Winter 1995

TA 55

Los Alamos National Laboratory • A U.S. Department of Energy Laboratory

The Actinide Research Quarterly

of the Nuclear Materials Technology Division

In This Issue

High-gradient Magnetic Separation (HGMS) Plays an Important Role in Radioactive Waste Remediation

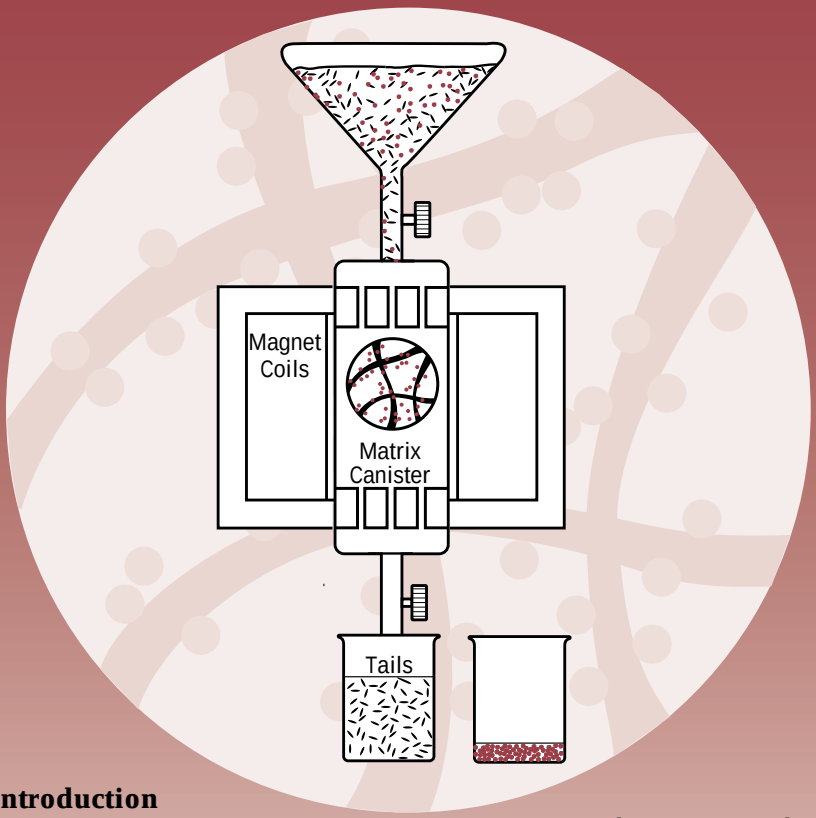


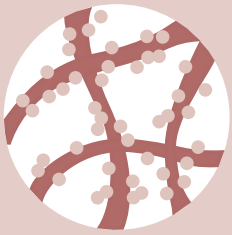
Figure 1. HGMS can be used to separate very fine particles of radioactive material from solid, liquid, or gas waste streams, magnetic particles trapped in steel wool or nickel foam. It reduces the volume of waste to be treated and thus reduces the volume of acids needed for treatment processes as well.

Introduction

Decontamination of materials such as soils or wastewater that contain radioactive isotopes, heavy metals, or hazardous components is a subject of great interest as indicated by the growth of waste remediation and minimization efforts. Conventional treatments of these wastes include both chemical and physical methods. Magnetic separation is a physical separation process that segregates materials on the basis of their magnetic susceptibility. Magnetic separation of radioactive wastes has been shown to reduce the volume of these wastes as well as to reduce the chemical reagents necessary for further remediation.

The HGMS method can be used to separate magnetic components from solids, liquids, or gases. A diagram of the method is shown in Figure 1. Usually, contaminated material is slurried with water and passed through a magnetized volume. Field gradients are produced in the magnetized volume by a ferromagnetic matrix material such as steel wool or nickel foam. Ferromagnetic and paramagnetic particles are extracted from the slurry by the ferromagnetic matrix. The diamagnetic fraction and fluid pass through the magnetized volume. The extracted particulates are then flushed from the matrix when the magnetic field is turned off.

