Annealing of Ion Implanted GaAs," **P. PIANETTA, C. STOLTE** and **J. HANSEN**, Hewlett-Packard Co.

9:30 — "Annealing of GaAs Ion Implanted Layers Using Pulsed Electron Beam of Large Dimension," **G.M. MARTIN, C. VENGER, M. STEERS**, and **D.B. THEETEN**, LEP, France

9:45 — "Optical Properties of Laser-Annealed CdSe Thin Films," **R.R. PARSONS, J.A. ROSTWOROWSKI**, University of British Columbia, and **W.D. WESTWOOD, R.M. FEENSTRA, F.R. SHEPHERD** and **S.J. INGREY**, Bell-Northern Research Labs

10:00 — "Photoluminescent Properties of Laser Annealed GaAs and GaAlAs," **R.R. PARSONS** and **J.A. ROSTWOROWSKI**, University of British Columbia, and **A.J. SPRINGTHORPE** and **J.Y. DYMENT**, Bell-Northern Research Labs

10:15 — "Laser Induced Metal to Semiconductor Phase Transition in Mixed Al-Sb Films," **R. ANDREW, L.D. LAUDE, M. LEDEZMA, M. LOVATO** and **M. WAUTELET**, Universite de L'Etat, Belgium

## VI. Device Applications

Chairman: C.L. Anderson,  
Hughes Research Labs

November 29, 1979  
Thursday Morning

### Invited Talks

- 8:30 — "Applications of Scanning Laser and Electron Beams to Silicon Device Technology," **J.F. GIBBONS**, Stanford Electronics Laboratory
- 9:00 — "Device Applications of Laser Annealing," **T. TOKUYAMA**, Hitachi Central Research Labs, Japan

### Contributed Papers

- 9:30 — "Laser Annealed Silicon Impatt Diodes," **L.D. HESS, C.R. ITO, E.M. NAKAJI**, and **G.L. OLSON**, Hughes Research Labs
- 9:45 — "Electrical Characteristics of Laser Annealed Polysilicon Resistors for Device Application," **L.D. HESS, G.L. OLSON** and **G. YARON**, Hughes Research Labs
- 10:00 — "Thin Film MOSFETs Fabricated in Laser-Annealed Polycrystalline Silicon," **K.F. LEE, J.F. GIBBONS, K.C. SARASWAT**, Stanford Electronics Laboratories and **T.I. KAMINS**, Hewlett-Packard Laboratories
- 10:15 — "Influence of Laser Annealing on Diffused Resistor Values," **S.E. SMALL** and **W.A. PORTER**, Texas A&M Univ.
- 10:30 — "Influence of Laser Annealing on Diode Leakage Current," **W. SEVRIN, W.A. PORTER** and **P.E. ALLEN**, Texas A&M Univ.
- 10:45 — "A Comparative Study of Arsenic Implanted Junctions in Polysilicon Annealed by Nd-Yag, CW Argon and Electron Beam Techniques," **P.M. SANDOW**, Burroughs Corp.
- 11:00 — "A Comparison of Pulsed Laser and Electron Beam Annealed Ion Implanted Silicon Structures," **J. STEPHEN** and **B.J. SMITH**, AERE Harwell, UK
- 11:15 — "Laser Techniques in Solar Cell Fabrication," **R.T. YOUNG, J. NARAYAN, R.D. WESTBROOK, C.W. WHITE** and **R.F. WOOD**, Oak Ridge National Laboratory
- 11:30 — "Laser Annealed Silicon Solar Cells," **J. KATZEFF**, Lockheed
- 11:45 — "Characterization of Ion Implanted and Pulse Laser Annealed Junctions; Application to Silicon Solar Cells," **J. MICHEL** and **E. FABRE**, LEP, France and **I. YAMADA, D. HOONHOUT** and **F. SARIS**, FOM Institute, the Netherlands
- 12:00 — "Electron Beam and Laser Process Applications for Silicon Solar Cells," **J. MINNUCCI, K. MATTHEI, A. GREENWALD, R. LITTLE**, and **A. KIRKPATRICK**, SPIRE Corp.
- 12:15 — "Laser Induced Photochemical Reactions for Electronic Device Fabrication," **T.F. DEUTSCH, D.J. EHRLICH** and **R.M. OSGOOD, JR.**, Lincoln Labs
- 12:30 — LUNCH



## VII. Metals and Other Materials

Chairman: S.T. Picraux,  
Sandia Laboratory

Thursday Afternoon

### Invited Talks

2:00 — "Metastable Phase Formation by Rapid Energy Deposition," **J.M. POATE**, Bell Labs

### Contributed Papers

2:30 — "Electron-Beam Pulsed Annealing of Ion-Implanted Aluminum," **D.M. FOLLSTAEDT**, **W.R. WAMPLER**, and **S.T. PICRAUX**, Sandia Laboratories

2:45 — "Effects of Ion Implantation and Laser Annealing in High  $T_c$  Superconducting Alloys," **B.R. APPLETON**, **C.W. WHITE**, Oak Ridge National Laboratory, and **J.R. GAVALER**, **A.I. BRAGINSKZY** and **M. ASHKIN**, Westinghouse R and D

3:00 — "Laser Processing of Ion Implanted Mo Single Crystals," **B.R. APPLETON** and **C.W. WHITE**, Oak Ridge National Laboratory

3:15 — "Laser Alloying of Single Crystal Nickel," **C.W. DRAPER**, Western Electric ERC, and **C.M. PREECE** and **J.M. POATE**, Bell Labs

3:30 — "Laser Processing of Ion Implanted Nickel," **P.P. PRONKO**, **A.P. PAULIKAS**, **K. SESHAN** and **H. WIEDERSICH**, Argonne National Laboratory

3:45 — "Laser and Ion-Beam Induced Reactions in Metal-Metal Thin Films," **B.Y. TSAUR**, **M. VON ALLMEN**, **M.-A. NICOLET** and **J.W. MAYER**, Caltech

4:00 — "Laser Surface Melting of Copper Alloys," **C.W. DRAPER**, Western Electric ERC

4:15 — "Relationship of Heat Flow to Structure in Surface Melting," **R. MEHRABIAN**, Univ. of Illinois

4:30 — "Constitution and Microstructure of Ag-Cu Alloys Produced by Continuous Laser Melt Quenching," **D.G. BECK**, **S.M. COPLEY**, and **M. BASS**, Univ. of Southern California

4:45 — "Wear Resistant Surfaces by Laser Processing," **J. MAZUMDER**, USC Center for Laser Studies

5:00 — "Solidification Microstructure and Microsegregation of Laser-Glazed Ni-Al-Ta and Ni-Al-Cr Dendritic Monocrystals," **I. KATTAMIS**, Univ. of Connecticut

5:15 — "The Use of Laser/Electron Beam Surface Melting for Obtaining Hard Iron-Base Materials," **B.R. STRUTT** and **B. LEWIS**, Univ. of Connecticut

## VIII. Panel Discussion

Chairman: P.S. Peercy,  
Sandia Laboratories

Thursday Evening

### Invited Talks

8:00 — "DARPA Sponsored Research for Directed Energy Processing," A.L. BEMENT, DARPA

Panel Moderator: P.S. Peercy, Sandia Laboratories

Members: W.L. Brown, Bell Labs  
R.T. Young, Oak Ridge National Laboratory  
L.D. Hess, Hughes Research Labs  
J.E. Baglin, IBM  
M. Von Allmen, Caltech  
J.F. Gibbons, Stanford Electronics Laboratory  
G.K. Celler, Western Electric ERC  
S.T. Picraux, Sandia Laboratories  
S. Namba, Univ. of Osaka, Japan

(Other panel members will be announced)

## IX. Electrical Properties and Defects\*

Chairman: K.N. Tu, IBM

Friday Morning  
November 30, 1979

### Invited Talks

8:30 — "Defects in Laser Processed Semiconductors," L.C. KIMMERLING, Bell Labs

9:00 — "Crystallinity and Electrical Characterization of Silicon Produced by Graphoepitaxy," M.W. GEIS, D. ANTONIADIS, D.C. FLANDERS, and H.I. SMITH, Lincoln Labs

9:30 — "Structural Defects in Laser and Electron Beam Annealed Semiconductors," J. NARAYAN, Oak Ridge National Laboratory

### Contributed Papers

10:00 — "Hydrogen Dressing of Defects in Pulsed-Laser Annealed a-Si," H.J. STEIN and P.S. PEERCY, Sandia Laboratories

10:15 — "A New Silicon Defect Associated with Laser Annealing: Doubly Twinned Crystal Regions," T.Y. TAN, R. TSU and J. LANKARD, IBM

10:30 — "Structural Studies of P<sup>+</sup> Implanted and Laser-Annealed Si," D.K. SADANA and J. WASHBURN, Lawrence Berkeley Laboratory, and G.R. BOOKER, University of Oxford, England

10:45 — "A Comparison of Ion-Implantation Induced Deep Levels in Scanning Electron Beam and CW Laser Annealed Silicon," N.M. JOHNSON and D.J. BARTELINK, Xerox Palo Alto Research Center and J.F. GIBBONS, K.N. RATNAKUMAR and J.L. REGOLINI, Stanford Electronics Laboratory

- 11:00 — "Electronic Properties of Ion-Implanted Silicon Annealed with Microsecond Dye-Laser Pulses," **D.R. MYERS, P. ROITMAN, S. MAYO** and **D. HOROWITZ**, NBS
- 11:15 — "Defect Luminescence in Laser Annealed Silicon," **R.A. STREET** and **N.M. JOHNSON**, Xerox Palo Alto Research Center
- 11:30 — "EPR Studies of Laser Annealed Silicon," **K.L. BROWER** and **P.S. PEERCY**, Sandia Laboratories
- 11:45 — "Positron Annihilation in Ion Implanted, Laser Annealed Silicon," **F.H. HSU**, Georgia State University and **C.W. WHITE**, Oak Ridge National Laboratory
- 12:00 — "Impurity Segregation in Laser Annealed Silicon Studied by Transmission Electron Microscopy," **A.G. CULLIS, H.C. WEBBER, D.V. McCAUGHAN** and **N.G. CHEW**, Royal Radar Establishment, Malvern, England and **J.M. POATE**, Bell Labs

\*Jointly sponsored with Symposium C on "Advances in Defect Characterization in Semiconductor Materials and Devices" (Chairman: P. Petroff, Bell Labs)

## SYMPOSIUM B

# SURFACE MODIFICATION OF MATERIALS BY ION IMPLANTATION

### SYMPOSIUM CHAIRMEN

<p><b>J.K. Hirvonen</b> Naval Research Laboratory Washington, D.C. 20375</p>	<p><b>C.M. Preece</b> Bell Laboratories Murray Hill, NJ 07974</p>
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**November 30, 1979**  
**Friday Morning**

- 8:30 — "Practical Applications of Ion Implantation," **G. DEARNALEY**, U.K. A.E.R.E., Harwell
- 9:15 — "High Dose Implantation and Ion Beam Mixing," **J.W. MAYER, S.S. LAU, B.Y. TSAUR**, California Institute of Technology, Pasadena, California, **J.M. POATE**, Bell Laboratories, Murray Hill, NJ, and **J.K. HIRVONEN**, N.R.L.
- 9:45 — "Implantation Studies of Impurity Immobilization Mechanisms," **S.M. MYERS**, Sandia Laboratories, Albuquerque, NM
- 10:15 — *POSTER SESSION (participants listed below)*
- 12:00 — "The Effect of Ion Implantation on the Aqueous Corrosion Behavior of an Austenitic Stainless Steel," **V. ASHWORTH, A.R. MOHAMMED** and **R.P.M. PROCTER**, University of Manchester, Institute of Science and Technology, Manchester, UK, and **W.A. GRANT**, University of Salford, Salford, UK
- 12:30 — LUNCH

### Friday Afternoon

- 2:00 — "Modification of the Corrosion Behaviour of Steel by Phosphorus Implantation," **C.R. CLAYTON, K.G.K. DOSS, H. HERMANN, S. PRASAD, Y-F. WANG,** SUNY/Stony Brook, NY, **J.K. HIRVONEN** and **G.K. HUBLER**, Naval Research Laboratory, Washington, DC
- 2:30 — "Mechanical Properties of Ion Implanted Alloys," **R.A. KANT**, Naval Research Laboratory, Washington, DC
- 3:00 — "The Structure and Properties of Nickel and Copper Alloys Prepared by Ion Implantation," **C.M. PREECE, E.N. KAUFMANN, A. STAUDINGER,** and **J.M. POATE**, Bell Laboratories, Murray Hill, NJ
- 3:30 — POSTER SESSION (participants listed below)
- 5:00 — DIRECTED DISCUSSION (with wine and cheese)

