Los Alamos National Laboratory
# The Actinide Research Quarterly
Nuclear Materials Research and Technology
a U.S. Department of Energy Laboratory

## In This Issue



## Organizers Issue an Invitation to


The second of a series of international conferences on plutonium will be held in Santa Fe, NM, this summer, July 10–13. It follows the highly successful 1997 conference, "Plutonium Futures - The Science," which attracted over 300 participants representing 14 countries. The U.S. participants, who made up about 70 percent of the total participants, came from Department of Energy national laboratories and a score of universities and industries. As in 1997, the conference is sponsored by the Los Alamos National Laboratory in cooperation with the American Nuclear Society.

From the beginning, the conference organizers recognized that there are a multitude of issues surrounding plutonium and other actinides and that both short- and long-term solutions to managing the global nuclear materials threat rest ultimately on the scientific and technological knowledge base. Thus, one of the main objectives of the conference is to provide an opportunity to present and assess our current understanding of plutonium and actinide sciences and to focus on the science needed for solving important national and international issues associated with plutonium. Another equally important objective is to inform the public, our stakeholders as well as the scientists, and to attract today's students who will carry on the task of solving the nuclear issues into the next century.

We are pleased to present the preliminary conference program in this issue of *Actinide Research Quarterly*. As in the first conference, we have an exciting collection of some 180 invited and contributed papers with topics ranging very broadly in materials science, transuranic waste forms, nuclear fuels and isotopes, separations, actinides in the environment, detection and analysis, actinide compounds and complexes, and condensed matter physics of actinides. These papers, presented in separate oral and poster sessions, will give attendees a chance to learn about current research outside of their particular specialties and provide an opportunity for interdisciplinary discussions among the participants.

For this year's conference program, two striking features to be noted are a dramatic increase in international papers and a significantly increased number of students who have contributed papers. Both aspects of this conference are welcome developments after extensive efforts by the organizers and a few support staff at Los Alamos who have communicated with colleagues worldwide.

With the presentation of the conference preliminary program in *Actinide Research Quarterly*, the organizers also wish to acknowledge the Basic Energy Science Office of Department of Energy for providing funds for the students' participation and the Associate Laboratory Directorates for Nuclear Weapons and Threat Reduction at Los Alamos for their generous support of the conference. Hope to see you all at the conference in July.

Conference Program Co-Chairs
*K. C. Kim and Sam Pillay*

# $^{238}$Pu Aqueous Processing Line Will Provide New NMT Capability

This article was contributed by **M. E. Pansoy-Hjelvik** (NMT-9). Others involved in this work are **J. Laurinat** (WSRTC) and **J. Nixon, J. Brock, G. Silver, M. A. Reimus** and **K. B. Ramsey** (NMT-9).

A $^{238}$Pu aqueous scrap recovery glove box line is being built at the TA-55 Plutonium Facility with an annual throughput capacity of several kilograms $^{238}$Pu. This new capability within NMT Division is anticipated to be in operation by fiscal year 2001 and further supports NMT's role as a lead DOE facility for plutonium processing.

The aqueous line is designed to purify $^{238}$Pu-oxide ($^{238}PuO_2$) fuel, used in the fabrication of general-purpose heat sources (GPHS) or light-weight radioisotope heater units (LWRHUs). The heat sources supply the thermal energy used in thermoelectric generators to power spacecraft for deep space missions and to heat critical components in the cold environs of space. The Power Source Technologies Group, NMT-9, has manufactured LWRHUs for use in the NASA space program for approximately 20 years (see Fig. 1). More recently, Los Alamos manufactured the GPHSs to power the spacecraft in the Cassini mission to Saturn (See *Actinide Research Quarterly*, Fall 1996 and Summer 1997).

The purification of $^{238}PuO_2$ is necessary because of unacceptable levels of $^{234}$U and other impurities in scrap fuel. Impurities at levels above GPHS and LWRHU specifications may impair the performance of the heat sources. The purification involves a nitric acid / hydrofluoric acid reflux of the oxide powder, followed by oxalate precipitation and filtration. In cases where the $^{238}$Pu material contains gross levels of impurities, it is necessary to treat it through the nitrate anion exchange process before the oxalate precipitation step. Plutonium-238 recovered from other material and various waste forms will eventually be processed through the aqueous line. With the expected high levels of impurities in this material, nitrate anion exchange becomes an important unit operation in the $^{238}$Pu aqueous scrap recovery line. The bench-scale experimental efforts in performing nitrate anion exchange for $^{238}$Pu purification are summarized in this article.

Previous research at Los Alamos in collaboration with Reilley Industries focused on producing an anion exchange resin with increased safety and high-loading-capacity characteristics. This work led to the formulation of the polyvinylpyridine-based Reillex-HPQ resin. The studies showed the resin to be resistant to radiolytic and thermal degradation and to display comparable or superior sorption kinetics in comparison to several other polystyrene-based resins used for actinide purification. Based on these studies, the Reillex-HPQ anion exchange resin was chosen for $^{238}$Pu aqueous processing.