High-gradient Magnetic Separation (HGMS) Plays an Important Role in Radioactive Waste Remediation *con't.*



The principal developers of this project are **Laura A. Worl** and **Dennis D. Padilla** Advanced Technology Group Nuclear Materials Technology Division

F. Coyne Prenger and **Dallas D. Hill** Energy and Process Engineering Group, Engineering Sciences and Applications Division

Thomas L. Tolt Lockheed Environmental Systems and Technology Company

In many situations radioactive contaminants are found concentrated in the fine-particle-size fraction of less than 20 microns. For effective decontamination of the fine-particle-size range most conventional operations resort to expensive chemical dissolution methods for treatment. HGMS is able to separate out particles in the range of 90 to ~0.1 microns effectively without chemicals. (The technology is currently used on a commercial scale in the kaolin clay industry.)

HGMS work at Los Alamos National Laboratory (LANL) is being developed for soil remediation, wastewater treatment, and treatment of actinide chemical processing residues. LANL and Lockheed Environmental Systems and Technologies Company (LESAT) have worked on a co-operative research and development agreement (CRADA) to develop HGMS for radioactive soil decontamination. The program is designed to transfer HGMS from the Laboratory to industry for the treatment of radioactively contaminated materials on a commercial scale.

High-gradient Magnetic Separation Equipment

The development of HGMS at LANL has included the design, purchase, and installment of several magnet units. LANL currently has one conventional coil and three superconducting, high-gradient separators. The conventional coil (1-inch bore diameter) and one 3-inch bore superconducting magnet are installed in a vented hood in the plutonium facility. These two magnetic systems comprise the radioactive soil treatment laboratory that became operational in 1993. The second 3-inch bore superconducting magnet is installed in a glove box. It is used for testing highly contaminated material such as processing residues or radioactive wastewater. LANL also has a 6-inch bore magnet that is being used for nonradioactive tests and prototype development for soil decontamination work under the CRADA.

HGMS Results

We have completed a comprehensive series of HGMS experiments with nonradioactive surrogates and have progressed to routine testing of radioactive materials. Our results on spiked material have been used to develop an analytical model that describes the HGMS process. The model provides guidance in selecting the appropriate bench-scale experiments to perform and assists in analyzing the resulting data. A validated analytical model also supports prototype design and process scale-up. It takes into account variables in the material characteristics (such as particle size and magnetic susceptibility) and the separator parameters (such as the magnetic field strength).

In studies involving soil remediation, we are developing and testing HGMS as part of an integrated system with LESAT's soil-washing and gravity-based separation equipment. The goal is to replace an expensive chemical leach-unit operation with magnetic separation for treatment of the fine-particle-size fraction. HGMS tests have been conducted on uranium- and plutonium-contaminated soils and soil-washing residues from Fernald, China Lake, Johnston Atoll, Rocky Flats Plant (RFP), Idaho National Engineering Laboratory, LANL, and the Nevada Test Site (NTS). Test results to date are promising. For example, tests on Fernald's contaminated uranium soils indicate that HGMS can effectively reduce the uranium concentration in nearly 75% of the soil mass to below 70 ppm. Further testing continues on Fernald soils to demonstrate the technology on a pilot scale.

HGMS is also being developed for magnetic filtration of fluid waste streams at the waste treatment facility or those generated during actinide chemical processing. The caustic liquid waste generated by chloride processing operations at TA-55 can produce up to 15,000 liters (l) of liquid effluent

annually, with an average alpha activity of 10^{10} dpm/l. The TA-55 caustic liquid effluent is transferred to the LANL Wastewater Treatment Facility (TA-50), where precipitation and filtration operations are conducted until the effluent meets the industrial waste disposal criteria (<0.52 mCi/l). This effluent is then combined with all other LANL liquid waste for continued treatment. The goal at TA-55 is to reduce actinide activity in the process waste streams to <0.52 mCi/l, which could eliminate the generation of transuranic waste at TA-50, and meet the acceptance level for disposal as an industrial liquid waste.

Several series of tests have been performed on caustic waste samples. Figure 2 illustrates the HGMS test results on a TA-55 caustic waste stream effluent. After processing 500 ml of the pH-unadjusted solution through the separator, only 70% of the activity was removed. The lower activity limit reached was 34 mCi/l. In three other tests the pH was adjusted to 9.5, and the solution was processed three times at 6.5 tesla. In addition to undergoing pH adjustment, two solutions were aged at 70 °C for 6 and 24 hours, respectively. Controlled heating is well documented in the generation of controlled crystallization and specific particle-sized species. In all three solutions the results indicated that it is possible to reduce activity to levels acceptable to the industrial waste discard limits. After two passes through the separator, more than 99% of the activity was removed. These results are significant and illustrate the flexibility of HGMS for treating a variety of caustic waste samples.