#### Poster Session Papers:

- "Analysis and Wear Properties of Ion Implanted Alloys," **C.A. CAROSELLA, I.L. SINGER, R.A. KANT, R.G. VARDIMAN** and **C.R. GOSSETT**, Naval Research Laboratory, Washington, DC
- "Surface Hardness and Abrasive Wear of Ion Implanted Steels," **R.H. BOLSTER** and **I.L. SINGER**, Naval Research Laboratory, Washington, DC
- "A Study of Alloy Corrosion Mechanisms in Pt-Implanted Ti," **B. LICHTER**, Vanderbilt University, Nashville, TN
- "Electrical Conductivity of Ion Implanted  $SrTiO_3$ ," **K. SUGAWARA, E.B. HALE** and **R. GERSON**, University of Missouri-Rolla, Rolla, MO
- "Corrosion Behavior of Ion Implanted Surfaces," **G.W. WARREN** and **D.D.L. CHUNG**, Carnegie-Mellon University, Pittsburgh, PA
- "Modification of Surface Sensitive Properties of Cu and Fe by Ion Implantation," **CHARLES BURR**, SUNY/Binghamton, NY, **H. BAKHRU** and **W. GIBSON**, SUNY/Albany, NY
- "A Study of the Surface-Related Mechanical Properties of Nitrogen-Implanted 1018 Steel," **H. HERMAN, W.W. HU, C.R. CLAYTON**, SUNY/Stony Brook, NY, **J.K. HIRVONEN, R. KANT**, Naval Research Laboratory, Washington, DC, and **R.K. MacCRONE**, Rensselaer Polytechnic Institute, Troy, NY
- "X-Ray Diffraction Characterization of Aluminum Ion Implanted Copper Crystals," **STEPHEN SPOONER**, Georgia Institute of Technology, Atlanta, GA
- "The Effect of Aluminum Ion Implantation on the Fatigue Crack Initiation of Copper," **ADESOLA KUJORE, EDGAR A. STARKE, JR., KEITH LEGGE** and **SAGHANA B. CHAKRABORTHY**, Georgia Institute of Technology, Atlanta, GA
- "Characterization of Lithium Implanted Nickel," **K. SESHAN, P.P. PRONKO, P.M. BALDO** and **H. WIEDENSICH**, Argonne National Laboratory, Argonne, IL
- "Ion-Induced Interface Mixing as an Ultrafast Quenching Technique for Metastable Alloy Formation: The Au-Si System," **B.Y. TSAUR** and **J.W. MAYER**, Caltech, Pasadena, CA

"Amorphous Surface Layers in Ti-Implanted Fe," J.A. KNAPP, D.M. FOLLSTAEDT and S.T. PICRAUX, Sandia Laboratories, Albuquerque, NM

"Inhibition of Grain Growth in Titanium by Ion Implantation," J.M. CATHCART, J.R. STEVENSON and K.O. LEGGE, Georgia Institute of Technology, Atlanta, GA

**SYMPOSIUM C  
ADVANCES IN DEFECT  
CHARACTERIZATION IN  
SEMICONDUCTOR MATERIALS  
AND DEVICES**

SYMPOSIUM CHAIRMAN

**P.M. Petroff**  
Bell Laboratories  
Murray Hill, NJ 07974

**SESSION 1**

**November 29, 1979  
Thursday Morning**

- 9:00 — "DLTS and EPR Correlation in Defect Studies in Silicon," G. WATKINS, Lehigh University (Invited)
- 9:45 — "Analysis of Deep and Shallow Level Constituents in Indium and Selenium-doped Silicon by IR Spectroscopy," J.C. SWARTZ and D.H. LEMMON, Westinghouse R&D Center
- 10:00 — "Deep Level Defect States in II-VI Semiconductor Heterojunctions," P. BASOMI and B.W. WESSELS, Northwestern University
- 10:25 — COFFEE BREAK
- 10:45 — "Phonon Optics in Semiconductors: The Case of Deep Levels in GaAs," V. NARAYANAMURTI, Bell Laboratories (Invited)
- 11:30 — END OF SESSION

**SESSION 2**

**Thursday Afternoon**

- 2:00 — "Recent Uses and Analysis of Rutherford Back-Scattering in Semiconductors," T. SEIDEL, Bell Laboratories (Invited)
- 2:45 — "Strain and Strain Relaxation in Tantalum Sputtered Silicon Substrates," S. WEISSMAN, Rutgers University
- 3:10 — "Interface Luminescence in Ga<sub>1-x</sub>Al<sub>x</sub>As Heterojunctions," P.M. PETROFF and R.A. LOGAN, Bell Laboratories
- 3:30 — COFFEE BREAK
- 3:45 — "Electron Imaging Techniques with Resolution Better than 10 nm," H. FOLL, IBM (Invited)
- 4:30 — END OF SESSION

## SESSION 3\*

November 30, 1979

Friday Morning

**A common session  
with Symposium A**

### *Invited Talks*

- 8:30 — "Defects in Laser Processed Semiconductors,"  
**L.C. KIMMERLING**, Bell Labs
- 9:00 — "Crystallinity and Electrical Characterization of  
Silicon Produced by Graphoepitaxy," **M.W. GEIS, D.  
ANTONIADIS, D.C. FLANDERS,** and **H.I. SMITH**, Lin-  
coln Labs
- 9:30 — "Structural Defects in Laser and Electron Beam  
Annealed Semiconductors," **J. NARAYAN**, Oak Ridge  
National Laboratory

### *Contributed Papers*

- 10:00 — "Hydrogen Dressing of Defects in Pulsed-Laser  
Annealed a-Si," **H.J. STEIN** and **P.S. PEERCY**, Sandia  
Laboratories
- 10:15 — "A New Silicon Defect Associated with Laser  
Annealing: Doubly Twinned Crystal Regions," **T.Y.  
TAN, R. TSU** and **J. LANKARD**, IBM
- 10:30 — "Structural Studies of  $P^+$  Implanted and Laser-  
Annealed Si," **D.K. SADANA** and **J. WASHBURN**,  
Lawrence Berkeley Laboratory, and **G.R. BOOKER**,  
University of Oxford, England
- 10:45 — "A Comparison of Ion-Implantation Induced  
Deep Levels in Scanning Electron Beam and CW Laser  
Annealed Silicon," **N.M. JOHNSON** and **D.J.  
BARTELINK**, Xerox Palo Alto Research Center and **J.F.  
GIBBONS, K.N. RATNAKUMAR** and **J.L. REGOLINI**,  
Stanford Electronics Laboratory
- 11:00 — "Electronic Properties of Ion-Implanted Silicon  
Annealed with Microsecond Dye-Laser Pulses," **D.R.  
MYERS, P. ROITMAN, S. MAYO,** and **D. HOROWITZ**,  
NBS
- 11:15 — "Defect Luminescence in Laser Annealed  
Silicon," **R.A. STREET** and **N.M. JOHNSON**, Xerox Palo  
Alto Research Center
- 11:30 — "EPR Studies of Laser Annealed Silicon," **K.L.  
BROWER** and **P.S. PEERCY**, Sandia Laboratories
- 11:45 — "Positron Annihilation in Ion Implanted, Laser  
Annealed Silicon," **F.H. HSU**, Georgia State University  
and **C.W. WHITE**, Oak Ridge National Laboratory
- 12:00 — "Impurity Segregation in Laser Annealed Silicon  
Studied by Transmission Electron Microscopy," **A.G.  
CULLIS, H.C. WEBBER, D.V. McCAUGHAN** and **N.G.  
CHEW**, Royal Radar Establishment, Malvern, England  
and **J.M. POATE**, Bell Labs

\*Jointly sponsored with Symposium A on "Laser and  
Electron Beam Processing of Materials" (Co-Chairmen:  
C.W. White, ORNL and P.S. Peercy, Sandia Laboratories).

# SYMPOSIUM D SEMICONDUCTOR INTERFACES

## SYMPOSIUM CHAIRMEN

**K.N. Tu**  
IBM Research Center  
Yorktown Heights, NY 10598

**J.W. Mayer**  
Dept. of Electrical  
Engineering  
Caltech  
Pasadena, CA 91109

## SESSION A Interface Structure

November 27, 1979  
Tuesday Morning

- 9:00 — "High Resolution Electron Microscopic Study of Semiconductor Interfaces," **O. KRIVANEK**, Berkeley  
9:45 — "Backscattering-Channeling Studies of Si Interfaces," **L.C. Feldman**, Bell  
10:30 — "Diffraction Studies of the Atomic Structure of Grain Boundaries," **S. SASS**, Cornell  
11:15 — "Structural Modeling of  $\alpha$ -Si/Si Interfaces," **F. SPAEPEN**, Harvard  
12:00 — LUNCH

## SESSION B Interface Properties

Tuesday Afternoon

- 2:00 — "Electronic Structure of Stacking Fault and Twin Boundary in Si," **S.G. LOUIE**, University of Pennsylvania  
2:45 — "Chemical Bonds and Reactions at the Metal-Silicon Interfaces," **G.W. RUBLOFF**, IBM  
3:30 — "Properties of the Semiconductor-Conductor Interface," **J.O. McCALDIN**, Caltech  
4:15 — "Metal Contacts to Semiconductors and the Influence of Absorbed Layers," **R.H. WILLIAMS**, Ulster and Xerox

## SESSION C Interface Reactions

November 28, 1979  
Wednesday Morning

- 9:00 — "The Thermal Oxidation of Silicon," **W.A. TILLER**, Stanford  
9:45 — "Shallow Silicide Contact," **K.N. TU**, IBM  
10:30 — "Parallel Silicide Contacts," **I. OHDOMARI**, Waseda  
11:15 — "The Use of Radioactive  $^{31}\text{Si}$  as a Marker for Studying Thin-Film Interaction," **R. PRETORIUS**, Southern Universities Nuclear Institute  
12:00 — LUNCH

SESSION D  
**Interface Analysis**

Wednesday Afternoon

- 2:00 — "Microanalysis by Scanning Transmission Electron Microscopy," **P.E. BATSON**, IBM  
2:45 — "Metal-Semiconductor Interfaces — Sputtering, XPS and Channeling Analysis," **J.M. MAYER**, Caltech  
3:30 — "Interface Analysis by Auger Electron Spectroscopy," **P.S. HO**, IBM  
4:15 — "The Applicability of SIMS for Interface Analysis," **P. WILLIAMS**, Illinois

SYMPOSIUM E  
**MATERIAL PROBLEMS IN  
MICROSTRUCTURE  
FABRICATION**

SYMPOSIUM CHAIRMEN

**R.W. Keyes**  
IBM Research Center  
Yorktown Heights, NY 10598

**J.M. Ballantyne**  
Cornell University  
Ithaca, NY 14853

SESSION A  
**Resists And Processes**

Chairman: **R.S. Horwath**, IBM Research Center  
Yorktown Heights, NY 10598

November 29, 1979  
Thursday Morning

- 8:45 — "Materials and Processes for Deep UV Printing of Submicron Images," **S. OHNO**, Olki Electric Corp., Japan  
9:20 — "A New Materials Approach to High Resolution Negative Resists for Lithography Involving a Radiation-Induced Charge-Transfer Process," **FRANK B. KAUFMAN**, **STEVE KRAMER** and **DON C. HOFER**, IBM Research Center, Yorktown Heights, NY 10598  
9:55 — COFFEE BREAK  
10:10 — "Plasma Polymerization: Key to Future Passivation of Submicron Circuits," **G. CZORNYJ** and **H.R. ANDERSON**, IBM, East Fishkill, NY 12533  
10:45 — "Plasma Enhanced Oxidation of Silicon," **T. SUGANO**, University of Tokyo, Tokyo, Japan  
11:20 — "Silicon Surface Modification for Solar Cells," **C. JOHNSON**, IBM, East Fishkill, NY 12533



