Chelant Screening And Refinement Tests - Phase I Task 2

**Topical Report
December 1993 - June 1994**

July 1995

Work Performed Under Contract No.: DE-AC21-93MC30168

U.S. Department of Energy
Office of Environmental Management
Office of Technology Development
Washington, DC

For

U.S. Department of Energy
Office of Fossil Energy
Morgantown Energy Technology Center
Morgantown, West Virginia

By
Babcock and Wilcox Company
Contract Research Division
Alliance, OH 44601

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EXECUTIVE SUMMARY

Under contract to the U. S. Department of Energy, the Babcock & Wilcox Company is developing a chemical decontamination process using chelating agents to remove uranium compounds and other actinide species from process equipment. The overall goal of the program is to develop a solvent capable of selectively chelating uranium; an additional requirement of the process is the ability to control corrosion of the base metal during decontamination. In cases where reuse of the equipment is a possibility, corrosion must be controlled at a low rate. However, if contamination has migrated into the grain boundaries of the base metal, a more aggressive solvent is required to corrode away base metal and expose radioactive species for removal. Another objective of the program is to recycle the chelating solvent, thereby minimizing the generation of secondary waste streams.

The project is divided into Phase I: "Lab Scale/Small Pilot Proof of Concept," and Phase II: "Field Demonstration." Phase I encompasses Task 1: "NEPA Study"; Task 2: "Chelate Chemistry/Process Optimization," the goal of which is to identify promising chelating solvents and optimize application parameters for maximum effectiveness; Task 3: "Solvent Recycle/Contaminant Reduction," the objective of which is to develop a process to break the chelant-metal bond and make chelant available for reuse; Task 4: "Bench Scale Tests," to evaluate the developed solvent system under dynamic test conditions; and Task 5: "Pilot Plant Study," involving application of the process to equipment actually contaminated in service. This report describes chelant screening and refinement testing performed under Task 2 of the program.

CHELANT SCREENING

As a first part of this task, a literature search was conducted to select organic chelating agents for screening. Due to the limited availability and high cost of many of the identified candidates, screening tests were initiated using three readily available chelating agents: EDTA (ethylenediaminetetraacetic acid), HEDTA (hydroxyethylethylenediaminetriacetic acid), and DTPA (diethylenetriaminepentaacetic acid). Additionally, several proprietary formulations of chelating solvents, provided by Environmental Scientific Incorporated (ESI), were evaluated. Screening tests were performed by placing a known weight of uranium dioxide in a three-liter test flask, then adding a known volume of test solvent to the flask and holding at carefully controlled conditions. Solvent was analyzed periodically to evaluate the extent of uranium dissolution. Monel, nickel and carbon steel coupons were included in some tests to evaluate solvent corrosivity.

Each of the candidate chelants was initially subjected to several screening tests at 93°C (200°F), run at varying pH's and utilizing several different additives. Dissolution results for this high temperature testing were unacceptable. A decision was then made to test chelants in conjunction with hydrogen peroxide and carbonate salts; the combination of peroxide and carbonate has been applied to the dissolution of uranium compounds in the mining industry. The combination of chelant, ammonium carbonate, and hydrogen peroxide, adjusted to a pH of 9.0 with ammonium hydroxide and applied at room temperature, was found to effect virtually 100% dissolution of available UO_2 within the first two hours of exposure. Results were equivalent for EDTA, HEDTA, and DTPA.

Further testing was then performed using an EDTA/ammonium carbonate/hydrogen peroxide solvent. EDTA was favored over the other two candidates due to its lower cost and large information base regarding its application. Several tests were performed to determine the effect of the chelant on the dissolution process. Results indicated that dissolution was 95-100% complete using a solvent containing peroxide and carbonate only; dissolution occurred slightly more rapidly, and to 100% completion, with the solvent containing chelant. The effect of carbonate on the dissolution process was also evaluated. A solvent containing just chelant and peroxide was found to dissolve only 16% of the uranium dioxide placed in the test flask. These results indicated that complexation of the uranium by carbonate was essential to the dissolution process.

Based on the results of the screening test program, two solvents were considered sufficiently promising to be carried forward to solvent refinement testing:

- (1) 50 g/L EDTA
20 g/L ammonium carbonate
5.0 g/L hydrogen peroxide
pH 9.0 with ammonium hydroxide
- (2) 20 g/L ammonium carbonate
5.0 g/L hydrogen peroxide
pH 9.0 with ammonium hydroxide

A third solvent, ESI-600, one of the proprietary formulations from ESI, was also chosen for limited refinement testing. Although the solvent did not perform well during screening, the manufacturer provided information on prior successful field application of ESI-600 which prompted further evaluation.

REFINEMENT TESTING

The purpose of refinement testing was to vary solvent parameters in order to maximize solvent effectiveness. The goal was to optimize performance while minimizing the amount of chemicals used, to reduce costs as well as the generation of secondary waste. Refinement testing with ESI-600, reformulated by the vendor, again showed that this solvent did not dissolve uranium dioxide effectively. Therefore, the majority of refinement testing was performed on the EDTA/carbonate/peroxide and carbonate/peroxide solvents. Parameters that were investigated were alternate oxidants, solvent constituent concentrations, and application scenarios.

Oxidants evaluated as alternatives to hydrogen peroxide, which requires care during handling and application, were air, oxygen, sodium nitrite, potassium bromate, and ferric chloride. None of the alternate oxidants performed comparably to peroxide. Testing with varying solvent constituent concentrations showed that the basic solvent system was effective over a wide range of concentrations. However, the importance of tailoring the solvent system to process application conditions was demonstrated. Specifically, the surface area of metal exposed during testing affected uranium dissolution; increased metal content in the system necessitated an increase in the initial H_2O_2 concentration for complete dissolution to occur.

These results showed that the metal surface area to solvent volume ratio must be factored into solvent formulation as it is tailored for a specific application.

A secondary part of the refinement testing was to evaluate the feasibility of applying the selected solvents in the foam state. A paste of uranium dioxide was dried onto coupons, which were subsequently exposed to the foamed EDTA/carbonate/peroxide solvent. The tests showed that UO_2 could be dissolved by the solvent in the foam state; however, a significant portion of the deposit was dissolved after it had dislodged from the coupon and dropped into the liquid. Further testing of foamed solvent with more appropriate test samples (material contaminated in-service, if available) should be performed.

In the final phase of refinement testing, process application testing, various application scenarios were simulated to evaluate their effect on dissolution and corrosion. The results of these final tests were used to develop the recommended process for the bench scale and pilot scale testing. Based on the results of testing, the following process application scenario was chosen for application in bench- and pilot-scale testing:

- (1) Two hours at room temperature
- (2) Heatup to 93°C and hold for four hours
- (3) Cool to room temperature and inject peroxide
- (4) Two hours at room temperature.

The rationale for this application scenario is that readily available uranium will be dissolved during the initial low temperature exposure. The four-hour 93°C exposure will result in corrosion of the base metal, thereby releasing contamination trapped in grain boundaries. This released contamination will be dissolved by the final low temperature exposure.

Using this application sequence for the EDTA/carbonate/peroxide solvent, 100% of the available UO_2 was dissolved and a carbon steel corrosion rate of 1.4 mils in four hours was achieved. These results exceeded the established success criteria for the solvent developed in this task, those being 90% dissolution of uranium present in the system in less than eight hours, and capability of a carbon steel corrosion rate greater than two mils per eight hours.

CONCLUSIONS

The conclusions drawn from Task 2 chelant screening and refinement testing were as follows:

- (1) None of the chelant-only solvents (including proprietary and commercially available formulations) tested at high temperature (93°C) effected acceptable uranium dioxide dissolution.
- (2) The two solvents found to exhibit targeted uranium dissolution effectiveness (90% in eight hours) when applied at room temperature were:
 - (a) ammonium carbonate/hydrogen peroxide at pH 9.0 with NH_4OH , and
 - (b) EDTA/ammonium carbonate/hydrogen peroxide at pH 9.0 with NH_4OH ,

- (3) The carbonate/peroxide solvent caused negligible corrosion to the metals being tested when applied at either room temperature or 93°C. The EDTA/carbonate/peroxide solvent was not corrosive at room temperature; however, when applied at 93°C, significant general corrosion, of a uniform nature, was observed on carbon steel. Such corrosion is required for removal of contamination embedded in base metal grain boundaries.
- (3) Metal surface area to solvent volume ratio was found to be an important process variable. Increased metal content in the system resulted in enhanced decomposition of hydrogen peroxide. Therefore, care must be taken to maintain a sufficient level of peroxide to effectively promote uranium dissolution.
- (4) Foaming tests performed were a qualified success. Foam application of the selected solvents appeared to be feasible, since they effected rapid uranium dissolution at room temperature.
- (5) The selected application scenario resulted in a solvent performance which met the proposed acceptance criteria (>90% of available uranium dissolved and >2 mils corrosion on carbon steel in eight hour period).

RECOMMENDATIONS

It is recommended that both the EDTA/carbonate/peroxide and carbonate/peroxide solvents be evaluated in the bench scale and pilot plant phases of this program. The recommended application sequence for both solvents is:

- (1) Hold two hours at room temperature
- (2) Heatup to 93°C and hold four hours
- (3) Cooldown to room temperature and spike with peroxide
- (4) Hold two hours at room temperature.

Additional foam application testing with more suitable test specimens (preferably contaminated process equipment) is also recommended.

1.0 INTRODUCTION

The Department of Energy (DOE) is now faced with the task of meeting decontamination and decommissioning obligations at numerous facilities by the year 2019. Due to the tremendous volume of material involved, innovative decontamination technologies are being sought that can reduce the volumes of contaminated waste materials and secondary wastes requiring disposal. With sufficient decontamination, some of the material from DOE facilities could be released as scrap into the commercial sector for recycle, thereby reducing the volume of radioactive waste requiring disposal. Although recycling may initially prove to be more costly than current disposal practices, rapidly increasing disposal costs are expected to make recycling more and more cost effective (Reference 1). Additionally, recycling is now perceived as the ethical choice in a world where the consequences of replacing resources and throwing away reusable materials are impacting the well-being of the environment.

Current approaches to the decontamination of metals most often involve one of four basic process types: (1) chemical, (2) manual and mechanical, (3) electrochemical, and (4) ultrasonic (Reference 2). "Hard" chemical decontamination solutions, capable of achieving decontamination factors (Df's) of 50 to 100, generally involve reagent concentrations in excess of 5%, tend to physically degrade the surface treated, and generate relatively large volumes of secondary waste. "Soft" chemical decontamination solutions, capable of achieving Df's of 5 to 10, normally consist of reagents at concentrations of 0.1 to 1%, generally leave treated surfaces in a usable condition, and generate relatively low secondary waste volumes. Under contract to the Department of Energy (DOE Contract Number DE-AC21-93MC30168), the Babcock & Wilcox Company is developing a chemical decontamination process using chelating agents to remove uranium compounds and other actinide species from process equipment.

The project is divided into Phase I: "Lab Scale/Small Pilot Proof of Concept," and Phase II: "Field Demonstration." Phase I activity under Task 1: "NEPA Study" and Task 2: "Chelate Chemistry/Process Optimization," the goal of which is to identify promising chelating solvents and optimize application parameters for maximum effectiveness, has been completed. Remaining Phase I activity includes Task 3: "Solvent Recycle/Contaminant Reduction," the objective of which is to develop a process to break the chelant-metal bond and make chelant available for reuse; Task 4: "Bench Scale Tests," to evaluate the developed solvent system under dynamic test conditions; and Task 5: "Pilot Plant Study," involving application of the process to equipment actually contaminated in service. This topical report describes chelant screening and refinement testing performed under Task 2 of the program.

2.0 BACKGROUND/OBJECTIVES

2.1 Overall Program Background/Goals

This work is being performed in response to DOE's request for research on methodologies for the decontamination of process equipment. At the time of project initiation, DOE offered equipment from the gaseous diffusion plant at Oak Ridge, Tennessee, for use in the full scale demonstration of the developed technology. This equipment may or may not be used for the full scale demonstration. However, it was used as the basis for the project plan. For this reason, the selected technical approach was to develop a process suitable for application to process equipment contaminated in this manner.

Internal components of equipment utilized in the uranium enrichment process were in contact with uranium hexafluoride (UF_6) gas at elevated temperatures over many years of operation. It is suspected that inleakage of air during operations and after plant shutdown have resulted in deposits of other uranium compounds, possibly UO_2F_6 and UF_4 . Additionally, occasional outleakage of process gas has left small radioactive deposits on external surfaces.

The compressor internals are expected to not only have surface contamination, but, due to long exposures at high temperatures, it is anticipated that the radioactive contaminants have penetrated the grain boundaries of the base metal. The Allis Chalmers centrifugal compressors in the K-27 building typically have housings constructed of carbon steel with less than 0.001 inch of internal nickel plating. The rotors are typically made of Monel; the shafts, of carbon steel.

DOE's preliminary evaluation of the potential for recycling the compressor materials was that some equipment parts, such as the compressor base and rotor shaft, might be surface contaminated only, and, as such, releasable for unrestricted use under existing guidelines (eg. NRC Regulatory Guide 1.86, DOE Order 5400.5). Other parts, such as the compressor housing, rotor, and piping, were expected to be bulk contaminated with radionuclides, preventing unrestricted release and making the equipment potentially reusable within the DOE complex. Requirements of the decontamination technology applied to the compressors were: (1) removal of as much contamination as possible in a cost effective manner, (2) minimization of the volume of secondary waste generated, and (3) minimization of worker exposure. The technical approach and test plan for this program were developed in accordance with this information.

2.2 Specific Chelant Screening/Refinement Task Objectives

The use of chelating agents for the chemical cleaning and decontamination of nuclear steam generating equipment is well known. Ethylenediaminetetraacetic acid (EDTA)-based solvents are currently state-of-the-art technology for the dissolution of magnetite (Fe_3O_4), copper, and other metals and metal oxides from the secondary side of nuclear steam generators. Technologies developed for the decontamination of commercial nuclear power reactors (eg. LOMI and CANDEREM processes) also utilize chelating agents; these processes have been tailored for the removal of metal oxides which are radioactive either from having spent time in-core or from incorporation of radioactive ions in solution into the oxide lattice as it grows on

the metal surface. Thus, the vast majority of information available on cleaning and decontamination using chelants does not specifically apply to the removal of actinides.

The approach taken in this program was to build on the chemical cleaning expertise acquired by Babcock & Wilcox during the development and qualification of the Electric Power Research Institute/Steam Generator Owners Group (EPRI/SGOG) chemical cleaning process (Reference 3). The mechanism of the technology proposed for development was similar to that of the referenced process, and entails the formation of stable complexes between the chelant and contaminant species. Metal ions possess reactive sites at which the activity of the metal is centered. To inhibit the reaction of a metal ion, it is necessary to introduce a material which forms a stable complex with metal ions, and thus, blocks the reactive sites of the metal ion. When used appropriately, chelating agents can effectively stabilize a metal ion in solution. Stabilization of the metal ion in solution also shifts the metal to ion equilibrium and allows chelating solutions to continuously promote dissolution of metals into the solution phase (Reference 4). Chelating agents have been successfully used for a number of years in the chemical cleaning industry for deposit dissolution.

The generic goal of this program is to develop a solvent capable of selectively chelating uranium and other actinides. This selectivity is required to eliminate the potential for the chelating capacity of the solvent to be exhausted by metallic species, such as iron, which might be present in overpowering quantities. A second requirement of the process is the ability to control corrosion of the base metal. In cases where materials are surface contaminated only, and reuse of the equipment is a possibility, corrosion should be controlled at a low rate. However, in cases where contamination has migrated into the grain boundaries of the base metal, a more aggressive solvent is required, to corrode away base metal and expose the radioactive species for removal.

The specific goal of this task was to first perform laboratory screening tests to identify the best solvents for the selective chelation of uranium. The best solvents from the screening test program were then carried forward into the refinement phase of this task. The specific objective of the refinement tests was to optimize the solvent application parameters and to define the process application sequence for the subsequent bench and pilot plant tests.

3.0 CHELANT SCREENING - LITERATURE SEARCH

As previously stated, the goal of this task was to perform laboratory screening tests to identify the best solvent for the selective chelation of uranium. As a first part of this task, a literature search was conducted to select organic chelating agents for screening. This computerized search encompassed technical literature back over the past twenty years, up to the most current information available. The criterion for selection was the ability of the chelant to complex the various forms of uranium expected to be present on the compressor surfaces. Numerous references were located that described laboratory evaluations of the stability constants of uranium chelates (References 5-18). However, virtually all of these studies were performed by titrating the chelating agent with solutions of uranium compounds; no references were found in which insoluble uranium compounds were solubilized by the action of chelants, or in which current research on decontamination of equipment interiors had utilized chelants.

Attempts were made to procure several chelating agents described in the literature as forming stable complexes with various forms of uranium. The majority of these compounds were not available for purchase from organic chemical vendors; of those that were available, most were too expensive for practical application to decontamination requirements of the magnitude expected. A table of some of the candidates identified by the literature search appears as Appendix A. The chelants listed as "not available" could not be purchased from Fisher Scientific or Eastman Kodak in quantities sufficient for the planned testing. The costs of those chelants that were available are shown in the table.

A third consideration in the selection of candidate chelating agents was the status of EPA approval for utilization of the chemical; in the planning stages of the project, DOE personnel indicated that EPA approval was a requirement for application of the process in the field demonstration. Based on these considerations, the screening tests were initiated using three readily available chelating agents, namely EDTA (ethylenediaminetetraacetic acid), HEDTA (hydroxyethylethylenediaminetriacetic acid), and DTPA (diethylenetriaminepentaacetic acid), already approved for use in chemical cleaning applications. It should be noted that the conditions of availability, pricing, and EPA approval were merely used to select candidates for initial screening investigations, not to exclude candidates from the study. It was planned that if an effective solvent system were not developed using readily available chemicals, further evaluation of more expensive or less widely used materials would be undertaken.

EDTA is a chelating agent widely used for the chemical cleaning of fossil and nuclear steam generators. It is also integral to various commercially available decontamination solvent systems such as CANDEREM. Because of its widespread use, EDTA is relatively inexpensive and its characteristics are well known. These factors made EDTA a logical choice for inclusion into the test program.

HEDTA is similar to EDTA. Like EDTA, HEDTA has 6 metal complexing sites and in general provides similar performance to EDTA for complexing of metals, including uranium. EDTA is usually the chelate of choice, in comparison to HEDTA, because of cost. The advantage of HEDTA is that it is soluble over a wider pH range than EDTA. This increases the versatility of HEDTA, especially if a wide range of application parameters are required for optimum performance.

Chemical cleaning experience with DTPA (References 3 and 19) has shown it to also provide similar performance compared to EDTA. Like HEDTA, DTPA is more expensive than EDTA and is less widely used. However, DTPA has 8 metal complexing sites. The literature references indicated that actinides, in general, preferred chelates with 8 metal complexing sites. This was the reason for the inclusion of DTPA in the test program.

Proprietary chelants synthesized by Environmental Scientific, Incorporated (ESI) were also included in the test program. The goal of the program was always to utilize readily available nonproprietary compounds, if possible. However, to provide the best chance for success, it was necessary to draw upon all available resources. The ESI products were chosen because of the reported claims of being effective in the dissolution of uranium and plutonium. The ESI products were also reported to be many times more effective than EDTA, especially at low temperatures.

The initial literature also identified other possible candidates. The most promising appeared to be a selective actinide chelator being developed by New Mexico State University (NMSU) under sponsorship of a separate DOE program (Reference 20). A schematic of this tetrahydroxamate ligand is shown in Figure 1. NMSU was anxious to include this compound in the testing. However, purification of the compound after synthesis proved to be a problem and the chelate was not available in sufficient quantities for inclusion into this test program.

Figure 1
Selective Actinide Chelator Synthesized
by New Mexico State University

4.0 SCREENING AND REFINEMENT TEST PROCEDURE

As previously presented, the purpose of the screening tests was to select three solvents for refinement testing, based strictly on their ability to chelate uranium. The deposit material chosen for dissolution testing was uranium dioxide (UO_2), since it was felt to represent one of the least soluble contaminants potentially present. Each candidate chelant was subjected to several screening tests, run at varying pH's. The other conditions were held constant throughout the initial stages of the screening test program. These conditions included the following:

Chelant Concentration	10% weight/volume
Solution Temperature	93°C
Solution pH	5.5, 7.0, 9.0
Uranium Concentration	4 grams UO_2 /liter solvent
Exposure Time	8 hours

The screening tests were conducted in three-liter four-neck reaction flasks. A schematic of a typical solvent screening test flask arrangement is shown in Figure 2. The general procedure followed for testing was as follows:

- (1) Prepare solvent and analyze to ensure it is within specification.
- (2) Add solvent to a reservoir flask and heat to 93°C in a controlled temperature water bath.
- (3) Add weighed amount uranium dioxide to bottom of a reaction flask.
- (4) Assemble reaction flask lid by inserting stirrer, sampling tube, fill/drain line, condenser, and thermocouple in appropriate penetrations.
- (5) Secure lid on test flask, place flask in controlled temperature water bath, start flow of cooling water to condenser and heat bath to 93°C.
- (6) When the solvent in the reservoir flask reaches 93°C, pump heated solution into the reaction flask containing uranium dioxide. Begin stirring solution vigorously. Maintain temperature at 93°C $\pm$ 2°C throughout the test period.
- (7) Take samples of the solvent after 1, 2, 4, 6, and 8 hours of exposure. Analyze samples for dissolved uranium (by inductively coupled plasma spectroscopy) and available chelant. Filter samples through tared Millipore filters to remove particulate material. Dry and weigh filters.
- (8) At the conclusion of the test, filter the entire solution remaining in the test flask. Dry and weigh the filtered material.

Figure 2
Schematic of Typical Solvent Screening
Test Flask Arrangement

Prew weighed and dimensioned corrosion test specimens (~ 2.0"x0.75"x0.1") of carbon steel, Monel 400 and Nickel 200 were placed in the reaction flask prior to solvent injection, for corrosion monitoring by weight loss determination. These materials were selected based on the equipment from the gaseous diffusion plant at Oak Ridge, Tennessee, which was being used as the preliminary basis for evaluation of the solvent systems (Section 2.1 of this report).

The technique of estimating general corrosion by weight loss of corrosion test specimens is discussed in the NACE (National Association of Corrosion Engineers) Standard Test Method TM0193-93, "Laboratory Corrosion Testing of Metals in Static Chemical Cleaning Solutions at Temperatures below 93°C (200°F)." Coupon weight loss data from the chelant screening and refinements tests were calculated to mils penetration for the test period (generally 8 hours) using the following equation:

$$\text{Mils penetration} = \left[\text{weight loss (g)} \right] \times \left[\frac{1}{\text{density(g/cm}^3\text{)}} \right] \times \left[\frac{1}{2.54 \text{ cm/in}} \right]^3 \times \left[\frac{1000 \text{ mils/in}}{\text{surface area (in}^2\text{)}} \right]$$

where, density = density of coupon material
 surface area = surface area of coupon.

As mentioned previously, the ability to control corrosion was a requirement of the solvent system developed. In cases where surface contamination only is to be removed, the solvent should be noncorrosive. When contamination is embedded in base metal grain boundaries, a more aggressive solvent is required, to corrode away surface layers and expose underlying contamination. One pre-determined success criterion for the developed solvent was the ability to remove 2 mils of carbon steel in an eight hour exposure period.

The results of uranium analysis on samples taken during the test were used to characterize the rate of uranium dissolution for each solvent tested. Particulate material removed during sampling and during final filtration of the spent solvent were weighed and compared to the amount of uranium calculated to be dissolved using results of ICP analysis.

When an analytical method was available, chelant analysis was also performed periodically during the exposures, to monitor the amount of free chelant available for complexation with uranium. In evaluating analytical data from the screening and refinement testing, it can be observed that the level of free chelant determined occasionally dropped during an exposure, then rose slightly at the end of the test. This was most likely due to a change of analyst, since the method utilized for determination of free chelant was a titration with a colorimetric endpoint. The determination of the endpoint was somewhat operator sensitive; this was not considered to pose an analytical problem, because the available chelant level was not a control parameter, but was for information only.

This was the basic procedure followed for both the screening and refinement tests. As the program progressed, this basic procedure was modified for low temperature tests and the addition of oxidants. These specific changes to the basic test procedure will be presented, as appropriate, with the test results.

5.0 RESULTS AND DISCUSSION - SOLVENT SCREENING TESTS

5.1 Introduction

A total of 33 tests were performed as part of the solvent screening portion of this test program. These can be divided into three sets:

- Preliminary Testing (Tests 1 - 6)
- High Temperature (93°C) Uranium Dissolution Testing (Tests 7-26)
- Room Temperature/Oxidizing Tests (Tests 27-33)

Although only thirty screening tests were originally scheduled, three extra tests were required to evaluate the role of various solvent constituents (chelant, ammonium carbonate, and hydrogen peroxide) in the room temperature/oxidizing tests.

The main criterion used for selecting solvent systems for further evaluation was rate of uranium dissolution, as determined by dissolved uranium analysis of the samples removed from the test flasks. These values were confirmed by the total amount of uranium dissolved, based on weight loss of the deposit added to the test flask. The absence of localized corrosion attack was also a selection criterion. As previously presented, in cases where materials are surface contaminated only, and reuse of the equipment is a possibility, corrosion should be controlled at a low rate. In cases where contamination has migrated into the grain boundaries of the base metal, a more aggressive solvent is required. However, even with the aggressive solvent, corrosion needs to be uniform and predictable in order to corrode away base metal and expose the radioactive species for removal.

A summary of the analytical results of each test can be found in Appendix B of this report. A detailed material balance using the original solvent volume, sample volumes, and analytical values was also performed for each test. These material balances and a compilation of all of the raw test data can be found in Appendix C. The results of each of the tests are presented in more detail in the subsequent sections.

5.2 Preliminary Testing

Prior to starting the uranium dissolution testing it was necessary to process a B&W Research & Development Division Job Safe Practice (JSP) to ensure the proper and safe handling and disposal of the slightly radioactive material. This JSP had to be approved by the appropriate R&D Division oversight committee (in this case the Radioisotope Committee) and properly implemented. The initial six tests were performed without the presence of UO_2 during the time period that the JSP was going through approval and implementation. The purpose of these first six tests was to obtain corrosion data and to also thoroughly familiarize test personnel with the test equipment and procedures.

These first six tests utilized EDTA, HEDTA, and DTPA at a pH of 7.0 and 9.0. The standard test procedure, as described in Section 4 was used for these tests. The application temperature was maintained at 93°C with a constant temperature water bath. A corrosion inhibitor was added at a concentration of 3 mL/L. The inhibitor chosen was Rodine 31A, which

is a chemical cleaning industry standard for use with organic acids and chelating agents.

As can be seen from the data presented in Appendices B and C, corrosion loss was very low in all cases and for all materials. Total corrosion ranged from a low of 0 (no detectable weight loss) to a high of 0.0044 mils (0.11 μm) on one of the carbon steel coupons. This value of 0.0044 mils in eight (8) hours of exposure calculates to a very low corrosion rate of 4.8 mils per year (equivalent to 0.01 $\mu\text{m/hr}$). These results indicated that the inhibited solvent system would likely meet the criteria of low controlled corrosion rates.

5.3 High Temperature (93°C) Uranium Dissolution Testing

Once the JSP was approved, the uranium dissolution phase of the testing commenced. Each of the three candidate chelants (EDTA, HEDTA, DTPA) was initially tested, using the standard Section 4 test procedure, at a pH of 7.0 and 9.0. EDTA was also tested at a pH of 5.5. These were designated Tests 7 through 13. Note that DTPA was also tested at an initial pH of 5.0 (Test 17). All of these tests were performed at 93°C and utilized an inhibitor (again Rodine 31A) concentration of 3 mL/L.

The results were similar for all of these tests; only a small amount of the uranium dioxide added to the test flask (1%-4%) dissolved, generally during the first few hours of exposure. The UO_2 solubility values reported in Appendix B tables were calculated from the weight of deposit filtered from the spent solvent after testing. These values were adjusted for loss of deposit removed during sampling and captured on Millipore filters during sample preparation. Corrosion of the Monel 400 and the Nickel 200 was negligible and equivalent to that of the solvents without the UO_2 added. The corrosion rate of the carbon steel increased slightly over the no-deposit case. The rate appeared to increase as the initial pH of the solvent was lowered. However, the highest carbon steel corrosion rate (Test 17 - DTPA/pH 5) in these tests was only 47 mils per year (mpy) or 0.14 $\mu\text{m/hr}$. This corrosion rate still met the acceptance criteria.

At this point the trials shifted to the proprietary ESI products (Tests 14, 15, and 16). These tests utilized the ESI products in the as-received condition, as requested by ESI. ESI-600 was used in Test 14. This product had an initial pH of 6.8. The ESI-600 was reported by Environmental Scientific to contain 5.9% chelant with no corrosion inhibitor. ESI-603X was used in Test 15. This product had an initial pH of 10.7. The ESI-603X was reported by Environmental Scientific to contain 7% chelant with no corrosion inhibitor. ESI-680 was used in Test 16. This product was supplied as a powder. Per instructions, the powder was dissolved in water. A temperature between 80°C and 90°C was required to dissolve the powder. The ESI-680 also tended to crystallize if the temperature fell below 80°C. The final solution had an initial pH of 4.7. The ESI-680 was reported to contain an inhibitor and 6% chelant. All of the ESI tests were performed using the standard test procedure at an application temperature of 93°C.

The results with the ESI products were similar to the earlier tests with EDTA, HEDTA, and DTPA. Only a small amount of the uranium dioxide added to the test flask (1%-4%) dissolved, generally during the first few hours of exposure. Corrosion was slightly higher with the ESI products, especially for the carbon steels. The ESI-600 test (14) resulted in a carbon steel corrosion rate of 507 mpy (1.5 $\mu\text{m/hr}$). However, the criterion of uniform corrosion loss

was achieved. In addition, the total corrosion loss for the eight hour exposure was only 0.46 mils (11.7 μm). Therefore, the corrosion acceptance criteria was still met.

In an attempt to improve the uranium dissolution, the follow-on tests were then performed at a lower pH (2.5-3.2), achieved by adding citric or formic acid to the solvent formulation (Tests 18, 19, and 20). These organic acids have also been used in the chemical cleaning industry successfully for removal of deposits from power generating equipment. HEDTA was used in Test 18 while DTPA was used in Tests 19 and 20. Again testing was performed at 93°C with 3 mL/L Rodine 31A corrosion inhibitor added. As can be seen from the data in Appendices B and C, these formulations showed no improvement in uranium dissolution over the previous tests.

The next series of tests (Tests 21, 22, and 23) concentrated on the three base chelants at a pH of 5.5. The corrosion coupons were removed from the test set up. Although the ionic contribution of the metals from corrosion of the coupons had been low, there was a possibility that they may have interfered with the effectiveness of the solvent system. Therefore Tests 21 - 23 were performed to eliminate this concern. The inhibitor was also removed from the formulation in the event that it was retarding deposit dissolution. As with the previous tests, these were performed at 93°C.

As can be seen from the data presented in Appendices B and C, the dissolution of uranium improved slightly with the removal of the coupons. However, dissolution effectiveness was still less than 5% after eight hours exposure. As with the previous tests, most of the dissolution occurred during the first few hours of exposure. These dissolution results were still considered to be unacceptable.

One additional test was run using HEDTA at a pH of 2.0; the pH adjustment was made using nitric acid, since HNO_3 is known to be an effective solvent for uranium compounds. As with the previous three tests, no inhibitor was used. This formulation was evaluated in Test 24. No corrosion coupons were used in this test. The addition of the HNO_3 did not, however, result in improved dissolution of uranium dioxide.

The effect of increasing chelant concentration to 15% was also evaluated, with no enhancement of uranium dissolution observed. This testing was performed with DTPA at a pH of 5.5 in Test 25. No corrosion coupons or corrosion inhibitor were used in Test 25.

A final elevated temperature test was performed (Test 26). This test was a repeat of Test 25 with the addition of ammonium bifluoride (ABF) to the solvent formulation. ABF is a standard additive to many chemical cleaning formulations and generally improves the dissolution performance. No corrosion coupons or corrosion inhibitor were present in this test. This was the first partial success in the screening tests. Uranium dissolution increased significantly (29% versus 4% comparing Test 26 to Test 25). In addition, uranium appeared to be dissolving throughout the exposure period. However, total dissolution was still less than 30% after eight hours exposure, and not considered acceptable. Since the addition of a known activator (ABF) did not result in acceptable performance, a decision was made to stop the elevated temperature testing and investigate lower temperature processes. The results of these tests are presented in the next section.

5.4 Room Temperature/Oxidizing Tests

As presented in the preceding, the high temperature reducing conditions were ineffective in dissolving uranium. Therefore, a decision was made to test chelants in conjunction with hydrogen peroxide and carbonate salts. The combination of peroxide and carbonate has been applied to the dissolution of uranium compounds in the mining industry (oxidation of uranium to the +6 valence state by peroxide, followed by complexation with carbonate, References 21-23), and to the dissolution of copper compounds in the chemical cleaning industry. The testing was performed at room temperature, due, in part to the known potential for violent reaction between peroxide and organic materials. In addition, it is easier to maintain oxidizing conditions with H_2O_2 at lower temperatures.

The first test in this series (Test 27) used DTPA at about 100 g/L with the addition of about 30 g/L ammonium carbonate ($(NH_4)_2CO_3$). Hydrogen peroxide (H_2O_2) was added to the solvent at a concentration of about 3% and the solvent was pumped into the reaction flask. Note that the H_2O_2 was added just prior to injection to the reaction flask. No corrosion coupons were used in this testing. It is known that low temperature H_2O_2 /chelate solutions are essentially non-corrosive (References 3 and 24).

Table 1 summarizes the analytical data from Test 27 (this same data can be found in Appendices B and C). In Test 27, the pH dropped from the original 9.0 to 8.43 due to the addition of the low pH H_2O_2 solution (30% H_2O_2 at a pH of 5.5 was used for the peroxide addition). The pH remained essentially constant for the remainder of the exposure. Temperature increased from 23.9°C (75°F) to a maximum of 35.3°C (95.6°F). This peak in temperature occurred 1.5 hours after the start of the test. The free DTPA (i.e. uncomplexed DTPA) decreased due to chelation with the uranium and also from decomposition reactions caused by the H_2O_2 . The test was terminated after four hours due to the very rapid dissolution. Analytical results and visual observations indicated that essentially complete dissolution of the UO_2 occurred within the first hour of exposure. Post test weight loss of the deposit indicated greater than 99% dissolution.

Table 1
Analytical Data From Test 27
Low Temperature/Oxidizing Test Sequence

Elapsed Time (Hours)	pH	Free [DTPA] (g/L)	[Uranium] (ppm)	Temperature (°C)
0*	9.00	110.8	-	23.9
1	8.43	38.2	3470	34.8
2	8.43	12.7	3492	34.6
4	8.41	6.4	3542	30.7

* - 0 Hour analysis just prior to addition of concentrated H_2O_2 solution - [DTPA] after addition = 99.7 g/L

Test 27 was considered to represent a total success. Test 28 was performed to verify that the results could be duplicated. Test 28 again used DTPA at about 100 g/L. To save on chemical usage, a decision was made to add only 15 g/L $(\text{NH}_4)_2\text{CO}_3$. Hydrogen peroxide (H_2O_2) was also reduced to a concentration of about 1.5%. As with Test 27, the H_2O_2 was added just prior to introduction of solvent into the reaction flask. No corrosion coupons were used in this testing.

Table 2 summarizes the analytical results from Test 28. The results were essentially identical to Test 27. Uranium dissolution was rapid and essentially complete within the first hour of exposure. Weight loss at the end of testing again indicated greater than 99% uranium dissolution. The lower concentration of H_2O_2 added resulted in less of a temperature rise (29.9°C maximum temperature) and also less destruction of the free chelate (DTPA in this case).

Table 2
Analytical Data From Test 28
Low Temperature/Oxidizing Test Sequence

Elapsed Time (Hours)	pH	Free [DTPA] (g/L)	[Uranium] (ppm)	Temperature (°C)
0*	8.99	103.8	-	23.9
1	8.56	81.3	3612	29.0
2	8.52	68.7	3682	29.9
4	8.53	50.0	3819	27.9

* - 0 Hour analysis just prior to addition of concentrated H_2O_2 solution - [DTPA] after addition = 98.6 g/L

The results of Test 28 essentially duplicated the results of Test 27, even with the lower carbonate and peroxide concentration. The next step was to determine the effect of carbonate on the dissolution process. Test 28 was repeated with a solvent containing just chelant (DTPA) and H_2O_2 . All other parameters were identical. This test was designated Test 29. Table 3 summarizes the analytical results from Test 29. Figure 3 graphically shows a comparison between Tests 28 and 29 for uranium dissolution effectiveness.

From Table 3 and Figure 3 it is apparent that a solvent containing just chelant and peroxide was not as effective as the carbonate/chelant solvent. The solvent containing only chelant and peroxide dissolved only 16% of the uranium dioxide placed in the test flask versus essentially 100% for the carbonate/chelant solvent. These results indicated that complexation of the uranium by carbonate was essential to the dissolution process. It is likely that a mixed chelate complex was formed in the presence of carbonate and chelant (Reference 25); this assumption was supported by color differences observed between solutions containing uranium dissolved by carbonate alone, and by mixed carbonate/chelant solvents.

Figure 3
Comparison of Uranium Dioxide Dissolution for
Solvent With and Without Carbonate

Table 3
Analytical Data From Test 29
Low Temperature/Oxidizing Test Sequence

Elapsed Time (Hours)	pH	Free [DTPA] (g/L)	[Uranium] (ppm)	Temperature (°C)
0*	9.00	102.5	-	22.7
1	8.95	85.4	531	23.9
2	8.86	76.8	555	24.0
4	8.74	71.8	562	23.2
6	8.66	64.4	596	23.4

* - 0 Hour analysis just prior to addition of concentrated H₂O₂ solution - [DTPA] after addition = 98.6 g/L

The next three tests (30, 31, and 32) were an exact repeat of Test 28 with alternate chelants. Tests 30 and 32 used EDTA at about 100 g/L while Test 31 used HEDTA, also at 100 g/L. As with Test 28, carbonate was added at about 15 g/L and the H₂O₂ was added at about 1.5%. The results of these tests duplicated the results of Test 28 and will not be shown here (all results are tabulated in Appendices B and C). The combination of chelant, ammonium carbonate, and hydrogen peroxide at a pH of 9.0 (adjusted with ammonium hydroxide) was found to effect virtually 100% dissolution of the uranium dioxide placed in the test flask, within the first hour of exposure. Results were equivalent for each of the three tested chelating agents (EDTA, DTPA, and EDTA).

It should be noted here that the H₂O₂ depletes during the exposure period. H₂O₂ is consumed during the oxidation reactions, and also by decomposition. Peroxide values are presented in Appendix B. The results of peroxide analyses are a strong function of the time between sampling and analysis because of the decomposition that occurs even after sampling. Refrigeration of the sample aids in preserving the sample but does not guarantee complete stabilization. Therefore, the peroxide values should be used for general trending rather than for the absolute values. In all tests using chelant/carbonate/peroxide, the H₂O₂ was essentially 100% consumed by the end of the 4 hour exposure.

One final test was performed examining the role of the chelant in the uranium dissolution process. Test 33 was a repeat of the previous tests (28, 30, 31, and 32) with the elimination of the chelant. In Test 33, ammonium carbonate at a concentration of approximately 15 g/L and H₂O₂ at a concentration of approximately 1.5% were used. The results of Test 33 are summarized in Table 4. Excellent dissolution was achieved with essentially all of the uranium being dissolved within the first two hours. The temperature rise in this test was essentially non-existent in comparison to the previous tests with chelant present. Another difference in Test 33 versus the Tests 28, 30, 31, and 32 was the fact the H₂O₂ depletion rate appeared to be much slower. Approximately 1.4% H₂O₂ remained in solution at the completion of the four hour

exposure. Test 33 was considered as the completion of the screening phase of this program.

Table 4
Analytical Data From Test 33
Low Temperature/Oxidizing Test Sequence

Elapsed Time (Hours)	pH	Free [Chelant] (g/L)	[Uranium] (ppm)	Temperature (°C)
0*	9.00	NA	-	20.0
1	8.88	NA	3050	20.6
2	8.85	NA	3294	20.4
4	8.81	NA	3327	19.3

* - 0 Hour analysis just prior to addition of concentrated H₂O₂

NA - Not Applicable since no chelant was added to solvent

5.5 Conclusions/Recommendations - Screening Tests

None of the elevated temperature (93°C) solvent systems provided acceptable uranium dissolution. Therefore none of these systems were recommended for further evaluation in the refinement phase of this test program.

The combination of chelant, ammonium carbonate, and hydrogen peroxide at a pH of 9.0 (adjusted with ammonium hydroxide) was found to effect virtually 100% dissolution of the uranium dioxide placed in the test flask, within the first hour of exposure. Results were equivalent for each of the three tested chelating agents.

This type of combined solvent appeared to be promising for several reasons:

- (1) Since uranium dioxide was dissolved effectively at room temperature, the solvent could be utilized in surface decontamination applications without interference from chelation of iron, which does not occur readily at low temperatures.
- (2) The addition of carbonate and hydrogen peroxide does not complicate the secondary waste stream, since these are not hazardous materials.

Based on the results of the screening test program, it was decided that two solvents would be carried forward to solvent refinement testing on the basis of their performance. Those selected:

- (1) EDTA, ammonium carbonate, and hydrogen peroxide: pH 9.0 with NH₄OH
- (2) ammonium carbonate and hydrogen peroxide: pH 9.0 with NH₄OH.

Both of these solvent systems exhibited excellent uranium dissolution. Although corrosion testing was not performed with these solvent systems, historical data with similar solvents (Electric Power Research Institute/Steam Generator Owners Group and Halliburton copper dissolution solvents) indicated that corrosion would be low and uniform. At this point in the program it was thought that a carbonate/peroxide solvent might be effective for removal of light surface uranium contamination. It was further theorized that the addition of chelant would be required for decontamination of surfaces characterized by heavier deposits, to stabilize the uranium ions in solution and prevent precipitation from occurring during the cleaning process. Chelant would also be required to effect base metal corrosion if contamination were buried in the metal surfaces.

The third solvent chosen for refinement testing was ESI-600, one of the proprietary formulations from Environmental Scientific Incorporated. Although this solvent did not dissolve uranium dioxide effectively, the manufacturer provided information on successful field application of ESI-600 to the decontamination of turbine rotors from a nuclear power station. Additionally, during screening, this solvent had exhibited corrosivity toward carbon steel, a second requirement of the developed process. For these reasons, the solvent was carried forward to refinement testing.

Test 34 was a baseline test using the basic solvent system formulated with air saturated water. The solvent was formulated and stirred overnight in the open to ensure air saturation. This lowered the initial pH of the solvent to 8.85. The test was carried out at room temperature. After two hours of exposure it was visually evident that essentially no dissolution was occurring. In addition, the two hour sample contained only 81 ppm of dissolved uranium. After the two hour sample, 20 mL of a 30% H_2O_2 solvent was injected into the test flask. Uranium dissolution appeared to occur immediately. The dissolved uranium increased to 1652 ppm for the three hour sample. The 20 mL injection of 30% H_2O_2 was performed after the four hour sample and again after five hours of exposure with continued uranium dissolution. The H_2O_2 concentration at the end of the test was 0.343% and greater than 99% uranium dioxide dissolution was achieved. This test verified the effectiveness of the H_2O_2 as an oxidant in this system, even at a relatively low concentration.

Tests 35 through 39 all used sparging of the solvent. Test 25 used an air sparge (typical plant compressed air). Tests 36 through 39 all used an oxygen sparge (from a compressed gas tank containing oxygen). For all of the sparging tests, the gas was bubbled through the solvent by means of a glass frit. All of these tests were performed without corrosion coupons.

The initial tests (35 and 36) were applied at room temperature. Overall effectiveness was very low. From fossil chemical cleaning experience (References 26 and 27) oxygen sparged solvents for copper dissolution are normally applied at higher temperatures. Tests 37, 38, and 39 were therefore performed at progressively higher temperatures (32.2°C, 43.3°C, and 65.6°C respectively) to evaluate this parameter. The results of these tests are shown graphically in Figure 4 and can be found in Appendices B and C. The increase in temperature only marginally improved the performance. None of the oxygen sparged systems showed acceptable uranium dissolution.

At this point in the program, the alternate oxidant tests were temporarily put on hold to evaluate some additional proprietary solvent formulations (Tests 40 - 42 which will be presented later). The oxidant tests were restarted at Test 43. The solvent system used for Test 43 was similar to that used in Test 39 (EDTA/carbonate/65.6°C/oxygen sparge). Sodium nitrite (NaNO_2) at 5 g/L was also added to the formulation. Sodium nitrite is used as an additive to accelerate the rate of oxidation in some standard copper dissolution solvents (References 28 and 29). Corrosion coupons were mistakenly included in the test.

Test 43 showed improved performance, as compared to Test 39 (approximately 39% uranium dissolution). At first glance this was attributed to the addition of the sodium nitrite. However, there was also a considerable amount of dissolved iron in solution (about 1000 ppm by the end of the test) from corrosion of the coupons. Because of the oxygen sparge, the dissolved iron would be expected to be complexed and in the ferric state. The ferric:EDTA complex is also known to be a strong oxidizing agent (Reference 29). Therefore, it was uncertain if the improved uranium dissolution was due to the sodium nitrite or the presence of the ferric:EDTA complex.

Base Solvent:

100 g/L EDTA

15 g/L Ammonium Carbonate

pH 9.0

Oxidant Key:

Test 32 - Peroxide

Test 36 - Oxygen Sparge At Room Temperature

Test 39 - Oxygen Sparge At 66°C

Test 46 - Ferric Ion/Oxygen Sparge/66°C

Test 50 - Ferric Ion/Air Sparge/66°C

Figure 4

Comparison of Uranium Dioxide Dissolution With Various Oxidants in the Base Solvent

Note that the corrosion coupons experienced relatively high corrosion rates as compared to the earlier tests:

C1018 - 4.391 mils (112 μm)

N200 - 0.937 mils (24 μm)

M400 - 0.973 mils (24.7 μm)

Note further that the corrosion loss was uniform. This was an early indication that temperature control could be used to cause uniform corrosion of base metal, if required to expose contamination buried deep in the components.

Test 44 was performed in an attempt to clarify the results of Test 43. The corrosion coupons were eliminated from Test 44. All other parameters were the same as for Test 43. The results of Test 44 more nearly duplicated Test 39 than Test 43 (see Appendices B and C for details). Comparing Tests 39, 43, and 44, it was concluded that the improved results from Test 43 were the result of the ferric:EDTA complex rather than the addition of the sodium nitrite. This was evaluated further in Test 46 (Test 45 will be discussed later).

Test 46 used 100 g/L EDTA, 15 g/L ammonium carbonate, and 3 g/L ferric chloride (FeCl_3). The initial pH of the solvent was 9.0 and the application temperature was 65.6°C (150°F). An oxygen sparge was also used. Test 46 clearly demonstrated the benefits of the ferric:EDTA complex as an oxidizing agent. Greater than 60% uranium dissolution was achieved. The results of the various oxygen sparge tests are graphically compared in Figure 4. Note that even with the ferric:EDTA complex initially present in the solvent, uranium dissolution effectiveness was still lower than the basic H_2O_2 system.

A final test of the ferric:EDTA solvent system was performed in Test 50. Test 50 was the same as Test 46 with the exception that air sparging was substituted for the oxygen sparge. Air sparging would be easier to utilize than oxygen sparging in actual application. The results of Test 50 are also shown graphically in Figure 4. Not surprisingly, the oxygen sparge resulted in improved dissolution over the air sparge in this system. Note however, that the air sparge/ferric:EDTA system (Test 50) outperformed the systems using oxygen sparging and no ferric:EDTA.

Test 49 rounded out the data on oxygen sparging. This was a 24 hour oxygen sparge at relatively low temperatures (35°C maximum temperature). Test 49 was used to determine, if given enough residence time (which could be engineered into a delivery system) if the oxygen sparge concept could be utilized. Results were poor.

Tests 45, 47 and 48 evaluated potassium bromate as the oxidant. Potassium bromate is a standard oxidant used in copper dissolution solvents for fossil boiler chemical cleanings. The potassium bromate chemical cleaning solvents are typically applied at about 66°C. Therefore, these tests were also applied at this temperature. Test 45 utilized the basic solvent system with 40 g/L potassium bromate (KBrO_3). Test 48 also used the same basic solvent system with a lower concentration of potassium bromate (25 g/L). Test 47 used the same solvent as Test 48 with the addition of oxygen sparging throughout the test.

The results of Tests 45, 47, and 48 are shown graphically in Figure 5. Overall effectiveness was similar between all of the bromate solvents tested. Overall uranium dissolution was in the 70-80% range, which was an improvement over the other alternate oxidants tested. However, results were still less than that achieved with the H_2O_2 . A decision was made at this time to concentrate all further testing with the H_2O_2 system. Although limited success was achieved with bromate and ferric chloride, application temperature had to be increased to about 66°C . These additives also had the potential of complicating the secondary waste stream. The H_2O_2 was very effective at room temperature, and has already been stated, does not cause a secondary waste problem. There was still the concern of handling H_2O_2 . However, H_2O_2 has been successfully used in numerous large scale chemical cleaning projects. Therefore, the engineering of the H_2O_2 delivery system is well understood.

