Barbara

Department of Energy
Los Alamos Area Office
Albuquerque Operations Office
Los Alamos, New Mexico 87544

JUL 05 1995

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CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Benito J. Garcia, Bureau Chief
Hazardous and Radioactive Materials Bureau
New Mexico Environment Department
525 Camino de los Marquez, Suite 4
P. O. Box 26110
Santa Fe, NM 87502

LANL
TA-59

TA-54

Dear Mr. Garcia:

SUBJECT: Treatability Studies Notification

The purpose of this letter is to provide notification of intent to conduct one hazardous waste treatability study at Los Alamos National Laboratory (LANL). This study will be conducted by the Waste Treatment and Minimization Science and Technology Group (CST-18). This study will evaluate the effectiveness of the treatment of mixed waste samples using electrochemical processes that will electrochemically extract metals from metallic solutions and deposit them on cathodes, oxidize cyanides to cyanates, and oxidize organic compounds to carbon dioxide, water, or other non-toxic organic compounds. The remaining solution will contain only low-level radioactive nuclei, but no longer a Resource Conservation and Recovery Act (RCRA)-regulated hazardous constituent. After analyzing and verifying that no RCRA-regulated constituents remain, liquid effluents will be disposed into LANL's radioactive wastewater drainage system. If hazardous constituents have not been successfully removed, the solution will be re-run through the electrochemical process, or managed as a mixed waste. Three hundred and fifty-six kilograms of waste will be needed to conduct this study.

If you have any questions, please contact me at (505) 665-5042.

Sincerely,

R.L. (Jody) Plum
Office of Environment and Projects

LAAMEP:1JP-004

Enclosure:
Electrochemical Treatment of Mixed Waste

cc:
See page 2

11349

cc w/enclosure:
J. Carmichael, ESH-19, LANL,
MS-K498
J. Dziewinski, CST-18, LANL,
MS-H824

cc w/o enclosure:
ESH-19 (950296.JAC), LANL,
MS-K490

ENCLOSURE 1

Electrochemical Treatment of Mixed Waste

Facility Name: Los Alamos National Laboratory, Chemical Science & Technology Division, CST-18 Waste Treatment and Minimization Science & Technology.

Project Title: Electrochemical Treatment of Mixed Waste.

Project Contact: Jacek Dziewinski, M.Sc. LANL; CST-18, H824
(505)667-9792; FAX (505) 665-5886

Other Contacts: Wayne Smith, Ph.D. LANL, NMT-6, E501.
(505)667-2365; FAX (505) 6654459

Stanislaw Marczak, Ph.D. LANL, CST-18, H824
(505)667-9792; FAX (505) 665-5886

Facility EPA ID Number: **NM0890010515**

Project Description:

Problem(s) Being Addressed: LANL is obligated by law (Federal Facilities Compliance Act or FFCA) to treat the inventory of mixed waste stored at Technical Area 54 (TA-54). This waste includes some 4500 drums containing over 7000 of distinguishable waste items. Mixed waste is defined as low level radioactive waste (less than 100 nCi/g) containing one or more chemically hazardous components, per Resource Conservation and Recovery Act (RCRA) definition. Many of mixed waste items stored at TA-54 may be treated by electrochemical processing. Wastes treatable by the technology include toxic metals, cyanides, nitrate salts, and toxic organic wastes.

Objectives:
1.) Demonstrate the feasibility and advantage of application of electrochemical systems for effective, safe and economical treatment of mixed wastes.
2.) Obtain experimental data for designing of a prototype plant.

Samples of wastes which are listed on next page will be transferred from TA-54 to the radiation controlled laboratory, at TA-53, Building 1, Room 125D. The transportation of samples will be arranged according to LANL procedures for internal transportation of low level mixed waste. The waste samples will be analyzed. The results of the analyses will be compared with the information in the mixed waste inventory database. If the analyses differ significantly the sample will not be treated, but returned to the storage area. The samples will then be treated using electrochemical cells and auxiliary equipment (pumps, tanks, agitators, pH meters, thermometers, alarms, power supplies, etc.) Metals will be electrochemically extracted from the solutions and deposited on cathodes, cyanides will be oxidized to cyanates, and organic compounds oxidized to carbon dioxide and water. The remaining solution will contain low level radioactivity, but no longer a RCRA component.

After analyzing and verifying that no RCRA regulated constituents remain, liquid effluents will be disposed into LANL's radioactive wastewater drainage system . If the RCRA components have not been successfully removed the solution will be re-run through the electrochemical process, or returned to CST-5 as a mixed waste. Recovered metals will be monitored for radioactivity. They are expected to be free from radioactive contamination. These metals will be reused for other laboratory activities. Our work at TA-53 involves experiments with a great deal of chemical reagents. The recovered metals will be converted to sulfates, chlorides, nitrates, or oxides, and used as reagents. The other option will be to return them the plating shop to be reused for plating. If trace radioactivity is detected, they will be returned to waste storage.