**SESSION B**  
**Materials Problems in**  
**Superconducting Devices**

**Chairman: R.A. Buhrman, Cornell University**  
**Ithaca, NY 14853**

**Thursday Afternoon**

- 1:45 — *"Advanced Superconducting Materials: Fabrication and Processing,"* **M.R. BEASLEY**, Stanford University, Stanford, CA 94305.
- 2:20 — *"Properties of Lead Alloy and Niobium Josephson Tunnel Junctions,"* **C.J. KIRCHER**, IBM Research Center, Yorktown Heights, NY 10598
- 2:55 — COFFEE BREAK
- 3:10 — *"Superconductor-Semiconductor Microstructure Devices,"* **A.H. SILVER**, The Aerospace Corporation, El Segundo, CA 90245
- 3:45 — *"Nb-Nb Oxide-Pb Alloy Josephson Junctions,"* **S.I. RAIDER**, IBM Research Center, Yorktown Heights, NY 10598
- 4:20 — *"Microfabrication of Josephson Devices,"* **L.D. JACKEL, R.E. HOWARD, and E.L. HU**, Bell Telephone Labs, Murray Hill, NJ 07974

**SESSION C**  
**GaAs Microstructures for**  
**High Performance Electron Devices**

**Chairman: L.F. Eastman, Cornell University**  
**Ithaca, NY 14853**

**November 30, 1979**

**Friday Morning**

- 8:45 — *"France-U.S. Workshop on GaAs Microstructures and High Performance Devices — A Review,"* **L.F. EASTMAN**, Electrical Engineering Department, Cornell University, Ithaca, NY 14850
- 9:20 — *"Molecular Beam Growth and Properties of Ultrathin Multilayer Semiconductor Structures,"* **A.C. GOSSARD**, Bell Laboratories, Murray Hill, NJ 07974
- 9:55 — COFFEE BREAK
- 10:10 — *"Novel Doping and Contact Studies by MBE,"* **C.E.C. WOOD, D. DeSIMONE, R. STALL, G. METZE, and J. DEVLIN**, Electrical Engineering Department, Cornell University, Ithaca, NY 14853
- 10:45 — *"Integrated Monolithic Receivers on Gallium Arsenide for Millimeter and Submillimeter Wave Applications,"* **B.J. CLIFTON and R.A. MURPHY**, M.I.T. Lincoln Laboratories, P.O. Box 73, Lexington, MA 02173
- 11:20 — *"Application of Electron Beam Lithography for GaAs Integrated Circuits,"* **F. OZDEMIR and C. KRUMM**, Hughes Research Laboratory, Malibu, CA 90265

*SYMPOSIUM F*  
**NONDESTRUCTIVE OPTICAL  
TECHNIQUES FOR INTERFACE  
AND THIN-FILM ANALYSIS**

SYMPOSIUM CHAIRMAN

**David E. Aspnes**  
Bell Laboratories  
Murray Hill, NJ 07974

**November 30, 1979**

**Friday Morning**

- 9:00 — *"Use of Ellipsometry to Investigate Locked-in Layers and Thin Films,"* **E.A. TAFT**, General Electric
- 9:40 — *"Optical Characterization of Thin Films by Visible and UV Cathodoluminescence,"* **E.D. PALIK**, Naval Research Laboratory
- 10:20 — BREAK
- 10:35 — *"Optical Reflection Spectroscopy of Thin Films and Interfaces,"* **J.D.E. McINTYRE**, Bell Laboratories
- 11:15 — *"Raman Study of Oxide-Semiconductor Interfacial Reactions,"* **G.P. SCHWARTZ**, Bell Laboratories
- 11:55 — LUNCH

**Friday Afternoon**

- 2:00 — *"Combined Spectroscopic Ellipsometric/Reflectance Studies of Solid-Liquid Interfaces,"* **B. CAHAN**, Case Western Reserve
- 2:40 — *"The Optical Characterization of Materials Deposited on Highly Porous Substrates,"* **S. GAROFF**, Exxon Research
- 3:00 — *"In-Situ Studies of the Oxidation of Copper and Copper Alloys Using Differential Reflectometry,"* **R.E. HUMMEL** and **J. FINNEGAN**, University of Florida
- 3:20 — BREAK
- 3:35 — *"Infrared Characterization of GaAs Epitaxial Films on GaAs Substrates,"* **R.T. HOLM** and **E.D. PALIK**, Naval Research Laboratory
- 3:55 — *"Infrared Interference-Fringe Analysis of Silicon Implanted with High-Energy Nitrogen and Phosphorous,"* **G.K. HUBLER** and **P.R. MALMBERG**, Naval Research Laboratory, **W.G. SPITZER** and **C.N. WADDELL**, University of Southern California
- 4:15 — *"Analysis of the Layer Structure of Anodic Oxides on GaAs by Spectroscopic Ellipsometry,"* **D.E. ASPNES**, **G.P. SCHWARTZ**, **G.J. GUALTIERI**, and **B. SCHWARTZ**, Bell Laboratories
- 4:35 — *"High Temperature Optical Characterization of Thin Film Reflector and Absorber Layers,"* **M.R. JACOBSON** and **R. LAMOREAUX**, University of Arizona
- 4:55 — END OF SYMPOSIUM

*SYMPOSIUM G*  
**SCIENTIFIC BASIS FOR  
NUCLEAR WASTE  
MANAGEMENT**

SYMPOSIUM CHAIRMAN

**C.J. Northrup**  
*Sandia Laboratories  
Albuquerque, NM*

**ABOUT THE SYMPOSIUM**

The purpose of this symposium is to provide an interdisciplinary forum for discussion of the scientific aspects of nuclear waste management. This will include discussions of waste stream processing, partitioning and transmutation, storage and disposal, waste forms, engineered barriers, nuclide migration, relevant topics in the geosciences, and new concepts for an integrated approach to fuel reprocessing and waste management. Modeling and risk assessment will be considered in terms of the presentation of new models, sensitivity analyses, validation, and important directions for experimental programs. In addition, various specific waste management repositories will be reviewed from the standpoint of both the current technical understanding and the principal scientific questions that need to be further addressed. The emphasis will be on the presentation and discussion of work which addresses the important scientific foundations underlying these and associated topics. Papers will be presented in the following subject areas.

- I. Nuclear Fuel Cycle: New Integrated Fuel Reprocessing and Waste Management Concepts.
- II. Nuclear Waste Processing: Radionuclide Removal, Partitioning, Transmutation, Decontaminated Salt, Criteria/Disposal, Mine Tailings, TRU Wastes.
- III. Solid Waste Hosts (Preparation and Characterization, Leaching, etc.).
- IV. Engineered Barriers (Canisters, Overpacks).
- V. Radioactive Wastes in the Geologic Media.
- VI. Performance Assessment of Nuclear Waste Management Systems (Released Scenarios, Radionuclide Migration, Dose Consequence Calculations, Performing Sensitivity Analysis and Model Validations).

**PROCEEDINGS AND ABSTRACTS**

Arrangements are being made to publish the proceedings of the Symposium by direct reproduction of camera-ready copy. Abstracts of the papers will be available at the conference.

SESSION A  
The Solid Waste Form —  
Basic Properties

Presiding

**J.G. Moore**  
Oak Ridge National Lab  
Oak Ridge, TN

**C. Sombret**  
Centre de Marcoule  
France

November 27, 1979  
Tuesday Morning

8:15-11:30

*Greetings and Opening Remarks — C.J. Northrup*

A1\* *"Survey of Nuclear Waste Forms," HANS W. LEVI,*  
Hahn Meitner Institut, Berlin, Germany

A2 *"Crystal Chemistry and Phase Equilibria in the  
Synthetic Minerals of Ceramic Waste Forms: Fluorite  
and Monazite Structure Phases," G.J. McCARTHY,*  
Dept. Chemistry & Geology, North Dakota State Univ.,  
Fargo, ND; **JOHN G. PEPIN, D. DAVIS** and **D.  
PFOERTSCH**, Materials Research Laboratory, Penn  
State University, University Park, PA

A3 *"Krypton-85 Storage in Solid Matrices," G.L. TINGEY, E.  
McCLANAHAN, M. BAYNE, W. GRAY,* Battelle Pacific  
Northwest Laboratory, and **C. HINMAN**, Hanford  
Engineering Development Laboratory

9:50-10:10 COFFEE

A4 *"Monazite and Other Lanthanide Orthophosphates as  
Alternate Actinide Waste Forms," L.A. BOATNER and  
G.W. BEALL,* Oak Ridge National Laboratory, Oak  
Ridge, TN

A5 *"Structure and Chemical Stability of Incinerated  $\alpha$   
Waste Products," R. De BATIST, W. TIMMERMANS,*  
and **J. VANGEEL**, S.C.K./C.E.N., B-2400 MOL, Belgium,  
and **E. De GRAVE**, University of Gent, B-9000, GENT,  
Belgium

A6 *"Influence of Ionizing Irradiation on the Properties of  
Aluminosilicate Minerals of Radioactive Wastes  
Depositories," V.I. SPITSYN,* Institute of Physical  
Chemistry, Academy of Sciences, Moscow, USSR

\* Invited Paper

**SESSION B**  
**Characterization of**  
**Nuclear Waste Forms**

Presiding

**C.J. Northrup**  
Sandia Laboratories  
Albuquerque, NM

**W. Lutze**  
Hahn Meitner Institute  
Berlin, West Germany

**Tuesday Afternoon**

1:00-3:30

- B1 "Long Term Extrapolation of Laboratory Glass Leaching Data For the Prediction of Fission Product Release Under Actual Groundwater Conditions," **F.B. WALTON**, Whiteshell Nuclear Research Establishment, Pinawa, Manitoba, Canada; and **W.F. MERRITT**, Chalk River Nuclear Laboratory, Chalk River, Ontario, Canada
- B2 "Resistance of High Level Waste Materials to Dissolution in Aqueous Media," **K.F. FLYNN**, **L.J. JARDINE** and **M.J. STEINDLER**, Argonne National Laboratory, Argonne, IL
- B3 "Leaching of Irradiated Candu UO<sub>2</sub> Fuel," **T.T. VANDERGRAAF**, **L.H. JOHNSON**, and **D.W.P. LAU**, Storage Disposal Branch, Whiteshell Nuclear Research Establishment, Pinawa, Manitoba, Canada
- B4 "Investigation on the Chemical Stability of a Phosphate Glass Under Hydrothermal Conditions," **B. GRAMBOW** and **W. LUTZE**, Hahn-Meitner-Institut für Kernforschung Berlin, Dept. of Chemistry and Reactor, Glienicke Strasse 100, Berlin
- B5 "Alternative Waste Forms — A Comparative Study," **J.M. RUSIN**, **R.O. LOKKEN** and **J.W. WALD**, Pacific Northwest Laboratory, Richland, WA
- B6 "Long-Term Leaching of Irradiated Spent Fuel," **Y.B. KATAYAMA** and **D.J. BRADLEY**, Pacific Northwest Laboratory, Richland, WA
- B7 "Effect of Radiation Damage on SYNROC Minerals," **A.E. RINGWOOD** and **V. OVERSBY**, The Australian National Univ., Research School of Earth Sciences, Canberra, Australia

**POSTER SESSION C**  
**The Solid Waste Form —**  
**Processing and Characterization**

Presiding

**S.V. Topp**  
Savannah River  
Laboratory  
Aiken, SC

**J. Mendel**  
Battelle Pacific  
Northwest Labs  
Richland, WA

**Tuesday Afternoon**

4:00-5:00

- C1-A "Atomic Displacements & Radiation Damage in Glasses Incorporating HLW," **M. ANTONINI, P. CAMAGNI, F. LANZA, and A. MANARA**, Joint Research Centre, Varese, Italy
- C1-B "Low Temperature Ceramic Waste Form: Characterization of Supercalcine-Cement Composites," **D.M. ROY, B.D. SCHEETZ, M.W. GRUTZECK, L. WAKELEY and S.D. ATKINSON**, Materials Research Lab, Penn State Univ., University Park, PA
- C1-C "An Investigation on the Valency State of Molybdenum in Glasses Containing Fission Products," **B. CAMARA,\* W. LUTZE,\*\* J. LUX,\*** Institute fur Werkstoffwissenschaften III der Friedrich-Alexander-Universitat Erlangen-Nurmburg, Martensstrasse 5-D-8520 Erlangen, \*\* Hahn Meitner Institute, Berlin GmbH Berlin, West Germany
- C1-D "Extension of SYNROC Technology to the Immobilization of Defense Waste," **A.E. RINGWOOD and S.E. KESSON**, The Australian National Univ., Res. School of Earth Sciences, Canberra, Australia
- C1-E "The Behavior of Actinides in  $\alpha$  Doped Glasses as Regard to the Long Term Disposal of High Level Radioactive Materials," **CLAUDE SOMBRET, R.A. BONNIAUD and N.R. JACQUET-FRANCILLON**, Commissariat a l'Energie Atomique, Centre de Marcoule, France
- C1-F "Technical Feasibility of Krypton-85 Storage in Sodalite," **R.W. BENEDICT, A.B. CHRISTENSEN, J.A. DEL DEBBIO, J.H. KELLER, and D.A. KNECHT**, Allied Chemical Corp., Idaho Falls, ID
- C1-G "Leaching Characteristics of Actinides from Simulated Reactor Waste Glass, Part 2," **H.C. WEED, D.G. COLES, D.J. BRADLEY, R.W. MENSING and J.S. SCHWEIGER**, Univ. of Calif., Lawrence Livermore Lab, Battelle Pacific Northwest Laboratories
- C1-H "Statistically Designed Study of a Nuclear Waste Glass System," **L.A. CHICK, G.F. PIEPEL, and G.B. MELLINGER**, Battelle Pacific Northwest
- C1-I "Temperature Dependence for Hydrothermal Reactions of Waste Glasses and Ceramics," **J.H. WESTSIK, JR. and G.L. McVAY**, Battelle Pacific Northwest Laboratories
- C1-J "Phase-Separating Glasses in Thermal Gradients," **R.W. HOPPER**, Lawrence Livermore Lab, Livermore, CA