6.3 Process Optimization

At this point in the program the decision was made to concentrate efforts on optimization of the basic EDTA-carbonate-peroxide solvent system. The base solvent selected was as follows:

100 g/L EDTA
15 g/L $(\text{NH}_4)_2\text{CO}_3$
15 g/L H_2O_2
pH 9.0
Room Temperature Application

This was the solvent tested and proved to be effective in Test 32. The results of Test 34 indicated that the H_2O_2 concentration could be lowered with no loss in efficiency. It was thought that other constituents could also be lowered. The next sequence of testing methodically lowered the individual solvent constituents and evaluated the uranium dioxide dissolution effectiveness.

Tests 51, 52, and 53 examined lower initial H_2O_2 concentrations. The initial H_2O_2 concentration was lowered to 10 g/L (Test 51), then to 5 g/L (Test 52) and then 2.5 g/L (Test 53). Essentially 100% uranium dissolution was achieved in all three tests (see Appendices B and C for the data). In all cases dissolution was rapid, essentially all occurring prior to the first sample (taken after 1 hour). The temperature rise from the exothermic reactions was relatively small for all tests (from about 22°C to about 28°C).

For the next series of tests, the Test 53 solvent became the new baseline:

100 g/L EDTA
15 g/L $(\text{NH}_4)_2\text{CO}_3$
2.5 g/L H_2O_2
pH 9.0
Room Temperature Application

Base Solvent:

100 g/L EDTA

15 g/L Ammonium Carbonate

66°C

Figure 5

Comparison of Uranium Dioxide Dissolution With Bromate as the Oxidant in the Base Solvent

In Tests 54, 55, and 56 the ammonium carbonate in the solvent was evaluated at 10 g/L (Test 56), 7.5 g/L (Test 54) and 5 g/L (Test 55). Essentially 100% dissolution was easily and rapidly achieved with 10 g/L ammonium carbonate (See Appendices B and C). The results at the lower carbonate concentrations (7.5 and 5 g/L) were inconsistent and showed less than 99% uranium dioxide dissolution. Based on Test 54 through 56 a decision was made to use 10 g/L as the lower limit on ammonium carbonate concentration.

Results from Test 33 had already demonstrated the effectiveness of a solvent containing only ammonium carbonate and peroxide. Therefore, only one test was performed at an intermediate EDTA concentration (50 g/L in Test 57). In Test 57 the ammonium carbonate was added at 10 g/L and the H_2O_2 was added at 2.5 g/L. As expected, rapid, almost complete dissolution of the uranium dioxide was achieved.

Tests 51 through 57 indicated that the basic solvent system was effective over a wide range of concentrations. This could allow for tailoring the solvent for differing levels of contamination and to minimize chemical usage. The next series of tests investigated the effectiveness of the uranium dissolution solvent at higher uranium dioxide loadings. Up to this time, all tests were performed with a uranium dioxide loading of 4 g/L. This amounted to 10 grams in the 2.5 liters of solvent used for each test. Tests 58, 59, 60 and 61 used higher UO_2 loadings.

In Test 58 the UO_2 loading was increased to 8 g/L (20 grams in 2.5 liters). The solvent used for Test 58 was as follows:

50 g/L EDTA
10 g/L $(\text{NH}_4)_2\text{CO}_3$
2.5 g/L H_2O_2
pH 9.0
Room Temperature Application

Even at double the loading, uranium dissolution was extremely effective. Essentially complete dissolution occurred within the first two hours of exposure. With the relatively low H_2O_2 concentration, temperature only rose to about 26°C . The H_2O_2 concentration after 8 hours of exposure was 540 ppm.

In Test 59 the UO_2 was again added at 8 g/L (20 grams total in the 2.5 liter test solution). The EDTA was eliminated from the solvent making the Test 59 solvent formulation as follows:

10 g/L $(\text{NH}_4)_2\text{CO}_3$
2.5 g/L H_2O_2
pH 9.0
Room Temperature Application

The results for Test 59 were essentially identical to Test 58. Nearly 100% dissolution of the 8 g/L UO_2 was accomplished within the first two hours of exposure. There was essentially no

temperature rise. The final H_2O_2 concentration was 1200 ppm. In this case, the elimination of the EDTA did not significantly alter the solvent's performance.

The final two tests in the optimization phase (Tests 60 and 61) increased the uranium dioxide concentration to 12 g/L (30 grams of UO_2 in the 2.5 liters of solvent). Test 60 used the carbonate only solvent evaluated in Test 59. Results at the higher UO_2 concentration were good, but there was a slight fall off in efficiency (about 98.5% of the UO_2 added was dissolved). Like the other solvent applications, almost all of the dissolution appeared to occur over the first two hours of exposure. The results of this test (see Appendices B and C for details) indicated that the limits of this particular solvent were being reached. Note, however that this test used the low peroxide and carbonate concentration.

For Test 61, the EDTA was added back into the formulation:

50 g/L EDTA
10 g/L $(\text{NH}_4)_2\text{CO}_3$
2.5 g/L H_2O_2
pH 9.0
Room Temperature Application

Again, 12 g/L of UO_2 was added to the test flask. Corrosion coupons were once again included in the test flask (as previously stated, corrosion coupons had not been used in the previous optimization studies). Dissolution was good, but unexpectedly lower than Test 60 (about 94% UO_2 dissolution). A small amount of corrosion occurred to the Monel 400 coupon (0.5 μm) with the 1018 carbon steel and the Nickel 200 coupons experiencing no weight loss. This small amount of dissolved metal (confirmed by the metals analyses - see Appendix B) would not be expected to cause a drop in chelating capacity. However, it was also noted that the peroxide concentration dropped to below 0.1% by the first hour of exposure. This relatively rapid loss of H_2O_2 was thought to be the cause of the slight drop in dissolution efficiency in Test 61. More discussion on this theory will be presented in Section 6.5.

This completed this phase of the process optimization testing. The remaining optimization tests were performed with corrosion coupons. These final optimization tests will be presented in more detail in Section 6.5 of this report.

6.4 Miscellaneous Tests

As already stated, the original test plan allowed for three solvents to be carried forward into the refinement phase of the program, and ESI-600 had been selected for limited testing. A reformulation of this solvent, and also of ESI-603, were supplied by the manufacturer along with a request for re-evaluation of their performance. None of the proprietary formulations matched the performance of the basic solvent systems. The tests of the proprietary solvent systems are included in this section for completeness.

The original plan also included baseline tests with nitric acid (HNO_3). It is known that uranium is highly soluble in nitric acid and it is the solvent of choice in the reprocessing of uranium fuel. Therefore, HNO_3 was considered as the appropriate baseline for judging the rate

of dissolution of the solvents developed in this program. The results of the HNO₃ tests are also presented in this section for completeness.

The nitric acid tests were identified as Tests 62 and 63. Both used uninhibited HNO₃ at a concentration of 150 g/L. Test 62 was performed at 65.6°C (150°F). Test 63 was performed at room temperature. The heat of reaction in Test 63 caused an increase in temperature of the solvent system from 21.7°C (71°F) up to a maximum of 28.9°C (84°F). Corrosion coupons were included in both Tests 62 and 63. The dissolved metal analyses for Tests 62 and 63 are presented in Tables 5 and 6.

Table 5
Dissolved Metal Analysis From Test 62
HNO₃ at 65.6°C

Elapsed Time (Hours)	Dissolved Metals (ppm)			
	Uranium	Iron	Nickel	Copper
1	3544	8194	3638	700
2	3062	8197	8225	1430
4	3230	8711	14378	2490
6	3352	8948	15933	2849
8	3404	9447	16506	2877

Table 6
Dissolved Metal Analysis From Test 63
HNO₃ at Room Temperature

Elapsed Time (Hours)	Dissolved Metals (ppm)			
	Uranium	Iron	Nickel	Copper
1	2987	5886	350	27
2	3517	8507	1375	221
4	3634	9355	4495	802
6	3655	9430	6642	1258
8	3703	9548	9044	1725

As was evident from the dissolved metal analyses, corrosion of the coupons was quite high. The coupons in Test 62 were completely dissolved (they could not be found after the test). The carbon steel coupon in Test 63 was also completely dissolved. The nickel and Monel 400 coupons in Test 63 experienced excessive (about 660 μ m) corrosion, but were retrievable at the end of test. This was not unexpected when using an uninhibited HNO₃ solvent. A corrosion inhibitor would decrease the corrosion rates, but excessive metal loss would still be expected.

This is the reason that HNO_3 was considered only as a baseline solvent in this test program for uranium dissolution effectiveness. In this application the nitric acid would have limited reuse value due to the excessive loading of iron, nickel, and copper from the equipment being cleaned.

Uranium dissolution was essentially complete within the first two hours of exposure to the HNO_3 solvent at both room temperature and the elevated temperature. Note that the dissolved uranium values in Test 62 fluctuated up and down during the duration of the exposure. This was most likely due to an analytical interference on spectroscopic uranium determination by the high dissolved metals levels resulting from excessive coupon corrosion in this test. In test 63, the dissolved uranium concentration increased slowly throughout the latter portion of the exposure, although the majority of dissolution occurred during the first two hours. From the standpoint of uranium dioxide dissolution, the carbonate peroxide solvent developed in this program compares favorably with the HNO_3 baseline tests.

Environmental Scientific Incorporated (ESI) was notified of the poor performance of their proprietary solvents (Tests 14, 15 and 16 - See Section 5) in this test program. They reformulated the ESI-600 and ESI-603 and requested they be re-evaluated. This was done in Tests 40 and 41. Test 40 was performed at 93°C with corrosion coupons and used ESI-600. The new formulation reportedly had a higher chelant concentration and included a corrosion inhibitor. Test 41 was also performed at 93°C with corrosion coupons and used ESI-603. The new formulation reportedly had a higher concentration of chelant. The new formulations marginally improved performance but overall uranium dioxide dissolution was still less than 10% (See Appendices B and C for details).

Late in the program, ESI requested one additional round of tests be performed on their products. A revised formulation of ESI-600 was evaluated at 93°C and 65.6°C in Tests 74 and 75. The results were essentially the same as the previous ESI tests with less than 10% uranium dissolution after 8 hours exposure.

One final trial was performed with the ESI-600 supplied for Test 75. In Test 76, 20 g/L of ammonium carbonate was added to 2.5 liters of the ESI-600 and the pH adjusted to 9.0 with ammonium hydroxide. Approximately 5 g/L of H_2O_2 was then added to the solvent and the solvent was injected at room temperature into the test flask using standard procedures. No corrosion coupons were used. As can be seen from the data in Appendices B and C, this formulation greatly improved the uranium dioxide dissolution to greater than 80%. This improvement in performance, however, was still below the acceptance criteria and also below that achieved with the EDTA based system. No additional tests of ESI products were performed.

One additional proprietary product was tested in this program. This product was identified from the on-going literature search performed as part of this program. Reference 30 evaluated a number of commercially available decontamination solutions on sludge from the Savannah River Plant. One of the top performers was Radiac Wash manufactured by Biodex Medical Systems. The Radiac Wash reportedly decontaminates by sequestering metallic ions and also by mechanical action. Based on this information, the Radiac Wash apparently contains a chelant and also a surfactant. The Radiac Wash, as supplied by the vendor, was evaluated in Test 42.

Corrosion coupons were used in Test 42 and the application temperature was 93°C. The initial pH of the solution, as tested, was 4.5. The Radiac Wash marginally outperformed the basic solvents tested at 93°C, but still overall dissolution efficiency was less than 20%. No additional proprietary or commercially available solvent systems were tested in this program.

6.5 Corrosion/Dissolution Tests

Limited corrosion testing was performed prior to going on to the process development phase of this task (which will be presented in Section 8). This testing was performed with the carbonate only solvent. Corrosion with the EDTA/carbonate system was expected to be higher based on past experience with EDTA-based solvent systems (References 3 and 24). Based on the data generated to date it was also expected that the dissolution behavior of the EDTA/carbonate system and the carbonate alone system would be similar. Additional testing with the EDTA/carbonate system was also planned for the process development phase of this task.

The purpose of the corrosion tests was two fold:

1. Determine corrosion rates of 1018 carbon steel, Nickel 200, and Monel 400 in the candidate carbonate/H₂O₂ decontamination solvent.
2. Determine if the presence of the metal specimens adversely affected the uranium dissolution performance of the solvent.

The first test with corrosion coupons (Test 64) used the carbonate only system with all solvent constituents at their lowest tested concentration:

10 g/L (NH₄)₂CO₃
2.5 g/L H₂O₂
pH 9.0
4 g/L UO₂ Deposit Added To Test Flask
Room Temperature Application

The test duration was eight hours. Corrosion loss was low and uniform. The 1018 carbon steel corrosion was 0.86 μm (0.034 mils). This calculates to the very low corrosion rate of 0.11 μm/hr. The corrosion loss on the Nickel 200 and Monel 400 were both 0.05 μm (0.002 mils).

The surprising result from Test 64 was the low uranium oxide dissolution. Less than 60% of the UO₂ added to the test flask was dissolved. Based on the previous testing 100% dissolution was expected. The low corrosion rate of the coupons was not expected to affect the overall UO₂ dissolution effectiveness.

Closer examination of the data revealed rapid H₂O₂ depletion. Table 7 compares Test 64 H₂O₂ concentrations to the Test 59 H₂O₂ concentrations. Both tests used the same basic solvent. Test 59 had a greater amount of deposit present (8 g/L UO₂) but no corrosion coupons. The Test 59 application resulted in essentially 100% deposit dissolution. From Table 7 it is evident that very rapid H₂O₂ decomposition occurred during Test 64. It was theorized that the

presence of the metal coupons helped to catalyze the H_2O_2 decomposition resulting in a peroxide concentration too low to effect complete dissolution. This theory was investigated further in Test 65.

Table 7
 H_2O_2 Concentration Comparison
 Test 59 (No Coupons) Versus Test 64 (With Coupons)

Elapsed Time (Hours)	H_2O_2 Concentration (ppm)	
	Test 59	Tests 64
1	1310	110
2	1280	74
4	1270	< 60
6	1260	< 60
8	1200	< 60

Test 65 utilized the same solvent system as used for Test 64:

10 g/L $(NH_4)_2CO_3$

2.5 g/L H_2O_2

pH 9.0

4 g/L UO_2 Deposit Added To Test Flask

Room Temperature Application

The peroxide injection was delayed until the four hour exposure time. Corrosion coupons were included in the test. The dissolved metals analyses from Test 65 are presented in Table 8. Once again less than 60% uranium dissolution occurred. From Table 8 it is evident that most of the dissolution occurred after the H_2O_2 injection, which occurred after the 4-hour sample. The dissolved iron, nickel, and copper indicate that corrosion occurred during the exposure, with the majority occurring prior to the peroxide injection. Essentially all of the corrosion was confined to the Monel 400, which lost 4 μm (0.16 mils). The 1018 carbon steel and the Nickel 200 showed no weight loss.

In Test 65 the peroxide injection occurred after the 4-hour sample. The next sample was taken after six hours of exposure. By the 6-hour sample the H_2O_2 was already below 60 ppm. The results of Test 64 and 65 clearly indicated that a minimum initial H_2O_2 concentration is required for effective uranium dissolution. This minimum level appeared to be different if corrosion specimens were present. Presumably the metal helped to catalyze the H_2O_2 decomposition reactions. This theory was investigated further in Tests 66 and 67.

Table 8
Dissolved Metal Analysis From Test 65
Carbonate Solvent With 2.5 g/L H₂O₂ and Coupons

Elapsed Time (Hours)	Dissolved Metals (ppm)			
	Uranium	Iron	Nickel	Copper
2	104	141	30	4
4	113	147	35	5
6	940	150	40	8
8	966	156	40	9
9	1730	156	48	10

Tests 66 and 67 used a solvent with increased carbonate and peroxide:

20 g/L (NH₄)₂CO₃

5 g/L H₂O₂

pH 9.0

4 g/L UO₂ Deposit Added To Test Flask

Room Temperature Application

Corrosion specimens were exposed in both tests. Peroxide analyses were performed during Test 66. These results are shown in Table 9, comparing them to Tests 59 and 64. Weight loss of the deposit after test showed that essentially 100% dissolution of the UO₂ was accomplished during this test. Visual observations indicated this to have occurred within the first two hours of exposure. Corrosion with the higher level of H₂O₂ present was also lower with all specimens experiencing only about 0.05 μm (0.002 mils) loss.

Table 9
H₂O₂ Concentration Comparison
Test 59 Versus Test 64 Versus 66

Elapsed Time (Hours)	H ₂ O ₂ Concentration (ppm)		
	Test 59	Test 64	Tests 66
1	1310	110	3330
2	1280	74	2720
4	1270	< 60	2340
6	1260	< 60	1510
8	1200	< 60	540

Test 67 utilized the Test 66 solvent system with corrosion coupons present. A new batch of H_2O_2 was used resulting in an initial H_2O_2 concentration of about 7.5 g/L (by analysis after the start of testing). After two hours of exposure the H_2O_2 was still greater than 5 g/L. At this point temperature was increased to 65.6°C. This was done as a trial on equipment performance in preparation for the process development testing which was to follow. After a total of seven hours exposure the solvent temperature was lowered to room temperature and spiked with H_2O_2 . Again, this was done as a trial in preparation for the process development testing. Test 67 resulted in essentially 100% UO_2 dissolution with low corrosion of all coupons (less than 0.03 μm). This test concluded this phase of the refinement testing.

6.6 Conclusions/Recommendations - Refinement Tests

It was recommended to carry both the EDTA-carbonate- H_2O_2 and carbonate- H_2O_2 solvent systems forward into the process development phase of the test program. These comprised the basic solvent systems developed in this program. None of the proprietary formulations matched the performance of the basic solvent systems.

Testing was performed to evaluate the possibility of using an oxidant other than hydrogen peroxide in the solvent. This testing was performed to determine if application could be simplified. Limited success was achieved with bromate and ferric chloride, however application temperature had to be increased to about 66°C. These additives also had the potential of complicating the secondary waste stream. H_2O_2 is recommended as the oxidant of choice to be carried forward into the process development phase of the program.

Testing in this program indicated that the basic solvent systems were effective over a wide range of concentrations. This can allow for tailoring the solvent for differing levels of contamination and to minimize chemical usage. From the standpoint of uranium dioxide dissolution, the carbonate-peroxide solvents (with or without EDTA) developed in this program compared favorably with the HNO_3 baseline tests.

The addition of corrosion coupons affected the uranium dioxide dissolution. This necessitated an increase in the initial H_2O_2 concentration. This effect is graphically shown in Figure 6. The presence of the metal coupons helped to catalyze the H_2O_2 decomposition which could result in a peroxide concentration too low to effect complete dissolution. This will need to be factored into the solvent formulation as it is being tailored for a specific application.

Figure 6
Effects of Coupons and Peroxide Concentration
On Uranium Dissolution

7.0 RESULTS AND DISCUSSION - FOAM APPLICATION TESTING

7.1 Introduction

A secondary part of the refinement testing was to run a series of tests with the selected solvents to determine if they could be used effectively in the foam state. Some of the process equipment requiring decontamination at DOE sites is very large; foam cleaning is an industrial process used to clean large components. Additionally, foam decontamination technology is currently being developed, as it has shown waste reduction of 70% over present decontamination methods (Reference 31). In this method of solvent application, the foam is the transport medium which carries the solvent to the metal surfaces, reducing the amount of solution required for coverage. The normal procedure for generating foam is to add a surfactant to the solvent and inject air (or an inert gas) below the liquid surface. Bubbles formed by the sparge are directed to the vessel or component to be cleaned by the slight positive pressure of the sparge gas.

7.2 Laboratory Foaming Tests

A series of laboratory tests were run to determine if the selected solvents could be applied in the foam state. A schematic of the equipment utilized is shown in Figure 7. A three-liter reaction flask was equipped with a lid with four penetrations. Two of the penetrations were sealed with single-hole rubber stoppers, which allowed the introduction of solvent and air. The solvent was pumped into the reaction flask using a peristaltic pump. Solvent level was maintained between 500 and 1000 milliliters during the test period. The second one-hole stopper was fitted with a long glass tube and a fritted disc. The frit was placed near the bottom of the reaction flask, and the other end of the tube was connected to a compressed air supply.

A length of large diameter plastic tubing was placed over the third penetration, and the other end of the tubing was placed in a reservoir for foam collection. The center penetration in the lid was stoppered, but a wire was secured to it on the inside to allow for suspension of test coupons in the reaction flask.

Prior to the first test, four carbon steel coupons were cleaned and weighed. Ten grams of uranium dioxide powder was mixed with deionized water to form a paste. The test coupons were coated with the paste, and placed in an oven to dry at 110°C. After drying, the coupons were reweighed and found to have between 1.0 and 1.5 grams of dried uranium dioxide on their surfaces.

For the first test, one coupon was suspended in the upper part of the reaction flask. One liter of solvent with a composition of 50g/L EDTA, 20 g/L ammonium carbonate, 1.5 g/L hydrogen peroxide, and 30 mL/L foaming agent (FOME-ADD™, DuBois USA) was pumped into the reaction flask. Air was then introduced under the surface of the solvent through the glass frit. The rate of air flow was regulated to provide a steady flow of foam. Solution temperature was maintained at ambient throughout the testing. A photograph of this testing is shown as Figure 8.

Figure 7
Schematic of Bench Scale Foaming Tests

Figure 8.
Photograph of Foam Application Testing

After one hour of foam generation, the test coupon was removed for inspection. Essentially 100% of the uranium dioxide had been removed from the coupon at this time. A small amount of deposit was observed in the bottom of the reaction flask. This material was filtered, dried, and weighed. Based on the weight of deposit recovered, the foaming process appeared to have dissolved 98% of the uranium dioxide originally present on the coupon.

Because it appeared that some of the baked-on deposit had flaked off the coupon prior to dissolution, the test was repeated using a different method of applying uranium dioxide to the test specimen. As done earlier, the UO_2 was made into a paste by mixing with deionized water, then dried on a four-inch diameter ceramic disc with many perforations (photograph in Figure 9). Approximately 9.1 grams of deposit were dried onto the disc.

The disc was suspended in the upper part of the reaction flask, and foaming was initiated as for the first test. After one hour of foaming, the disc was inspected and found to be 95% free of deposit. However, there was a considerable amount of deposit in the bottom of the flask. Foaming was continued for an additional hour. At that time, the uranium was totally dissolved in the solvent and the foam.

These foaming tests were successful in showing that uranium dioxide can be dissolved by the EDTA/carbonate/peroxide solvent in the foam state. However, a significant portion of the deposit was dissolved after it dislodged from the coupons and disc, and dropped into the liquid. Several tests were subsequently run in an attempt to develop a binder which would hold the deposit on the test specimen while dissolution took place. Potential binding agents evaluated were calcium carbonate, calcium silicate, dolomite, and cement. However, an appropriate binder was not identified by this study, because the resulting pastes did not adhere sufficiently to the disc.

7.3 Conclusions/Recommendations - Foam Application Tests

The foaming tests were considered as a qualified success. From the limited data generated in this phase of the program, it appeared that the EDTA/carbonate/peroxide solvent developed in this program could be effectively applied in the foam state. The lack of a suitable test coupon to bind the uranium dioxide for the foam tests limits the broad applicability of the test results.

It is recommended that additional foam tests be performed with a more suitable test coupon. This could be actual contaminated material, if available. The low application temperature and the relatively short time required for uranium dioxide dissolution make the EDTA/carbonate/peroxide solvent particularly adaptable to foam cleaning.

Figure 9
Photograph of Ceramic Disc Coated With
Uranium Dioxide Paste

8.0 RESULTS AND DISCUSSION - PROCESS DEVELOPMENT TESTING

8.1 Introduction

As the final phase of solvent refinement testing, two solvents were selected for process development testing. The compositions of the two solvents were as follows:

Solvent A 50 g/L EDTA
 20 g/L $(\text{NH}_4)_2\text{CO}_3$
 5.0 g/L H_2O_2
 pH 9.0 with ammonium hydroxide

Solvent B 20 g/L $(\text{NH}_4)_2\text{CO}_3$
 5.0 g/L H_2O_2
 pH 9.0 with ammonium hydroxide

The purpose of the process development testing was to simulate several potential solvent application scenarios in order to evaluate their effect on uranium dissolution and corrosion. The two application scenarios tested were as follows:

Scenario #1 - Application of solvent two hours at room temperature (to dissolve surface uranium contamination), followed by heatup to 93°C (or 66°C) and hold for four hours (to corrode and remove base metal), then cooldown to room temperature, spike with peroxide and hold two hours (to chelate remaining uranium),

and

Scenario #2 - Application of solvent at 93°C (or 66°C) for four hours (to remove base metal), followed by cooldown to room temperature, spike with peroxide and hold four hours (to chelate uranium).

As with previous testing, the evaluation of the processes involved the rate and extent of uranium dissolution, as well as the amount and type of corrosion to the materials of interest. The process development testing was performed using the same equipment arrangement and type of test procedures as the solvent screening tests. Corrosion coupons were included for each of the tests performed.

The results of the process development testing, along with those from the solvent recycle testing, were used to develop the process recommended for use in the bench scale and pilot scale tests.

8.2 Testing of Application Scenario #1

As mentioned above, the rationale for the first application sequence was that solvent would first be applied at room temperature to allow for dissolution of readily available (surface)

uranium contamination. After two hours of room temperature application, the solvent was to be heated and held at temperature for four hours, to allow for corrosion of base metal with subsequent release of uranium having penetrated the grain boundaries of the metal. After four hours of exposure at elevated temperature, the solvent was to be cooled to room temperature, spiked with hydrogen peroxide (which would have decomposed at elevated temperature), and held for two hours to allow for dissolution of uranium contamination released by the corrosion of base metal.

Four tests (67-70) of Scenario #1 were run to evaluate each of the two selected solvents at two temperatures of application (66°C and 93°C). An identification of the four tests follows:

- Test 67: Carbonate-peroxide solvent @ 66°C
- Test 68: EDTA-carbonate-peroxide solvent @66°C
- Test 69: Carbonate-peroxide solvent @ 93°C
- Test 70: EDTA-carbonate-peroxide solvent @93°C

In Test 67, Solvent A (carbonate-peroxide) was first applied for two hours at room temperature. The initial concentration of hydrogen peroxide was analyzed to be 7.5 grams per liter. At the conclusion of this exposure, the uranium concentration of the solvent was 3.67 grams per liter. Subsequently, the contents of the flask were heated to 66°C and held there for four hours; the uranium concentration of the solvent remained essentially constant during this step. The solvent was then cooled to room temperature and spiked with hydrogen peroxide. The amount of peroxide added was sufficient to bring the concentration of the solvent to 5 grams/liter, assuming that all peroxide added at the beginning of the test was destroyed in the heating step. Analysis for peroxide one hour after the spike showed it to be present at a level of 3.72 grams per liter; after one and one-half hours, peroxide was determined to be 1.3 grams per liter.

The test flask was then held at room temperature for two hours, during which time the uranium concentration increased slightly, to 3.94 grams/liter. This application sequence resulted in essentially 100% dissolution of the added uranium dioxide; the corrosion coupons experienced negligible corrosion (<0.003 mils).

Test 69 was a repeat of Test 67, except the high temperature application was performed at 93°C. Results for this test were very similar to those for Test 67, except that the uranium appeared to go into solution slightly more slowly than in the first test. A check of hydrogen peroxide concentration showed that this species was present at a level of 5 grams per liter throughout the room temperature exposure. After two hours at room temperature, the solvent contained 2.70 grams dissolved uranium per liter. During heatup to 93°C for the high temperature exposure, the uranium concentration increased to 3.48 grams U per liter, while peroxide levels dropped to <0.06 grams per liter. For some unknown reason, a temperature increase was necessary to catalyze the final stages of uranium dissolution. Subsequently, the uranium concentration of the solvent remained essentially constant throughout the remainder of the test. At the conclusion of the test, 100% of the added uranium dioxide had been dissolved; all coupons experienced less than 0.002 mils corrosion.

In test 68, Solvent B (EDTA-carbonate-peroxide) was applied in the same manner as that in Test 67 (high temperature application at 66°C). At the conclusion of the two-hour room temperature exposure, the uranium concentration of the solvent was 3.50 grams per liter. During the four-hour exposure at 66°C, the uranium concentration of the solvent increased slightly to 3.82 grams per liter. The solvent was then cooled to room temperature and spiked with hydrogen peroxide. The test flask was held at room temperature for two hours, during which time the uranium concentration decreased slightly, to 3.72 grams/liter. This apparent decrease is due in part to the dilution of solvent through addition of peroxide, as well as normal analytical variance. This application sequence resulted in essentially 100% dissolution of the added uranium dioxide. As expected, the coupons experienced considerable general corrosion, as determined by weight loss (carbon steel 0.918 mils, nickel 0.069 mils, Monel 0.122 mils).

Test 70 was a repeat of Test 68, except the high temperature application was performed at 93°C. Results for this test were very similar to those for Test 68; again, that the uranium appeared to go into solution slightly more slowly than in the first test of the EDTA solvent. After two hours at room temperature, the solvent contained 2.31 grams dissolved uranium per liter. The concentration increased to 3.36 grams U per liter after one-half hour of the high temperature exposure. Again, as in Test 69, the temperature increase during heatup appeared to catalyze the uranium dissolution reaction. The uranium concentration of the solvent increased slightly throughout the remainder of the test. A graphical representation of test results appears at Figure 10. Note that the dissolved uranium concentration increased slightly after the peroxide spike after cooling to room temperature. At the conclusion of the test, 100% of the added uranium dioxide had been dissolved; the coupons experienced considerable general corrosion, as determined by weight loss (carbon steel 1.405 mils, nickel 0.196 mils, Monel 0.124 mils).

The results of testing on Scenario #1 indicated that requirements for uranium dissolution efficiency could be met by either solvent using this application sequence. The carbonate-peroxide solvent exhibited negligible corrosion rates as applied; the EDTA solvent showed general corrosion rates sufficient to remove 1.5 mils of carbon steel during a four hour exposure at 93°C.

8.3 Testing of Application Scenario #2

The rationale for the second application sequence was that solvent would first be applied at elevated temperature, to allow for corrosion of base metal with subsequent release of uranium having penetrated the grain boundaries of the metal. After the high-temperature exposure, the solvent was to be cooled to room temperature, spiked with hydrogen peroxide (which would have decomposed at elevated temperature), and held for four hours to allow for dissolution of uranium contamination.

Four tests (71-74) of Scenario #2 were run to evaluate each of the two selected solvents at two temperatures of application (66°C and 93°C). An identification of the four tests follows:

- Test 71: Carbonate-peroxide solvent @ 66°C
- Test 72: EDTA-carbonate-peroxide solvent @66°C
- Test 73: Carbonate-peroxide solvent @ 93°C
- Test 74: EDTA-carbonate-peroxide solvent @93°C

Figure 10
Chelant/Carbonate/Peroxide Solvent
Room Temperature - 93°C - Room Temperature

In Test 71, Solvent A (carbonate-peroxide) was first applied for four hours at 66°C. After two hours at temperature, the uranium concentration of the solvent was 3.69 grams per liter. This dissolution appeared to have taken place during heatup of the solvent, prior to peroxide decomposition. After two hours at temperature, the peroxide concentration had dropped from 6 grams per liter to 0.3 g/L. At this point, uranium dissolution ceased until the solvent was spiked with peroxide after cooldown. The amount of peroxide added was sufficient to bring the concentration of the solvent to 5 grams/liter, assuming that all peroxide added at the beginning of the test was destroyed during the high temperature exposure.

The test flask was then held at room temperature for four hours, during which time the uranium concentration increased slightly, to 3.78 grams/liter. This application sequence resulted in essentially 100% dissolution of the added uranium dioxide; the corrosion coupons experienced negligible corrosion (<0.001 mils).

Test 73 was a repeat of Test 71, except the initial high temperature application was performed at 93°C. Results for this test were similar to those for Test 71. After two hours at temperature, the solvent contained 3.50 grams dissolved uranium per liter. The uranium concentration of the solvent remained essentially constant throughout the remainder of the test. At the conclusion of the test, 97% of the added uranium dioxide had been dissolved; all coupons experienced less than 0.001 mils corrosion.

In test 72, Solvent B (EDTA-carbonate-peroxide) was applied in the same manner as that in Test 71 (initial high temperature application at 66°C). However, in this test, peroxide was inadvertently left out of the solvent during preparation. Therefore, the solvent heatup and high temperature application took place without hydrogen peroxide being present. After two hours at temperature, the uranium concentration of the solvent was only 0.16 grams per liter. After the cooldown and peroxide spike, however, the rate of uranium dissolution increased dramatically, and dissolution continued throughout the room temperature exposure. By the end of the test, 99.4% of the added uranium dioxide had been dissolved.

A surprising result of this test was the very low corrosion experienced by the carbon steel coupon (<0.001 mil). The weight loss calculation was corroborated by the analyses for dissolved iron in the solvent, which showed essentially no iron in solution. The corrosion loss for the Monel coupon was 0.038 mils; the nickel coupon lost 0.042 mils. These results bear some resemblance to those from Test 65 of the carbonate solvent, in which no corrosion was observed for carbon steel and nickel, but the Monel coupon exhibited a loss of 0.16 mils.

Test 74 was a repeat of Test 72, except the high temperature application was performed at 93°C. Again, peroxide was omitted from the original solvent formulation. Results for this test were, however, somewhat different from for Test 72. After two hours at temperature, the uranium concentration of the solvent was only 0.16 grams per liter. After the cooldown and peroxide spike, the rate of uranium dissolution increased dramatically, but dissolution did not continue throughout the room temperature exposure. Peroxide analysis during this phase of the test showed that the level of peroxide was only 0.086 grams per liter one hour after the spike. The rapid peroxide decomposition was most likely effected by the higher concentration of metal ions in solution (iron was present at a concentration of 0.081 grams per liter at the time of the spike).

9.0 CONCLUSIONS

The following is a summary of the significant conclusions from the data generated during Task 2 of DOE Program DE-AC21-83MC30168, "Chemical Decontamination of Process Equipment Using Recyclable Chelating Agents."

None of the elevated temperature (93°C) chelant-only solvent systems provided acceptable uranium dissolution. This included the proprietary and commercially available solvents evaluated in the program.

The combination of chelant, ammonium carbonate, and hydrogen peroxide at a pH of 9.0 (adjusted with ammonium hydroxide) was found to effect virtually 100% dissolution of the uranium dioxide placed in the test flask, within the first two hours of exposure. The solvent was effective in uranium dissolution at room temperature. Based on the results of the screening and refinement test program, two solvent systems were concluded to provide optimum uranium dioxide dissolution:

- (1) EDTA, ammonium carbonate, and hydrogen peroxide: pH 9.0 with NH_4OH
- (2) ammonium carbonate and hydrogen peroxide: pH 9.0 with NH_4OH .

Testing in this program indicated that the basic solvent systems were effective over a wide range of concentrations. This can allow for tailoring the solvent for differing levels of contamination and to minimize chemical usage. From the standpoint of uranium dioxide dissolution, the carbonate-peroxide solvents (with or without EDTA) developed in this program compared favorably with the HNO_3 baseline tests.

Testing was performed to evaluate the possibility of using an oxidant other than hydrogen peroxide in the solvent. This testing was performed to determine if application could be simplified. Limited success was achieved with bromate and ferric chloride, however they did not outperform the H_2O_2 . Therefore, H_2O_2 became the oxidant of choice for the solvent.

The addition of corrosion coupons affected the uranium dioxide dissolution. This necessitated an increase in the initial H_2O_2 concentration. The presence of the metal coupons helped to catalyze the H_2O_2 decomposition which apparently resulted in a peroxide concentration too low to effect complete dissolution. This will need to be factored into the solvent formulation as it is being tailored for a specific application. Peroxide is an important variable that needs to be carefully applied for optimum performance. This was evident from all of the testing covered by this report.

The foaming tests were considered as a qualified success. From the limited data generated in this phase of the program, it appeared that the EDTA/carbonate/peroxide solvent developed in this program could be effectively applied in the foam state. The lack of a suitable test coupon to bind the uranium dioxide for the foam tests limits the broad applicability of the test results.

The preferred application scenario for the process is as follows:

1. Two hours at room temperature with either solvent
2. Heatup to 93°C and hold for approximately 4 hours
3. Cooldown to room temperature
4. Inject peroxide to remove additional uranium contamination uncovered by the high temperature exposure.
5. Hold two hours at room temperature.

By starting with an initial low temperature application, all readily available uranium contamination is easily removed. Heatup to 93°C appears to dissolve the remaining readily available uranium contamination. The 93°C application results in higher corrosion rates than the 66°C application. This is necessary to expose contamination buried more deeply into the component. Even at 93°C, the corrosion is uniform in nature.

This application scenario resulted in a solvent performance which met the pre-determined selection criteria for this Task: >90% of available uranium dissolved and >2 mils corrosion on carbon steel in an eight hour period. Therefore, statement of work activities under Task 2 were considered to have been completed successfully.

10.0 RECOMMENDATIONS

It is recommended to continue to test both of the basic solvent systems in the bench scale and pilot plant phases of the program:

- (1) EDTA, ammonium carbonate, and hydrogen peroxide: pH 9.0 with NH_4OH
- (2) ammonium carbonate and hydrogen peroxide: pH 9.0 with NH_4OH .

From the data generated to date, the carbonate/peroxide solvent should be effective for removal of surface uranium contamination. The addition of chelant appears necessary for decontamination of surfaces where the contamination is buried deeper in the metal surfaces. In this case, the EDTA results in the necessary higher base metal corrosion during the 93°C application phase of the decontamination process. It is further recommended to utilize the application sequence as described in Section 9.0 for the bench scale and pilot plant test.

It is also recommended that additional foam tests be performed with a more suitable test coupon. This could be actual contaminated material, if available. The low temperature application temperature and the relatively short time required for uranium dioxide dissolution make the EDTA/carbonate/peroxide solvent particularly adaptable to foam cleaning.

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APPENDIX A

TASK 2 TOPICAL REPORT

DOE CONTRACT DE-AC21-93MC30168

TABLE OF CHELANTS IDENTIFIED IN LITERATURE SEARCH

CHELANTS IDENTIFIED IN LITERATURE SEARCH

Compound	Reference #	Limitation
2-pyridine-carboxaldehyde	5	not available
chlorokojic acid	5	not available
ethylenebis-(diphenylarsine)	5	not available
ethylenebis-(diphenylphosphine)	5	not available
uracil-6-carboxylic acid	7	not available
carboxymethylthiosuccinic acid	8	not available
salicylhydroxamic acid	9	not available
diethylenetriaminopentapropionic acid	10	not available
3-chloro-phthalic acid	11	not available
trans-1,2-cyclohexanediaminetetraacetic acid	12	not available
N-hydroxyethyliminodiacetic acid	12	not available
triethylenetetraminehexaacetic acid	12	not available
picolinate	14	not available
TTA crown ether	15	not available
PMBP crown ether	15	not available
H-octadentate catecholamides	16	not available
ethylenediaminetetraacetic acid (EDTA)	12	\$12/100g*
hydroxyethylethylenediaminetriacetic acid (HEDTA)	12	\$0.5/100g*
diethylenetriaminepentaacetic acid (DTPA)	12	\$13/100g*
iminodiacetic acid, disodium salt	12	\$20/100g
sodium diethyldithiocarbamate	18	\$25/100g
kojic acid (5-hydroxy-2-hydroxymethyl-4-pyrone)	5	\$300/100g
1-hydroxy-2-nitrosonaphthalene-4-sulphonic acid	17	\$50/100g

not available = not available from Fisher Scientific or Eastman Kodak

* cost from Fisher Scientific - these can also be purchased in a Technical Grade at a lower price

APPENDIX B

TASK 2 TOPICAL REPORT

DOE CONTRACT DE-AC21-93MC30168

**ANALYTICAL RESULTS FOR SOLVENT SCREENING
AND REFINEMENT TESTS**

DOE/UO2 SOLUBILITY AND CORROSION TEST

CORROSION ONLY

@TEMPERATURE

200°F

Date: 12/21/93

SOLUTION & pH	HRS	EDTA g/l	pH	U ppm	Fe ppm	Ni ppm	Cu ppm	CORROSION – mils
10% EDTA – pH 7.0 Test 1	1	100	7.03	N.A.	1.34	<1.0	<1.0	C1018 – 0.004
	2	100	7.03	N.A.	1.61	<1.0	<1.0	N200 – 0.003
	4	100	7.03	N.A.	1.65	<1.0	<1.0	M400 – 0.001
	6	100	6.98	N.A.	2.10	<1.0	<1.0	UO2 SOLUBILITY
	8	100	6.99	N.A.	2.12	<1.0	<1.0	# WT. LOSS – N.A.

pH ADJUSTED WITH NH4OH N.A.= NOT APPLICABLE

ADJUSTED FOR SAMPLE LOSS (MILLIPORES)

CORROSION ONLY

@ TEMPERATURE

@ 200°F (93.3°C)

Date: 12/27/93

SOLUTION & pH	HRS	DTPA g/l	pH	U ppm	Fe ppm	Ni ppm	Cu ppm	CORROSION – mils
10% DTPA – pH 7.0 Test 2	1	97.5	6.98	N.A.	<1.0	<1.0	<1.0	C1018 – 0.001
	2	97.5	6.98	N.A.	<1.0	<1.0	<1.0	N200 – 0.001
	4	97.5	6.98	N.A.	1.40	<1.0	<1.0	M400 – 0.000
	6	97.5	6.89	N.A.	1.90	<1.0	<1.0	UO2 SOLUBILITY
	8	97.5	6.89	N.A.	2.49	<1.0	<1.0	# WT. LOSS N.A.

pH ADJUSTED WITH NH4OH N.A.= NOT APPLICABLE

ADJUSTED FOR SAMPLE LOSS (MILLIPORES)

CORROSION ONLY

@ TEMPERATURE

200°F (93.3°C)

Date: 12/28/93

SOLUTION & pH	HRS	HEDTA g/l	pH	U ppm	Fe ppm	Ni ppm	Cu ppm	CORROSION – mils
10% HEDTA – pH 7.0 Test 3	1	98.8	7.10	N.A.	<1.0	<1.0	<1.0	C1018 – 0.0025
	2	98.8	7.07	N.A.	<1.0	<1.0	<1.0	N200 – 0.0015
	4	98.8	7.10	N.A.	<1.0	<1.0	<1.0	M400 – 0.0006
	6	98.8	7.09	N.A.	<1.0	<1.0	<1.0	UO2 SOLUBILITY
	8	98.8	7.09	N.A.	<1.0	<1.0	<1.0	# WT. LOSS N.A.

pH ADJUSTED WITH NH4OH N.A.= NOT APPLICABLE

ADJUSTED FOR SAMPLE LOSS (MILLIPORES)

DOE/UO2 SOLUBILITY AND CORROSION TEST

CORROSION ONLY @ TEMPERATURE 200°F (93.3°C)

Date: 01/05/94

'SOLUTION & pH	HRS	EDTA g/l	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – MILS
10% EDTA – pH 9.0 Test 4	1	100	8.98	N.A.	<1.0	<1.0	<1.0	C1018 – 0.004
	2	100	8.94	N.A.	<1.0	<1.0	<1.0	N200 – 0.002
	4	100	8.94	N.A.	<1.0	<1.0	<1.0	M400 – 0.001
	6	100	8.93	N.A.	<1.0	<1.0	<1.0	UO2 SOLUBILITY
	8	100	8.90	N.A.	<1.0	<1.0	<1.0	# N.A.

pH ADJUSTED WITH NH4OH

ADJUSTED FOR LOSS (MILLIPORES)

CORROSION ONLY @ TEMPERATURE 200°F (93.3°C)

Date: 01/07/94

SOLUTION AND – pH	HRS	DTPA g/l	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – mils
10% DTPA – pH 9.0 Test 5	1	92.9	8.95	N.A.	<1.0	<1.0	<1.0	C1018 – 0.002
	2	92.9	8.90	N.A.	1.0	<1.0	<1.0	N200 – 0.003
	4	95.3	8.95	N.A.	1.4	<1.0	<1.0	M400 – 0.002
	6	91.6	8.85	N.A.	1.9	<1.0	<1.0	UO2 SOLUBILITY
	8	95.3	8.76	N.A.	2.49	<1.0	<1.0	# N.A.

pH ADJUSTED WITH NH4OH

ADJUSTED FOR LOSS (MILLIPORES)

CORROSION ONLY @ TEMPERATURE 200°F (93.3°C)

Date: 01/10/94

SOLUTION & pH	HRS	HEDTA g/l	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – mils
10% HEDTA – pH 9.0 Test 6	1	103	8.98	N.A.	<1.0	<1.0	<1.0	C1018 – 0.0021
	2	103	9.00	N.A.	<1.0	<1.0	<1.0	N200 – 0.0000
	4	103	9.0	N.A.	<1.0	<1.0	<1.0	M400 – 0.000
	6	103	9.0	N.A.	<1.0	<1.0	<1.0	UO2 SOLUBILITY
	8	103	9.0	N.A.	<1.0	<1.0	<1.0	# N.A.

pH ADJUSTED WITH NH4OH

ADJUSTED FOR LOSS (MILLIPORES)

DOE/UO2 SOLUBILITY AND CORROSION TEST

UO2 SOLUBILITY @ TEMPERATURE 200°F (93.3°C)

Date: 01/21/94

'SOLUTION & pH	HRS	EDTA g/l	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – MILS
10% EDTA – pH 7.0 Test 7	1	98.0	6.98	26.4	<1.0	<1.0	<1.0	C1018 – 0.012
	2	98.0	6.98	36.9	1.1	<1.0	<1.0	N200 – 0.001
	4	98.0	6.98	46.9	1.6	<1.0	<1.0	M400 – 0.000
	6	98.0	7.11	49.8	1.88	<1.0	<1.0	UO2 SOLUBILITY
	8	96.2	7.52	43.3	5.0	<1.0	<1.0	# .4809g

pH ADJUSTED WITH NH4OH

ADJUSTED FOR LOSS (MILLIPORES)

UO2 SOLUBILITY @ TEMPERATURE

Date: 01/24/94

SOLUTION AND – pH	HRS	EDTA g/l	pH	U –ppm	Fe–ppm	Ni–ppm	Cu–ppm	CORROSION – mils
10% EDTA – pH 9.0 Test 8	1	100	8.88	39.0	<1.0	<1.0	<1.0	C1018–0.008
	2	100	8.79	51.0	1.0	<1.0	<1.0	N200–0.001
	4	100	8.72	54.0	1.3	<1.0	<1.0	M400–0.001
	6	100	8.58	56.0	1.5	<1.0	<1.0	UO2 SOLUBILITY
	8	97.1	8.91	59.0	1.6	<1.0	<1.0	# 0.3548

pH ADJUSTED WITH NH4OH

ADJUSTED FOR LOSS (MILLIPORES)

@ TEMPERATURE 200°F (93.3°C)

Date:01/26/94

SOLUTION & pH	HRS	EDTA g/l	pH	U–ppm	Fe–ppm	Ni–ppm	Cu–ppm	CORROSION – mils
10% EDTA – pH 5.5 Test 9	1	104	5.49	47.2	1.0	<1.0	<1.0	C1018 –0.021
	2	100	5.61	56.1	1.0	<1.0	<1.0	N200 – 0.004
	4	101	5.56	65	1.1	<1.0	<1.0	M–400 – 0.004
	6	100	5.55	70.1	1.88	<1.0	<1.0	UO2 SOLUBILITY
	8	98	5.61	76.3	2.34	<1.0	<1.0	# 0.4109

pH ADJUSTED WITH NH4OH

ADJUSTED FOR LOSS (MILLIPORES)

DOE/UO2 SOLUBILITY AND CORROSION TEST

@ TEMPERATURE @ 200°F (93.3°C)

Date: 01/27/94

'SOLUTION & pH	HRS	DTPA g/l	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – MILS
10% DTPA – pH 7.0 Test 10	1	98.1	6.99	42.3	<1.0	<1.0	<1.0	C1018 – 0.0129
	2	98.1	6.91	54.4	<1.0	<1.0	<1.0	N200 – 0.000
	4	98.1	6.90	61.5	1.35	<1.0	<1.0	M400 – 0.0025
	6	98.1	6.92	62.4	1.46	<1.0	<1.0	UO2 SOLUBILITY # 1.7043
	8	96.6	6.97	65.6	1.53	<1.0	<1.0	

pH ADJUSTED WITH NH4OH

ADJUSTED FOR LOSS (MILLIPORES)

@ TEMPERATURE @ 200°F (93.3°C)

Date: 02/01/94

SOLUTION AND – pH	HRS	DTPA g/l	pH	U –ppm	Fe–ppm	Ni–ppm	Cu–ppm	CORROSION – mils
10% DTPA – pH 9.0 Test 11	1	100	8.85	34.8	<1.0	<1.0	<1.0	C1018 – 0.0031
	2	100	8.83	39.0	<1.0	<1.0	<1.0	N200 – 0.001
	4	100	8.83	47.4	<1.0	<1.0	<1.0	M400 – 0.001
	6	100	8.84	52.4	<1.0	<1.0	<1.0	UO2 SOLUBILITY # 0.2506
	8	98.5	8.97	61.5	<1.0	<1.0	<1.0	

pH ADJUSTED WITH NH4OH

ADJUSTED FOR LOSS (MILLIPORES)

@ TEMPERATURE @ 200°F (93.3°C)

