

Cambridge University Press

978-1-107-41112-8 - Scientific Basis for Nuclear Waste Management X: Materials Research

Society Symposia Proceedings: Volume 84

Editors: John K. Bates and Waldemar B. Seefeldt

Frontmatter

[More information](#)

Scientific Basis for Nuclear Waste Management X

Cambridge University Press

978-1-107-41112-8 - Scientific Basis for Nuclear Waste Management X: Materials Research

Society Symposia Proceedings: Volume 84

Editors: John K. Bates and Waldemar B. Seefeldt

Frontmatter

[More information](#)

Cambridge University Press

978-1-107-41112-8 - Scientific Basis for Nuclear Waste Management X: Materials Research Society Symposia Proceedings: Volume 84

Editors: John K. Bates and Waldemar B. Seefeldt

Frontmatter

[More information](#)

MATERIALS RESEARCH SOCIETY SYMPOSIA PROCEEDINGS

ISSN 0272 - 9172

- Volume 1—Laser and Electron-Beam Solid Interactions and Materials Processing, J. F. Gibbons, L. D. Hess, T. W. Sigmon, 1981
- Volume 2—Defects in Semiconductors, J. Narayan, T. Y. Tan, 1981
- Volume 3—Nuclear and Electron Resonance Spectroscopies Applied to Materials Science, E. N. Kaufmann, G. K. Shenoy, 1981
- Volume 4—Laser and Electron-Beam Interactions with Solids, B. R. Appleton, G. K. Celler, 1982
- Volume 5—Grain Boundaries in Semiconductors, H. J. Leamy, G. E. Pike, C. H. Seager, 1982
- Volume 6—Scientific Basis for Nuclear Waste Management IV, S. V. Topp, 1982
- Volume 7—Metastable Materials Formation by Ion Implantation, S. T. Picraux, W. J. Choyke, 1982
- Volume 8—Rapidly Solidified Amorphous and Crystalline Alloys, B. H. Kear, B. C. Giessen, M. Cohen, 1982
- Volume 9—Materials Processing in the Reduced Gravity Environment of Space, G. E. Rindone, 1982
- Volume 10—Thin Films and Interfaces, P. S. Ho, K.-N. Tu, 1982
- Volume 11—Scientific Basis for Nuclear Waste Management V, W. Lutze, 1982
- Volume 12—In Situ Composites IV, F. D. Lemkey, H. E. Cline, M. McLean, 1982
- Volume 13—Laser-Solid Interactions and Transient Thermal Processing of Materials, J. Narayan, W. L. Brown, R. A. Lemons, 1983
- Volume 14—Defects in Semiconductors II, S. Mahajan, J. W. Corbett, 1983
- Volume 15—Scientific Basis for Nuclear Waste Management VI, D. G. Brookins, 1983
- Volume 16—Nuclear Radiation Detector Materials, E. E. Haller, H. W. Kraner, W. A. Higinbotham, 1983
- Volume 17—Laser Diagnostics and Photochemical Processing for Semiconductor Devices, R. M. Osgood, S. R. J. Brueck, H. R. Schlossberg, 1983
- Volume 18—Interfaces and Contacts, R. Ludeke, K. Rose, 1983
- Volume 19—Alloy Phase Diagrams, L. H. Bennett, T. B. Massalski, B. C. Giessen, 1983
- Volume 20—Intercalated Graphite, M. S. Dresselhaus, G. Dresselhaus, J. E. Fischer, M. J. Moran, 1983
- Volume 21—Phase Transformations in Solids, T. Tsakalakos, 1984
- Volume 22—High Pressure in Science and Technology, C. Homan, R. K. MacCrone, E. Whalley, 1984
- Volume 23—Energy Beam-Solid Interactions and Transient Thermal Processing, J. C. C. Fan, N. M. Johnson, 1984
- Volume 24—Defect Properties and Processing of High-Technology Nonmetallic Materials, J. H. Crawford, Jr., Y. Chen, W. A. Sibley, 1984

Cambridge University Press

978-1-107-41112-8 - Scientific Basis for Nuclear Waste Management X: Materials Research Society Symposia Proceedings: Volume 84

Editors: John K. Bates and Waldemar B. Seefeldt

Frontmatter

[More information](#)