- C1-K *"Vitrification of High Alumina Nuclear Waste,"* **J.R. BROTZMAN**, Exxon Nuclear, Inc., Idaho Falls, ID
- C1-L *"Novel Metal & Metal Matrix Waste Forms,"* **N.H. MACMILLAN** and **RUSTUM ROY**, Materials Research Laboratory, Penn State Univ., PA, and **P.T.B. SHAFFER**, Carborundum Co., Electro-Minerals Div., Niagara Falls, NY
- C1-M *"Processing Methods For Actinides of Partitioning, Reprocessing & Refabrication of Plant TRU Waste,"* **D.W. TEDDER**, **B.C. FINNEY**, and **J.O. BLOMEKE**, Oak Ridge National Lab, Oak Ridge, TN
- 4:30-5:30
- C2-N *"Development & Characterization of Cermet Forms for Radioactive Waste,"* **W.S. AARON**, **T.C. QUINBY**, and **E.H. KOBISK**, Oak Ridge National Laboratory, Oak Ridge, TN
- C2-O *"Uranium and Thorium Minerals: Natural Analogues for Crystalline Radioactive Waste Forms,"* **R.F. HAAKER** and **R.C. EWING**, Dept. of Geology, Univ. of New Mexico, Albuquerque, NM
- C2-P *"Characterization of Impact Fracture of Brittle Solid-Waste Forms,"* **W.J. MECHAM**, **L.J. JARDINE** and **M.J. STEINDLER**, Argonne National Laboratory, Argonne, IL
- C2-Q *"Microstructural Characterization of Glass and Ceramic Simulated Waste Forms,"* **T.J. HEADLEY**, **J.T. HEALEY**, **P.F. HLAVA**, Sandia Laboratories, Albuquerque, NM, **M.J. KUPFER** and **D.M. STRACHEN**, Rockwell Hanford Operations, Richland, WA
- C2-R *"Characterization of Weathered Glass by Analyzing Ancient Artifacts,"* **M.F. KAPLAN**, Analytic Sciences Corp., Reading, MA
- C2-S *"Mechanism for Elevated Temperature Leaching,"* **B.T. KENNA** and **K.D. MURPHY**, Sandia Laboratories, Albuquerque, NM
- C2-T *"Improved Glass Compositions for Immobilization of SRP Waste,"* **M.J. PLODINEC**, Savannah River Laboratory, E.I. du Pont de Nemours & Co., Aiken, SC
- C2-U *"A Microscopic Approach For the Simulation of Radioactive Waste Storage in Glass,"* **J.C. DRAN**, **M. MAURETTE**, and **J.C. PETIT**, Laboratoire Rene Bernas, Orsay, France
- C2-V *"Actinide Separation from HLW,"* **J.O. LILJENZIN**, **G. PETERSON**, **I. HAGSTROM**, and **I. SVANTESSON**, Dept. of Nuclear Energy, Chalmers Univ. of Technology, S-412, Goteberg, Sweden
- C2-W *"Devitrification of Nuclear Waste Glasses,"* **R.P. TURCOTTE**, **J.W. WALD**, and **R.P. MAY**, Battelle Pacific Northwest, Richland, WA
- C2-X *"Product and Characterization of Actual High-Level Waste Canisters,"* **G.H. BRYAN**, **W.J. BJORKLUND**, and **W.L. KUHN**, Pacific Northwest Laboratory, Richland, WA

C2-Y "Fixation of MLW in Titanates and Zeolites: Progress Towards a System for Transfer of Nuclear Reactor Activities from Spent Organic to Inorganic Ion Exchangers," **S. FORBERG** and **T. WESTERMARK**, Dept. of Nuclear Chemistry, **R. ARNEK** and **I. GRENTHE**, Dept. of Inorganic Chemistry, Royal Institute of Technology, Stockholm, and **L. FALTH** and **S. ANDESSON**, Inorganic Chemistry 2, Institute of Technology, Lund, Sweden

(WINE AND CHEESE RECEPTION, 6:00-7:00 p.m.)

## SESSION D Radionuclide Transport in Geomedia

Presiding

**E.A. Bryant**  
Los Alamos Scientific Lab  
Los Alamos, NM

**S. Fried**  
Argonne National Lab  
Argonne, IL

**November 28, 1979**  
**Wednesday Morning**

8:15-11:30

- D1 "The Study of Radionuclide Transport, Why and How," **E.A. BRYANT**, Los Alamos Scientific Laboratory, Los Alamos, NM
- D2 "Chemical Reactions in the Bedrock-Groundwater System of Importance for the Sorption of Actinides," **B. ALLARD** and **G.W. BEALL**, Transuranium Research Laboratory, Oak Ridge National Laboratory, Oak Ridge, TN
- D3 "Parameters Affecting Radionuclide Migration in Geologic Media," **B.R. ERDAL**, **B.P. BAYHURST**, **W.R. DANIELS**, **S.J. DeVILLIERS**, **F.O. LAWRENCE**, **J.L. THOMPSON**, **E.N. VINE**, and **K. WOLFSBERG**, Los Alamos Scientific Laboratory, Los Alamos, NM
- D4 "Radionuclide Transport in a Dolomite Aquifer," **R.G. DOSCH** and **A.W. LYNCH**, Sandia Laboratories, Albuquerque, NM
- D5 "Preliminary Rate Expressions for Analysis of Radionuclide Migration Resulting from Fluid Flow Through Jointed Media," **K.L. ERICKSON**, Sandia Laboratories, Albuquerque, NM
- D6 "Transport Through Deep Aquifers of Transuranic Nuclides Leached from Vitrified High Level Wastes," **A. AVOGADRO**, **C.N. MURRAY** and **A. DePLANO**, Commission of European Communities — Joint Research Centre, Ispra Establishment 21020 ISPRA, Varese, Italy
- D7 "<sup>99</sup>Tc, Pb and Ru Migration Around the Oklo Natural Fission Reactors," **A.J. GANCARZ**, **G.A. COWAN**, and **D.B. CURTIS**, Univ. of California, Los Alamos Scientific Lab, Los Alamos, NM, and **W.J. MAECK**, Idaho National Engineering Lab, Allied Chemical Corp., Idaho Falls, ID



SESSION E  
**Radioactive Wastes in  
the Geologic Setting**

Presiding

**W. Potter**  
U.S. Geological Survey  
Menlo Park, CA

**V.I. Spitsyn**  
Academy of Sciences  
of USSR  
Moscow, USSR

**Wednesday Afternoon**

1:00-3:30

- E1 "The Thermomechanical Response of an Underground Granite Rock Mass and Its Relationship to Thermomechanical Properties of Granite Measured in Laboratory Experiments: Results from Stripa," **N.G.W. COOK** and **M. HOOD**, Dept. of Materials Science & Mineral Engineering, Univ. of Calif., Berkeley, and **T. CHAN**, Lawrence Berkeley Laboratory, Univ. of Calif.
- E2 "Shale Rocks as Nuclear Waste Repositories: Hydrothermal Reactions with Glass & Ceramic Waste Forms," **W.P. FREEBORN**, **SRIDHAR KOMARNENI**, **B.E. SCHEETZ**, **D.K. SMITH**, and **W.P. WHITE**, Materials Research Laboratory, Penn State Univ., University Park, PA, and **G.J. McCARTHY**, Depts. of Chemistry & Geology, North Dakota State Univ., Fargo, ND
- E3 "Surface Chemistry Changes of Granite & Dissolution Rates of 'Harvest' Borosilicate Glasses Under Repository Hydrothermal Conditions of Pressure and Temperature," **N.A. CHAPMAN** and **D. SAVAGE**, Institute of Geological Sciences, Environmental Pollution Section, Harwell Laboratory, Harwell, Oxfordshire, UK
- E4 "The Application of the Physicochemical Properties of Boiling Bitterns to the Interpretation of Brine Migration Experiments Related to Salt Repositories," **R.W. POTTER**, **M.A. CLYNNE**, and **V.L. THURMOND**, U.S. Geological Survey, Menlo Park, CA
- E5 "Brine Chemistry Effects on the Durability of a Simulated Nuclear Waste Glass," **J.W. BRAITHWAITE**, Sandia Labs, Albuquerque, NM
- E6 "In-Situ Experiments to Support Development of the Waste Isolation Pilot Plant (WIPP)," **A.R. SATTler**, **H.C. WALKER** and **T.O. HUNTER**, Sandia Laboratories, Albuquerque, NM
- E7 "Physico-Chemical Processes in Rock Salt During Irradiation," **V.I. SPITSYN**, **S.A. KABAKCHI**, and **L.I. BARSOVA**, Institute of Physical Chemistry, Academy of Sciences, Moscow, USSR

POSTER SESSION F  
**Nuclear Wastes —  
Processing, Radionuclide Transport  
and Geologic Interactions**

Presiding

**R.G. Dosch**  
Sandia Laboratories  
Albuquerque, NM

**D. Brookins**  
University of New Mexico  
Albuquerque, NM

**Wednesday Afternoon**

4:00-5:00

- F1-A "A Slagging Pyrolysis Incinerator for Processing Low-Level Transuranic Waste," **M.D. McCORMACK**, EG&G Idaho, Inc.
- F1-B "Development of an Ion Exchange Process for Removing Cesium from High Level Radioactive Liquid Wastes," **P.K. BAUMGARTEN, R.M. WALLACE, D.A. WHITEHURST**, and **J.M. STEED**, Savannah River Laboratory, E.I. du Pont de Nemours & Co., Aiken, SC
- F1-C "An Electrolytic Volume Reduction Method for High Level Salt Wastes from the Nonaqueous Reprocessing of Nuclear Fuels," **R.E. BARLETTA, L.J. JARDINE, T. GERDING, D. KROECK**, and **M. KRUMPELT**, Argonne National Laboratory, Argonne, IL
- F1-D "Ruthenium Volatility Behavior During HLLW-Vitrification in a Liquid Fed Ceramic Melter," **S. WEISENBURGER** and **K. WEISS**, Karlsruhe Nuclear Research Centre, 7500 Karlsruhe 1, Federal Republic of Germany
- F1-E "Interaction of Radionuclides with Geomedia from the Nevada Test Site," **A.W. LYNCH** and **R.G. DOSCH**, Sandia Laboratories, Albuquerque, NM
- F1-F "Nuclide Tracer Tests Performed in the Field for WIPP in Southeastern New Mexico," **D.D. GONZALEZ** and **L.R. HILL**, Sandia Laboratories, Albuquerque, NM
- F1-G "Continued Radionuclide Sorption Studies on Abyssal Red Clays," **K.L. ERICKSON**, Sandia Laboratories, Albuquerque, NM
- F1-H "Long Term Stability of Evaporite Minerals: Geochronological Evidence," **J.K. REGISTER, JR., D.G. BROOKINS, M.E. REGISTER**, Dept. of Geology, Univ. of New Mexico, Albuquerque, NM, and **S.J. LAMBERT**, Sandia Laboratories, Albuquerque, NM
- F1-I "The Effect of Radiation on the Oxidation States of Plutonium in Various Aqueous Solutions," **S. FRIED, A. FRIEDMAN, R. SJOBLOM, D. COHEN, K. NASH** and **J.C. SULLIVAN**, Chemistry Division, Argonne National Laboratory, Argonne, IL
- F1-J "Characterization of Geological Discontinuities in the Stripa Granite — Time Scale Experiment," **R. THORPE**, Lawrence Berkeley Laboratory, University of California