Date: 02/02/94

SOLUTION & pH	HRS	HEDTA g/l	pH	U–ppm	Fe–ppm	Ni–ppm	Cu–ppm	CORROSION – mils
10% HEDTA pH 7.0 Test 12	1	100	7.08	34.4	<1.0	<1.0	<1.0	C1018 – 0.017
	2	100	7.21	43.4	<1.0	<1.0	<1.0	N200 – 0.000
	4	100	7.02	51.5	1.0	<1.0	<1.0	M400 – 0.001
	6	100	7.07	54.5	1.31	<1.0	<1.0	UO2 SOLUBILITY # 0.3342 g
	8	99.0	7.14	60.2	1.60	<1.0	<1.0	

pH ADJUSTED WITH NH4OH

ADJUSTED FOR LOSS (MILLIPORES)

DOE/UO2 SOLUBILITY AND CORROSION TEST

@ TEMPERATURE @ 200°F (93.3°C)

Date: 02/03/94

'SOLUTION & pH	HRS	HEDTA g/l	pH	U - ppm	Fe - ppm	Ni - ppm	Cu - ppm	CORROSION - MILS
10% HEDTA - pH 9.0 Test 13	1	98.	8.67	22.7	<1.0	<1.0	<1.0	C1018 - 0.016
	2	98	8.67	31.6	<1.0	<1.0	<1.0	N200 - 0.003
	4	98	8.70	42.6	<1.0	<1.0	<1.0	M400 - 0.002
	6	98	8.75	45.6	<1.0	<1.0	<1.0	UO2 SOLUBILITY
	8	95.9	9.04	48.8	1.34	<1.0	<1.0	# 0.3758

pH ADJUSTED WITH NH4OH

ADJUSTED FOR LOSS (MILLIPORES)

@ TEMPERATURE 200°F (93.3°C)

Date: 02/08/94

SOLUTION AND - pH	HRS	ESI 600 g/l	pH	U - ppm	Fe - ppm	Ni - ppm	Cu - ppm	CORROSION - mils
ESI - 600 pH 7.0 Test 14	1	**	6.79	54.2	15.2	<1.0	<1.0	C1018 - 0.465
	2	**	7.07	55.6	23.8	<1.0	<1.0	N200 - 0.002
	4	**	7.07	56.6	40.8	<1.0	<1.0	M400 - 0.003
	6	**	7.08	58.9	62.1	<1.0	<1.0	UO2 SOLUBILITY
	8	**	7.29	59.6	85.5	<1.0	<1.0	# 0.4009

pH ADJUSTED WITH NH4OH

** NO ANALYTICAL METHOD IN PLACE AT TIME OF TEST

ADJUSTED FOR LOSS (MILLIPORES)

@ TEMPERATURE 200 °F (93.3°C)

Date: 02/09/94

SOLUTION & pH	HRS	ESI g/l	pH	U - ppm	Fe - ppm	Ni - ppm	Cu - ppm	CORROSION - mils
ESI - 603 pH 10 Test 15	1	**	10.7	58.2	16.8	<3	<5	C1018 - 0.153
	2	**	10.4	59.2	27.4	<3	<5	N200 - 0.004
	4	**	10.4	60.4	47.2	<3	<5	M400 - 0.002
	6	**	10.3	60.6	73.2	<3	<5	UO2 SOLUBILITY
	8	**	10.2	60.6	98.6	<3	<5	# 0.4292

pH ADJUSTED WITH NH4OH

** NO ANALYTICAL METHOD IN PLACE AT TIME OF TEST.

ADJUSTED FOR LOSS (MILLIPORES)

DOE/UO2 SOLUBILITY AND CORROSION TEST

@ TEMPERATURE 200 °F (93.3°C)

Date: 02/10/94

SOLUTION & pH	HRS	ESI 680 g/l	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – MILS
ESI 680 pH5.0 Test 16	1	**	4.56	65.6	6.25	1.57	<1.0	C1018 – 0.148
	2	**	4.56	67.7	8.95	2.36	<1.0	N200 – 0.015
	4	**	4.57	70.4	15.2	3.38	<1.0	M400 – 0.003
	6	**	4.56	72.2	21.3	3.59	<1.0	UO2 SOLUBILITY
	8	**	4.6	73.0	26.8	4.94	<1.0	# 0.5342

pH ADJUSTED WITH NH4OH

** NO ANALYTICAL METHOD IN PLACE AT TIME OF TEST

ADJUSTED FOR LOSS (MILLIPORES)

@ TEMPERATURE 200° F (93.3°C)

Date: 02/15/94

SOLUTION AND – pH	HRS	DTPA g/l	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – mils
10% DTPA – pH .50 Test 17	1	97.5	4.95	65.9	1.89	<1.0	<1.0	C1018 – 0.042
	2	97.5	4.96	68.9	2.60	<1.0	<1.0	N200 – 0.008
	4	97.5	4.96	73.1	3.61	<1.0	<1.0	M400 – 0.007
	6	97.5	4.91	74.0	4.73	<1.0	<1.0	UO2 SOLUBILITY
	8	97.5	5.08	76.2	5.92	<1.0	<1.0	# 0.6167

pH ADJUSTED WITH NH4OH

ADJUSTED FOR LOSS (MILLIPORES)

@ TEMPERATURE 200° F (93.3°C)

Date: 02/16/94

SOLUTION & pH	HRS	HEDTA g/l	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – mils
10% HEDTA pH 3.1 Test 18	1	92	3.09	66.4	2.77	1.83	<1.0	C1018 – 0.126
	2	88	3.07	66.5	4.31	2.36	<1.0	N200 – 0.019
	4	88	2.99	67.0	6.67	4.61	<1.0	M400 – 0.029
	6	88	2.98	67.2	9.62	5.25	<1.0	UO2 SOLUBILITY
	8	94.9	3.06	67.3	12.75	7.19	<1.0	# 0.4032

pH ADJUSTED WITH NH4OH

ADJUSTED FOR LOSS (MILLIPORES)

DOE/UO2 SOLUBILITY AND CORROSION TEST

@ TEMPERATURE 200°F (93.3°C)

Date: 02/17/94

'SOLUTION & pH	HRS	DTPA g/l	pH	U ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – MILS
10% DTPA pH 3.2 Test 19	1	101	3.11	62.7	2.68	3.30	<1.0	C1018 – 0.165
	2	98.4	3.10	63.1	5.46	3.57	<1.0	N200 – 0.022
	4	98.4	3.10	64.4	8.66	4.78	<1.0	M400 – 0.028
	6	98.4	3.10	64.5	13.4	6.14	<1.0	UO2 SOLUBILITY
	8	100.3	3.24	65.3	17.4	7.47	<1.0	# 0.5623

pH ADJUSTED WITH NH4OH

ADJUSTED FOR LOSS (MILLIPORES)

@ TEMPERATURE 200 °F(93.3°C)

Date:02/18/94

SOLUTION AND – pH	HRS	DTPA g/l	pH	U –ppm	Fe–ppm	Ni–ppm	Cu–ppm	CORROSION – mils
10% DTPA pH 2.63 Test 20	1	94.4	2.62	69.1	3.61	3.50	<1.0	C1018 – 0.139
	2	94.4	2.62	69.6	5.88	5.06	<1.0	N200 – 0.009
	4	94.4	2.62	71.1	14.5	9.41	<1.0	M400 – 0.053
	6	94.4	2.62	73.2	21.2	14.8	<1.0	UO2 SOLUBILITY
	8	95	2.65	73.5	26.7	17.6	<1.0	# 0.5856

pH ADJUSTED WITH NH4OH

ADJUSTED FOR LOSS (MILLIPORES)

NO INHIBITOR @ TEMPERATURE 200 °F (93.3°C)

Date: 02/22/94

SOLUTION & pH	HRS	EDTA g/l	pH	U–ppm	Fe–ppm	Ni–ppm	Cu–ppm	CORROSION – mils
10% EDTA pH 5.5 Test 21	1	101.9	5.29	90.5	N.A.	N.A.	N.A.	C1018 No Coupon
	2	101.9	5.21	107	N.A.	N.A.	N.A.	N200 – No Coupon
	4	101.9	5.18	118	N.A.	N.A.	N.A.	M400 – No Coupon
	6	101.9	5.25	123	N.A.	N.A.	N.A.	UO2 SOLUBILITY
	8	102.9	5.25	124	N.A.	N.A.	N.A.	# 0.5536

pH ADJUSTED WITH NH4OH

ADJUSTED FOR LOSS (MILLIPORES)

DOE/UO2 SOLUBILITY AND CORROSION TEST

NO INHIBITOR

TEMPERATURE 200 °F (93.3°C)

Date: 02/23/94

'SOLUTION & pH	Hrs	DTPA g/l	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – MILS
10% DTPA – pH 5.5 Test 22	1	100.6	5.47	80.6	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	100.6	5.35	84.4	N.A.	N.A.	N.A.	N200 – No Coupon
	4	100.6	5.33	90.4	N.A.	N.A.	N.A.	M400 – No Coupon
	6	99.4	5.34	93.8	N.A.	N.A.	N.A.	UO2 SOLUBILITY # 0.8484
	8	97.5	5.45	97.5	N.A.	N.A.	N.A.	

pH ADJUSTED WITH NH4OH

ADJUSTED FOR LOSS (MILLIPORES)

NO INHIBITOR

@ TEMPERATURE 200°F (93.3°C)

Date: 02/24/94

SOLUTION AND – pH	HRS	HEDTA g/l	pH	U –ppm	Fe–ppm	Ni–ppm	Cu–ppm	CORROSION – mils
10% HEDTA – pH 5.5 Test 23	1	96.9	5.44	94.2	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	96.9	5.49	102	N.A.	N.A.	N.A.	N200 – No Coupon
	4	95.9	5.50	110	N.A.	N.A.	N.A.	M400 – No Coupon
	6	95.9	5.45	115	N.A.	N.A.	N.A.	UO2 SOLUBILITY # 1.4068
	8	97.9	6.06	127	N.A.	N.A.	N.A.	

pH ADJUSTED WITH NH4OH

ADJUSTED FOR LOSS (MILLIPORES)

NO INHIBITOR

@ TEMPERATURE 200 °F (93.3°C)

Date: 02/25/94

SOLUTION & pH	HRS	HEDTA g/l	pH	U–ppm	Fe–ppm	Ni–ppm	Cu–ppm	CORROSION – mils
10% HEDTA – pH 2.0 Test 24	1	94.9	2.12	93.7	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	94.9	2.24	99.5	N.A.	N.A.	N.A.	N200 – No Coupon
	4	92.6	2.42	107	N.A.	N.A.	N.A.	M400 – No Coupon
	6	92.8	2.44	109	N.A.	N.A.	NA.	UO2 SOLUBLITY # 0.3065
	8	95.8	2.16	111	N.A.	N.A.	N.A.	

pH ADJUSTED WITH NH4OH

ADJUSTED FOR LOSS (MILLIPORES)

DOE/UO2 SOLUBILITY AND CORROSION TEST

@ TEMPERATURE 200 °F (93.3°C)

Date: 02/28/94

SOLUTION & pH	HRS	DTPA g/l	pH	U - ppm	Fe - ppm	Ni - ppm	Cu - ppm	CORROSION - MILS
15% DTPA - pH 5.5 No Inhibitor Test 25	1	146.3	5.18	79.5	N.A.	N.A.	N.A.	C1018 - No Coupon
	2	142.5	5.27	79.8	N.A.	N.A.	N.A.	N200 - No Coupon
	4	142.5	5.25	84.5	N.A.	N.A.	N.A.	M400 - No Coupon
	6	142.5	5.28	84.7	N.A.	N.A.	N.A.	UO2 Solubility
	8	141.1	5.36	85.8	N.A.	N.A.	N.A.	# 0.4600

pH ADJUSTED WITH NH4OH

ADJUSTED FOR LOSS (MILLIPORES)

NO INHIBITOR

@ TEMPERATURE 200°F (93.3°C)

Date: 03/01/94

SOLUTION AND - pH	HRS	DTPA g/l	pH	U - ppm	Fe - ppm	Ni - ppm	Cu - ppm	CORROSION - mils
15% DTPA+ABF pH 5.5 Test 26	1	146.4	5.54	230	N.A.	N.A.	N.A.	C1018 - No Coupon
	2	141.3	5.51	298	N.A.	N.A.	N.A.	N200 - No Coupon
	4	141.3	5.51	475	N.A.	N.A.	N.A.	M400 - No Coupon
	6	142.6	5.53	760	N.A.	N.A.	N.A.	UO2 SOLUBILITY
	8	146.3	5.89	997	N.A.	N.A.	N.A.	# 2.8916

pH ADJUSTED WITH NH4OH

ADJUSTED FOR LOSS (MILLIPORES)

NO INHIBITOR

@ TEMPERATURE ROOM TEMPERATURE 95.6°F max

Date: 03/02/94

SOLUTION & pH	HRS	DTPA g/l	pH	U - ppm	Fe - ppm	Ni - ppm	Cu - ppm	CORROSION - mils
10% DTPA +3% (NH4OH)2CO3 +3 % H2O2 Test 27	1	38.2	8.43	3470	N.A.	N.A.	N.A.	C 1018 - No Coupon
	2	12.7	8.43	3492	N.A.	N.A.	N.A.	N200 - No Coupon
	4	6.4	8.41	3542	N.A.	N.A.	N.A.	M400 - No Coupon
	6	+++	+++	+++	N.A.	N.A.	N.A.	UO2 SOLUBILITY
	8	+++	+++	+++	N.A.	N.A.	N.A.	# 9.9714

pH ADJUSTED WITH NH4OH

+++ = TEST TERMINATED AFTER FOUR HOURS

ADJUSTED FOR LOSS (MILLIPORES)

H2O2% = orig 1.81, 2hrs=0.82, 4hrs= 0.69,

DOE/UO2 SOLUBILITY AND CORROSION TEST

@ TEMPERATURE ROOM TEMPERATURE 86.6°F max

Date: 03/03/94

SOLUTION & pH	HRS	DTPA	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – MILS
10% DTPA ' + 1.5% (NH ₄) ₂ CO ₃ +1.5% H ₂ O ₂ Test 28 pH 9.0	1	81.35	8.56	3612	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	68.74	8.52	3682	N.A.	N.A.	N.A.	N200 – No Coupon
	4	50.0	8.53	3819	N.A.	N.A.	N.A.	M400 – No Coupon
	6	+++	+++	+++	N.A.	N.A.	N.A.	UO ₂ SOLUBILITY
	8	+++	+++	+++	N.A.	N.A.	N.A.	# 9.9859

pH ADJUSTED WITH NH₄OH

+++ = TEST TERMINATED AFTER 4 HRS.

ADJUSTED FOR LOSS (MILLIPORES)H₂O₂ = orig=1.24 % 1hr=0.21 2hr=0.17

@ TEMPERATURE R.T. 76.4 °F max

Date: 03/04/94

SOLUTION AND – pH	HRS	DTPA g/l	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – mils
10% DTPA +1.5% H ₂ O ₂ pH 9.0 Test 29	1	85.4	8.95	531	N.A.	N.A.	N.A.	C1018 – NoCoupon
	2	76.8	8.86	555	N.A.	N.A.	N.A.	N200 – No Coupon
	4	71.8	8.74	562	N.A.	N.A.	N.A.	M400 – No Coupon
	6	64.4	8.66	596	N.A.	N.A.	N.A.	UO ₂ SOLUBILITY
	8	+++	+++	+++	N.A.	N.A.	N.A.	# 1.6651

pH ADJUSTED WITH NH₄OH

TEST RUN SIX HOURS

H₂O₂ – 0hrs= 1.36% 2hrs=.75 4hr=0.55 6hrs=0.38%

ADJUSTED FOR LOSS (MILLIPORES)

@ TEMPERATURE R.T. 77.6 °F max.

Date: 03/07/94

SOLUTION & pH	HRS	EDTA	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – mils
10% EDTA +1.5% (NH ₄) ₂ CO ₃ +1.5% H ₂ O ₂ pH 9.0 Test 30	1	95.2	8.94	2955	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	87.5	8.84	2976	N.A.	N.A.	N.A.	N200 – No Coupon
	4	81.7	8.91	2990	N.A.	N.A.	N.A.	M400 – No Coupon
	6	+++	+++	+++	N.A.	N.A.	N.A.	UO ₂ SOLUBILITY
	8	+++	+++	+++	N.A.	N.A.	N.A.	# 9.8325

pH ADJUSTED WITH NH₄OHH₂O₂ – 0hrs= 0.966% 2hrs= 0.14 4hrs= 0.03

ADJUSTED FOR LOSS (MILLIPORES)

DOE/UO2 SOLUBILITY AND CORROSION TEST

@ TEMPERATURE R.T. 79.0°F max.

Date: 03/08/94

'SOLUTION & pH	HRS	HEDTA	pH	U - ppm	Fe - ppm	Ni - ppm	Cu - ppm	CORROSION - MILS
10% HEDTA + 1.5% (NH ₄) ₂ CO ₃ + 1.5% H ₂ O ₂ pH9.0 Test 31	1	52.0	8.89	3453	N.A.	N.A.	N.A.	C1018 - No Coupon
	2	46.0	8.90	3578	N.A.	N.A.	N.A.	N200 - No Coupon
	4	43.0	8.83	3596	N.A.	N.A.	N.A.	M400 - No Coupon
	6	+++	+++	+++	N.A.	N.A.	N.A.	UO2 SOLUBILITY
	8	+++	+++	+++	N.A.	N.A.	N.A.	# 9.9800g

pH ADJUSTED WITH NH₄OH+++ = TEST TERMINATED AT 4 HRS H₂O₂% = 0.74%, 2hr= 0.17, 4hrs= 0.087

ADJUSTED FOR LOSS (MILLIPORES)

@ TEMPERATURE R.T. '83.7°F max.

Date: 03/09/94

SOLUTION AND - pH	HRS	EDTA g/l	pH	U -ppm	Fe-ppm	Ni-ppm	Cu-ppm	CORROSION - mils
10% EDTA + 1.5% (NH ₄) ₂ CO ₃ + 1.5 % H ₂ O ₂ - pH 9.0 Test 32	1	84.8	8.5	3534	N.A.	N.A.	N.A.	C1018 - No Coupon
	2	69.5	8.42	3545	N.A.	N.A.	N.A.	N200 - No Coupon
	4	57.1	8.34	3566	N.A.	N.A.	N.A.	M400 - No Coupon
	6	+++	+++	+++	N.A.	N.A.	N.A.	UO2 SOLUBILITY
	8	+++	+++	+++	N.A.	N.A.	N.A.	# 9.9675g

pH ADJUSTED WITH NH₄OH

+++ TEST TERMINATED AFTER 4 HRS

ADJUSTED FOR LOSS (MILLIPORES)

H₂O₂ - 0hr=1.36% 2Hrs=0.50 4Hrs=0.023%

@ TEMPERATURE R.T. '69.0°F

Date: 03/10/94

SOLUTION & pH	HRS	NONE	pH	U-ppm	Fe-ppm	Ni-ppm	Cu-ppm	CORROSION - mils
No Chelant + 1.5 % (NH ₄) ₂ CO ₃ + 1.5 % H ₂ O ₂ - pH 9.0 Test 33	1	--	8.88	3050	N.A.	N.A.	N.A.	C1018 - No Coupon
	2	--	8.85	3294	N.A.	N.A.	N.A.	N200 - No Coupon
	4	--	8.81	3327	N.A.	N.A.	N.A.	M400 - No Coupon
	6	+++	+++	+++	N.A.	N.A.	N.A.	UO2 SOLUBILITY
	8	+++	+++	+++	N.A.	N.A.	N.A.	# 9.9940

pH ADJUSTED WITH NH₄OH

+++ = TEST TERMINATED AT 4 HRS.

ADJUSTED FOR LOSS (MILLIPORES)

H₂O₂-0Hr= 1.64 % 2Hrs=1.45 4Hrs=1.43 %

DOE/UO2 SOLUBILITY AND CORROSION TEST

OXIDANT STUDIES

@ TEMPERATURE R.T. 65.3 °F max.

Date: 03/11/94

'SOLUTION & pH	HRS	EDTA g/l	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – MILS
10% EDTA 1.5 % (NH4)2CO3 AIR SATURATED SOL. pH 9.0 Test 34	1	100	8.85	78.4	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	100	8.85	81.4	AIR SATURATION			N200 – No Coupon
	3	99	8.85	1652	ADD H2O2 IF NECESSARY			M400 – No Coupon
	4	99	8.82	2945	3 – 20ml INJECTIONS H2O2			UO2 SOLUBILITY # 9.9665
	5	96.10	8.81	3284	BEGINING AFTER 2 HOURS			
	6	93.20	8.87	3380				

pH ADJUSTED WITH NH₄OHH₂O₂ – 2Hrs 0.169% 3Hrs 0.133% 4Hrs 0.270% 5Hrs 0.408% 6Hrs 0.342%

ADJUSTED FOR LOSS (MILLIPORES)

H₂O₂ added @ 2hrs, 4hrs, 5hrs

@ TEMPERATURE R.T. 70.2° F COOLED TO 58.8°F

Date: 03/14/94

SOLUTION AND – pH	HRS	EDTA g/l	pH	U –ppm	Fe–ppm	Ni–ppm	Cu–ppm	CORROSION – mils
10% EDTA + 1.5 % (NH ₄) ₂ CO ₃ AIR SPARGE – pH 9.0 Test 35	1	100.9	8.86	73.4	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	100.9	8.87	81.5	N.A.	N.A.	N.A.	N200 – No Coupon
	4	100.9	8.86	97.1	N.A.	N.A.	N.A.	M400 – No Coupon
	6	100.9	8.86	112	N.A.	N.A.	N.A.	UO ₂ SOLUBILITY # 0.7000
	8	100.9	8.88	125	N.A.	N.A.	N.A.	

pH ADJUSTED WITH NH₄OH

ADJUSTED FOR LOSS (MILLIPORES)

@ TEMPERATURE R.T. 70.2 °F max.

Date: 03/15/94

SOLUTION & pH	HRS	EDTA g/l	pH	U–ppm	Fe–ppm	Ni–ppm	Cu–ppm	CORROSION – mils
10% EDTA + 1.5 % (NH ₄) ₂ CO ₃ + O ₂ SPARGE – pH 9.0 Test 36	1	100.9	8.66	117	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	100.9	8.70	126	N.A.	N.A.	N.A.	N200 – No Coupon
	4	100.9	8.75	149	N.A.	N.A.	N.A.	M400 – No Coupon
	6	100.0	8.84	163	N.A.	N.A.	N.A.	UO ₂ SOLUBILITY #1.7784g
	8	100.0	8.90	163	N.A.	N.A.	N.A.	

pH ADJUSTED WITH NH₄OH

ADJUSTED FOR LOSS (MILLIPORES)

DOE/UO2 SOLUBILITY AND CORROSION TEST

@ TEMPERATURE 90°F

Date: 03/16/94

'SOLUTION & pH	HRS	EDTA g/l	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – MILS
10% EDTA + 1.5 % (NH ₄) ₂ CO ₃ + O ₂ SPARGE / WITH HEAT pH 9.0 Test 37	1	101.0	9.16	109	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	101.0	9.18	119	N.A.	N.A.	N.A.	N200 – No Coupon
	4	101.9	9.20	149	N.A.	N.A.	N.A.	M400 – No Coupon
	6	101.9	9.28	175	N.A.	N.A.	N.A.	UO ₂ SOLUBILITY
	8	101.9	9.28	182	N.A.	N.A.	N.A.	# 2.7271g

pH ADJUSTED WITH NH₄OH

ADJUSTED FOR LOSS (MILLIPORES)

@ TEMPERATURE 110 °F

Date: 03/17/94

SOLUTION AND – pH	HRS	EDTA g/l	pH	U –ppm	Fe–ppm	Ni–ppm	Cu–ppm	CORROSION – mils
10% EDTA + 1.5% (NH ₄) ₂ CO ₃ + O ₂ SPARGE / WITH HEAT pH 9.0 Test 38	1	101.9	8.79	131	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	101.9	8.78	159	N.A.	N.A.	N.A.	N200 – No Coupon
	4	100.0	8.85	190	N.A.	N.A.	N.A.	M400 – No Coupon
	6	100.0	8.81	225	N.A.	N.A.	N.A.	UO ₂ SOLUBILITY
	8	101.9	8.92	250	N.A.	N.A.	N.A.	# 0.7762

pH ADJUSTED WITH NH₄OH

ADJUSTED FOR LOSS (MILLIPORES)

@ TEMPERATURE 150 °F

Date: 03/18/94

SOLUTION & pH	HRS	EDTA g/l	pH	U–ppm	Fe–ppm	Ni–ppm	Cu–ppm	CORROSION – mils
10% EDTA + 1.5% (NH ₄) ₂ CO ₃ + O ₂ SPARGE / WITH HEAT pH 9.0 Test 39	1	101.9	8.82	138	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	98.1	8.85	168	N.A.	N.A.	N.A.	N200 – No Coupon
	4	100.9	8.94	227	N.A.	N.A.	N.A.	M400 – No Coupon
	6	100.9	8.94	249	N.A.	N.A.	N.A.	UO ₂ SOLUBILITY
	8	99.1	8.97	292	N.A.	N.A.	N.A.	# 1.1173

pH ADJUSTED WITH NH₄OH

ADJUSTED FOR LOSS (MILLIPORES)

DOE/UO2 SOLUBILITY AND CORROSION TEST

SOLVENT SCREENING

COMMERCIAL SOLVENTS @ TEMPERATURE 200 °F (93.3°C)

Date: 03/22/94

SOLUTION & pH	HRS	ESI-600N	pH	U - ppm	Fe - ppm	Ni - ppm	Cu - ppm	CORROSION - MILS
ESI - 600 NS pH 7.71 Test 40	1	***	7.71	113	N.A.	N.A.	N.A.	C1018 - WT. GAIN
	2	***	7.58	115	N.A.	N.A.	N.A.	N200 - 0.014
	4	***	7.72	119	N.A.	N.A.	N.A.	M400 - 0.005
	6	***	7.78	121	N.A.	N.A.	N.A.	UO2 SOLUBILITY
	8	***	7.61	123	N.A.	N.A.	N.A.	# 0.7119

pH ADJUSTED WITH NH4OH

***=NO METHOD FOR THIS SOLUTION N.A.=NOT ANALYZED

ADJUSTED FOR LOSS (MILLIPORES)

@ TEMPERATURE 200 °F (93.3 °C)

Date: 03/23/94

SOLUTION AND - pH	HRS	ESI - 603	pH	U -ppm	Fe-ppm	Ni-ppm	Cu-ppm	CORROSION - MILS
ESI - 603 (N.S.) pH 10 Test 41	1	***	10.7	125	N.A.	N.A.	N.A.	C1018 - 0.291
	2	***	10.1	127	N.A.	N.A.	N.A.	N200 - 0.003
	4	***	10.1	129	N.A.	N.A.	N.A.	M400 - 0.003
	6	***	10.0	129	N.A.	N.A.	N.A.	UO2 SOLUBILITY
	8	***	10.1	128	N.A.	N.A.	N.A.	# 0.6760

pH ADJUSTED WITH NH4OH

***=NO METHOD FOR THIS SOLUTION N.A.=NOT ANALYZED

ADJUSTED FOR LOSS (MILLIPORES)

@ TEMPERATURE 200 °F (93.3 °C)

Date: 03/24/94

SOLUTION & pH	HRS	RADWASH	pH	U-ppm	Fe-ppm	Ni-ppm	Cu-ppm	CORROSION - mils
RADIAC WASH pH - 4.5 Test 42	1	***	4.57	134	N.A.	N.A.	N.A.	C1018 - 1.270
	2	***	4.53	138	N.A.	N.A.	N.A.	N200 - 0.026
	4	***	4.56	140	N.A.	N.A.	N.A.	M400 - 0.027
	6	***	4.52	142	N.A.	N.A.	N.A.	UO2 SOLUBILITY
	8	***	4.52	142	N.A.	N.A.	N.A.	# 1.9500

pH ADJUSTED WITH NH4OH ***=NO METHOD FOR THIS SOLUTION

N.A.=NOT ANALYZED

ADJUSTED FOR LOSS (MILLIPORES)

DOE/UO2 SOLUBILITY AND CORROSION TEST

@ TEMPERATURE 150° F

Date:03/25/94

SOLUTION & pH	HRS	EDTA g/l	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – MILS
10% EDTA + 1.5% (NH ₄) ₂ CO ₃ +0.5% NaNO ₂ pH 9.0 Test 43 O ₂ SPARGE	1	99.1	9.04	334	151	N.A.	4.88	C1018 – 4.391
	2	!	!	!	!	!	!	N200 – 0.937
	4	93.4	9.10	1242	698	N.A.	33.2	M400 – 0.973
	6	92.5	9.09	1383	966	N.A.	64.4	UO ₂ SOLUBILITY
	8	+++	+++	+++	+++	+++	+++	# 3.9300

pH ADJUSTED WITH NH₄OH

+++ = TEST TERMINATED AT 6HRS

! = SAMPLE NOT TAKEN

ADJUSTED FOR LOSS (MILLIPORES)

N.A. = NOT ANALYZED

@ TEMPERATURE 150° F

Date: 03/28/94

SOLUTION AND – pH	HRS	EDTA g/l	pH	U –ppm	Fe–ppm	Ni–ppm	Cu–ppm	CORROSION – mils
10% EDTA + 1.5% (NH ₄) ₂ CO ₃ + .5% NaNO ₂ pH 9.0 Test 44 O ₂ SPARGE	1	99.0	9.01	165	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	99.0	9.10	184	N.A.	N.A.	N.A.	N200 – No Coupon
	4	99.0	9.08	245	N.A.	N.A.	N.A.	M400 – No Coupon
	6	99.0	9.10	292	N.A.	N.A.	N.A.	UO ₂ SOLUBILITY
	8	+++	+++	+++	+++	+++	+++	# 1.0211

pH ADJUSTED WITH NH₄OH

+++ = TEST TERMINATED AT 6HRS

N.A. = NOT ANALYZED

ADJUSTED FOR LOSS (MILLIPORES)

@ TEMPERATURE 150 °F

Date: 03/29/94

SOLUTION & pH	HRS	EDTA g/l	pH	U–ppm	Fe–ppm	Ni–ppm	Cu–ppm	CORROSION – mils
10% EDTA + 1.5% (NH ₄) ₂ CO ₃ + 4.0% KBrO ₃ pH 9.0 Test 45	1	99.0	8.73	770	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	95.2	8.78	1218	N.A.	N.A.	N.A.	N200 – No Coupon
	4	92.4	8.76	1976	N.A.	N.A.	N.A.	M400 – No Coupon
	6	92.4	8.70	2436	N.A.	N.A.	N.A.	UO ₂ SOLUBILITY
	8	90.5	8.60	2636	N.A.	N.A.	N.A.	# 7.4510

pH ADJUSTED WITH NH₄OH

ADJUSTED FOR LOSS (MILLIPORES)

DOE/UO2 SOLUBILITY AND CORROSION TEST

@ TEMPERATURE 150 °F

Date: 03/30/94

'SOLUTION & pH	HRS	EDTA	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – MILS
10% EDTA + 1.5% (NH ₄)CO ₃ + 0.3% FeCl ₃ + O ₂ SPARGE – pH 9.0 Test 46	1	97.1	8.83	286	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	96.1	8.79	376	N.A.	N.A.	N.A.	N200 – No Coupon
	4	97.1	8.76	1351	N.A.	N.A.	N.A.	M400 – No Coupon
	6	97.1	8.74	2005	N.A.	N.A.	N.A.	UO ₂ SOLUBILITY
	8	96.0	8.74	2048	N.A.	N.A.	N.A.	# 6.2928

pH ADJUSTED WITH NH₄OH (Sparge after 3 hrs)

ADJUSTED FOR LOSS (MILLIPORES)

@ TEMPERATURE 150 °F

Date: 04/01/94

SOLUTION AND – pH	HRS	EDTA g/l	pH	U –ppm	Fe–ppm	Ni–ppm	Cu–ppm	CORROSION – mils
10% EDTA + 1.5% (NH ₄) ₂ CO ₃ + 2.5% KBrO ₃ + O ₂ SPARGE Test 47 pH – 9.0	1	100.9	8.81	856	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	98.1	8.89	1616	N.A.	N.A.	N.A.	N200 – No Coupon
	4	98.1	8.93	2403	N.A.	N.A.	N.A.	M400 – No Coupon
	6	93.3	9.00	2740	N.A.	N.A.	N.A.	UO ₂ SOLUBILITY
	8	+++	N.A.	N.A.	N.A.	N.A.	N.A.	# 8.3184

pH ADJUSTED WITH NH₄OH

ADJUSTED FOR LOSS (MILLIPORES)

@ TEMPERATURE 150 °F

Date: 04/05/94

SOLUTION AND – pH	HRS	EDTA g/l	pH	U –ppm	Fe–ppm	Ni–ppm	Cu–ppm	CORROSION – mils
10% EDTA 1.5% (NH ₄) ₂ CO ₃ 2.5% KBrO ₃ pH 9.0 Test 48	1	96.1	8.62	612	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	92.4	8.60	1136	N.A.	N.A.	N.A.	N200 – No Coupon
	4	82.9	8.70	2000	N.A.	N.A.	N.A.	M400 – No Coupon
	6	79.0	8.69	2515	N.A.	N.A.	N.A.	UO ₂ SOLUBILITY
	8	76.2	8.73	2971	N.A.	N.A.	N.A.	# 7.815g

pH ADJUSTED WITH NH₄OH

ADJUSTED FOR LOSS (MILLIPORES)

DOE/UO2 SOLUBILITY AND CORROSION TEST

@ TEMPERATURE R.T. (95° F max)

Date: 04/11/94

SOLUTION & pH	HRS	EDTA g/l	pH	U-ppm	Fe-ppm	Fe-ppm	Cu-ppm	CORROSION – mils
10% EDTA + 1.5% (NH ₄) ₂ CO ₃ +O ₂ SPARGE @ 24 hrs pH – 9.0 Test 49	2	98.8	9.04	153	N.A.	N.A.	N.A.	C1018 – No Coupon
	6	100	9.17	202	N.A.	N.A.	N.A.	N200 – No Coupon
	12	100	9.10	238	N.A.	N.A.	N.A.	M400 – No Coupon
	18	100	9.04	276	N.A.	N.A.	N.A.	UO ₂ SOLUBILITY
	23.5	101.8	9.04	321	N.A.	N.A.	N.A.	# 1.4007

pH ADJUSTED WITH NH₄OH

ADJUSTED FOR LOSS (MILLIPORES)

@ TEMPERATURE 150 °F

Date: 04/12/94

SOLUTION & pH	HRS	EDTA g/l	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – MILS
10% EDTA +1.5% (NH ₄) ₂ CO ₃ 0.3% Fe Cl ₃ pH 9.0 Test 50 air sparge	1	99	8.82	677	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	96	8.88	950	N.A.	N.A.	N.A.	N200 – No Coupon
	4	96	8.68	1064	N.A.	N.A.	N.A.	M400 – No Coupon
	6	96	8.65	1119	N.A.	N.A.	N.A.	UO ₂ SOLUBILITY
	8	100	8.60	1152	N.A.	N.A.	N.A.	# 3.3794

pH ADJUSTED WITH NH₄OH

ADJUSTED FOR LOSS (MILLIPORES)

H₂O₂ / Carbonate optimizing @ TEMPERATURE R.T. (82°F max.)

Date: 04/13/94

SOLUTION AND – pH	HRS	EDTA g/l	pH	U – ppm	Fe-ppm	Ni-ppm	Cu-ppm	CORROSION – mils
10% EDTA 1.5% (NH ₄) ₂ CO ₃ 1.0% H ₂ O ₂ pH – 9.0 Test 51	1	89.4	8.96	3507	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	83.4	8.88	3520	N.A.	N.A.	N.A.	N200 – No Coupon
	4	72.1	8.85	3522	N.A.	N.A.	N.A.	M400 – No Coupon
	6	72.1	8.86	3539	N.A.	N.A.	N.A.	UO ₂ SOLUBILITY
	8	+++	N.A.	N.A.	N.A.	N.A.	N.A.	# 9.9932g

pH ADJUSTED WITH NH₄OH

+++ = TEST TERMINATED AT 6 HRS

H₂O₂ = org..775%, 1hr=.439%, 2hr=.241%

ADJUSTED FOR LOSS (MILLIPORES)

H₂O₂ 4hr=.114% 6hr=.067%

DOE/UO2 SOLUBILITY AND CORROSION TEST

H2O2 / Carbonate optimizing @ TEMPERATURE R.T. (82° F max.)

Date: 04/14/94

SOLUTION & pH	HRS	EDTA g/l	pH	U-ppm	Fe-ppm	Fe-ppm	Cu-ppm	CORROSION – mils
10% EDTA + 1.5% (NH4)2CO3 + 0.5% H2O2 pH 9.0 Test 52	1	98.1	8.91	3494	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	92.3	8.89	3496	N.A.	N.A.	N.A.	N200 – No Coupon
	4	89.4	8.89	3454	N.A.	N.A.	N.A.	M400 – No Coupon
	6	89.4	8.91	3544	N.A.	N.A.	N.A.	UO2 SOLUBILITY
	8	+++	N.A.	N.A.	N.A.	N.A.	N.A.	#9.9879

pH ADJUSTED WITH NH4OH

+++ = TEST TERMINATED AT 6 HRS

H2O2=org. 0.398%, 1hr 0.221%, 2hr 0.121%

ADJUSTED FOR LOSS (MILLIPORES)

4hr 0.0625%, 5hr 0.016

@ TEMPERATURE R.T. 77°F max

Date: 04/15/94

SOLUTION & pH	HRS	EDTA g/l	pH	U-ppm	Fe-ppm	Ni-ppm	Cu-ppm	CORROSION – mils
10% EDTA +1.5% (NH4)2CO3 +0.25% H2O2 pH – 9.0 Test 53	1	95.2	9.09	3233	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	95.2	9.09	3420	N.A.	N.A.	N.A.	N200 – No Coupon
	4	95.2	9.05	3420	N.A.	N.A.	N.A.	M400 – No Coupon
	6	+++	N.A.	N.A.	N.A.	N.A.	N.A.	UO2 SOLUBILITY
	8	+++	N.A.	N.A.	N.A.	N.A.	N.A.	# 9.9812

pH ADJUSTED WITH NH4OH

+++ = TEST TERMINATED AT 4 HRS

H2O2=org .175%, 1hr 0.0846%, 2hr 0.051%,

ADJUSTED FOR LOSS (MILLIPORES)

4hr H2O2= 0.0367%

@ TEMPERATURE R.T. (80° F max.)

Date: 04/18/94

SOLUTION & pH	HRS	EDTA g/l	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – MILS
10% EDTA + 0.5% (NH4)2CO3 +0.25% H2O2 pH 9.0 Test 55	1	98.0	9.09	2419	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	98.0	9.12	2950	N.A.	N.A.	N.A.	N200 – No Coupon
	4	98.0	9.13	3355	N.A.	N.A.	N.A.	M400 – No Coupon
	6	+++	N.A.	N.A.	N.A.	N.A.	N.A.	UO2 SOLUBILITY
	8	+++	N.A.	N.A.	N.A.	N.A.	N.A.	# 9.5640g

pH ADJUSTED WITH NH4OH

+++ = TEST TERMINATED AT 4 HRS

H2O2=org0.192% 1hr 0.099%, 2hr .070%,

ADJUSTED FOR LOSS (MILLIPORES)

4hr H2O2 = 0.042%

DOE/UO2 SOLUBILITY AND CORROSION TEST

@ TEMPERATURE R.T. 71°F (max.)

Date: 04/19/94

SOLUTION AND – pH	HRS	EDTA g/l	pH	U –ppm	Fe–ppm	Ni–ppm	Cu–ppm	CORROSION – mils
10% EDTA + 0.75% (NH ₄) ₂ CO ₃ + 0.25% H ₂ O ₂ pH – 9.0 Test 54	1	102.9	9.03	1034	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	102.9	9.05	1326	N.A.	N.A.	N.A.	N200 – No Coupon
	4	100	8.98	1891	N.A.	N.A.	N.A.	M400 – No Coupon
	6	100	8.98	1941	N.A.	N.A.	N.A.	UO ₂ SOLUBILITY #7.6626
	8	98.0	8.98	1963	N.A.	N.A.	N.A.	

pH ADJUSTED WITH NH₄OHH₂O₂=orig0.241%, 1hr 0.115% 2hr 0.077%, 4hr0.039%, 6hr 0.029, 8hr 0.0214%

ADJUSTED FOR LOSS (MILLIPORES)

@ TEMPERATURE R.T. (71° F max.)

Date: 04/21/94

SOLUTION & pH	HRS	EDTA g/l	pH	U –ppm	Fe –ppm	Fe –ppm	Cu –ppm	CORROSION – mils
10% EDTA + 1.0% (NH ₄) ₂ CO ₃ + 0.25% H ₂ O ₂ pH –9.0 Test 56	1	100.9	8.85	2671	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	99.0	8.84	3494	N.A.	N.A.	N.A.	N200 – No Coupon
	4	98.0	8.83	3575	N.A.	N.A.	N.A.	M400 – No Coupon
	6	+++	N.A.	N.A.	N.A.	N.A.	N.A.	UO ₂ SOLUBILITY # 9.9769
	8	+++	N.A.	N.A.	N.A.	N.A.	N.A.	

pH ADJUSTED WITH NH₄OHH₂O₂= orig 0.26% 1hr 0.139%, 2hr 0.103%, 4hr 0.039%,

ADJUSTED FOR LOSS (MILLIPORES)

@ TEMPERATURE R.T. (68° F max.)

Date: 04/22/94

SOLUTION & pH	HRS	EDTA g/l	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – MILS
5.0% EDTA 1.0% (NH ₄) ₂ CO ₃ 0.25% H ₂ O ₂ pH 9.0 Test 57	1	55	N.A.	3278	N.A.	N.A.	N.A.	C1018 – No Coupon
	2	53	9.01	3458	N.A.	N.A.	N.A.	N200 – No Coupon
	4	53	9.04	3498	N.A.	N.A.	N.A.	M400 – No Coupon
	+++	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	UO ₂ SOLUBILITY #9.9771
	+++	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	

pH ADJUSTED WITH NH₄OHH₂O₂=orig. 0.261%, 1hr 0.158%, 2hr. 0.132, 4hr 0.105%

ADJUSTED FOR LOSS (MILLIPORES)

DOE/UO2 SOLUBILITY AND CORROSION TEST

@ TEMPERATURE R.T. @ 79°F (max)

Date:04/26/94

SOLUTION AND – pH	HRS	EDTA	pH	U –ppm	Fe –ppm	Ni –ppm	Cu –ppm	CORROSION – mils
5% EDTA	1	49.0	8.84	6490	N.A.	N.A.	N.A.	C1018 – NO COUPONS
1% (NH4)2 CO3	2	49.0	8.85	6649	N.A.	N.A.	N.A.	N200 – NO COUPON
0.25% H2O2	4	49.0	8.85	6707	N.A.	N.A.	N.A.	M400 – NO COUPONS
pH 9.0	6	49.0	8.85	6708	N.A.	N.A.	N.A.	UO2 SOLUBILITY
Test 58 20g UO2	8	48	8.89	6779	N.A.	N.A.	N.A.	#19.9634

pH ADJUSTED WITH NH4OH H2O2=orig.0.183%, 1hr 0.096%, 2hr 0.0775%, 4hr0.0683%, 6hr 0.0621%, 8hr 0.054%

ADJUSTED FOR LOSS (MILLIPORES)

DATE: 04/27/94

SOLUTION & pH	HRS	EDTA	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION / mils
2.0% (NH4)2 CO3	1	none	8.77	6890	N.A.	N.A.	N.A.	C1018 – NO COUPON
0.25% H2O2	2	none	8.76	7127	N.A.	N.A.	N.A.	N200 – NO COUPON
pH 9.0	4	none	8.76	7168	N.A.	N.A.	N.A.	M400 – NO COUPON
Note:20g UO2	6	none	8.77	7166	N.A.	N.A.	N.A.	UO2 SOLUBILITY
Test 59	8	none	8.77	7182	N.A.	N.A.	N.A.	#19.9764g

pH adjusted with NH4OH H2O2= orig 0.279%, 1hr. 0.131%, 2hr 0.128%, 4hr 0.127%, 6hr 0.126%, 8hr 0.120%

ADJUSTED FOR LOSS (MILLIPORES)

* = not analyzed

@ Room Temperature – 72°F

DATE:04/28/94

SOLUTION & pH	Hrs	No EDTA	pH	U ppm	Fe ppm	Ni ppm	Cu ppm	CORROSION/mils
1.0% (NH4)2 CO3	1	none	8.79	8604	N.A.	N.A.	N.A.	C1018 – NO COUPON
.25% H2O2	2	none	8.80	9800	N.A.	N.A.	N.A.	N200 – NO COUPON
pH 9.0	4	none	8.78	9834	N.A.	N.A.	N.A.	M400 – NO COUPON
	6	none	8.70	9865	N.A.	N.A.	N.A.	UO2 SOLUBILITY
Test 60 Note 30g UO2	8	none	8.79	10406	N.A.	N.A.	N.A.	# 29.5659

pH adjusted with NH4OH H2O2=orig.080% 2hr .073 4hr .070 6hr .068 8hr.065

30g UO2 compiled from remnants of previous tests

= adjusted for loss on millipores

DOE/UO2 SOLUBILITY AND CORROSION TEST

@ Room Temperature – 72°F

DATE: 04/29/94

SOLUTION & pH	Hrs	g/l EDTA	pH	U ppm	Fe ppm	Ni ppm	Cu ppm	CORROSION/mils
5.0% EDTA 1.0% (NH ₄) ₂ CO ₃ 0.25% H ₂ O ₂ Test 61 Note: 30g UO ₂	1	50.9	9.19	8228	4.67	N.A.	2.18	C1018 – 0.000
	2	50.9	9.20	9070	5.05	N.A.	2.30	N200 – 0.001
	4	50.9	9.21	9789	5.36	N.A.	2.37	M400 – 0.016
	6	51.0	9.03	9932	5.53	N.A.	2.55	UO ₂ SOLUBILITY
	8	54.0	8.96	10308	5.55	N.A.	3.21	# 28.2464

pH adjusted with NH₄OH H₂O₂= 0.168%, 1hr=0.066%, 2hr=0.056%, 4hr=0.051%, 6hr=0.046%, 8hr=0.043%

N.A. = NOT ANALYZED

Temperature @ 150°F

DATE: 05/06/95

SOLUTION & pH	HRS	HNO ₃	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION/MILS
150 g/l HNO ₃ pH –0.55 Test 62	1	*	–0.58	3544	8194	3638	700	C1018 – DESTROYED
	2	*	–0.47	3062	8197	8225	1430	N200 – DESTROYED
	4	*	–0.51	3230	8711	14378	2490	M400 – DESTROYED
	6	*	–0.58	3352	8948	15933	2849	UO ₂ SOLUBILITY
	8	*	–0.58	3404	9447	16506	2877	#9.9851

*= NO ANALYSIS

@ TEMPERATURE R.T. 84°F

Date: 06/07/94

SOLUTION & pH	HRS	HNO ₃	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – MILS
150 g/l HNO ₃ pH= –0.25 Test 63	1	*	–0.20	2987	5886	350	27.1	C1018 – DESTROYED
	2	*	–0.20	3517	8507	1375	221	N200 – 26.782
	4	*	–0.18	3634	9355	4495	802	M400 – 25.902
	6	*	–0.08	3655	9430	6642	1258	UO ₂ SOLUBILITY
	8	*	–0.02	3703	9548	9044	1725	#9.9676g

ADJUSTED FOR LOSS (MILLIPORES)*= NO ANALYSIS

DOE/UO2 SOLUBILITY AND CORROSION TEST

@ TEMPERATURE R.T. @72°F

Date: 06/08/94

SOLUTION & pH	HRS	CO3	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – MILS
1.0% (NH4)2CO3 0.25% H2O2 pH = 9.0 Test 64	1	N.A.	8.95	1330	5.0	6.68	3.0	C1018 – 0.034
	2	N.A.	8.99	1508	<3.0	3.0	3.0	N200 – 0.0017
	4	N.A.	8.99	1662	<3.0	<3.0	<3.0	M400 – 0.0017
	6	N.A.	9.0	1790	<3.0	<3.0	<3.0	UO2 SOLUBILITY
	8	N.A.	8.98	2200	<3.0	<3.0	<3.0	#5.6058

pH adjusted with NH4OH N.A. = NOT AVAILABLE (ANALYSIS PROCEDURE)

ADJUSTED FOR LOSS (MILLIPORES)H2O2 % = 1hr=0.011, 2hrs=0.0074, 4hrs <0.006, 6hrs <0.006 8hrs <0.006

M-52255

@ TEMPERATURE

R.T.

