

Contents

PREFACE	xv
ACKNOWLEDGMENTS	xvii
MATERIALS RESEARCH SOCIETY SYMPOSIUM PROCEEDINGS	xx

KEYNOTE ADDRESS

*THE CHEMICAL BEHAVIOR OF TRANSURANIUM ELEMENTS AND BARRIER FUNCTIONS IN NATURAL AQUIFER SYSTEMS Jae-Il Kim	3
--	---

PART I: SPENT FUEL

KINEMATICS AND THERMODYNAMICS OF NON-STOICHIOMETRIC OXIDATION PHASE TRANSITIONS IN SPENT FUEL R.B. Stout, E.J. Kansa, and A.M. Wijesinghe	25
ELECTROCHEMICAL STUDIES OF CORROSION OF SIMFUEL: SIMULATED USED UO_2 FUEL S. Sunder, D.W. Shoesmith, and N.H. Miller	35
MEASUREMENTS OF GRAIN-BOUNDARY INVENTORIES OF ^{137}Cs , ^{90}Sr and ^{99}Tc IN USED CANDU FUEL S. Stroes-Gascoyne, J.C. Tait, R.J. Porth, J.L. McConnell, T.R. Barnsdale, and S. Watson	41
EFFECTS OF AIR OXIDATION ON THE DISSOLUTION RATE OF LWR SPENT FUEL W.J. Gray, L.E. Thomas, and R.E. Einziger	47
PHOTOTHERMAL DEFLECTION SPECTROSCOPY INVESTIGATIONS OF URANIUM ELECTROCHEMISTRY James D. Rudnicki and Richard E. Russo	55
KINETICALLY CONTROLLED DISSOLUTION OF $UO_2(s)$ UNDER OXIDIZING CONDITIONS. A COMBINED DISSOLUTION-OXIDATION MODEL Ignasi Casas, J. Gimenez, V. Marti, M.E. Torrero, and J. De Pablo	61
DISSOLUTION OF $UO_2(s)$ IN $MgCl_2$ -BRINES UNDER DIFFERENT REDOX CONDITIONS Ignasi Casas, J. Gimenez, J. De Pablo, and M.E. Torrero	67
THE IMPORTANCE OF CRITICALITY IN THE SAFETY ANALYSIS OF THE SPENT-FUEL WASTE CONTAINER William G. Culbreth and Paige Zielinski	73

PART II: GLASS AND CRYSTALLINE WASTE FORMS

INITIAL DEMONSTRATION OF THE VITRIFICATION OF HIGH-LEVEL NUCLEAR WASTE SLUDGE CONTAINING AN ORGANIC Cs-LOADED ION-EXCHANGE RESIN N.E. Bibler, J.P. Bibler, M.K. Andrews, and C.M. Jantzen	81
--	----

