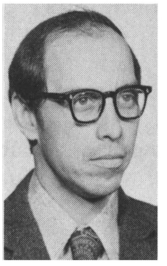
nuclear technology®

AUTHORS — MID-APRIL 1979

THE BACK END OF THE LIGHT WATER REACTOR FUEL CYCLE

COPROCESSING SOLVENT EXTRACTION STUDIES

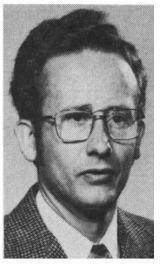
Martha S. Okamoto
Major C. Thompson

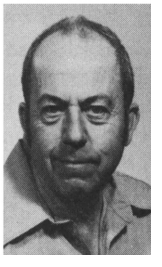


Martha S. Okamoto (top) (PhD, inorganic chemistry, University of Illinois, 1974) is a research chemist in the Petrochemicals Department of E. I. duPont de Nemours and Company at the Experimental Station in Wilmington, Delaware. Her work has been in end use research on man-made textile fibers and solvent extraction as applied to reprocessing nuclear fuels. Her current interests are homogeneous catalysis and oxidation reactions. **Major C. Thompson** (PhD, inorganic chemistry, Ohio State University, 1963) is a research staff chemist in the Separations Chemistry Division at Savannah River Laboratory. His work has been in the areas of synthesis of binary actinide compounds that are stable at high temperature, nuclear cross sections of transplutonium elements, and solvent extraction. His current interests focus on solvent extraction and associated chemistry.

PHOTOCHEMICALLY PRODUCED U(IV) AS A REDUCTANT FOR Pu(IV) AND APPLICATIONS IN NUCLEAR FUEL REPROCESSING

G. L. DePoorter
C. K. Rofer-DePoorter
S. W. Hayter

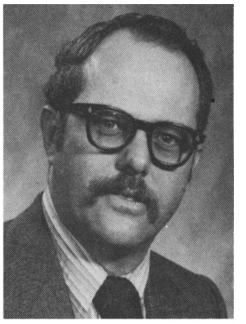




Gerald L. DePoorter (top) (BS, ceramic engineering, University of Washington, 1961; MS, mineral technology, University of California, Berkeley, 1963; PhD, mineral technology, University of California, Berkeley, 1965) has been working on chemical lasers and laser-induced chemistry at the Los Alamos Scientific Laboratory (LASL) since 1971. Currently on the staff of the Applied Photochemistry Division, he has been working most recently on photochemical applications to nuclear fuel reprocessing. For the academic year 1978-1979, he is on sabbatical leave to the Colorado School of Mines Department of Chemistry and Geochemistry. **Cheryl K. Rofer-DePoorter** (center) (AB, chemistry, Ripon College, 1963; MS, organic chemistry, University of California, Berkeley, 1964) has been working on the application of laser-induced chemistry to chemical processes in liquids at LASL since 1973. Currently a member of the staff of the Applied Photochemistry Division, she has been working most recently on photochemical applications to nuclear fuel reprocessing. For the academic year 1978-1979, she is on sabbatical leave to the Colorado School of Mines Department of Chemistry and Geochemistry. **Sidney W. Hayter** (bottom) (AA, chemistry, University of Chicago, 1942) has been a member of the technical staff of the Chemistry and Metallurgical Division of LASL since 1947. His work has primarily been the development of procedures for the recovery of uranium, plutonium, and americium from various processing residues.

REMOVAL OF ACTINIDES FROM SELECTED NUCLEAR FUEL REPROCESSING WASTES

James D. Navratil
Gary H. Thompson



James D. Navratil (photo not available) (PhD, chemistry, University of Colorado, 1975) is presently a staff member at the International Atomic Energy Agency, Vienna, in the Research and Laboratories Division, on leave from Rockwell International. His work has been in actinide chemistry and separations, analytical chemistry, chemical thermodynamics, and americium and plutonium processing. **Gary H. Thompson** (right) (PhD, chemistry, University of Utah, 1969) is employed by Rockwell International as manager of the Chemical Research Group at the Rocky Flats Plant. His work has been in actinide chemistry and separations and radioactive waste management.