Bench-scale experiments are being conducted to demonstrate that high levels of impurities are separated from $^{238}$Pu solutions using Reillex-HPQ resin, and to determine if chemical pretreatment is necessary to maintain the $^{238}$Pu in the (IV) oxidation state. The results of the bench-scale experiments also determine the baseline operation method to be used for the full-scale process. Other work in collaboration with Westinghouse Savannah River Technology Center (WSRTC) involves heat transfer calculations to determine the thermal gradients expected during ion exchange processing.

It is the Pu(IV)-hexanitrato complex in 7 molar (M) nitric acid that sorbs onto the Reillex-HPQ resin during ion exchange. Maintaining all of the Pu in the (IV) tetravalent state is difficult because of the high oxidizing environment that develops in 7 M nitric acid containing $^{238}$Pu. Most of the plutonium in 7 M nitric acid is expected to exist in the Pu(IV) tetravalent state. However, the high alpha activity of 17 Ci / gm $^{238}$Pu results in an increased oxidizing environment (more oxidizing radiolysis products), which results in the formation of Pu(VI). The hexavalent state weakly sorbs to the resin leading to Pu breakthrough in the effluent waste solutions and low ion exchange efficiencies.

Our bench-scale studies show that chemical pretreatment is important for maintaining $^{238}$Pu in the (IV) valence state. Greater than 99% efficiencies using 3 to 5 grams of $^{238}$Pu in nitric acid solutions have been achieved with chemical pretreatment. Chemical pretreatment was accomplished using urea, ferrous ammonium sulfate, and sodium nitrite. Similar results were obtained using ferrous sulfamate instead

of ferrous ammonium sulfate. Without chemical pretreatment a large percentage of $^{238}Pu$ is lost to the effluent and wash streams, most likely as the Pu(VI) species.

The results of experiments in which the $^{238}Pu$ solution had been spiked with high levels of GPHS impurities showed that decontamination factors as high as $10^3$ are achievable.

The heat transfer calculations determined the maximum bed temperature during loading, washing, or elution for normal column (continual flow) operation and the equilibrium temperature for no flow through the column. The constants in the calculations were 75 grams of $^{238}Pu$ loaded onto 1.6 liters of resin in a 3-inch-diameter Pyrex column. The parameters varied were $^{238}Pu$ concentration, flow rate, and temperature of the Pyrex column outside wall. The results of the heat transfer calculations indicate that under full-scale operating conditions, the maximum resin bed temperature does not exceed 60°C. The operation of ion exchange columns below this temperature is deemed safe in safety review studies of ion exchange columns in nuclear processing. The results of the heat transfer calculations are available, as necessary, for process hazards analysis of the full-scale ion exchange operation.

The heat transfer calculations were based on a previous study at WSRTC in support of the $^{238}Pu$ production campaign to provide material to Los Alamos National Laboratory for heat source fabrication. The heat transfer calculations were performed using a computer code that incorporated models for absorption and elution of $^{238}Pu$, and for forced and natural convection within the resin bed.

Other efforts include current work to develop the separation of fractional levels of thorium from $^{238}Pu$ solutions utilizing a mixture of, for example, 0.007 M hyrofluoric acid and 0.45 M nitric acid as the eluant. The method of using 0.007 M hydrofluoric acid and 0.45 M nitric acid was developed by F. Marsh at Los Alamos. Some impure $^{238}PuO_2$ fuel sources are expected to have high levels of thorium, which must be decreased to below the GPHS specification of 0.5% during the purification process. In the past this has proven to be difficult because some thorium sorption occurs during ion exchange.

A major effort is also underway to qualify all of the experimental methodology developed during bench-scale work for the full-scale operation. This includes the comminution, dissolution and filtration, ion exchange, and oxalate precipitation processes.

The $^{238}Pu$ aqueous scrap recovery line provides a unique capability for the aqueous purification of $^{238}Pu$ heat sources as well as aqueous processing of $^{238}Pu$ recovered from other material and various waste forms.

