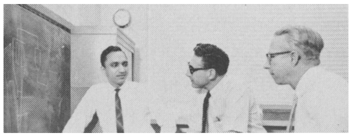
AUTHORS AND PAPERS

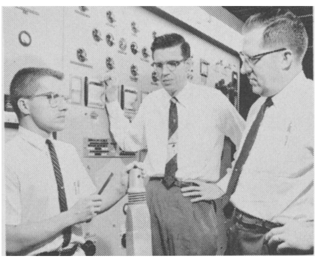
The highly condensed summaries of papers and technical notes (below) are intended to assist the busy reader in determining the order in which to read the technical material. Biographical comments are for human interest.



FLUID BED FLOURIDE VOLATILITY I

The large difference in volatility between UF_6 and the fluorides of fission product elements is the basis of a new process for recovering uranium from spent fuels. Bench-scale studies established that $>99\%$ of the uranium in the fuel can be recovered by separating the alloying metal as a volatile chloride, then fluorinating uranium to UF_6.

D. Ramaswami, N. M. Levitz, and A. A. Jonke, shown left to right, are engaged in the development of advanced methods for fuel reprocessing at the Chemical Engineering Division, Argonne National Laboratory. Dr. Ramaswami, who holds a D. Sc. degree from the Andhra University, India, and a Ph.D. from the University of Wisconsin, is an Associate Engineer at Argonne. Mr. Levitz, who holds a B.S. degree from the University of Illinois, is an Associate Engineer and Group Leader with long experience in fluidized-bed systems and fluorination processes. Mr. Jonke, who earned his M.S. at I.I.T., is a Senior engineer and Section Head in charge of fluoride volatility reprocessing and related studies.



FLUID BED FLOURIDE VOLATILITY II

The bench-scale studies in the preceding paper are taken a step further in a companion paper which describes a fluoride volatility pilot plant that has successfully demonstrated the recovery of uranium as UF_6 from unirradiated uranium-zirconium and aluminum-uranium alloy fuels. In tests involving the processing of up to 30 kg of simulated fuel, uranium recoveries of $>99\%$ were achieved. The volatile chlorides of aluminum and zirconium are converted to solid oxides for waste disposal.

For several years the authors have been engaged in process and equipment development in general and with fluoride volatility processes in particular. John T. Holmes (left) received his M.S. degree from the University of California (Berkeley). John Barghusen (center) holds a Ph.D. degree from Iowa State University, and Howard Stethers (right) has an M.S. degree from Virginia Polytechnic Institute.

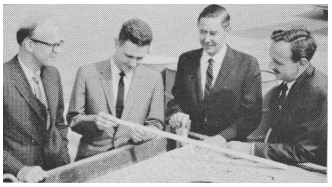
HYDROGEN REDUCTION OF Pu(V) TO Pu(III)

Gaseous hydrogen diluted with argon safely and directly reduces plutonium in a scheme which eliminates two-thirds of the oxides from aqueous Purex waste, simplifying treatment and disposal.

Robert Rainey is a chemist in the Chemical Technology Division at ORNL. He has specialized in developing nuclear fuel processing methods, including plutonium concentration and purification and americium recovery, and holds the patent on the Acid Thorex Process. Currently he is simplifying processes for recovering power reactor fuels.

NEUTRON AND GAMMA-RAY DIE-AWAY

Time-dependent spectra of thermal neutrons and capture gamma rays in a number of physically interesting heterogeneous rock-fluid systems have been obtained with a ^3He counter and a NaI detector. Although similar asymptotic behavior is observed with both detectors for a given material arrangement, early features of the spectra for most cases depend strongly on the type of detector used.



Techniques for using pulsed neutron sources in oilwell logging have recently received considerable attention at the Socony Mobil Field Research Laboratory. W. R. Mills (Ph.D., California Institute of Technology, 1955), L. S. Allen (M.S., Southern Methodist University, 1961), and R. L. Caldwell (Ph.D., University of Missouri, 1949) have provided the neutron physics research in this effort, Caldwell being Supervisor of the Nuclear Physics and Well Logging Section. Franz Selig (Ph.D., University of Vienna), Supervisor of Applied Mathematics, has provided the necessary mathematical support.

CHEMONUCLEAR OZONE PROCESS STUDY

The economics of a chemonuclear process for the production of ozone from a gaseous oxygen feed stream are evaluated parametrically. It appears that a G value of 9 at a steady-state co .centration of 0.1% ozone would make the chemonuclear process competitive with conventional ozonizers, indicating the need for research to determine if such yields are feasible.

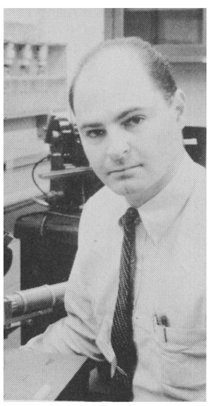
Morris Beller has had broad experience in chemical process design and plant evaluation of industrial cryogenic processes. Donald Goellner has performed extensive work in fuel cycle management and reactor design at BNL and is currently completing the requirements for a Ph.D. in Nuclear Engineering at MIT. Meyer Steinberg is presently supervising the Radiation Process Development Section in the BNL Nuclear Engineering Department. His primary interest over the past six years has been in the application of nuclear energy for the production of industrial chemicals, especially the fixation of nitrogen and the polymerization of ethylene.

^{244}Cm PRODUCTION AND SEPARATION

Successive neutron capture is used for the production of ^{244}Cm from ^{239}Pu at Savannah River. The curium product, isolated from intermediates and fission products in a separations process which has been successfully piloted, produces 2.65 watts of heat per gram.