MATERIALS RESEARCH SOCIETY SYMPOSIA PROCEEDINGS

- Volume 25—Thin Films and Interfaces II, J. E. E. Baglin, D. R. Campbell, W. K. Chu, 1984
- Volume 26—Scientific Basis for Nuclear Waste Management VII, G. L. McVay, 1984
- Volume 27—Ion Implantation and Ion Beam Processing of Materials, G. K. Hubler, O. W. Holland, C. R. Clayton, C. W. White, 1984
- Volume 28—Rapidly Solidified Metastable Materials, B. H. Kear, B. C. Giessen, 1984
- Volume 29—Laser-Controlled Chemical Processing of Surfaces, A. W. Johnson, D. J. Ehrlich, H. R. Schlossberg, 1984.
- Volume 30—Plasma Processing and Synthesis of Materials, J. Szekely, D. Apelian, 1984
- Volume 31—Electron Microscopy of Materials, W. Krakow, D. A. Smith, L. W. Hobbs, 1984
- Volume 32—Better Ceramics Through Chemistry, C. J. Brinker, D. E. Clark, D. R. Ulrich, 1984
- Volume 33—Comparison of Thin Film Transistor and SOI Technologies, H. W. Lam, M. J. Thompson, 1984
- Volume 34—Physical Metallurgy of Cast Iron, H. Fredriksson, M. Hillerts, 1985
- Volume 35—Energy Beam-Solid Interactions and Transient Thermal Processing/1984, D. K. Biegelsen, G. A. Rozgonyi, C. V. Shank, 1985
- Volume 36—Impurity Diffusion and Gettering in Silicon, R. B. Fair, C. W. Pearce, J. Washburn, 1985
- Volume 37—Layered Structures, Epitaxy, and Interfaces, J. M. Gibson, L. R. Dawson, 1985
- Volume 38—Plasma Synthesis and Etching of Electronic Materials, R. P. H. Chang, B. Abeles, 1985
- Volume 39—High-Temperature Ordered Intermetallic Alloys, C. C. Koch, C. T. Liu, N. S. Stoloff, 1985
- Volume 40—Electronic Packaging Materials Science, E. A. Giess, K.-N. Tu, D. R. Uhlmann, 1985
- Volume 41—Advanced Photon and Particle Techniques for the Characterization of Defects in Solids, J. B. Roberto, R. W. Carpenter, M. C. Wittels, 1985
- Volume 42—Very High Strength Cement-Based Materials, J. F. Young, 1985.
- Volume 43—Fly Ash and Coal Conversion By-Products: Characterization, Utilization, and Disposal I, G. J. McCarthy, R. J. Lauf, 1985
- Volume 44—Scientific Basis for Nuclear Waste Management VIII, C. M. Jantzen, J. A. Stone, R. C. Ewing, 1985
- Volume 45—Ion Beam Processes in Advanced Electronic Materials and Device Technology, B. R. Appleton, F. H. Eisen, T. W. Sigmon, 1985
- Volume 46—Microscopic Identification of Electronic Defects in Semiconductors, N. M. Johnson, S. G. Bishop, G. D. Watkins, 1985

Cambridge University Press

978-1-107-41112-8 - Scientific Basis for Nuclear Waste Management X: Materials Research Society Symposia Proceedings: Volume 84

Editors: John K. Bates and Waldemar B. Seefeldt

Frontmatter

[More information](#)

MATERIALS RESEARCH SOCIETY SYMPOSIA PROCEEDINGS

- Volume 47—Thin Films: The Relationship of Structure to Properties, C. R. Aita, K. S. SreeHarsha, 1985
- Volume 48—Applied Materials Characterization, W. Katz, P. Williams, 1985
- Volume 49—Materials Issues in Applications of Amorphous Silicon Technology, D. Adler, A. Madan, M. J. Thompson, 1985
- Volume 50—Scientific Basis for Nuclear Waste Management IX, L. O. Werme, 1986
- Volume 51—Beam-Solid Interactions and Phase Transformations, H. Kurz, G. L. Olson, J. M. Poate, 1986
- Volume 52—Rapid Thermal Processing, T. O. Sedgwick, T. E. Seidel, B.-Y. Tsaur, 1986
- Volume 53—Semiconductor-on-Insulator and Thin Film Transistor Technology, A. Chiang, M. W. Geis, L. Pfeiffer, 1986
- Volume 54—Thin Films—Interfaces and Phenomena, R. J. Nemanich, P. S. Ho, S. S. Lau, 1986
- Volume 55—Biomedical Materials, J. M. Williams, M. F. Nichols, W. Zingg, 1986
- Volume 56—Layered Structures and Epitaxy, J. M. Gibson, G. C. Osbourn, R. M. Tromp, 1986
- Volume 57—Phase Transitions in Condensed Systems—Experiments and Theory, G. S. Cargill III, F. Spaepen, K.-N. Tu, 1987
- Volume 58—Rapidly Solidified Alloys and Their Mechanical and Magnetic Properties, B. C. Giessen, D. E. Polk, A. I. Taub, 1986
- Volume 59—Oxygen, Carbon, Hydrogen, and Nitrogen in Crystalline Silicon, J. C. Mikkelsen, Jr., S. J. Pearton, J. W. Corbett, S. J. Pennycook, 1986
- Volume 60—Defect Properties and Processing of High-Technology Nonmetallic Materials, Y. Chen, W. D. Kingery, R. J. Stokes, 1986
- Volume 61—Defects in Glasses, F. L. Galeener, D. L. Griscom, M. J. Weber, 1986
- Volume 62—Materials Problem Solving with the Transmission Electron Microscope, L. W. Hobbs, K. H. Westmacott, D. B. Williams, 1986
- Volume 63—Computer-Based Microscopic Description of the Structure and Properties of Materials, J. Broughton, W. Krakow, S. T. Pantelides, 1986
- Volume 64—Cement-Based Composites: Strain Rate Effects on Fracture, S. Mindess, S. P. Shah, 1986
- Volume 65—Fly Ash and Coal Conversion By-Products: Characterization, Utilization and Disposal II, G. J. McCarthy, F. P. Glasser, D. M. Roy, 1986
- Volume 66—Frontiers in Materials Education, L. W. Hobbs, G. L. Liedl, 1986
- Volume 67—Heteroepitaxy on Silicon, J. C. C. Fan, J. M. Poate, 1986
- Volume 68—Plasma Processing, J. W. Coburn, R. A. Gottscho, D. W. Hess, 1986
- Volume 69—Materials Characterization, N. W. Cheung, M.-A. Nicolet, 1986
- Volume 70—Materials Issues in Amorphous-Semiconductor Technology, D. Adler, Y. Hamakawa, A. Madan, 1986