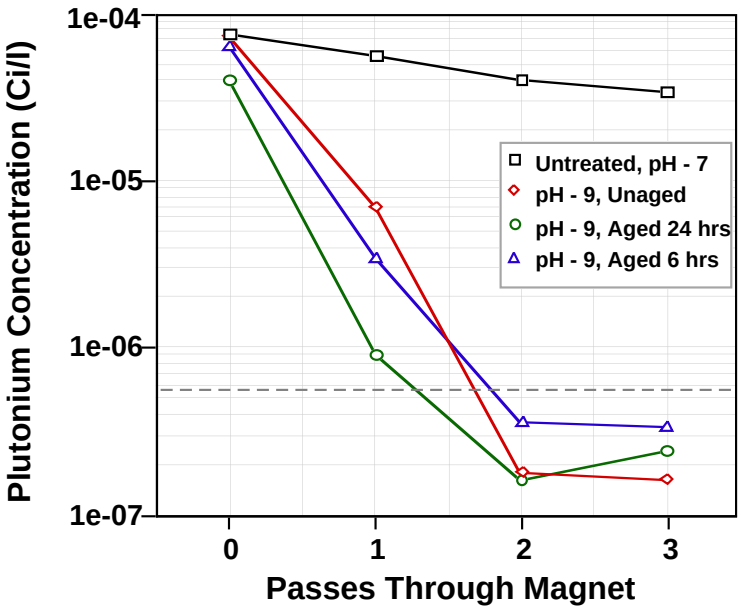
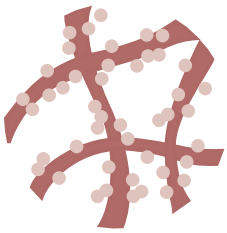


Figure 2. HGMS of TA-55 waste effluent showing the effect of the aging and pH adjustment.

Benefits of Magnetic Separation

We have shown that HGMS can be used to concentrate plutonium and uranium in waste streams and contaminated soils. One of the major benefits of this technology is that it only partitions the existing waste volume. It does not create additional waste. The ability to concentrate the actinides from extraneous materials before further processing reduces the volume of waste to be processed and yields more efficient recovery or treatment operations. For example, it reduces the volume of chemical reagents (acids) necessary for subsequent operations, it allows a more efficient ion exchange or solvent extraction, and it reduces the chemicals in subsequent waste treatment operations.



Researchers Invent Novel Plutonium-Selective Anion Exchange Resins for Waste Minimization

The principal developers of this project are **S. Fredric Marsh,** NMT-6 associate, **Gordon D. Jarvinen,** NMT-6, and Richard A. Bartsch, Texas Tech University

How can we minimize the plutonium content of our waste streams? We asked ourselves this question as we reviewed the anion exchange process used for nearly 40 years to recover plutonium from a variety of impurities.

Background

Ion exchange resins are polymers that contain charged functional groups. Such resins have been used for many years in a wide range of applications for recovery of positively charged cations and negatively charged anions from solution. Perhaps the most common application is the removal of impurities from potable water in home water softeners.

Ion exchange resins contain fixed-charge functional groups that require counterions of the opposite charge to maintain an overall electroneutrality. Anions or cations present in solution may exchange with groups of the same charge bound electrostatically to the resin functional groups, hence the term *ion exchange* for this process. A major advantage of the ion exchange process is the ease of separating the solid resin from the treated solution.

Although ion exchange is a mature technology, the performance characteristics of a specific resin structure and solution composition are determined by complex factors that are still only partially predictable. For this reason, we have directed much effort toward gaining a better theoretical understanding of ion exchange processes.

Plutonium

Pu(IV), the most stable oxidation state of plutonium in acid solutions, has four positive charges, yet it readily bonds with six nitrate ions to form a double-negative complex that is strongly retained on anion exchange resins. Anion exchange is an especially attractive option for separating plutonium because (1) the Pu(IV) nitrate complex is very strongly held, and (2) few other metal ions form competing complexes.