Shown 1. to r., are H. J. Groh, J. A. Smith, R. T. Huntoon, F. H. Springer, and C. S. Schlea at the Savannah River Laboratory. Harry Groh (Ph.D., University of Rochester, 1952) has been concerned with the development of methods for purifying curium and preparing curium compounds for power sources. Dick Huntoon (M.S., Carnegie Institute of Technology, 1949) supervised the development of processes for fabricating the reactor fuel and target elements for producing curium, and presently is responsible for developing encapsulated heat sources. Carl Schlea (Ph.D., The Ohio State University, 1955) participated in the development of the radiochemical separations process for separating actinides from plutonium and fission products. Jim Smith (Ph.D., The Ohio State University, 1953) coordinated the physics design of the reactor lattices for producing curium. Fred Springer (M.S., Emory University, 1954) is a technical editor in the Technical Information Service at Savannah River.

DISPLACEMENT SPIKE EFFECTS



Earlier work by Boltax and others is confirmed in a study of fast neutron effects in copper-rich Cu-Fe alloys. Fast neutron irradiation can cause aging or re-solution depending on the pre-irradiation condition of the sample. The results obtained on aged samples are consistent with the displacement spike model where the calculated value for the spike radius is approximately 35 Å (15,000 atoms).

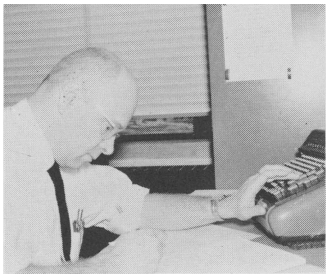
A. Boltax is Manager of Fuel Development at the Westinghouse Astronuclear Laboratory. His current responsibilities involve research and development of graphite-matrix fuel elements for nuclear rocket applications. Prior to joining Westinghouse in 1960, he was Group Leader and Project Manager at Nuclear Metals, Inc., where his work involved fabrication and development of metallic fuel elements and research on precipitation-hardening alloys and radiation effects. He received S.B. and Sc.D. degrees from MIT in physical metallurgy.

PREPARATION OF PuC PELLETS

Plutonium monocarbide pellets of 93% theoretical density were prepared by pressing and sintering techniques. Optimum sintering temperatures ranged from 1250 to 1400° C, depending on particle size. Binders decreased densities and increased carbon content.

Owen L. Kruger, Associate Metallurgist, has been engaged in development of plutonium bearing fuels for fast reactors since he joined the staff at Argonne National Laboratory in 1957. A search for high-temperature fuel materials led him to studies of the phase relationships and property measurements of plutonium ceramics, which have been his main interest over the past five years. He received his B.S. degree in Metallurgical Engineering from Illinois Institute of Technology in 1954.

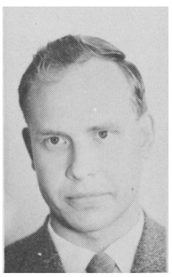
EXPONENTIAL CURRENT GENERATOR



Calibration and testing of reactor period meters have been subject to signal generator limitations. A generator with a range of three decades without switching, starting at 2.5 x 10^{-9} amperes, employs a photomultiplier tube in an unusual application. Six different current functions are available, representing reactor periods from 3.8 to 168 seconds in this particular design.

For the past five years James Talboy has been associated with the Reactor Operations Division of ANL. Prior to this he was with Bendix Research Laboratory in Detroit. His major interests are the physics and instrumentation of operating reactors. His Ph.D. (physics, 1956) and B.S. (1950) degrees are from Iowa State University.

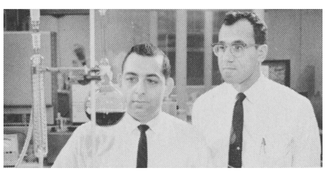
COMPARISON OF SHIELDING CALCULATIONS



Extensive neutron and gamma attenuation measurements have been performed in magnetite and ordinary concreate up to a depth of 2 meters to collect reference data for a study of the accuracy attainable by shield calculation methods. Experimental facilities and the configurations studied are described accurately enough to enable the reader to test his own methods against these measurements. Great weight has been laid upon absolute accuracy and a thorough error analysis.

Erkki Aalto is the Supervisor of the Shielding Group of the Swedish Atomic Energy Company, Stockholm, where he is in charge of research, development, and design of power reactor shielding. Prior to his present post he spent two years as Research Scientist (on shielding) at the Studsvik Research Center. He received a Dipl. ing. (1957) in civil engineering from the Finnish Institute of Technology, an M.S. degree (1960) in nuclear engineering from the University of Wisconsin, and a Tekn. Lic. (Ph.D.) degree (1964) in reactor physics from Chalmers University of Technology, Gothenburg.

MICRODETERMINATION OF RUTHENIUM



A selective method for microdetermination of ruthenium in uranium compounds permits determination of 0.2 μg of ruthenium. The limit of error in determining 10 μg is ± 10% at the 95% confidence level. It is possible to measure concentrations of 0.02 μg of ruthenium per gram of sample or even lower if sufficient sample is available.

Orlando A. Vita (left) is leader of a group specializing in analyses for process control and development programs at the Goodyear Atomic Corporation. He holds a B.S. Degree (chemistry, 1953) from the University of Pittsburgh. Charles F. Trivisonno is Supervisor of the Analytical Chemistry Department at GAC. His B.S. (chemical engineering, 1945) and M.S. (chemistry, 1948) degrees are from Case Institute of Technology. Both men are concerned with analytical methods for uranium, its compounds, and trace impurities encountered.