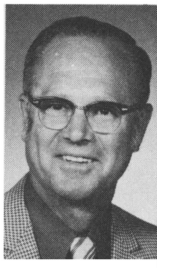
DESIGN AND OPERATIONAL CHARACTERISTICS OF HIGH-DENSITY FUEL STORAGE FACILITIES

E. A. Grimm

E. A. Grimm (MS, physical chemistry, University of Idaho, 1951) is manager of Fuel Storage Projects in the General Electric (GE) Nuclear Energy Group at San Jose, California. He has been involved in nuclear energy work with GE since 1951 and has participated in reactor design, construction, and startup testing at Hanford, Washington; Tarapur, India; Dresden, Illinois; and Brunswick, North Carolina. Since 1974, he has held engineering and project management positions with GE's reprocessing and fuel storage activities.

SUBSURFACE STORAGE OF COMMERCIAL SPENT NUCLEAR FUEL

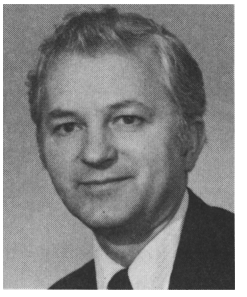
L. M. Richards
M. J. Szulinski



Lawrence M. Richards (top) (MA, chemistry, University of California, Los Angeles; PhD, organic chemistry, University of Wisconsin) has been chairman of the Department of Chemistry at the Stanford Research Institute. He was manager and vice president of research and development for Richfield Oil Corporation and was president of the Atlantic Richfield Hanford Company (ARCO) from 1967 to 1973. Prior to retiring in 1978, he was active in developing commercial nuclear projects for Atlantic Richfield and in strategic planning for ARCO Polymers. **Milton J. Szulinski** (BChE, Johns Hopkins University) has been active in nuclear energy since he was transferred to the University of Chicago by the E. I. duPont de Nemours Company in 1943. He worked with Hanford contractors until 1977, when he opened the Richland office for Science Applications, Inc. With Atlantic Richfield he was active in developing commercial nuclear programs.

SPENT FUEL STORAGE EXPERIENCE

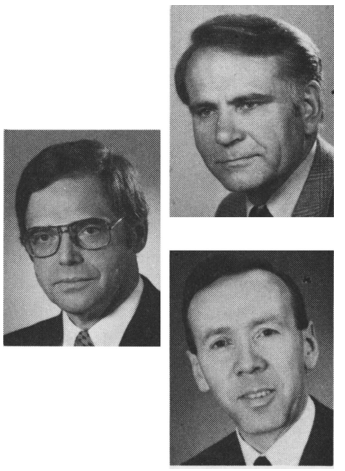
A. B. Johnson, Jr



A. B. Johnson, Jr. (PhD, fuel technology, University of Utah, 1958) is a staff scientist in the Materials Department at Battelle-Pacific Northwest Laboratories. His principal areas of work have been metallic corrosion in fission and fusion reactors, including activity transport and decontamination, tritium production and transport in fission and fusion, corrosion in dry cooling and solar, and spent nuclear fuel storage. He has lectured at the Joint Center for Graduate Study.

EXPERIENCE WITH THE USE OF RECYCLE PLUTONIUM IN MIXED-OXIDE FUEL IN LIGHT WATER REACTORS IN THE FEDERAL REPUBLIC OF GERMANY