The major disadvantage of the nitrate anion exchange system has always been the unusually slow rate at which the Pu(IV) nitrate complex sorbs onto the resin. For this reason, we previously measured the sorption rate of more than 30 commercial and experimental resins. The results of that study led us to replace gel-type polystyrene resin with a macroporous polystyrene resin, whose more porous structure significantly increased the plutonium sorption rate.

Safety Considerations

Although such polystyrene anion exchange resins have been used for many years in the nuclear industry, these polymers can react exothermally with nitric acid under certain conditions. Another polymer, polyvinyl-pyridine, is known to provide greater stability to chemical attack by nitric acid and radiolytic degradation; however, no commercial polyvinylpyridine resin was suitable for plutonium. Consequently, we began a collaborative effort with Reilly Industries, Inc., a manufacturer of vinylpyridine polymers. Our collaboration resulted in Reillex^{TM} HPQ, a new macroporous anion exchange resin that met our objectives.

For the past six years Reillex HPQ has been used for plutonium processing at TA-55. This polyvinylpyridine resin has outperformed all known commercial resins, while providing superior resistance to nitric acid and radiation.

Development of Plutonium-Selective Resins

Although our efforts had significantly improved the plutonium recovery process, we felt we could do better. However, this time we took a more creative approach. We tried to envision the structure of an anion exchange resin that might be an ideal match for the plutonium nitrate complex. What resin structure, we asked, might provide a “glove” into which the plutonium “hand” would best fit?

Since our successful collaboration with Reilly Industries, we have used many powerful structural analysis techniques, including

spectrophotometry, nuclear magnetic resonance, and extended x-ray absorption fine structure analysis to identify which plutonium complexes are involved in the anion exchange process. Our investigations revealed that the uncharged tetranitrato complex is most likely to be sorbed on an anion exchange resin, even though this neutral complex acquires two more nitrate groups and a double-negative charge during the sorption process.

Once we had identified the plutonium complex, we attempted to design a bifunctional anion exchange resin structure that would provide two anion exchange sites separated by a fixed distance. We then contracted the research group of Prof. Richard Bartsch of Texas Tech University to synthesize a series of novel bifunctional resins that provide specified spacings between two anion exchange sites. Such resins were prepared with the second exchange site being an alkylammonium, phosphonium, or pyridinium group.

Performance of Plutonium-Selective Resins

As these new resins were synthesized, we compared their performance by measuring the sorption of Pu(IV) from a range of nitric acid concentrations. We compared the distribution coefficients (Kd values) of Pu(IV) on Reillex HPQ resin and on three of our new bifunctional resins, each with a 5-carbon spacer between the two exchange groups. We measured Kd values for 30 minutes, 2 hours, and 6 hours to obtain information about the rate at which plutonium is removed from solution.

Our tests demonstrated that bifunctional anion exchange resins with the two exchange groups separated by five carbon atoms offer a much faster and more quantitative uptake of plutonium from intermediate concentrations of nitric acid. Moreover, the uptake of plutonium from dilute nitric acid was much lower, which should allow the purified plutonium to be recovered more completely in a smaller liquid volume. Thus, these new bifunctional resins offer the realistic prospect of significantly decreasing the quantity of plutonium in our waste streams while simultaneously decreasing the volume of secondary liquid waste.

We compared the removal of Pu(IV) from an acidic Hanford waste simulant on the Reillex HPQ and on one of the early versions of our new bifunctional resin. Although some of our later resins significantly outperform this one, we noted that the Kd value on our resin in 30 minutes is more than twice what Reillex HPQ achieves in 6 hours. We noted also that, although our new resin greatly enhances Kd values for plutonium, the Kd values of the other 13 elements included in our study change relatively little, which demonstrates how selectively the new bifunctional resin removes plutonium.

An important advantage of our bifunctional resins is that they can all be prepared as derivatives of the Reillex HP commercial resin. Because these new resins are modifications of an existing resin, they are much simpler to prepare in commercial quantities than a resin that requires complete synthesis. Moreover, the fact that the major starting material is an existing Reillex resin makes Reilly Industries the obvious choice to be our commercial partner. Reilly has expressed a strong interest in manufacturing these new resins under license to the Laboratory.

Los Alamos National Laboratory has submitted a patent application for this new class of anion exchange resins. Although we have tested them primarily for plutonium recovery applications, we anticipate that related resins can be designed to remove other targeted anions selectively from ground water and industrial waste streams.