Cambridge University Press

978-1-107-41112-8 - Scientific Basis for Nuclear Waste Management X: Materials Research Society Symposia Proceedings: Volume 84

Editors: John K. Bates and Waldemar B. Seefeldt

Frontmatter

[More information](#)

MATERIALS RESEARCH SOCIETY SYMPOSIA PROCEEDINGS

- Volume 71—Materials Issues in Silicon Integrated Circuit Processing, M. Wittmer, J. Stimmell, M. Strathman, 1986
- Volume 72—Electronic Packaging Materials Science II, K. A. Jackson, R. C. Pohanka, D. R. Uhlmann, D. R. Ulrich, 1986
- Volume 73—Better Ceramics Through Chemistry II, C. J. Brinker, D. E. Clark, D. R. Ulrich, 1986
- Volume 74—Beam-Solid Interactions and Transient Processes, S. T. Picraux, M. O. Thompson, J. S. Williams, 1987
- Volume 75—Photon, Beam and Plasma Stimulated Chemical Processes at Surfaces, V. M. Donnelly, I. P. Herman, M. Hirose, 1987
- Volume 76—Science and Technology of Microfabrication, R. E. Howard, E. L. Hu, S. Pang, S. Namba, 1987
- Volume 77—Interfaces, Superlattices, and Thin Films, J. D. Dow, I. K. Schuller, 1987
- Volume 78—Advances in Structural Ceramics, P. F. Becher, M. V. Swain, S. Somiya, 1987
- Volume 79—Scattering, Deformation and Fracture in Polymers, B. Crist, T. P. Russell, E. L. Thomas, G. D. Wignall, 1987
- Volume 80—Science and Technology of Rapidly Quenched Alloys, M. Tenhover, L. E. Tanner, W. L. Johnson, 1987
- Volume 81—High-Temperature Ordered Intermetallic Alloys, II, C. C. Koch, C. T. Liu, N. S. Stoloff, O. Izumi, 1987
- Volume 82—Characterization of Defects in Materials, R. W. Siegel, R. Sinclair, J. R. Weertman, 1987
- Volume 83—Physical and Chemical Properties of Thin Metal Overlayers and Alloy Surfaces, D. M. Zehner, D. W. Goodman, 1987
- Volume 84—Scientific Basis for Nuclear Waste Management X, J. K. Bates, W. B. Seefeldt, 1987
- Volume 85—Microstructural Development During the Hydration of Cement, L. Struble, P. Brown, 1987
- Volume 86—Fly Ash and Coal Conversion By-Products Characterization, Utilization and Disposal III, G. J. McCarthy, F. P. Glasser, D. M. Roy, S. Diamond, 1987
- Volume 87—Materials Processing in the Reduced Gravity Environment of Space, R. H. Doremus, P. C. Nordine, 1987
- Volume 88—Optical Fiber Materials and Properties, S. R. Nagel, G. Sigel, J. W. Fleming, D. A. Thompson, 1987
- Volume 89—Diluted Magnetic (Semimagnetic) Semiconductors, J. K. Furdyna, R. L. Aggarwal, S. von Molnar, 1987
- Volume 90—Materials for Infrared Detectors and Sources, R. F. C. Farrow, J. F. Schetzina, J. T. Cheung, 1987

Cambridge University Press

978-1-107-41112-8 - Scientific Basis for Nuclear Waste Management X: Materials Research
Society Symposia Proceedings: Volume 84

Editors: John K. Bates and Waldemar B. Seefeldt

Frontmatter

[More information](#)

MATERIALS RESEARCH SOCIETY SYMPOSIA PROCEEDINGS VOLUME 84

Scientific Basis for Nuclear Waste Management X

Symposium held December 1-4, 1986, Boston, Massachusetts, U.S.A.