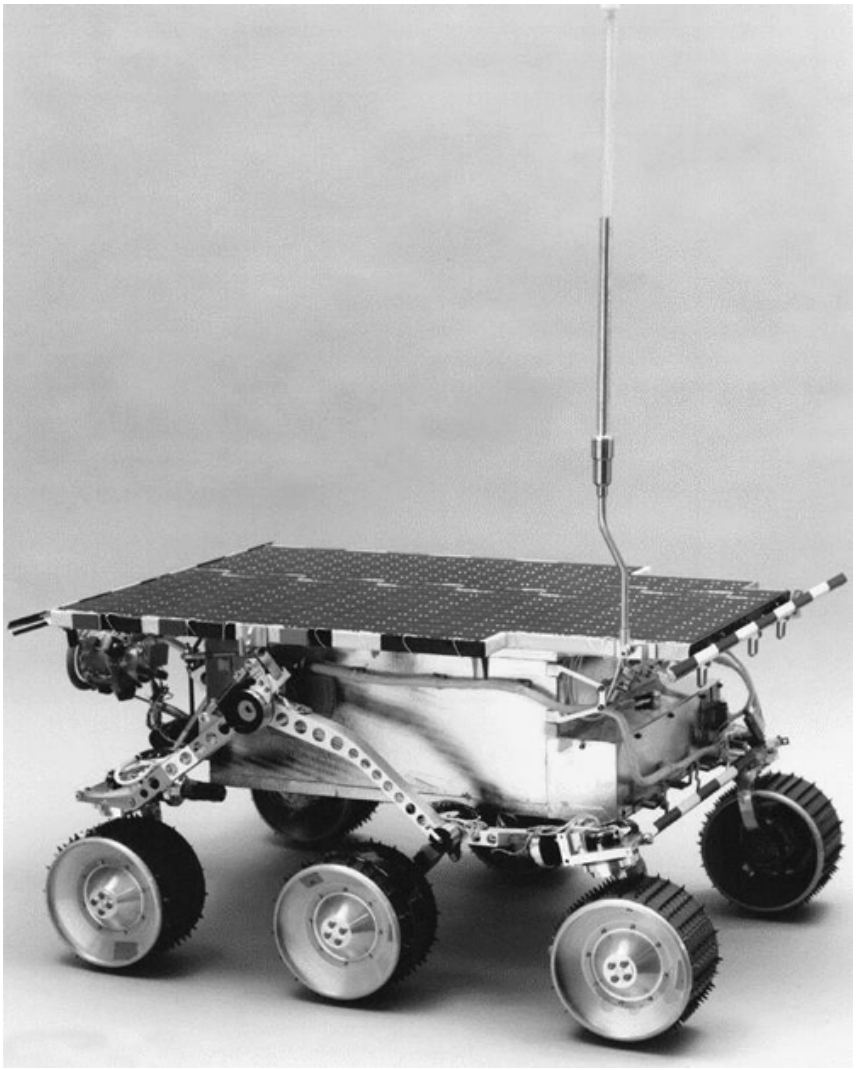


*Figure 1. The $^{238}Pu$ aqueous recovery glove box line is being built at the TA-55 Plutonium Facility. It is designed to purify $^{238}PuO_2$ used in the fabrication of heat sources that supply thermal energy to power spacecraft for deep space missions and to heat critical components in the cold environs of space. Three such heat sources were used on this Mars Pathfinder Rover to keep electronic equipment within normal operating temperatures.*

# Transactinium Science Needs Educational Rearmament—A Strategic Reinvestment for the Nation

This editorial was contributed by **David L. Clark,** (Director, G. T. Seaborg Institute), NMT-DO.

The opinions in this editorial are the author's. They do not necessarily represent the opinions of Los Alamos National Laboratory, the University of California, the Department of Energy, or the U.S. government.

Transactinium science deals with the chemical, physical, and nuclear properties of a large group of elements ranging from thorium through lawrencium (the actinides), and rutherfordium through the most recently discovered element with atomic number 118 (the transactinides). (See Fig. 1.) This group of transactinium elements, which comprises about 21% of the elements in the periodic table, is unique because most of these elements are man-made (with the exception of the first three members—thorium, protactinium, and uranium). The remaining elements are either synthesized by neutron irradiation of uranium or are produced in atom amounts by bombardments with heavy ions. Another common characteristic of these elements is that they are all radioactive, which makes their study a particularly difficult and highly specialized field of science. To perform measurements on highly radioactive materials requires special facilities, instrumentation, and training for their safe handling. In total, these characteristics distinguish transactinium science from other research fields.

A knowledge of transactinium science continues to be essential to the U.S. and central to the mission of the DOE, including national defense, energy, environmental restoration, and radioactive waste management. The U.S. has not had a long-range policy for the development of nuclear power or nuclear fuels. However, with the growing shortfall of fossil fuels, the recognition of greenhouse warming, and the environmentally destructive effects of burning coal, it is virtually certain that nuclear energy will assume a greater role in the nation's energy policy in the future. Moreover, it is clear that nuclear weapons technology will continue to play a key role in national defense policy for the foreseeable future.

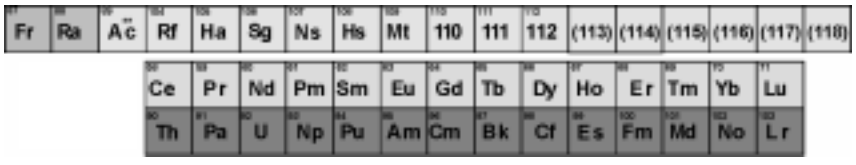



*Figure 1. Transactinium elements in the periodic table.*

Knowledge and expertise in the production, processing, purification, characterization, analysis, and disposal of transactinium elements is essential to U.S. national security. Even if no new radioactive or transactinium waste were generated, a host of DOE sites require assessment, cleanup and closure. Our nation's future therefore requires a core capability and expertise in transactinium science that will allow future decisions in defense and energy policy to be made based on sound technical understanding and expert judgement developed through theory, experiment, and simulation.