*Invited Paper

REDOX SYSTEMATICS IN MODEL GLASS COMPOSITIONS FROM WEST VALLEY	87
Henry D. Schreiber, Charlotte W. Schreiber, and Cary C. Ward	
LEACH RESISTANCE PROPERTIES AND RELEASE PROCESSES FOR SALT-OCCLUDED ZEOLITE A	95
M.A. Lewis, D.F. Fischer, and J.J. Laidler	
CATALYTIC EFFECT OF SOME OXIDES ON CALCINATION OF SODIUM NITRATE	103
A.N. Sembira and M.M. Perez	
QUANTITATIVE X-RAY DIFFRACTION ANALYSIS OF TITANATE WASTE FORMS AND ITS APPLICATION TO DAMAGE INGROWTH	109
T.J. White and H. Mitamura	
FUNDAMENTAL STUDY ON THE SOLIDIFICATION OF Cs ⁺ AND Sr ²⁺ WITH HYDROUS Ti ^{IV} OXIDE MODIFIED WITH Si AND Zr	117
Y. Inoue, H. Yamazaki, and R. Erza	
INCORPORATION OF RADIONUCLIDES INTO MINERAL PHASES VIA A THERMALLY UNSTABLE COMPLEXANT LIGAND	123
Allen W. Apblett, Galina D. Georgieva, and Joel T. Mague	
URANIUM AND RARE EARTH PARTITIONING IN SYNROC	129
K.L. Smith, G.R. Lumpkin, and M.G. Blackford	
THE REACTION OF SRL 202 GLASS IN J-13 AND DIW	137
W.L. Ebert, J.K. Bates, and E.C. Buck	
PART III: GLASS PERFORMANCE: MECHANISMS AND MODELS	
THE LEACHING OF Pu, Am, Np AND Tc FROM HIGH-LEVEL WASTE GLASSES IN CLAY MEDIA	147
K. Lemmens, P. Van Iseghem, and L. Wang	
PLUTONIUM LEACHING FROM A REFERENCE NUCLEAR WASTE GLASS IN SYNTHETIC INTERSTITIAL CLAYWATER	155
Lian Wang, P. Van Iseghem, and A. Maes	
ENHANCEMENT OF THE GLASS CORROSION IN THE PRESENCE OF CLAY MINERALS: TESTING EXPERIMENTAL RESULTS WITH AN INTEGRATED GLASS DISSOLUTION MODEL	163
Enzo Curti, N. Godon, and E.Y. Vernaz	
DISSOLUTION OF R7T7 GLASS IN STATIC AND FLOWING CONDITIONS: INFLUENCE OF Si DIFFUSION MECHANISM IN THE LEACHED LAYER	171
F. Delage, F. Larche, and E. Vernaz	
EFFECTS OF MgO ON THE SHORT- AND LONG-TERM STABILITY OF R7T7 AND M7 NUCLEAR WASTE GLASS ON AQUEOUS MEDIA	177
T. Advocat, J.L. Crovisier, J.L. Dussossoy, and E. Vernaz	
EFFECTS OF RADIATION EXPOSURE ON GLASS ALTERATION IN A STEAM ENVIRONMENT	183
D.J. Wronkiewicz, L.M. Wang, J.K. Bates, and B.S. Tani	
EFFECTS OF α -DECAY ON MECHANICAL PROPERTIES OF SIMULATED NUCLEAR WASTE GLASS	191
Y. Inagaki, H. Furuya, Y. Ono, K. Idemitsu, T. Banba, S. Matsumoto, and S. Muraoka	

ANALYTICAL ELECTRON MICROSCOPY STUDY OF COLLOIDS FROM NUCLEAR WASTE GLASS REACTION	199
E.C. Buck, J.K. Bates, J.C. Cunnane, W.L. Ebert, X. Feng, and D.J. Wronkiewicz	
DOES FULLY RADIOACTIVE GLASS BEHAVE DIFFERENTLY THAN SIMULATED WASTE GLASS?	207
X. Feng, J.K. Bates, C.R. Bradley, and E.C. Buck	
COUPLED PROCESS MODELING AND WASTE-PACKAGE PERFORMANCE	215
B.P. McGrail and D.W. Engel	
HIGH-LEVEL NUCLEAR-WASTE BOROSILICATE GLASS: A COMPENDIUM OF CHARACTERISTICS	225
J.C. Cunnane, J.K. Bates, W.L. Ebert, X. Feng, J.J. Mazer, D.J. Wronkiewicz, J. Sproull, W.L. Bourcier, and B.P. McGrail	
PART IV: CEMENTITIOUS MATERIALS	
EVALUATION OF SOME LOW-ACTIVATION STRUCTURAL MATERIALS FOR MINIMIZING RADIOACTIVE WASTE PRODUCTION BY FUTURE NUCLEAR FUSION POWER PLANTS	235
Aldo Donato	
EFFECTS OF RELATIVE SURFACE AREA AND LEACHANT COMPOSITION ON THE ¹³⁷ Cs LEACH RATE FROM CEMENT WASTE FORMS	241
Aleksandar D. Peric, Ilija B. Plecas, and Snezana D. Glodic	
THE ROLE OF OXYGEN DIFFUSION IN THE RELEASE OF TECHNETIUM FROM REDUCING CEMENTITIOUS WASTE FORMS	247
Robert W. Smith and John C. Walton	
ALKALI-ACTIVATED FLY ASH-SLAG CEMENT BASED NUCLEAR WASTE FORMS	255
W. Jiang, X. Wu, and D.M. Roy	
*THE POSSIBILITY FOR MICROBially INFLUENCED DEGRADATION OF CEMENT SOLIDIFIED LOW-LEVEL RADIOACTIVE WASTE FORMS	261
Robert D. Rogers, Melinda A. Hamilton, and John W. McConnell	
EFFECTS OF MICROORGANISMS GROWTH ON THE LONG-TERM STABILITY OF CEMENT AND BITUMEN	267
Marie F. Libert, R. Sellier, G. Jouquet, M. Trescinski, and H. Spor	
BORATE SUBSTITUTED ETTRINGITES	273
Laszlo J. Csetenyi and F.P. Glasser	
MOBILITY OF CHELATED RADIONUCLIDES IN ENGINEERED CONCRETE BARRIERS	279
Craig A. Dicke and Robert W. Smith	
THE RADIATION STABILITY OF GROUND GRANULATED BLAST FURNACE SLAG/ORDINARY PORTLAND CEMENT GROUTS CONTAINING ORGANIC ADMIXTURES	285
John D. Palmer and Graham A. Fairhall	
IN-SITU ELECTROCHEMICAL CHARACTERIZATION OF GROUTED RADIOACTIVE WASTE	291
Albert A. Kruger, Jingyan Gu, and Micha Tomkiewicz	