- F1-K "Hydrothermal Interaction of Simulated Nuclear Waste Glass in the Presence of Basalt," **B.E. SCHEETZ, SRIDHAR KOMARNENI, D.K. SMITH**, Materials Research Laboratory, Penn State Univ., University Park, PA, and **G.J. McCARTHY**, Depts. of Chemistry & Geology, North Dakota State Univ., Fargo, ND
- F1-L "Canister Compatibility with Carlsbad Salt," **W.N. RANKIN**, Savannah River Laboratory, E.I. du Pont de Nemours & Co., Aiken, SC
- F1-M "Corrosion Resistant Metallic Canisters: An Important Element of the Multibarrier Disposal Concept," **J.W. BRAITHWAITE** and **N.J. MAGNANI**, Sandia Labs, Albuquerque, NM
- 4:30-5:30
- F2-N "Hydrogeologic Characteristics of Fractured Rocks for Waste Isolation — Results from Stripa," **J.E. GALE** and **O. QUINN**, University of Waterloo, Waterloo, Ontario, **D.G. McEDWARDS, P.A. WITHERSPOON**, and **T. DOE**, Lawrence Berkeley Laboratory, Univ. of Calif., Berkeley, CA
- F2-O "The Role of Large-Scale Permeability Measurements in Fractured Rock and Their Application at Stripa," **P.A. WITHERSPOON, C.R. WILSON, J.C.S. LONG, R. GALBRAITH**, Lawrence Berkeley Lab., Univ. of Calif., **J.E. GALE**, Univ. of Waterloo, and **M. McPHERSON**, Univ. of Nottingham, UK
- F2-P "Rock Instrumentation Problems for Large Scale In-Situ Heater Tests," **E.P. BINNALL, A.O. DuBOIS**, Lawrence Berkeley Laboratory, Univ. of Calif., and **R. LINGLE**, TerraTek.
- F2-Q "The Importance of Isotopic and Geochemical Groundwater Data for Waste Isolation — The Stripa Experience," **P. FRITZ, J. BARKER**, and **J.E. GALE**, Univ. of Waterloo, Waterloo, Ontario
- F2-R "Asphalt Emulsion Sealing of Uranium Mill Tailings," **J.N. HARTLEY, P.L. KOEHMSTEDT**, and **D.J. ESTERL**, Battelle Pacific Northwest Laboratories, Richland, WA
- B7-S "Processing of High Temperature Simulated Waste Glass in a Continuous Ceramic Melter," **S.M. BARNES** and **M.S. HANSON**, Battelle Memorial Institute, Pacific Northwest Laboratory, Richland, WA
- F2-T "Advances in the Fluorocarbon Absorption Process for Decontamination of Reprocessing Plant Off-Gas," **B.E. KANAK**, Union Carbide Corp., Nuclear Division, Oak Ridge, TN
- F2-U "Migration of <sup>90</sup>Sr from Low-Level Radioactive Waste by Ground-Water Flow in Bedrock," **A.M. STUEBER, I.L. MILLER, N.D. FARROW**, Environmental Sciences Div., ORNL, **T.G. SCOTT**, Analytical Chemistry Div., ORNL, and **D.A. WEBSTER**, U.S. Geological Survey, Knoxville, TN
- F2-V "Effect of the Denitration on the Ruthenium Vaporization," **R. ODOJ, E. MERZ**, and **R. WOLTERS**, Nucl. Res. Centre, PB1913, Inst. fur Chem. Tech., 5170 Julich, W. Germany

- F2-W "Recent Studies on Radiation-Induced Color Centers and Colloid Formation in Synthetic NaCl and Natural Rock Salt for Radioactive Waste Disposal Applications," **K.J. SWYLER, R.W. KLAFFKY and P.W. LEVY**, Brookhaven National Laboratory, Upton, NY
- F2-X "Corrosion of Materials in Clay Environment," **CASTEELS, H. TAS, J. NAETS, M.J. BRABERS**, S.C.K./C.E.N. 200, Boeretang, Mol, Belgium, and **K.U.L. LEUVEN**, Metaalkunde, B-3030 Heverlee, Belgium
- F2-Y "Stability of Savannah River Plant Glass Waste-Forms in Geologic Media," **J.R. WILEY, M.D. DUKES, W.N. RANKIN**, and **M.H. TENNANT**, Savannah River Laboratory, Aiken, SC
- F2-Z "Chemical Considerations in Storing HAW in Deep Bedrock," **B. ALLARD, K. ANDERSSON, B. TORSTENFELT** and **J. RYDBERG**, Dept. of Nucl. Chem., Chalmers Univ. of Technology, Goteborg, Sweden

## SESSION G

### Overviews

Presiding

**R.L. Schwoebel**  
Sandia Laboratories  
Albuquerque, NM

**D. Ferguson**  
Oak Ridge National  
Laboratory  
Oak Ridge, TN

#### Wednesday Evening

7:30-10:30

- G1 "General Criteria for Radioactive Waste Disposal," **MARGARET N. MAXEY**, Univ. of Detroit, **LAURENCE I. MOSS**, Energy/Environment Consultant, **BURDON C. MUSGRAVE**, INEL, and **GOLDIE B. WATKINS**, New York State Dept. of Health
- G2 "The Environmental Effects Associated with the Transportation of Radioactive Materials," **R.B. POPE, R.E. LUNA, H. RICHARD YOSHIMURA**, and **J.D. McCLURE**, Transportation Technology Center, Sandia Laboratories, Albuquerque, NM
- G3 "Radioactive Waste Disposal in Geological Formations: Research Activities and Programmes of the Commission of European Communities," **F. GIRARDI, M. BRESESTI, S. ORLOWSKI**, and **M. VENET**, Commission of European Communities
- G4 "Development of Solid Radionuclide Waste Forms in the U.S.A.," **JOHN CRANDALL**, Savannah River Laboratory, Aiken, SC
- G5 "The Perspective of Waste Isolation Research Issues and Assessment of Consequences for Radionuclide Release," **T.O. HUNTER**, Sandia Laboratories, Albuquerque, NM
- G6 "Status Report on Feasibility Studies for Storing Nuclear Wastes in Columbia Plateau Basalt," **R. DEJU** and **G.C. EVANS**, Rockwell International, Richland, WA

**SESSION H**  
**Waste Isolation**  
**Performance Assessment**

Presiding

**C. Burkholder**  
*Battelle Memorial  
Institute*  
Columbus, OH

**J. Mather**  
*Harwell Laboratory*  
Oxfordshire, England

**November 29, 1979**  
**Thursday Morning**

8:15-11:30

- H1 "Waste Isolation Performance Assessment — A Status Report," **H.C. BURKHOLDER**, Office of Nuclear Waste Isolation, Battelle Memorial Institute, Columbus, OH
- H2 "Scenarios for Long-Term Release of Radionuclides from the Proposed Waste Isolation Pilot Plant in Southeastern New Mexico," **F.W. BINGHAM** and **G.E. BARR**, Sandia Laboratories, Albuquerque, NM
- H3 "Calculated Hydrogeologic Pressures & Temperatures Resulting from Radioactive Waste in the Eleana Argillite," **R.R. EATON** and **W.D. SUNDBERG**, Sandia Laboratories, Albuquerque, NM
- H4 "Modeling of Brine Migration in Halite," **H. CHEUNG**, **M.E. FULLER**, Lawrence Livermore Laboratory, Livermore, CA, and **E.S. GAFFNEY**, Pacifica Technology, Del Mar, CA
- H5 "Computer Modeling of Nuclear Waste Storage Canister Corrosion," **W.D. LUDEMANN** and **R.D. McCRIGHT**, IL, Lawrence Livermore Laboratory, Livermore, CA
- H6 "Regional Thermohydrological Effects of an Underground Repository for Nuclear Wastes in Hard Rock," **J.S.Y. WANG** and **C.F. TSANG**, Lawrence Berkeley Laboratory, Berkeley, CA
- H7 "The Effect of Variations in Parameter Values on the Predicted Radiological Consequences of Geologic Disposal of High-Level Waste," **M.D. HILL**, National Radiological Protection Board, Harwell, Oxon, UK

**SESSION I**  
**Backfill Barriers**

Presiding

**G.J. McCarthy**  
*North Dakota State  
University*  
Fargo, ND

**T. Westermark**  
*Royal Institute of  
Technology*  
Stockholm, Sweden

**Thursday Afternoon**

1:00-3:30

- I1 "Solution Interaction of Nuclear Waste Anions with Selected Geological Materials," **G.W. BIRD** and **V.J. LOPATA**, Atomic Energy of Canada Ltd., Whiteshell Nuclear Research Establishment, Pinawa, Manitoba, Canada

- 12 "Clay Minerals Suitable for Overpack in Waste Repositories: Evidence from Uranium Deposits," **D.G. BROOKINS**, Dept. of Geology, Univ. of New Mexico, Albuquerque, NM
- 13 "The Backfill as an Engineered Barrier for Nuclear Waste Management," **E.J. NOWAK**, Sandia Laboratories, Albuquerque, NM
- 14 "SUPEROVERPACK: Tailor-Made Mixtures of Zeolites and Clays," **S. KOMARNENI** and **RUSTUM ROY**, Materials Research Laboratory, Penn State Univ., University Park, PA
- 15 "Comparison of Tailored Cement Formulations for Borehole Plugging in Crystalline Silicate Rocks and Evaporite Mineral Sequences," **B.E. SCHEETZ**, **D.M. ROY**, **E.L. WHITE** and **D. WOLFE-CONFER**, Materials Research Laboratory, Penn State Univ., PA
- 16 "Control of Radionuclide Migration in Soil by the Application of DC Electric Current," **F.N. CASE**, **N.H. CUTSHALL**, Oak Ridge National Laboratory, Oak Ridge, TN

**POSTER SESSION J**  
**Nuclear Waste**  
**Performance Assessment**  
**and Backfill Barriers**

Presiding

**P. Gnirk**,  
 Pres., *RE/SPEC, Inc.*  
 Rapid City, SD

**C. Clairborne**  
 Oak Ridge National  
 Laboratory  
 Oak Ridge, TN

**D. Roy**  
 Penn State Univ.  
 University Park, PA

**Thursday Afternoon**

4:00-5:30

- J1-A "Clay Mineral-Brine Interactions During Evaporite Formation: Lanthanide Distribution in WIPr Samples," **D.G. BROOKINS**, **J.K. REGISTER, JR.**, **M.E. REGISTER**, Dept. of Geology, Univ. of New Mexico, Albuquerque, NM, and **S.J. LAMBERT**, Sandia Laboratories, Albuquerque, NM
- J1-B "The Complex Relationship Between Ground-Water Velocity and Concentration of Radioactive Contaminants," **F.E. KASZETA**, **F.W. BOND**, Battelle Pacific Northwest, Richland, WA
- J1-C "Release Consequence Analysis of Radionuclide Transport from Nuclear Waste Repositories," **J.R. RAYMOND**, Battelle Northwest Laboratories, and **G. SEGOL**, Bechtel, Inc.
- J1-D "Parametric Analysis of Radionuclide Migration from a Nuclear Waste Repository in Basalt Media," **D.R. PARKS**, **R.G. BACA**, and **M.S. BENSKY**, Rockwell Hanford Operations, Richland, WA