DOE and its predecessors (Manhattan Project, AEC, ERDA) have a half-century-long historical commitment and tradition of leadership in transactinium science. Of real concern, however, is the recognition that the academic component of the field of transactinium science is small and shrinking, with the majority of research faculty nearing retirement. The impending manpower shortage will soon affect all aspects of government and industrial nuclear science and technology. At the national laboratories, for example, we recognize that a large fraction of Laboratory staff will retire within the next decade. The field of transactinium science is becoming subcritical at a time when its core competence is crucial for our nation's industrial, environmental, and scientific survival. It is *strategically important* that all of us involved in the science and technology of nuclear materials take on a more active role in transactinium science education.

J. Robert Oppenheimer recognized the strategic value of nuclear science education in 1943 when he initiated weekly technical colloquia (see Fig. 2.) to teach Laboratory staff about the disparate scientific fields that had to cooperate to produce the first atomic weapons.

In order to ensure the future of nuclear science and technology at the Laboratory, we must recapture Oppenheimer's seminal philosophy of teaching our colleagues and our students about the science and technology of nuclear materials. This type of educational rearmament should include new educational

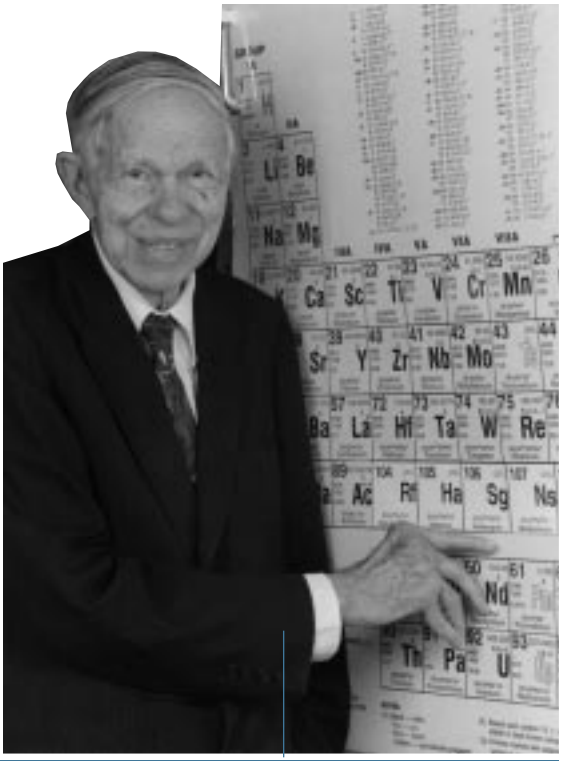
programs for our current Laboratory employees, enhanced interactions with colleges and universities, and improved student opportunities (at all levels) at the Laboratory. The need for educational rearmament goes far beyond the future requirements of the Laboratory. Nobel Laureate Glenn T. Seaborg (See Fig. 3.) argued in 1991:

*Figure 2. This famous historical photograph shows an early postwar scientific colloquium at Los Alamos. Seated from left to right are Norris Bradbury, Robert Oppenheimer, John Manley, Richard Feynman, Enrico Fermi, and J. Kellog.*

*Figure 3. Nobel Laureate Glenn T. Seaborg (1913–1999), co-discoverer of the element plutonium, points to element 106—Seaborgium—recently named in his honor. Seaborg devoted his career to nuclear science education.*

"Our once unchallenged preeminence in commerce, industry, science and technological innovation is being overtaken by competitors throughout the world…the educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a Nation and as a people.…If an unfriendly foreign power had attempted to impose on America the mediocre educational performance that exists today, we might well have viewed it as an act of war. As it stands, we have allowed this to happen to ourselves…. We have, in effect, been committing an act of unthinking, unilateral educational disarmament."

We must act now to begin an educational rearmament at the Laboratory in order to help provide an adequate pool of scientists and engineers with the quality and breadth of knowledge to meet the changing needs of the nation. At Los Alamos, for example, our Laboratory mission is to enhance global security by ensuring confidence in the safety, reliability, and performance of U.S. nuclear weapons without testing; develop technical solutions to reduce the threat of weapons of mass destruction; and remediate the environmental and nuclear materials legacy of the Cold War. However, no program of nuclear stewardship can be better than the quality of the scientists and engineers doing the work and providing the necessary leadership. Transactinium science education is therefore strategically important for the nation.



# PLUTONIUM FUTURES—THE SCIENCE
## PRELIMINARY PROGRAM

### SUNDAY, JULY 9, 2000

**Conference Registration**
La Fonda Hotel Mezzanine
12:00–8:00 P.M.

**Tutorial Session**

Session Chair: David L. Clark
La Fonda Hotel, 1:30–5:00 P.M.

Welcome
Fundamentals of Nuclear and Radiochemistry
Introduction to Chemistry and Physics of Plutonium
Overview of the Nuclear Fuel Cycle

**Conference Reception**

La Fonda Hotel Mezzanine, 6:00–8:00 P.M.

### MONDAY, JULY 10, 2000

**Conference Registration**
La Fonda Hotel

**Plenary Session**

Session Co-Chairs: Timothy G. George & Bruce Matthews
La Fonda Ballroom, 8:00 A.M.–12:00 P.M.