*Invited Paper

USE OF FLY-ASH FOR SEALING A RADIOACTIVE WASTE REPOSITORY	297
Marc Ollagnier, Christian Tauziede, and Joël Olivier	

SOLIDIFICATION OF MICROBIOLOGICALLY TREATED ION-EXCHANGE RESINS USING PORTLAND CEMENT-BASED SYSTEMS	303
Ari Ipatti	

PART V: CONTAINER ALTERATION

CREVICE CORROSION—NaCl CONCENTRATION MAP FOR GRADE-2 TITANIUM AT ELEVATED TEMPERATURE	311
Shigeo Tsujikawa and Yoichi Kojima	

CORROSION OF STAINLESS STEEL FOR HLW CONTAINERS UNDER GAMMA IRRADIATION	317
K. Osada and S. Muraoka	

EFFECTS OF CHLORIDE, BROMIDE, AND THIOSULFATE IONS ON THE CRITICAL CONDITIONS FOR CREVICE CORROSION OF SEVERAL STAINLESS ALLOYS AS A MATERIAL FOR GEOLOGICAL DISPOSAL PACKAGES FOR NUCLEAR WASTE	323
Guen Nakayama, Hisao Wakamatsu, and Masatsune Akashi	

CRITICAL CONDITIONS FOR INITIATION OF LOCALIZED CORROSION OF MILD STEELS IN CONTACT WITH BENTONITE USED IN GEOLOGICAL DISPOSAL PACKAGES OF NUCLEAR WASTE	329
Guen Nakayama and Masatsune Akashi	

LABORATORY STUDIES OF GAS GENERATION FOR THE WASTE ISOLATION PILOT PLANT	335
L.H. Brush, M.A. Molecke, R.E. Westerman, A.J. Francis, J.B. Gillow, R.H. Vreeland, and D.T. Reed	

PART VI: MICROBIOLOGICALLY INFLUENCED CORROSION

*RECENT ADVANCES IN THE STUDY OF MICROBIOLOGICALLY INFLUENCED CORROSION	343
Brenda Little and Patricia Wagner	

SUSCEPTIBILITY OF STAINLESS STEEL WELDMENTS TO MICROBIOLOGICALLY INFLUENCED CORROSION	353
Susan Watkins Borenstein	

PRINCIPLES OF THE SELECTION OF EFFECTIVE AND ECONOMIC CORROSION-RESISTANT ALLOYS IN CONTACT WITH BIOLOGICALLY ACTIVE ENVIRONMENTS	361
Nicholas J.E. Dowling, Carl Lundin, Dan Sachs, Jan A. Bullen, and David C. White	

*THE USE OF IMAGE ANALYSIS IN LONG-TERM NONDESTRUCTIVE CORROSION MONITORING OF NUCLEAR ALLOYS	369
P.J.B. Scott, S. Sandloehken, and Gerard Guerin	