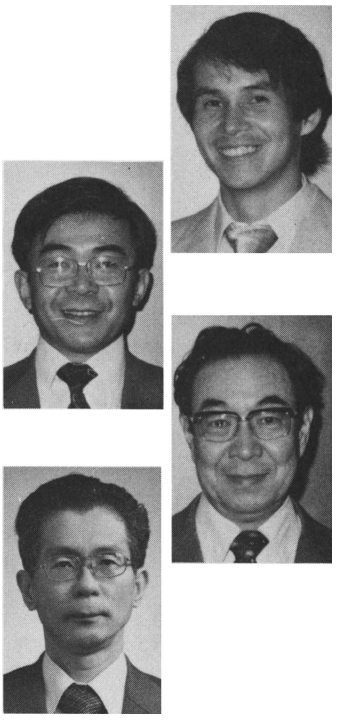
H. J. Schenk
K. L. Huppert
W. Stoll



Herbert J. Schenk (top) (Dr. rer. nat., physics, University of Stuttgart, 1955) is director of Kernkraftwerk Obrigheim GmbH, which built and has operated the nuclear power plant at Obrigheim since 1968. **Karl L. Huppert** (center) [PhD, chemistry (natural science), University of Karlsruhe] is a technical manager for plant operation of the Wiederaufarbeitungsanlage Karlsruhe, the German 35 ton/yr reprocessing pilot plant. He has been active in the fuel reprocessing field since 1964. **Wolfgang Stoll** (bottom) (Technical University of Vienna, 1946-1952) is technical manager of Alkem GmbH, which started industrial plutonium handling in the Federal Republic of Germany and which has been a leading manufacturer of plutonium-containing fuel since 1963.

A PROCESS CONTROL AND SAFEGUARDS SYSTEM PLUTONIUM INVENTORY CONTROL FOR MOX FUEL FACILITY

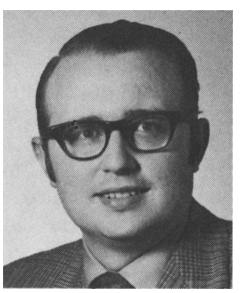
Tsuyoshi Mishima
Minoru Aoki
Tadashi Muto
Tsuyoshi Amanuma



Tsuyoshi Mishima (top right) (BS, nuclear engineering, Tohoku University, 1969) is a staff member of the Plutonium Fuel Division of Power Reactor and Nuclear Fuel Development Corporation (PNC) and is involved in the design of a new 15-ton fuel fabrication facility for the MONJU fast breeder reactor. He is working toward automation of process equipment as well as development of a safeguards system. **Minoru Aoki** (top left) (BS, applied physics, Tokai University, 1962) was a leader of the computer room for 13 years, where the present accountancy system of the plutonium facility was founded and developed, and is now deputy manager of the administration section of the Plutonium Fuel Division at PNC. **Tadashi Muto** (bottom right) (DSc, geology, University of Tokyo, 1951) has worked in the areas of refractory, uranium mineral, and ceramic fuels of uranium and plutonium and has led the plutonium fuel development programs of PNC as a division manager since 1975. **Tsuyoshi Amanuma** (bottom left) (D Eng, metallurgy, Kyoto University, 1944) has worked in the area of nuclear fuel since 1958 and developed a once-through refining process of uranium named the PNC process. He was a leader in the area of PNC's whole nuclear fuel development program for five years and is now a professor of nuclear engineering at Nagoya University.

THE EXXON NUCLEAR FUEL RECOVERY AND RECYCLING CENTER: PROCESS DESCRIPTION

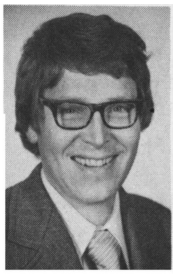
G. L. Ritter



G. L. Ritter (MS, chemical engineering, University of California, Berkeley, 1964) is manager of the Reprocessing Engineering Section at Exxon Nuclear Company, Inc. (ENC). He has worked at ENC since 1971 on a reprocessing plant project after spending several years at Hanford in various reprocessing and waste management assignments.