Date: 06/10/94

SOLUTION & pH	HRS	CO3	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – MILS
1.0% (NH4)2CO3 0.25% H2O2 added @ 4 hrs pH 9.0 Test 65	2	N.A.	8.89	104	141	30.3	4.27	C1018 – 0.000
	4	N.A.	8.86	113	147	35.1	5.23	N-200 – 0.000
	6	N.A.	9.08	940	150	39.8	8.19	M400 – 0.157
	8	N.A.	9.06	966	156	40.0	9.20	UO2 SOLUBILITY
	9	N.A.	9.09	1730	156	47.8	9.50	5.1304

pH ADJUSTED WITH NH4OH N.A. = NOT AVAILABLE (PROCEDURE)

ADJUSTED FOR LOSS (MILLIPORES)H2O2 % = 6hrs <0.006 (H2O2 Injected After 4-Hour Sample)

@ TEMPERATURE R.T.79°FMAX

Date: 06/11/94

SOLUTION AND – pH	HRS	CO3	pH	U –ppm	Fe–ppm	Ni–ppm	Cu–ppm	CORROSION – mils
2.0% (NH4)2 CO3 0.50% H2O2 pH–9.0 Test 66	1	N.A.	8.95	2924	15.8	4.94	4.26	C1018 –0.002
	2	N.A.	8.89	3496	17.0	<3.0	<3.0	N200 – .000
	4	N.A.	–	3526	17.4	<3.0	<3.0	M400 –0.001
	6	N.A.	8.91	3918	18.2	<3.0	<3.0	UO2 SOLUBILITY
	8	N.A.	8.94	4031	18.3	<3.0	<3.0	#9.9901

pH ADJUSTED WITH NH4OH N.A. = NOT AVAILABLE (PROCEDURE)

ADJUSTED FOR LOSS (MILLIPORES)H2O2 % = 0.535, 1hr=0.333, 2hrs=0.272, 4hrs=0.234, 6hrs=0.151, 8hrs=0.054

DOE/UO2 SOLUBILITY AND CORROSION TEST

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@ TEMPERATURE

R.T. To 150°F To R.T.

Date: 06/14/94

SOLUTION & pH	HRS	CO3	pH	U-ppm	Fe-ppm	Ni-ppm	Cu-ppm	CORROSION - mils
2.0% (NH) ₂ CO ₃ 0.50% H ₂ O ₂ pH-9.01 Test 67	1	N.A.	9.0	2544	<3.0	<3.0	<3.0	C-1018 0.001
	2	N.A.	8.87	3670	<3.0	<3.0	<3.0	N-200 0.002
	4	N.A.	8.83	3780	<3.0	<3.0	<3.0	M-400 0.002
	6	N.A.	9.0	3774	<3.0	<3.0	<3.0	UO ₂ SOLUBILITY
	8	N.A.	9.02	3944	<3.0	<3.0	<3.0	# 10.000

pH ADJUSTED WITH NH₄OH

N.A. = NOT AVAILABLE (PROCEDURE)

ADJUSTED FOR LOSS (MILLIPORES) 'H₂O₂% 0.748, 1hr=0.593, 2hr@R.T.=0.556, 1hrCooled=0.372, 2hrs cooled=0.13

M-52269

@ TEMPERATURE R.T. to 150°F to R.T.

Date: 06/15/94

'SOLUTION & pH	HRS	EDTA g/l	pH	U - ppm	Fe - ppm	Ni - ppm	Cu - ppm	CORROSION - MILS
5% EDTA 2.0% (NH ₄) ₂ CO ₃ 0.50% H ₂ O ₂ pH 9.0 Test 68	1	47.8	8.85	2140	<3.0	<3.0	<3.0	C1018 - 0.918
	2	45.7	8.78	3504	<3.0	<3.0	<3.0	N200 - 0.069
	3	35.1	8.53	3534	3.08	13.9	6.70	M400 - 0.122
	4	30.8	8.53	3816	94.0	26.6	7.90	UO ₂ SOLUBILITY
	7	24.4	8.55	3688	177	30.5	9.80	10.000
	8	22.3	8.62	3723	179	31.2	9.3	

pH ADJUST W/NH₄OHH₂O₂% = 0.475, 1Hrs=0.356, 2Hrs=0.273, 1hr hot= 0.018, 3hrs hot=0.0077

ADJUSTED FOR LOSS (MILLIPORES) 1hr cooled=0.0067 2hrs cooled=0.0062,

M-52270

@ TEMPERATURE

R.T.- 200°F - R.T.

Date: 06/16/94

SOLUTION AND - pH	HRS	NH ₄ CO ₃	pH	U -ppm	Fe-ppm	Ni-ppm	Cu-ppm	CORROSION - mils
2.0% (NH ₄) ₂ CO ₃ 0.5% H ₂ O ₂ pH 9.0 Test 69 NOTE: ODD HRS	1	N.A.	9.15	2256	<3.0	<3.0	<3.0	C1018 - 0.001
	2	N.A.	9.14	2698	<3.0	<3.0	<3.0	N200 - 0.001
	3	N.A.	9.36	3476	<3.0	<3.0	<3.0	M400 - 0.001
	4	N.A.	9.47	3498	<3.0	<3.0	<3.0	UO ₂ SOLUBILITY
	7	N.A.	9.53	3547	<3.0	<3.0	<3.0	#9.7382
	8	N.A.	9.43	3548	<3.0	<3.0	<3.0	YELLOW PRECIP REMAIN

ADJUSTED FOR LOSS (MILLIPORES)

N.A. = NOT AVAILABLE (PROCEDURE)

H₂O₂ % =0.63, 1hr=0.599, 2hrs 0.577, 1hr hot=<0.006, 2hr hot=<0.006, 1hr cooled= 0.14, 2hrcooled=0.066

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DOE/UO2 SOLUBILITY AND CORROSION TEST

M-52271

@

TEMPERATURE

75°F – 200°F W/H2O2 SPIKE

Date:06/17/94

SOLUTION AND – pH	HRS	EDTA	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – mils
5% EDTA 2.0% (NH4)2CO3 0.5% H2O2 pH 9.0 Test 70 Note: odd hrs	1	51.1	8.83	1720	<3.0	<3.0	<3.0	C1018 – 1.405
	2	45.5	9.01	2314	<3.0	<3.0	<3.0	N200 – 0.196
	3	28.4	9.38	3358	81.0	22.5	5.40	M400 – 0.124
	4	25.0	9.04	3416	219	47.0	6.70	
	7	21.6	9.25	3566	276	54.4	7.50	UO2 SOLUBILITY
	8	21.0	9.26	3516	271	57.6	9.45	#9.4676

pH ADJUSTED WITH NH4OH

H2O2 % = 0.39, 1Hr = 0.30, 2Hr = 0.23, 1Hr HOT = <0.01, 2Hr HOT = <0.01,

ADJUSTED FOR LOSS (MILLIPORES) 1Hr COOLED 0.022%

M-52304

@

TEMPERATURE

150°F COOL TO R.T.

Date:06/21/94

SOLUTION & pH	Hr.	NH4CO3	pH	U – ppm	Fe – ppm	Fe – ppm	Cu – ppm	CORROSION – mils
2.0% (NH4)2CO3 0.5% H2O2 pH 9.0 Test 71	2	N.A.	8.89	3687	<3.0	<3.0	<3.0	C1018 – 0.000
	4.0	N.A.	8.90	3398	<3.0	<3.0	<3.0	N200 – 0.000
	5.5	N.A.	8.96	3437	<3.0	<3.0	<3.0	M400 – 0.000
	6.5	N.A.	8.98	3465	<3.0	<3.0	<3.0	UO2 SOLUBILITY
	8.5	N.A.	8.99	3780	<3.0	<3.0	<3.0	# 10.000

pH ADJUSTED WITH NH4OH

N.A. = NOT AVAILABLE (PROCEDURE)

ADJUSTED FOR LOSS (MILLIPORES) H2O2 % = 0.602, 2Hr HOT = 0.029, 4Hr HOT = 0.022, 1Hr COOL = 0.716, 2Hr COOL = 0.633

4Hr COOL = 0.576%

M-52305

@

TEMPERATURE 150°F – 75°F

Date: 06/22/94

SOLUTION AND – pH	HRS	EDTA	pH	U – ppm	Fe – ppm	Ni – ppm	Cu – ppm	CORROSION – mils
5% EDTA 2% (NH4)2CO3 0.5% H2O2 pH 9.0 Test 72	2	54.8	8.97	159	<3.0	7.50	<3.0	C1018 – 0.000
	4	54.8	8.82	163	<3.0	10.4	<3.0	N200 – 0.042
	5.5	36.9	8.88	1552	<3.0	10.7	3.66	M400 – 0.038
	6.5	40.5	8.87	3164	<3.0	12.6	<3.0	UO2 SOLUBILITY
	8.5	42.8	8.88	3606	<3.0	12.3	<3.0	# 9.7412

pH ADJUST W/NH4OH

NOTE: 1 HR SAMPLE NOT TAKEN

H2O2 NOT PUT IN FLASK UNTIL AFTER COOLDOWN TO R.T.

ADJUSTED FOR LOSS (MILLIPORES)

1Hr = 0.34%, 2Hr = 0.183%, 4Hr = 0.123%

DOE/UO2 SOLUBILITY AND CORROSION TEST

M-52316

@ TEMPERATURE 150 °F

Date: 06/29/94

SOLUTION & pH	HRS		pH	U-ppm	Fe-ppm	Ni-ppm	Cu-ppm	CORROSION - mils
ESI 600NS pH 7.0 Test 76	1	N.A.	7.14	40.8	13.9	<3.0	<3.0	C1018 - 0.443
	2	N.A.	7.03	62.8	19.8	<3.0	<3.0	N200 - 0.007
	4	N.A.	7.08	87.0	36.0	<3.0	<3.0	M400 - 0.013
	6	N.A.	7.07	94.6	48.9	<3.0	<3.0	UO2 SOLUBILITY
	8	N.A.	7.21	107.0	69.8	<3.0	<3.0	#1.1066

pH ADJUSTED WITH NH4OH

N.A.=NOT AVAILABLE (PROCEDURE)

ADJUSTED FOR LOSS (MILLIPORES)

M-52317

@ TEMPERATURE R.T. (73° F max.)

Date: 06/30/94

SOLUTION & pH	HRS	**	pH	U - ppm	Fe - ppm	Ni - ppm	Cu - ppm	CORROSION - MILS
2.5 l ESI 600 NS 2. % (NH4)2CO3 0.6% H2O2 pH 9.0 Test 77	2	**	8.90	1406	<3.0	<3.0	<3.0	C1018 - NO COUPONS
	3	**	8.83	2185	<3.0	<3.0	<3.0	N200 - NO COUPONS
	5	**	8.80	2625	<3.0	<3.0	<3.0	M400 - NO COUPONS
	-	-	-	-	-	-	-	UO2 SOLUBILITY
	-	-	-	-	-	-	-	#7.5090

pH ADJUSTED WITH NH4OH

NOTE: NO SIGNIFICANT TEMPERATURE RISE

ADJUSTED FOR LOSS (MILLIPORES)

APPENDIX C

TASK 2 TOPICAL REPORT

DOE CONTRACT DE-AC21-93MC30168

**RAW DATA FROM SCREENING AND REFINEMENT TESTS &
CORROSION AND MASS BALANCE CALCULATIONS**

DOE Uranium Dioxide Dissolution Testing

Date of test: 12/21/93Solvent composition: 10% EDTA @pH 7.0 (1)
TEMP 200F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in ²)	Calculated General Corrosion (mils)
C1018-1	22.7353	22.7333	0.0020	3.79	0.004
N200-1	23.8508	23.8492	0.0016	3.72	0.003
M400-1	23.2705	23.2698	0.0007	3.70	0.001

Weight Reservoir Plus Solvent Before Transfer	4165		
Weight Reservoir Plus Solvent After Transfer	1563	Initial Density (g/L)	1.0480
Tare Weight Reservoir Flask	1328		
Weight Solvent Transferred	2602		
Volume Solvent Transferred	2483		
Weight Test Flask Plus Solvent After Test	3787		
Tare Weight Test Flask	1278	Final Density (g/L)	1.0490
Weight Solvent Remaining in Flask	2509		
Volume Solvent Remaining in Flask	2392		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	7.01	100.0	NA	0.0000	0.0000	0.0000	0.00	0.00
1	7.03	100.0	NA	0.0013	<0.0010	<0.0010	24.243	23.130
2	7.03	100.0	NA	0.0016	<0.0010	<0.0010	22.537	21.498
4	7.03	100.0	NA	0.0017	<0.0010	<0.0010	21.488	21.425
6	6.98	100.0	NA	0.0021	<0.0010	<0.0010	22.466	21.763
8	6.99	100.0	NA	0.0021	<0.0010	<0.0010	22.499	20.193

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	NA	0.00	0.00	0.00	0.00	0.00
1	NA	0.00	0.00	0.00	0.00	0.00
2	NA	0.00	0.00	0.00	0.00	0.00
4	NA	0.00	0.00	0.00	0.00	0.00
6	NA	0.00	0.00	0.00	0.01	0.01
8	NA	0.00	0.00	0.00	0.01	0.01

12/21/93

GRAMS DISSOLVED

Elapsed Time<-----Copper----->				<-----Nickel----->			
(Hours)	Sample	Flask	Total	Sample	Flask	Total	
0	0.00	0.00	0.00	0.00	0.00	0.00	
1	0.00	0.00	0.00	0.00	0.00	0.00	
2	0.00	0.00	0.00	0.00	0.00	0.00	
4	0.00	0.00	0.00	0.00	0.00	0.00	
6	0.00	0.00	0.00	0.00	0.00	0.00	
8	0.00	0.00	0.00	0.00	0.00	0.00	

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
1	1 hr	8.7091	21.4900	12.7809	12.194		
2	1 hr	8.7614	20.2238	11.4624	10.935		
3	2 hr	8.6425	20.5916	11.9491	11.399		
4	2 hr	8.6552	19.2430	10.5878	10.099		
5	4 hr	8.6645	19.5647	10.9002	10.396		
6	4 hr	8.7085	20.2740	11.5655	11.029		
7	6 hr	8.6819	19.6150	10.9331	10.425	Total Removed (g)	113.25
8	6 hr	8.7673	20.6581	11.8908	11.338		
9	8 hr	8.7373	19.8788	11.1415	10.622	Total Removed (mL)	108.01
10	8 hr	8.6325	18.6720	10.0395	9.571		

Coupon #	Length (in)	Width (in)	Height (in)	Hole D (in)	S.A. (in ²)
C1018-1	2.0150	0.7690	0.1195	0.1255	3.79
N200-1	2.0120	0.7695	0.1085	0.1255	3.72
M400-1	2.0145	0.7645	0.1085	0.1250	3.70

Grams Uranium Dioxide Added to Flask	0.00		
Weight Glass Filter Plus Deposit	NA		
Tare Weight Glass Filter	NA	Grams UO ₂ Lost	0.00
Weight Deposit Remaining in Flask	NA		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.		
1.00	1 hr	0.0232	0.0270	0.0038		
2.00	2 hr	0.0231	0.0264	0.0033		
3.00	4 hr	0.0230	0.0256	0.0026	Total on Millipores (g)	0.0153
4.00	6 hr	0.0231	0.0261	0.0030		
5.00	8 hr	0.0231	0.0257	0.0026		

DOE Uranium Dioxide Dissolution Testing

Date of test: 12/27/93Solvent composition: 10% DTPA @pH 7.0 (2)
TEMP 200F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in ²)	Calculated General Corrosion (mils)
C1018-2	22.4271	22.4265	0.0006	3.77	0.001
N200-2	23.4742	23.4736	0.0006	3.70	0.001
M400-2	25.0975	25.0975	0.0000	3.92	0.000

Weight Reservoir Plus Solvent Before Transfer	4130		
Weight Reservoir Plus Solvent After Transfer	1565	Initial Density (g/L)	1.0450
Tare Weight Reservoir Flask	1278		
Weight Solvent Transferred	2565		
Volume Solvent Transferred	2455		
Weight Test Flask Plus Solvent After Test	3753		
Tare Weight Test Flask	1328	Final Density (g/L)	1.0490
Weight Solvent Remaining in Flask	2425		
Volume Solvent Remaining in Flask	2312		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	7.01	98.6	NA	0.000	0.00	0.00	0.000	0.000
1	6.98	97.5	NA	<.0010	<.0010	<.0010	24.528	23.458
2	6.98	97.5	NA	<.0010	<.0010	<.0010	25.920	24.770
4	6.98	97.5	NA	0.0014	<.0010	<.0010	25.388	22.102
6	6.89	97.5	NA	0.0019	<.0010	<.0010	23.145	21.818
8	6.89	97.5	NA	0.0025	<.0010	<.0010	22.115	19.946

GRAMS DISSOLVED

Elapsed Time (Hours)	Sample	Flask	Total	Sample	Flask	Total
0	NA	0.00	0.00	0.00	0.00	0.00
1	NA	0.00	0.00	0.00	0.00	0.00
2	NA	0.00	0.00	0.00	0.00	0.00
4	NA	0.00	0.00	0.00	0.00	0.00
6	NA	0.00	0.00	0.00	0.00	0.00
8	NA	0.00	0.00	0.00	0.01	0.01

GRAMS DISSOLVED				12/27/94		
Copper				Nickel		
Elapsed Time (Hours)	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
1	1 hr	8.6976	20.4045	11.7069	11.198	
2	1 hr	8.7445	21.5660	12.8215	12.260	
3	2 hr	8.7179	21.4185	12.7006	12.140	
4	2 hr	8.6714	21.8903	13.2189	12.630	
5	4 hr	8.6056	20.7749	12.1693	11.623	
6	4 hr	8.5961	19.5716	10.9755	10.479	
7	6 hr	8.7058	19.8453	11.1395	10.631	Total Removed (g)
8	6 hr	8.6369	20.3628	11.7259	11.187	
9	8 hr	8.7315	19.3694	10.6379	10.145	Total Removed (mL)
10	8 hr	8.6757	18.9573	10.2816	9.801	
						117.38
						112.09

Coupon #	Length (in)	Width (in)	Height (in)	Hole D (in)	S.A. (in ²)
C1018-2	2.0165	0.7695	0.1160	0.1250	3.77
N200-2	2.0135	0.7645	0.1080	0.1275	3.70
M400-2	2.1025	0.7675	0.1170	0.1295	3.92

Grams Uranium Dioxide Added to Flask	0.00	
Weight Glass Filter Plus Deposit	NA	
Tare Weight Glass Filter	NA	Grams UO ₂ Lost
Weight Deposit Remaining in Flask	NA	0.00

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.	
1.00	1 hr	0.0231	0.0249	0.0018	
2.00	2 hr	0.0234	0.0253	0.0019	
3.00	4 hr	0.0234	0.0243	0.0009	
4.00	6 hr	0.0233	0.0271	0.0038	
5.00	8 hr	0.0233	0.0248	0.0015	
					Total on Millipores (g)
					0.0099

DOE Uranium Dioxide Dissolution Testing

Date of test: 12/28/94Solvent composition: 10% HEDTA @pH 7.0(3)
TEMP 200F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in ²)	Calculated General Corrosion (mils)
C1018-3	22.2189	22.2175	0.0014	3.74	0.003
N200-3	23.3318	23.3310	0.0008	3.69	0.002
M400-3	24.8692	24.8687	0.0005	3.75	0.001

Weight Reservoir Plus Solvent Before Transfer	4225		
Weight Reservoir Plus Solvent After Transfer	1654	Initial Density (g/L)	1.0455
Tare Weight Reservoir Flask	1278		
Weight Solvent Transferred	2571		
Volume Solvent Transferred	2459		
Weight Test Flask Plus Solvent After Test	3731		
Tare Weight Test Flask	1342	Final Density (g/L)	1.0480
Weight Solvent Remaining in Flask	2389		
Volume Solvent Remaining in Flask	2280		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	7.10	98.8	NA	0.0000	0.0000	0.0000	0.0000	0.0000
1	7.10	98.8	NA	<.0010	<.0010	<.0010	21.3494	20.3853
2	7.07	98.8	NA	<.0010	<.0010	<.0010	21.8375	20.8481
4	7.10	98.8	NA	<.0010	<.0010	<.0010	23.7272	22.6486
6	7.09	98.8	NA	<.0010	<.0010	<.0010	21.5166	20.5352
8	7.09	98.8	NA	<.0010	<.0010	<.0010	20.6162	19.6727

GRAMS DISSOLVED

Uranium				Iron			
Elapsed Time (Hours)	Sample	Flask	Total	Sample	Flask	Total	
0	NA	0.00	0.00	0.00	0.00	0.00	
1	NA	0.00	0.00	0.00	0.00	0.00	
2	NA	0.00	0.00	0.00	0.00	0.00	
4	NA	0.00	0.00	0.00	0.00	0.00	
6	NA	0.00	0.00	0.00	0.00	0.00	
8	NA	0.00	0.00	0.00	0.00	0.00	

GRAMS DISSOLVED				12/28/94		
Elapsed Time<-----Copper----->				<-----Nickel----->		
(Hours)	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
21.0000	1 hr	8.5662	19.0088	10.4426	9.971		
22.0000	1 hr	8.6121	19.5189	10.9068	10.414		
23.0000	2 hr	8.6413	20.0801	11.4388	10.921		
24.0000	2 hr	8.6818	19.0805	10.3987	9.927		
25.0000	4 hr	8.6937	21.5942	12.9005	12.315		
26.0000	4 hr	8.7887	19.6154	10.8267	10.334		
27.0000	6 hr	8.6531	19.5612	10.9081	10.411	Total Removed (g)	109.0469
28.0000	6 hr	8.6000	19.2085	10.6085	10.124		
29.0000	8 hr	8.6880	19.2287	10.5407	10.059	Total Removed (mL)	104.0900
30.0000	8 hr	8.7202	18.7957	10.0755	9.614		

Coupon #	Length (in)	Width (in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-3	2.0150	0.7635	0.1155	0.1240	3.74
N200-3	2.0100	0.7660	0.1075	0.1250	3.69
M400-3	2.0085	0.7690	0.1150	0.1240	3.75

Grams Uranium Dioxide Added to Flask	0.00		
Weight Glass Filter Plus Deposit	NA		
Tare Weight Glass Filter	NA	Grams UO2 Lost	0.0000
Weight Deposit Remaining in Flask	NA		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.		
12.0000	1 hr	0.0233	0.0251	0.0018		
13.0000	2 hr	0.0233	0.0242	0.0009		
14.0000	4 hr	0.0233	0.0255	0.0255	Total on Millipores (g)	0.0784
15.0000	6 hr	0.0233	0.0255	0.0255		
16.0000	8 hr	0.0233	0.0247	0.0247		

DOE Uranium Dioxide Dissolution Testing

Date of test: 1/5/94

Solvent composition:

10% EDTA @pH 9.0 (4)TEMP 200F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in2)	Calculated General Corrosion (mils)
C1018-4	21.7466	21.7448	0.0018	3.76	0.004
N200-4	23.1733	23.1725	0.0008	3.70	0.002
M400-4	25.1159	25.1154	0.0005	3.75	0.001

Weight Reservoir Plus Solvent Before Transfer	4405		
Weight Reservoir Plus Solvent After Transfer	1752	Initial Density (g/L)	1.0460
Tare Weight Reservoir Flask	1344		
Weight Solvent Transferred	2653		
Volume Solvent Transferred	2536		
Weight Test Flask Plus Solvent After Test	3773		
Tare Weight Test Flask	1328	Final Density (g/L)	1.0460
Weight Solvent Remaining in Flask	2445		
Volume Solvent Remaining in Flask	2337		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.00	100.0	NA	0.000	0.000	0.000	0	0
1	8.98	100.0	NA	<.0010	<.0010	<.0010	22.999	21.987
2	8.94	100.0	NA	<.0010	<.0010	<.0010	23.073	22.058
4	8.94	100.0	NA	<.0010	<.0010	<.0010	21.704	19.903
6	8.93	100.0	NA	<.0010	<.0010	<.0010	20.819	22.351
8	8.90	100.0	NA	<.0010	<.0010	<.0010	23.508	21.035

GRAMS DISSOLVED

Elapsed Time (Hours)	Sample	Flask	Total	Sample	Flask	Total
0	NA	0.00	0.00	0.00	0.00	0.00
1	NA	0.00	0.00	0.00	0.00	0.00
2	NA	0.00	0.00	0.00	0.00	0.00
4	NA	0.00	0.00	0.00	0.00	0.00
6	NA	0.00	0.00	0.00	0.00	0.00
8	NA	0.00	0.00	0.00	0.00	0.00

Elapsed Time<-----Copper----->				GRAMS DISSOLVED			<-----Nickel----->			1/5/94
(Hours)	Sample	Flask	Total		Sample	Flask	Total			
0	0.00	0.00	0.00		0.00	0.00	0.00			
1	0.00	0.00	0.00		0.00	0.00	0.00			
2	0.00	0.00	0.00		0.00	0.00	0.00			
4	0.00	0.00	0.00		0.00	0.00	0.00			
6	0.00	0.00	0.00		0.00	0.00	0.00			
8	0.00	0.00	0.00		0.00	0.00	0.00			

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
1	1 hr	8.6904	19.8986	11.2082	10.715		
2	1 hr	8.7175	20.5078	11.7903	11.272		
3	2 hr	8.6969	20.1289	11.4320	10.929		
4	2 hr	8.7340	20.3746	11.6406	11.129		
5	4 hr	8.7508	18.8140	10.0632	9.621		
6	4 hr	8.6627	19.4184	10.7557	10.283		
7	6 hr	8.5812	21.3332	12.7520	12.191	Total Removed (g)	112
8	6 hr	8.5832	19.2107	10.6275	10.160		
9	8 hr	8.6636	19.6260	10.9624	10.480	Total Removed (mL)	107
10	8 hr	8.6719	19.7117	11.0398	10.554		

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in ²)
C1018-4	2.0165	0.7685	0.1150	0.1275	3.76
N200-4	2.0105	0.7695	0.1065	0.1260	3.70
M400-4	2.0070	0.7670	0.1175	0.1235	3.75

Grams Uranium Dioxide Added to Flask	0.00		
Weight Glass Filter Plus Deposit	NA		
Tare Weight Glass Filter	NA	Grams UO2 Lost	0
Weight Deposit Remaining in Flask	NA		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.		
1	1 hr	0.0232	0.0268	0.0036		
2	2 hr	0.0232	0.0270	0.0038		
3	4 hr	0.0234	0.0269	0.0035	Total on Millipores (g)	0.0170
4	6 hr	0.0232	0.0261	0.0029		
5	8 hr	0.0233	0.0265	0.0032		

DOE Uranium Dioxide Dissolution Testing

Date of test: 1/7/94Solvent composition: 10% DTPA @pH 9.0 (5)
TEMP 200F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in ²)	Calculated General Corrosion (mils)
C1018-5	22.1765	22.1755	0.0010	3.77	0.002
N200-5	22.9509	22.9495	0.0014	3.68	0.003
M400-5	25.2843	25.2835	0.0008	3.77	0.002

Weight Reservoir Plus Solvent Before Transfer	0		
Weight Reservoir Plus Solvent After Transfer	0	Initial Density (g/L)	1.0450
Tare Weight Reservoir Flask	0		
Weight Solvent Transferred	0		
Volume Solvent Transferred	2500		
Weight Test Flask Plus Solvent After Test	0		
Tare Weight Test Flask	0	Final Density (g/L)	1.0435
Weight Solvent Remaining in Flask	0		
Volume Solvent Remaining in Flask	0		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	8.95	96.3	NA	0.000	0.000	0.000	0	0
1	8.95	92.9	NA	<.0010	<.0010	<.0010	25.154	24.096
2	8.90	92.9	NA	<.0010	<.0010	<.0010	14.146	13.552
4	8.95	95.3	NA	0.0014	<.0010	<.0010	13.192	12.639
6	8.85	91.6	NA	0.0019	<.0010	<.0010	13.192	11.910
8	8.76	95.3	NA	0.0025	<.0010	<.0010	12.430	11.823

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	NA	0.00	0.00	0.00	0.00	0.00
1	NA	0.00	0.00	0.00	0.00	0.00
2	NA	0.00	0.00	0.00	0.00	0.00
4	NA	0.00	0.00	0.00	0.00	0.00
6	NA	0.00	0.00	0.00	0.00	0.00
8	NA	0.00	0.00	0.00	0.01	0.01

GRAMS DISSOLVED				1/7/94		
Copper				Nickel		
Elapsed Time< (Hours)	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
11	1 hr	8.6201	22.0325	13.4124	12.848	
11	1 hr	8.6201	20.3620	11.7419	11.248	
12	2 hr	8.6179	22.7638	14.1459	13.552	
12	2 hr	0.0000	0.0000	0.0000	0.000	
13	4 hr	8.6867	21.8783	13.1916	12.639	
13	4 hr	0.0000	0.0000	0.0000	0.000	
14	6 hr	8.6456	21.0753	12.4297	11.910	Total Removed (g) 77.2593
14	6 hr	0.0000	0.0000	0.0000	0.000	
15	8 hr	8.6657	21.0035	12.3378	11.823	Total Removed (mL) 74.0219
15	8 hr	0.0000	0.0000	0.0000	0.000	

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-5	2.0135	0.7690	0.1165	0.1295	3.77
N200-5	2.0110	0.7645	0.1055	0.1240	3.68
M400-5	2.0130	0.7690	0.1170	0.1280	3.77

Grams Uranium Dioxide Added to Flask	0.00	
Weight Glass Filter Plus Deposit	NA	
Tare Weight Glass Filter	NA	Grams UO2 Lost 0
Weight Deposit Remaining in Flask	NA	

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.	
6	1 hr	0.0232	0.0366	0.0134	
7	2 hr	0.0234	0.0345	0.0111	
8	4 hr	0.0234	0.0265	0.0031	Total on Millipores (g) 0.0395
9	6 hr	0.0235	0.0342	0.0107	
10	8 hr	0.0234	0.0246	0.0012	

DOE Uranium Dioxide Dissolution Testing

Date of test: 1/10/94Solvent composition: 10% HEDTA @pH 9.0 (6)

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in2)	Calculated General Corrosion (mils)
C1018-6	21.5057	21.5043	0.0014	3.75	0.003
N200-6	22.7895	22.7896	-0.0001	3.68	-0.000
M400-6	24.4543	24.4543	0.0000	3.73	0.000

Weight Reservoir Plus Solvent Before Transfer	0		
Weight Reservoir Plus Solvent After Transfer	0	Initial Density (g/L)	1.0400
Tare Weight Reservoir Flask	0		
Weight Solvent Transferred	0		
Volume Solvent Transferred	2500		
Weight Test Flask Plus Solvent After Test	0		
Tare Weight Test Flask	0	Final Density (g/L)	1.0435
Weight Solvent Remaining in Flask	0		
Volume Solvent Remaining in Flask	0		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	8.96	103.0	NA	<.0010	<.0010	<.0010	0	0
1	8.98	103.0	NA	<.0010	<.0010	<.0010	25.118	24.098
2	9.00	103.0	NA	<.0010	<.0010	<.0010	23.160	22.214
4	9.00	103.0	NA	<.0010	<.0010	<.0010	23.292	21.885
6	9.00	103.0	NA	<.0010	<.0010	<.0010	22.823	20.477
8	9.00	103.0	NA	<.0010	<.0010	<.0010	23.453	23.640

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0000	0.00	0.00	0.00	0.00	0.00
2	0.0000	0.00	0.00	0.00	0.00	0.00
4	0.0000	0.00	0.00	0.00	0.00	0.00
6	0.0000	0.00	0.00	0.00	0.00	0.00
8	0.0000	0.00	0.00	0.00	0.00	0.00

Elapsed Time<-----Copper----->				GRAMS DISSOLVED			1/10/94
(Hours)	Sample	Flask	Total	Sample	Flask	Total	
0	0.00	0.00	0.00	0.00	0.00	0.00	
1	0.00	0.00	0.00	0.00	0.00	0.00	
2	0.00	0.00	0.00	0.00	0.00	0.00	
4	0.00	0.00	0.00	0.00	0.00	0.00	
6	0.00	0.00	0.00	0.00	0.00	0.00	
8	0.00	0.00	0.00	0.00	0.00	0.00	

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
16	1 hr	8.5945	21.5068	12.9123	12.389	
17	1 hr	8.6900	20.8954	12.2054	11.709	
18	2 hr	8.6404	19.6113	10.9709	10.523	
19	2 hr	8.5581	20.7471	12.1890	11.690	
20	4 hr	8.6880	19.7905	11.1025	10.647	
21	4 hr	8.6917	20.4120	11.7203	11.238	
22	6 hr	8.6756	20.4084	11.7328	11.248	Total Removed (g) 117.13
23	6 hr	8.7116	18.3393	9.6277	9.229	
24	8 hr	8.7138	20.6034	11.8896	11.395	Total Removed (mL) 112.31
25	8 hr	8.6884	21.4652	12.7768	12.244	

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-6	2.0115	0.7700	0.1140	0.1300	3.75
N200-6	2.0085	0.7675	0.1050	0.1225	3.68
M400-6	2.0130	0.7650	0.1135	0.1290	3.73

Grams Uranium Dioxide Added to Flask	0.00		
Weight Glass Filter Plus Deposit	NA		
Tare Weight Glass Filter	NA	Grams UO2 Lost	0.0000
Weight Deposit Remaining in Flask	NA		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.	
12	1 hr	0.0235	0.0299	0.0064	
13	2 hr	0.0235	0.0276	0.0041	
14	4 hr	0.0232	0.0256	0.0024	
15	6 hr	0.0234	0.0244	0.0010	
16	8 hr	0.0232	0.0270	0.0038	
					Total on Millipores (g) 0.0177

DOE Uranium Dioxide Dissolution Testing

Date of test: 1/21/94Solvent composition: 10% EDTA @pH 7.0 (7)
TEMP 200F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in ²)	Calculated General Corrosion (mils)
C1018-7	21.7794	21.7735	0.0059	3.75	0.012
N200-7	24.3592	24.3588	0.0004	3.73	0.001
M400-7	23.9488	23.9487	0.0001	3.74	0.000

Weight Reservoir Plus Solvent Before Transfer	4228		
Weight Reservoir Plus Solvent After Transfer	1509	Initial Density (g/L)	1.0465
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2719		
Volume Solvent Transferred	2598		
Weight Test Flask Plus Solvent After Test	3797		
Tare Weight Test Flask	1275	Final Density (g/L)	1.0485
Weight Solvent Remaining in Flask	2522		
Volume Solvent Remaining in Flask	2405		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	7.02	98.0	0.0000	0.0000	0.0000	0.0000	0	0
1	6.98	98.0	0.0264	0.0010	<.0010	<.0010	21.799	20.824
2	6.98	98.0	0.0369	0.0019	<.0010	<.0010	23.199	22.154
4	6.98	98.0	0.0469	0.0016	<.0010	<.0010	20.989	19.620
6	7.11	98.0	0.0498	0.0021	<.0010	<.0010	20.554	24.692
8	7.52	96.2	0.0433	0.0050	<.0010	<.0010	23.183	24.174

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0005	0.07	0.07	0.00	0.00	0.00
2	0.0008	0.09	0.10	0.00	0.00	0.00
4	0.0009	0.12	0.12	0.00	0.00	0.00
6	0.0012	0.13	0.13	0.00	0.01	0.01
8	0.0010	0.11	0.11	0.00	0.01	0.01

GRAMS DISSOLVED				1/21/94		
Elapsed Time<-----Copper----->				<-----Nickel----->		
(Hours)	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
1	1 hr	8.6766	19.9500	11.2734	10.770	
2	1 hr	8.6545	19.1800	10.5255	10.054	
3	2 hr	8.5627	21.0380	12.4753	11.914	
4	2 hr	8.6854	19.4094	10.7240	10.240	
5	4 hr	8.7125	18.9778	10.2653	9.800	
6	4 hr	8.6624	18.9508	10.2884	9.820	
7	6 hr	8.6371	21.5314	12.8943	12.305	Total Removed (g)
8	6 hr	8.5628	21.5462	12.9834	12.388	
9	8 hr	8.7214	21.9320	13.2106	12.602	Total Removed (mL)
10	8 hr	8.6914	20.8242	12.1328	11.572	
						116.77
						111.46

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-7	2.0130	0.7690	0.1145	0.1295	3.75
N200-7	2.0115	0.7675	0.1120	0.1250	3.73
M400-7	2.0165	0.7680	0.1115	0.1230	3.74

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	9.7314		
Tare Weight Glass Filter	0.2123	Grams UO2 Lost	0.4809
Weight Deposit Remaining in Flask	9.5191		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.	
1	1 hr	0.0231	0.0245	0.0014	
2	2 hr	0.0230	0.0258	0.0028	
3	4 hr	0.0240	0.0249	0.0009	
4	6 hr	0.0233	0.0260	0.0027	
5	8 hr	0.0231	0.0260	0.0029	
					Total on Millipores (g)
					0.0107

DOE Uranium Dioxide Dissolution Testing

Date of test: 1/24/94Solvent composition: 10% EDTA @pH 9.0 (8)
TEMP 200F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in ²)	Calculated General Corrosion (mils)
C1018-8	22.3800	22.3762	0.0038	3.77	0.008
N200-8	24.4322	24.4318	0.0004	3.73	0.001
M400-8	23.9321	23.9317	0.0004	3.73	0.001

Weight Reservoir Plus Solvent Before Transfer	4213		
Weight Reservoir Plus Solvent After Transfer	1521	Initial Density (g/L)	1.0450
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2692		
Volume Solvent Transferred	2576		
Weight Test Flask Plus Solvent After Test	3816		
Tare Weight Test Flask	1278	Final Density (g/L)	1.0450
Weight Solvent Remaining in Flask	2538		
Volume Solvent Remaining in Flask	2429		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.06	100.0	0.0000	0.0000	0.0000	0.0000	0	0
1	8.88	100.0	0.0390	<.0010	<.0010	<.0010	22.773	21.792
2	8.79	100.0	0.0510	0.0010	<.0010	<.0010	24.306	23.260
4	8.72	100.0	0.0540	0.0013	<.0010	<.0010	22.495	20.890
6	8.58	100.0	0.0560	0.0015	<.0010	<.0010	21.830	22.180
8	8.91	97.1	0.0590	0.0016	<.0010	<.0010	21.988	23.855

GRAMS DISSOLVED

Elapsed Time (Hours)	-----Uranium----->			<-----Iron----->		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0008	0.10	0.10	0.00	0.00	0.00
2	0.0012	0.13	0.13	0.00	0.00	0.00
4	0.0011	0.14	0.14	0.00	0.00	0.00
6	0.0012	0.14	0.14	0.00	0.00	0.00
8	0.0014	0.15	0.15	0.00	0.00	0.00

Elapsed Time<-----Copper----->		GRAMS DISSOLVED			<-----Nickel----->		1/24/94
		Sample	Flask	Total			
0		0.00	0.00	0.00	0.00	0.00	0.00
1		0.00	0.00	0.00	0.00	0.00	0.00
2		0.00	0.00	0.00	0.00	0.00	0.00
4		0.00	0.00	0.00	0.00	0.00	0.00
6		0.00	0.00	0.00	0.00	0.00	0.00
8		0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
11	1 hr	8.6230	19.0777	10.4547	10.004		
12	1 hr	8.6419	20.9602	12.3183	11.788		
13	2 hr	8.6313	21.2916	12.6603	12.115		
14	2 hr	8.6916	20.3375	11.6459	11.144		
15	4 hr	8.7316	19.5811	10.8495	10.382		
16	4 hr	8.7674	19.7478	10.9804	10.508		
17	6 hr	8.6944	19.7021	11.0077	10.534	Total Removed (g)	117.02
18	6 hr	8.6922	20.8622	12.1700	11.646		
19	8 hr	8.6444	20.8108	12.1664	11.642	Total Removed (mL)	111.98
20	8 hr	8.7231	21.4851	12.7620	12.212		

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-8	2.0165	0.7690	0.1170	0.1290	3.77
N200-8	2.0120	0.7660	0.1125	0.1255	3.73
M400-8	2.0145	0.7665	0.1115	0.1235	3.73

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	9.8598		
Tare Weight Glass Filter	0.2146	Grams UO2 Lost	0.3548
Weight Deposit Remaining in Flask	9.6452		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.		
6	1 hr	0.0231	0.0255	0.0024		
7	2 hr	0.0228	0.0257	0.0029		
8	4 hr	0.0231	0.0261	0.0030	Total on Millipores (g)	0.0142
9	6 hr	0.0230	0.0256	0.0026		
10	8 hr	0.0230	0.0263	0.0033		

DOE Uranium Dioxide Dissolution Testing

Date of test: 1/26/94

Solvent composition:

10% EDTA @pH 5.5 (9)TEMP 200F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in2)	Calculated General Corrosion (mils)
C1018-9	22.5706	22.5605	0.0101	3.78	0.021
N200-9	23.8991	23.8973	0.0018	3.73	0.004
M400-9	23.3825	23.3807	0.0018	3.71	0.004

Weight Reservoir Plus Solvent Before Transfer	4200		
Weight Reservoir Plus Solvent After Transfer	1560	Initial Density (g/L)	1.0465
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2640		
Volume Solvent Transferred	2523		
Weight Test Flask Plus Solvent After Test	3792		
Tare Weight Test Flask	1278	Final Density (g/L)	1.0470
Weight Solvent Remaining in Flask	2514		
Volume Solvent Remaining in Flask	2401		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	5.60	102.9	0.0000	0.0000	0.0000	0.0000	0	0
1	5.49	104.0	0.0472	0.0010	<.0010	<.0010	21.806	20.830
2	5.61	100.0	0.0561	0.0010	<.0010	<.0010	24.042	22.965
4	5.56	101.0	0.0650	0.0011	<.0010	<.0010	20.288	20.557
6	5.55	100.0	0.0701	0.0019	<.0010	<.0010	21.522	19.256
8	5.61	98.0	0.0763	0.0023	<.0010	<.0010	22.237	24.498

GRAMS DISSOLVED

Elapsed Time (Hours)	-----Uranium----->			<-----Iron----->		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0010	0.12	0.12	0.00	0.00	0.00
2	0.0013	0.14	0.14	0.00	0.00	0.00
4	0.0013	0.16	0.16	0.00	0.00	0.00
6	0.0013	0.17	0.18	0.00	0.00	0.00
8	0.0019	0.18	0.19	0.00	0.01	0.01

Elapsed Time<-----Copper----->				GRAMS DISSOLVED			1/26/94	
(Hours)	Sample	Flask	Total	Sample	Flask	Total		
0	0.00	0.00	0.00	0.00	0.00	0.00		
1	0.00	0.00	0.00	0.00	0.00	0.00		
2	0.00	0.00	0.00	0.00	0.00	0.00		
4	0.00	0.00	0.00	0.00	0.00	0.00		
6	0.00	0.00	0.00	0.00	0.00	0.00		
8	0.00	0.00	0.00	0.00	0.00	0.00		

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.			
21	1 hr	8.6522	19.2782	10.6260	10.150			
22	1 hr	8.7088	19.8888	11.1800	10.679			
23	2 hr	8.6389	21.8428	13.2039	12.613			
24	2 hr	8.6465	19.4844	10.8379	10.352			
25	4 hr	8.6620	18.1121	9.4501	9.027			
26	4 hr	8.6390	20.7107	12.0717	11.531			
27	6 hr	8.7208	18.8863	10.1655	9.710	Total Removed (g)	113.18	
28	6 hr	8.7155	18.7101	9.9946	9.546			
29	8 hr	8.7233	21.6625	12.9392	12.359	Total Removed (mL)	108.11	
30	8 hr	8.7263	21.4368	12.7105	12.140			

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in ²)
C1018-9	2.0165	0.7675	0.1190	0.1290	3.78
N200-9	2.0135	0.7680	0.1105	0.1255	3.73
M400-9	2.0145	0.7640	0.1095	0.1250	3.71

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	9.8025		
Tare Weight Glass Filter	0.2134	Grams UO ₂ Lost	0.4109
Weight Deposit Remaining in Flask	9.5891		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.				
11	1 hr	0.0232	0.0255	0.0023				
12	2 hr	0.0229	0.0272	0.0043				
13	4 hr	0.0230	0.0259	0.0029				
14	6 hr	0.0230	0.0260	0.0030				
15	8 hr	0.0230	0.0256	0.0026				
					Total on Millipores (g)	0.0151		

DOE Uranium Dioxide Dissolution Testing

Date of test: 1/27/94Solvent composition: 10% DTPA @pH 7.0 (10)
TEMP 200F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in ²)	Calculated General Corrosion (mils)
C1018-10	21.9668	21.9606	0.0062	3.76	0.013
N200-10	23.8486	23.8486	0.0000	3.72	0.000
M400-10	23.7855	23.7843	0.0012	3.74	0.002

Weight Reservoir Plus Solvent Before Transfer	4191		
Weight Reservoir Plus Solvent After Transfer	1516	Initial Density (g/L)	1.0450
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2675		
Volume Solvent Transferred	2560		
Weight Test Flask Plus Solvent After Test	3830		
Tare Weight Test Flask	1278	Final Density (g/L)	1.0425
Weight Solvent Remaining in Flask	2552		
Volume Solvent Remaining in Flask	2448		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	7.10	98.1	0.0000	0.0000	0.0000	0.0000	0	0
1	6.99	98.1	0.0423	<.0010	<.0010	<.0010	22.800	21.859
2	6.91	98.1	0.0544	<.0010	<.0010	<.0010	22.494	21.568
4	6.90	98.1	0.0615	0.0014	<.0010	<.0010	24.107	22.146
6	6.92	98.1	0.0624	0.0015	<.0010	<.0010	23.094	19.383
8	6.97	96.6	0.0656	0.0015	<.0010	<.0010	20.474	24.280

GRAMS DISSOLVED

-----Uranium----->				<-----Iron----->			
Elapsed Time (Hours)	Sample	Flask	Total	Sample	Flask	Total	
0	0.0000	0.00	0.00	0.00	0.00	0.00	
1	0.0009	0.11	0.11	0.00	0.00	0.00	
2	0.0012	0.14	0.14	0.00	0.00	0.00	
4	0.0014	0.15	0.16	0.00	0.00	0.00	
6	0.0012	0.15	0.16	0.00	0.00	0.00	
8	0.0016	0.16	0.17	0.00	0.00	0.00	

Copper				Nickel		
Elapsed Time<	GRAMS DISSOLVED			>		
(Hours)	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
31	1 hr	8.6101	20.4456	11.8355	11.347	
32	1 hr	8.7116	19.6757	10.9641	10.512	
33	2 hr	8.5923	19.7060	11.1137	10.656	
34	2 hr	8.6736	20.0535	11.3799	10.912	
35	4 hr	8.6307	21.3576	12.7269	12.204	
36	4 hr	8.7828	19.1496	10.3668	9.942	
37	6 hr	8.7064	18.8136	10.1072	9.693	Total Removed (g) 113.91
38	6 hr	8.6623	18.7651	10.1028	9.690	
39	8 hr	8.6358	21.1223	12.4865	11.977	Total Removed (mL) 109.24
40	8 hr	8.6801	21.5062	12.8261	12.303	

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-10	2.0145	0.7690	0.1150	0.1245	3.76
N200-10	2.0120	0.7695	0.1095	0.1230	3.72
M400-10	2.0155	0.7675	0.1120	0.1250	3.74

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	8.5095		
Tare Weight Glass Filter	0.2138	Grams UO2 Lost	1.7043
Weight Deposit Remaining in Flask	8.2957		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.	
16	1 hr	0.0233	0.0256	0.0023	
17	2 hr	0.0231	0.0265	0.0034	
18	4 hr	0.0235	0.0256	0.0021	
19	6 hr	0.0234	0.0259	0.0025	
20	8 hr	0.0233	0.0250	0.0017	
					Total on Millipores (g) 0.0120

DOE Uranium Dioxide Dissolution Testing

Date of test: 2/01/94Solvent composition: 10% DTPA @pH 9.0 (11)
TEMP 200F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in2)	Calculated General Corrosion (mils)
C1018-11	21.9978	21.9962	0.0016	3.76	0.003
N200-11	23.9331	23.9328	0.0003	3.73	0.001
M400-11	23.5749	23.5746	0.0003	3.72	0.001

Weight Reservoir Plus Solvent Before Transfer	4211		
Weight Reservoir Plus Solvent After Transfer	1608	Initial Density (g/L)	1.0440
Tare Weight Reservoir Flask	1343		
Weight Solvent Transferred	2603		
Volume Solvent Transferred	2493		

Weight Test Flask Plus Solvent After Test	3820		
Tare Weight Test Flask	1343	Final Density (g/L)	1.0450
Weight Solvent Remaining in Flask	2477		
Volume Solvent Remaining in Flask	2370		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.01	100.1	0.0000	0.0000	0.0000	0.0000	0	0
1	8.85	100.0	0.0348	<.0010	<.0010	<.0010	22.137	21.187
2	8.83	100.0	0.0390	<.0010	<.0010	<.0010	24.028	22.996
4	8.83	100.0	0.0474	<.0010	<.0010	<.0010	23.826	20.528
6	8.84	100.0	0.0524	<.0010	<.0010	<.0010	21.450	21.898
8	8.97	98.5	0.0615	<.0010	<.0010	<.0010	20.827	24.070

GRAMS DISSOLVED

-----Uranium----->				<-----Iron----->			
Elapsed Time (Hours)	Sample	Flask	Total	Sample	Flask	Total	
0	0.0000	0.00	0.00	0.00	0.00	0.00	
1	0.0007	0.09	0.09	0.00	0.00	0.00	
2	0.0009	0.10	0.10	0.00	0.00	0.00	
4	0.0010	0.12	0.12	0.00	0.00	0.00	
6	0.0011	0.13	0.13	0.00	0.00	0.00	
8	0.0015	0.15	0.15	0.00	0.00	0.00	