Project Goals:

Phase 1: Conduct tests with selected inorganic wastes to electrochemically extract toxic metals and oxidize cyanides. Demonstrate feasibility of the process and deliver data input for designing of prototype plant.

Phase 2: Conduct tests with selected organic wastes to electrochemically convert them to carbon dioxide and water, or other non-toxic organic compounds. Demonstrate feasibility of the process and deliver data input for designing of prototype plant.

Project Tasks:

1. Obtain samples from the storage area (TA-54, area L)
2. Analyze the samples.
3. Conduct tests with inorganic wastes.
4. Conduct tests with organic wastes.
5. Wrap up the equipment.
6. Return unused samples (if any left) and secondary waste (if any generated) to the mixed waste storage area.

Milestone Number/Title: Start date will begin 45 days after submittal of treatability study notification to NMED. (Desired start day August 15, 1995)

A. Inorganic Tests Finished	8/31/95
B. Organic Tests Finished	9/30/95

Location of Project:

TA-53 bldg. 1. room D125.

Amount of Hazardous Waste:

WASTE NAME	APPROXIMATE COMPOSITION	QUANTITY (KG)
spent chromic acid	chromic acid, sodium dichromate, sulfuric acid and water, U238 suspect	50
nitric acid with mercury salts	HNO3, water, uranyl nitrate, Hg salts	10
mercuric cyanide	mercuric cyanide solid, U235, Pu239 suspect	2
copper cyanide	copper cyanide solid, U235, Pu239 suspect	2
cuprous cyanide	cuprous cyanide solid, U235 suspect	2
silver cyanide plating solution	sliver cyanide solution, U235 suspect	10
sodium, potassium cyanide	NaCN, KCN solids, U235,Pu235 suspect	2
HCL with CD unused chemical	HCL, Cd, H2O, U235,Pu235 suspect	1
mercury/HNO3 waste liquid used as an acid bath	Hg, HNO3, water, MFP suspect	2
isopropyl alcohol, ammonia tetrahydro fufuryl alcohol	15% isopropyl alc, 10% ammonia, 5% tetrahydrofuryl alc, 70% water, U238, U235 38 nCi/L	200
chemstrip waste	methylene chloride, methyl alcohol, isopropanol, epoxy paint, mineral spirit, Pu239 suspect, Pu238 suspect, H3 suspect	75

Qualifications

1. Experience.

Our team has many years of diversified experience in chemical engineering and chemistry including radiochemistry and environmental chemistry. Among others we have developed electrochemical systems for recovery of nitric acid from plutonium waste, treatment for water-reactive mixed waste, we modified industrial processes, and developed new analytical procedures. The electrochemical systems that we are planning to use was profoundly studied using artificial waste compositions.

2. Key Staff:

Jacek Dziewinski: M.Sc. Chemical Process Engineering, Technical University of Cracow; Experience: 5 yrs industrial research experience, University of Mining and Metallurgy (mass, heat exchange, reaction kinetics, adsorption), 6 yrs. industrial operations experience as Senior Process Engineer, BRZ Corporation (electrochemical processes, extractive metallurgy), 2 yrs with LANL, Principal Investigator (environmental projects).

Wayne H. Smith: Ph.D. in Chemistry, University of Texas, postdoctoral appointment at the California Institute of Technology, 7 yrs Assistant Professor of Chemistry at Texas Tech, 13 yrs. LANL/Nuclear Materials Technology Division, projects involve recovery and purification of actinide elements and development of new processes for the treatment of radioactive waste.

Stanislaw Marczak: Ph.D. Inorganic Chemistry and Electrochemistry (Warsaw University, Poland), 8 yrs Warsaw University, 3 months National Lab. (LANL); experience: chemical analysis (spectral and electrochemical), transition metals chemistry (separation, complex compounds), mechanisms of electrode reactions, chemical and electrochemical kinetics.

3. Equipment and Facilities.

The tests will be performed in radiation controlled room equipped with appropriate monitoring and ventilation systems, and a radioactive waste water drainage system. Radioactivity Control Technician will be available on call as required by the regulations. We will use two RETEC cells 0.63 m^2 each, a packed bed Electro Syn ES-Cell, 0.1 - 1.0 m^2 Electro Prod Cell, 100 A Dynatronix DPR20-100-400 power supply. The auxiliary equipment will include pumps, pH meters, thermometers, chart recorders, alarms, and vapor condensing system. We have adequate analytical capabilities which will include ICP AES, GC-MS, FT-IR, UV-VIS cyanide analyzer, stripping voltametry, and ion sensitive electrodes.

JD/dj

Cy: Guy Lussiez, CST-18, H824
CST-18A file