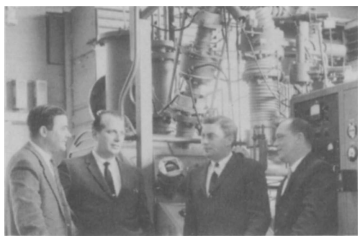
AUTHORS AND PAPERS

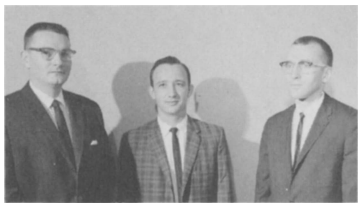
The highly condensed summaries of papers and technical notes (below) are intended to assist the busy reader in determining the order in which to read the technical material. Biographical comments are for human interest.



FABRICATION OF Ti-V ALLOY TUBING

Thin-walled small-diameter tubing of an alloy of vanadium and titanium (V-20wt% Ti) can be fabricated by extrusion. Compacted vanadium chip and titanium sponge rods are electron-beam melted, followed by arc melting of the ingot. Tube blanks are produced by a secondary extrusion operation. Finishing of the tube blanks is by swaging and drawing with intermediate vacuum anneals as required.

The authors, (left to right in photo) W. R. Burt, Jr., R. M. Mayfield, W. C. Kramer, and F. J. Karasek, are associated with the Foundry and Fabrication Group of the Metallurgy Division at Argonne National Laboratory. At present, their major efforts are directed toward developing techniques for the fabrication of high-quality small-diameter thin-wall tubing of exotic metals.



PYROLYTIC-CARBON-COATED FUEL PARTICLES

This paper emphasizes the structural features of pyrolytic carbon deposited on ceramic fuel particles in a fluidized bed. The carbon was formed by decomposing methane on UC particles. Variations in deposition temperature and in methane flow rate strongly influenced microstructure, density, crystallite size, and preferred orientation of the coatings. The microhardness of the coatings deposited at 1400°C varied by a factor of 3 over the range of methane flow rates employed.

J. L. Cook, F. L. Carlsen, Jr., and R. L. Beatty (shown left to right) are members of the Ceramics Laboratory of the Metals and Ceramics Division at Oak Ridge National Laboratory. Mr. Beatty (BS, Pennsylvania State University, 1961) was primarily responsible for the development of the equipment and procedures used in the coating process, while Mr. Carlsen (BS, Georgia Institute of Technology, 1958; MS, University of Tennessee, 1965) and Mr. Cook (BS, University of Tennessee, 1961) have been involved with the evaluation and property measurements.

FLUIDIZED-BED TUNGSTEN PROCESS

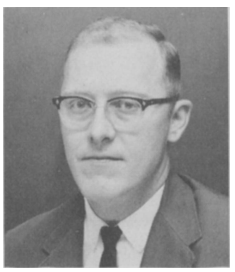
When tungsten hexafluoride undergoes hydrogen reduction in a fluidized bed of tungsten seed particles, a high-purity tungsten granular product results. A gas-pressure bonding technique was used to consolidate these granules into bars, which were then rolled to premium-quality sheet and strip.

The development of a fluoride-process tungsten metal was the result of the combined efforts of Battelle's Columbus Laboratories and the General Chemical Division of Allied Chemical Company. Shown in the top photo is J. H. Pearson (left), who supervised the overall program for Allied, while R. S. Park (right) followed the Battelle research. The research program was carried out under the supervision of J. M. Blocher. In the lower photo are (left to right) Blocher, Project Engineer J. H. Oxley, Principal Investigator E. A. Beidler, and Senior Technical Consultant C. J. Lyons.

TUNGSTEN-RHENIUM VAPOR DEPOSITION

Simultaneous hydrogen reduction of tungsten and rhenium hexafluorides was used in this study of the deposition of tungsten-rhenium alloys. Deposits formed on the inner wall of heated copper-deposition tubes through which the reacting gases passed. Under the conditions studied, nonuniform deposits having higher rhenium content near the inlet to the reaction zone than farther downstream were noted. Homogeneity was improved by using argon with the reacting gases.

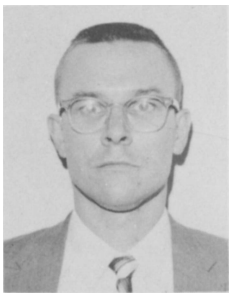
C. F. Leitten, Jr. (BS, University of Notre Dame, 1954; MS, University of Tennessee, 1960), shown on the left, is head of the Metal Forming and Casting Group of the Metals and Ceramics Division of Oak Ridge National Laboratory, where he has made notable contributions to the development of dispersion-type fuel elements and control-rod-material technology. J. I. Federer (BS, University of Kentucky, 1954) is on the staff of the Metals and Ceramics Division of Oak Ridge National Laboratory, where he has been engaged in applied research on stress-corrosion cracking of stainless steels, pyrometallurgical reprocessing methods for nuclear fuels, capsule fuel irradiation, diffusion in metals and ceramics, and thermochemical deposition of refractory metals and alloys.