Elapsed Time<-----Copper----->				GRAMS DISSOLVED			2/1/94		
(Hours)	Sample	Flask	Total	Sample	Flask	Total	<-----Nickel----->		
0	0.00	0.00	0.00	0.00	0.00	0.00			
1	0.00	0.00	0.00	0.00	0.00	0.00			
2	0.00	0.00	0.00	0.00	0.00	0.00			
4	0.00	0.00	0.00	0.00	0.00	0.00			
6	0.00	0.00	0.00	0.00	0.00	0.00			
8	0.00	0.00	0.00	0.00	0.00	0.00			

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
41	1 hr	8.6487	19.4816	10.8329	10.368		
42	1 hr	8.6419	19.9457	11.3038	10.819		
43	2 hr	8.7682	20.7058	11.9376	11.425		
44	2 hr	8.7376	20.8276	12.0900	11.571		
45	4 hr	8.6791	20.4154	11.7363	11.232		
46	4 hr	8.6265	18.3405	9.7140	9.296		
47	6 hr	8.7284	19.8410	11.1126	10.635	Total Removed (g)	115.65
48	6 hr	8.7305	20.5007	11.7702	11.264		
49	8 hr	8.6970	21.4921	12.7951	12.244	Total Removed (mL)	110.68
50	8 hr	8.6496	21.0075	12.3579	11.826		

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-11	2.0160	0.7705	0.1140	0.1265	3.76
N200-11	2.0105	0.7710	0.1095	0.1240	3.73
M400-11	2.0115	0.7675	0.1110	0.1240	3.72

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	9.9630		
Tare Weight Glass Filter	0.2136	Grams UO2 Lost	0.2506
Weight Deposit Remaining in Flask	9.7494		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.					
21	1 hr	0.0231	0.0266	0.0035					
22	2 hr	0.0231	0.0259	0.0028					
23	4 hr	0.0233	0.0260	0.0027					
24	6 hr	0.0230	0.0262	0.0032					
25	8 hr	0.0231	0.0251	0.0020					
					Total on Millipores (g)	0.0142			

DOE Uranium Dioxide Dissolution Testing

Date of test: 2/02/94Solvent composition: 10% HEDTA @pH 7.0 (12)
TEMP 200F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in ²)	Calculated General Corrosion (mils)
C1018-12	21.4329	21.4249	0.0080	3.73	0.017
N200-12	23.3350	23.3349	0.0001	3.69	0.000
M400-12	23.3945	23.3942	0.0003	3.72	0.001

Weight Reservoir Plus Solvent Before Transfer	4182		
Weight Reservoir Plus Solvent After Transfer	1504	Initial Density (g/L)	1.0415
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2678		
Volume Solvent Transferred	2571		
Weight Test Flask Plus Solvent After Test	3892		
Tare Weight Test Flask	1343	Final Density (g/L)	1.0420
Weight Solvent Remaining in Flask	2549		
Volume Solvent Remaining in Flask	2446		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	7.06	100.0	0.0000	0.0000	0.0000	0.0000	0	0
1	7.08	100.0	0.0344	<.0010	<.0010	<.0010	22.328	21.429
2	7.21	100.0	0.0434	<.0010	<.0010	<.0010	24.852	23.852
4	7.02	100.0	0.0515	0.0010	<.0010	<.0010	23.553	22.268
6	7.07	100.0	0.0545	0.0013	<.0010	<.0010	23.202	20.223
8	7.14	99.0	0.0602	0.0016	<.0010	<.0010	22.558	24.181

GRAMS DISSOLVED

Elapsed Time (Hours)	-----Uranium----->			<-----Iron----->		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0007	0.09	0.09	0.00	0.00	0.00
2	0.0010	0.11	0.11	0.00	0.00	0.00
4	0.0011	0.13	0.13	0.00	0.00	0.00
6	0.0011	0.14	0.14	0.00	0.00	0.00
8	0.0015	0.15	0.15	0.00	0.00	0.00

Copper				Nickel		
Elapsed Time<-----				>-----		
(Hours)	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
51	1 hr	8.6076	20.3463	11.7387	11.266	
52	1 hr	8.6708	19.2596	10.5888	10.163	
53	2 hr	8.6233	20.9190	12.2957	11.801	
54	2 hr	8.6772	21.2339	12.5567	12.051	
55	4 hr	8.6671	19.6632	10.9961	10.553	
56	4 hr	8.5655	20.7715	12.2060	11.714	
57	6 hr	8.5798	18.9318	10.3520	9.935	Total Removed (g)
58	6 hr	8.6782	19.3981	10.7199	10.288	
59	8 hr	8.6594	21.4126	12.7532	12.239	Total Removed (mL)
60	8 hr	8.6607	21.1043	12.4436	11.942	

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-12	2.0070	0.7695	0.1120	0.1260	3.73
N200-12	2.0120	0.7635	0.1080	0.1240	3.69
M400-12	2.0135	0.7685	0.1095	0.1240	3.72

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	9.8794		
Tare Weight Glass Filter	0.2136	Grams UO2 Lost	0.3342
Weight Deposit Remaining in Flask	9.6658		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.	
26	1 hr	0.0231	0.0255	0.0024	
27	2 hr	0.0232	0.0263	0.0031	
28	4 hr	0.0226	0.0263	0.0037	
29	6 hr	0.0230	0.0258	0.0028	
30	8 hr	0.0231	0.0254	0.0023	
					Total on Millipores (g)
					0.0143

DOE Uranium Dioxide Dissolution Testing

Date of test: 2/03/94Solvent composition: 10% HEDTA @pH 9.0 (13)
TEMP 200F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in ²)	Calculated General Corrosion (mils)
C1018-13	21.8311	21.8236	0.0075	3.73	0.016
N200-13	23.4058	23.4045	0.0013	3.70	0.003
M400-13	23.2341	23.2330	0.0011	3.72	0.002

Weight Reservoir Plus Solvent Before Transfer	4201		
Weight Reservoir Plus Solvent After Transfer	1596	Initial Density (g/L)	1.0405
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2605		
Volume Solvent Transferred	2504		

Weight Test Flask Plus Solvent After Test	3827		
Tare Weight Test Flask	1343	Final Density (g/L)	1.0410
Weight Solvent Remaining in Flask	2484		
Volume Solvent Remaining in Flask	2386		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.00	98.0	0.0000	0.0000	0.0000	0.0000	0	0
1	8.67	98.0	0.0227	<.0010	<.0010	<.0010	23.704	22.772
2	8.67	98.0	0.0316	<.0010	<.0010	<.0010	24.076	23.129
4	8.70	98.0	0.0426	<.0010	<.0010	<.0010	22.725	22.588
6	8.75	98.0	0.0456	<.0010	<.0010	<.0010	23.514	21.721
8	9.04	95.9	0.0488	0.0013	<.0010	<.0010	24.396	25.872

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0005	0.06	0.06	0.00	0.00	0.00
2	0.0007	0.08	0.08	0.00	0.00	0.00
4	0.0010	0.10	0.11	0.00	0.00	0.00
6	0.0010	0.11	0.11	0.00	0.00	0.00
8	0.0013	0.12	0.12	0.00	0.00	0.00

Copper				Nickel		
GRAMS DISSOLVED				2/03/94		
Elapsed Time<-----	Sample	Flask	Total	Sample	Flask	Total
(Hours)						
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
61	1 hr	8.5706	19.4411	10.8705	10.443	
62	1 hr	8.6362	21.4696	12.8334	12.329	
63	2 hr	8.6845	20.5158	11.8313	11.366	
64	2 hr	8.6754	20.9198	12.2444	11.763	
65	4 hr	8.6455	19.1259	10.4804	10.068	
66	4 hr	8.7042	21.7375	13.0333	12.520	
67	6 hr	8.6538	20.0168	11.3630	10.916	Total Removed (g)
68	6 hr	8.6208	19.8691	11.2483	10.805	120.84
69	8 hr	8.7223	22.2080	13.4857	12.955	Total Removed (mL)
70	8 hr	8.6247	22.0715	13.4468	12.917	116.08

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-13	2.0155	0.7650	0.1135	0.1270	3.73
N200-13	2.0135	0.7685	0.1065	0.1240	3.70
M400-13	2.0130	0.7680	0.1090	0.1240	3.72

Grams Uranium Dioxide Added to Flask	10.00	
Weight Glass Filter Plus Deposit	22.8378	
Tare Weight Glass Filter	13.2136	Grams UO2 Lost
Weight Deposit Remaining in Flask	9.6242	0.3758

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.	
31	1 hr	0.0231	0.0303	0.0072	
32	2 hr	0.0230	0.0266	0.0036	
33	4 hr	0.0230	0.0243	0.0013	
34	6 hr	0.0231	0.0255	0.0024	Total on Millipores (g)
35	8 hr	0.0234	0.0240	0.0006	0.0151

DOE Uranium Dioxide Dissolution Testing

Date of test: 2/08/94Solvent composition: ESI-600 @pH 6.79 (14)
TEMP 200F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in2)	Calculated General Corrosion (mils)
C1018-14	21.8055	21.5813	0.2242	3.74	0.465
N200-14	23.1569	23.1559	0.0010	3.69	0.002
M400-14	23.1490	23.1476	0.0014	3.73	0.003

Weight Reservoir Plus Solvent Before Transfer	4251		
Weight Reservoir Plus Solvent After Transfer	1635	Initial Density (g/L)	1.0660
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2616		
Volume Solvent Transferred	2454		
Weight Test Flask Plus Solvent After Test	3816		
Tare Weight Test Flask	1343	Final Density (g/L)	1.0650
Weight Solvent Remaining in Flask	2473		
Volume Solvent Remaining in Flask	2322		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	6.79	NA	0.0000	0.0000	0.0000	0.0000	0	0
1	7.06	NA	0.0542	0.0152	<.0010	<.0010	20.480	19.228
2	7.07	NA	0.0556	0.0238	<.0010	<.0010	22.200	20.844
4	7.07	NA	0.0566	0.0408	<.0010	<.0010	23.727	21.603
6	7.08	NA	0.0589	0.0621	<.0010	<.0010	23.008	19.932
8	7.29	NA	0.0596	0.0855	<.0010	<.0010	20.010	23.740

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0010	0.13	0.13	0.00	0.04	0.04
2	0.0012	0.13	0.14	0.00	0.06	0.06
4	0.0012	0.14	0.14	0.00	0.10	0.10
6	0.0012	0.14	0.14	0.00	0.15	0.15
8	0.0014	0.14	0.15	0.00	0.20	0.21

Copper				Nickel		
Elapsed Time<	GRAMS DISSOLVED			>		
(Hours)	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
71	1 hr	8.6539	18.6901	10.0362	9.423	
72	1 hr	8.6224	19.0660	10.4436	9.805	
73	2 hr	8.6878	19.4800	10.7922	10.133	
74	2 hr	8.7019	20.1098	11.4079	10.711	
75	4 hr	8.5639	20.8833	12.3194	11.567	
76	4 hr	8.6127	19.3016	10.6889	10.036	
77	6 hr	8.7548	18.0755	9.3207	8.752	Total Removed (g) 112.20
78	6 hr	8.5574	20.4646	11.9072	11.180	
79	8 hr	8.6715	21.5526	12.8811	12.095	Total Removed (mL) 105.35
80	8 hr	8.7516	21.1542	12.4026	11.646	

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-14	2.0140	0.7680	0.1130	0.1250	3.74
N200-14	2.0105	0.7665	0.1060	0.1240	3.69
M400-14	2.0135	0.7705	0.1100	0.1235	3.73

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	22.5991		
Tare Weight Glass Filter	13.0000	Grams UO2 Lost	0.4009
Weight Deposit Remaining in Flask	9.5991		

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.	
36	1 hr	0.0231	0.0275	0.0044	
37	2 hr	0.0233	0.0284	0.0051	
38	4 hr	0.0231	0.0282	0.0051	
39	6 hr	0.0233	0.0279	0.0046	
40	8 hr	0.0232	0.0248	0.0016	
					Total on Millipores (g) 0.0208

DOE Uranium Dioxide Dissolution Testing

Date of test: 2/09/94Solvent composition: ESI-603X @pH 10.69 (15)
TEMP 200F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in2)	Calculated General Corrosion (mils)
C1018-15	21.4273	21.3542	0.0731	3.74	0.152
N200-15	24.0002	23.9985	0.0017	3.71	0.004
M400-15	23.1164	23.1156	0.0008	3.72	0.002

Weight Reservoir Plus Solvent Before Transfer	4364		
Weight Reservoir Plus Solvent After Transfer	1576	Initial Density (g/L)	1.0940
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2788		
Volume Solvent Transferred	2548		
Weight Test Flask Plus Solvent After Test	4016		
Tare Weight Test Flask	1343	Final Density (g/L)	1.0950
Weight Solvent Remaining in Flask	2673		
Volume Solvent Remaining in Flask	2441		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	10.69	NA	0.0000	0.0000	0.0000	0.0000	0	0
1	10.41	NA	0.0582	0.0168	<.0050	<.0030	23.082	21.081
2	10.42	NA	0.0592	0.0274	<.0050	<.0030	24.400	22.285
4	10.38	NA	0.0604	0.0472	<.0050	<.0030	23.486	19.712
6	10.33	NA	0.0606	0.0732	<.0050	<.0030	21.584	19.405
8	10.21	NA	0.0606	0.0986	<.0050	<.0030	20.224	23.597

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0012	0.15	0.15	0.00	0.04	0.04
2	0.0013	0.15	0.15	0.00	0.07	0.07
4	0.0012	0.15	0.15	0.00	0.12	0.12
6	0.0012	0.15	0.15	0.00	0.18	0.18
8	0.0014	0.15	0.15	0.00	0.24	0.25

Elapsed Time<-----Copper----->			GRAMS DISSOLVED			2/9/94	
(Hours)	Sample	Flask	Total	Sample	Flask	Total	
0	0.00	0.00	0.00	0.00	0.00	0.00	
1	0.00	0.00	0.00	0.00	0.00	0.00	
2	0.00	0.00	0.00	0.00	0.00	0.00	
4	0.00	0.00	0.00	0.00	0.00	0.00	
6	0.00	0.00	0.00	0.00	0.00	0.00	
8	0.00	0.00	0.00	0.00	0.00	0.00	

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
81	1 hr	8.6344	20.2088	11.5744	10.571	
82	1 hr	8.6451	20.1524	11.5073	10.510	
83	2 hr	8.6644	20.5941	11.9297	10.895	
84	2 hr	8.6836	21.1540	12.4704	11.389	
85	4 hr	8.7619	19.7772	11.0153	10.060	
86	4 hr	8.6887	19.2572	10.5685	9.652	
87	6 hr	8.6745	18.3295	9.6550	8.818	Total Removed (g)
88	6 hr	8.6868	20.2796	11.5928	10.587	
89	8 hr	8.6264	21.6402	13.0138	11.885	Total Removed (mL)
90	8 hr	8.6624	21.4877	12.8253	11.713	
						116.15
						106.08

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-15	2.0135	0.7700	0.1115	0.1235	3.74
N200-15	2.0120	0.7665	0.1095	0.1240	3.71
M400-15	2.0120	0.7695	0.1080	0.1245	3.72

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	22.5708		
Tare Weight Glass Filter	13.0000	Grams UO2 Lost	0.4292
Weight Deposit Remaining in Flask	9.5708		

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.	
41	1 hr	0.0232	0.0360	0.0128	
42	2 hr	0.0232	0.0339	0.0107	
43	4 hr	0.0230	0.0380	0.0150	
44	6 hr	0.0229	0.0348	0.0119	
45	8 hr	0.0231	0.0274	0.0043	
					Total on Millipores (g)
					0.0547

DOE Uranium Dioxide Dissolution Testing

Date of test: 2/10/94

Solvent composition:

ESI-680 @pH 4.68 (16)

TEMP 200F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in ²)	Calculated General Corrosion (mils)
C1018-16	22.7674	22.6952	0.0722	3.79	0.148
N200-16	24.0199	24.0129	0.0070	3.71	0.015
M400-16	22.9343	22.9331	0.0012	3.71	0.003

Weight Reservoir Plus Solvent Before Transfer	4289		
Weight Reservoir Plus Solvent After Transfer	1512	Initial Density (g/L)	1.0800
Tare Weight Reservoir Flask	1328		
Weight Solvent Transferred	2777		
Volume Solvent Transferred	2571		
Weight Test Flask Plus Solvent After Test	3975		
Tare Weight Test Flask	1343	Final Density (g/L)	1.0800
Weight Solvent Remaining in Flask	2632		
Volume Solvent Remaining in Flask	2437		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	4.68	NA	0.0000	0.0000	0.0000	0.0000	0	0
1	4.56	NA	0.0656	0.0063	<.0010	0.0016	23.022	21.317
2	4.56	NA	0.0677	0.0090	<.0010	0.0024	24.535	22.717
4	4.57	NA	0.0704	0.0152	<.0010	0.0034	22.001	19.452
6	4.56	NA	0.0722	0.0213	<.0010	0.0036	21.009	19.260
8	4.60	NA	0.0730	0.0268	<.0010	0.0049	20.385	22.763

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0014	0.17	0.17	0.00	0.02	0.02
2	0.0015	0.17	0.17	0.00	0.02	0.02
4	0.0014	0.18	0.18	0.00	0.04	0.04
6	0.0014	0.18	0.19	0.00	0.05	0.05
8	0.0017	0.18	0.19	0.00	0.07	0.07

Copper				Nickel		
GRAMS DISSOLVED				2/10/94		
Elapsed Time<-----	Sample	Flask	Total	Sample	Flask	Total
(Hours)						
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.01	0.01
4	0.00	0.00	0.00	0.00	0.01	0.01
6	0.00	0.00	0.00	0.00	0.01	0.01
8	0.00	0.00	0.00	0.00	0.01	0.01

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
91	1 hr	8.7151	21.1568	12.4417	11.520	
92	1 hr	8.8105	19.3910	10.5805	9.797	
93	2 hr	8.6348	21.5831	12.9483	11.989	
94	2 hr	8.5543	20.1407	11.5864	10.728	
95	4 hr	8.6133	19.0277	10.4144	9.643	
96	4 hr	8.6549	19.2491	10.5942	9.809	
97	6 hr	8.6790	18.4699	9.7909	9.066	Total Removed (g)
98	6 hr	8.6550	19.6645	11.0095	10.194	
99	8 hr	8.7023	21.2004	12.4981	11.572	Total Removed (mL)
100	8 hr	8.6123	20.6980	12.0857	11.190	
						113.95
						105.51

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-16	2.0130	0.7710	0.1185	0.1255	3.79
N200-16	2.0105	0.7655	0.1105	0.1240	3.71
M400-16	2.0160	0.7675	0.1070	0.1245	3.71

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	22.4658		
Tare Weight Glass Filter	13.0000	Grams UO2 Lost	0.5342
Weight Deposit Remaining in Flask	9.4658		

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.	
46	1 hr	0.0230	0.0328	0.0098	
47	2 hr	0.0232	0.0326	0.0094	
48	4 hr	0.0230	0.0340	0.0110	
49	6 hr	0.0230	0.0307	0.0077	
50	8 hr	0.0231	0.0284	0.0053	
					Total on Millipores (g)
					0.0432

DOE Uranium Dioxide Dissolution Testing

Date of test: 2/15/94Solvent composition: DTPA @pH 5.00 (17)
TEMP 200F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in2)	Calculated General Corrosion (mils)
C1018-17	22.5562	22.5358	0.0204	3.74	0.042
N200-17	24.3438	24.3398	0.0040	3.73	0.008
M400-17	22.7577	22.7543	0.0034	3.70	0.007

Weight Reservoir Plus Solvent Before Transfer	4205		
Weight Reservoir Plus Solvent After Transfer	1598	Initial Density (g/L)	1.0400
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2607		
Volume Solvent Transferred	2507		
Weight Test Flask Plus Solvent After Test	3820		
Tare Weight Test Flask	1343	Final Density (g/L)	1.0430
Weight Solvent Remaining in Flask	2477		
Volume Solvent Remaining in Flask	2375		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	5.03	97.5	0.0000	0.0000	0.0000	0.0000	0	0
1	4.95	97.5	0.0659	0.0019	<.0010	<.0010	21.008	20.191
2	4.96	97.5	0.0689	0.0026	<.0010	<.0010	23.473	22.547
4	4.96	97.5	0.7310	0.0036	<.0010	<.0010	23.604	20.856
6	4.91	97.5	0.0740	0.0047	<.0010	<.0010	21.724	21.000
8	5.08	97.5	0.0762	0.0059	<.0010	<.0010	20.623	23.784

GRAMS DISSOLVED

-----Uranium----->				<-----Iron----->			
Elapsed Time (Hours)	Sample	Flask	Total	Sample	Flask	Total	
0	0.0000	0.00	0.00	0.00	0.00	0.00	
1	0.0013	0.16	0.17	0.00	0.00	0.00	
2	0.0016	0.17	0.17	0.00	0.01	0.01	
4	0.0152	1.79	1.80	0.00	0.01	0.01	
6	0.0016	0.18	0.20	0.00	0.01	0.01	
8	0.0018	0.18	0.20	0.00	0.01	0.01	

Copper				Nickel		
GRAMS DISSOLVED				2/15/94		
Elapsed Time<	Sample	Flask	Total	Sample	Flask	Total
(Hours)						
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
1	1 hr	8.7061	19.0735	10.3674	9.966	
2	1 hr	8.7938	19.4342	10.6404	10.225	
3	2 hr	8.5689	19.1446	10.5757	10.160	
4	2 hr	8.6364	21.5336	12.8972	12.387	
5	4 hr	8.6553	19.3617	10.7064	10.280	
6	4 hr	8.6973	19.7151	11.0178	10.576	
7	6 hr	8.6673	18.2729	9.6056	9.218	Total Removed (g) 112.90
8	6 hr	8.7108	20.9928	12.2820	11.782	
9	8 hr	8.6288	20.8987	12.2699	11.767	Total Removed (mL) 108.38
10	8 hr	8.7619	21.2953	12.5334	12.017	

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-17	2.0145	0.7600	0.1180	0.1290	3.74
N200-17	2.0080	0.7695	0.1115	0.1240	3.73
M400-17	2.0125	0.7685	0.1065	0.1245	3.70

Grams Uranium Dioxide Added to Flask	10.00	
Weight Glass Filter Plus Deposit	22.3833	
Tare Weight Glass Filter	13.0000	Grams UO2 Lost 0.6167
Weight Deposit Remaining in Flask	9.3833	

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.	
51	1 hr	0.0218	0.0257	0.0039	
52	2 hr	0.0221	0.0258	0.0037	
53	4 hr	0.0221	0.0271	0.0050	Total on Millipores (g) 0.0232
54	6 hr	0.0221	0.0287	0.0066	
55	8 hr	0.0223	0.0263	0.0040	

DOE Uranium Dioxide Dissolution Testing

Date of test: 2/16/94Solvent composition: HEDTA @pH 3.14 (18)
TEMP 200F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in ²)	Calculated General Corrosion (mils)
C1018-18	22.0599	21.9988	0.0611	3.75	0.126
N200-18	23.8217	23.8125	0.0092	3.71	0.019
M400-18	23.7589	23.7449	0.0140	3.72	0.029

Weight Reservoir Plus Solvent Before Transfer	4223		
Weight Reservoir Plus Solvent After Transfer	1692	Initial Density (g/L)	1.0475
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2531		
Volume Solvent Transferred	2416		
Weight Test Flask Plus Solvent After Test	3745		
Tare Weight Test Flask	1277	Final Density (g/L)	1.0485
Weight Solvent Remaining in Flask	2468		
Volume Solvent Remaining in Flask	2354		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	3.19	98.0	0.0000	0.0000	0.0000	0.0000	0	0
1	3.09	92.0	0.0664	0.0028	<.0010	0.0018	21.500	20.514
2	3.07	88.0	0.0665	0.0043	<.0010	0.0024	21.964	20.954
4	2.99	88.0	0.0670	0.0067	<.0010	0.0046	22.051	19.368
6	2.98	88.0	0.0672	0.0096	<.0010	0.0053	20.303	22.275
8	3.06	94.9	0.0673	0.0128	<.0010	0.0072	20.245	22.869

GRAMS DISSOLVED

Elapsed Time (Hours)	-----Uranium----->			<-----Iron----->		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0014	0.16	0.16	0.00	0.01	0.01
2	0.0014	0.16	0.16	0.00	0.01	0.01
4	0.0013	0.16	0.16	0.00	0.02	0.02
6	0.0015	0.16	0.16	0.00	0.02	0.02
8	0.0015	0.16	0.16	0.00	0.03	0.03

Copper			Nickel		
Sample	Flask	Total	Sample	Flask	Total
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.01	0.01
0.00	0.00	0.00	0.00	0.01	0.01
0.00	0.00	0.00	0.00	0.01	0.01
0.00	0.00	0.00	0.00	0.02	0.02

Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
1 hr	8.6233	19.0784	10.4551	9.976	
1 hr	8.6819	19.7272	11.0453	10.538	
2 hr	8.6564	20.3804	11.7240	11.185	
2 hr	8.7179	18.9577	10.2398	9.769	
4 hr	8.7330	20.5440	11.8110	11.267	
4 hr	8.7748	17.2672	8.4924	8.101	
6 hr	8.7552	20.5077	11.7525	11.210	Total Removed (g)
6 hr	8.7548	20.3547	11.5999	11.064	
8 hr	8.6947	20.4626	11.7679	11.224	Total Removed (mL)
8 hr	8.5911	20.8003	12.2092	11.644	
					111.10
					105.98

Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
2.0170	0.7675	0.1140	0.1265	3.75
2.0085	0.7680	0.1090	0.1240	3.71
2.0105	0.7660	0.1115	0.1245	3.72

µm Dioxide Added to Flask	10.00		
Filter Plus Deposit	22.5968		
Glass Filter	13.0000	Grams UO2 Lost	0.4032
sit Remaining in Flask	9.5968		

Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.	
1 hr	0.0218	0.0269	0.0051	
2 hr	0.0221	0.0245	0.0024	
4 hr	0.0221	0.0295	0.0074	
6 hr	0.0221	0.0303	0.0082	
8 hr	0.0223	0.0339	0.0116	
				Total on Millipores (g)
				0.0347

DOE Uranium Dioxide Dissolution Testing

Date of test: 2/17/94Solvent composition: DTPA @pH 3.20 (19)
TEMP 200F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in ²)	Calculated General Corrosion (mils)
C1018-19	22.2623	22.1828	0.0795	3.77	0.164
N200-19	24.7386	24.7281	0.0105	3.74	0.022
M400-19	24.0812	24.0676	0.0136	3.73	0.028

Weight Reservoir Plus Solvent Before Transfer	4218		
Weight Reservoir Plus Solvent After Transfer	1556	Initial Density (g/L)	1.0510
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2662		
Volume Solvent Transferred	2533		
Weight Test Flask Plus Solvent After Test	3795		
Tare Weight Test Flask	1277	Final Density (g/L)	1.0510
Weight Solvent Remaining in Flask	2518		
Volume Solvent Remaining in Flask	2396		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	3.20	100.9	0.0000	0.0000	0.0000	0.0000	0	0
1	3.11	100.9	0.0627	0.0027	<.0010	0.0033	22.009	20.941
2	3.10	98.4	0.0631	0.0055	<.0010	0.0036	21.102	20.078
4	3.10	98.4	0.0644	0.0087	<.0010	0.0048	21.349	23.590
6	3.10	98.4	0.0645	0.0134	<.0010	0.0061	24.794	19.555
8	3.24	100.3	0.0653	0.0174	<.0010	0.0075	23.615	23.000

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0013	0.16	0.16	0.00	0.01	0.01
2	0.0013	0.16	0.16	0.00	0.01	0.01
4	0.0015	0.16	0.16	0.00	0.02	0.02
6	0.0013	0.16	0.16	0.00	0.03	0.03
8	0.0015	0.16	0.17	0.00	0.04	0.04

Copper				Nickel		
Elapsed Time (Hours)	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.01	0.01
2	0.00	0.00	0.00	0.00	0.01	0.01
4	0.00	0.00	0.00	0.00	0.01	0.01
6	0.00	0.00	0.00	0.00	0.01	0.02
8	0.00	0.00	0.00	0.00	0.02	0.02

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
21	1 hr	8.7894	19.3981	10.6087	10.094	
22	1 hr	8.6454	20.0454	11.4000	10.847	
23	2 hr	8.6539	19.7459	11.0920	10.554	
24	2 hr	8.7269	18.7372	10.0103	9.525	
25	4 hr	8.6490	19.9875	11.3385	10.788	
26	4 hr	8.6400	22.0951	13.4551	12.802	
27	6 hr	8.6636	18.8230	10.1594	9.666	Total Removed (g) 112.63
28	6 hr	8.6500	19.0426	10.3926	9.888	
29	8 hr	8.6547	20.6490	11.9943	11.412	Total Removed (mL) 107.16
30	8 hr	8.6281	20.8070	12.1789	11.588	

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in ²)
C1018-19	2.0155	0.7695	0.1160	0.1250	3.77
N200-19	2.0115	0.7680	0.1130	0.1240	3.74
M400-19	2.0105	0.7680	0.1125	0.1230	3.73

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	22.4377		
Tare Weight Glass Filter	13.0000	Grams UO ₂ Lost	0.5623
Weight Deposit Remaining in Flask	9.4377		

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.	
61	1 hr	0.0221	0.0269	0.0048	
62	2 hr	0.0220	0.0341	0.0121	
63	4 hr	0.0221	0.0269	0.0048	
64	6 hr	0.0221	0.0281	0.0060	
65	8 hr	0.0220	0.0553	0.0333	
					Total on Millipores (g) 0.0610

DOE Uranium Dioxide Dissolution Testing

Date of test: 2/18/94Solvent composition: DTPA @pH 2.6 (20)
TEMP 200F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in2)	Calculated General Corrosion (mils)
C1018-20	21.7944	21.7276	0.0668	3.73	0.139
N200-20	24.3731	24.3686	0.0045	3.72	0.009
M400-20	23.5176	23.4922	0.0254	3.71	0.053

Weight Reservoir Plus Solvent Before Transfer	4261		
Weight Reservoir Plus Solvent After Transfer	1597	Initial Density (g/L)	1.0650
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2664		
Volume Solvent Transferred	2501		
Weight Test Flask Plus Solvent After Test	3817		
Tare Weight Test Flask	1277	Final Density (g/L)	1.0650
Weight Solvent Remaining in Flask	2540		
Volume Solvent Remaining in Flask	2385		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	2.63	94.4	0.0000	0.0000	0.0000	0.0000	0	0
1	2.62	94.4	0.0691	0.0036	<.0010	0.0035	24.242	22.763
2	2.62	94.4	0.0696	0.0059	<.0010	0.0051	22.546	21.169
4	2.62	94.4	0.0711	0.0145	<.0010	0.0094	23.894	20.458
6	2.62	94.4	0.0732	0.0212	<.0010	0.0148	21.788	18.605
8	2.65	95.0	0.0735	0.0267	<.0010	0.0176	18.277	22.920

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0016	0.17	0.17	0.00	0.01	0.01
2	0.0015	0.17	0.17	0.00	0.01	0.01
4	0.0015	0.17	0.18	0.00	0.04	0.04
6	0.0014	0.18	0.18	0.00	0.05	0.05
8	0.0017	0.18	0.18	0.00	0.06	0.07

Copper			Nickel		
Elased Time<-----			>-----		
(Hours)	Sample	Flask	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.01	0.01
2	0.00	0.00	0.00	0.01	0.01
4	0.00	0.00	0.00	0.02	0.02
6	0.00	0.00	0.00	0.04	0.04
8	0.00	0.00	0.00	0.04	0.04

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
31	1 hr	8.5956	20.4646	11.8690	11.145	
32	1 hr	8.6852	21.0583	12.3731	11.618	
33	2 hr	8.6724	18.9713	10.2989	9.670	
34	2 hr	8.6404	20.8870	12.2466	11.499	
35	4 hr	8.7307	20.3778	11.6471	10.936	
36	4 hr	8.7222	18.8630	10.1408	9.522	
37	6 hr	8.6889	16.8252	8.1363	7.640	Total Removed (g)
38	6 hr	8.7370	20.4145	11.6775	10.965	
39	8 hr	8.6925	21.1146	12.4221	11.664	Total Removed (mL)
40	8 hr	8.6035	20.5909	11.9874	11.256	
						112.80
						105.91

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-20	2.0170	0.7650	0.1130	0.1250	3.73
N200-20	2.0075	0.7670	0.1115	0.1245	3.72
M400-20	2.0115	0.7655	0.1095	0.1240	3.71

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	22.4144		
Tare Weight Glass Filter	13.0000	Grams UO2 Lost	0.5856
Weight Deposit Remaining in Flask	9.4144		

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.	
66	1 hr	0.0224	0.0437	0.0213	
67	2 hr	0.0220	0.0410	0.0190	
68	4 hr	0.0221	0.0445	0.0224	
69	6 hr	0.0221	0.0582	0.0361	
70	8 hr	0.0231	0.0343	0.0112	
					Total on Millipores (g)
					0.1100

DOE Uranium Dioxide Dissolution Testing

Date of test: 2/22/94Solvent composition: EDTA @pH 5.5 (21)

TEMP 200F

NO COUPONS

Coupon # Pre-Weight Post-Weight Weight Loss S.A.(in2) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	4224		
Weight Reservoir Plus Solvent After Transfer	1539	Initial Density (g/L)	1.0490
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2685		
Volume Solvent Transferred	2560		
Weight Test Flask Plus Solvent After Test	3844		
Tare Weight Test Flask	1277	Final Density (g/L)	1.0490
Weight Solvent Remaining in Flask	2567		
Volume Solvent Remaining in Flask	2447		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	5.52	103.9	0.0000	NA	NA	NA	0	0
1	5.29	101.9	0.0905	NA	NA	NA	22.568	21.514
2	5.21	101.9	0.1070	NA	NA	NA	23.883	22.767
4	5.18	101.9	0.1180	NA	NA	NA	24.513	19.709
6	5.24	101.9	0.1230	NA	NA	NA	20.675	22.627
8	5.25	102.9	0.1240	NA	NA	NA	22.192	22.086

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0019	0.23	0.23	0.00	0.00	0.00
2	0.0024	0.27	0.27	0.00	0.00	0.00
4	0.0023	0.29	0.30	0.00	0.00	0.00
6	0.0028	0.30	0.31	0.00	0.00	0.00
8	0.0027	0.30	0.32	0.00	0.00	0.00

Copper				Nickel		
Elapsed Time<	GRAMS DISSOLVED			>		
(Hours)	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
41	1 hr	8.5419	18.6710	10.1291	9.656	
42	1 hr	8.6600	21.0990	12.4390	11.858	
43	2 hr	8.6512	19.4257	10.7745	10.271	
44	2 hr	8.7492	21.8575	13.1083	12.496	
45	4 hr	8.6920	20.0966	11.4046	10.872	
46	4 hr	8.7167	17.9870	9.2703	8.837	
47	6 hr	8.6336	21.5548	12.9212	12.318	Total Removed (g) 114.03
48	6 hr	8.6333	19.4479	10.8146	10.309	
49	8 hr	8.6727	19.8269	11.1542	10.633	Total Removed (mL) 108.70
50	8 hr	8.6607	20.6742	12.0135	11.452	

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00	
Weight Glass Filter Plus Deposit	22.4464	
Tare Weight Glass Filter	13.0000	Grams UO2 Lost 0.5536
Weight Deposit Remaining in Flask	9.4464	

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.	
71	1 hr	0.0231	0.0447	0.0216	
72	2 hr	0.0231	0.0378	0.0147	
73	4 hr	0.0228	0.0451	0.0223	Total on Millipores (g) 0.0827
74	6 hr	0.0230	0.0432	0.0202	
75	8 hr	0.0233	0.0272	0.0039	

DOE Uranium Dioxide Dissolution Testing

Date of test: 2/23/94Solvent composition: DTPA @pH 5.5 (22)

TEMP 200F

NO COUPONS

Coupon # Pre-Weight Post-Weight Weight Loss S.A.(in2) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	4211		
Weight Reservoir Plus Solvent After Transfer	1648	Initial Density (g/L)	1.0440
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2563		
Volume Solvent Transferred	2455		
Weight Test Flask Plus Solvent After Test	3782		
Tare Weight Test Flask	1343	Final Density (g/L)	1.0465
Weight Solvent Remaining in Flask	2439		
Volume Solvent Remaining in Flask	2331		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	5.48	100.6	0.0000	NA	NA	NA	0	0
1	5.46	100.6	0.0806	NA	NA	NA	24.283	23.212
2	5.35	100.6	0.0844	NA	NA	NA	23.324	22.293
4	5.33	100.6	0.0940	NA	NA	NA	22.048	22.577
6	5.34	99.4	0.0938	NA	NA	NA	23.623	20.341
8	5.45	97.5	0.0975	NA	NA	NA	23.153	24.321

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0019	0.20	0.20	0.00	0.00	0.00
2	0.0019	0.20	0.21	0.00	0.00	0.00
4	0.0021	0.22	0.23	0.00	0.00	0.00
6	0.0019	0.22	0.23	0.00	0.00	0.00
8	0.0024	0.23	0.24	0.00	0.00	0.00

Elapsed Time<-----Copper----->				GRAMS DISSOLVED			2/23/94	
(Hours)	Sample	Flask	Total	Sample	Flask	Total		
0	0.00	0.00	0.00	0.00	0.00	0.00		
1	0.00	0.00	0.00	0.00	0.00	0.00		
2	0.00	0.00	0.00	0.00	0.00	0.00		
4	0.00	0.00	0.00	0.00	0.00	0.00		
6	0.00	0.00	0.00	0.00	0.00	0.00		
8	0.00	0.00	0.00	0.00	0.00	0.00		

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.			
51	1 hr	8.5937	19.8455	11.2518	10.756			
52	1 hr	8.7446	21.7755	13.0309	12.456			
53	2 hr	8.7096	20.7470	12.0374	11.506			
54	2 hr	8.7147	20.0010	11.2863	10.787			
55	4 hr	8.5434	19.3047	10.7613	10.285			
56	4 hr	8.5362	21.3975	12.8613	12.292			
57	6 hr	8.7665	19.0584	10.2919	9.836	Total Removed (g)	117.96	
58	6 hr	8.6750	19.6679	10.9929	10.505			
59	8 hr	8.6510	21.3034	12.6524	12.091	Total Removed (mL)	112.74	
60	8 hr	8.6438	21.4423	12.7985	12.230			

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	22.1516		
Tare Weight Glass Filter	13.0000	Grams UO2 Lost	0.8484
Weight Deposit Remaining in Flask	9.1516		

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.				
76	1 hr	0.0233	0.0352	0.0119				
77	2 hr	0.0230	0.0364	0.0134				
78	4 hr	0.0230	0.0361	0.0131				
79	6 hr	0.0231	0.0343	0.0112				
80	8 hr	0.0230	0.0278	0.0048				
					Total on Millipores (g)	0.0544		

DOE Uranium Dioxide Dissolution Testing

Date of test: 2/24/94Solvent composition: HEDTA @pH 5.5 (23)

TEMP 200F

NO COUPONS

Coupon # Pre-Weight Post-Weight Weight Loss S.A.(in2) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	4196		
Weight Reservoir Plus Solvent After Transfer	1650	Initial Density (g/L)	1.0420
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2546		
Volume Solvent Transferred	2443		
Weight Test Flask Plus Solvent After Test	3758		
Tare Weight Test Flask	1343	Final Density (g/L)	1.0415
Weight Solvent Remaining in Flask	2415		
Volume Solvent Remaining in Flask	2319		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	5.50	102.0	0.0000	NA	NA	NA	0	0
1	5.44	96.9	0.0942	NA	NA	NA	22.844	21.933
2	5.49	96.9	0.1020	NA	NA	NA	25.171	24.167
4	5.50	95.9	0.1100	NA	NA	NA	24.965	23.499
6	5.45	95.9	0.1150	NA	NA	NA	24.475	21.007
8	6.06	97.9	0.1270	NA	NA	NA	22.226	23.059

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0021	0.23	0.23	0.00	0.00	0.00
2	0.0025	0.24	0.25	0.00	0.00	0.00
4	0.0026	0.26	0.27	0.00	0.00	0.00
6	0.0024	0.27	0.28	0.00	0.00	0.00
8	0.0029	0.30	0.31	0.00	0.00	0.00

Elapsed Time<-----Copper----->			GRAMS DISSOLVED			2/24/94		
(Hours)	Sample	Flask	Total	Sample	Flask	Total		
0	0.00	0.00	0.00	0.00	0.00	0.00		
1	0.00	0.00	0.00	0.00	0.00	0.00		
2	0.00	0.00	0.00	0.00	0.00	0.00		
4	0.00	0.00	0.00	0.00	0.00	0.00		
6	0.00	0.00	0.00	0.00	0.00	0.00		
8	0.00	0.00	0.00	0.00	0.00	0.00		

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
61	1 hr	8.6259	18.7761	10.1502	9.745		
62	1 hr	8.7436	21.4376	12.6940	12.188		
63	2 hr	8.6753	20.6347	11.9594	11.482		
64	2 hr	8.6480	21.8597	13.2117	12.685		
65	4 hr	8.6521	20.4049	11.7528	11.284		
66	4 hr	8.5966	21.3183	12.7217	12.214		
67	6 hr	8.6050	18.1094	9.5044	9.125	Total Removed (g)	118.39
68	6 hr	8.6335	21.0086	12.3751	11.882		
69	8 hr	8.7053	21.0185	12.3132	11.822	Total Removed (mL)	113.66
70	8 hr	8.6618	20.3643	11.7025	11.236		

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	21.5932		
Tare Weight Glass Filter	13.0000	Grams UO2 Lost	1.4068
Weight Deposit Remaining in Flask	8.5932		

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.		
81	1 hr	0.0232	0.0279	0.0047		
82	2 hr	0.0231	0.0387	0.0156		
83	4 hr	0.0231	0.0318	0.0087	Total on Millipores (g)	0.0470
84	6 hr	0.0232	0.0360	0.0128		
85	8 hr	0.0219	0.0271	0.0052		

DOE Uranium Dioxide Dissolution Testing

Date of test: 2/25/94Solvent composition: HEDTA @pH 2.0 (24)

TEMP 200F

NO COUPONS

Coupon # Pre-Weight Post-Weight Weight Loss S.A.(in2) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	4244		
Weight Reservoir Plus Solvent After Transfer	1638	Initial Density (g/L)	1.0500
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2606		
Volume Solvent Transferred	2482		
Weight Test Flask Plus Solvent After Test	3783		
Tare Weight Test Flask	1343	Final Density (g/L)	1.0505
Weight Solvent Remaining in Flask	2440		
Volume Solvent Remaining in Flask	2323		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	2.00	100.0	0.0000	NA	NA	NA	0	0
1	2.12	94.9	0.0937	NA	NA	NA	21.179	20.162
2	2.24	94.9	0.0995	NA	NA	NA	23.572	22.440
4	2.42	92.6	0.1070	NA	NA	NA	24.489	23.437
6	2.44	92.8	0.1090	NA	NA	NA	24.620	23.919
8	2.16	95.8	0.1110	NA	NA	NA	24.300	23.426

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0019	0.23	0.23	0.00	0.00	0.00
2	0.0022	0.24	0.25	0.00	0.00	0.00
4	0.0025	0.26	0.27	0.00	0.00	0.00
6	0.0026	0.26	0.27	0.00	0.00	0.00
8	0.0026	0.26	0.27	0.00	0.00	0.00

Copper				Nickel		
Elapsed Time<	Sample	Flask	Total	Sample	Flask	Total
(Hours)						
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
71	1 hr	8.6153	19.5010	10.8857	10.363	
72	1 hr	8.5980	18.8915	10.2935	9.799	
73	2 hr	8.7055	19.7419	11.0364	10.506	
74	2 hr	8.7065	21.2420	12.5355	11.933	
75	4 hr	8.5842	20.5372	11.9530	11.379	
76	4 hr	8.6973	21.3645	12.6672	12.059	
77	6 hr	8.5789	20.2120	11.6331	11.074	Total Removed (g) 119.11
78	6 hr	8.6231	22.1169	13.4938	12.845	
79	8 hr	8.6802	20.9129	12.2327	11.645	Total Removed (mL) 113.38
80	8 hr	8.6513	21.0271	12.3758	11.781	

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	22.6935		
Tare Weight Glass Filter	13.0000	Grams UO2 Lost	0.3065
Weight Deposit Remaining in Flask	9.6935		

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.	
86	1 hr	0.0222	0.0285	0.0063	
87	2 hr	0.0220	0.0295	0.0075	
88	4 hr	0.0222	0.0294	0.0072	
89	6 hr	0.0221	0.0301	0.0080	
90	8 hr	0.0222	0.0257	0.0035	
					Total on Millipores (g) 0.0325

DOE Uranium Dioxide Dissolution Testing

Date of test: 2/28/94Solvent composition: 15% DTPA @pH 5.5 (25)
TEMP 200F
NO COUPONSCoupon # Pre-Weight Post-Weight Weight Loss S.A.(in²) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	4252		
Weight Reservoir Plus Solvent After Transfer	1526	Initial Density (g/L)	1.0655
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2726		
Volume Solvent Transferred	2558		
Weight Test Flask Plus Solvent After Test	3855		
Tare Weight Test Flask	1277	Final Density (g/L)	1.0660
Weight Solvent Remaining in Flask	2578		
Volume Solvent Remaining in Flask	2418		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	5.48	146.3	0.0000	NA	NA	NA	0	0
1	5.18	146.3	0.0795	NA	NA	NA	27.709	26.004
2	5.27	142.5	0.0798	NA	NA	NA	25.906	24.309
4	5.25	142.5	0.0845	NA	NA	NA	24.789	23.253
6	5.28	142.5	0.0847	NA	NA	NA	24.783	24.100
8	5.36	141.1	0.0858	NA	NA	NA	24.045	23.770

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0021	0.20	0.20	0.00	0.00	0.00
2	0.0019	0.20	0.20	0.00	0.00	0.00
4	0.0020	0.21	0.22	0.00	0.00	0.00
6	0.0020	0.21	0.22	0.00	0.00	0.00
8	0.0020	0.21	0.22	0.00	0.00	0.00

DOE Uranium Dioxide Dissolution Testing

Date of test: 3/01/94Solvent composition: 15% DTPA + 0.2 ABF @pH 5.5 (26)

TEMP 200F

NO COUPONS

Coupon # Pre-Weight Post-Weight Weight Loss S.A.(in2) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	4196		
Weight Reservoir Plus Solvent After Transfer	1565	Initial Density (g/L)	1.0665
Tare Weight Reservoir Flask	1277		
Weight Solvent Transferred	2631		
Volume Solvent Transferred	2467		
Weight Test Flask Plus Solvent After Test	3741		
Tare Weight Test Flask	1327	Final Density (g/L)	1.0675
Weight Solvent Remaining in Flask	2414		
Volume Solvent Remaining in Flask	2261		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	5.49	147.7	0.0000	NA	NA	NA	0	0
1	5.54	146.4	0.2300	NA	NA	NA	24.438	22.902
2	5.51	141.3	0.2980	NA	NA	NA	27.705	25.961
4	5.51	141.3	0.4750	NA	NA	NA	26.927	25.496
6	5.53	142.6	0.7600	NA	NA	NA	27.212	22.456
8	5.89	146.3	0.9970	NA	NA	NA	24.801	24.251

GRAMS DISSOLVED

Elapsed Time (Hours)	-----Uranium-----			-----Iron-----		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0053	0.56	0.57	0.00	0.00	0.00
2	0.0077	0.72	0.73	0.00	0.00	0.00
4	0.0121	1.14	1.16	0.00	0.00	0.00
6	0.0171	1.80	1.84	0.00	0.00	0.00
8	0.0242	2.34	2.41	0.00	0.00	0.00

Copper				GRAMS DISSOLVED			Nickel			3/1/94
Elapsed Time<	Sample	Flask	Total	>	Sample	Flask	Total	>		
(Hours)										
0	0.00	0.00	0.00		0.00	0.00	0.00			
1	0.00	0.00	0.00		0.00	0.00	0.00			
2	0.00	0.00	0.00		0.00	0.00	0.00			
4	0.00	0.00	0.00		0.00	0.00	0.00			
6	0.00	0.00	0.00		0.00	0.00	0.00			
8	0.00	0.00	0.00		0.00	0.00	0.00			

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
11	1 hr	8.7670	19.7551	10.9881	10.298		
12	1 hr	8.6461	22.0962	13.4501	12.604		
13	2 hr	8.7141	22.7928	14.0787	13.193		
14	2 hr	8.6498	22.2761	13.6263	12.768		
15	4 hr	8.7567	22.0571	13.3004	12.462		
16	4 hr	8.6965	22.6077	13.9112	13.034		
17	6 hr	8.6952	19.5845	10.8893	10.202	Total Removed (g)	129.21
18	6 hr	8.6539	21.7336	13.0797	12.254		
19	8 hr	8.6251	21.4746	12.8495	12.038	Total Removed (mL)	121.07
20	8 hr	8.7603	21.7982	13.0379	12.213		

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in ²)
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Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	20.1084		
Tare Weight Glass Filter	13.0000	Grams UO ₂ Lost	2.8916
Weight Deposit Remaining in Flask	7.1084		

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.		
6	1 hr	0.0231	0.0356	0.0125		
7	2 hr	0.0231	0.0381	0.0150		
8	4 hr	0.0230	0.0417	0.0187	Total on Millipores (g)	0.0750
9	6 hr	0.0230	0.0337	0.0107		
10	8 hr	0.0231	0.0412	0.0181		