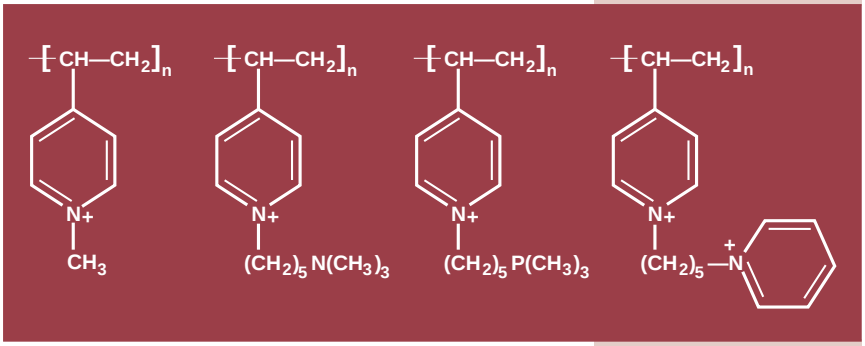


Figure 3. Anion exchange polymer structures such as these can be used to remove Pu(IV) from waste streams.

TA-55 Hosts Local and National Media Tours

Who would have believed even five years ago that Los Alamos National Laboratory would open its "inner sanctum," the rooms of Building PF-4, to journalists–with cameras! But now New Mexico and national news media representatives have seen a glimpse of the facility and the role it plays in its primary national security mission and in support of national and international goals: space exploration, nuclear energy, prevention of the proliferation of nuclear materials, and handling and disposal of the radioactive materials that are the legacy of fifty years of nuclear weapons activities.

Joe Martz and Stephanie Hale of NMT-5, Dennis Brandt of NMT-4, Steve Schreiber of NMT-2, and Jim Danneskiold of PA-1 served as hosts for the historic New Mexico media tour on November 16 and the national media tour on December 12. The latter tour included representatives from NBC television with 37 million viewers. *Time* magazine with 15 million readers, and the *Los Angeles Times* with 3.5 million readers.

The hosts, aided by several escorts from the plutonium facility, helped the journalists go through the elaborate security procedures to enter PF-4 and the radiological monitoring procedures to exit the facility. While inside, the journalists heard presentations on plutonium machining, cost-effective and efficient ways to remove plutonium from scrap or residue, and how to extract actinides from waste to minimize the processing and storage of such wastes. More than a dozen experts did their best to explain in simple terms highly technical processes such as nondestructive assay, magnetic separation, and the hydriding-dehydriding process. Following the highly successful tour of December 12, Laboratory Director Sig Hecker and Division Director Bruce Matthews held an informal news conference in the auditorium to answer questions left over from the presentations and to help the journalists see the work of TA-55 in the context of nationally and internationally important goals.

LDRD Funds Seven Research Areas in NMT

Two new projects funded by Laboratory Directed Research and Development (LDRD) money have been awarded to the Nuclear Materials Technology (NMT) Division. in FY96. The new projects are "Reaction Kinetics Relevant to the Recycle Hydride-Dehydride Process for Plutonium Recovery," Principal Investigator **John Haschke,** other investigators **Thomas Allen and Charles Radosevich;** and "Zircon as a Host Phase for Plutonium Disposition," Principal Investigator **K. C. Kim,** and investigator **John Huang.** We also expect some funding for "New Anion Exchange Polymers for Improved Separations in Nuclear and Industrial Applications," Principal Investigator **Gordon Jarvinen.** The LDRD Program funds four ongoing projects as well: "Integration of Advanced Nuclear Materials Separations Processes," Principal Investigator **Gordon Jarvinen;** "Decontamination of Radioactive Liquids by Freeze Concentration and Fractional Precipitation," Principal Investigator to be announced; "Disposition of Weapons Plutonium as Non-fertile Fuel for Light-Water Reactors, Principal Investigator **Kenneth Chidester;** and "Structural and Magnetic Characterization of Actinide Materials, Principal Investigator **Barbara Cort.**

NMT also expects to participate in LDRD-funded projects awarded to the Accelerator Driven Transmutation Technology (ADTT) Program. Chief Scientist **K. C. Kim** says the Division's tactical goal to win $1 million in LDRD funds for FY96 has been met or exceeded. The division's success in winning FY96 LDRD funds is a measure of the importance of its work in supporting the Laboratory's core mission to reduce the global nuclear danger and of the excellence of its facilities and personnel for performing basic research.