EDITORS:

John K. Bates

Argonne National Laboratory, Argonne, Illinois, U.S.A.

Waldemar B. Seefeldt

Argonne National Laboratory, Argonne, Illinois, U.S.A.



MATERIALS RESEARCH SOCIETY

Pittsburgh, Pennsylvania

Cambridge University Press
978-1-107-41112-8 - Scientific Basis for Nuclear Waste Management X: Materials Research
Society Symposia Proceedings: Volume 84
Editors: John K. Bates and Waldemar B. Seefeldt
Frontmatter
[More information](#)

CAMBRIDGE UNIVERSITY PRESS
Cambridge, New York, Melbourne, Madrid, Cape Town,
Singapore, São Paulo, Delhi, Mexico City

Cambridge University Press
32 Avenue of the Americas, New York NY 10013-2473, USA

Published in the United States of America by Cambridge University Press, New York

www.cambridge.org
Information on this title: www.cambridge.org/9781107411128

Materials Research Society
506 Keystone Drive, Warrendale, PA 15086
<http://www.mrs.org>

© Materials Research Society 1987

This publication is in copyright. Subject to statutory exception
and to the provisions of relevant collective licensing agreements,
no reproduction of any part may take place without the written
permission of Cambridge University Press.

This publication has been registered with Copyright Clearance Center, Inc.
For further information please contact the Copyright Clearance Center,
Salem, Massachusetts.

First published 1987
First paperback edition 2012

Single article reprints from this publication are available through
University Microfilms Inc., 300 North Zeeb Road, Ann Arbor, MI 48106

CODEN: MRSPDH

ISBN 978-1-107-41112-8 Paperback

Cambridge University Press has no responsibility for the persistence or
accuracy of URLs for external or third-party internet websites referred to in
this publication, and does not guarantee that any content on such websites is,
or will remain, accurate or appropriate.

A substantial portion of the funding for this symposium was provided by the United States Department of Energy and the United States Nuclear Regulatory Commission. However, the views and findings of the various papers are solely those of the authors, and do not necessarily represent the policy of either agency. The agencies encourage wide dissemination of the technical information contained herein, with due respect for the Publisher's rights regarding the complete volume.

Contents

PREFACE xvii

PART I: PLENARY SESSION: LONG-TERM PROJECTION
OF MATERIALS INTERACTIONS

*HIGH-LEVEL WASTE PACKAGE LICENSING CONSIDERATIONS FOR
EXTRAPOLATING TEST DATA
T.C. Johnson, K.C. Chang, T.L. Jungling, L.S. Person,
C.H. Peterson, J.C. Voglewede, and E.A. Wick 3

*DOE PROGRESS IN ASSESSING THE LONG TERM PERFORMANCE
OF WASTE PACKAGE MATERIALS
A. Berusch and E. Gause 13

*DEVELOPMENT, APPLICATION AND VALIDATION OF MODELS FOR
WASTE PACKAGE LONG-TERM PERFORMANCE; CURRENT TRENDS
L.O. Werme and B. Grambow 29

*ON A GLOBAL DATABASE STRATEGY FOR PUBLIC ENGINEERING
DECISION MAKING
J.T. Fong 45

*MATERIALS INTERACTIONS RELATING TO LONG-TERM GEOLOGIC
DISPOSAL OF NUCLEAR WASTE GLASS
N.E. Bibler and C.M. Jantzen 47

*NATURAL ANALOGUES: THEIR APPLICATION TO THE PREDICTION
OF THE LONG-TERM BEHAVIOR OF NUCLEAR WASTE FORMS
R.C. Ewing and M.J. Jercinovic 67

PART II: WASTE FORM PERFORMANCE: SPENT FUEL

*SPENT FUEL AS A WASTE FORM--DATA NEEDS TO ALLOW LONG
TERM PERFORMANCE ASSESSMENT UNDER REPOSITORY DISPOSAL
CONDITIONS
V.M. Oversby 87

OXIDATION OF CANDU™ FUEL BY THE PRODUCTS OF THE ALPHA
RADIOLYSIS OF GROUNDWATER
S. Sunder, D.W. Shoesmith, L.H. Johnson,
G.J. Wallace, M.G. Bailey, and A.P. Snaglewski 103