DOE Uranium Dioxide Dissolution Testing

Date of test: 3/02/94Solvent composition: 10% DTPA + 3%AMMONIUM CARBONATE + 3% PEROXIDE (27)
ROOM TEMP
NO COUPONS

Coupon # Pre-Weight Post-Weight Weight Loss S.A.(in2) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	4381		
Weight Reservoir Plus Solvent After Transfer	1475	Initial Density (g/L)	1.0680
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2906		
Volume Solvent Transferred	2721		
Weight Test Flask Plus Solvent After Test	3888		
Tare Weight Test Flask	1327	Final Density (g/L)	1.0750
Weight Solvent Remaining in Flask	2561		
Volume Solvent Remaining in Flask	2382		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.00	110.8	0.0000	NA	NA	NA	0	0
1	8.43	38.2	3.4700	NA	NA	NA	25.323	23.583
2	8.43	12.7	3.4920	NA	NA	NA	26.461	24.630
4	8.41	6.4	3.5420	NA	NA	NA	26.075	23.933

GRAMS DISSOLVED

Elapsed Time (Hours)	-----Uranium----->			<-----Iron----->		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0818	9.36	9.44	0.00	0.00	0.00
2	0.0860	9.33	9.50	0.00	0.00	0.00
4	0.0848	9.38	9.63	0.00	0.00	0.00

Copper				Nickel		
Copper				Nickel		
Elapsed Time (Hours)	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
21	1 hr	8.7287	22.2962	13.5675	12.646	
22	1 hr	8.7647	20.5201	11.7554	10.954	
23	2 hr	8.5693	21.4309	12.8616	11.982	
24	2 hr	8.6438	22.2432	13.5994	12.667	
25	4 hr	8.6839	21.1596	12.4757	11.618	
26	4 hr	8.6473	21.8968	13.2495	12.336	
27	6 hr					Total Removed (g) 77.51
28	6 hr					
29	8 hr					Total Removed (mL) 72.20
30	8hr					

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00	
Weight Glass Filter Plus Deposit	13.0286	
Tare Weight Glass Filter	13.0000	Grams UO2 Lost 9.9714
Weight Deposit Remaining in Flask	0.0286	

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.	
11	1 hr	0.0230	0.0257	0.0027	
12	2 hr	0.0230	0.0236	0.0006	
13	4 hr	0.0230	0.0245	0.0015	Total on Millipores (g) 0.0048
14	6 hr				
15	8 hr				

DOE Uranium Dioxide Dissolution Testing

Date of test: 03/03/94

Solvent composition: 10% DTPA, 1.5% Ammonium Carbonate,
1.5% peroxide, pH 9.0 (28)
NO COUPONS / ROOM TEMP

Coupon # Pre-Weight Post-Weight Weight Loss S.A.(in2) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer

Weight Reservoir Plus Solvent After Transfer

Tare Weight Reservoir Flask

Weight Solvent Transferred

Volume Solvent Transferred 2500

Initial Density (g/L)

1.0645

Weight Test Flask Plus Solvent After Test

Tare Weight Test Flask 1277

Weight Solvent Remaining in Flask 2462

Volume Solvent Remaining in Flask 2300

Final Density (g/L)

1.0705

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	8.99	102.8	0.000	NA	NA	NA	0	0
1	8.56	81.3	3.612	NA	NA	NA	21.4385	20.027
2	8.52	68.8	3.682	NA	NA	NA	23.5355	21.986
4	8.53	50.0	3.819	NA	NA	NA	37.7376	35.252

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0723	8.96	9.03	0.00	0.00	0.00
2	0.0810	9.05	9.20	0.00	0.00	0.00
4	0.1346	9.25	9.54	0.00	0.00	0.00

Copper				Nickel			
Elapsed Time<	Sample	Flask	Total	Sample	Flask	Total	>
(Hours)							
0	0.00	0.00	0.00	0.00	0.00	0.00	
1	0.00	0.00	0.00	0.00	0.00	0.00	
2	0.00	0.00	0.00	0.00	0.00	0.00	
4	0.00	0.00	0.00	0.00	0.00	0.00	

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
28	1 hr	8.6774	19.1909	10.5135	9.821		
29	1 hr	8.7097	19.6347	10.9250	10.206		
30	2 hr	8.6302	20.1337	11.5035	10.746		
31	2 hr	8.7617	20.7937	12.0320	11.240		
32	4 hr	8.6166	21.2048	12.5882	11.759		
33	4 hr	8.6318	21.6429	13.0111	12.154		
34	4 hr	8.7465	20.8848	12.1383	11.339	Total Removed (g)	82.71
						Total Removed (mL)	77.26

Coupon #	Length (in)	Width (in)	Height (in)	Hole D (in)	S.A. (in ²)
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Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	13.0141		
Tare Weight Glass Filter	13.0000	Grams UO ₂ Lost	9.9859
Weight Deposit Remaining in Flask	0.0141		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.		
1	1 hr	0.0230	0.0252	0.0022		
2	2 hr	0.0237	0.0248	0.0011		
4	4 hr	0.0237	0.0252	0.0015	Total on Millipores (g)	0.0048

DOE Uranium Dioxide Dissolution Testing

Date of test: 03/04/94

Solvent composition: 10% DTPA,
1.5% peroxide, pH 9.0 (29)
NO COUPONS / ROOM TEMP

Coupon # Pre-Weight Post-Weight Weight Loss S.A.(in2) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	4140		
Weight Reservoir Plus Solvent After Transfer		Initial Density (g/L)	1.0495
Tare Weight Reservoir Flask	1554		
Weight Solvent Transferred	2586		
Volume Solvent Transferred	2464		
Weight Test Flask Plus Solvent After Test	3730		
Tare Weight Test Flask	1277	Final Density (g/L)	1.0520
Weight Solvent Remaining in Flask	2453		
Volume Solvent Remaining in Flask	2332		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.00	92.9	0.000	NA	NA	NA	0	0
1	8.95	85.4	0.531	NA	NA	NA	24.572	23.358
2	8.86	76.8	0.555	NA	NA	NA	37.165	22.863
4	8.74	71.8	0.562	NA	NA	NA	38.088	36.404
6	8.66	64.4	0.596	NA	NA	NA	37.171	36.205
8								

GRAMS DISSOLVED

Elapsed Time (Hours)	-----Uranium-----			-----Iron-----		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0124	1.30	1.31	0.00	0.00	0.00
2	0.0127	1.34	1.37	0.00	0.00	0.00
4	0.0205	1.34	1.38	0.00	0.00	0.00
6	0.0216	1.40	1.46	0.00	0.00	0.00

Copper				Nickel		
GRAMS DISSOLVED				3/4/94		
Elapsed Time<-----	Sample	Flask	Total	Sample	Flask	Total
(Hours)						
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
35	1 hr	8.5661	20.7264	12.1603	11.559	
36	1 hr	8.6482	21.0602	12.4120	11.798	
37	2 hr	8.5647	20.4950	11.9303	11.341	
38	2 hr	8.6411	20.7625	12.1214	11.522	
39	2 hr	8.7161	21.8289	13.1128	12.465	
40	4 hr	8.5691	21.6683	13.0992	12.452	
41	4 hr	8.652	20.7370	12.0850	11.488	Total Removed (g)
42	4 hr	8.7342	21.6377	12.9035	12.266	
43	6 hr	8.6061	20.5544	11.9483	11.358	Total Removed (mL)
44	6 hr	8.682	22.3582	13.6762	13.000	
45	6 hr	8.6762	20.2231	11.5469	10.976	
Coupon #	Length (in)	Width (in)	Height (in)	Hole D (in)	S.A. (in2)	

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	21.3349		
Tare Weight Glass Filter	13.0000	Grams UO2 Lost	1.6651
Weight Deposit Remaining in Flask	8.3349		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.	
1	1 hr	0.0231	0.0245	0.0014	
2	2 hr	0.0250	0.0258	0.0008	
3	4 hr	0.0240	0.0249	0.0009	
4	6 hr	0.0233	0.0260	0.0027	
					Total on Millipores (g)
					0.0058

DOE Uranium Dioxide Dissolution Testing

Date of test: 3/07/94

Solvent composition:

10% EDTA + 1.5% AMMONIUM CARBONATE + 1.5% PEROXIDE (30)

ROOM TEMP

NO COUPONS

Coupon # Pre-Weight Post-Weight Weight Loss S.A.(in²) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	4185		
Weight Reservoir Plus Solvent After Transfer	1571	Initial Density (g/L)	1.0550
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2614		
Volume Solvent Transferred	2478		
Weight Test Flask Plus Solvent After Test	3809		
Tare Weight Test Flask	1277	Final Density (g/L)	1.0535
Weight Solvent Remaining in Flask	2532		
Volume Solvent Remaining in Flask	2403		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.07	100.0	0.0000	NA	NA	NA	0	0
1	8.94	95.2	2.9550	NA	NA	NA	24.536	24.905
2	8.84	87.5	2.9760	NA	NA	NA	25.912	26.381
4	8.91	81.7	2.9900	NA	NA	NA	26.287	24.311

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0736	7.25	7.32	0.00	0.00	0.00
2	0.0785	7.22	7.37	0.00	0.00	0.00
4	0.0727	7.18	7.41	0.00	0.00	0.00

Copper				Nickel		
GRAMS DISSOLVED				3/7/94		
Elapsed Time (Hours)	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
46	1 hr	8.6943	19.4755	10.7812	10.934	
47	1 hr	8.5374	22.2917	13.7543	13.971	
48	2 hr	8.6472	21.4047	12.7575	12.978	
49	2 hr	8.7979	21.9528	13.1549	13.403	
50	4 hr	8.6273	21.7589	13.1316	13.400	
51	4 hr	8.6694	19.3466	10.6772	10.912	
1	6 hr					Total Removed (g) 74.26
1	6 hr					
1	8 hr					Total Removed (mL) 75.60
1	8hr					

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00	
Weight Glass Filter Plus Deposit	13.1675	
Tare Weight Glass Filter	13.0000	Grams UO2 Lost 9.8325
Weight Deposit Remaining in Flask	0.1675	

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.	
21	1 hr	0.0230	0.0256	0.0026	
22	2 hr	0.0230	0.0256	0.0026	
23	4 hr	0.0230	0.0247	0.0017	Total on Millipores (g) 0.0069

DOE Uranium Dioxide Dissolution Testing

Date of test: 3/08/94Solvent composition: 10% HEDTA + 1.5% AMMONIUM CARBONATE + 1.5% PEROXIDE (31)
ROOM TEMP
NO COUPONS

Coupon # Pre-Weight Post-Weight Weight Loss S.A.(in2) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer 4290
 Weight Reservoir Plus Solvent After Transfer 1673
 Tare Weight Reservoir Flask 1277
 Weight Solvent Transferred 2617
 Volume Solvent Transferred 2491

Initial Density (g/L) 1.0505

Weight Test Flask Plus Solvent After Test 3824
 Tare Weight Test Flask 1277
 Weight Solvent Remaining in Flask 2547
 Volume Solvent Remaining in Flask 2421

Final Density (g/L) 1.0520

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.15	89.0	0.0000	NA	NA	NA	0	0
1	8.89	52.0	3.4530	NA	NA	NA	27.691	26.328
2	8.90	46.0	3.5780	NA	NA	NA	25.158	23.918
4	8.83	43.0	3.5960	NA	NA	NA	25.040	23.013

CHELANT 100G/L BEFORE PEROXIDE ADDITON

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0909	8.51	8.60	0.00	0.00	0.00
2	0.0856	8.73	8.91	0.00	0.00	0.00
4	0.0828	8.69	8.95	0.00	0.00	0.00

Copper				GRAMS DISSOLVED			3/8/94
Elapsed Time<	Sample	Flask	Total	Sample	Flask	Total	>
(Hours)							
0	0.00	0.00	0.00	0.00	0.00	0.00	
1	0.00	0.00	0.00	0.00	0.00	0.00	
2	0.00	0.00	0.00	0.00	0.00	0.00	
4	0.00	0.00	0.00	0.00	0.00	0.00	

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
52	1 hr	8.6300	22.7115	14.0815	13.388		
53	1 hr	8.7047	22.3145	13.6098	12.939		
54	2 hr	8.6642	19.9757	11.3115	10.754		
55	2 hr	8.7277	22.5744	13.8467	13.164		
56	4 hr	8.8080	20.0009	11.1929	10.641		
57	4 hr	8.6082	21.6222	13.0140	12.372		
58	6 hr					Total Removed (g)	77.06
59	6 hr						
60	8 hr					Total Removed (mL)	73.26
61	8 hr						

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	13.0200		
Tare Weight Glass Filter	13.0000	Grams UO2 Lost	9.9800
Weight Deposit Remaining in Flask	0.0200		

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.		
24	1 hr	0.0230	0.0251	0.0021		
25	2 hr	0.0230	0.0247	0.0017		
26	4 hr	0.0232	0.0236	0.0004	Total on Millipores (g)	0.0042

DOE Uranium Dioxide Dissolution Testing

Date of test: 3/09/94Solvent composition: 10% EDTA + 1.5%AMMONIUM CARBONATE + 1.5% PEROXIDE (32)
ROOM TEMP
NO COUPONS

Coupon # Pre-Weight Post-Weight Weight Loss S.A.(in2) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	4192		
Weight Reservoir Plus Solvent After Transfer	1567	Initial Density (g/L)	1.0550
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2625		
Volume Solvent Transferred	2488		
Weight Test Flask Plus Solvent After Test	3797		
Tare Weight Test Flask	1277	Final Density (g/L)	1.0605
Weight Solvent Remaining in Flask	2520		
Volume Solvent Remaining in Flask	2376		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.07	101.9	0.0000	NA	NA	NA	0	0
1	8.50	84.8	3.5340	NA	NA	NA	24.534	23.143
2	8.42	69.5	3.5450	NA	NA	NA	25.472	24.024
4	8.34	57.1	3.5660	NA	NA	NA	25.914	24.161

EDTA 105.8 BEFORE PEROXIDE ADDITON

GRAMS DISSOLVED

Elapsed Time (Hours)	-----Uranium----->			<-----Iron----->		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0818	8.71	8.79	0.00	0.00	0.00
2	0.0852	8.65	8.82	0.00	0.00	0.00
4	0.0862	8.62	8.87	0.00	0.00	0.00

Elapsed Time (Hours)	Copper			Nickel		
	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
58	1 hr	8.6524	20.6645	12.0121	11.331	
59	1 hr	8.6776	21.1997	12.5221	11.812	
60	2 hr	8.6522	21.2538	12.6016	11.886	
61	2 hr	8.6087	21.4791	12.8704	12.138	
62	2hr	8.6997	21.2628	12.5631	11.847	
63	4 hr	8.6640	21.7073	13.0433	12.299	
64	4 hr	8.7802	21.9344	13.1542	12.403	
63	4 hr	8.6510	21.2300	12.5790	11.861	
Total Removed (g)						101.35
Total Removed (mL)						95.58

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00	
Weight Glass Filter Plus Deposit	13.0325	
Tare Weight Glass Filter	13.0000	Grams UO2 Lost
Weight Deposit Remaining in Flask	0.0325	9.9675

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.	
27	1 hr	0.0233	0.0249	0.0016	
28	2 hr	0.0231	0.0251	0.0020	
29	4 hr	0.0232	0.0247	0.0015	
Total on Millipores (g)					0.0051

DOE Uranium Dioxide Dissolution Testing

Date of test: 03/10/94

Solvent composition: No EDTA, 1.5% Ammonium Carbonate,
1.5% peroxide, pH 9.0 (33)
ROOM TEMP. / NO COUPONS

Coupon # Pre-Weight Post-Weight Weight Loss S.A.(in2) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	3949		
Weight Reservoir Plus Solvent After Transfer	1384	Initial Density (g/L)	1.0150
Tare Weight Reservoir Flask	-		
Weight Solvent Transferred	2565		
Volume Solvent Transferred	2527		
Weight Test Flask Plus Solvent After Test	3739		
Tare Weight Test Flask	1277	Final Density (g/L)	1.0165
Weight Solvent Remaining in Flask	2462		
Volume Solvent Remaining in Flask	2422		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.00	NA	0.000	NA	NA	NA	0	0
1	8.90	NA	3.050	NA	NA	NA	24.041	23.651
2	8.90	NA	3.294	NA	NA	NA	25.111	35.637
4	8.80	NA	3.327	NA	NA	NA	23.717	12.397
6								
8								

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0721	7.64	7.71	0.00	0.00	0.00
2	0.1174	8.13	8.32	0.00	0.00	0.00
4	0.0412	8.17	8.40	0.00	0.00	0.00

Elapsed Time< (Hours)	Copper<-----			GRAMS DISSOLVED			Nickel<-----		3/10/94
	Sample	Flask	Total	Sample	Flask	Total	Sample	Flask	
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
66	1 hr	8.7849	21.7333	12.9484	12.738		
67	1 hr	8.7637	19.8564	11.0927	10.913		
68	2 hr	8.7859	20.6118	11.8259	11.634		
69	2 hr	8.6953	21.9801	13.2848	13.069		
70	4 hr	8.7049	19.8197	11.1148	10.934		
71	4 hr	8.7557	21.3574	12.6017	12.397		
						Total Removed (g)	72.87
						Total Removed (mL)	71.69

Coupon #	Length (in)	Width (in)	Height (in)	Hole D (in)	S.A. (in ²)
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Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	13.0060		
Tare Weight Glass Filter	13.0000	Grams UO ₂ Lost	9.9940
Weight Deposit Remaining in Flask	0.0060		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.		
29	1 hr	0.0232	0.0237	0.0005		
30	2 hr	0.0231	0.0232	0.0001		
31	4 hr	0.0229	0.0233	0.0004	Total on Millipores (g)	0.001

DOE Uranium Dioxide Dissolution Testing

Date of test: 3/11/94Solvent composition: 10% EDTA + 1.5% AMMONIUM CARBONATE, AIR SAT. @pH 9.0 (34)
SMALL PEROXIDE ADDITONS (20mL)
NO COUPONS, ROOM TEMPCoupon # Pre-Weight Post-Weight Weight Loss S.A.(in²) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	3902		
Weight Reservoir Plus Solvent After Transfer	1330	Initial Density (g/L)	1.0510
Tare Weight Reservoir Flask	942		
Weight Solvent Transferred	2572		
Volume Solvent Transferred	2447		
Weight Test Flask Plus Solvent After Test	3754		
Tare Weight Test Flask	1277	Final Density (g/L)	1.0550
Weight Solvent Remaining in Flask	2477		
Volume Solvent Remaining in Flask	2348		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	8.85	100.0	0.0000	NA	NA	NA	0	0
1	8.85	100.0	0.0784	NA	NA	NA	25.004	23.716
2	8.85	100.0	0.0814	NA	NA	NA	26.051	24.708
3	8.84	99.0	1.6500	NA	NA	NA	23.703	22.480
4	8.82	99.0	2.9450	NA	NA	NA	21.144	20.050
5	8.81	96.1	3.2800	NA	NA	NA	21.061	19.969
6	8.70	93.2	3.3380	NA	NA	NA	21.866	23.450

PEROXIDE ADDITION AFTER 2,4 & 5 HR.

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0019	0.19	0.19	0.00	0.00	0.00
2	0.0020	0.20	0.20	0.00	0.00	0.00
3	0.0371	3.92	3.96	0.00	0.00	0.00
4	0.0590	6.94	7.04	0.00	0.00	0.00
5	0.0655	7.66	7.83	0.00	0.00	0.00
6	0.0783	7.72	7.96	0.00	0.00	0.00

Elapsed Time<-----Copper----->				GRAMS DISSOLVED<-----Nickel----->				3/11/94
(Hours)	Sample	Flask	Total	Sample	Flask	Total		
0	0.00	0.00	0.00	0.00	0.00	0.00		
1	0.00	0.00	0.00	0.00	0.00	0.00		
2	0.00	0.00	0.00	0.00	0.00	0.00		
3	0.00	0.00	0.00	0.00	0.00	0.00		
4	0.00	0.00	0.00	0.00	0.00	0.00		
5	0.00	0.00	0.00	0.00	0.00	0.00		
6	0.00	0.00	0.00	0.00	0.00	0.00		
Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.			
72	1 hr	8.7328	19.9878	11.2550	10.676			
73	1 hr	8.6744	22.4231	13.7487	13.040			
74	2 hr	8.6738	22.0184	13.3446	12.657			
75	2 hr	8.7461	21.4528	12.7067	12.051			
76	2hr	8.6230	19.6194	10.9964	10.429			
77	3hr	8.7231	21.7793	13.0562	12.381			
78	3hr	8.7234	19.3352	10.6118	10.063			
79	3hr	8.6631	21.8215	13.1584	12.477			
80	4 hr	8.7286	18.8757	10.1471	9.621			
81	4 hr	8.7958	19.7093	10.9135	10.348			
82	4 hr	8.5528	20.2716	11.7188	11.111			
83	5hr	8.7490	22.0703	13.3213	12.630			
84	5hr	8.7042	22.3064	13.6022	12.895			
85	5hr	8.7746	22.3480	13.5734	12.867			
86	6 hr	8.7470	19.5128	10.7658	10.205	Total Removed (g)		207.72
87	6 hr	8.6690	22.6416	13.9726	13.245			
88	6hr	8.6877	19.5128	10.8251	10.261	Total Removed (mL)		196.96

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	12.0335		
Tare Weight Glass Filter	12.0000	Grams UO2 Lost	9.9665
Weight Deposit Remaining in Flask	0.0335		

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.
33	1 hr	0.0232	0.0389	0.0157
34	2 hr	0.0233	0.0375	0.0142
35	3hr	0.0232	0.0307	0.0075
36	4hr	0.0232	0.0253	0.0021
37	5hr	0.0232	0.0286	0.0054
38	6hr	0.0231	0.0257	0.0026

3/11/94

Total on Millipores (g) 0.0449

3/11/94

DOE Uranium Dioxide Dissolution Testing

Date of test: 3/14/94

Solvent composition:

10% EDTA + 1.5%AMMONIUM CARBONATE + AIR SPAR @pH 9.0 (35)

ROOM TEMP

NO COUPONS

Coupon # Pre-Weight Post-Weight Weight Loss S.A.(in2) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer 4159
 Weight Reservoir Plus Solvent After Transfer 1592
 Tare Weight Reservoir Flask 1327
 Weight Solvent Transferred 2567
 Volume Solvent Transferred 2445

Initial Density (g/L) 1.0500

Weight Test Flask Plus Solvent After Test 3662
 Tare Weight Test Flask 1277
 Weight Solvent Remaining in Flask 2385
 Volume Solvent Remaining in Flask 2271

Final Density (g/L) 1.0500

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.01	100.9	0.0000	0.0000	0.0000	0.0000	0	0
1	8.86	100.9	0.0734	0.0000	0.0000	0.0000	25.270	24.067
2	8.87	100.9	0.0815	0.0000	0.0000	0.0000	25.579	24.361
4	8.86	100.9	0.0971	0.0000	0.0000	0.0000	27.016	25.729
6	8.86	100.9	0.1120	0.0000	0.0000	0.0000	24.066	21.096
8	8.88	100.9	0.1250	0.0000	0.0000	0.0000	21.549	24.425

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0018	0.18	0.18	0.00	0.00	0.00
2	0.0020	0.20	0.20	0.00	0.00	0.00
4	0.0025	0.23	0.24	0.00	0.00	0.00
6	0.0024	0.26	0.27	0.00	0.00	0.00
8	0.0031	0.29	0.30	0.00	0.00	0.00

Elapsed Time<-----Copper----->				GRAMS DISSOLVED			3/14/94
(Hours)	Sample	Flask	Total	Sample	Flask	Total	
0	0.00	0.00	0.00	0.00	0.00	0.00	
1	0.00	0.00	0.00	0.00	0.00	0.00	
2	0.00	0.00	0.00	0.00	0.00	0.00	
4	0.00	0.00	0.00	0.00	0.00	0.00	
6	0.00	0.00	0.00	0.00	0.00	0.00	
8	0.00	0.00	0.00	0.00	0.00	0.00	

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
89	1 hr	8.7530	20.1240	11.3710	10.830	
90	1 hr	8.7089	22.6080	13.8991	13.237	
91	2 hr	8.7354	20.6250	11.8896	11.323	
92	2 hr	8.7167	22.3860	13.6693	13.018	
93	4 hr	8.6257	21.9723	13.3466	12.711	
94	4 hr	8.6897	19.4093	10.7196	10.209	
95	6 hr	8.6910	19.5206	10.8296	10.314	Total Removed (g) 122.69
96	6 hr	8.6568	19.9777	11.3209	10.782	
97	8 hr	8.7248	21.8759	13.1511	12.525	Total Removed (mL) 116.85
98	8hr	8.7932	21.2881	12.4949	11.900	

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00	
Weight Glass Filter Plus Deposit	22.3000	
Tare Weight Glass Filter	13.0000	Grams UO2 Lost 0.7000
Weight Deposit Remaining in Flask	9.3000	

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.	
39	1 hr	0.0232	0.0282	0.0050	
40	2 hr	0.0230	0.0274	0.0044	
41	4 hr	0.0231	0.0287	0.0056	Total on Millipores (g) 0.0319
42	6 hr	0.0232	0.0344	0.0112	
43	8 hr	0.0233	0.0290	0.0057	

DOE Uranium Dioxide Dissolution Testing

Date of test: 03/15/94

Solvent composition: 10% EDTA, 1.5% Ammonium Carbonate,
O2 Sparge, pH 9.0 (36)
ROOM TEMP / NO COUPONS

Coupon # Pre-Weight Post-Weight Weight Loss S.A.(in²) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	4173		
Weight Reservoir Plus Solvent After Transfer	1614	Initial Density (g/L)	1.0515
Tare Weight Reservoir Flask			
Weight Solvent Transferred	2559		
Volume Solvent Transferred	2434		
Weight Test Flask Plus Solvent After Test	3716		
Tare Weight Test Flask	1277	Final Density (g/L)	1.0495
Weight Solvent Remaining in Flask	2439		
Volume Solvent Remaining in Flask	2324		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.10	100.9	0.0000	NA	NA	NA	0	0
1	8.66	100.9	0.1170	NA	NA	NA	23.757	22.636
2	8.70	100.9	0.1260	NA	NA	NA	24.314	23.167
4	8.75	100.9	0.1490	NA	NA	NA	24.596	23.436
6	8.84	100.9	0.1630	NA	NA	NA	24.497	23.341
8	8.90	100.0	0.1630	NA	NA	NA	22.772	21.698

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GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0026	0.28	0.28	0.00	0.00	0.00
2	0.0029	0.30	0.31	0.00	0.00	0.00
4	0.0035	0.35	0.36	0.00	0.00	0.00
6	0.0038	0.38	0.39	0.00	0.00	0.00
8	0.0035	0.38	0.39	0.00	0.00	0.00

Copper				Nickel		
Elapsed Time<-----	GRAMS DISSOLVED			3/15/94		
(Hours)	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
99	1 hr	8.6651	21.5828	12.9177	12.308	
100	1 hr	8.6934	19.5327	10.8393	10.328	
1	2 hr	8.6798	18.7333	10.0535	9.579	
2	2 hr	8.6333	22.8934	14.2601	13.588	
3	4 hr	8.7288	19.3518	10.6230	10.122	
4	4 hr	8.6183	22.5911	13.9728	13.314	
5	6 hr	8.6512	19.2060	10.5548	10.057	Total Removed (g)
6	6 hr	8.6476	22.5897	13.9421	13.285	97.16
7	8 hr	8.6645	18.2394	9.5749	9.123	Total Removed (mL)
8	8 hr	8.7432	21.9405	13.1973	12.575	114.28

Coupon #	Length (in)	Width (in)	Height (in)	Hole D (in)	S.A. (in ²)
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Grams Uranium Dioxide Added to Flask	10.00	
Weight Glass Filter Plus Deposit	21.2216	
Tare Weight Glass Filter	13.0000	Grams UO ₂ Lost
Weight Deposit Remaining in Flask	8.2216	1.7784

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.	
1	1 hr	0.0231	0.0366	0.0135	
2	2 hr	0.0232	0.0408	0.0176	
3	4 hr	0.0232	0.0374	0.0142	
4	6 hr	0.0232	0.0385	0.0153	
5	8 hr	0.0233	0.0341	0.0108	
					Total on Millipores (g)
					0.0714

DOE Uranium Dioxide Dissolution Testing

Date of test: 3/16/94Solvent composition: 10% EDTA + 1.5%AMMONIUM CARBONATE + OXYGEN SPARGE
WITH HEAT 90F @pH 9.0 (37)
NO COUPONS

Coupon # Pre-Weight Post-Weight Weight Loss S.A.(in2) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	4171		
Weight Reservoir Plus Solvent After Transfer	1613	Initial Density (g/L)	1.0500
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2558		
Volume Solvent Transferred	2436		
Weight Test Flask Plus Solvent After Test	3712		
Tare Weight Test Flask	1277	Final Density (g/L)	1.0510
Weight Solvent Remaining in Flask	2435		
Volume Solvent Remaining in Flask	2317		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.06	103.9	0.0000	NA	NA	NA	0	0
1	9.16	101.0	0.1090	NA	NA	NA	24.413	23.239
2	9.18	101.0	0.1190	NA	NA	NA	24.240	23.072
4	9.20	101.9	0.1490	NA	NA	NA	24.683	23.492
6	9.28	101.9	0.1750	NA	NA	NA	26.945	22.485
8	9.28	101.9	0.1820	NA	NA	NA	23.987	21.864

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0025	0.26	0.27	0.00	0.00	0.00
2	0.0027	0.28	0.29	0.00	0.00	0.00
4	0.0035	0.35	0.36	0.00	0.00	0.00
6	0.0039	0.41	0.42	0.00	0.00	0.00
8	0.0040	0.42	0.44	0.00	0.00	0.00

Elapsed Time<-----Copper----->				GRAMS DISSOLVED			3/16/94		
(Hours)	Sample	Flask	Total	Sample	Flask	Total	<-----Nickel----->		
0	0.00	0.00	0.00	0.00	0.00	0.00			
1	0.00	0.00	0.00	0.00	0.00	0.00			
2	0.00	0.00	0.00	0.00	0.00	0.00			
4	0.00	0.00	0.00	0.00	0.00	0.00			
6	0.00	0.00	0.00	0.00	0.00	0.00			
8	0.00	0.00	0.00	0.00	0.00	0.00			

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
9	1 hr	8.7432	19.9701	11.2269	10.687		
10	1 hr	8.6093	21.7958	13.1865	12.552		
11	2 hr	8.7260	21.4146	12.6886	12.077		
12	2 hr	8.6545	20.2058	11.5513	10.994		
13	4 hr	8.6839	21.8156	13.1317	12.498		
14	4 hr	8.6127	22.4258	13.8131	13.146		
15	6 hr	8.5475	18.7209	10.1734	9.681	Total Removed (g)	122.21
16	6 hr	8.6896	22.1454	13.4558	12.804		
17	8 hr	8.7033	19.3874	10.6841	10.166	Total Removed (mL)	116.30
18	8hr	8.6376	20.9315	12.2939	11.697		

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00			
Weight Glass Filter Plus Deposit	20.2729			
Tare Weight Glass Filter	13.0000	Grams UO2 Lost	2.7271	
Weight Deposit Remaining in Flask	7.2729			

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.					
49	1 hr	0.0233	0.0417	0.0184					
50	2 hr	0.0232	0.0348	0.0116					
51	4 hr	0.0216	0.0345	0.0129					
52	6 hr	0.0219	0.0328	0.0109					
53	8 hr	0.0218	0.0308	0.0090					
					Total on Millipores (g)				
					0.0628				

DOE Uranium Dioxide Dissolution Testing

Date of test: 3/17/94Solvent composition: 10% EDTA + 1.5% AMMONIUM CARBONATE + O2 SPARGE @pH 9.0
WITH HEAT 110F (38)
NO COUPONS

Coupon # Pre-Weight Post-Weight Weight Loss S.A.(in2) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	4181		
Weight Reservoir Plus Solvent After Transfer	1597	Initial Density (g/L)	1.0510
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2584		
Volume Solvent Transferred	2459		
Weight Test Flask Plus Solvent After Test	3717		
Tare Weight Test Flask	1277	Final Density (g/L)	1.0510
Weight Solvent Remaining in Flask	2440		
Volume Solvent Remaining in Flask	2322		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.06	101.9	0.0000	NA	NA	NA	0	0
1	8.79	101.9	0.1310	NA	NA	NA	26.598	25.308
2	8.78	101.9	0.1590	NA	NA	NA	23.671	22.522
4	8.85	100.0	0.1900	NA	NA	NA	23.460	22.321
6	8.81	100.0	0.2250	NA	NA	NA	24.316	21.887
8	8.92	101.9	0.2500	NA	NA	NA	21.670	23.814

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0033	0.32	0.32	0.00	0.00	0.00
2	0.0036	0.38	0.39	0.00	0.00	0.00
4	0.0042	0.45	0.46	0.00	0.00	0.00
6	0.0049	0.53	0.55	0.00	0.00	0.00
8	0.0060	0.59	0.61	0.00	0.00	0.00

Copper				Nickel		
GRAMS DISSOLVED				3/17/94		
Elapsed Time<	Sample	Flask	Total	Sample	Flask	Total
(Hours)						
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
19	1 hr	8.7127	21.7266	13.0139	12.382	
20	1 hr	8.7179	22.3023	13.5844	12.925	
21	2 hr	8.5487	21.6767	13.1280	12.491	
22	2 hr	8.6088	19.1514	10.5426	10.031	
23	4 hr	8.6538	21.5710	12.9172	12.290	
24	4 hr	8.5717	19.9706	11.3989	10.846	
25	6 hr	8.6902	18.9611	10.2709	9.773	Total Removed (g)
26	6 hr	8.6923	21.4249	12.7326	12.115	122.62
27	8 hr	8.7021	21.4390	12.7369	12.119	Total Removed (mL)
28	8hr	8.5970	20.8882	12.2912	11.695	116.67

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00	
Weight Glass Filter Plus Deposit	22.2238	
Tare Weight Glass Filter	13.0000	Grams UO2 Lost
Weight Deposit Remaining in Flask	9.2238	0.7762

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.	
54	1 hr	0.0219	0.0275	0.0056	
55	2 hr	0.0224	0.0264	0.0040	
56	4 hr	0.0220	0.0257	0.0037	
57	6 hr	0.0219	0.0301	0.0082	
58	8 hr	0.0221	0.0264	0.0043	
					Total on Millipores (g)
					0.0258

DOE Uranium Dioxide Dissolution Testing

Date of test: 3/18/94Solvent composition: 10% EDTA + 1.5%AMMONIUM CARBONATE + O2 SPARGE @pH 9.0
WITH HEAT 150F (39)
NO COUPONS

Coupon # Pre-Weight Post-Weight Weight Loss S.A.(in2) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	4192		
Weight Reservoir Plus Solvent After Transfer	1665	Initial Density (g/L)	1.0520
Tare Weight Reservoir Flask	1115		
Weight Solvent Transferred	2527		
Volume Solvent Transferred	2402		
Weight Test Flask Plus Solvent After Test	3690		
Tare Weight Test Flask	1277	Final Density (g/L)	1.0470
Weight Solvent Remaining in Flask	2413		
Volume Solvent Remaining in Flask	2305		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.00	97.1	0.0000	NA	NA	NA	0	0
1	8.82	101.9	0.1380	NA	NA	NA	23.394	22.320
2	8.85	98.1	0.1680	NA	NA	NA	25.083	23.938
4	8.94	100.9	0.2270	NA	NA	NA	24.984	23.845
6	8.94	100.9	0.2490	NA	NA	NA	23.831	23.828
8	8.97	99.1	0.2920	NA	NA	NA	24.818	23.686

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0031	0.33	0.33	0.00	0.00	0.00
2	0.0040	0.40	0.40	0.00	0.00	0.00
4	0.0054	0.53	0.54	0.00	0.00	0.00
6	0.0059	0.57	0.59	0.00	0.00	0.00
8	0.0069	0.67	0.69	0.00	0.00	0.00

Copper				Nickel		
GRAMS DISSOLVED				3/18/94		
Elapsed Time<	Sample	Flask	Total	Sample	Flask	Total
(Hours)						
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
29	1 hr	8.6050	19.8518	11.2468	10.730	
30	1 hr	8.6451	20.7918	12.1467	11.590	
31	2 hr	8.6983	20.8145	12.1162	11.562	
32	2 hr	8.7000	21.6670	12.9670	12.376	
33	4 hr	8.6931	20.7096	12.0165	11.470	
34	4 hr	8.6963	20.5106	11.8143	11.278	
35	6 hr	8.7177	21.7210	13.0033	12.415	Total Removed (g)
36	6 hr	8.7934	20.7456	11.9522	11.413	122.06
37	8 hr	8.8159	21.2612	12.4453	11.885	Total Removed (mL)
38	8hr	8.6890	21.0442	12.3552	11.801	116.52

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00	
Weight Glass Filter Plus Deposit	21.8827	
Tare Weight Glass Filter	13.0000	Grams UO2 Lost
Weight Deposit Remaining in Flask	8.8827	1.1173

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.	
59	1 hr	0.0221	0.0312	0.0091	
60	2 hr	0.0217	0.0312	0.0095	
61	4 hr	0.0220	0.0305	0.0085	
62	6 hr	0.0220	0.0302	0.0082	
63	8 hr	0.0219	0.0327	0.0108	
					Total on Millipores (g)
					0.0461

DOE Uranium Dioxide Dissolution Testing

Date of test: 3/22/94Solvent composition: ESI-600 NS @pH 7.71 (40)
HEAT 200F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in2)	Calculated General Corrosion (mils)
C1018-21	21.1111	21.9385	-0.8274	3.76	-1.708
N200-21	23.4600	23.4533	0.0067	3.70	0.014
M400-21	23.3484	23.3461	0.0023	3.72	0.005

Weight Reservoir Plus Solvent Before Transfer	4536		
Weight Reservoir Plus Solvent After Transfer	1677	Initial Density (g/L)	1.0970
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2859		
Volume Solvent Transferred	2606		
Weight Test Flask Plus Solvent After Test	3990		
Tare Weight Test Flask	1277	Final Density (g/L)	1.0960
Weight Solvent Remaining in Flask	2713		
Volume Solvent Remaining in Flask	2475		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	7.71	NA	0.0000	NA	NA	NA	0	0
1	7.71	NA	0.1130	NA	NA	NA	22.995	20.977
2	7.58	NA	0.1150	NA	NA	NA	21.729	19.823
4	7.72	NA	0.1190	NA	NA	NA	21.004	19.557
6	7.78	NA	0.1210	NA	NA	NA	21.436	20.381
8	7.61	NA	0.1230	NA	NA	NA	21.507	23.135

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0024	0.29	0.29	0.00	0.00	0.00
2	0.0023	0.30	0.30	0.00	0.00	0.00
4	0.0023	0.30	0.31	0.00	0.00	0.00
6	0.0025	0.31	0.32	0.00	0.00	0.00
8	0.0028	0.31	0.32	0.00	0.00	0.00

Copper				Nickel		
GRAMS DISSOLVED				3/22/94		
Elapsed Time<	Sample	Flask	Total	Sample	Flask	Total
(Hours)						
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
39	1 hr	8.6674	19.3671	10.6997	9.761	
40	1 hr	8.6694	20.9642	12.2948	11.216	
41	2 hr	8.6261	18.9131	10.2870	9.385	
42	2 hr	8.6865	20.1280	11.4415	10.438	
43	4 hr	8.7887	18.3507	9.5620	8.724	
44	4 hr	8.7370	20.6111	11.8741	10.833	
45	6 hr	8.7248	18.3574	9.6326	8.788	Total Removed (g) 113.85
46	6 hr	8.7577	21.4634	12.7057	11.592	
47	8 hr	8.7390	21.5161	12.7771	11.658	Total Removed (mL) 103.87
48	8 hr	8.7489	21.3279	12.5790	11.477	

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-21	2.0140	0.7690	0.1145	0.1250	3.76
N200-21	2.0115	0.7670	0.1080	0.1235	3.70
M400-21	2.0130	0.7685	0.1090	0.1245	3.72

Grams Uranium Dioxide Added to Flask	10.00	
Weight Glass Filter Plus Deposit	22.2881	
Tare Weight Glass Filter	13.0000	Grams UO2 Lost 0.7119
Weight Deposit Remaining in Flask	9.2881	

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.	
64	1 hr	0.0217	0.0478	0.0261	
65	2 hr	0.0216	0.0542	0.0326	
66	4 hr	0.0220	0.0391	0.0171	Total on Millipores (g) 0.1021
67	6 hr	0.0219	0.0396	0.0177	
68	8 hr	0.0218	0.0304	0.0086	

DOE Uranium Dioxide Dissolution Testing

Date of test: 3/23/94Solvent composition: ESI-603 NS @pH 10.36 (41)
HEAT 200F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in ²)	Calculated General Corrosion (mils)
C1018-22	21.3182	21.1776	0.1406	3.75	0.291
N200-22	24.8884	24.8871	0.0013	3.75	0.003
M400-22	23.0955	23.0941	0.0014	3.71	0.003

Weight Reservoir Plus Solvent Before Transfer	4624		
Weight Reservoir Plus Solvent After Transfer	1764	Initial Density (g/L)	1.1170
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2860		
Volume Solvent Transferred	2560		
Weight Test Flask Plus Solvent After Test	4121		
Tare Weight Test Flask	1425	Final Density (g/L)	1.1200
Weight Solvent Remaining in Flask	2696		
Volume Solvent Remaining in Flask	2407		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	10.36	NA	0.0000	NA	NA	NA	0	0
1	10.07	NA	0.1250	NA	NA	NA	19.980	17.846
2	10.09	NA	0.1270	NA	NA	NA	21.896	19.556
4	10.05	NA	0.1290	NA	NA	NA	22.714	20.433
6	10.03	NA	0.1290	NA	NA	NA	22.880	19.724
8	10.06	NA	0.1280	NA	NA	NA	22.596	16.811

GRAMS DISSOLVED

Elapsed Time (Hours)	-----Uranium----->			<-----Iron----->		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0022	0.32	0.32	0.00	0.00	0.00
2	0.0025	0.32	0.33	0.00	0.00	0.00
4	0.0026	0.32	0.33	0.00	0.00	0.00
6	0.0025	0.32	0.33	0.00	0.00	0.00
8	0.0022	0.32	0.33	0.00	0.00	0.00

Copper				Nickel		
GRAMS DISSOLVED				3/23/94		
Elapsed Time< (Hours)	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
49	1 hr	8.6741	19.0483	10.3742	9.267	
50	1 hr	8.7672	18.3728	9.6056	8.580	
51	2 hr	8.7699	18.4923	9.7224	8.684	
52	2 hr	8.6638	20.8371	12.1733	10.872	
53	4 hr	8.6269	19.1677	10.5408	9.414	
54	4 hr	8.7515	21.0909	12.3394	11.019	
55	6 hr	8.7346	18.9913	10.2567	9.159	Total Removed (g) 105.67
56	6 hr	8.7206	20.5519	11.8313	10.565	
57	8 hr	8.6358	18.5606	9.9248	8.862	Total Removed (mL) 94.37
58	8 hr	8.7290	17.6321	8.9031	7.949	

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-22	2.0125	0.7675	0.1145	0.1240	3.75
N200-22	2.0140	0.7675	0.1140	0.1235	3.75
M400-22	2.0145	0.7675	0.1080	0.1245	3.71

Grams Uranium Dioxide Added to Flask	10.00	
Weight Glass Filter Plus Deposit	22.3240	
Tare Weight Glass Filter	13.0000	Grams UO2 Lost 0.6760
Weight Deposit Remaining in Flask	9.3240	

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.	
69	1 hr	0.0221	0.0334	0.0113	
70	2 hr	0.0221	0.0403	0.0182	
71	4 hr	0.0219	0.0413	0.0194	
72	6 hr	0.0219	0.0331	0.0112	
73	8 hr	0.0220	0.0262	0.0042	
					Total on Millipores (g) 0.0643

DOE Uranium Dioxide Dissolution Testing

Date of test: 3/24/94Solvent composition: RADIAC WASH @pH 4.56 (42)
HEAT 200F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in ²)	Calculated General Corrosion (mils)
C1018-23	21.6532	21.0387	0.6145	3.75	1.270
N200-23	25.8397	25.8271	0.0126	3.77	0.026
M400-23	22.3016	22.2891	0.0125	3.63	0.027

Weight Reservoir Plus Solvent Before Transfer	4367		
Weight Reservoir Plus Solvent After Transfer	1728	Initial Density (g/L)	1.0480
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2639		
Volume Solvent Transferred	2518		
Weight Test Flask Plus Solvent After Test	3650		
Tare Weight Test Flask	1425	Final Density (g/L)	1.0480
Weight Solvent Remaining in Flask	2225		
Volume Solvent Remaining in Flask	2123		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	4.56	NA	0.0000	NA	NA	NA	0	0
1	4.57	NA	0.1340	NA	NA	NA	21.391	20.411
2	4.53	NA	0.1380	NA	NA	NA	23.836	22.745
4	4.56	NA	0.1400	NA	NA	NA	22.967	19.417
6	4.52	NA	0.1420	NA	NA	NA	20.349	21.960
8	4.52	NA	0.1420	NA	NA	NA	21.538	20.502

GRAMS DISSOLVED

Elapsed Time (Hours)	-----Uranium----->			<-----Iron----->		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0027	0.33	0.34	0.00	0.00	0.00
2	0.0031	0.34	0.35	0.00	0.00	0.00
4	0.0027	0.34	0.35	0.00	0.00	0.00
6	0.0031	0.35	0.36	0.00	0.00	0.00
8	0.0029	0.34	0.36	0.00	0.00	0.00

Copper				GRAMS DISSOLVED			Nickel			3/24/94
Elapsed Time<-----	Sample	Flask	Total	Sample	Flask	Total	Sample	Flask	Total	
(Hours)										
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
59	1 hr	8.5892	19.1526	10.5634	10.080		
60	1 hr	8.6911	19.5185	10.8274	10.331		
61	2 hr	8.7226	18.8090	10.0864	9.624		
62	2 hr	8.6231	22.3731	13.7500	13.120		
63	4 hr	8.7473	17.9645	9.2172	8.795		
64	4 hr	8.7668	19.8984	11.1316	10.622		
65	6 hr	8.6918	19.0978	10.4060	9.929	Total Removed (g)	110.08
66	6 hr	8.6645	21.2731	12.6086	12.031		
67	8 hr	8.5652	19.1662	10.6010	10.115	Total Removed (mL)	105.04
68	8 hr	8.7256	19.6112	10.8856	10.387		

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-23	2.0155	0.7675	0.1145	0.1285	3.75
N200-23	2.0120	0.7680	0.1185	0.1235	3.77
M400-23	2.0120	0.7530	0.1060	0.1240	3.63

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	21.0452		
Tare Weight Glass Filter	12.9952	Grams UO2 Lost	1.9500
Weight Deposit Remaining in Flask	8.0500		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.		
74	1 hr	0.0219	0.0263	0.0044		
75	2 hr	0.0220	0.0322	0.0102		
76	4 hr	0.0222	0.0387	0.0165	Total on Millipores (g)	0.0710
77	6 hr	0.0226	0.0377	0.0151		
78	8 hr	0.0229	0.0477	0.0248		

DOE Uranium Dioxide Dissolution Testing

Date of test: 3/25/94Solvent composition: 100g/L EDTA + 15 g/L (NH₄)₂CO₃ + 5G/L NaNO₂ @pH 9.0 (43)
HEAT 150F / OXYGEN SPARGE

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in ²)	Calculated General Corrosion (mils)
C1018-24	21.1122	18.9900	2.1222	3.75	4.391
N200-24	25.5640	25.1101	0.4539	3.76	0.936
M400-24	23.1234	22.6588	0.4646	3.70	0.973

Weight Reservoir Plus Solvent Before Transfer	0		
Weight Reservoir Plus Solvent After Transfer	0	Initial Density (g/L)	1.0525
Tare Weight Reservoir Flask	0		
Weight Solvent Transferred	0		
Volume Solvent Transferred	2500		
Weight Test Flask Plus Solvent After Test	3758		
Tare Weight Test Flask	1308	Final Density (g/L)	1.0525
Weight Solvent Remaining in Flask	2450		
Volume Solvent Remaining in Flask	2328		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.02	0.0	0.0000	0.0000	0.0000	NA	0	0
1	9.04	99.1	0.3340	0.1510	0.0049	NA	24.960	23.715
4	9.10	93.4	1.2420	0.6980	0.0322	NA	ERR	24.056
6	9.09	92.5	1.3830	0.9660	0.0644	NA	25.319	24.223

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0079	0.83	0.84	0.00	0.37	0.38
4	0.0299	3.05	3.08	0.02	1.71	1.73
6	0.0335	3.36	3.43	0.02	2.35	2.39

Elapsed Time (Hours)	Copper			Nickel		
	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
11	1 hr	8.6461	20.3934	11.7473	11.068	
12	1 hr	8.6810	21.7313	13.0503	12.303	
13	2 hr	8.6727	20.6146	11.9419	11.265	
14	2 hr	8.6262	20.7622	12.1360	11.456	
15	4 hr	8.6777	21.6951	13.0174	12.295	
16	4 hr	8.7183	19.1133	10.3950	9.824	
17	6 hr	8.6573	20.0737	11.4164	10.796	Total Removed (g)
18	6 hr	8.6692	18.9994	10.3302	9.775	
19	8 hr	8.6842	18.8958	10.2116	9.669	Total Removed (mL)
20	8 hr	8.6348	20.5883	11.9535	11.325	