Chief Scientist's Notes:
NMT Researchers Nurture the Year-Old *Actinide Research Quarterly*

This issue, the fifth publication of the Actinide Research Quarterly, marks its first-year anniversary. If you have followed the past issues, you will have noticed significant improvements in both the contents and appearance of the newsletter. We are still experimenting to find out how best to create a newsletter suitable for NMT. From the beginning it was meant to evolve through NMT members' participation. A newsletter is in some sense like a living plant. A plant is constantly absorbing essential elements to synthesize nutrients for its growth, constantly trying to adapt to its changing environment, and constantly in need of nurturing. In its own way, the *Actinide Research Quarterly* has the same needs as that plant!

During the past year we have covered eleven scientific and technical articles, two work teams' profiles, and lists of numerous publications and reports by NMT members. The invention disclosed in one of the technical articles in the second issue received an R&D 100 Award in 1995. Additionally, other newsworthy events and NMT members' activities on the scientific and technical front were reported. We printed 600 copies of the first issue and about 750 of the latest one. This increase is due largely to a demand for copies outside the Laboratory, an indication that our work is gaining some external publicity.

A newsletter needs a supportive and informed readership for its existence. Two areas need special attention: one is the need for publishing a newsletter that communicates our science and technology research efforts more effectively to our primary audience—internal readers—and secondarily to our external readers as their interest in our work increases. The other need is for NMT members to nurture the newsletter with contributed articles and news inputs. Their contributions to the newsletter and their informed readership should have a synergistic effect. Science and technology, in the right environment, is constantly being renewed. Many NMT enthusiasts, this Chief Scientist among them, believe that even after having published a dozen or so technical highlights, information about the wealth of NMT's scientific resources has not been exhausted.

Just as in our inaugural issue, this anniversary issue shows photo highlights of the annual NMT Division Review. To some of us who helped launch the newsletter a year ago, this issue marks a new beginning. For now, this is a time to pause, to reminisce, to celebrate a bit (without much fanfare), and, most importantly, to thank you all who have contributed articles and news items, and those who have provided many valuable ideas. Special thanks are owed to the CIC-1 writer/editors, Ann Mauzy and Chris Pearcy, and to our invaluable design and production person, Susan Carlson. Congratulations to all of you for having done such a wonderful job in supporting this worthwhile endeavor.

CIC-9 RN93-229-030

NMT Chief Scientist K. C. Kim

Tim Nelson

Director Sig Hecker sent Division Director Bruce Matthews an e-mail message that summarizes NMT's accomplishments the week of November 13, "Congratulations for a stellar week. I was delighted to hear the great report from our External Review Committee at the outbrief. Kudos to the entire NMT team for doing a superb job of turning things around from a difficult year in 1994. In addition, your people did an excellent job with the media tour at TA-55. everything I heard has been very positive. Thank everyone involved for a great job."

November 13–15, 1995

NMT Division Science and Technology Assessment for 1995 Draws Praise

The External Review Committee the Director refers to (see sidebar) participated in NMT Division's second annual Division Science and Technology Assessment (formerly called Division Review) November 13-15, 1995. Eight Division Review Committee (DRC) members participated in this year's event, and there were approximately 130 internal and external attendees. This year's assessment was one of the largest in terms of the total number of participants and attendees.

The theme for this year's assessment was "The Plutonium Roadmap." The oral presentations included a welcome and opening statement by the Nuclear Weapons Technology Program Director John Immele, standing in for Laboratory Director Sig Hecker, followed by an NMT Division Overview by Division Director Bruce Matthews, a Laboratory and Division Tactical Planning discussion by Deputy Division Director Dana Christensen, a Nuclear Materials and Stockpile Management Program Overview by its Director Paul Cunningham, and a review of a dozen or so ongoing projects that support the main theme. Also, there were eighteen poster presentations that covered a broad range of NMT's science and technology activities. A Director-hosted

reception was held at the Bradbury Science Museum the evening of the second day of the review, providing an opportunity for the internal and external participants to exchange ideas and socialize after two days of intense technical and programmatic discussions.

While the DRC report is yet to come, all preliminary indications show that we have had an enormously successful division review.