USE OF SPUTTER-DEPOSITED 316L STAINLESS STEEL ULTRATHIN FILMS FOR MICROBIAL INFLUENCED CORROSION STUDIES	381
P.A. Suci, A.J. Pedraza, M.J. Godbole, and G.G. Geesey	

*Invited Paper

PART VII: NEAR-FIELD INTERACTIONS

DEALING WITH UNCERTAINTY IN THE CHEMICAL ENVIRONMENT IN BENTONITE BACKFILL R.C. Arthur, M.J. Apted, and J.L. Conca	389
AQUEOUS DIFFUSION IN REPOSITORY AND BACKFILL ENVIRONMENTS James L. Conca, Mick Apted, and Randy Arthur	395
STUDY ON RETARDATION MECHANISM OF ^3H , ^{99}Tc , ^{137}Cs , ^{237}Np AND ^{241}Am IN COMPACTED SODIUM BENTONITE H. Sato, T. Ashida, Y. Kohara, and M. Yui	403
DIFFUSION OF URANIUM IN COMPACTED SODIUM BENTONITE Arto Muurinen, Kaija Ollila, and Jarmo Lehtikoinen	409
TEMPERATURE AND MOISTURE DISTRIBUTIONS IN A CLAY BUFFER MATERIAL DUE TO THERMAL GRADIENTS A.M.O. Mohamed, R.N. Yong, and B. Kjartansson	417
MOISTURE ADSORPTION AND VOLUME CHANGE OF PARTIALLY SATURATED BENTONITE BUFFER MATERIALS Takeshi Kanno and Hisao Wakamatsu	425
RADIOLYTICALLY-INDUCED GAS PRODUCTION IN PLUTONIUM-SPIKED WIPP BRINE D.T. Reed, S. Okajima, L.H. Brush, and M.A. Molecke	431
ANALYSIS OF EVAPORATION IN NUCLEAR WASTE BOREHOLES IN UNSATURATED TUFF W. Zhou, P.L. Chambré, T.H. Pigford, and W.W.-L. Lee	439
COMPARED STUDY OF RADIOLYSIS-INDUCED GAS LIBERATION IN ROCKSALT FROM VARIOUS ORIGINS N. Akram, J.C. Blanchard, M.T. Gaudez, and P. Toulhoat	447
RADIATION DAMAGE IN NaCl: CALCULATIONS WITH AN EXTENDED JAIN-LIDIARD MODEL Wim J. Soppe and J. Pij	453
EVALUATION OF THE RETENTION CAPABILITY OF BACKFILL MATERIALS IN THE PRESENCE OF CEMENT WASTE FORM N.K. Ghattas, K.A. El Adham, S.B. Eskander, and N.S. Mahmoud	459
DIFFUSION OF CORROSION PRODUCTS OF IRON IN COMPACTED BENTONITE K. Idemitsu, H. Furuya, and Y. Inagaki	467
STUDY OF THE PERFORMANCE OF SEALING SYSTEMS FOR ACCESS SHAFTS IN A HIGH-LEVEL WASTE REPOSITORY A. Saotome, K. Hara, and J. Okamoto	475
RESULTS FROM SIMULATED REMOTE-HANDLED TRANSURANIC WASTE EXPERIMENTS AT THE WASTE ISOLATION PILOT PLANT (WIPP) Martin A. Molecke	481

PART VIII: NATURAL ANALOGUES

MODELLING IN-SITU MATRIX DIFFUSION AT PALMOTTU NATURAL ANALOGUE STUDY SITE IN SW FINLAND Kari Rasilainen and Juhani Suksi	489
--	-----

