

AUTHORS — DECEMBER 1982

THE BACKFILL AS AN ENGINEERED BARRIER FOR RADIOACTIVE WASTE MANAGEMENT

BACKFILL PERFORMANCE REQUIREMENTS—ESTIMATES FROM TRANSPORT MODELS *Bernard J. Wood*

Bernard J. Wood (BSc, geology and chemistry, London University, 1967; MSc, geochemistry, Leeds University, 1968; PhD, geophysics, University of Newcastle-upon-Tyne, 1971) is a professor of geological sciences at Northwestern University. His interests include low-temperature solution geochemistry and transport modeling, high-pressure, high-temperature experimental geochemistry, and metamorphic petrology.



CHEMICAL ASPECTS GOVERNING THE CHOICE OF BACKFILL MATERIALS FOR NUCLEAR WASTE REPOSITORIES *Gary W. Beall Bert Allard*

Gary W. Beall (top) (PhD, physical chemistry, Baylor University, 1975) is currently group leader of solid waste disposal at Radian Corporation in Austin, Texas. His interests are in the impact of radionuclides on the environment in general and actinides in particular. He has been very active in the development of backfill materials for waste repositories, alternate waste forms for high-level waste, and evaluation of migration of nuclides through geologic media. **Bert Allard** (MSc, 1970, and PhD, 1975, inorganic and nuclear chemistry, Chalmers University of Technology, Sweden) is a senior scientist at the Department of Nuclear Chemistry of Chalmers University of Technology. He is presently involved in studies of retention and migration of radionuclides in the environment in connection with geological disposal of radioactive waste products. His special interests include actinide solution chemistry.



BASALT AS A POTENTIAL WASTE PACKAGE BACKFILL COMPONENT IN A REPOSITORY LOCATED WITHIN THE COLUMBIA RIVER BASALT *Marcus I. Wood William E. Coons*

Marcus I. Wood (top) (BS, geology, University of North Carolina, 1973; MS, 1977, and PhD, 1979, geochemistry, Brown University) is currently a senior geochemist for the Basalt Waste Isolation Project at Rockwell Hanford Operations. He is currently working on the development of the backfill component of a nuclear waste package, which involves the measurement of chemical, physical, and mechanical properties of geologic materials in a deep underground repository environment. **William E. Coons** (BS, geology; MS, earth science; and PhD,

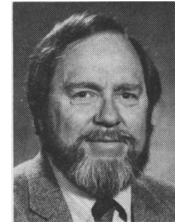


geochemistry, Arizona State University, 1978) is currently a staff scientist for D'Appolonia Consulting Engineers, Inc. in Albuquerque, New Mexico, and is engaged in research relevant to nuclear waste repository sealing design as well as nuclear and chemical waste control.

GEOCHEMISTRY OF THE DAKOTA FORMATION OF NORTHWESTERN NEW MEXICO: RELEVANCE TO RADIOACTIVE WASTE STUDIES

Douglas G. Brookins

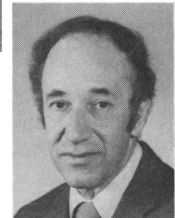
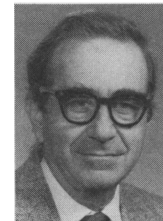
Douglas G. Brookins (PhD, isotope geology, Massachusetts Institute of Technology, 1963) is professor of geology at the University of New Mexico. He has actively worked in many areas of radioactive waste disposal since 1973, with emphasis on geochemical studies of the Oklo natural reactor, use of natural analogs for radwaste disposal, actinide and fissionogenic nuclide behavior in natural systems, low-level radioactive waste, and uranium mill tailings.



MEASUREMENT OF RADIONUCLIDE DIFFUSION IN OCEAN FLOOR SEDIMENT AND CLAY

*Felix Schreiner
Sherman Fried
Arnold M. Friedman*

Felix Schreiner (top) [PhD, physical chemistry, University of Hamburg, Federal Republic of Germany (FRG), 1959] was an assistant professor of physical chemistry at the University of Kiel, FRG, until 1961. Since 1961 he has been a chemist at Argonne National Laboratory (ANL). He is currently involved in the application of physicochemical measurements to the study of radionuclide behavior in the environment. **Sherman Fried** (center) (PhD, University of Chicago) worked at Northwestern University from 1942 to 1943 before coming to the Metallurgical Laboratory (now ANL). He worked at the Radiation Laboratory, University of California, from 1960 to 1966. His field of research has continued to be the chemistry of the actinide elements with interest in basic research as well as with applications to special problems. A senior scientist, he is involved in studies of migration of actinides from radionuclide repositories into the environment. **Arnold M. Friedman** (bottom) (PhD, nuclear chemistry, Washington University, 1953) is a senior chemist at ANL, where he has worked since 1953. His interests are in nuclear structure, application of nuclear techniques to medicine, and radioactive waste disposal. He is currently a visiting professor at the University of Chicago.