**John Browne**
Director, Los Alamos National Laboratory
Welcome

**Nikolai Ponomarev-Stepnoi**
Academician, Russian Research Centre, Kurchatov Institute

**Ernest J. Moniz**
Undersecretary of Energy, U.S. Department of Energy

BREAK

**Leo Brewer**
Department of Chemistry, University of California
"How to Develop New Materials"

**Vladimir Onoufriev**
International Atomic Energy Agency
"Status and Trends in Plutonium Recycling in Nuclear Power Reactors"

**Siegfried S. Hecker**
Los Alamos National Laboratory
"Fundamentally, Why Is Plutonium Such an Unusual Metal?"

## I. Materials Science/ Nuclear Fuels

La Fonda Ballroom, 1:30–5:00 P.M.

**Self-Irradiation of Pu, Its Alloys and Compounds**
L. F. Timofeeva
(GNC RF A.A. Bochvar's VNIINM, Russia)

**Modeling of Delta-Phase Stabilization and Compositional Homogenization in Pu-1 Wt. % Ga Alloys**
J. N. Mitchell, F. E. Gibbs, T. G. Zocco, R. A. Pereyra
(Los Alamos National Laboratory)

**Radiation Resistance of Gadolinium Zirconate Pyrochlore**
S. X. Wang[1], L. M. Wang[1], R. C. Ewing[1], K. V. Govidan Kutty[2], W. J. Weber[3]
([1]University of Michigan, [2]Indira Gandhi Centre for Atomic Research, India,
[3]Pacific Northwest National Laboratory)

**Plutonium Stabilization in Zircon: Effects of Self-Radiation**
W. J. Weber[1], N. J. Hess[1], R. E. Williford[1], H. L. Heinisch[1], B. D. Begg[2], S. D. Conradson[3], R. C. Ewing[4]
([1]Pacific Northwest National Laboratory, [2]Australian Nuclear Science and Technology Organisation, Australia, [3]Los Alamos National Laboratory, [4]University of Michigan)

BREAK

**Inert Matrix Fuels for Incineration of Plutonium and Transmutation of Americium**
Hj. Matzke
(European Commission, Joint Research Centre, Institute for Transuranium Elements, Germany)

**Capability of the MIMAS Process to Convert the Stockpiles of Separated Plutonium into MOX Fuel for Use in LWRs**
P. Deramaix, Y. Vanderborck, W. Couwenbergh
(Belgonucleaire S.A.)

**Some Less Conventional Options for Plutonium Disposal**
W. Stoll
(Germany)

## Plenary Speakers & Invited Guests Panel Discussion —All Participants

Panel Chair: Paul Cunningham
La Fonda Ballroom, 7:00–9:00 P.M.

TUESDAY, JULY 11, 2000

## II. Condensed Matter Physics

La Fonda Ballroom, 8:30 A.M.–12:00 P.M.

**The Electronic Structure and Elastic Properties of the Actinide Chalcogenides (U,Np,Pu,Am): The Puzzle of AmTe**
**P. Wachter[1], M. Filzmoser[1], J. Rebizant[2]**
([1]Laboratorium für Festkörperphysik, ETH Zürich, Switzerland
[2]European Institute for Transuranium Elements, Germany)

**Phase Transitions in Plutonium: New Insights from Diffraction**
A. C. Lawson[1], B. Martinez[1], J. A. Roberts[1], R. B. Von Dreele[1], J. W. Richardson, Jr.[2], A. Mehta[3], J. Arthur[3]
([1]Los Alamos National Laboratory, [2]Argonne National Laboratory,
[3]Stanford Synchrotron National Laboratory)

**Magnetic Properties Of $Pu_{(1-x)}$ $Am_x$ Solid Solutions**
M. Dormeval[1], N. Baclet[1], J. Fournier[2]
([1]CEA-Centre de Valduc, France, [2]Université Joseph Fourier LEG-INPG, France)

**X-ray Magnetic Scattering from Transuranium Systems**
G. H. Lander[1], D. Mannix[1,2], R. Caciuffo[3], N. Bernhoeft[4], P. Normile[5], W. G. Stirling[5], E. Lidström[2], A. Hiess[6], C. Vettier[2,6], F. Wastin[1], and J. Rebizant[1].
([1]European Commission, JRC, Institute for Transuranium Elements, Germany, [2]European Synchrotron Radiation Facility, France, [3]Università di Ancona, Italy, [4]Dépt. de Recherche Fond. sur la Matière Condensée, France, [5]Physics Dept., UK, [6]Institut Laue Langevin, France)

**BREAK**

**The Stabilization of fcc Plutonium: A Solid-State-Solution-Like Phase of Stable and Fluctuating Configuration Plutonium**
B. R. Cooper
(West Virginia University)

**Electronic Structure of α- and δ-Pu from PES Measurements**
A. J. Arko, J. J. Joyce, L. Morales, J. Wills, J. Lashley
(Los Alamos National Laboratory)

**Resonant Ultrasound Studies of Pu**
**A. Migliori, J. P. Baiardo, T. W. Darling, F. Friebert, B. Martinez, H. Roder, D. A. Dimitrov**
(Los Alamos National Laboratory)

## Poster Session

Session Co-Chairs: Sandra Mecklenburg & David E. Hobart
La Fonda Santa Fe Room, New Mexico Room, & Mezzanine, 1:30–5:00 P.M.