Bruce Matthews


Noah Pope


Dana Christensen


Paul Cunningham


Cathy Blackwell

Recent Publications and Presentations

K. K. S. Pillay, "Waste Minimization at a Plutonium Processing Facility," ANS Winter Meeting, October-November 1995.

W. B. Smith, J. Moyer, and D. D. Wilkey, "Draft Data Report for Plutonium Conversion Facility," LA-UR-95-1721.

R. A. Bibeau, T. J. Karki, B. E. Wright, N. G. Pope, R. E. Brown, and W. J. Turner, "TA-55 Facility Control System Wiring Data Base," LA-Report xxxx.

N. V. Coppa and J. M. McHale, "Aqueous Preparation of Solid Titanyl Nitrate," submitted to *J. Am. Chem.* Soc., LA-UR-95-3007, 1995.

H.L. Nekimken, J. Macdonald, N. G. Pope, R. A. Bibeau, and B. G. Gomez, "Case Study for the Evaluation and Selection of MMI (Man-Machine Interface) Software," Instrument Society of America National Conference, Chicago, IL, October 6-11, 1996.

J. M. Haschke, "Reactions of Plutonium and Uranium with Water: Kinetics and Potential Hazards," LA-MS Report 13069-MS, November 1995.

D. J. Lujan and M. Barbe, "Laser Based Pit Gas Sampling System," ? ? ?, 1995.

M. J. Palmer and K. W. Fife, "Magnesium Hydroxide as the Neutralizing Agent for Radioactive Hydrochloric Acid Solutions," LA-12975-MS, October 1995.

D. C. Christensen, R. B. Matthews, and T. J. Trapp, "The Future Role of Plutonium Technology in Society," presented at American Nuclear Society, 1995 winter meeting and Embedded Topical, San Francisco, California, Oct. 29–Nov. 2.

D. C. Christensen, S. Yarbro, M. Dinehart, K. K. S. Pillay, "The Technology Basis for Plutonium Stabilization and Immobilization Workshop, U. S. Department of Energy, Washington DC, Dec. 12–14, 1995.

Poster sessions for the 1995 NMT Division Review

S.M. Long (NMT-4), "Design and Fabrication of Nondestructive Assay (NDA) Standards"

L. D. Schulte, S. D. McKee, R. R. Salazar (NMT-6), "Full-Scale Testing of Extraction Chromatography for Actinide Decontamination of Concentrated Hydrochloric Acid Waste Streams"

R. R. Salazar, B. J. Griego, L. D. Schulte, S. D. McKee, W. B. Smith, M. J. Palmer, V. A. Hatler (NMT-2), "Oxalate Precipitation of Pu(III) from Very Dilute HCl Solutions"

W. R. Dworzak (NMT-6), "Operating System (OAC / MOS) Development Project (CRADA)"

B. H. Atkins, D. D. Hill, H. E. Martinez, C. F. Prenger, W. Romero, and L. Stapf (ESA Division); M. E. Huerta, L. Jaramillo, J. T. McFarlan, A. N. Morgan, T. O. Nelson, and M. A. Williamson (NMT-6), "Using Cryogrinding to Produce a Homogeneous Sample"

A. N. Morgan, T. O. Nelson, and D. K. Veirs (NMT-6), "Apha Swipe Spectroscopy for Oralloy Disposition"

J. C. Martz and J. M. Haschke (NMT-5), "A Mechanism for Violent Oxidation and Explosion of Plutonium Metal Spheres"

J. Foropoulos, Jr. (NMT-6), "Solid Alkali Destruction of Volatile Hazardous Components from Mixed Waste"

D. J. Kathios (NMT-2), G. D. Jarvinen (NMT-6), S. L. Yarbro (NMT-2), J. R. Duke, Jr. (MST-7), B. C. Benicewicz (MST-7), B. S. Jorgensen (MST-7), "A Preliminary Evaluation of Polymeric Microcellular Foams as Solid Sorbents for Metal Ion Separations"

P. K. Benicewicz and D. K. Veirs (NMT-6), "Characterization of Plutonium Surrogates via the Temporal and Spatial Evolution of Emissions from Laser-Created Plasmas"

R. Pereyra (CST-15), K. M. Axler and P. C. Lopez (NMT-6), "Metallographic Investigations of Plutonium-Based Alloy Exposure Tests"