RADIATION INDUCED DISSOLUTION OF UO₂
H. Christensen and E. Bjergbakke 115

EXPERIMENTAL STUDY OF THE DISSOLUTION OF SPENT FUEL
AT 85°C IN NATURAL GROUND WATER
C.N. Wilson and H.F. Shaw 123

*Invited paper

TRANSIENT AND STEADY-STATE RADIONUCLIDE TRANSPORT THROUGH PENETRATIONS IN NUCLEAR WASTE CONTAINERS P.L. Chambre', W.W.-L. Lee, C.L. Kim, and T.H. Pigford	131
COMPARISON OF URANIUM RELEASE FROM SPENT FUEL AND UNIRRADIATED UO ₂ IN SALT BRINE W.J. Gray	141
THE DETERMINATION OF THE SOLUBILITY OF AMORPHOUS UO ₂ (S) AND THE MONONUCLEAR HYDROLYSIS CONSTANTS OF URANIUM(IV) AT 25°C J. Bruno, I. Casas, B. Lagerman, and M. Munoz	153
SOLIDS CHARACTERIZATION FROM HYDROTHERMAL TESTS WITH SPENT FUEL N.H. Uziemblo, L.E. Thomas, L.H. Schoenlein, B. Mastel, and E.D. Jensen	161
LASER PHOTOACOUSTIC SPECTROSCOPY FOR TRACE LEVEL DETECTION OF ACTINIDES IN GROUNDWATER M.M. Doxtader, V.A. Maroni, J.V. Beitz, and M. Heaven	173
CARBON-14 IN WASTE PACKAGES FOR SPENT FUEL IN A TUFF REPOSITORY R.A. Van Konynenburg, C.F. Smith, H.W. Culham, and H.D. Smith	185
PART III: METAL CORROSION	
*STATISTICAL ISSUES IN PITTING CORROSION OF CARBON STEEL M.B. McNeil	199
MCC CORROSION TESTS AT REFERENCE TESTING CONDITIONS FOR A27 CAST STEEL IN HANFORD GROUND WATER M.D. Merz, F. Gerber, and R. Wang	215
AN APPROACH FOR EVALUATING THE GENERAL AND LOCALIZED CORROSION OF CARBON-STEEL CONTAINERS FOR NUCLEAR WASTE DISPOSAL G.P. Marsh, K.J. Taylor, S.M. Sharland, and P.W. Tasker	227
EVALUATION OF THE SUSCEPTIBILITY OF ASTM A216 GRADE WCA MILD STEEL TO STRESS CORROSION CRACKING IN SIMULATED SALT REPOSITORY ENVIRONMENTS S.G. Pitman	239
STATISTICS OF PIT INITIATION: ANALYSIS OF CURRENT TRANSIENTS DURING PASSIVE FILM BREAKDOWN U. Bertocchi, S. Leigh, A.C. Van Orden, and G. Yang	251
METAL-MATRIX CORROSION STUDIES IN CANADIAN SHIELD GRANITIC GROUNDWATERS P. M. Mathew and P.A. Krueger	261

*Invited paper

Cambridge University Press
978-1-107-41112-8 - Scientific Basis for Nuclear Waste Management X: Materials Research
Society Symposia Proceedings: Volume 84
Editors: John K. Bates and Waldemar B. Seefeldt
Frontmatter
[More information](#)

A CORROSION MODEL FOR NUCLEAR WASTE CONTAINERS J.C. Walton and B. Sagar	271
THE THEORETICAL EVALUATION OF LOCALIZED CORROSION IN RADIOACTIVE WASTE CANISTERS S.M. Sharland	283
CORROSION BEHAVIOR OF CONTAINER MATERIALS IN GRANDE RONDE BASALT GROUNDWATER R.P. Anantatmula and R.L. Fish	295
PART IV: LOW-LEVEL WASTE AND MATERIALS	
EFFECT OF PORE SOLUTION COMPOSITION ON CESIUM LEACHABILITY OF CEMENT-BASED WASTE FORMS S. Hoyle and M.W. Grutzeck	309
MODELLING POREWATER CHEMISTRY IN HYDRATED PORTLAND CEMENT U.R. Berner	319
SOLUBILITY MODELLING OF CEMENTS: IMPLICATIONS FOR RADIOACTIVE WASTE IMMOBILIZATION F.P. Glasser, D.E. Macphee, and E.E. Lachowski	331
A STRUCTURED PROGRAMME OF RESEARCH INTO THE CHEMICAL ASPECTS OF RADIOACTIVE WASTE DISPOSAL D. Read, A.A. Krol, and B.G.J. Thompson	343
ATTENUATION OF Pu, Am, Cs, AND Sr MOBILITY IN CONCRETE A.T. Jakubick, R.W. Gillham, I. Kahl, and M. Robin	355
CALCULATION OF NEAR-FIELD RADIOACTIVITY RELEASE RATES FROM NEUTRON-ACTIVATED REACTOR PARTS IN A SHALLOW-LAND BURIAL SITE AT OAK RIDGE NATIONAL LABORATORY J.R. Hightower and A.D. Keimers	369
PERFORMANCE ANALYSIS OF A REPOSITORY FOR LOW AND INTERMEDIATE LEVEL REACTOR WASTE T. Vieno, H. Nordman, S. Vuori, and E. Peltonen	381
LEACHING STUDIES OF CEMENT-GLASS PACKAGE CONTAINING SODIUM BORATE M. Okamoto, K. Chino, T. Baba, T. Izumida, F. Kawamura, and M. Kikuchi	393
BIODEGRADATION TESTING OF BITUMEN R.E. Barletta, B.S. Bowerman, R.E. Davis, and C.E. Shea	399
PART V: MATERIALS INTERACTIONS	
MULTICOMPONENT SYSTEMS TESTS ON USED FUEL AND FUEL RECYCLE WASTE GLASS AT 200°C R.B. Heimann	409