WEDNESDAY, JULY 12, 2000

## III. Actinides in the Environment/ Separation and Analysis

La Fonda Ballroom, 8:30 A.M.–12:00 P.M.

**Aquatic Chemistry of Actinides: Is a Thermodynamic Approach Appropriate to Describe Natural Dynamic Systems?**
J. I. Kim
(Forschungszentrum Karlsruhe, Institut für Nukleare Entsorgungstechnik, Germany)

**Sorption of Plutonium onto Clinoptilolite (Zeolite) Colliods**
N. L. Hakem, A. Brachmann, M. Zavarin, A. B. Kersting
(Lawerence Livermore National Laboratory)

**Actinide (Pu, U) Interactions with Aerobic Soil Microbes and Their Exudates: Fundamental Chemistry and Effects on Environmental Behavior**
M. P. Neu, C. E. Ruggiero, M. T. Johnson, J. R. Fairlee, J. H. Matonic, L. A. Vanderberg, L. E. Hersman, L. He, M. M. Cox, D. J. Chitwood, P. D. Gladden, G. L. Wagner
(Los Alamos National Laboratory)

**The Interaction of Plutonium with Bacteria in the Repository Environment**
**J. B. Gillow[1], A. J. Francis[1], D. A. Lucero[2], H. W. Papenguth[2]**
([1]Brookhaven National Laboratory, [2]Sandia National Laboratories)

BREAK

**Transuranium Removal from Hanford High Level Waste Simulants Using Sodium Permanganate and Calcium**
W. R. Wilmarth, S. W. Rosencrance, C. A. Nash, F. F. Fonduer, D. P. DiPrete, C. C. DiPrete
(Savannah River Technology Center, Westinghouse Savannah River Company)

**Radiolysis of Hexavalent Plutonium in Solutions of Uranyl Nitrate Containing Fission Product Simulants**
P. J. W. Rance[1], B.Ya. Zilberman[2], G. A. Akopov[2]
([1]British Nuclear Fuels, Sellafield, Seacsale, Cumbria, UK, [2]V.G. Khlopin Radium Institute, 2nd Murinsky Prospekt, St. Petersburg, Russia)

**Contribution of the Surface Contamination of Uranium-materials on the Quantitative Analysis Results by Electron Probe Microbeam Analysis**
O. Bonino[1], C. Fournier[1], C. Merlet[2], C. Fucili[1], O. Dugne[1]
([1]DCC/DTE/SIM – CEA Valrho BP 111, France, [2] ISTEEM, Université de Montpellier II, France)

## IV. Actinides/ Processing

La Fonda Ballroom, 1:30–5:00 P.M.

**Oxidation/Reduction of Mulylvalent terW**
D. T. Reed[1], B. E. Rittman[2], S. B. Aase[1], A. J. Kropf[1]
([1]Argonne National Laboratory, [2]Northwestern University, Evanston, IL)

**Gas-Phase Plutonium Oxide Cluster Ions and Initial Actinide Ion Trapping Experiments**
J. K. Gibson, R. G. Haire, D. C. Duckworth
(Oak Ridge National Laboratory)

**Actinide Science with Soft X-ray Synchrotron Radiation**
D. K. Shuh
(The Glenn T. Seaborg Center, Berkeley)

**Recent Achievements in the Development of Partitioning Processes of Minor Actinides from Nuclear Wastes Obtained in the Frame of the NEWPART European Programme (1996-1999)**
C. Madic[1], M. J. Hudson[2], J. O. Lijenzin[3], J. P. Glatz[4], R. Nannicini[5], A. Facchini[6], Z. Kolarik[7], R. Odoj[8]
([1]CEA/Saclay, France, [2]University of Reading, [3]Chalmers University of Technology, [4]ITU, JRC, Karlsruhe, [5]ENEA, Ispra, Italy, [6]Politecnicao Di Milano, [7]INE, KFK, Karlsruhe, Germany, [8]ISR, FZJ, Juelich, Germany)

BREAK

**Actinide Chemistry: From Test Tube to $B Plant – A BNFL Perspective**
P. Parkes
(British Nuclear Fuels)

**High Level Waste Partitioning Studies at the Research Centre Jülich**
U. Wenzel
(Forschungszentrum Juelich - Institute for Safety Research and Reactor Technology Section for Nuclear Waste Management)

**New Nuclear Safe Plutonium Ceramic Compositions with Neutron Poisons for Plutonium Storage**
B. A. Nadykto[1], L. F. Timofeeva[2]
([1]RFNC-VNIIEF, Russia, [2]GSCRF-VNIINM, Russia)

## Conference Banquet

La Fonda Hotel, 6:30–8:30 P.M.

**"Plutonium, Nonproliferation, and the Future of Nuclear Power"**
J. P. Holdren
(Teresa and John Heinz Professor of Environmental Policy at the Kennedy School of Government and Director of the Science, Technology, and Public Policy Program, Harvard University)

THURSDAY, JULY 13, 2000

## V. Actinides/ TRU Wastes

La Fonda Ballroom, 8:30 A.M.–12:00 P.M.