URANIUM MINERAL—GROUNDWATER EQUILIBRATION AT THE PALMOTTU NATURAL ANALOGUE STUDY SITE, FINLAND Lasse Ahonen, H. Ervanne, T. Ruskeenemi, T. Jaakkola, and R. Blomqvist	497
OXIDATIVE ALTERATION OF URANINITE AT THE NOPAL I DEPOSIT, MEXICO: POSSIBLE CONTAMINANT TRANSPORT AND SOURCE TERM CONSTRAINTS FOR THE PROPOSED REPOSITORY AT YUCCA MOUNTAIN Bret W. Leslie, English C. Percy, and James D. Prikrýl	505
THE ALTERATION OF URANINITE TO CLARKEITE Robert J. Finch and Rodney C. Ewing	513
KINETIC STUDIES OF NATURAL URANIUM MINERALS FOR THE LONG-TERM EVOLUTION OF SPENT NUCLEAR FUEL UNDER OXIDIZING CONDITIONS Ignasi Casas, E. Cera, and J. Bruno	521
A MODELLING STUDY ON THE FRACTIONATION OF URANIUM AMONG MINERALS DURING ROCK WEATHERING Toshihiko Ohnuki, Takashi Murakami, and Nobuyuki Yanase	527
A MODELLING STUDY OF THE EFFECT OF ROCK ALTERATION ON THE REDISTRIBUTION OF URANIUM Takashi Murakami and Hideo Kimura	535
SURFACE-DISCHARGING HYDROTHERMAL SYSTEMS AT YUCCA MOUNTAIN—EXAMINING THE EVIDENCE Schön S. Levy	543
CORROSION MODEL VALIDATION IN HIGH LEVEL NUCLEAR WASTE PACKAGE RESEARCH M.B. McNeil and J.B. Moody	549
PART IX: LONG-TERM PREDICTION FOR ENGINEERED BARRIERS	
*THE LONG-TERM PERFORMANCE OF NUCLEAR WASTE FORMS: NATURAL MATERIALS—THREE CASE STUDIES Rodney C. Ewing	559
ACCELERATED GLASS REACTION UNDER PCT CONDITIONS W.L. Ebert, J.K. Bates, E.C. Buck, and C.R. Bradley	569
MODELING SURFACE AREA TO VOLUME EFFECTS ON BORO-SILICATE GLASS DISSOLUTION William L. Bourcier, W.L. Ebert, and X. Feng	577
INCREASES IN LEACH RATE DUE TO POSSIBLE CRACKING IN SILICATE GLASSES J.C. Sang, A. Barkatt, I.G. Talmy, and M.K. Norr	583
*OBSERVATION BY SEM/EDXS OF LEACHED LAYERS ON SRL-165 GLASS FROM 5-YEAR MIT TEST Pedro B. Macedo and Andrew C. Buechele	591
A JUSTIFICATION FOR THE USE OF DATA FROM ACCELERATED LEACH TESTS OF GLASS Tae M. Ahn, Charles G. Interrante, and Richard A. Weller	599

*Invited Paper

ANCIENT METALLURGY AND NUCLEAR WASTE CONTAINMENT Martha Goodway	605
*LONG-TERM PREDICTIONS RELATING TO ENVIRONMENT SENSITIVE CRACKING R.N. Parkins	613
THE POTENTIAL ROLE OF DIFFUSION-INDUCED GRAIN-BOUNDARY MIGRATION IN EXTENDED LIFE PREDICTION C.A. Handwerker, J.E. Blendell, C.G. Interrante, and T.M. Ahn	625
*EXPERIMENTS AND MODELLING STUDIES CONCERNING LOCALISED CORROSION OF CARBON STEEL AND STAINLESS STEEL CONTAINERS FOR INTERMEDIATE- AND LOW-LEVEL RADIOACTIVE WASTE A.R. Hoch, C.C. Naish, S.M. Sharland, A.C. Smith, and K.J. Taylor	637
REPASSIVATION POTENTIALS FOR LONG-TERM LIFE PREDICTION OF LOCALIZED CORROSION Narasi Sridhar and Gustavo Cragnolino	649
 PART X: PERFORMANCE ASSESSMENT OF ENGINEERED BARRIER SYSTEMS	
*THE ENGINEERED BARRIER SYSTEM: PERFORMANCE ISSUES T.H. Pigford	657
*PROGRESS IN WASTE PACKAGE AND ENGINEERED BARRIER SYSTEM PERFORMANCE ASSESSMENT AND DESIGN Abraham Van Luik, David Stahl, and Diane Harrison	663
*SOME IMPORTANT MECHANISMS AND PROCESSES IN THE NEAR FIELD OF THE SWEDISH REPOSITORY FOR SPENT NUCLEAR FUEL Ivars Neretnieks	675
*PERFORMANCE ASSESSMENT OF ENGINEERED BARRIERS USING THE VAULT MODEL L.H. Johnson and D.M. LeNeveu	689
*KEY ISSUES INFLUENCING THE PERFORMANCE OF NEAR-FIELD BARRIERS P.W. Tasker, S.J. Wisbey, and C.B. Boyle	697
*RESEARCH NEEDS IN HLW DISPOSAL PROGRAMMES Joerg Hadermann and Charles McCombie	707
THE IAEA COORDINATED RESEARCH PROGRAMME ON THE PERFORMANCE OF HIGH-LEVEL WASTE FORMS AND PACKAGES UNDER REPOSITORY CONDITIONS Vladimir S. Tsyplov	719
THE NEAR-FIELD TRANSPORT CODE TULLGARN AND ITS USE IN PERFORMANCE ASSESSMENT Patrik Sellin and Nils Kjellbert	725
NEAR-FIELD PERFORMANCE ASSESSMENT FOR THE SALTSTONE DISPOSAL FACILITY Roger R. Seitz, John C. Walton, Craig A. Dicke, and James R. Cook	731