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	15.1850		
Tare Weight Glass Filter	13.0000	Grams UO2 Lost	7.8150
Weight Deposit Remaining in Flask	2.1850		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.	
100	1hr	0.0226	0.0323	0.0097	
1	2hr	0.0230	0.0330	0.0100	
2	4 hr	0.0229	0.0323	0.0094	
3	6 hr	0.0230	0.0331	0.0101	
4	8 hr	0.0227	0.0315	0.0088	

Total on Millipores (g) 0.0480

GRAMS DISSOLVED				4/11/94		
Elapsed Time<-----Copper----->				<-----Nickel----->		
(Hours)	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00
23.5	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
21	2 hr	8.7694	21.4783	12.7089	12.109	
22	2 hr	8.6589	21.3011	12.6422	12.046	
23	6 hr	8.6457	19.4319	10.7862	10.277	
24	6 hr	8.7398	19.9491	11.2093	10.681	
25	12 hr	8.7468	21.8166	13.0698	12.453	
26	12 hr	8.7413	21.1422	12.4009	11.816	
27	18 hr	8.7120	20.4506	11.7386	11.185	Total Removed (g)
28	18 hr	8.7434	20.9559	12.2125	11.636	
29	23.5 hr	8.7064	21.0940	12.3876	11.803	Total Removed (mL)
30	23.5 hr	8.7175	20.5495	11.8320	11.274	
						120.99
						115.28

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	21.5993		
Tare Weight Glass Filter	13.0000	Grams UO2 Lost	1.4007
Weight Deposit Remaining in Flask	8.5993		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.	
5	2hr	0.0228	0.0480	0.0252	
6	6hr	0.0227	0.0382	0.0155	
7	12hr	0.0228	0.0362	0.0134	
8	18hr	0.0228	0.0327	0.0099	
9	23.5hr	0.0227	0.0416	0.0189	
					Total on Millipores (g)
					0.0829

DOE Uranium Dioxide Dissolution Testing

Date of test: 4/12/94Solvent composition: 100g/L EDTA + 15 g/L (NH₄)₂CO₃ + 3g/L FeCl₃ @pH 9.0 (50)
HEAT 150F AIR SPARGE
NO COUPONSCoupon # Pre-Weight Post-Weight Weight Loss S.A.(in²) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	4056		
Weight Reservoir Plus Solvent After Transfer	1523	Initial Density (g/L)	1.0520
Tare Weight Reservoir Flask	1277		
Weight Solvent Transferred	2533		
Volume Solvent Transferred	2408		
Weight Test Flask Plus Solvent After Test	3737		
Tare Weight Test Flask	1343	Final Density (g/L)	1.0500
Weight Solvent Remaining in Flask	2394		
Volume Solvent Remaining in Flask	2280		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	8.99	99.0	0.0000	NA	NA	NA	0	0
1	8.82	99.0	0.0677	NA	NA	NA	23.541	22.411
2	8.88	96.0	0.0950	NA	NA	NA	22.091	21.032
4	8.68	96.0	1.0640	NA	NA	NA	23.508	21.955
6	8.65	96.0	1.1190	NA	NA	NA	23.058	20.672
8	8.60	100.0	1.1520	NA	NA	NA	21.542	22.043

GRAMS DISSOLVED

-----Uranium-----				-----Iron-----		
Elapsed Time (Hours)	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0015	0.16	0.16	0.00	0.00	0.00
2	0.0020	0.22	0.23	0.00	0.00	0.00
4	0.0234	2.49	2.52	0.00	0.00	0.00
6	0.0231	2.60	2.65	0.00	0.00	0.00
8	0.0254	2.65	2.72	0.00	0.00	0.00

Copper				Nickel		
GRAMS DISSOLVED				4/12/94		
Elapsed Time<-----	Sample	Flask	Total	Sample	Flask	Total
(Hours)						
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
31	1 hr	8.7444	18.9389	10.1945	9.705	
32	1 hr	8.8047	22.1513	13.3466	12.706	
33	2 hr	8.7167	18.2246	9.5079	9.052	
34	2 hr	8.6324	21.2153	12.5829	11.980	
35	4 hr	8.6048	19.5299	10.9251	10.402	
36	4 hr	8.7530	20.8856	12.1326	11.553	
37	6 hr	8.8138	18.2227	9.4089	8.960	Total Removed (g)
38	6 hr	8.6496	20.9483	12.2987	11.712	
39	8 hr	8.5902	19.4379	10.8477	10.331	Total Removed (mL)
40	8 hr	8.5942	20.2704	11.6762	11.120	
						112.92
						107.52

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	19.6206		
Tare Weight Glass Filter	13.0000	Grams UO2 Lost	3.3794
Weight Deposit Remaining in Flask	6.6206		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.	
10	1hr	0.0226	0.0325	0.0099	
11	2hr	0.0227	0.0316	0.0089	
12	4hr	0.0227	0.0326	0.0099	
13	6hr	0.0226	0.0332	0.0106	
14	8hr	0.0227	0.0317	0.0090	
					Total on Millipores (g)
					0.0483

DOE Uranium Dioxide Dissolution Testing

Date of test: 4/13/94Solvent composition: 100g/L EDTA + 15 g/L (NH₄)₂CO₃ + 10g/L H₂O₂ @pH 9.0 (51)
ROOM TEMP
NO COUPONSCoupon # Pre-Weight Post-Weight Weight Loss S.A.(in²) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	4145		
Weight Reservoir Plus Solvent After Transfer	1521	Initial Density (g/L)	1.0505
Tare Weight Reservoir Flask	1277		
Weight Solvent Transferred	2624		
Volume Solvent Transferred	2498		
Weight Test Flask Plus Solvent After Test	3833		
Tare Weight Test Flask	1343	Final Density (g/L)	1.0600
Weight Solvent Remaining in Flask	2490		
Volume Solvent Remaining in Flask	2349		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.00	102.8	0.0000	NA	NA	NA	0	0
1	8.96	89.4	3.5070	NA	NA	NA	28.484	26.904
2	8.88	83.4	3.5200	NA	NA	NA	27.324	25.799
4	8.85	72.1	3.5220	NA	NA	NA	26.145	24.428
6	8.86	72.1	3.5390	NA	NA	NA	25.881	22.790

GRAMS DISSOLVED

Elapsed Time (Hours)	-----Uranium----->			<-----Iron----->		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0944	8.67	8.76	0.00	0.00	0.00
2	0.0908	8.61	8.79	0.00	0.00	0.00
4	0.0860	8.53	8.80	0.00	0.00	0.00
6	0.0807	8.49	8.84	0.00	0.00	0.00

Elapsed Time<-----Copper----->			GRAMS DISSOLVED			<-----Nickel----->			4/13/94
(Hours)	Sample	Flask	Total	Sample	Flask	Total			
0	0.00	0.00	0.00	0.00	0.00	0.00			
1	0.00	0.00	0.00	0.00	0.00	0.00			
2	0.00	0.00	0.00	0.00	0.00	0.00			
4	0.00	0.00	0.00	0.00	0.00	0.00			
6	0.00	0.00	0.00	0.00	0.00	0.00			
8	0.00	0.00	0.00	0.00	0.00	0.00			

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
41	1 hr	8.7694	22.9868	14.2174	9.873		
42	1 hr	8.8139	23.0801	14.2662	9.842		
43	2 hr	8.7634	22.5889	13.8255	9.476		
44	2 hr	8.6479	22.1465	13.4986	9.192		
45	4 hr	8.7841	21.4306	12.6465	8.556		
46	4 hr	8.6534	21.8882	13.2348	8.897		
47	6 hr	8.6592	21.7100	13.0508	8.718	Total Removed (g)	105.84
48	6 hr	8.6690	19.7735	11.1045	7.371		
1	8 hr					Total Removed (mL)	71.93
1	8 hr						

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	13.0068		
Tare Weight Glass Filter	13.0000	Grams UO2 Lost	9.9932
Weight Deposit Remaining in Flask	0.0068		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.		
15	1hr	0.0227	0.0291	0.0064		
16	2hr	0.0227	0.0247	0.0020		
17	4hr	0.0227	0.0249	0.0022	Total on Millipores (g)	0.0137
18	6hr	0.0224	0.0255	0.0031		
1	8hr					

DOE Uranium Dioxide Dissolution Testing

Date of test: 4/14/94Solvent composition: 100g/L EDTA + 15 g/L (NH₄)₂CO₃ + 5g/L H₂O₂ @pH 9.0 (52)
ROOM TEMP
NO COUPONSCoupon # Pre-Weight Post-Weight Weight Loss S.A.(in²) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	3912		
Weight Reservoir Plus Solvent After Transfer	1343	Initial Density (g/L)	1.0515
Tare Weight Reservoir Flask	1277		
Weight Solvent Transferred	2569		
Volume Solvent Transferred	2443		
Weight Test Flask Plus Solvent After Test	3808		
Tare Weight Test Flask	1343	Final Density (g/L)	1.0505
Weight Solvent Remaining in Flask	2465		
Volume Solvent Remaining in Flask	2347		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.01	100.9	0.0000	NA	NA	NA	0	0
1	8.91	98.1	3.4940	NA	NA	NA	25.932	24.683
2	8.89	92.3	3.4960	NA	NA	NA	26.306	25.040
4	8.89	89.4	3.4540	NA	NA	NA	24.236	22.114
6	8.91	89.4	3.5440	NA	NA	NA	23.232	24.296

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0862	8.45	8.54	0.00	0.00	0.00
2	0.0875	8.37	8.54	0.00	0.00	0.00
4	0.0764	8.19	8.44	0.00	0.00	0.00
6	0.0861	8.32	8.65	0.00	0.00	0.00

Elapsed Time<-----Copper----->			GRAMS DISSOLVED			4/14/94	
(Hours)	Sample	Flask	Total	Sample	Flask	Total	
0	0.00	0.00	0.00	0.00	0.00	0.00	
1	0.00	0.00	0.00	0.00	0.00	0.00	
2	0.00	0.00	0.00	0.00	0.00	0.00	
4	0.00	0.00	0.00	0.00	0.00	0.00	
6	0.00	0.00	0.00	0.00	0.00	0.00	
8	0.00	0.00	0.00	0.00	0.00	0.00	

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
49	1 hr	8.7569	21.5509	12.7940	12.762		
50	1 hr	8.6881	21.8263	13.1382	13.119		
51	2 hr	8.6547	21.7663	13.1116	13.105		
52	2 hr	8.5846	21.7793	13.1947	13.201		
53	4 hr	8.7506	19.7916	11.0410	11.058		
54	4 hr	8.7085	20.8993	12.1908	12.221		
55	6 hr	8.7082	21.1579	12.4497	12.493	Total Removed (g)	100.99
56	6 hr	8.7315	21.8050	13.0735	13.133		
1	8 hr					Total Removed (mL)	101.09
1	8 hr						

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	13.0121		
Tare Weight Glass Filter	13.0000	Grams UO2 Lost	9.9879
Weight Deposit Remaining in Flask	0.0121		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.		
19	1hr	0.0224	0.0239	0.0015		
20	2hr	0.0227	0.0249	0.0022		
21	4hr	0.0225	0.0231	0.0006	Total on Millipores (g)	0.0060
22	6hr	0.0226	0.0243	0.0017		
1	8hr					

DOE Uranium Dioxide Dissolution Testing

Date of test: 4/15/94Solvent composition: 100g/L EDTA + 15 g/L (NH₄)₂CO₃ + 2.5g/L H₂O₂ @pH 9.0 (53)
ROOM TEMP
NO COUPONSCoupon # Pre-Weight Post-Weight Weight Loss S.A.(in²) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	3929		
Weight Reservoir Plus Solvent After Transfer	1347	Initial Density (g/L)	1.0500
Tare Weight Reservoir Flask	1277		
Weight Solvent Transferred	2582		
Volume Solvent Transferred	2459		
Weight Test Flask Plus Solvent After Test	3894		
Tare Weight Test Flask	1343	Final Density (g/L)	1.0525
Weight Solvent Remaining in Flask	2551		
Volume Solvent Remaining in Flask	2424		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.01	103.8	0.0000	NA	NA	NA	0	0
1	9.09	95.2	3.2330	NA	NA	NA	26.581	22.267
2	9.09	95.2	3.4200	NA	NA	NA	26.279	21.923
4	9.05	95.2	3.4200	NA	NA	NA	26.556	22.741

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0720	7.88	7.95	0.00	0.00	0.00
2	0.0750	8.26	8.41	0.00	0.00	0.00
4	0.0778	8.18	8.41	0.00	0.00	0.00

Copper				Nickel		
GRAMS DISSOLVED				4/15/94		
Elapsed Time<	Sample	Flask	Total	Sample	Flask	Total
(Hours)						
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
57	1 hr	8.6900	21.8271	13.1371	11.016	
58	1 hr	8.7725	22.2165	13.4440	11.250	
59	2 hr	8.6689	21.9674	13.2985	11.105	
60	2 hr	8.6392	21.6200	12.9808	10.817	
61	4 hr	8.6518	22.2267	13.5749	11.289	
62	4 hr	8.6479	22.4471	13.7992	11.452	
55	6 hr					Total Removed (g) 80.23
56	6 hr					
1	8 hr					Total Removed (mL) 66.93
1	8 hr					

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00	
Weight Glass Filter Plus Deposit	13.0188	
Tare Weight Glass Filter	13.0000	Grams UO2 Lost 9.9812
Weight Deposit Remaining in Flask	0.0188	

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.	
23	1hr	0.0225	0.0259	0.0034	
24	2hr	0.0226	0.0243	0.0017	
25	4hr	0.0226	0.0233	0.0007	Total on Millipores (g) 0.0058
1					
1					

DOE Uranium Dioxide Dissolution Testing

Date of test: 4/18/94Solvent composition: 100g/L EDTA + 5 g/L (NH₄)₂CO₃ + 2.5g/L H₂O₂ @pH 9.0 (55)
ROOM TEMP
NO COUPONSCoupon # Pre-Weight Post-Weight Weight Loss S.A.(in²) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	3883		
Weight Reservoir Plus Solvent After Transfer	1295	Initial Density (g/L)	1.0460
Tare Weight Reservoir Flask	1295		
Weight Solvent Transferred	2588		
Volume Solvent Transferred	2474		
Weight Test Flask Plus Solvent After Test	3860		
Tare Weight Test Flask	1343	Final Density (g/L)	1.0500
Weight Solvent Remaining in Flask	2517		
Volume Solvent Remaining in Flask	2397		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	8.95	100.9	0.0000	NA	NA	NA	0	0
1	9.09	98.0	2.4190	NA	NA	NA	24.185	18.606
2	9.12	98.0	2.9500	NA	NA	NA	27.389	20.939
4	9.13	98.0	3.3550	NA	NA	NA	26.918	18.477

GRAMS DISSOLVED

Elapsed Time (Hours)	-----Uranium----->			<-----Iron----->		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0450	5.94	5.99	0.00	0.00	0.00
2	0.0618	7.18	7.29	0.00	0.00	0.00
4	0.0620	8.11	8.28	0.00	0.00	0.00

GRAMS DISSOLVED							4/18/94
Elapsed Time<-----Copper----->				<-----Nickel----->			
(Hours)	Sample	Flask	Total	Sample	Flask	Total	
0	0.00	0.00	0.00	0.00	0.00	0.00	
1	0.00	0.00	0.00	0.00	0.00	0.00	
2	0.00	0.00	0.00	0.00	0.00	0.00	
4	0.00	0.00	0.00	0.00	0.00	0.00	

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
63	1 hr	8.5374	21.4661	12.9287	9.960		
64	1 hr	8.7236	19.9795	11.2559	8.645		
65	2 hr	8.6701	22.2007	13.5306	10.360		
66	2 hr	8.6661	22.5243	13.8582	10.579		
67	4 hr	8.7617	21.8213	13.0596	9.939		
68	4 hr	8.6675	19.9205	11.2530	8.538		
55	6 hr					Total Removed (g)	75.89
56	6 hr						
1	8 hr					Total Removed (mL)	58.02
1	8 hr						

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	13.4360		
Tare Weight Glass Filter	13.0000	Grams UO2 Lost	9.5640
Weight Deposit Remaining in Flask	0.4360		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.		
26	1hr	0.0225	0.0262	0.0037		
27	2hr	0.0224	0.0238	0.0014		
28	4hr	0.0224	0.0298	0.0074	Total on Millipores (g)	0.0125
1						
1						

DOE Uranium Dioxide Dissolution Testing

Date of test: 4/20/94Solvent composition: 100g/L EDTA + 7.5 g/L (NH₄)₂CO₃ + 2.5g/L H₂O₂ @pH 9.0 (54)
ROOM TEMP
NO COUPONSCoupon # Pre-Weight Post-Weight Weight Loss S.A.(In²) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	3905		
Weight Reservoir Plus Solvent After Transfer	1295	Initial Density (g/L)	1.0460
Tare Weight Reservoir Flask	1078		
Weight Solvent Transferred	2610		
Volume Solvent Transferred	2495		
Weight Test Flask Plus Solvent After Test	3824		
Tare Weight Test Flask	1343	Final Density (g/L)	1.0465
Weight Solvent Remaining in Flask	2481		
Volume Solvent Remaining in Flask	2371		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.00	102.9	0.0000	NA	NA	NA	0	0
1	9.03	102.9	1.0340	NA	NA	NA	26.094	24.936
2	9.05	102.9	1.3260	NA	NA	NA	20.339	19.436
4	8.98	100.0	1.8910	NA	NA	NA	24.690	24.590
6	8.98	100.0	1.9410	NA	NA	NA	25.733	23.860
8	8.98	98.0	1.9630	NA	NA	NA	24.969	23.613

GRAMS DISSOLVED

Elapsed Time (Hours)	-----Uranium----->			<-----Iron----->		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0258	2.55	2.58	0.00	0.00	0.00
2	0.0258	3.25	3.30	0.00	0.00	0.00
4	0.0465	4.59	4.69	0.00	0.00	0.00
6	0.0463	4.66	4.81	0.00	0.00	0.00
8	0.0464	4.67	4.86	0.00	0.00	0.00

Copper				Nickel		
Elapsed Time<	Sample	Flask	Total	Sample	Flask	Total
(Hours)						
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
69	1 hr	8.6832	21.7771	13.0939	12.513	
70	1 hr	8.6458	21.6456	12.9998	12.423	
71	2 hr	8.7147	17.3442	8.6295	8.246	
72	2 hr	8.7609	20.4699	11.7090	11.189	
73	4 hr	8.7465	21.7271	12.9806	12.404	
74	4 hr	8.5936	21.3456	12.7520	12.186	
75	6 hr	8.7330	20.9500	12.2170	11.674	Total Removed (g)
76	6 hr	8.6178	21.1112	12.4934	11.938	
77	8 hr	8.6969	20.3840	11.6871	11.168	Total Removed (mL)
78	8 hr	8.5025	21.7901	13.2876	12.697	

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	15.3374		
Tare Weight Glass Filter	13.0000	Grams UO2 Lost	7.6626
Weight Deposit Remaining in Flask	2.3374		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.	
29	1hr	0.0224	0.0295	0.0071	
30	2hr	0.0223	0.0255	0.0032	
31	4hr	0.0224	0.0298	0.0074	
32	6hr	0.0224	0.0292	0.0068	
33	8hr	0.0225	0.0369	0.0144	

Total on Millipores (g) 0.0389

DOE Uranium Dioxide Dissolution Testing

Date of test: 4/21/94Solvent composition: 100g/L EDTA + 10 g/L (NH₄)₂CO₃ + 2.5g/L H₂O₂ @pH 9.0 (56)
ROOM TEMP
NO COUPONSCoupon # Pre-Weight Post-Weight Weight Loss S.A.(in²) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer 3942
 Weight Reservoir Plus Solvent After Transfer 1300
 Tare Weight Reservoir Flask 1343
 Weight Solvent Transferred 2642
 Volume Solvent Transferred 2516

Initial Density (g/L) 1.0500

Weight Test Flask Plus Solvent After Test 3862
 Tare Weight Test Flask 1343
 Weight Solvent Remaining in Flask 2519
 Volume Solvent Remaining in Flask 2393

Final Density (g/L) 1.0525

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.00	100.9	0.0000	NA	NA	NA	0	0
1	8.85	100.9	2.6710	NA	NA	NA	26.791	21.454
2	8.84	99.0	3.4940	NA	NA	NA	25.181	20.085
4	8.83	98.0	3.5750	NA	NA	NA	25.447	20.447

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0573	6.66	6.72	0.00	0.00	0.00
2	0.0702	8.65	8.77	0.00	0.00	0.00
4	0.0731	8.77	8.97	0.00	0.00	0.00

Copper				GRAMS DISSOLVED			4/21/94
Elapsed Time<	Sample	Flask	Total	Sample	Flask	Total	>
(Hours)							
0	0.00	0.00	0.00	0.00	0.00	0.00	
1	0.00	0.00	0.00	0.00	0.00	0.00	
2	0.00	0.00	0.00	0.00	0.00	0.00	
4	0.00	0.00	0.00	0.00	0.00	0.00	

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
79	1 hr	8.7602	22.0916	13.3314	10.686		
80	1 hr	8.7387	22.1981	13.4594	10.768		
81	2 hr	8.6430	21.3540	12.7110	10.149		
82	2 hr	8.7031	21.1730	12.4699	9.936		
83	4 hr	8.7371	21.7145	12.9774	10.320		
84	4 hr	8.6582	21.4185	12.7603	10.127		
1	6 hr					Total Removed (g)	77.71
1	6 hr						
1	8 hr					Total Removed (mL)	61.99
1	8 hr						

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	13.0231		
Tare Weight Glass Filter	13.0000	Grams UO2 Lost	9.9769
Weight Deposit Remaining in Flask	0.0231		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.		
34	1hr	0.0225	0.0264	0.0039		
35	2hr	0.0226	0.0234	0.0008		
36	4hr	0.0224	0.0237	0.0013	Total on Millipores (g)	0.0060

DOE Uranium Dioxide Dissolution Testing

Date of test: 4/22/94Solvent composition: 50g/L EDTA + 10 g/L (NH₄)₂CO₃ + 2.5g/L H₂O₂ @pH 9.0 (57)
ROOM TEMP
NO COUPONSCoupon # Pre-Weight Post-Weight Weight Loss S.A.(in²) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	3877		
Weight Reservoir Plus Solvent After Transfer	1313	Initial Density (g/L)	1.0290
Tare Weight Reservoir Flask	1343		
Weight Solvent Transferred	2564		
Volume Solvent Transferred	2492		
Weight Test Flask Plus Solvent After Test	3799		
Tare Weight Test Flask	1343	Final Density (g/L)	1.0320
Weight Solvent Remaining in Flask	2456		
Volume Solvent Remaining in Flask	2380		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.00	55.0	0.0000	NA	NA	NA	0	0
1	NR	55.0	3.2780	NA	NA	NA	25.400	19.760
2	9.01	53.0	3.4580	NA	NA	NA	26.092	20.203
4	9.04	53.0	3.4980	NA	NA	NA	25.630	17.846

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0648	8.10	8.17	0.00	0.00	0.00
2	0.0699	8.48	8.61	0.00	0.00	0.00
4	0.0624	8.51	8.71	0.00	0.00	0.00

Elapsed Time<-----Copper----->				GRAMS DISSOLVED			4/22/94
(Hours)	Sample	Flask	Total	Sample	Flask	Total	
0	0.00	0.00	0.00	0.00	0.00	0.00	
1	0.00	0.00	0.00	0.00	0.00	0.00	
2	0.00	0.00	0.00	0.00	0.00	0.00	
4	0.00	0.00	0.00	0.00	0.00	0.00	

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
85	1 hr	8.7143	21.7106	12.9963	10.122		
86	1 hr	8.7462	21.1501	12.4039	9.638		
87	2 hr	8.7776	22.1754	13.3978	10.386		
88	2 hr	8.7391	21.4330	12.6939	9.817		
89	4 hr	8.7526	21.6888	12.9362	9.982		
90	4 hr	8.5839	18.7992	10.2153	7.864		
1	6 hr					Total Removed (g)	74.64
1	6 hr						
1	8 hr					Total Removed (mL)	57.81
1	8 hr						

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	13.0229		
Tare Weight Glass Filter	13.0000	Grams UO2 Lost	9.9771
Weight Deposit Remaining in Flask	0.0229		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.		
36	1hr	0.0226	0.0240	0.0014		
37	2hr	0.0223	0.0254	0.0031		
38	4hr	0.0225	0.0243	0.0018	Total on Millipores (g)	0.0063
1	6hr					
1	8hr					

DOE Uranium Dioxide Dissolution Testing

Date of test: 4/26/94Solvent composition: 50g/L EDTA + 10 g/L (NH₄)₂CO₃ + 2.5g/L H₂O₂ @pH 9.0 (58)
ROOM TEMP
NO COUPONSCoupon # Pre-Weight Post-Weight Weight Loss S.A.(in²) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	3877		
Weight Reservoir Plus Solvent After Transfer	1313	Initial Density (g/L)	1.0345
Tare Weight Reservoir Flask	1343		
Weight Solvent Transferred	2564		
Volume Solvent Transferred	2478		
Weight Test Flask Plus Solvent After Test	3750		
Tare Weight Test Flask	1327	Final Density (g/L)	1.0345
Weight Solvent Remaining in Flask	2423		
Volume Solvent Remaining in Flask	2342		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	8.90	51.9	0.0000	NA	NA	NA	0	0
1	8.84	49.0	6.4900	NA	NA	NA	24.376	23.563
2	8.85	49.0	6.6490	NA	NA	NA	27.174	26.267
4	8.85	49.0	6.7070	NA	NA	NA	26.159	24.342
6	8.85	49.0	6.7080	NA	NA	NA	25.182	24.293
8	8.89	48.0	6.7790	NA	NA	NA	25.131	24.201

GRAMS DISSOLVED

Elapsed Time (Hours)	-----Uranium----->			<-----Iron----->		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.1529	15.93	16.09	0.00	0.00	0.00
2	0.1747	16.15	16.48	0.00	0.00	0.00
4	0.1633	16.13	16.62	0.00	0.00	0.00
6	0.1630	15.97	16.62	0.00	0.00	0.00
8	0.1641	15.97	16.79	0.00	0.00	0.00

Copper				Nickel		
Elapsed Time<-----				>-----		
(Hours)	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
91	1 hr	8.5771	20.1121	11.5350	11.150	
92	1 hr	8.6968	21.5382	12.8414	12.413	
93	2 hr	8.6040	22.1090	13.5050	13.055	
94	2 hr	8.7337	22.4024	13.6687	13.213	
95	4 hr	8.6687	21.1591	12.4904	12.074	
96	4 hr	8.7269	21.4183	12.6914	12.268	
97	6 hr	8.7066	21.1460	12.4394	12.025	Total Removed (g)
98	6 hr	8.7198	21.3163	12.5965	12.176	101.77
1	8 hr					Total Removed (mL)
1	8 hr					98.37

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	20.00		
Weight Glass Filter Plus Deposit	13.0366		
Tare Weight Glass Filter	13.0000	Grams UO2 Lost	19.9634
Weight Deposit Remaining in Flask	0.0366		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.	
40	1hr	0.0226	0.0252	0.0026	
41	2hr	0.0223	0.0242	0.0019	
42	4hr	0.0225	0.0234	0.0009	
43	6hr	0.0224	0.0225	0.0001	
					Total on Millipores (g)
					0.0055

DOE Uranium Dioxide Dissolution Testing

Date of test: 4/27/94Solvent composition: 10 g/L (NH₄)₂CO₃ + 2.5g/L H₂O₂ @pH 9.0 (59)

ROOM TEMP

NO COUPONS

Coupon # Pre-Weight Post-Weight Weight Loss S.A.(in²) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	3926		
Weight Reservoir Plus Solvent After Transfer	1393	Initial Density (g/L)	1.0290
Tare Weight Reservoir Flask	946		
Weight Solvent Transferred	2533		
Volume Solvent Transferred	2462		
Weight Test Flask Plus Solvent After Test	3718		
Tare Weight Test Flask	1327	Final Density (g/L)	1.0300
Weight Solvent Remaining in Flask	2391		
Volume Solvent Remaining in Flask	2321		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.00	0.0	0.0000	NA	NA	NA	0	0
1	8.77	0.0	6.8900	NA	NA	NA	20.786	20.182
2	8.76	0.0	7.1270	NA	NA	NA	21.075	20.462
4	8.76	0.0	7.1680	NA	NA	NA	21.813	23.191
6	8.77	0.0	7.1660	NA	NA	NA	23.886	22.966
8	8.77	0.0	7.1820	NA	NA	NA	23.654	22.518

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.1391	16.82	16.96	0.00	0.00	0.00
2	0.1458	17.25	17.54	0.00	0.00	0.00
4	0.1662	17.19	17.64	0.00	0.00	0.00
6	0.1646	17.02	17.63	0.00	0.00	0.00
8	0.1617	16.89	17.67	0.00	0.00	0.00

Elapsed Time<-----Copper----->			GRAMS DISSOLVED			4/27/94	
(Hours)	Sample	Flask	Total	Sample	Flask	Total	
0	0.00	0.00	0.00	0.00	0.00	0.00	
1	0.00	0.00	0.00	0.00	0.00	0.00	
2	0.00	0.00	0.00	0.00	0.00	0.00	
4	0.00	0.00	0.00	0.00	0.00	0.00	
6	0.00	0.00	0.00	0.00	0.00	0.00	
8	0.00	0.00	0.00	0.00	0.00	0.00	

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
99	1 hr	8.6840	19.0058	10.3218	10.022		
101	1 hr	8.7448	19.2088	10.4640	10.160		
102	2 hr	8.6901	19.1802	10.4901	10.185		
103	2 hr	8.7254	19.3099	10.5845	10.277		
104	4 hr	8.6774	19.9060	11.2286	10.902		
105	4 hr	8.6469	21.3042	12.6573	12.289		
106	6 hr	8.7174	19.7139	10.9965	10.676	Total Removed (g)	109.07
107	6 hr	8.6990	20.8954	12.1964	11.841		
108	8 hr	8.6513	18.4539	9.8026	9.517	Total Removed (mL)	105.90
109	8 hr	8.6258	18.9553	10.3295	10.029		

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in ²)
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Grams Uranium Dioxide Added to Flask	20.00		
Weight Glass Filter Plus Deposit	13.6557		
Tare Weight Glass Filter	13.6321	Grams UO ₂ Lost	19.9764
Weight Deposit Remaining in Flask	0.0236		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.		
45	1hr	0.0225	0.0248	0.0023		
46	2hr	0.0223	0.0244	0.0021		
47	4hr	0.0225	0.0238	0.0013	Total on Millipores (g)	0.0070
48	6hr	0.0225	0.0232	0.0007		
49	8hr	0.0226	0.0232	0.0006		

DOE Uranium Dioxide Dissolution Testing

Date of test: 4/28/94Solvent composition: 10 g/L (NH₄)₂CO₃ + 2.5g/L H₂O₂ @pH 9.0 (60)
ROOM TEMP 30g UO₂ COMPILED FROM OTHER TEST
NO COUPONSCoupon # Pre-Weight Post-Weight Weight Loss S.A.(in²) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer	4151		
Weight Reservoir Plus Solvent After Transfer	1658	Initial Density (g/L)	1.0075
Tare Weight Reservoir Flask	946		
Weight Solvent Transferred	2493		
Volume Solvent Transferred	2474		
Weight Test Flask Plus Solvent After Test	3726		
Tare Weight Test Flask	1327	Final Density (g/L)	1.0170
Weight Solvent Remaining in Flask	2399		
Volume Solvent Remaining in Flask	2359		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.00	0.0	0.0000	NA	NA	NA	0	0
1	8.79	0.0	8.6040	NA	NA	NA	20.879	17.657
2	8.80	0.0	9.8000	NA	NA	NA	20.743	17.495
4	8.78	0.0	9.8340	NA	NA	NA	23.443	22.291
6	8.70	0.0	9.8650	NA	NA	NA	22.509	22.008
8	8.79	0.0	10.4060	NA	NA	NA	22.263	24.134

GRAMS DISSOLVED

Elapsed Time (Hours)	-----Uranium----->			<-----Iron----->		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.1519	21.14	21.29	0.00	0.00	0.00
2	0.1714	23.91	24.23	0.00	0.00	0.00
4	0.2192	23.77	24.31	0.00	0.00	0.00
6	0.2171	23.63	24.39	0.00	0.00	0.00
8	0.2511	24.67	25.68	0.00	0.00	0.00

Elapsed Time<-----Copper----->				GRAMS DISSOLVED			4/28/94
(Hours)	Sample	Flask	Total	Sample	Flask	Total	
0	0.00	0.00	0.00	0.00	0.00	0.00	
1	0.00	0.00	0.00	0.00	0.00	0.00	
2	0.00	0.00	0.00	0.00	0.00	0.00	
4	0.00	0.00	0.00	0.00	0.00	0.00	
6	0.00	0.00	0.00	0.00	0.00	0.00	
8	0.00	0.00	0.00	0.00	0.00	0.00	

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
110	1 hr	8.6273	18.9842	10.3569	8.765		
111	1 hr	8.7320	19.2536	10.5216	8.892		
112	2 hr	8.6090	18.7769	10.1679	8.582		
113	2 hr	8.6494	19.2240	10.5746	8.913		
1	4 hr	8.6922	21.5608	12.8686	12.753		
2	4 hr	8.6836	18.3238	9.6402	9.538		
3	6 hr	8.6315	21.2542	12.6227	12.470	Total Removed (g)	112.08
4	6 hr	8.6738	20.4988	11.8250	11.664		
5	8 hr	8.6255	18.9887	10.3632	10.206	Total Removed (mL)	104.70
6	8 hr	8.6078	21.7435	13.1357	12.916		

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
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Grams Uranium Dioxide Added to Flask	30.00		
Weight Glass Filter Plus Deposit	14.0639		
Tare Weight Glass Filter	13.6298	Grams UO2 Lost	29.5659
Weight Deposit Remaining in Flask	0.4341		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.		
49	1hr	0.0225	0.0256	0.0031		
50	2hr	0.0225	0.0247	0.0022		
1	4hr	0.0230	0.0244	0.0014	Total on Millipores (g)	0.0093
2	6hr	0.0228	0.0243	0.0015		
3	8hr	0.0229	0.0240	0.0011		

DOE Uranium Dioxide Dissolution Testing

Date of test: 4/29/94Solvent composition: 50g/L EDTA + 10g/L (NH₄)₂CO₃ + 2.5g/L H₂O₂ (61)
ROOM TEMP 30g UO₂

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in ²)	Calculated General Corrosion (mils)
C1018-25	21.1571	21.1571	0.0000	3.72	0.000
N200-25	24.6579	24.6576	0.0003	3.74	0.001
M400-25	23.9603	23.9527	0.0076	3.70	0.016

Weight Reservoir Plus Solvent Before Transfer	3916		
Weight Reservoir Plus Solvent After Transfer	1621	Initial Density (g/L)	1.0320
Tare Weight Reservoir Flask	1327		
Weight Solvent Transferred	2295		
Volume Solvent Transferred	2224		
Weight Test Flask Plus Solvent After Test	3483		
Tare Weight Test Flask	1327	Final Density (g/L)	1.0395
Weight Solvent Remaining in Flask	2156		
Volume Solvent Remaining in Flask	2074		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.10	54.9	0.000	0.000	0.000	0.000	0	0
1	9.19	50.9	8.2280	0.0047	0.0022	NA	27.413	26.473
2	9.20	50.9	9.0700	0.0051	0.0023	NA	27.887	26.907
4	9.21	50.9	9.7890	0.0054	0.0024	NA	27.282	25.468
6	9.03	51.0	9.9320	0.0055	0.0026	NA	26.420	23.458
8	8.96	54.0	10.3080	0.0056	0.0032	NA	24.427	25.408

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.2178	18.08	18.30	0.00	0.01	0.01
2	0.2440	19.69	20.15	0.00	0.01	0.01
4	0.2493	21.00	21.71	0.00	0.01	0.01
6	0.2330	21.07	22.02	0.00	0.01	0.01
8	0.2619	21.61	22.81	0.00	0.01	0.01

GRAMS DISSOLVED							4/29/94
Elapsed Time<-----Copper----->				<-----Nickel----->			
(Hours)	Sample	Flask	Total	Sample	Flask	Total	
0	0.00	0.00	0.00	0.00	0.00	0.00	
1	0.00	0.00	0.00	0.00	0.00	0.00	
2	0.00	0.00	0.00	0.00	0.00	0.00	
4	0.00	0.00	0.01	0.00	0.00	0.00	
6	0.00	0.01	0.01	0.00	0.00	0.00	
8	0.00	0.01	0.01	0.00	0.00	0.00	

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
7	1 hr	8.6715	22.1317	13.4602	13.001		
8	1 hr	8.6045	22.5574	13.9529	13.471		
9	2 hr	8.6841	22.9678	14.2837	13.784		
10	2 hr	8.6358	22.2395	13.6037	13.122		
11	4 hr	8.6687	22.3466	13.6779	13.188		
12	4 hr	8.7029	21.4454	12.7425	12.280		
13	6 hr	8.6642	20.3484	11.6842	11.255	Total Removed (g)	132.48
14	6 hr	8.6098	21.2829	12.6731	12.203		
15	8 hr	8.6881	22.0371	13.3490	12.848	Total Removed (mL)	127.71
16	8 hr	8.6249	21.6816	13.0567	12.561		

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-25	2.0095	0.7695	0.1100	0.1275	3.72
N200-25	2.0115	0.7670	0.1135	0.1280	3.74
M400-25	2.0090	0.7645	0.1100	0.1095	3.70

Grams Uranium Dioxide Added to Flask	30.00		
Weight Glass Filter Plus Deposit	14.7536		
Tare Weight Glass Filter	13.0000	Grams UO2 Lost	28.2464
Weight Deposit Remaining in Flask	1.7536		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.		
4	1 hr	0.0227	0.0293	0.0066		
5	2 hr	0.0228	0.0287	0.0059		
6	4 hr	0.0227	0.0269	0.0042		
7	6 hr	0.0228	0.0272	0.0044		
8	8 hr	0.0227	0.0280	0.0053		
					Total on Millipores (g)	0.0264

DOE Uranium Dioxide Dissolution Testing

Date of test: 5/6/94Solvent composition: 150g/L HNO₃ (62)
TEMP 150F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in ²)	Calculated General Corrosion (mils)
C1018-26	22.2348	0.0000	22.2348	3.80	45.331
N200-26	23.9387	0.0000	23.9387	3.68	50.446
M400-26	24.0375	0.0000	24.0375	3.72	50.162

Weight Reservoir Plus Solvent Before Transfer	0		
Weight Reservoir Plus Solvent After Transfer	0	Initial Density (g/L)	1.1010
Tare Weight Reservoir Flask	0		
Weight Solvent Transferred	0		
Volume Solvent Transferred	2500		
Weight Test Flask Plus Solvent After Test	0		
Tare Weight Test Flask	0	Final Density (g/L)	1.1300
Weight Solvent Remaining in Flask	0		
Volume Solvent Remaining in Flask	0		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	-0.55	0.0	0.000	0.000	0.000	0.000	0	0
1	-0.80	0.0	3.544	8.194	0.700	3.638	13.959	12.612
2	-0.47	0.0	3.062	8.197	1.430	8.225	11.505	10.341
4	-0.51	0.0	3.230	8.711	2.490	14.378	14.022	12.538
6	-0.58	0.0	3.352	8.948	2.849	15.933	14.022	11.614
8	-0.58	0.0	3.404	9.447	2.877	16.506	13.056	11.906

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0447	8.82	8.86	0.10	20.38	20.49
2	0.0317	7.58	7.66	0.08	20.30	20.49
4	0.0405	7.96	8.08	0.11	21.47	21.77
6	0.0389	8.22	8.38	0.10	21.95	22.35
8	0.0405	8.31	8.51	0.11	23.06	23.57

Copper				Nickel		
Elapsed Time<	GRAMS DISSOLVED			>		
(Hours)	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.01	1.71	1.72	0.05	8.88	8.93
2	0.01	3.49	3.51	0.09	20.08	20.21
4	0.03	6.08	6.13	0.18	35.10	35.41
6	0.03	6.95	7.04	0.19	38.89	39.39
8	0.03	7.02	7.14	0.20	40.29	40.98

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
1	1 hr	8.7029	22.6615	13.9586	12.612	
1	1 hr	0.0000	0.0000	0.0000	0.000	
2	2 hr	8.7002	20.2055	11.5053	10.341	
2	2 hr	0.0000	0.0000	0.0000	0.000	
3	4 hr	8.6000	22.6223	14.0223	12.538	
3	4 hr	0.0000	0.0000	0.0000	0.000	
4	6 hr	8.5903	21.6465	13.0562	11.614	Total Removed (g)
4	6 hr	0.0000	0.0000	0.0000	0.000	66.00
5	8 hr	8.6547	22.1088	13.4541	11.906	Total Removed (mL)
5	8 hr	0.0000	0.0000	0.0000	0.000	59.01

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in ²)
C1018-26	2.0315	0.7695	0.1170	0.1255	3.80
N200-26	2.0125	0.7560	0.1115	0.1235	3.68
M400-26	2.0125	0.7645	0.1115	0.1225	3.72

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	13.0149		
Tare Weight Glass Filter	13.0000	Grams UO ₂ Lost	9.9851
Weight Deposit Remaining in Flask	0.0149		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.	
19	1 hr	0.0215	0.0222	0.0007	
20	2 hr	0.0217	0.0218	0.0001	
21	4 hr	0.0215	0.0221	0.0006	
22	6 hr	0.0216	0.0220	0.0004	
23	8 hr	0.0216	0.0217	0.0001	
					Total on Millipores (g)
					0.0019

DOE Uranium Dioxide Dissolution Testing

Date of test: 6/7/94Solvent composition: 150g/L HNO₃ (63)
ROOM TEMP

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in ²)	Calculated General Corrosion (mils)
C1018-27	22.3548	0.0000	22.3548	3.77	45.940
N200-27	24.1876	11.3101	12.8775	3.73	26.782
M400-27	23.3751	10.9111	12.4640	3.73	25.902

Weight Reservoir Plus Solvent Before Transfer	4153		
Weight Reservoir Plus Solvent After Transfer	1426	Initial Density (g/L)	1.080
Tare Weight Reservoir Flask	1095		
Weight Solvent Transferred	2727		
Volume Solvent Transferred	2525		
Weight Test Flask Plus Solvent After Test	3876		
Tare Weight Test Flask	1229	Final Density (g/L)	1.110
Weight Solvent Remaining in Flask	2647		
Volume Solvent Remaining in Flask	2385		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	-0.25	0.0	0.000	0.000	0.000	0.000	0	0
1	-0.20	0.0	2.987	5.886	0.027	0.350	13.855	12.758
2	-0.18	0.0	3.517	8.507	0.221	1.375	13.980	12.803
4	-0.08	0.0	3.634	9.355	0.802	4.495	13.003	11.842
6	-0.04	0.0	3.655	9.430	1.258	6.642	13.003	11.541
8	-0.02	0.0	3.703	9.548	1.725	9.044	12.741	24.666

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0381	7.50	7.54	0.08	14.79	14.86
2	0.0450	8.79	8.87	0.11	21.26	21.45
4	0.0430	9.04	9.17	0.11	23.27	23.57
6	0.0422	9.05	9.22	0.11	23.35	23.75
8	0.0913	9.08	9.34	0.24	23.41	24.05

Copper				Nickel			
GRAMS DISSOLVED				6/7/94			
Elapsed Time<-----	Sample	Flask	Total	Sample	Flask	Total	>-----
(Hours)							
0	0.00	0.00	0.00	0.00	0.00	0.00	
1	0.00	0.07	0.07	0.00	0.86	0.86	
2	0.00	0.54	0.54	0.02	3.37	3.39	
4	0.01	1.97	1.98	0.05	11.02	11.09	
6	0.01	3.08	3.11	0.08	16.28	16.43	
8	0.04	4.23	4.30	0.22	22.17	22.55	

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
1	1 hr	8.6936	22.5487	13.8551	12.758		
1	1 hr	0.0000	0.0000	0.0000	0.000		
2	2 hr	8.8618	22.8422	13.9804	12.803		
2	2 hr	0.0000	0.0000	0.0000	0.000		
3	4 hr	8.6777	21.6802	13.0025	11.842		
3	4 hr	0.0000	0.0000	0.0000	0.000		
4	6 hr	8.6486	21.3898	12.7412	11.541	Total Removed (g)	80.96
4	6 hr	0.0000	0.0000	0.0000	0.000		
5	8 hr	8.7395	22.2022	13.4627	12.129	Total Removed (mL)	73.61
5	8 hr	8.6220	22.5388	13.9168	12.538		

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-27	2.0140	0.7690	0.1175	0.1255	3.77
N200-27	2.0095	0.7680	0.1120	0.1225	3.73
M400-27	2.0160	0.7695	0.1095	0.1230	3.73

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	0.2431		
Tare Weight Glass Filter	0.2107	Grams UO2 Lost	9.9676
Weight Deposit Remaining in Flask	0.0324		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.		
9	1 hr	0.0205	0.0208	0.0003		
10	2 hr	0.0205	0.0229	0.0024		
11	4 hr	0.0206	0.0226	0.0020	Total on Millipores (g)	0.0117
12	6 hr	0.0205	0.0238	0.0033		
13	8 hr	0.0205	0.0242	0.0037		

DOE Uranium Dioxide Dissolution Testing

Date of test: 6/8/94Solvent composition: 10g/L AMMONIUM CARBONATE 2.5g/L H₂O₂ @ pH 9.0 (64)
ROOM TEMP

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in ²)	Calculated General Corrosion (mils)
C1018-28	21.1773	21.1757	0.0016	3.68	0.003
N200-28	23.7329	23.7321	0.0008	3.70	0.002
M400-28	22.9511	22.9503	0.0008	3.67	0.002

Weight Reservoir Plus Solvent Before Transfer	3712		
Weight Reservoir Plus Solvent After Transfer	1190	Initial Density (g/L)	1.0090
Tare Weight Reservoir Flask	-		
Weight Solvent Transferred	2522		
Volume Solvent Transferred	2500		
Weight Test Flask Plus Solvent After Test	3599		
Tare Weight Test Flask	1327	Final Density (g/L)	1.0090
Weight Solvent Remaining in Flask	2272		
Volume Solvent Remaining in Flask	2252		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.01	0.0	0.000	0.000	0.000	0.000	0	0
1	8.95	0.0	1.330	0.005	0.003	0.007	24.211	23.995
2	8.99	0.0	1.508	<.003	0.003	0.003	24.878	24.656
4	8.99	0.0	1.662	<.003	<.003	<.003	24.296	20.416
6	9.00	0.0	1.790	<.003	<.003	<.003	20.600	23.011
8	8.98	0.0	2.200	<.003	<.003	<.003	18.847	20.061

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0319	3.29	3.32	0.00	0.01	0.01
2	0.0372	3.70	3.76	0.00	0.00	0.00
4	0.0339	4.04	4.14	0.00	0.00	0.00
6	0.0412	4.31	4.45	0.00	0.00	0.00
8	0.0441	5.25	5.44	0.00	0.00	0.00

GRAMS DISSOLVED

6/8/94

Elapsed Time<-----Copper----->					<-----Nickel----->			
(Hours)	Sample	Flask	Total		Sample	Flask	Total	
0	0.00	0.00	0.00		0.00	0.00	0.00	
1	0.00	0.01	0.01		0.00	0.02	0.02	
2	0.00	0.01	0.01		0.00	0.01	0.01	
4	0.00	0.00	0.00		0.00	0.00	0.00	
6	0.00	0.00	0.00		0.00	0.00	0.00	
8	0.00	0.00	0.00		0.00	0.00	0.00	

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
1	1 hr	8.6238	20.8308	12.2070	12.098		
1	1 hr	8.6534	20.6574	12.0040	11.897		
2	2 hr	8.7092	21.5820	12.8728	12.758		
2	2 hr	8.7465	20.7515	12.0050	11.898		
3	4 hr	8.6664	20.9570	12.2906	12.181		
3	4 hr	8.7268	17.0357	8.3089	8.235		
4	6 hr	8.6586	19.1965	10.5379	10.444	Total Removed (g)	113.15
4	6 hr	8.6869	21.3675	12.6806	12.567		
5	8 hr	8.7395	18.8832	10.1437	10.053	Total Removed (mL)	112.14
5	8 hr	8.6220	18.7196	10.0976	10.008		

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in ²)
C1018-28	2.0110	0.7470	0.1180	0.1270	3.68
N200-28	2.0095	0.7660	0.1095	0.1270	3.70
M400-28	2.0055	0.7650	0.1055	0.1255	3.67

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	4.6069		
Tare Weight Glass Filter	0.2127	Grams UO ₂ Lost	5.6058
Weight Deposit Remaining in Flask	4.3942		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.		
1	1 hr	0.0220	0.0234	0.0014		
2	2 hr	0.0222	0.0234	0.0012		
4	4 hr	0.0270	0.0281	0.0011	Total on Millipores (g)	0.0058
6	6 hr	0.0252	0.0258	0.0006		
8	8 hr	0.0206	0.0221	0.0015		

DOE Uranium Dioxide Dissolution Testing

Date of test: 6/10/94

Solvent composition: 10g/L AMMONIUM CARBONATE 2.5g/L H₂O₂ @ pH 9.0 (65)
ROOM TEMP - PEROXIDE ADDED AFTER 4 HOURS