**Theoretical Predictions of Hydrolysis and Complex Formation of the Heaviest Elements**
V. Pershina
(Institut für Kernchemie, Universität Mainz, Germany)

**New Field of Actinides Solution Chemistry; Electrochemical Study on Phase Transfer of Actinide Ions across Aqueous/Organic Solutions Interface**
Y. Kitatsuji[1], H. Aoyagi[1], Z. Yoshida[1], S. Kihara[2]
([1]Advanced Science Research Center, Japan Atomic Energy Research Institute, Japan, [2]Department of Chemistry, Kyoto Institute of Technology, Japan)

**Extraction of Lanthanides and Actinides from H. A. Waste by Calix[4]Arenes Bearing CMPO Units**
J. F. Dozol, A. Garcia Carrera, H. Rouquette
(DCC /DESD / SEP / LPTE, CEA Cadarache, France)

**Two New Insoluble Polymer Composites for the Treatment of LLW: 1. Polypyrrole Doped by $UO_2^{2+}$ Complexing Polyanions 2. $UO_2^{2+}$ Complexing Sol-gel Based Composites. Stability Constants, Leaching Tests, Alpha and Gamma Irradiation**
D. Leroy[1], L. Martinot[1], F. Caprasse[1], C. Jérôme[2], R. Jérôme[2]
([1]Coordination and Radiochemistry, University of Liège, Belgium, [2]Center for Education and Research on Macromolecules (CERM), University of Liège, Belgium)

BREAK

**Waste Forms from the Electrometallurgical Treatment of DOE Spent Fuel: Production and General Characteristics**
R. W. Benedict[1], S. G. Johnson[1], D. D. Keiser[1], T. P. O'Holleran[1], K. M. Goff[1], S. McDeavitt[2], W. Ebert[2]
([1]Argonne National Laboratory-West, [2]Argonne National Laboratory-East)

**Plutonium and Uranium Disposition in a Sodalite/Glass Composite Waste Form via XAFS**
M. K. Richmann, A. J. Kropf, D. T. Reed, S. B. Aase,
M. C. Hash, L. Putty, D. Lexa.
(Argonne National Laboratory, Chemical Technology Division)

## Conference Summary and Assessment

Conference Rapporteur: Darleane Hoffman
(Lawrence Berkeley National Laboratory)
La Fonda Ballroom, 11:30 A.M.–12:00 P.M.

## Poster Session Presentations

Session Co-Chairs: Sandra Mecklenberg & David E. Hobart
La Fonda Hotel Santa Fe Room, New Mexico Room, & Mezzanine, 1:30–5:00 P.M.

### Materials Science

1. **XANES and EXAFS Studies of Plutonium (III, VI) Sorbed on Thorium Oxide.**
   R. Drot[1], E. Ordonez-Regil[1], E. Simoni[1], Ch. Den Auwer[2], Ph. Moisy[2]
   ([1]Université Paris Sud, France, [2]CEA Marcoule, DCC/DRRV/SEMP, France)

2. **Effects Of Fission Product Accumulation in Cubic Zirconia**
   L. Wang, S. Wang, S. Zhu, R. Ewing
   (University of Michigan)

3. **Identification of a Physical Metallurgy Surrogate for the Plutonium-1 Wt% Gallium Alloy**
   F. Gibbs
   (Los Alamos National Laboratory)

4. **Innovative Concepts for the Plutonium Facilities at La Hague**
   B. Gillet[1], F. Drain[2], A. Gresle[2]
   ([1]COGEMA, France, [2]SGN, France)

5. **Anisotropic Expansion of Pu Through the α–β–γ Phase Transitions While Under Radial Compressive Stress**
   D. R. Spearing, D. K. Veirs, F. C. Prenger
   (Los Alamos National Laboratory)

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   L. Morales[1], J. Haschke[2], T. Allen[1]
   ([1]Los Alamos National Laboratory, [2]Actinide Consulting)

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([1]SIA Radon, Russia, [2]Institute of Geochemistry, Russia, [3]Institute of Geology of Ore Deposits, Russia)

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E. A. Smirnov[1], L. F. Timofeeva[2]
([1]Moscow State Engineering Physics Institute [Technical University], Russia, [2]All-Russia Scientific Research A.A. Bochvar Institute of Inorganic Materials, Russia)

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O. A. Alexeev[1], A. A. Shmakov[2], E. A. Smirnov[2]
([1]All-Russia Scientific Research A. A. Bochvar Institute of Inorganic Materials, Russia,
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([1]Kholpin Radium Institute, Russia, [2]Lawrence Livermore National Laboratory)

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([1]G. T. Seaborg Institute for Transactinium Science, [2]Lawrence Livermore National Laboratory)

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H. Xu[1], Y. Wang[2]
([1]The University of New Mexico, [2]Sandia National Laboratories)

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([1]Los Alamos National Laboratory, [2]Pennsylvania State University)

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([1]Commissariat à l'Energie Atomique, France, [2]Oak Ridge National Laboratory)