- J1-E "A Review of the Environmental Impact of Mining and Milling of Uranium Ores," **J.M. COSTELLO, D.R. DAVY, F.C.R. CATTELL** and **J.E. COOK**, Australian Atomic Energy Commission Research Establishment, Private Mail Bag, Sutherland, New South Wales, Australia
- J1-F "Sensitivity Studies of the SWIFT Radionuclide Transport Model," **J.E. CAMPBELL, B.S. LANGKOPF, R.L. IMAN**, Sandia Laboratories, and **MARK REEVES**, INTERA Environmental Consultants, Houston, TX
- J1-G "Geologic Waste Disposal and a Model for Surface Radionuclide Movement," **J.C. HELTON**, Sandia Laboratories, and **S. SCHREURS**, U.S. Nuclear Regulatory Commission
- J1-H "Temperatures Generated by Underground Storage of Defense Waste Canisters," **M.H. TENNANT**, Savannah River Laboratory, Aiken, SC
- J1-I "Far Field Thermal Calculations for the WIPP Site in SENM," **S.B. PAHWA**, INTERA Environmental Consultants, Inc., and **J.R. WAYLAND**, Sandia Laboratories, Albuquerque, NM
- J1-J "Probabilistic Aspects of the Estimates of Faulting in Anisotropic Media," **R.M. CRANWELL**, Sandia Laboratories, and **F.A. DONATH**, Univ. of Illinois
- J1-K "Migration of Fluid Inclusions in WIPP Salt in Thermal Gradients," **EDWIN ROEDDER** and **H.E. BELKIN**, U.S. Geol. Survey, Reston, VA
- J1-L "Measurement of the Mobility of Actinide Element Traces in Sediment From the Ocean Floor," **S. FRIED, A.M. FRIEDMAN, F. SCHREINER, J.J. HINES, G. SCHMITZ**, and **R. SJOBLUM**, Chemistry Div., Argonne National Laboratory, Argonne, IL
- 4:30-5:30
- J2-M "A Stochastic Model of Radionuclide Migration from Natural and Engineered Repositories," **A.S. KIREMIDJIAN** and **P. KRUGER**, Civil Engineering Dept., Stanford Univ., Stanford, CA
- J2-N "Finite Medium Green's Function Solutions to Nuclide Transport in Porous Material," **S.G. OSTON**, Analytic Sciences Corp., Reading, MA
- J2-O "Kinetic Effects on Radionuclide Transport by Groundwater," **H.S. LEVINE**, Sandia Laboratories, Albuquerque, NM
- J2-P "Probabilistic Analysis of Geological Segregation of Radioactive Waste in a Clay Formation," **A. BONNE**, CEN/SKC, **M. D'ALESSANDRO**, J.R.C., Mol, Belgium
- J2-Q "Environmental Effects from Disposal of Defense High-Level Radioactive Wastes in a Generic Geologic Repository," **N.A. CHIPMAN** and **G.G. SIMPSON**, Exxon Nuclear Idaho, Inc., Idaho Falls, ID; **H. LAWROSKI**, Consultant, Idaho Falls, ID; **W.A. RODGER** and **R.L. FRENDBERG**, Nuclear Safety Associates, Bethesda, MD
- J2-R "A Systematic Approach for Assessment of Alternative Nuclear Waste Management Strategies," **GOUR-TSYH YEH**, Environmental Sciences Div., ORNL, Oak Ridge, TN

- J2-S "Water Migration in Geologic Disposal Media," **R.K. THOMAS, G.R. HADLEY, J.J. HOHLFELDER** and **A.R. LAPPIN**, Sandia Laboratories, Albuquerque, NM
- J2-T "Thermal Aspects of the Eleana Near-Surface Heater Experiment," **D.F. McVEY**, and **A.R. LAPPIN**, Sandia Laboratories, Albuquerque, NM
- J2-U "Thermal Aspects of Waste Emplacement in Layered Tuffs," **B.M. BULMER** and **A.R. LAPPIN**, Sandia Laboratories, Albuquerque, NM
- J2-V "Mechanical Modeling of Nuclear Waste Disposal in Argillite at the Nevada Test Site," **R.K. THOMAS** and **A.R. LAPPIN**, Sandia Laboratories, Albuquerque, NM
- J2-W "Possible Retention of Iodine in the Ground," **B. ALLARD, B. TORSTENFELT, K. ANDERSSON** and **J. RYDBERG**, Dept. of Nuclear Chemistry, Chalmers University of Technology, Goteborg, Sweden

## SESSION K

### Radiolysis Effects and Nuclear Waste Performance Criteria

Presiding

**W. Schulz**  
Rockwell International  
Hanford, WA

**R. Roy**  
Penn State University  
University Park, PA

**November 30, 1979**  
**Friday Morning**

8:15-11:30

K1 "The Reaction of Hydrogen and Oxygen in the Presence of Concretes Incorporating Simulated Radioactive Waste," **S. KATZ**, ORNL, Oak Ridge, TN

K2 "Radiolytic Gas Generation in Concrete Made with Incinerator Ash Containing Transuranium Nuclides," **N.E. BIBLER**, Savannah River Laboratory, Aiken, SC

K3 "Gas Generation from Transuranic Waste Degradation," **M.A. MOLECKE**, Sandia Laboratories, Albuquerque, NM

9:50-10:10 COFFEE

K4 "Policy Overview Concerning DOE Waste Immobilization Programs," **STEPHEN M. GOLDBERG**, Dept. of Energy, Office of Nuclear Policy Analysis, Washington, DC 20585

K5 "Repository Modeling from a Systems Basis," **S.F. SCHREURS**, U.S. Nuclear Regulatory Commission

K6 "Criteria for Assessing the Acceptability of Waste Forms," **D.M. ROHRER**, U.S. Nuclear Regulatory Commission

CLOSE OF SYMPOSIUM



## PROGRAM COMMITTEE

**C.J. Northrup**, Sandia Laboratories, USA (*Chairman*)  
**E.A. Bryant**, Los Alamos Scientific Laboratory, USA  
**H.C. Burkholder**, Battelle Memorial Institute, Columbus,  
USA  
**K.J. McCarthy**, North Dakota State University, USA  
**J.B. Moore**, Oak Ridge National Laboratory, USA  
**R.W. Potter**, U.S. Geological Survey, USA  
**W. Shulz**, Rockwell International, Hanford, USA  
**S.V. Topp**, Savannah River Laboratory, USA

## STEERING COMMITTEE

**R.L. Schwoebel**, Sandia Laboratories, USA (*Chairman*)  
**W. Carbiener**, Battelle Memorial Institute, Columbus, USA  
**D. Ferguson**, Oak Ridge National Laboratory, USA  
**W. Heimerl**, DWK, Mol, Belgium  
**W. Lutze**, Hahn Meitner Institut, Berlin, W. Germany  
**J.D. Mather**, Institute of Geological Sciences, Harwell, UK  
**G. Oertel**, Department of Energy, USA  
**R. Roy**, Pennsylvania State University, USA  
**C. Sombret**, Centre d'Etudes Nucleaires, Marcoule, France  
**V.I. Spitsyn**, Academy of Sciences, Moscow, USSR  
**D.B. Stewart**, U.S. Geological Survey, USA  
**W.D. Weart**, Sandia Laboratories, USA  
**T. Westermark**, Royal Institute of Technology, Stockholm,  
Sweden

## SYMPOSIUM H COAL: MATERIAL PROPERTIES AND CONVERSION

### SYMPOSIUM CHAIRMEN

**Pedro A. Montano**  
*Department of Physics*  
*West Virginia University*  
*Morgantown, WV 26506*

**Herald W. Stewart**  
*Aerodyne Research Inc.*  
*Crosby Drive*  
*Bedford, MA 01730*

**Peter R. Solomon**  
*United Technologies*  
*Research Center*  
*East Hartford, CT 06108*

**November 27, 1979**  
**Tuesday Morning**

**Chairman: P.A. Montano**

9:00 — "*Elemental Distribution in Coals*," **HAROLD J. GLUSKOTER**, Exxon Production Research Co., Houston and **JOHN K. KUHN**, Kentucky Institute for Mining and Minerals Research, Kentucky

9:30 — "*Microstructural-Chemical Characterization of Coal by Combined Scanning Electron Microscope and Wavelength and Energy Dispersive X-ray Analysis*," **RAYMOND T. GREER**, Iowa State University, Ames, Iowa 50011

10:00 — "*Mineral Matter Transformations During Carbonization and Combustion*," **F.E. HUGGINS**, **G.P. HUFFMAN** and **R.J. LEE**, U.S. Steel Corp., Monroeville, PA 15146

- 10:30 — BREAK
- 10:45 — "Trace Elements in Coal: Can we get the lead out?" **ROBERT B. FINKELMAN**, USGS, Reston, VA 22092
- 11:15 — "TEM Characterization in Coal Liquefaction," **L.A. HARRIS** and **C.S. YUST**, Oak Ridge National Laboratory, Oak Ridge, TN
- 12:00 — LUNCH

**Tuesday Afternoon**

**Chairman: P.R. Solomon**

- 2:00 — "Optical Microscopy as a Means of Characterizing Coal Rank, Composition and Behavior," **ALAN DAVIS**, The Pennsylvania State University, University Park, PA 16802
- 2:30 — "Macromolecular Structure of Coal," **J.W. LARSON**, The University of Tennessee, Knoxville, TN 37916
- 3:00 — BREAK
- 3:15 — "Rearrangement and Fragmentation of Hydroaromatic Free Radicals During Coal Hydroliquefaction," **JAMES A. FRANZ** and **DONALD M. CAMAIONI**, Pacific Northwest Laboratory operated by Battelle Memorial Institute, Richland, WA
- 3:45 — "Donor Solvent Kinetics and Coal Liquefaction Modeling," **T. GANGWER**, Department of Energy and Environment, Brookhaven National Laboratory, NY 11973
- 4:15 — "Factors Affecting Form Coking," **A.C.D. CHAKLADER**, The University of British Columbia, Vancouver, B.C., Canada
- 4:45 — "Physical and Chemical Characterization of High Ash Brazilian Coal," **CARLOS A. LUENGO**, Department of Physics and Energy Group, UNICAMP, Campinas, Brazil

**November 28, 1979**

**Wednesday Morning**

**Chairman: G.W. Stewart**

- 9:00 — "Chemical Structures in Coals as Inferred from High Resolution Solid State Carbon and Proton NMR, and Fourier Transform IR Spectroscopy," **BERNARD C. GERSTEIN**, **P. DUBOIS MURPHY**, **L.M. RYAN**, **T. TAKI**, **T. SOGABE**, Iowa State University and **P.R. SOLOMON**, United Technologies Research Center, East Hartford, CT 06108
- 9:30 — "Organic Structure of Coal from FT Infrared Analysis," **P.R. SOLOMON**, United Technologies Research Center, East Hartford, CT 06108
- 10:00 — "Porosity and Surface Area in Coal and Changes Upon Pyrolysis and Gasification," **P.L. WALKER, JR.**, The Pennsylvania State University, University Park, PA 16802
- 10:30 — BREAK
- 10:45 — "The Pyrolysis Stage of Coal Particle Combustion," **DAVID W. BLAIR**, Corporate Applied Research, Exxon Research and Engineering Company, P.O. Box 8, Linden, New Jersey 07036

11:15 — *"Chemical and Physical Properties of Coal which Influence Liquefaction,"* **D.D. WHITEHURST**, Mobile Research and Development Corp., Central Research Division, P.O. Box 1025, Princeton, NJ 08540

11:45 — *"Mineral Effects in Coal Liquefaction,"* **BARRY GRANOFF**, Sandia Laboratories, Albuquerque, NM 87185

12:30 — LUNCH

**Wednesday Afternoon**

**Chairman: P.A. Montano**

2:00 — *"The Vaporization of Mineral Constituents During Pulverized Coal Combustion,"* **ADEL F. SAROFIM, C.A. MIMS, M. NEVILLE, R. SHUCK, and R. QUANN**, Massachusetts Institute of Technology, Cambridge, MA 02139

2:30 — *"Heterogeneous Reactions and Processes in Coal Combustion Streams,"* **C.D. STINESPRING and G.W. STEWART**, Supporting Research Branch, Morgantown, WV 26505

3:00 — *"Alkali Vapor Transport Over Coal Minerals and Slags,"* **J.W. HASTIE, E.R. PLANTE and D. BONNELL**, Chemical Stability and Corrosion Division, National Bureau of Standards, 20234

3:30 — BREAK

3:45 — *"The Characterization of High Temperature Compounds of Importance to Energy Technologies,"* **JAMES GOLE**, Georgia Institute of Technology, Atlanta, GA 30332

4:15 — *"Thermochemical and Kinetic Data Requirements for Computer Modeling of Coal Conversion Streams,"* **C.E. KOLB**, Center for Chemical and Environmental Physics, Aerodyne Research, Inc., Bedford, MA 01730