EXXON NUCLEAR FUEL RECOVERY AND RECYCLING CENTER FACILITY DESCRIPTION

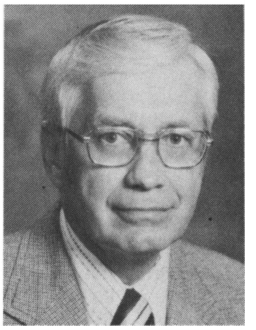
J. E. Birchler
H. L. Caudill



J. E. Birchler (top) (BS, chemistry, MS, nuclear engineering, Michigan Technological University) has been employed by Nuclear Fuel Services, Inc. and the Ralph M. Parsons Company. Since joining Exxon Nuclear Company, Inc., he has been involved with fuel reprocessing, facility, and process design. He is currently a project engineer, responsible for a spent fuel storage rack project. **H. L. Caudill** (BS, chemical engineering, Montana State University) has been involved in the design, construction, and operation of nuclear fuel reprocessing facilities since 1950. His primary area of interest is in Project Engineering and related Project activities. He is currently employed by Exxon Nuclear Company, Inc. as manager of Fuel Reprocessing Project Engineering.

A SAFETY ANALYSIS FOR THE NUCLEAR FUEL RECOVERY AND RECYCLING CENTER

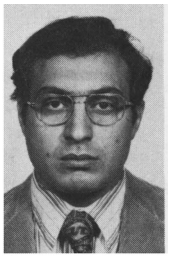
L. T. Lakey

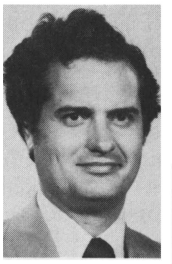


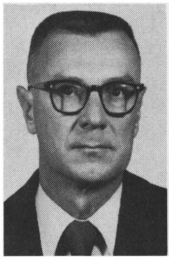
L. T. Lakey (BS, chemical engineering, Montana State University, 1948; MS, chemical engineering, University of Idaho, 1969) is manager of nuclear waste handling in the Nuclear Waste Technology Program Office with Battelle-Pacific Northwest Laboratories (PNL). Prior to joining PNL, he was a senior process engineer with Exxon Nuclear Company, Inc. His primary interests are nuclear waste management and safety.

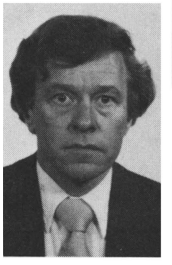
DYNAMIC MATERIALS ACCOUNTING IN THE BACK END OF THE LIGHT WATER REACTOR FUEL CYCLE

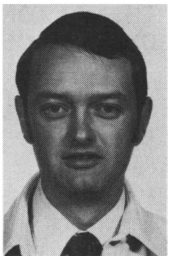
H. A. Dayem
D. D. Cobb
R. J. Dietz
E. A. Hakkila
J. P. Shipley
D. B. Smith









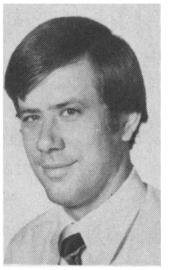


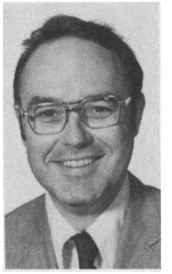
Hassan A. Dayem (top right) (PhD, nuclear engineering, University of Maryland, 1976) has performed research in the areas of reactor physics and neutral particle transport theory in the Safeguards Systems and Technology Transfer Group at Los Alamos Scientific Laboratory (LASL). His current interests are safeguards design and modeling and simulation techniques. **Donald D. Cobb** (top left) (PhD, physics, University of Iowa, 1970) has been an active participant in safeguards system design and development for the nuclear fuel cycle since joining LASL in 1976. He was previously employed by EG&G, Inc., where he developed atmospheric physics and radiation transport models for advanced nuclear explosion detection systems. **R. J. Dietz** (center right) (PhD, inorganic-nuclear chemistry, Massachusetts Institute of Technology, 1958) is group leader for the Safeguards Systems and Technology Transfer Group at LASL. His involvement in national defense and nuclear power programs has ranged from the evaluation of materials properties and separations techniques to the assessment of sensitive technologies. **E. Arnold Hakkila** (center left) (PhD, analytical chemistry, Ohio State University, 1957) has been employed in the Analytical Chemistry and Safeguards Groups at LASL since 1957. His areas of interest include x-ray fluorescence and absorption edge analysis, analytical chemistry of the actinides, micron area analysis, and safeguards systems design. **James P. Shipley** (bottom right) (PhD, electrical engineering, University of New Mexico, 1973) has been involved in research and development of nuclear and solar energy technologies since joining LASL in 1966. His current interests include the structure of safeguards systems and statistical techniques for analysis of materials accounting data. Dr. Shipley is alternate group