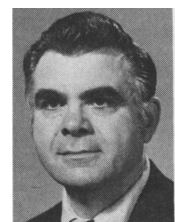


LIGHT WATER REACTOR CORE AND STRUCTURAL MATERIALS

SIGNIFICANCE OF SELECTED RESIDUAL ELEMENTS TO THE RADIATION SENSITIVITY OF A302-B STEELS

J. Russell Hawthorne

J. Russell Hawthorne (BS, metallurgical engineering, University of Pennsylvania, 1953, and MS, metallurgical engineering, Rensselaer Polytechnic Institute, 1955) has been with the Naval Research Laboratory since 1957 working on radiation effects to metals and alloys. His special interests include the isolation of factors responsible for variable radiation embrittlement sensitivity in structural alloys and the development of radiation resistant materials for advanced power reactor systems.



ANALYTIC PREDICTIONS OF THE ANNEALING RESPONSE OF A533-B REACTOR VESSEL STEEL WELDS

Alan P. Main (top) (MS, nuclear engineering, University of Virginia, 1980) is presently completing the research for his PhD degree in nuclear engineering at the University of Virginia. He also serves as a senior reactor operator for the two University of Virginia reactors. His research interests include the modeling of radiation effects in reactor pressure vessel steels. **Bryce L. Shriver** (PhD, metallurgical engineering, University of Missouri-Rolla, 1973) is director of the Nuclear Reactor Facility and research assistant professor at the University of Virginia. Prior to joining the University of Virginia he served as an engineer on Admiral Rickover's staff in the U.S. Department of Energy. His research interests include the effects of radiation on the properties of structural materials.

*Alan P. Main
Bryce L. Shriver*



RADIATION ANNEALING MECHANISMS OF LOW-ALLOY REACTOR PRESSURE VESSEL STEELS DEPENDENT ON IRRADIATION TEMPERATURE AND NEUTRON FLUENCE

Dieter Pachur (Diplom-Physiker, University Münster, Federal Republic of Germany, 1962) is a research physicist at the Kernforschungsanlage Jülich. His interests include behavior of material in the radiation field of nuclear reactors, influence of irradiation parameters, and materials testing. Technical management of reactor pressure vessel steel irradiation programs of nuclear industry and steel manufacturers is part of his responsibility. Fundamental research on radiation damage is under way in cooperation with the university.

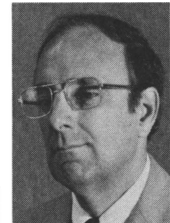
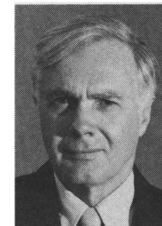
Dieter Pachur



DEVELOPMENT OF HAFNIUM AND COMPARISON WITH OTHER PRESSURIZED WATER REACTOR CONTROL ROD MATERIALS

Herbert W. Keller (top right) (BS, mechanical engineering, University of Pittsburgh, 1956; MS, 1967) is manager of major programs for Westinghouse Electric Corporation, Nuclear Fuel Division. He has been involved in engineering activities related to nuclear power with Westinghouse since 1959. His experience includes design, development, and servicing of pressurized water reactor fuel, associated core components, reactor internals, and other reactor and related plant equipment. **John M. Shallenberger** (top left) (BS, petroleum engineering, University of Pennsylvania, 1950) is a fellow engineer in the Advanced Product Engineering Group for the Westinghouse Electric Corporation, Nuclear Fuel Division. He has held positions as an engineer for commercial nuclear fuel refueling equipment design and nuclear fuel assembly and control rod design development. Prior to this commercial nuclear power experience, he was responsible for refueling equipment design and initial core loadings for the U.S. Naval nuclear program. **David A. Hollein** (bottom right) (BS, mechanical engineering, University of Pittsburgh, 1968) is a senior nuclear fuel evaluations engineer for the Westinghouse Electric Corporation, Nuclear Commercial Operations Division. He has been a projects engineer for both domestic and international nuclear fuel supply contracts. Prior to his commercial nuclear power experience, he was responsible for the Westinghouse design, procurement, and operation of nuclear fuel refueling equipment, fuel shipping containers, and primary system pumps for the U.S. Naval nuclear program. **A. Carl Hott** (bottom left) (BS, geology, Texas Tech University,