DEVELOPMENT AND EVALUATION OF A TRACER-
INJECTION HYDROTHERMAL TECHNIQUE FOR STUDIES
OF WASTE PACKAGE INTERACTIONS
T.E. Jones, D.G. Coles, R.C. Britton, and
J.R. Burnell 421

INTEGRATED TESTING OF SRL-165 GLASS WASTE FORM
D.L. Phinney, F.J. Ryerson, V.M. Oversby,
W.A. Lanford, R.D. Aines, and J.K. Bates 433

LEACHING OF ACTINIDE-DOPED NUCLEAR WASTE
GLASS IN A TUFF-DOMINATED SYSTEM
F. Bazan, J. Rego, and R.D. Aines 447

BOROSILICATE GLASS CORROSION IN THE PRESENCE
OF STEEL CORROSION PRODUCTS
G. Bart, H.U. Zwicky, E.T. Aerne,
T. Graber, D. Z'Berg, M. Tokiwaï 459

MODELING OF THE EFFECT OF IRON CORROSION
PRODUCTS ON NUCLEAR WASTE GLASS PERFORMANCE
B. Grambow, H.U. Zwicky, G. Bart,
I.K. Bjoener, and L.O. Werme 471

STANDARDIZED TEST METHODS FOR USE IN WASTE COMPLIANCE
TESTING IN THE DEPARTMENT OF ENERGY'S WASTE
ACCEPTANCE PROCESS
G.B. Mellinger 483

PART VI: WASTE FORM PERFORMANCE: GLASS

*WASTE GLASS LEACHING: CHEMISTRY AND KINETICS
B.C. Bunker 493

LARGE SCALE LEACH TESTING OF DWPF CANISTER
SECTIONS
D.F. Bickford and D.J. Pellarin 509

EFFECTS OF AQUEOUS PHASE COMPOSITION ON THE
LEACH BEHAVIOR OF NUCLEAR WASTE GLASSES
X. Feng and A. Barkatt 519

TRANSPORT AND REACTION KINETICS AT THE
GLASS:SOLUTION INTERFACE REGION: RESULTS OF
REPOSITORY-ORIENTED LEACHING EXPERIMENTS
T.A. Abrajano, Jr. and J.K. Bates 533

HYDROGEN SPECIATION IN HYDRATED LAYERS
ON NUCLEAR WASTE GLASS
R.D. Aines, H.C. Weed, and J.K. Bates 547

MODELLING OF THE DISSOLUTION OF SILICATE GLASSES BY
A MONTE-CARLO CODE (ETCH)
J-C. Dran, Y. Langevin, E. Doorhyee, and J-C. Petit 559

*Invited paper

STRUCTURAL CHANGES AROUND URANIUM AT THE SURFACE OF
WASTE GLASSES CAUSED BY LEACHING
N.T. Barrett, G.M. Antonini, F.R. Thornley,
G.N. Greaves, and A. Manara 571

PART VII: RADIATION EFFECTS

LONG-TERM CORROSION BEHAVIOR OF COPPER-BASE
MATERIALS IN A GAMMA-IRRADIATED ENVIRONMENT
W.H. Yunker and R.S. Glass 579

COPPER CORROSION IN IRRADIATED ENVIRONMENTS.
THE INFLUENCE OF H₂O₂ ON THE ELECTROCHEMISTRY
OF COPPER DISSOLUTION IN HCl ELECTROLYTE
W.H. Smyrl, B.T. Bell, R.T. Atanasoski,
and R.S. Glass 591

RADIOLYTICALLY INDUCED OXIDATION REACTIONS OF
ACTINIDE IONS IN CONCENTRATED SALT SOLUTIONS
J.I. Kim, Ch. Lierse, K. Buppelmann, and
S. Magirius 603