THERMOCHEMICAL DEPOSITION OF UO_2

Thermochemical reduction of uranium halides is being investigated at ORNL as a means of fabricating high-density refractory uranium compounds for fuel element applications. A one-step conversion of uranium hexafluoride to uranium dioxide has been effected by combining the uranium hexafluoride with hydrogen and oxygen at elevated temperatures and reduced pressures. It is anticipated that the process might be optimized for fuels having high enrichments or for reprocessing contaminated fuels, thus giving more-efficient controlled conversion to a desired form.

R. L. Heestand (BS, Ohio State University, 1953) joined the staff of Oak Ridge National Laboratory in 1957 and conducted fuel-element-fabrication studies for the Experimental Gas Cooled Reactor. In 1960, Mr. Heestand joined High Temperature Materials, Incorporated, as senior staff member conducting investigation in high-temperature pyrolytic processes. In 1961 he returned to ORNL and has been engaged in development of pyrolytic processes for fabrication of high-temperature nuclear fuel elements. Biographical material on C. F. Leitten, Jr. appears above in the section describing a paper on tungsten-rhenium alloy, for which he was also a coauthor.



GRAIN-GROWTH SUPPRESSION

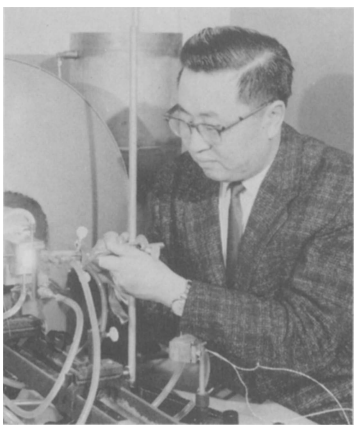
Electropolishing removal of the layer of small equiaxed randomly oriented grains of tungsten initially deposited during the hydrogen reduction of WF_6 eliminates variance in subsequent grain-growth behavior in the overlying columnar crystals.

The authors, A. F. Weinberg (PhD, Illinois Institute of Technology, 1960), J. R. Lindgren (BS, Michigan College of Mining and Technology, 1952), N. B. Elsner (BS, Virginia Polytechnic Institute, 1955), shown left to right in the group photo, and R. G. Mills (MS, Rutgers University, 1954), shown above, are all members of the Metallurgy Department of the General Atomic Division of the General Dynamics Corporation. This work was conducted while all the authors were members of the Material and Fabrication Development Group in support of the Direct Energy Conversion Project.

CHLORINATION OF BENZENE

This work confirms previous studies of the radiation-induced reaction between benzene and chlorine in the liquid phase. The reaction was found to be a chain reaction, first order with respect to chlorine concentration, resulting in the formation of a mixture of the stereoisomers of 1, 2, 3, 4, 5, 6-hexachlorocyclohexane.

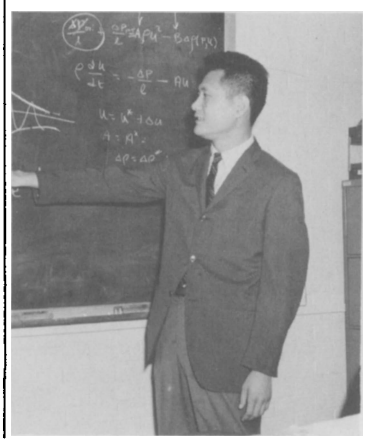
R. E. Faw (PhD, University of Minnesota, 1962) is Assistant Professor of Nuclear Engineering at Kansas State University, where his research interests are in the fields of radiation chemistry and radiation shielding. H. S. Isbin (DSc, Massachusetts Institute of Technology, 1947) is Professor of Chemical Engineering at the University of Minnesota and is presently on sabbatical leave at Euratom, CCR, Ispra, Italy. His primary research interests are in radiation chemistry and heat transfer. J. M. McCabe (PhD, University of Minnesota, 1961) has been with Eastman Kodak Company, where his research has been in the technology of magnetic tape and in the development of techniques for improving instrumentation tape.