# SYMPOSIUM I

## COAL CONVERSION CATALYSIS

### CHAIRMEN

**T.P. Kobylinski**  
Gulf Research &  
Development Company  
P.O. Drawer 2038  
Pittsburgh, PA 15230

**M.A. Vannice**  
Pennsylvania State  
University  
University Park, PA 16802

**November 29, 1979**  
**Thursday Morning**

- 8:30 — Plenary Lecture: "Coal Liquefaction, Catalysis, Its Problems and Future," **HAROLD BEUTHER**, GR&DC
- 9:15 — "Catalyst Development for Liquefying Eastern and Western Coal," **D.K. KIM, K.K. ROBINSON** and **R.J. BERTALOCINI**, Amoco Oil Res. & Devel.
- 9:45 — "Reaction Kinetics — Reaction Networks and Active Sites in Hydrodenitrogenation," **J.R. KATZER**, Dept. of Chem. Eng., University of Delaware
- 10:15 — BREAK
- 10:45 — "Titanium and Other Metals Deposition in an HDS-Coal Liquefaction Reactor," **L.E. MAKOVSKY, S.S. POLLACK, F.R. BROWN** and **R.G. LETT**, Dept. of Energy, Pittsburgh Energy Technology Center
- 11:15 — "Hydrogenation Reactions of Model Titanium Compounds," **C. SPITLER, M. TREBLOW** and **F.R. BROWN**, Dept. of Energy, Pittsburgh Energy Technology Center
- 11:45 — LUNCH

**Thursday Afternoon**

- 1:30 — "Coal Liquefaction by Slurry Catalysts," **A. SOOD** and **T.P. KOBYLINSKI**, GR&DC
- 2:00 — "Free Radicals in Coal Liquefaction," **L. PETRAKIS** and **D.W. GRANDY**, GR&DC
- 2:30 — "The Role of Catalysis in Coal Gasification," **K. OTTO** and **M. SHELEF**, Ford Motor Company
- 2:50 — "Catalytic Pattern of Group VIII Metals in CO + H<sub>2</sub> Synthesis," **J.H. RABO**, Union Carbide Corporation
- 3:20 — BREAK
- 3:45 — "Oxidation, Reduction and Carborization of Some Fe Alloy Fischer-Tropsch Catalysts," **J.E.E. UNMUTH, J.B. BUTT, R. MATYA**, and **L.H. SCHWARTZ**, Northwestern University
- 4:15 — "Conversion of Synthesis Gas to Gasoline Range Hydrocarbons Over Bifunctional Zeolite Catalysts," **R.J. GORMLEY, V.U.S. RAO**, and **H.R. APPELL**, DOE

**SYMPOSIUM J**  
**CATALYST PREPARATION**  
**TECHNIQUES AND**  
**MAINTENANCE OF**  
**CATALYST ACTIVITY**

SYMPOSIUM CHAIRPERSONS

**D.J.C. Yates**  
Exxon Research and  
Engineering  
P.O. Box 45  
Linden, NJ 07036

**K.C. Taylor**  
General Motors Research  
Laboratories  
Physical Chemistry Dept.  
Warren, MI 48090

**Chair: D.J.C. Yates**

**Tuesday Morning**  
**November 27, 1979**

8:45 — "Review of the Scientific Principles of Catalyst Preparation," **L.L. MURRELL**, Exxon Research and Engineering Company

9:45 — "Adsorption of Metal Complexes on Alumina," **M.J. D'ANIELLO, JR.**, General Motors Research Laboratories

10:20 — BREAK

10:40 — "Laser Raman Spectroscopy of Precipitated Molybdate Catalysts," **G.L. SCHRADER, M.A. BASISTO** and **C.B. BERGMAN**, University of Delaware

11:20 — "Thermal and Photolytic Activation of Supported Transition Metal Complexes," **DENNIS A. HUCUL, THOMAS H. ARNOLD** and **ALAN BRENNER**, Wayne State University

12:00 — LUNCH

**Chair: K.C. Taylor**

**Tuesday Afternoon**

2:00 — "Review of the Parameters Controlling Rhodium Dispersion," **D.J.C. YATES**, Exxon Research and Engineering Company

2:40 — "The Characterization of Rh-Ir Films and Silica Supported Catalysts," **T.C. WONG, S-H CHIN** and **G.L. HALLER**, Yale University

3:20 — BREAK

3:40 — "Regeneration of Three-Way Catalysts," **JACK C. SUMMERS, D.R. MONROE, C.C. CHANG** and **S.W. GAARENSTROOM**, General Motors Research Laboratories

4:20 — "Synthesis and Properties of Catalytic Nickel Produced from Atomized Pro-Eutectic Aluminum Alloys," **C.S. BROOKS, G.S. GOLDEN** and **F.D. LEMKEY**, United Technologies Research Center

5:30-7:30 — Wine and Cheese

# SYMPOSIUM K GLASSY METALS

CHAIRMAN

**B.C. Giessen**  
Northeastern University  
Boston, Massachusetts 02115

## SESSION 1 Formation and Some Electronic Properties of Glassy Metals

Chairmen

<b>B.C. Giessen</b> Materials Science Division Institute of Chemical Analysis Northeastern University Boston, MA 02115	<b>N.J. Grant</b> Department of Materials Science and Engineering MIT Cambridge, MA 02139
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November 27, 1979

Tuesday Morning

- 9:00 — "Formation of Metallic Glasses, **D. TURNBULL**, Division of Engineering and Applied Physics, Harvard University, Cambridge, MA 02138 (invited)
- 9:45 — "Electronic Structure and Transport Properties of Metallic Glasses," **S. NAGEL**, James Franck Institute, University of Chicago, 5640 South Ellis Avenue, Chicago, IL 60637 (invited)
- 10:30 — COFFEE BREAK
- 10:40 — "Phase Diagram Calculations as Applied to Metallic Glass Formation," **L.E. TANNER**, Manlabs, Inc., 21 Erie Street, Cambridge, MA 02139
- 11:00 — "On the Formation of U-Fe Metallic Glasses: Liquid Quenching vs. Irradiation Techniques," **R.O. ELLIOTT** and **D.A. KOSS**, University of California, Lr J. Alamos Scientific Laboratory, Los Alamos, NM 87545; and **B.C. GIESSEN**, Materials Science Division, Institute of Chemical Analysis, Northeastern University, Boston, MA 02115
- 11:20 — "Electronic and Lattice Properties of Pd-Si and Pd-Si-Cu Alloys," **T.B. MASSALSKI**, Department of Metallurgy and Materials Science and Physics, Carnegie-Mellon University, Schenley Park, Pittsburgh, PA 15213; and **U. MIZUTANI**, Department of Applied Physics, Faculty of Engineering, The University of Nagoya, Nagoya 464, Japan (invited)
- 11:40 — "Superconductivity in Amorphous Equi-Electronic Metal Alloys," **C.C. KOCH**, Metals and Ceramics Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830; **B.C. GIESSEN**, Materials Science Division, Institute of Chemical Analysis, Northeastern University, Boston, MA 02115; and **D.M. KROEGER** and **J.O. SCARBROUGH**, Metals and Ceramics Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830

**SESSION 2**  
**Thermal and Mechanical**  
**Properties of Glassy Metals I**

Chairmen

**Kear**  
United Technologies  
Research Center  
Silver Lane  
East Hartford, CT 06108

**F. Spaepen**  
Division of Engineering  
and Applied Physics  
Harvard University  
Cambridge, MA 02138

**Tuesday Afternoon**

- 2:00 — "Glass Transition, Relaxation and Crystallization Temperatures of Metallic Glasses," **B.C. GIESSEN**, Materials Science Division, Institute of Chemical Analysis, Northeastern University, Boston, MA 02115 (invited)
- 2:45 — "Thermal Stability of Amorphous Alloy Compounds: A Crystal Chemistry Point of View," **R. WANG**, Battelle Pacific Northwestern Laboratory, Richland, WA 99352
- 3:05 — "Influence of Composition on the Stabilities of Fe-, Ni- and Co-Based Metallic Glasses," **I.W. DONALD** and **H.A. DAVIES**, Department of Metallurgy, University of Sheffield, United Kingdom
- 3:25 — COFFEE BREAK
- 3:40 — "Preparation, Electrical, Thermal and Mechanical Properties of Some Refractory Glassy Alloys," **S. WHANG**, **S. MAHMOUD** and **B.C. GIESSEN**, Materials Science Division, Institute of Chemical Analysis, Northeastern University; Boston, MA 02115; **M. FISCHER**, Brown-Boveri Company, Baden, Aargau, Switzerland; and **D.E. POLK**, 3341 Dent Place, NW, Washington, D.C. 20007
- 4:00 — "Metallic Glasses in the Fe-Mo-B, Ni-Mo-B and Co-Mo-B Systems with High Tensile Strengths and High Crystallization Temperatures\*," **R. RAY**, Department of Chemistry, Northeastern University, Boston, MA 02115 and **L.E. TANNER**, Manlabs, Inc., Cambridge, MA 02139 (\*based on research carried out at the Corporate Development Center, Allied Chemical Corporation, Morristown, NJ 07960)
- 4:20 — "Athermal and Time-Dependent Nucleation of Crystallization in Metal-Metalloid Glasses," **U. KOSTER** and **U. HEROLD**, Institut für Werkstoffe, Ruhr-Universität Bochum, Bochum, West Germany
- 4:40 — "Formation and Properties of Glass-like Metallic Organotin Films," **E. KNY**, **W.J. JAMES** and **L.L. LEVENSON**, Graduate Center for Materials Research, University of Missouri-Rolla, Rolla, MO 65401; and **R.A. AUERBACH**, Lord Corporation, Erie, PA 16512

**SESSION 3**  
**Thermal and Mechanical**  
**Properties of Glassy Metals II**

Chairmen

**H.S. Chen**  
Bell Telephone Labs  
Murray Hill, NJ 07974

**D.E. Polk**  
3341 Dent Place NW,  
Washington, DC 20007

**November 28, 1979**

**Wednesday Morning**

- 9:00 — *"Elastic and Inelastic Properties of Metallic Glasses,"* **F. SPAEPEN**, Division of Engineering and Applied Physics, Harvard University, Cambridge, MA 02138 (invited)
- 9:45 — *"Flow and Fracture of a Ni-Fe Metallic Glass,"* **L.A. DAVIS** and **Y.T. YEOW**, Corporate Development Center, Allied Chemical Corporation, Morristown, NJ 07960
- 10:05 — *"Ultra-High-Strength Ferrous Metallic Glasses\*,"* **R. RAY**, Department of Chemistry, Northeastern University, Boston MA 02115 (\*based on research carried out at the Corporate Development Center, Allied Chemical Corporation, Morristown, NJ 07960)
- 10:25 — COFFEE BREAK
- 10:40 — *"Maximum Values of the Thermal Stability and Mechanical Properties of Binary Glassy Alloys Measured as Functions of Composition,"* **S. WHANG**, **H. HWANG** and **B.C. GIESSEN**, Materials Science Division, Institute of Chemical Analysis, Northeastern University, Boston, MA 02115
- 11:00 — *"Effect of Metalloidal Elements on the Aging Embrittlement of Iron-Base Glasses,"* **M. NAKA**, The Research Institute for Iron, Steel and Other Metals, Tohoku University, Sendai 980, Japan; **H.S. CHEN**, Bell Telephone Laboratories, Murray Hill, NJ 07974; and **T. MASUMOTO**, The Research Institute for Iron, Steel and Other Metals, Tohoku University, Sendai 980 Japan
- 11:20 — *"The Structure and Properties of Rapidly-Quenched Near-Eutectic Melts,"* **W.M.T. GALLERNEAULT** and **R.W. SMITH**, Metallurgical Engineering Department, Queen's University, Kingston, Ontario, Canada
- 11:40 — *"The Relation of the Electrical Resistivities of Some Ca-Base Alloy Glasses to their Elastic Properties and Pair Correlation Functions,"* **J. HONG**, **F. LU**, **L.T. KABACOFF** and **B.C. GIESSEN**, Materials Science Division, Institute of Chemical Analysis, and Department of Chemistry, Northeastern University, Boston, MA 02115; and **D. CHIPMAN** and **L. JENNINGS**, Army Mechanical and Materials Research Center, Watertown, MA 02172