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([1]SSC RF VNIINM A.A. Bochvar, Russia, [2]IGEM RAS, Russia, [3]Lawrence Livermore National Laboratory)

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([1]RIAR, Russia, [2]MinAtom, Russia)

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([1]Nuclear Physics Institute, France, [2]LMGE, France)

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E.T. Gaubert[1], M. Jobson[1], J.E. Birket[2], I.S. Denniss[2], I. May[3]
([1]Department of Process Integration, UK, [2]Research and Technology, UK, [3]BNFL Radiochemistry Center of Excellence, UK)

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([1]BNFL Radiochemical Centre of Excellence, UK, [2]Research and Technology, BNFL Sellafield, UK, [3]Department of Process Integration, UMIST, UK)

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([1]Los Alamos National Laboratory, [2]Naval Surface Warfare Center-Indian Head Division)

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([1]New Mexico State University, [2]Los Alamos National Laboratory)

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([1]Florida State University, [2]Bechtel BWXT Idaho, LLC, INEEL, [3]Clemson University-Clemson Research Park)

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J. Bruno[1], E. Cera[1], L. Duro[1], T. Erikssen[2], U. Eklund[3], M. Grivé[1] K. Spahiu[4]
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**([1]Service Radioanalyses Chimie Environnement, CEA, France,[2] Institut de Physique Nucléaire, France)**

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([1]Radiation Protection Institute, Ukraine, [2]Kiev National Taras Shevchenko University, Ukraine)

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**101. Rad Calc III: Radioanalysis Calculation Program for Plutonium and Americium Determination**
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**104. Plutonium Process Monitoring (PPM) System**
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**105. Determining Analyte Concentrations in Plutonium Metal by X-Ray Fluorescence Using a Dried Residue Method**
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**108. Microscopic Determination of the Size Distribution of $PuO_2$ -Rich Zones and Pores in Mox Pellets with an Image Analysis System**
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**109. Plasmon Resonance Spectroscopy of Plutonium Metal**
R. K. Schulze, J. D. Farr, J. C. Archuleta
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M.R. Voss, M.T. Paffett
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J. E. McAninch, T. F. Hamilton
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**112. Determination of Mercury in Radioactive Samples by Cold Vapor Atomic Fluorescence Spectrometry**
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J. Rebizant, E. Bednarczyk, P. Boulet, C. Fuchs, F. Wastin
(European Commission, Joint Research Centre, Institute for Transuranium Elements, Germany)

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([1]European Institute for Transuranium Elements, Germany, [2]Oak Ridge National Laboratory, [3]European Synchrotron Radiation Facility, Grenoble, France)

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([1]Colorado State University, [2]Los Alamos National Laboratory)

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([1]European Commission, Joint Research Centre, Institute for Transuranium Elements, Germany, [2]Université Joseph Foureier, Laboratoire LIME, France)

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## REGISTRATION

Registration Forms are now available on the conference web site at http://www.lanl.gov/pu2000.html (click on the "Registration" link). The early registration fee (before June 9) is $300 for the full meeting ($250 for ANS members); one-day registration is $150, and two-day registration is $250. There is no ANS discount for partial meeting registration. After June 9, 2000, all registrations increase by $100. Questions about registration may be addressed to Marion Hutton, hutton@lanl.gov, 505-667-8451.

## NewsMakers

■ The Nuclear Materials Technology Division will conduct its annual Science and Technology Assessment (also know as the "Division Review") May 9 through May 12. The programmatic topical areas to be covered include weapons surveillance/stewardship, enhanced surveillance, components manufacturing, and dynamic testing. The Division Review Committee members who will be participating in this year's review are Dr. Susan Wood (Chair), Dr. Ned Wogman, Dr. Richard Bartsch, Dr. A. D. Rollett, Dr. Anthony Thompson, and Dr. Lamar Miller (observer).

■ The Nuclear Materials Technology Division has formed an internal advisory group composed of senior members from sponsoring programs and collaborating organizations. The present membership includes Scott Gibbs, John Immele, Dennis Erickson, Allen Hartford, Susan Wood, Dave Clark, and K. C. Kim (coordinator). This group meets once a month and advises Division Leader Tim George on all aspects of NMT Division's operation and program execution.

■ The Science Leadership Council of NMT initiated a division seminar series starting in February. The seminar was delivered by Brett Kniss on "The Status of the Pit Rebuild Program," on February 3, The second and third seminars were given by Steve Yarbro and Ed Garcia on March 2. The titles of their talks were "Overview of Plutonium Processing," and "Chlorination of Sodium Carbonate Oxidized Pyrochemical Salt Residues." All three seminars were very informative and well attended.

■ The winners of this year's R. D. Baker Award for Science and Technology, which recognizes contributions of technical excellence in the division, are Gary Rinehart (Actinide Ceramics and Fabrication) and D. Kirk Veirs (Chemistry, Metallurgy, and Materials). The winner of the William J. Maraman Award in Operations Excellence, which recognizes a LANL employee or team for especially meritorious performance in the operation of nuclear facilities, is David Post (PM-DO). The award ceremony will be held during the Division Review in May.

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