LIQUID-METAL BOILING HEAT TRANSFER

This paper reviews the major progress in experimental and analytical investigations of boiling heat transfer with liquid metals, the evidence of agreements and disagreements between different investigators, and the difficulties in areas caused by lack of information, and it presents recommendations for future work. The trend of the literature, for practical reasons, leans toward seeking answers to specific applications rather than understanding of the boiling mechanism.

Y. S. Tang is a principal scientist in the Research Activity of Allison Division of General Motors where, since the Fall of 1959, he has been working primarily on space-oriented heat-transfer projects and recently has written on boiling liquid metals and two-phase flow. holds a BSME from the Chinese National Central University (1944), MSME from the University of Wisconsin (1948), and PhD in Chemical Engineering from the University of Florida (1952).



EFFECTIVE RESONANCE TEMPERATURE

The effective resonance temperature (T_{eff}) correlation of UO_2 pellets, based on experimental power-coefficient data from several PWR cores, can predict the total power defect of reactivity from hot zero power to full power, within experimental uncertainties, and T_{eff} at any power level within $\pm$ 80°F.

W. T. Sha (PhD, Columbia University, 1964) joined Westinghouse Atomic Power Division in 1960 and is now a senior scientist in the Nuclear Developments Group, where he has concentrated in the field of nuclear core design. This is his second contribution to NUCLEAR APPLICATIONS. He was a coauthor of a paper on void fraction determination, which appeared in our first issue.

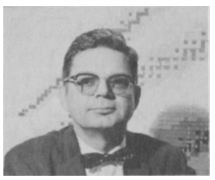
SAFE SLAB TANK FOR ENRICHED URANIUM

The nuclearly safe slab tank described in this work is the most recent of a number of important contributions in the field of nuclear safety originating at the Oak Ridge Gaseous Diffusion Plant. The new 1.7-in.-thick nuclearly safe triangular-slab tank is used with liquid honing machines to remove surface coatings of enriched uranium from equipment components removed for maintenance.

C. E. Newlon (MS, Columbia University), shown on the right in the top photo, is a Senior Technical Engineer of the ORGDP Nuclear Safety Staff, and he has received wide recognition for his computational work on neutron interacting arrays. R. J. Clouse (MS, University of Tennessee), shown alone, was Assistant Head of the ORDGP Chemical Operations before assuming his present duties as Supervisor of Uranium Chemical Operations with Kerr-McGee Oil Industries, Oklahoma City, Oklahoma. In his work at ORGDP, Clouse was responsible for supervising and training employees in the nuclear safety aspects of recovering and processing highly enriched uranium materials. A. J. Mallett, left in top photo (MA, Columbia University), Head of the ORGDP Nuclear Safety Department, Plant Engineering Division, is now actively engaged in the development and testing of shipping containers for radioactive materials.

LIQUID-SCINTILLATION RATE CONSTANTS

Absolute rate-constant values for fluorescence and fluorescence quenching in toluene and toluene-base scintillator solutions were obtained in this work by using a method of measuring absolute numbers of photons from beta-particle-induced fluorescence of liquids. Fluorescence efficiencies, based on the average number of fluorescent-state toluene molecules produced by beta particles from ^{14}C, were obtained.



H. R. Lukens, Jr., has been a member of the Activation Analysis Service group at General Atomic since 1962, where he is responsible for several research projects and TRIGA reactor-based analyses. He entered the field of radiochemistry in 1948 when he joined Tracerlab's Western Division and continued in this field at Shell Development from 1955 to 1962. He was worked primarily in the areas of activation anaylsis, radiochemistry, liquid scintillation counting, and radiotracer studies in organic, physical, and petroleum chemistry.

CARRIER-FREE ^{132}Cs and ^{129}Cs

A recoverable thallous iodide target and 35-MeV alphas are used in the production of carrier-free ^{132}Cs and ^{129}Cs through the $^{129}I(\alpha,n)^{132}Cs$, $^{129}I(\alpha,4n)^{129}Cs$, and $^{127}I(\alpha,2n)^{129}Cs$ reactions. This procedure permits upper limits for the production yields of these isotopes of 25 C / (A h) for ^{132}Cs and 2 mc / (A h) for ^{129}Cs.

For several years the authors have been engaged in nuclear chemistry research in the Isotopes Research Group at BNL. In addition to work of a fundamental nature, this group also seeks to develop ways of making available potentially useful, but otherwise unavailable, isotopes. Virginia Harris Wilson has an MS degree (1961) from Ohio University (Athens). Manny Hillman, (left in photo) leader of the group, and William Bishop, (shown on right in photo) received their PhD degrees from Washington University (1953) and the University of Florida (1961), respectively.