THE EFFECTS OF GAMMA RADIATION ON GROUNDWATER
CHEMISTRY AND GLASS REACTION IN A SATURATED
TUFF ENVIRONMENT
W.L. Ebert, J.K. Bates, T.J. Gerding, and
R.A. Van Konynenburg 613

EFFECTS OF GAMMA RADIOLYSIS ON WASTE PACKAGE
COMPONENTS
M.A. Lewis and D. Reed 623

NATURAL ANNEALING OF ALPHA-RECOIL DAMAGE IN METAMICT
MINERALS OF THE THORITE GROUP
Y. Eyal, G.R. Lumpkin, and R.C. Ewing 635

AN X-RAY ABSORPTION SPECTROSCOPY INVESTIGATION OF THE
Ta SITE IN ALPHA-RECOIL DAMAGED NATURAL PYROCHLORES
R.B. Gregor, F.W. Lytle, B.C. Chakoumakos,
G.R. Lumpkin, R.C. Ewing, C.L. Spiro, and J. Wong 645

RADIATION DAMAGE AND ITS ANNEALING IN SODIUM
SILICA GLASS
T.D. Mark and W. Ritter 659

A GENERALIZED MODEL FOR THE RADIOLYSIS OF
GROUNDWATERS: BICARBONATE CHEMISTRY AND
INFLUENCES
S.L. Nicolosi 671

PART VIII: GROUNDWATER CHEMISTRY AND INTERACTIONS

THE COUPLING OF CHEMICAL AND TRANSPORT
PROCESSES IN NEAR-FIELD MODELLING
S.M. Sharland, P.W. Tasker, and C.J. Tweed 683

Tc BEHAVIOR IN THE BASALT-SYNTHETIC GROUND-WATER SYSTEM AS A FUNCTION OF TEMPERATURE AND INITIAL OXYGEN CONTENT M.I. Wood, L.L. Ames, and J.E. McGarrah	695
THE TRANSPORT OF URANIUM AND TECHNETIUM THROUGH THE UNSATURATED TUFFS, YUCCA MOUNTAIN, NEVADA G.A. Cederberg, L.E. Greenwade, and B.J. Travis	703
SIMULATION OF URANIUM TRANSPORT WITH VARIABLE TEMPERATURE AND OXIDATION POTENTIAL: THE COMPUTER PROGRAM THCC C.L. Carnahan	713
IRREVERSIBILITY OF SE(VI)/SE(IV) REDOX COUPLE IN SYNTHETIC BASALTIC GROUND WATER AT 25°C AND 75°C D.D. Runnels, R.D. Lindberg, and J.H. Kempton	723
THE GEOCHEMISTRY OF NATURAL TECHNETIUM AND PLUTONIUM D.B. Curtis, J.H. Capps, R.E. Perrin, and D.J. Rokop	735
ZEOLITIZATION OF GLASSY TOPOPAH SPRING TUFF UNDER HYDROTHERMAL CONDITIONS K.G. Knauss	737
HUMIC COLLOID GENERATION OF TRANSURANIC ELEMENTS IN GROUNDWATER AND THEIR MIGRATION BEHAVIOR J.I. Kim, G. Buckau, and W. Zhuang	747
TRANSPORT OF RADIONUCLIDES BY CONCENTRATED BRINE IN A POROUS MEDIUM WITH MICROPORE-MACROPORE STRUCTURE S.M. Hassanizadeh	757
PART IX: ROCK/BACKFILL PERFORMANCE	
RADIOMETRIC DATING OF OCHOAN (PERMIAN) EVAPORITES, WIPP SITE, DELAWARE BASIN, NEW MEXICO, USA D.G. Brookins and S.J. Lambert	771
LABORATORY AND MODELLING STUDIES OF SODIUM BENTONITE GROUNDWATER INTERACTION M. Snellman, H. Uotila, and J. Rantanen	781
PERMANENT CRYSTAL LATTICE CONTRACTION, A PRIMARY MECHANISM IN THERMALLY INDUCED ALTERATION OF Na BENTONITE R. Pusch	791
DIFFUSION MECHANISMS OF STRONTIUM AND CESIUM IN COMPACTED SODIUM BENTONITE A. Muurinen, P. Penttila-Hiltunen, and J. Rantanen.....	803
CHOICE OF FRENCH CLAYS AS ENGINEERED BARRIER COMPONENTS FOR WASTE DISPOSAL H. Coulon, A. Lajudie, P. Debrabant, R. Atabek, M. Jorda, and R. Andre-Jehan	813

Cambridge University Press
978-1-107-41112-8 - Scientific Basis for Nuclear Waste Management X: Materials Research
Society Symposia Proceedings: Volume 84
Editors: John K. Bates and Waldemar B. Seefeldt
Frontmatter
[More information](#)