*Invited Paper

PART XI: RADIONUCLIDE CHEMISTRY AND TRANSPORT

BULK SOLUBILITY AND SPECIATION OF PLUTONIUM(VI) IN PHOSPHATE-CONTAINING SOLUTIONS H.T. Weger, S. Okajima, J.C. Cunnane, and D.T. Reed	739
EVIDENCE OF RADIOLYTIC OXIDATION OF ^{241}Am IN $\text{Na}^+/\text{Cl}^-/\text{HCO}_3^-/\text{CO}_3^{2-}$ MEDIA Eric Giffaut and Pierre Vitorge	747
THERMODYNAMIC MODELLING OF THE EFFECT OF HYDROXY- CARBOXYLIC ACIDS ON THE SOLUBILITY OF PLUTONIUM AT HIGH pH Anthony D. Moreton	753
A COMPARATIVE STUDY OF EUROPIUM, THORIUM AND URANIUM BINDING TO AN AQUATIC FULVIC ACID M. Nordén, Y. Albinsson, J.H. Ephraim, and B. Allard	759
THE ROLE OF SIDEROPHORES IN THE TRANSPORT OF RADIO- NUCLIDES Larry E. Hersman, Philip D. Palmer, and David E. Hobart	765
MICROBIAL EFFECTS ON THE RADIONUCLIDE TRANSPORT IN A DEEP NUCLEAR WASTE REPOSITORY Herve Spor, M. Trescinski, and M.F. Libert	771
EXPERIMENTAL STUDY OF URANIUM(6+) SORPTION ON THE ZEOLITE MINERAL CLINOPTILOLITE Roberto T. Pabalan, J.D. Prikryl, P.M. Muller, and T.B. Dietrich	777
RADIONUCLIDE SORPTION MODELING USING THE MINTEQA2 SPECIATION CODE David R. Turner, T. Griffin, and T.B. Dietrich	783
MEASUREMENTS OF METAL ADSORPTION IN OXIDE-CLAY MIXTURES: "COMPETITIVE-ADDITIVITY" AMONG MIXTURE COMPONENTS V.S. Tripathi, M.D. Siegel, and Z.S. Kooner	791
TRANSPORT OF NEPTUNIUM THROUGH YUCCA MOUNTAIN TUFFS I.R. Triay, B.A. Robinson, A.J. Mitchell, C.M. Overly, and R.M. Lopez	797
RADIONUCLIDE MIGRATION STUDIES ON TONALITE P. Hölttä, M. Siitari-Kauppi, M. Hakanen, and A. Hautojärvi	803
RADIO-LABELLED HUMIC MATERIALS IN MIGRATION STUDIES Lars Carlsen, Pia Lassen, Peter Warwick, and Amanda Randall	811
COLLOID PROPERTIES IN GRANITIC GROUNDWATER SYSTEMS, WITH EMPHASIS ON THE IMPACT ON SAFETY ASSESSMENT OF A RADIOACTIVE WASTE REPOSITORY C. Delguedre	817
THE INFLUENCE OF NON-LINEAR SORPTION ON COLLOID FACILITATED RADIONUCLIDE TRANSPORT THROUGH FRACTURED MEDIA Paul A. Smith	825
TRANSPORT MODELING IN A FINITE FRACTURED ROCK DOMAIN Craig F. Novak	831