*Herbert W. Keller
John M. Shallenberger
David A. Hollein
A. Carl Hott*



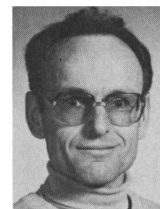
1958; MS, Columbia University, 1960) is a senior materials design and irradiation effects engineer for the Westinghouse Electric Corporation, Nuclear Fuel Division. He held nuclear materials development positions for 8 years prior to the current position, which he has held for 15 years.

FISSION REACTORS

RESULTS FROM AN INTERNATIONAL INTERCOMPARISON OF FUNDAMENTAL MODE BENCHMARK CALCULATIONS FOR STEAM INGRESS INTO GAS-COOLED FAST REACTOR CORES

Edgar Kiefhaber

Edgar Kiefhaber (PhD, nuclear engineering, Technical University of Karlsruhe, Federal Republic of Germany, 1967) has been working at Kernforschungszentrum Karlsruhe (KfK) since 1962 and is now a section head in the Institute of Neutron Physics and Reactor Technology at KfK. His research interests and activities include neutron thermalization and nuclear design of fast reactors with steam, gas, and sodium cooling. He works primarily in the field of neutron group constants for fast reactors and numerical methods applied in the analysis of critical assemblies and in the design of fast power reactors.

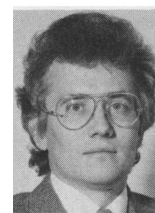
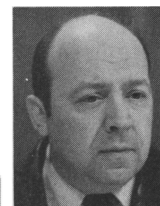


RADIOACTIVE WASTE MANAGEMENT

GAS FORMATION DURING THE GAMMA RADIOLYSIS OF CEMENTED LOW- AND INTERMEDIATE-LEVEL WASTE PRODUCTS

*Hermann J. Möckel
Rainer H. Köster*

Hermann J. Möckel (top) [Dipl.-Chem., Dr. rer. nat., analytical chemistry and radiation chemistry, Technical University of Berlin, Federal Republic of Germany (FRG), 1967] is a research chemist and lecturer in chemical separation science. He specializes in the gas chromatography determination of gases and the HPLC of sulfur and its compounds. His current main interest is the application of HPLC in inorganic chemistry. **Rainer H. Köster** (Dipl.-Chem., Dr. rer. nat., physical chemistry and radiation chemistry, Technical University of Berlin, FRG, 1971) is a research chemist and head of the final disposal section at the Nuclear Research Center Karlsruhe, FRG. He specializes in near-field phenomena in geologic disposal including waste product properties, waste packaging, waste-rock interaction, and modeling of release scenarios.

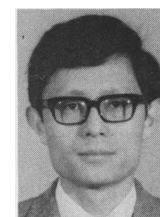


MATERIALS

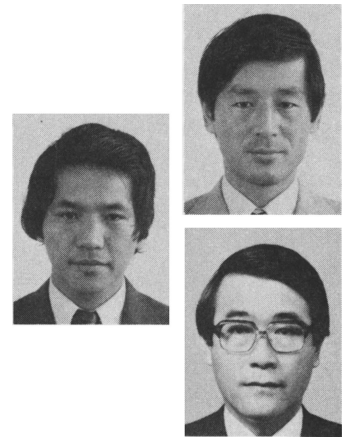
A MECHANISM OF RADIOACTIVE CORROSION PRODUCT BUILDUP ON THE STAINLESS STEEL SURFACE USED IN THE PRIMARY COOLING SYSTEMS OF BOILING WATER REACTORS

*Shunsuke Uchida
Yoshihiro Ozawa
Eishi Ibe
Yoshinori Meguro*

Shunsuke Uchida (right) (BS, physics, Osaka University, Japan, 1964; PhD, nuclear engineering, University of Tokyo, Japan, 1979) is a senior researcher in the Energy Research Laboratory



(ERL) of Hitachi Ltd. He has worked in radiation reduction programs for boiling water reactor (BWR) plants and is currently involved in research programs on materials and water interaction in the BWR system. **Yoshihiro Ozawa** (top) (BS, 1968, MS, 1970, and PhD, 1980, nuclear engineering, University of Tokyo, Japan) is a researcher at ERL and has been working on development of radiation reduction procedures in BWR plants. **Eishi Ibe** (center) (BS, physics, Kyoto University, Japan, 1975) is also a researcher at ERL. He has been working on the analysis of irradiation effects on materials, with a special interest in water radiolysis. **Yoshinori Meguro** (bottom) (BS, chemistry, Yokohama National University, Japan, 1963; PhD, nuclear engineering, University of Tokyo, Japan, 1982) is a manager of the Nuclear Technology Section at The Japan Atomic Power Company. He has been active in studying the water chemistry of BWR plants.