P. Watson (NMT-5), J. Eckert (LANSCE), and P. Vorderwisch (Hahn-Meitner Institute, Berlin), "Modeling of Inelastic Neutron Scattering Data for Rare-Earth and Actinide Hydrides"

T. H. Allen, J. M. Haschke, C. L. Radosevich (NMT-5), "Characterization of the Reaction of Plutonium Dioxide with Water"

K. Chidester (NMT-9), J. Buska (TSA-12), H. T. Blair, K. Ramsay, R. Eutsler (NMT-9), S. Eaton (TSA-12), "Disposition of Weapon Plutonium as Nonfertile Fuel for Light-Water Reactors (LDRD Project No. 95451)"

C. A. Smith and T. R. Mills (NMT-6), W. D. Smyth (NMT-2), "Hydrochloric Acid Recycling: Acid Reconcentration via Gas-Phase Membrane Separation"

H. Thomas Blair, NMT-9, "Mixed Oxide (MOX) Fuel Fabrication Studies in Support of the Fissile Materials Disposition Reactor Alternatives"

Tim Stewart (NMT-10), "Major Achievements and Future Projects of the NMT Support Services Group (NMT-10)"

M. Greenbank, F. Hampel, C. Leasure. C. Martinez, D. Martinez, R. Mason, R. Pereyra, L. Riedel, M. Valdez, E. Vigil (CST-15), "Electronic Imaging in Materials Characterization at TA-55"

NewsMakers

■ IPO Recognizes Uranium Chemical Process Team

The Industrial Partnership Office has given a Recognition Award for Outstanding Achievements in Industrial Partnerships to the Uranium Chemical Process Team (Moses Attrep and Kent Abner, CST-11; Mike West, MST-5; **Keith Axler, NMT-5**; Dan Knobeloch, MST-5; and John Fitzpatrick, CST-7) for their many contributions to technology transfer and industrial partnerships. The team was nominated for their, "sustained efforts and continuous, high-quality technology development in the area of uranium chemistry."

Pete Lyons, IPO Director, also cited the team for initiating several technology transfer programs, "to leverage technology demonstrations, funded by the DOE, for site cleanup and residue treatment of legacy material generated during the weapons production effort over the last fifty years." Among accomplishments listed were memoranda of understanding with Fluor Daniel Incorporated and Nuclear Fuel Services as well as a users' facility agreement for TA-48.

■ Employees Win Waste Minimization Award

Dennis Padilla and **Laura Worl** of NMT-6 join ESA-EPE employees Coyne Prenger and Dallas Hill and Tom Tolt of Lockheed in accepting a first-place award under the Pollution Prevention Awards Program, Large-Scale Operations category. The winning entry was "Magnetic Separation for Treatment of TA-55 Caustic Waste." This procedure will selectively extract actinide contaminants from caustic liquid waste streams thereby reducing or removing levels below the industrial waste water discharge limits. The technology has been successful on a bench scale.

Jeoff Urioste of the Pollution Prevention Program Office congratulated all Award Program entrants and encouraged them to continue their efforts and implement their ideas.

NewsWatch

■ NMT Seeks Productive Interactions with Universities

NMT Division and the Nuclear Materials and Stockpile Management (NMSM) Programs Office have jointly initiated a recruiting effort for postdoctoral research associates with required training and skills in the areas of metallurgy and materials science and engineering. Paul Cunningham, NMSM Program Director, says, "We need to be in the thoughts and minds of professors and students," principally at institutions that have supplied excellent postdocs over the years." The division is making a number of contacts with university colleagues and the division's review committee members to solicit their support for recruiting the best talents nationwide in these disciplines. The division hopes to bring on board up to three postdoctoral fellows within this fiscal year.

Los Alamos
NATIONAL LABORATORY

The Actinide Research Quarterly is published quarterly to highlight recent achievements and ongoing programs of the Nuclear Materials Technology Division. We welcome your suggestions and contributions.

LALP-96-
Director of NMT: Bruce Matthews
Deputy Director: Dana C. Christensen
Chief Scientist: Kyu C. Kim
Writer/Editor: Ann Mauzy
Design and Production: Susan L. Carlson

Nuclear Materials Technology Division
Mail Stop E500
Los Alamos National Laboratory
Los Alamos, New Mexico 87545
505/667-2556 FAX 505/667-7966

TA 55