DIRECT DETERMINATION OF TRANSPORT PARAMETERS IN REPOSITORY MATERIALS	839
J.L. Conca, M.J. Apted, and R.C. Arthur	
DIFFUSIVITY AND POROSITY IN ROCK MATRIX—LABORATORY METHODS USING ARTIFICIAL AND NATURAL TRACERS	845
M. Valkiainen, M. Olin, K. Uusheimo, H. Kumpulainen, J. Lehtikainen, and A. Muurinen	
DEVELOPMENT OF A GAS METHOD FOR MIGRATION STUDIES IN FRACTURED AND POROUS MEDIA	851
Kusti Väättäinen, Jussi Timonen, and Aimo Hautajärvi	
BNFL LYSIMETER PROGRAMME TO INVESTIGATE THE LEACHING OF RADIONUCLIDES FROM LOW-LEVEL RADIOACTIVE WASTE	857
K. Clayton, R. Clegg, R.G.G. Holmes, and G.W.A. Newton	
PILOT AND FIELD-SCALE URANIUM LYSIMETER STUDIES AT THE OAK RIDGE Y-12 PLANT	865
Dianne D. Gates, Chet W. Francis, Lisa M. Laster, and Rod Kimmitt	
 PART XII: PERFORMANCE ASSESSMENT OF GEOLOGICAL SYSTEMS	
*IS IT POSSIBLE TO DEMONSTRATE COMPLIANCE WITH THE REGULATIONS FOR HIGH-LEVEL-WASTE REPOSITORIES?	873
Felton W. Bingham	
*CONCEPTUAL STRUCTURE OF PERFORMANCE ASSESSMENTS CONDUCTED FOR THE WASTE ISOLATION PILOT PLANT	885
J.C. Helton, M.G. Marietta, and R.P. Rechard	
ITERATIVE PERFORMANCE ASSESSMENT FOR THE GREATER CONFINEMENT DISPOSAL FACILITIES: PRELIMINARY RESULTS OF ROUND TWO	899
Natalie E. Olague, T.A. Baer, and S.H. Conrad	
MODEL VALIDATION AND DECISION MAKING: AN EXAMPLE USING THE TWIN LAKES TRACER TEST	909
Natalie E. Olague, Paul A. Davis, Darla Smith, and Tom Feeney	
UNCERTAINTY AND SENSITIVITY ANALYSES OF GROUNDWATER TRAVEL TIME IN A TWO-DIMENSIONAL VARIABLY-SATURATED FRACTURED GEOLOGIC MEDIUM	921
A.B. Gureghian and B. Sagar	
EFFECTS OF SOME COMMON GEOLOGICAL FEATURES ON TWO-DIMENSIONAL VARIABLY SATURATED FLOW	929
Amvrossios C. Bagtzoglou, Rachid Ababou, Budhi Sagar, and M. Rashidul Islam	
A DEMONSTRATION OF DOSE MODELING AT YUCCA MOUNTAIN	937
Terri B. Miley and Paul W. Eslinger	
THE USE OF FORMAL AND INFORMAL EXPERT JUDGMENTS WHEN INTERPRETING DATA FOR PERFORMANCE ASSESSMENTS	943
Rob P. Rechard, Kathleen M. Trauth, Jonathan S. Rath, Robert V. Guzowski, Stephen C. Hora, and Martin S. Tierney	

*Invited Paper

*APPROACHES TO LONG-TERM PERFORMANCE ASSESSMENT OF DEEP UNDERGROUND DISPOSAL OF RADIOACTIVE WASTES: A EUROPEAN PERSPECTIVE Trevor J. Sumerling and David Read	951
AUTHOR INDEX	963
SUBJECT INDEX	967

*Invited Paper