HEAT TRANSFER AND FLUID FLOW

TURBULENT FLOW IN ROD BUNDLES WITH GEOMETRICAL DISTURBANCES

J. Hejna (top) (Dipl. Ing., engineering, Military Academy of A. Zápotocký, Brno, CSSR, 1968) works in the Nuclear Research Institute, Řež, as the head of a group of researchers in experimental hydrodynamics. His interests are in the research of fuel element hydrodynamics carried out on aerodynamic models. **F. Mantlík** (Dipl. Ing. and PhD, engineering, Technical College of Engineering and Electrical Engineering, Plzeň, 1961) obtained his degree in local hydrodynamic characteristics in channels with complex cross sections. His main focus in research work is on the hydrodynamics and heat transfer in fuel assemblies of sodium-cooled fast reactors. He is head of the Division of Hydrodynamics and Heat Transfer of the Nuclear Research Institute, Řež.

*J. Hejna
F. Mantlík*

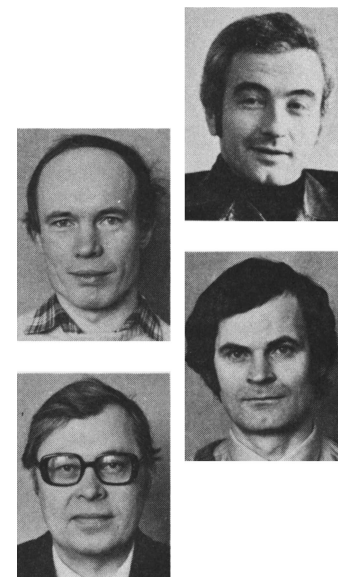


TECHNIQUES

LOW-BACKGROUND HIGH-EFFICIENCY DETECTOR FOR THE STUDY OF THE (n,α) REACTION AT PULSED NEUTRON SOURCE

Angel Antonov (top right) (BS, physics, Plovdiv University, Bulgaria; MS, 1967, and PhD, 1980, physics) has been an assistant professor in the Department of Nuclear Physics at Plovdiv University since 1974. From 1975 to 1980, he was a visiting scientist in the Laboratory of Neutron Physics (LNPh), Joint Institute for Nuclear Research (JINR), Dubna, USSR, studying the (n,α) reaction with resonance neutrons. **Andrej A. Bogdzel** (top left) (BS, nuclear electronics engineering, Ural Polytechnical Institute, USSR; MS, nuclear electronics engineering, 1972) is a senior engineer in the Radioelectronics Department of LNPh, JINR. His research interests include the electronics and systems for detecting multidimensional measurements at pulsed neutron sources. **Yurij M. Gledenov** (bottom right) (BS, physics, Moscow State University, USSR; MS, 1970) is a scientific worker at the LNPh, JINR. His current research interest is in the study of (n,α) and (n,p) reactions. **Viacheslav G. Tishin** (bottom left) (BS, physics, Moscow

*Angel Antonov
Andrej A. Bogdzel
Yurij M. Gledenov
Viacheslav G. Tishin*



Physical-Engineering Institute, USSR; MS, 1965, and PhD, 1969, physics) is head of a group in the Radioelectronics Department of LNPh, JINR. He is now engaged in nuclear electronics and digital technique studies.

EDUCATION

EDUCATIONAL LABORATORY EXPERIMENTS ON CHEMISTRY IN A NUCLEAR ENGINEERING SCHOOL

Eiko Akatsu

Eiko Akatsu (PhD, radiochemistry, Tohoku University, Japan, 1966) worked on solvent extraction and ion exchange at the Radiochemistry Laboratory of Japan Atomic Energy Research Institute (JAERI). She is now working as a senior scientist and teaching reactor chemistry at the Radioisotope and Nuclear Engineering School of JAERI.