## SESSION 4

### Magnetic Properties of Glassy Metals

Chairmen

**D. Graham, Jr.**  
Dept. of Metallurgy and  
Materials Science  
University of Pennsylvania  
Philadelphia, PA 19104

**F. E. Luborsky**  
G.E. Research Laboratories  
Schenectady, NY 12301

#### Wednesday Afternoon

- 2:00 — "Use of Magnetic Amorphous Alloys in Power Devices," **L. JOHNSON**, GE Research Laboratories, Schenectady, NY 12301 (invited)
- 2:45 — "Applications of Metallic Glasses in Electronic and Various Magnetic Devices," **HANS WARLIMONT**, Vacuumschmelze A.G., Hanau, West Germany (invited)
- 3:30 — COFFEE BREAK
- 3:40 — "NMR Study of the Amorphous Structure in Various Glassy Metals Through Electric Quadrupolar Effects," **P. PANISSOD, D. ALIAGA GUERRA** and **J. DURAND**, Laboratoire de Magnetisme et de Structure Electronique des Solides, Institut Le Bel, Universite Louis Pasteur, 67000 Strasbourg, France
- 4:00 — "Magnetic Properties of Fe-B-Si-C Metallic Glasses," **N. DeCRISTOFARO, A. FREILICH** and **D. NATHASINGH**, Corporate Development Center, Allied Chemical Corporation, Morristown, NJ 07960
- 4:20 — "Magnetic, Electrical, Thermal and Mechanical Properties of  $Ce_{100-x}Al_x$  and  $Pr_{100-x}Al_x$  Glasses," **L.T. KABACOFF, E.R. WONG** and **B.C. GIESSEN**, Materials Science Division, Institute of Chemical Analysis, and Department of Chemistry, Northeastern University, Boston, MA 02115; and **W.A. HINES**, Department of Physics, University of Connecticut, Storrs, CT 06268
- 4:40 — "Critical Properties of Rapidly Quenched Crystalline Superconductors," **J. BEVK**, Division of Applied Science, Harvard University, Cambridge, MA 02138

## SESSION 5

### Corrosion and Electrochemical Properties of Glassy Metals

Chairmen

**R.B. Diegle**  
Battelle-Columbus  
Laboratories  
505 King Avenue  
Columbus, OH 43201

**R.M. Latanision**  
Department of Materials  
Science and Engineering  
MIT  
Cambridge, MA 02139

November 29, 1979  
Thursday Morning

- 9:00 — "Corrosion Research on Metallic Glasses," **R.M. LATANISION**, Department of Materials Science and Engineering, MIT, Cambridge, MA 02139 (invited)

- 9:45 — "Localized Corrosion on Glassy Metal Surfaces,"  
**R.B. DIEGLE**, Battelle-Columbus Laboratories, 505  
 King Avenue, Columbus, OH 43201 (invited)
- 10:30 — COFFEE BREAK
- 10:45 — "Electrochemical Properties of Metalloid-Free  
 Amorphous Alloy Coatings," **R. WANG** and **M.C.  
 MERZ**, Battelle Pacific Northwest Laboratory,  
 Richland, WA 99352
- 11:00 — "Influence of Structure in the Corrosion  
 Resistance of Amorphous Zr-Cu Alloys," **J. TURN** and  
**R.M. LATANISION**, Department of Materials Science  
 and Engineering, MIT, Cambridge, MA 02139
- 11:20 — "The Influence of Surfaces and Interfaces on  
 Crystallization of Metallic Glasses," **U. HEROLD** and  
**U. KOSTER**, Institut für Werkstoffe, Ruhr-Universität  
 Bochum, Bochum, West Germany
- 11:40 — "Hydrogen Absorption Isotherms of Amorphous  
 and Crystalline Pd-Si Alloys," **T. FLANAGAN**,  
 Department of Chemistry, University of Vermont,  
 Burlington, VT 05401; and **R. FINOCCHIARO** and **B.C.  
 GIESSEN**, Department of Chemistry, Northeastern  
 University, Boston, MA 02115

## SESSION 6 Technology of Glassy Metals

### Chairmen

<p><b>C. Cline</b>          Lawrence Livermore Lab.          Code L369          Livermore, CA 94550</p>	<p><b>J.J. Gilman</b>          Corporate Development Ctr.          Allied Chemical Corp.          Morristown, NJ 07960</p>
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### Thursday Afternoon

- 2:00 — "Technologically Useful Rapid Quenching  
 Methods," **R. MARINGER**, Battelle Memorial In-  
 stitute, Columbus, OH 43201 (invited)
- 2:45 — "Applications for Glassy Metal Alloys," **C. CLINE**,  
 Lawrence Livermore Laboratory, Code L369, Liver-  
 more, CA 94550 (invited)
- 3:30 — COFFEE BREAK
- 3:40 — "A Study of Arc-Hammer Speeds and Critical  
 Cooling Rates in Amorphous Transition Metal Alloys,"  
**D.M. KROEGER**, **C.C. KOCH**, **D.S. EASTON** and **J.O.  
 SCARBROUGH**, Metals and Ceramics Division, Oak  
 Ridge National Laboratory, Oak Ridge, TN 37830
- 4:00 — "High Speed Casting of Metallic Foils by the Dou-  
 ble Roller Quenching Technique," **Y.V. MURTY** and  
**R.P.I. ADLER**, GTE Laboratories, Inc., 40 Sylvan Road,  
 Waltham, MA 02154
- 4:20 — "The Production and Compaction of Amorphous  
 $Cu_{60}Zr_{40}$  Powder," **S.A. MILLER** and **R.J. MURPHY**,  
 Mechanical Engineering Department, Northeastern  
 University, Boston, MA 02115
- 4:40 — "METGLAS<sup>®</sup> Ribbon Reinforced Composites,"  
**Y.T. YEOW**, Corporate Development Center, Allied  
 Chemical Corporation, Morristown, NJ 07960

**SYMPOSIUM I  
EXAFS IN MATERIALS  
RESEARCH: PAST, PRESENT  
AND FUTURE**

SYMPOSIUM CHAIRMEN

**Boon K. Teo**  
Bell Laboratories  
Murray Hill, NJ 07974

**David C. Joy**  
Bell Laboratories  
Murray Hill, NJ 07974

**EXAFS: History, Theory, Practice**

**Chairman: B.K. Teo**

**November 28, 1979  
Wednesday Morning**

- 9:00 — "History of EXAFS," **E.A. STERN**  
9:10 — "EXAFS: Current and Future Experimental Techniques," **P. EISENBERGER**  
9:45 — "EXAFS Theory: Recent Progress and Future Problems," **P.A. LEE**  
10:15 — "Many-body Effects in EXAFS," **E.A. STERN**  
10:45 — BREAK

**Chairman: D.C. Joy**

- 11:00 — "Electron Energy-loss EXAFS," **B.M. KINCAID**  
11:30 — "Core Edge Fine Structure in Electron Energy Loss Spectra," **R. LEAPMAN**  
11:50 — "EXAFS Studies in an Electron Microscope," **D. JOHNSON**  
12:10 — LUNCH

**Radiation Sources for  
Materials Research**

**Chairman: D.C. Joy**

**Wednesday Afternoon**

- 2:00 — "Materials Research Utilizing Synchrotron Radiation," **A. BIENENSTOCK**  
2:35 — "CHESS (Cornell High Energy Synchrotron Source)," **B. BATTERMAN**  
3:00 — "Synchrotron Light Source at BNL," **C. FRAZER**  
3:20 — BREAK  
3:30 — "The Synchrotron Radiation Center at Univ. of Wisconsin," **E. ROWE**  
3:50 — "Materials Science at NBS — SURF II," **R. MADDEN**  
4:05 — "Comparison of Electron and Photon Beams for EXAFS Studies," **M. ISAACSON**  
4:25 — General Discussion Session: Chairpersons — **D.C. JOY & B.K. TEO**

## EXAFS and Catalysis

Chairman: J. Reed

November 29, 1979

Thursday Morning

- 9:00 — "EXAFS and Edge Spectroscopic Investigations of Metal Catalysts," **F. LYTLE**
- 9:30 — "Applications of EXAFS to Dispersed Metal Catalysts," **J. SINFELT**
- 10:00 — "EXAFS Study of H<sub>2</sub>, O<sub>2</sub>, and CO<sub>2</sub> Adsorption on Supported Platinum," **J. KATZER**
- 10:20 — "EXAFS Studies of Homogeneous Catalysts," **R. STULTS**
- 10:40 — BREAK

## EXAFS and Materials

Chairman: H.S. Chen

- 11:00 — "EXAFS and Metallurgy," **P. EISENBERGER**
- 11:25 — "EXAFS of Dilute Solutions and Impurities," **J. HASTINGS**
- 11:50 — LUNCH

Thursday Afternoon

- 2:00 — "EXAFS Studies of Glassy Solids," **J. WONG**
- 2:20 — "EXAFS of Amorphous Alloys," **S. HUNTER**
- 2:40 — "X-ray Absorption Studies of Polymeric Conduction," **D. SAYERS**
- 3:00 — "Structural Studies of Superionic Conduction," **T. HAYES**
- 3:20 — BREAK
- 3:45 — "Disorder Effects in the EXAFS of Metals and Semiconductors in the Solid and Liquid State," **D. CROZIER**
- 4:05 — "Structural Evidence for Solutions from EXAFS Measurements," **D. SANDSTROM**
- 4:25 — CLOSE

SYMPOSIUM M  
**ADHESION TO POLYMER-  
SOLID INTERFACES  
AND GENERAL PAPERS**

SYMPOSIUM CHAIRMAN

**Harold Schonhorn**  
*Bell Laboratories*  
*Murray Hill, NJ 07974*

**November 28, 1979**  
**Wednesday Morning**

- 9:00 — *"Locus of Failure in Adhesive Bonding,"* **ROBERT J. GOOD**, SUNY-Buffalo (invited paper)
- 9:45 — *"The Effect of Surface Treatments on Aluminum Alloys,"* **DAVID A. JABLONSKI**, United Technologies Research Center, East Hartford, CT
- 10:15 — *"Adhesion, Wetting and Barrier Properties of Interpenetrating Polymer Networks,"* **H.L. FRISCH, K.C. FRISCH**, Department of Chemistry, SUNY-Albany, and **D. KLEMPNER**, Polymer Institute, University of Detroit.
- 10:45 — *"Adhesion of Nickel Films on Graphite,"* **J.R. SNYDER, M. SMITH**, and **L.L. LEVENSON**, Graduate Center for Materials Research, University of Missouri-Rolla
- 11:15 — *"Ion Beam Surface Modification: Characterization by ESCA and SEM,"* **DAVID W. DWIGHT**, Department of Materials Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA

# MATERIALS RESEARCH SOCIETY

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## 1979 Annual Meeting

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J.M. Poate, Bell Laboratories

B.C. Giessen, Northeastern University

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# ACTIVITIES LOCATOR

SYMPOSIA	MONDAY NOVEMBER 26			TUESDAY NOVEMBER 27			WEDNESDAY NOVEMBER 28			THURSDAY NOVEMBER 29			FRIDAY NOVEMBER 30		
	AM	PM	Evening	AM	PM	Evening	AM	PM	Evening	AM	PM	Evening	AM	PM	
A. Laser-Solid Interactions				Adams Ballroom			Adams Ballroom			Adams Ballroom			Adams Ballroom		
B. Ion Implantation													Thomas Paine B		
C. Defects in Semiconductors										Crispus Attucks		Adams Ballroom			
D. Semiconductor Interfaces				Molly Pitcher			Molly Pitcher								
E. Microstructure Fabrication										Molly Pitcher		Molly Pitcher			
F. Nondestructive Optical Techniques													Crispus Attucks		
G. Nuclear Waste Management				John F. Kennedy Ballroom			John F. Kennedy Ballroom			John F. Kennedy Ballroom		John F. Kennedy Ballroom			
H. Coal: Material Properties and Conversion				William Dawes A&B			William Dawes A&B								
I. Coal Catalysis										William Dawes A&B					
J. Catalysts				Haym Saloman											
K. Glassy Metals				Thomas Paine A&B			Thomas Paine A&B			Thomas Paine A&B					
L. EXAFS							Haym Saloman			Haym Saloman					
M. Polymer-Solid Adhesion							Crispus Attucks								
Committees				Council-President's Suite		Crispus Attucks 12:00-2:00				Crispus Attucks 12:00-2:00			Martin Luther King 12:00-2:00		
Registration				Lobby 6:00-9:00			<b>LOBBY</b> Daily 8:00 a.m. to 5:00 p.m.								

**VON HIPPLE AWARD RECEPTION — Wine and Cheese**  
**Presidents' Ballroom 5:30-7:30**

# Materials Research Society Annual Meeting, 1979

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Affiliation \_\_\_\_\_

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### SYMPOSIUM(A) INTEREST

Please indicate the Symposium(a) in  
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IMPORTANT FOR PLANNING.

A    B    C    D    E    F  
 G    H    I    J    K    L    M

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 25 both years  
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