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in ²)	Calculated General Corrosion (mils)
C1018-29	21.9550	21.9549	0.0001	3.76	0.000
N200-29	24.9915	24.9916	-0.0001	3.74	0.000
M400-29	22.6488	22.5750	0.0738	3.65	0.157

Weight Reservoir Plus Solvent Before Transfer	4230		
Weight Reservoir Plus Solvent After Transfer	1592	Initial Density (g/L)	1.0100
Tare Weight Reservoir Flask	1465		
Weight Solvent Transferred	2638		
Volume Solvent Transferred	2612		
Weight Test Flask Plus Solvent After Test	3854		
Tare Weight Test Flask	1229	Final Density (g/L)	1.0105
Weight Solvent Remaining in Flask	2625		
Volume Solvent Remaining in Flask	2598		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.10	0.0	0.000	0.000	0.000	0.000	0	0
2	8.89	0.0	0.104	0.141	0.004	0.030	0.000	0.000
4	8.86	0.0	0.113	0.147	0.005	0.035	11.841	11.722
6	9.08	0.0	0.940	0.150	0.008	0.040	11.459	11.342
8	9.06	0.0	0.966	0.156	0.009	0.040	11.459	22.993
9	9.09	0.0	1.730	0.156	0.010	0.047	12.984	20.144

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
2	0.0000	0.27	0.27	0.00	0.37	0.37
4	0.0013	0.29	0.30	0.00	0.38	0.38
6	0.0107	2.43	2.45	0.00	0.39	0.39
8	0.0222	2.48	2.51	0.00	0.40	0.41
9	0.0348	4.40	4.47	0.00	0.40	0.41

GRAMS DISSOLVED

6/10/94

Elapsed Time (Hours)	Copper			Nickel		
	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.01	0.01	0.00	0.08	0.08
4	0.00	0.01	0.01	0.00	0.09	0.09
6	0.00	0.02	0.02	0.00	0.10	0.10
8	0.00	0.02	0.02	0.00	0.10	0.10
9	0.00	0.02	0.02	0.00	0.12	0.12

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
1	1 hr	0.0000	0.0000	0.0000	0.000	
1	1 hr	0.0000	0.0000	0.0000	0.000	
2	2 hr	8.7854	20.6265	11.8411	11.722	
2	2 hr	0.0000	0.0000	0.0000	0.000	
3	4 hr	8.8178	20.2764	11.4586	11.342	
3	4 hr	0.0000	0.0000	0.0000	0.000	
4	6 hr	8.5878	21.5722	12.9844	12.852	Total Removed (g)
4	6 hr	8.6736	18.9218	10.2482	10.143	
5	8 hr	8.6558	18.8580	10.2022	10.097	Total Removed (mL)
5	9 hr	8.7129	18.8660	10.1531	10.048	
6	9hr	8.6315	18.8166	10.1851	10.079	

77.07

76.28

Coupon #	Length (in)	Width (in)	Height (in)	Hole D (in)	S.A. (in ²)
C1018-29	2.0155	0.7700	0.1135	0.1295	3.76
N200-29	2.0135	0.7675	0.1140	0.1260	3.74
M400-29	2.0125	0.7570	0.1055	0.1250	3.65

Grams Uranium Dioxide Added to Flask 10.00
 Weight Glass Filter Plus Deposit 17.8900
 Tare Weight Glass Filter 13.0204
 Weight Deposit Remaining in Flask 4.8696

Grams UO₂ Lost 5.1304

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.
1	1 hr	0.0206	0.0208	0.0002
2	2 hr	0.0206	0.0232	0.0026
4	4 hr	0.0206	0.0210	0.0004
6	6 hr	0.0206	0.0211	0.0005
8	8 hr	0.0204	0.0211	0.0007

Total on Millipores (g) 0.0044

DOE Uranium Dioxide Dissolution Testing

Date of test: 6/11/94Solvent composition: 20g/L AMMONIUM CARBONATE 5.0g/L H2O2 @ pH 9.0 (66)
ROOM TEMP

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in2)	Calculated General Corrosion (mils)
C1018-30	21.6435	21.6427	0.0008	3.76	0.002
N200-30	24.6018	24.6017	0.0001	3.73	0.000
M400-30	23.5342	23.5336	0.0006	3.72	0.001

Weight Reservoir Plus Solvent Before Transfer

-

Weight Reservoir Plus Solvent After Transfer

-

Initial Density (g/L)

1.0145

Tare Weight Reservoir Flask

-

Weight Solvent Transferred

-

Volume Solvent Transferred

2500

Weight Test Flask Plus Solvent After Test

3578

Tare Weight Test Flask

1229

Final Density (g/L)

1.0145

Weight Solvent Remaining in Flask

2349

Volume Solvent Remaining in Flask

2315

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	8.99	0.0	0.000	0.000	0.000	0.000	0	0
1	8.95	0.0	2.924	0.016	0.004	0.005	23.206	22.874
2	8.89	0.0	3.496	0.017	<0.003	<0.003	21.584	21.275
4	-	0.0	3.526	0.017	<0.003	<0.003	20.962	21.164
6	8.91	0.0	3.918	0.018	<0.003	<0.003	21.471	23.855
8	8.94	0.0	4.031	0.018	<0.003	<0.003	23.732	19.908

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0669	7.24	7.31	0.00	0.04	0.04
2	0.0744	8.59	8.73	0.00	0.04	0.04
4	0.0746	8.58	8.80	0.00	0.04	0.04
6	0.0935	9.45	9.75	0.00	0.04	0.05
8	0.0802	9.64	10.03	0.00	0.04	0.05

6/11/94

GRAMS DISSOLVED						
Elapsed Time (Hours)	Copper			Nickel		
	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.01	0.01	0.00	0.01	0.01
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
1	1 hr	8.6510	21.1740	12.5230	12.344	
1	1 hr	8.6227	19.3052	10.6825	10.530	
2	2 hr	8.6738	18.6907	10.0169	9.874	
2	2 hr	8.6813	20.2481	11.5668	11.401	
3	4 hr	8.6544	18.0499	9.3955	9.261	
3	4 hr	8.7556	20.8310	12.0754	11.903	
4	6 hr	8.7150	20.3718	11.6568	11.490	Total Removed (g)
4	6 hr	8.7362	21.2798	12.5436	12.364	
5	8 hr	8.6600	18.6320	9.9720	9.829	Total Removed (mL)
5	8 hr	8.7312	18.9560	10.2248	10.079	
						110.66
						109.08

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-30	2.0160	0.7690	0.1140	0.1250	3.76
N200-30	2.0080	0.7675	0.1130	0.1135	3.73
M400-30	2.0115	0.7690	0.1095	0.1275	3.72

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	0.2241		
Tare Weight Glass Filter	0.2142	Grams UO2 Lost	9.9901
Weight Deposit Remaining in Flask	0.0099		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.	
1	1 hr	0.0200	0.0207	0.0007	
2	2 hr	0.0200	0.0202	0.0002	
4	4 hr	0.0200	0.0202	0.0002	
6	6 hr	0.0208	0.0208	0.0000	
8	8 hr	0.0206	0.0211	0.0005	
					Total on Millipores (g)
					0.0016

DOE Uranium Dioxide Dissolution Testing

Date of test: 6/14/94

Solvent composition: 20g/L AMMONIUM CARBONATE 5.0g/L H₂O₂ @ pH 9.0 (67)
ROOM TEMP - 150°F - ROOM TEMP

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in ²)	Calculated General Corrosion (mils)
C1018-31	21.6775	21.6770	0.0005	3.74	0.001
N200-31	25.4706	25.4698	0.0008	3.76	0.002
M400-31	21.3207	21.3196	0.0011	3.59	0.002

Weight Reservoir Plus Solvent Before Transfer

-

Weight Reservoir Plus Solvent After Transfer

-

Initial Density (g/L)

1.0150

Tare Weight Reservoir Flask

-

Weight Solvent Transferred

2474

Volume Solvent Transferred

2437

Weight Test Flask Plus Solvent After Test

3857

Tare Weight Test Flask

1471

Final Density (g/L)

1.0150

Weight Solvent Remaining in Flask

2386

Volume Solvent Remaining in Flask

2351

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.00	0.0	0.000	0.000	0.000	0.000	0	0
1	9.00	0.0	2.544	<0.003	<0.003	<0.003	18.353	18.081
2	8.87	0.0	3.670	<0.003	<0.003	<0.003	20.764	20.457
4	8.83	0.0	3.780	<0.003	<0.003	<0.003	21.557	10.947
6	9.00	0.0	3.774	<0.003	<0.003	<0.003	11.111	19.631
8	9.02	0.0	3.944	<0.003	<0.003	<0.003	11.265	19.025

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0460	6.15	6.20	0.00	0.00	0.00
2	0.0751	8.80	8.93	0.00	0.00	0.00
4	0.0414	9.03	9.19	0.00	0.00	0.00
6	0.0741	8.94	9.17	0.00	0.00	0.00
8	0.0750	9.27	9.58	0.00	0.00	0.00

GRAMS DISSOLVED

6/14/94

Elapsed Time<-----Copper----->					<-----Nickel----->			
(Hours)	Sample	Flask	Total		Sample	Flask	Total	
0	0.00	0.00	0.00		0.00	0.00	0.00	
1	0.00	0.00	0.00		0.00	0.00	0.00	
2	0.00	0.00	0.00		0.00	0.00	0.00	
4	0.00	0.00	0.00		0.00	0.00	0.00	
6	0.00	0.00	0.00		0.00	0.00	0.00	
8	0.00	0.00	0.00		0.00	0.00	0.00	

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
1	1 hr	8.6672	17.9182	9.2510	9.114		
1	1 hr	8.6673	17.7688	9.1015	8.967		
2	2 hr	8.6673	18.9846	10.3173	10.165		
2	2 hr	8.6673	19.1136	10.4463	10.292		
3	4 hr	8.6673	19.7784	11.1111	10.947		
3	4 hr	0.0000	0.0000	0.0000	0.000		
4	6 hr	8.6673	19.9322	11.2649	11.098	Total Removed (g)	89.46
4	6 hr	8.6673	17.3276	8.6603	8.532		
5	8 hr	8.6673	18.3935	9.7262	9.582	Total Removed (mL)	88.14
5	8 hr	8.6673	18.2515	9.5842	9.443		

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-31	2.0145	0.7690	0.1115	0.1290	3.74
N200-31	2.0130	0.7695	0.1160	0.1240	3.76
M400-31	2.0110	0.7500	0.1005	0.1290	3.59

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	0.2241		
Tare Weight Glass Filter	0.2241	Grams UO2 Lost	10.0000
Weight Deposit Remaining in Flask	0.0000		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.		
1	1 hr	0.0215	0.0232	0.0017		
2	2 hr	0.0217	0.0217	0.0000		
4	4 hr	0.0217	0.0217	0.0000	Total on Millipores (g)	0.0019
6	6 hr	0.0215	0.0217	0.0002		
8	8 hr	0.0217	0.0217	0.0000		

DOE Uranium Dioxide Dissolution Testing

Date of test: 6/15/94

Solvent composition: 50 g/L EDTA + 20g/L AMMONIUM CARBONATE 5.0g/L H₂O₂ @ pH 9.0
ROOM TEMP - 150°F - ROOM TEMP (68)

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in ²)	Calculated General Corrosion (mils)
C1018-32	22.1442	21.7007	0.4435	3.75	0.918
N200-32	25.0863	25.0531	0.0332	3.73	0.069
M400-32	23.6453	23.5871	0.0582	3.70	0.122

Weight Reservoir Plus Solvent Before Transfer	-		
Weight Reservoir Plus Solvent After Transfer	-	Initial Density (g/L)	1.0150
Tare Weight Reservoir Flask	-		
Weight Solvent Transferred	-		
Volume Solvent Transferred	2500		
Weight Test Flask Plus Solvent After Test	-		
Tare Weight Test Flask	-	Final Density (g/L)	1.0150
Weight Solvent Remaining in Flask	-		
Volume Solvent Remaining in Flask	-		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.01	50.0	0.000	0.000	0.000	0.000	0	0
1	8.85	47.8	2.140	<0.003	<0.003	<0.003	26.756	26.360
2	8.78	45.7	3.504	<0.003	<0.003	<0.003	23.339	22.994
3	8.53	35.1	3.534	0.003	0.007	0.014	22.492	20.834
4	8.53	30.8	3.816	0.094	0.008	0.027	21.146	22.491
7	8.55	24.4	3.688	0.177	0.010	0.031	20.295	12.356
8	8.62	22.3	3.723	0.179	0.009	0.031	22.829	0.000

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0564	5.29	5.35	0.00	0.00	0.00
2	0.0806	8.59	8.72	0.00	0.00	0.00
3	0.0736	8.59	8.80	0.00	0.01	0.01
4	0.0858	9.19	9.48	0.00	0.23	0.23
7	0.0456	8.83	9.17	0.00	0.42	0.43
8	0.0000	8.92	9.26	0.00	0.43	0.43

6/15/94

GRAMS DISSOLVED

Elapsed Time<-----Copper----->				<-----Nickel----->			
(Hours)	Sample	Flask	Total	Sample	Flask	Total	
0	0.00	0.00	0.00	0.00	0.00	0.00	
1	0.00	0.00	0.00	0.00	0.00	0.00	
2	0.00	0.00	0.00	0.00	0.00	0.00	
3	0.00	0.02	0.02	0.00	0.03	0.03	
4	0.00	0.02	0.02	0.00	0.06	0.06	
7	0.00	0.02	0.02	0.00	0.07	0.07	
8	0.00	0.02	0.02	0.00	0.07	0.08	

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
1	1 hr	8.7561	21.8881	13.1320	12.938		
2	1 hr	8.7352	22.3588	13.6236	13.422		
3	1 hr	8.6264	20.4671	11.8407	11.666		
1	2 hr	8.7561	21.6571	12.9010	12.710		
2	2 hr	8.7352	21.3650	12.6298	12.443		
3	2 hr	8.6264	19.0645	10.4381	10.284		
1	3 hr	8.7561	20.8102	12.0541	11.876		
2	3 hr	8.7352	17.0482	8.3130	8.190		
3	3 hr	8.6264	17.7184	9.0920	8.958		
1	4 hr	8.7561	19.9587	11.2026	11.037	Total Removed (g)	173.86
2	4 hr	8.7352	20.3613	11.6261	11.454		
3	4 hr	8.6264	21.1674	12.5410	12.356	Total Removed (mL)	171.29
1	7 hr	8.7561	17.5807	8.8246	8.694		
2	7 hr	8.7352	20.4851	11.7499	11.576		
3	7 hr	8.6264	22.5206	13.8942	13.689		
1	8 hr	0.0000	0.0000	0.0000	0.000		
2	8 hr	0.0000	0.0000	0.0000	0.000		
3	8 hr	0.0000	0.0000	0.0000	0.000		

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-32	2.0165	0.7700	0.1115	0.1260	3.75
N200-32	2.0095	0.7620	0.1160	0.1270	3.73
M400-32	2.0140	0.7650	0.1080	0.1310	3.70

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	0.2241		
Tare Weight Glass Filter	0.2241	Grams UO2 Lost	10.0000
Weight Deposit Remaining in Flask	0.0000		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.
5	1 hr	0.0219	0.0229	0.0010
6	2 hr	0.0214	0.0225	0.0011
7	3 hr	0.0216	0.0219	0.0003
8	4 hr	0.0218	0.0225	0.0007
9	7 hr	0.0217	0.0220	0.0003
10	8 hr	0.0217	0.0227	0.0010

6/15/94

Total on Millipores (g) 0.0034

DOE Uranium Dioxide Dissolution Testing

Date of test: 6/16/94Solvent composition: 20g/L AMMONIUM CARBONATE 5.0g/L H2O2 @ pH 9.0 (69)
ROOM TEMP - 200°F - ROOM TEMP

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in2)	Calculated General Corrosion (mils)
C1018-33	22.5832	22.5827	0.0005	3.78	0.001
N200-33	24.5059	24.5052	0.0007	3.72	0.001
M400-33	23.9398	23.9393	0.0005	3.66	0.001

Weight Reservoir Plus Solvent Before Transfer	—		
Weight Reservoir Plus Solvent After Transfer	—	Initial Density (g/L)	1.0150
Tare Weight Reservoir Flask	—		
Weight Solvent Transferred	2612		
Volume Solvent Transferred	2573		
Weight Test Flask Plus Solvent After Test	3709		
Tare Weight Test Flask	1229	Final Density (g/L)	1.0150
Weight Solvent Remaining in Flask	2480		
Volume Solvent Remaining in Flask	2443		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.01	0.0	0.000	0.000	0.000	0.000	0	0
1	9.15	0.0	2.256	<0.003	<0.003	<0.003	22.334	22.004
2	9.14	0.0	2.698	<0.003	<0.003	<0.003	19.169	18.886
3	9.36	0.0	3.476	<0.003	<0.003	<0.003	22.705	22.369
4	9.47	0.0	3.498	<0.003	<0.003	<0.003	23.454	23.107
7	9.53	0.0	3.547	<0.003	<0.003	<0.003	21.915	21.591
8	9.43	0.0	3.548	<0.003	<0.003	<0.003	20.882	20.573

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0496	5.76	5.81	0.00	0.00	0.00
2	0.0510	6.83	6.93	0.00	0.00	0.00
3	0.0778	8.73	8.90	0.00	0.00	0.00
4	0.0808	8.70	8.96	0.00	0.00	0.00
7	0.0766	8.74	9.08	0.00	0.00	0.00
8	0.0730	8.67	9.08	0.00	0.00	0.00

GRAMS DISSOLVED

6/16/94

Elapsed Time (Hours)	Copper			Nickel		
	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
1	1 hr	8.6978	22.1547	13.4569	13.258		
2	1 hr	8.6767	17.5541	8.8774	8.746		
1	2 hr	8.6978	18.9897	10.2919	10.140		
2	2 hr	8.6767	21.0897	12.4130	12.230		
1	3 hr	8.6978	19.7384	11.0406	10.877		
2	3 hr	8.6767	19.5514	10.8747	10.714	Total Removed (g)	132.24
1	4 hr	8.6978	18.7051	10.0073	9.859		
2	4 hr	8.6767	19.1026	10.4259	10.272	Total Removed (mL)	130.29
1	7 hr	8.6978	20.8337	12.1359	11.957		
2	7 hr	8.6767	20.6809	12.0042	11.827		
1	8 hr	8.6978	19.5927	10.8949	10.734		
2	8 hr	7.1971	17.0190	9.8219	9.677		

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in ²)
C1018-33	2.0150	0.7710	0.1170	0.1235	3.78
N200-33	2.0100	0.7640	0.1130	0.1290	3.72
M400-33	2.0135	0.7500	0.1130	0.1275	3.66

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	0.4859		
Tare Weight Glass Filter	0.2241	Grams UO ₂ Lost	9.7382
Weight Deposit Remaining in Flask	0.2618		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.		
11	1 hr	0.0216	0.0218	0.0002		
12	2 hr	0.0217	0.0217	0.0000		
13	3 hr	0.0215	0.0216	0.0001		
14	4 hr	0.0216	0.0217	0.0001		
9	7 hr	0.0000	0.0000	0.0000		
15	8 hr	0.0215	0.0224	0.0009		
					Total on Millipores (g)	0.0004

DOE Uranium Dioxide Dissolution Testing

Date of test: 6/17/94Solvent composition: 50 g/L EDTA + 20g/L AMMONIUM CARBONATE 5.0g/L H2O2 @ pH 9.0
ROOM TEMP - 200°F - ROOM TEMP (70)

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in2)	Calculated General Corrosion (mils)
C1018-34	21.9642	21.2897	0.6745	3.72	1.405
N200-34	24.2024	24.1085	0.0939	3.72	0.196
M400-34	24.4355	24.3764	0.0591	3.71	0.124

Weight Reservoir Plus Solvent Before Transfer	-		
Weight Reservoir Plus Solvent After Transfer	-	Initial Density (g/L)	1.0320
Tare Weight Reservoir Flask	-		
Weight Solvent Transferred	-		
Volume Solvent Transferred	2500		
Weight Test Flask Plus Solvent After Test	-		
Tare Weight Test Flask	-	Final Density (g/L)	1.0320
Weight Solvent Remaining in Flask	-		
Volume Solvent Remaining in Flask	-		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.01	52.2	0.000	0.000	0.000	0.000	0	0
1	8.83	51.1	1.720	<0.003	<0.003	<0.003	24.260	23.508
2	9.01	45.5	2.314	<0.003	<0.003	<0.003	23.663	22.929
3	9.38	28.4	3.358	0.081	0.005	0.023	22.052	19.300
4	9.04	25.0	3.416	0.219	0.007	0.047	19.917	22.816
7	9.25	21.6	3.566	0.276	0.008	0.054	19.421	21.389
8	9.26	21.0	3.516	0.271	0.009	0.058	23.546	11.622

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0404	4.26	4.30	0.00	0.00	0.00
2	0.0531	5.68	5.77	0.00	0.00	0.00
3	0.0648	8.17	8.33	0.00	0.20	0.20
4	0.0779	8.24	8.47	0.00	0.53	0.53
7	0.0763	8.52	8.84	0.01	0.66	0.67
8	0.0409	8.36	8.72	0.00	0.64	0.66

6/17/94

GRAMS DISSOLVED

Elapsed Time<-----Copper----->				<-----Nickel----->			
(Hours)	Sample	Flask	Total	Sample	Flask	Total	
0	0.00	0.00	0.00	0.00	0.00	0.00	
1	0.00	0.00	0.00	0.00	0.00	0.00	
2	0.00	0.00	0.00	0.00	0.00	0.00	
3	0.00	0.01	0.01	0.00	0.05	0.05	
4	0.00	0.02	0.02	0.00	0.11	0.11	
7	0.00	0.02	0.02	0.00	0.13	0.13	
8	0.00	0.02	0.02	0.00	0.14	0.14	

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
1	1 hr	8.6299	19.2659	10.6360	10.306		
2	1 hr	8.7129	22.3369	13.6240	13.202		
3	1 hr	8.5763	21.3695	12.7932	12.397		
1	2 hr	8.6299	21.1180	12.4881	12.101		
2	2 hr	8.7129	21.2097	12.4968	12.109		
3	2 hr	8.5763	19.7509	11.1746	10.828		
1	3 hr	8.6299	19.5069	10.8770	10.540		
2	3 hr	8.7129	20.3349	11.6220	11.262		
3	3 hr	8.5763	17.6166	9.0403	8.760		
1	4 hr	8.6299	19.0109	10.3810	10.059	Total Removed (g)	210.89
2	4 hr	8.7129	21.8781	13.1652	12.757		
3	4 hr	8.5763	18.6561	10.0798	9.767	Total Removed (mL)	204.36
1	7 hr	8.6299	19.3172	10.6873	10.356		
2	7 hr	8.7129	21.0585	12.3456	11.963		
3	7 hr	8.5763	21.5076	12.9313	12.530		
1	8 hr	8.6299	21.0013	12.3714	11.988		
2	8 hr	8.7129	20.9001	12.1872	11.809		
3	8 hr	8.5763	20.5703	11.9940	11.622		

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in ²)
C1018-34	2.0155	0.7620	0.1135	0.1235	3.72
N200-34	2.0135	0.7660	0.1115	0.1265	3.72
M400-34	2.0140	0.7595	0.1135	0.1295	3.71

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	0.7453		
Tare Weight Glass Filter	0.2129	Grams UO ₂ Lost	9.4676
Weight Deposit Remaining in Flask	0.5324		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.
16	1 hr	0.0216	0.0225	0.0009
17	2 hr	0.0215	0.0223	0.0008
18	3 hr	0.0215	0.0219	0.0004
19	4 hr	0.0215	0.0227	0.0012
20	7 hr	0.0216	0.0221	0.0005
21	8 hr	0.0218	0.0263	0.0045

Total on Millipores (g)	0.0038
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6/17/94

DOE Uranium Dioxide Dissolution Testing

Date of test: 6/21/94Solvent composition: 20g/L AMMONIUM CARBONATE 5.0g/L H2O2 @ pH 9.0 (71)
150°F – ROOM TEMP

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in2)	Calculated General Corrosion (mils)
C1018-35	22.0292	22.0290	0.0002	3.76	0.000
N200-35	24.3456	24.3455	0.0001	3.72	0.000
M400-35	24.1512	24.1510	0.0002	3.73	0.000

Weight Reservoir Plus Solvent Before Transfer	—		
Weight Reservoir Plus Solvent After Transfer	—	Initial Density (g/L)	1.0150
Tare Weight Reservoir Flask	—		
Weight Solvent Transferred	—		
Volume Solvent Transferred	2500		
Weight Test Flask Plus Solvent After Test	—		
Tare Weight Test Flask	—	Final Density (g/L)	1.0150
Weight Solvent Remaining in Flask	—		
Volume Solvent Remaining in Flask	—		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.01	0.0	0.000	0.000	0.000	0.000	0	0
2	8.89	0.0	3.687	<0.003	<0.003	<0.003	22.959	22.620
4	8.90	0.0	3.398	<0.003	<0.003	<0.003	24.410	24.049
5.5	8.96	0.0	3.437	<0.003	<0.003	<0.003	25.105	24.734
6.5	8.98	0.0	3.465	<0.003	<0.003	<0.003	24.121	23.765
8.5	8.99	0.0	3.780	<0.003	<0.003	<0.003	25.651	25.272

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
2	0.0834	9.13	9.22	0.00	0.00	0.00
4	0.0817	8.34	8.50	0.00	0.00	0.00
5.5	0.0850	8.35	8.60	0.00	0.00	0.00
6.5	0.0823	8.33	8.67	0.00	0.00	0.00
8.5	0.0955	8.99	9.42	0.00	0.00	0.00

Elapsed Time (Hours)	Copper			Nickel		
	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00
6.5	0.00	0.00	0.00	0.00	0.00	0.00
8.5	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
1	2 hr	8.6818	21.1756	12.4938	12.309		
2	2 hr	8.5404	19.0054	10.4650	10.310		
1	4 hr	8.6818	22.6270	13.9452	13.739		
2	4 hr	8.5404	19.7003	11.1599	10.995		
1	5.5 hr	8.6818	21.6432	12.9614	12.770		
2	5.5 hr	8.5404	21.2298	12.6894	12.502	Total Removed (g)	122.20
1	6.5 hr	8.6818	21.2373	12.5555	12.370		
2	6.5 hr	8.5404	19.0979	10.5575	10.401	Total Removed (mL)	120.40
1	8.5 hr	8.6818	20.9956	12.3138	12.132		
2	8.5 hr	8.5404	21.6001	13.0597	12.867		
1	9.						
2	9.						

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-35	2.0115	0.7690	0.1165	0.1250	3.76
N200-35	2.0125	0.7635	0.1135	0.1250	3.72
M400-35	2.0095	0.7675	0.1125	0.1260	3.73

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	0.2241		
Tare Weight Glass Filter	0.2241	Grams UO2 Lost	10.0000
Weight Deposit Remaining in Flask	0.0000		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.		
22	2 hr	0.0215	0.0215	0.0000		
23	4 hr	0.0217	0.0217	0.0000		
24	5.5hr	0.0215	0.0215	0.0000		
25	6.5hr	0.0215	0.0215	0.0000		
26	8.5hr	0.0214	0.0214	0.0000		
					Total on Millipores (g)	0.0000

DOE Uranium Dioxide Dissolution Testing

Date of test: 6/22/94Solvent composition: 50 g/L EDTA + 20g/L AMMONIUM CARBONATE 5.0g/L H2O2 @ pH 9.0
150°F - ROOM TEMP (72)
NO PEROXIDE DURING 150°F CYCLE

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in2)	Calculated General Corrosion (mils)
C1018-36	21.4462	21.4460	0.0002	3.74	0.000
N200-36	25.4204	25.4001	0.0203	3.74	0.042
M400-36	24.0251	24.0068	0.0183	3.72	0.038

Weight Reservoir Plus Solvent Before Transfer

Weight Reservoir Plus Solvent After Transfer

Tare Weight Reservoir Flask

Weight Solvent Transferred

Volume Solvent Transferred

2500

Initial Density (g/L)

1.0320

Weight Test Flask Plus Solvent After Test

Tare Weight Test Flask

Weight Solvent Remaining in Flask

Volume Solvent Remaining in Flask

Final Density (g/L)

1.0320

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.00	54.8	0.000	0.000	0.000	0.000	0	0
2	8.97	54.8	0.159	<0.003	<0.003	0.008	23.627	22.894
4	8.82	54.8	0.163	<0.003	<0.003	0.010	24.552	23.791
5.5	8.88	36.9	1.552	<0.003	0.004	0.011	24.896	24.124
6.5	8.87	40.5	3.164	<0.003	<0.003	0.013	24.333	23.578
8.5	8.88	42.8	3.606	<0.003	<0.003	0.012	25.146	24.366

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
2	0.0036	0.39	0.40	0.00	0.00	0.00
4	0.0039	0.40	0.41	0.00	0.00	0.00
5.5	0.0374	3.77	3.82	0.00	0.00	0.00
6.5	0.0746	7.61	7.73	0.00	0.00	0.00
8.5	0.0879	8.59	8.79	0.00	0.00	0.00

GRAMS DISSOLVED

6/22/94

Elapsed Time (Hours)	Copper			Nickel		
	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.02	0.02
4	0.00	0.00	0.00	0.00	0.02	0.03
5.	0.00	0.01	0.01	0.00	0.03	0.03
6.5	0.00	0.00	0.00	0.00	0.03	0.03
8.5	0.00	0.00	0.00	0.00	0.03	0.03

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
1	2 hr	8.6411	20.7018	12.0607	11.687		
2	2 hr	8.6382	20.2041	11.5659	11.207		
1	4 hr	8.6411	21.6274	12.9863	12.584		
2	4 hr	8.6382	20.5474	11.9092	11.540		
1	5.5 hr	8.6411	21.0648	12.4237	12.038		
2	5.5 hr	8.6382	21.3607	12.7225	12.328	Total Removed (g)	117.86
1	6.5 hr	8.6411	18.2870	9.6459	9.347		
2	6.5 hr	8.6382	19.6900	11.0518	10.709	Total Removed (mL)	114.21
1	8.5 hr	8.6411	20.0927	11.4516	11.097		
2	8.5 hr	8.6382	20.6803	12.0421	11.669		
1	9.						
2	9.						

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-36	2.0115	0.7680	0.1135	0.1285	3.74
N200-36	2.0105	0.7625	0.1175	0.1250	3.74
M400-36	2.0115	0.7655	0.1115	0.1245	3.72

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	13.2588		
Tare Weight Glass Filter	13.0000	Grams UO2 Lost	9.7412
Weight Deposit Remaining in Flask	0.2588		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.		
1	2 hr	0.0215	0.0215	0.0000		
2	4 hr	0.0217	0.0217	0.0000		
3	5.5hr	0.0215	0.0215	0.0000	Total on Millipores (g)	0.0000
4	6.5hr	0.0215	0.0215	0.0000		
5	8.5hr	0.0214	0.0214	0.0000		

DOE Uranium Dioxide Dissolution Testing

Date of test: 6/23/94

Solvent composition: 20g/L AMMONIUM CARBONATE 5.0g/L H2O2 @ pH 9.0 (73)
200°F - ROOM TEMP

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in2)	Calculated General Corrosion (mils)
C1018-37	21.6031	21.6030	0.0001	3.74	0.000
N200-37	25.1637	25.1636	0.0001	3.74	0.000
M400-37	23.6716	23.6713	0.0003	3.71	0.001

Weight Reservoir Plus Solvent Before Transfer	-		
Weight Reservoir Plus Solvent After Transfer	-	Initial Density (g/L)	1.0510
Tare Weight Reservoir Flask	-		
Weight Solvent Transferred	-		
Volume Solvent Transferred	2500		
Weight Test Flask Plus Solvent After Test	3555		
Tare Weight Test Flask	-	Final Density (g/L)	1.0510
Weight Solvent Remaining in Flask	-		
Volume Solvent Remaining in Flask	-		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.06	0.0	0.000	0.000	0.000	0.000	0	0
2	9.07	0.0	3.498	0.006	<0.003	<0.003	18.099	17.221
4	9.24	0.0	3.553	0.004	<0.003	<0.003	22.576	21.480
5.5	9.43	0.0	3.638	<0.003	<0.003	<0.003	24.937	23.727
6.5	9.43	0.0	3.477	<0.003	<0.003	<0.003	21.724	20.670
8.5	9.35	0.0	3.442	0.004	<0.003	<0.003	19.928	18.961

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
2	0.0602	8.68	8.75	0.00	0.01	0.01
4	0.0763	8.74	8.88	0.00	0.01	0.01
5.5	0.0863	8.87	9.09	0.00	0.00	0.00
6.5	0.0719	8.40	8.70	0.00	0.00	0.00
8.5	0.0653	8.25	8.61	0.00	0.01	0.01

6/23/94

GRAMS DISSOLVED						
Elapsed Time<-----Copper----->				<-----Nickel----->		
(Hours)	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
5.	0.00	0.00	0.00	0.00	0.00	0.00
6.5	0.00	0.00	0.00	0.00	0.00	0.00
8.5	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
1	2 hr	8.7454	17.2707	8.5253	8.112	
2	2 hr	8.7200	18.2941	9.5741	9.110	
1	4 hr	8.7454	21.7471	13.0017	12.371	
2	4 hr	8.7200	20.6551	11.9351	11.356	
1	5.5 hr	8.7454	18.5341	9.7887	9.314	
2	5.5 hr	8.7200	18.8593	10.1393	9.647	Total Removed (g)
1	6.5 hr	8.7454	19.7902	11.0448	10.509	
2	6.5 hr	8.7200	18.8192	10.0992	9.609	Total Removed (mL)
1	8.5 hr	8.7200	19.3378	10.6178	10.103	
2	8.5 hr	8.7454	20.7179	11.9725	11.392	
1	9.					
2	9.					

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in ²)
C1018-37	2.0185	0.7645	0.1135	0.1250	3.74
N200-37	2.0135	0.7620	0.1165	0.1250	3.74
M400-37	2.0115	0.7655	0.1105	0.1260	3.71

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	0.7910		
Tare Weight Glass Filter	0.2106	Grams UO ₂ Lost	9.4196
Weight Deposit Remaining in Flask	0.5804		

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.	
9	2 hr	0.0220	0.0220	0.0000	
10	4 hr	0.0221	0.0221	0.0000	
11	5.5hr	0.0221	0.0228	0.0007	
12	6.5hr	0.0222	0.0229	0.0007	
13	8.5hr	0.0220	0.0232	0.0012	
					Total on Millipores (g)
					0.0026

DOE Uranium Dioxide Dissolution Testing

Date of test: 6/24/94Solvent composition: 50g/L EDTA + 20g/L AMMONIUM CARBONATE 5.0g/L H2O2 @ pH 9.0
200°F - ROOM TEMP (74)

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in2)	Calculated General Corrosion (mils)
C1018-40	21.2158	20.9883	0.2275	3.72	0.475
N200-40	23.8220	23.8089	0.0131	3.77	0.027
M400-38	22.7878	22.7338	0.0540	3.70	0.113

Weight Reservoir Plus Solvent Before Transfer

-

Weight Reservoir Plus Solvent After Transfer

-

Initial Density (g/L)

1.0325

Tare Weight Reservoir Flask

-

Weight Solvent Transferred

-

Volume Solvent Transferred

2500

Weight Test Flask Plus Solvent After Test

-

Tare Weight Test Flask

-

Final Density (g/L)

1.0325

Weight Solvent Remaining in Flask

-

Volume Solvent Remaining in Flask

-

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.05	51.1	0.000	0.000	0.000	0.000	0	0
2	8.96	48.9	0.159	0.058	<0.003	0.004	22.142	21.445
4	8.97	48.9	0.114	0.080	<0.003	0.007	22.523	21.814
6	9.28	43.5	1.414	0.081	<0.003	0.008	21.195	20.528
7	9.28	43.5	1.348	0.081	0.004	0.014	22.385	21.681
8	9.30	43.5	1.337	0.081	0.005	0.018	22.123	21.427

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
2	0.0034	0.39	0.40	0.00	0.14	0.14
4	0.0025	0.28	0.29	0.00	0.20	0.20
6	0.0290	3.44	3.48	0.00	0.20	0.20
7	0.0292	3.25	3.32	0.00	0.20	0.20
8	0.0286	3.20	3.29	0.00	0.19	0.20

6/24/94

Elapsed Time (Hours)	Copper			Nickel		
	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.01	0.01
4	0.00	0.00	0.00	0.00	0.02	0.02
6	0.00	0.00	0.00	0.00	0.02	0.02
7	0.00	0.01	0.01	0.00	0.03	0.03
8	0.00	0.01	0.01	0.00	0.04	0.04

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
1	2 hr	8.7047	19.5930	10.8883	10.546	
2	2 hr	8.7875	20.0411	11.2536	10.899	
3	2 hr	8.7358	19.3739	10.6381	10.303	
1	4 hr	8.6820	19.9515	11.2695	10.915	
2	4 hr	8.6763	20.3705	11.6942	11.326	
3	4 hr	8.6880	18.6134	9.9254	9.613	
1	6 hr	8.6820	21.1419	12.4599	12.068	
2	6 hr	8.6763	18.2106	9.5343	9.234	
3	6 hr	8.6880	18.3512	9.6632	9.359	Total Removed (g)
1	7 hr	8.6820	17.8421	9.1601	8.872	
2	7 hr	8.6763	20.6946	12.0183	11.640	Total Removed (mL)
3	7 hr	8.6880	18.8882	10.2002	9.879	
1	8 hr	8.6820	21.1619	12.4799	12.087	
2	8 hr	8.6763	19.1934	10.5171	10.186	
3	8 hr	8.6880	21.9274	13.2394	12.823	

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-40	2.0140	0.7655	0.1105	0.1250	3.72
N200-40	2.0150	0.7690	0.1160	0.1245	3.77
M400-38	2.0120	0.7690	0.1065	0.1285	3.70

Grams Uranium Dioxide Added to Flask	10.00	
Weight Glass Filter Plus Deposit	19.2974	
Tare Weight Glass Filter	13.0000	
Weight Deposit Remaining in Flask	6.2974	
	Grams UO2 Lost	3.7026

Millipore #	Sple Time	Tare Wt.	After Wt.	Deposit Wt.	
14	2 hr	0.0221	0.0263	0.0042	
15	4 hr	0.0221	0.0386	0.0165	
16	5.5hr	0.0221	0.0244	0.0023	
17	6.5hr	0.0220	0.0235	0.0015	
18	8.5hr	0.0220	0.0287	0.0067	
				Total on Millipores (g)	0.0312

DOE Uranium Dioxide Dissolution Testing

Date of test: 6/28/94Solvent composition: ESI-600 (NS) @pH 6.86 (75)
TEMP 200°F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in2)	Calculated General Corrosion (mils)
C1018-39	22.2906	21.7969	0.4937	3.72	1.030
N200-39	24.1746	24.1695	0.0051	3.76	0.011
M400-39	22.2355	22.2322	0.0033	3.67	0.007

Weight Reservoir Plus Solvent Before Transfer	—		
Weight Reservoir Plus Solvent After Transfer	—	Initial Density (g/L)	1.0650
Tare Weight Reservoir Flask	—		
Weight Solvent Transferred	—		
Volume Solvent Transferred	2500		
Weight Test Flask Plus Solvent After Test	4119		
Tare Weight Test Flask	2890	Final Density (g/L)	1.1300
Weight Solvent Remaining in Flask	1229		
Volume Solvent Remaining in Flask	1088		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	6.86	NA	0.000	0.000	0.000	0.000	0	0
1	7.34	NA	0.096	0.038	<0.003	<0.003	13.563	12.358
2	7.45	NA	0.104	0.065	<0.003	<0.003	13.387	12.198
4	7.40	NA	0.108	0.099	<0.003	<0.003	12.462	11.355
6	7.55	NA	0.116	0.133	<0.003	<0.003	12.462	13.089
8	7.21	NA	0.115	0.165	<0.003	<0.003	14.366	13.084

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0012	0.24	0.24	0.00	0.09	0.09
2	0.0013	0.26	0.26	0.00	0.16	0.16
4	0.0012	0.27	0.27	0.00	0.24	0.25
6	0.0015	0.29	0.29	0.00	0.33	0.33
8	0.0015	0.28	0.29	0.00	0.40	0.41

6/28/94

GRAMS DISSOLVED						
Copper				Nickel		
Elapsed Time (Hours)	Sample	Flask	Total	Sample	Flask	Total
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.	
1	1 hr	8.6695	22.2322	13.5627	12.735	
2	1 hr	0.0000	0.0000	0.0000	0.000	
1	2 hr	8.6695	22.0569	13.3874	12.570	
2	2 hr	0.0000	0.0000	0.0000	0.000	
1	4 hr	8.6695	21.1313	12.4618	11.701	
2	4 hr	0.0000	0.0000	0.0000	0.000	
1	6 hr	8.6695	23.0350	14.3655	13.489	Total Removed (g)
2	6 hr	0.0000	0.0000	0.0000	0.000	68.14
1	8 hr	8.6695	23.0295	14.3600	13.484	Total Removed (mL)
2	8 hr	0.0000	0.0000	0.0000	0.000	63.98

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-39	2.0145	0.7570	0.1165	0.1250	3.72
N200-39	2.0120	0.7685	0.1160	0.1240	3.76
M400-39	2.0060	0.7685	0.1025	0.1255	3.67

Grams Uranium Dioxide Added to Flask	10.00	
Weight Glass Filter Plus Deposit	22.0378	
Tare Weight Glass Filter	13.0000	Grams UO2 Lost
Weight Deposit Remaining in Flask	9.0378	0.9622

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.	
19	1 hr	0.0220	0.0356	0.0136	
20	2 hr	0.0219	0.0376	0.0157	
21	4 hr	0.0221	0.0350	0.0129	
22	6 hr	0.0219	0.0424	0.0205	
23	8 hr	0.0219	0.0344	0.0125	
					Total on Millipores (g)
					0.0752

DOE Uranium Dioxide Dissolution Testing

Date of test: 6/29/94

Solvent composition: ESI-600 (NS) @pH 6.86 (76)

TEMP 150°F

Coupon #	Pre-Weight	Post-Weight	Weight Loss	S.A.(in2)	Calculated General Corrosion (mils)
C1018-38	20.9553	20.7435	0.2118	3.72	0.442
N200-38	25.1153	25.1117	0.0036	3.75	0.007
M400-40	23.0191	23.0131	0.0060	3.69	0.013

Weight Reservoir Plus Solvent Before Transfer	—		
Weight Reservoir Plus Solvent After Transfer	—	Initial Density (g/L)	1.0405
Tare Weight Reservoir Flask	—		
Weight Solvent Transferred	—		
Volume Solvent Transferred	2500		
Weight Test Flask Plus Solvent After Test	4172		
Tare Weight Test Flask	2890	Final Density (g/L)	1.1300
Weight Solvent Remaining in Flask	1282		
Volume Solvent Remaining in Flask	1135		

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sphe Wt (g)	Sphe Vol (ml)
0	6.86	NA	0.000	0.000	0.000	0.000	0	0
1	7.14	NA	0.041	0.014	<0.003	<0.003	13.924	12.830
2	7.03	NA	0.063	0.020	<0.003	<0.003	13.396	12.344
4	7.08	NA	0.087	0.036	<0.003	<0.003	13.085	12.057
6	7.07	NA	0.095	0.049	<0.003	<0.003	13.085	11.145
8	7.21	NA	0.107	0.070	<0.003	<0.003	12.095	10.771

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
1	0.0005	0.10	0.10	0.00	0.03	0.03
2	0.0008	0.16	0.16	0.00	0.05	0.05
4	0.0010	0.21	0.22	0.00	0.09	0.09
6	0.0011	0.23	0.24	0.00	0.12	0.12
8	0.0012	0.26	0.27	0.00	0.17	0.17

6/29/94

GRAMS DISSOLVED

Elapsed Time<-----Copper----->				<-----Nickel----->			
(Hours)	Sample	Flask	Total	Sample	Flask	Total	
0	0.00	0.00	0.00	0.00	0.00	0.00	
1	0.00	0.00	0.00	0.00	0.00	0.00	
2	0.00	0.00	0.00	0.00	0.00	0.00	
4	0.00	0.00	0.00	0.00	0.00	0.00	
6	0.00	0.00	0.00	0.00	0.00	0.00	
8	0.00	0.00	0.00	0.00	0.00	0.00	

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.		
1	1 hr	8.6970	22.6208	13.9238	12.830		
2	1 hr	0.0000	0.0000	0.0000	0.000		
1	2 hr	8.6970	22.0928	13.3958	12.344		
2	2 hr	0.0000	0.0000	0.0000	0.000		
1	4 hr	8.6970	21.7821	13.0851	12.057		
2	4 hr	0.0000	0.0000	0.0000	0.000		
1	6 hr	8.6970	20.7923	12.0953	11.145	Total Removed (g)	64.19
2	6 hr	0.0000	0.0000	0.0000	0.000		
1	8 hr	8.6970	20.3867	11.6897	10.771	Total Removed (mL)	59.15
2	8 hr	0.0000	0.0000	0.0000	0.000		

Coupon #	Length (in)	Width(in)	Height (in)	Hole D (in)	S.A. (in2)
C1018-38	2.0135	0.7675	0.1095	0.1250	3.72
N200-38	2.0135	0.7660	0.1165	0.1250	3.75
M400-40	2.0145	0.7635	0.1075	0.1270	3.69

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	22.1039		
Tare Weight Glass Filter	13.2105	Grams UO2 Lost	1.1066
Weight Deposit Remaining in Flask	8.8934		

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.		
24	1 hr	0.0219	0.0427	0.0208		
25	2 hr	0.0216	0.0344	0.0128		
26	4 hr	0.0216	0.0406	0.0190	Total on Millipores (g)	0.0711
27	6 hr	0.0212	0.0334	0.0122		
28	8 hr	0.0213	0.0276	0.0063		

DOE Uranium Dioxide Dissolution Testing

Date of test: 6/30/94

Solvent composition:

ESI-600 (NS) + 20 g/L AMMONIUM CARBONATE + 6g/L H2O2
ROOM TEMP @pH 9.0 (77)

Coupon # Pre-Weight Post-Weight Weight Loss S.A.(in2) Calculated General Corrosion (mils)

Weight Reservoir Plus Solvent Before Transfer

Weight Reservoir Plus Solvent After Transfer

Tare Weight Reservoir Flask

Weight Solvent Transferred

Volume Solvent Transferred

2500

Initial Density (g/L)

1.0405

Weight Test Flask Plus Solvent After Test

Tare Weight Test Flask

Weight Solvent Remaining in Flask

Volume Solvent Remaining in Flask

Final Density (g/L)

1.1300

ANALYTICAL RESULTS

Sample Time (Hours)	pH	g/L Chelant	g/L Uranium	g/L Iron	g/L Copper	g/L Nickel	Sple Wt (g)	Sple Vol (ml)
0	9.00	NA	0.000	0.000	0.000	0.000	0	0
2	8.90	NA	1.406	<0.003	<0.003	<0.003	29.571	26.724
3	8.83	NA	2.185	<0.003	<0.003	<0.003	30.159	27.234
5	8.80	NA	2.625	<0.003	<0.003	<0.003	31.669	29.020

GRAMS DISSOLVED

Elapsed Time (Hours)	Uranium			Iron		
	Sample	Flask	Total	Sample	Flask	Total
0	0.0000	0.00	0.00	0.00	0.00	0.00
2	0.0376	3.48	3.51	0.00	0.00	0.00
3	0.0595	5.34	5.44	0.00	0.00	0.00
5	0.0762	6.34	6.52	0.00	0.00	0.00

GRAMS DISSOLVED

6/30/94

Elapsed Time<-----Copper----->				<-----Nickel----->			
(Hours)	Sample	Flask	Total	Sample	Flask	Total	
0	0.00	0.00	0.00	0.00	0.00	0.00	
2	0.00	0.00	0.00	0.00	0.00	0.00	
3	0.00	0.00	0.00	0.00	0.00	0.00	
5	0.00	0.00	0.00	0.00	0.00	0.00	

Syringe #	Sple Time	Tare Wt.	After Wt.	Sple Wt.	Sample Vol.
1	2 hr	8.7160	23.9280	15.2120	14.017
2	2 hr	8.1753	22.5343	14.3590	12.707
1	3 hr	8.7610	23.6733	14.9123	13.741
2	3 hr	8.1753	23.4223	15.2470	13.493
1	5 hr	8.7160	25.1384	16.4224	15.132
2	5 hr	8.1753	23.8687	15.6934	13.888

Total Removed (g) 91.85

Total Removed (mL) 82.98

Coupon # Length (in) Width(in) Height (in) Hole D (in) S.A. (in²)

Grams Uranium Dioxide Added to Flask	10.00		
Weight Glass Filter Plus Deposit	15.4910		
Tare Weight Glass Filter	13.0000	Grams UO ₂ Lost	7.5090
Weight Deposit Remaining in Flask	2.4910		

Millipore #	Sple Time	Tare Wt.	Filter Wt.	Deposit Wt.		
1	2 hr	0.0204	0.0436	0.0232		
2	3 hr	0.0206	0.0348	0.0142		
3	5 hr	0.0207	0.0388	0.0181		
27	6 hr	0.0000	0.0000	0.0000	Total on Millipores (g)	0.0555
28	8 hr	0.0000	0.0000	0.0000		