leader of the Safeguards Systems and Technology Transfer Group. **Darryl B. Smith** (right) (PhD, physics, University of New Mexico, 1968) has been involved in nuclear safeguards research at LASL since 1967. His current interest is the design and evaluation of nuclear materials measurement and control systems for nuclear fuel cycle facilities.

LIQUID WASTE HANDLING FACILITIES FOR A CONCEPTUAL LIGHT WATER REACTOR SPENT FUEL REPROCESSING COMPLEX

D. C. Witt
R. F. Bradley





D. C. Witt (top) (MS, chemical engineering, Purdue University, 1972) is a research engineer in the Separations Engineering Division at the Savannah River Laboratory (SRL). His work has been in the areas of nuclear waste evaporation, tank storage, and solidification. His current interest is the development of full-scale equipment for vitrification of nuclear waste. **R. F. Bradley** (PhD, chemical engineering, Vanderbilt University, 1966) is a research supervisor at SRL. His work has been in the areas of reaction kinetics, radiation chemistry, liquid-metal distillation, transplutonium process development, safety analyses, and both near- and long-term nuclear waste management. His current interest is the development of full-scale equipment for nuclear waste vitrification.

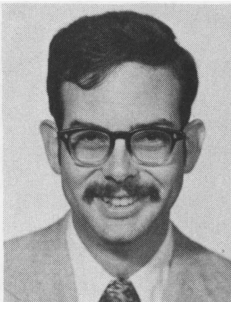
WIPED-FILM EVAPORATORS FOR EVAPORATING ALKALINE LIGHT WATER REACTOR RADIOACTIVE WASTES

C. B. Goodlett

C. B. Goodlett (BS, chemical engineering, Clemson University, 1954) is a member of the Separations Engineering Division of the Savannah River Laboratory. He has been engaged in the separations processes involved in processing radioactive nuclear fuel, with special interest in the handling of radioactive aqueous waste, since 1954. Presently, he is engaged in processes associated with the solidification of radioactive waste.

LEACH RATES OF HIGH ACTIVITY WASTE FROM BOROSILICATE GLASS

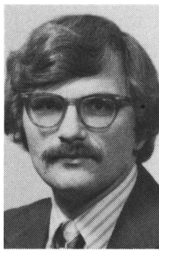
John R. Wiley



John R. Wiley (PhD, nuclear chemistry, Purdue University, 1974) has worked in the Long-Term Waste Management Program at Savannah River Laboratory since 1974. He has helped develop ion exchange methods to decontaminate alkaline waste solutions and has studied properties of borosilicate glass for solidifying high-level radioactive waste.

SOME ASPECTS OF THE THERMAL ANALYSIS OF METAL-ENCAPSULATED SPENT FUEL

L. J. Jardine
M. J. Steindler



Leslie J. Jardine (top) (PhD, nuclear engineering, University of California, Berkeley, 1972) worked in nuclear spectroscopy prior to joining the Chemical Engineering Division at Argonne National Laboratory (ANL) in 1975. He has been involved in fuel cycle studies, in the development of pyrochemical processes, and in the chemistry of liquid sodium. His current work involves the encapsulation of waste and spent fuel in a metal matrix and methods for fuel reprocessing with liquid-metal and fused salt systems. **Martin J. Steindler** (PhD, chemistry, University of Chicago, 1952) is associate director of the chemical Engineering Division at ANL and is responsible for nuclear fuel cycle programs. He has extensive experience in fuel reprocessing and in the chemistry of actinides and fission products. Some of his recent work includes studies dealing with geologic disposal of nuclear waste and the determination of waste properties.