AUTHOR INDEX 825
SUBJECT INDEX..... 827

Cambridge University Press

978-1-107-41112-8 - Scientific Basis for Nuclear Waste Management X: Materials Research

Society Symposia Proceedings: Volume 84

Editors: John K. Bates and Waldemar B. Seefeldt

Frontmatter

[More information](#)

Cambridge University Press

978-1-107-41112-8 - Scientific Basis for Nuclear Waste Management X: Materials Research
Society Symposia Proceedings: Volume 84

Editors: John K. Bates and Waldemar B. Seefeldt

Frontmatter

[More information](#)

Preface

This volume contains the Proceedings of the Tenth International Symposium on the Scientific Basis for Nuclear Waste Management. The Symposium was held December 1-4, 1986, in Boston, Massachusetts, as part of the Fall Meeting of the Materials Research Society (MRS). This symposia series is recognized for promoting the technical aspects of nuclear waste management and fosters discussion on a wide range of topics at the international level. The international character of the meeting was exemplified by representation from fifteen countries.

The theme of the Tenth Symposium was the long-term projection of materials interactions that govern the performance of repositories. In the initial Plenary Session, four invited speakers introduced the theme and described the current state of knowledge. In addition, invited speakers reviewed progress made in the past ten years in specific topic areas and made suggestions for avenues for further research.

The Proceedings consist of 71 papers that were presented at the Symposium. Each of the contributed papers was subjected to an extensive peer review process before acceptance for publication. The papers in the Proceedings have been arranged into nine parts: (I) plenary session (theme papers), (II) waste form performance: spent fuel, (III) metal corrosion, (IV) low-level waste and materials, (V) materials interactions, (VI) waste form performance: glass, (VII) radiation effects, (VIII) groundwater chemistry and interactions, and (IX) rock/backfill performance.

The organizers of the Symposium and editors of the Proceedings wish to acknowledge with thanks the invaluable help received from many individuals and organizations, all of whom helped make the Symposium a success.

The Program Committee assisted in selecting papers to be presented, conducting the required peer reviews, working with authors to ensure incorporation of the reviewer's comments into papers, and serving as Session Chairman. We are grateful for the time and energy that they contributed to the Symposium. The members of the Program Committee were:

John Bates, Argonne National Laboratory
Lawrence Johnson, Atomic Energy of Canada
Charles Interrante, National Bureau of Standards
Robert Barletta, Brookhaven National Laboratory
Ned Bibler, Savannah River Laboratory
Roger Aines, Lawrence Livermore National Laboratory
Donald Reed, Rockwell Hanford Operations
Donald Runnells, University of Colorado
David Stahl, Battelle Memorial Institute
James Cunnane, Battelle Memorial Institute
Dan Merz, Pacific Northwest Laboratory

Session Chairman also included:

Hilbert Christensen, Studsvik Energiteknik AB, Nyköping, Sweden
Susan M. Sharland, United Kingdom Atomic Energy Authority
F. P. Glasser, University of Aberdeen, Scotland
B. Grambow, Hahn-Meitner-Institut, Federal Republic of Germany
J. I. Kim, Institute für Radiochemie, Munich, FRG
Roland Pusch, Swedish Geological Sciences, Lund, Sweden

Cambridge University Press

978-1-107-41112-8 - Scientific Basis for Nuclear Waste Management X: Materials Research
Society Symposia Proceedings: Volume 84

Editors: John K. Bates and Waldemar B. Seefeldt

Frontmatter

[More information](#)

Theme speakers were:

Alan Berusch, U.S. Department of Energy
Thomas Jungling, U.S. Nuclear Regulatory Commission
Lars Werme, Swedish Nuclear Fuel and Waste Management Co. (SKB)
Jeffrey Fong, National Bureau of Standards

Invited speakers were:

Virginia Oversby, Lawrence Livermore National Laboratory
Bruce C. Bunker, Sandia National Laboratory
Michael McNeil, U.S. Nuclear Regulatory Commission
Ned Bibler, Savannah River Laboratory
Rodney C. Ewing, University of New Mexico

The preparation of these Proceedings was made possible with financial support from the U.S. Nuclear Regulatory Commission and jointly by the Office of Nuclear Energy, the Office of Civilian Radioactive Waste Management, and the Office of Defense Programs, of the U.S. Department of Energy.

Thanks are due to all those who have contributed to the Symposium as authors and in informal discussions, who made it possible to run the Symposium on a high scientific level. Special thanks are extended to Ms. Roberta Riel who provided invaluable assistance in preparing this volume, and to the management of Argonne National Laboratory for its encouragement, support, and use of facilities in this endeavor.

J. K. Bates
W. B. Seefeldt

January 1987