UNITED STATES DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
[formerly National Bureau of Standards]
Gaithersburg, Maryland 20899

February 28, 1989

Mr. Charles Peterson
Technical Review Branch
Division of High-Level Waste Management
Office of Nuclear Materials Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Re: Monthly Letter Status Report for October 1988 (FIN-A-4171-7)

Dear Mr. Peterson:

Enclosed is the October 1988 monthly progress report for the project "Evaluation and Compilation of DOE Waste Package Test Data" (FIN-A-4171-7). The financial information is attached to this letter.

Sincerely,

Charles G. Interrante

Charles G. Interrante
Program Manager
Corrosion Group
Metallurgy Division

Enclosures

Distribution:
WM Docket Control Center (1-original)

1/1

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A-4171
NH14

Monthly Letter Report for October 1988

Published January 1989

(FIN-A-4171-7)

Performing Organization: National Institute for Standards and Technology (NIST)
Gaithersburg, MD 20899

Sponsor: Nuclear Regulatory Commission (NRC)
Office of Nuclear Materials Safety and Safeguards
Washington, DC 20555

TASK 1 -- REVIEW OF WASTE PACKAGE DATA BASE

Appended to this report are the following Draft Reviews not previously submitted (see p. 9 to 15). Comments by the NRC and its contractors are solicited.

1. UCID-21272, "Plan for Spent Fuel Waste Form Testing for NNWSI," February 1987.

2. UCRL-92941, "Corrosion Processes of Austenitic Stainless Steels and Copper-Based Materials in Gamma-Irradiated Aqueous Environments," September 1985.

Status of Database

1013 Document citations in HLW database.
78 Completed reviews in HLW database (taken from Vols. 1 to 4).
15 Draft and completed reviews for Vol. 5.

Status of Recently Listed Reviewable Documents

Reviewable documents are classified as follows: papers currently being reviewed (Category 1), review when time permits (Category 2) and file with cross reference(s) to related report(s) (Category 3).

NNWSI

- 8 NNWSI reports currently under review (Category 1).
- 15 NNWSI reports to review when time permits (Category 2).
- 0 NNWSI reports to file with cross reference(s) to other reports (Category 3).
- 3 NNWSI reports identified and not yet categorized.
- 15 NNWSI reports received and not yet categorized.

GLASS -- VITRIFIED WASTE FORM

- 2 Reports currently under review (Category 1).
- 4 Reports to review when time permits (Category 2).
- 0 Reports to file with cross reference(s) to other reports (Category 3).
- 0 Reports identified and not yet categorized.

Database searches for the month of October, 1988 include the National Technical Information Services (NTIS), DOE Energy Database, and Compendex. Examples of the search conducted for each of these databases are presented at the end of this report.

STATUS OF REVIEWS OF NNWSI REPORTS

NNWSI -- Reports recently identified for review

Using equilibrated J-13 water at 90°C and a gamma radiation field of $1x10^4$ rd/h, SRL 165 type glass was leached for 182 days. Normalized leach rates show glass dissolution to be incongruent following a sequence $Li \geq Na \geq B \sim U \geq Si$. The concentration of the actinides, Am and Pu, is controlled by their solubility from the matrix [Abrajano, 1988].

An estimate of the release rate of radionuclides for waste packages, containing glass-based waste, is calculated. The assumptions and limitations of the estimate are described for upper limit dissolution conditions. A repository closure date of 2050 is assumed for the calculations [Aines, 1986].

This is a semiannual report of a 52-week trial run of a test method for obtaining data on the release of waste components from the waste package. Using SRL frit borosilicate glass at 90°C in J-13 water, leach tests have been conducted simulating unsaturated repository conditions (drip tests).

In a second set of experiments, test parameters are varied (parametric tests), and the data compared to the unsaturated tests. The authors conclude that the test procedure is relevant to repository conditions [Bates, 1986].

1. Abrajano, T. A., Bates, J. K., Gerding, T. J. and Ebert, W. L., "The Reaction of Glass During Gamma Irradiation in a Saturated Tuff Environment, Part 3: Long-Term Experiments at $1x10^4$ rad/hr," ANL-88-14, February 1988.

2. Aines, R. D., "Estimates of Radionuclide Release from Glass Waste Forms in a Tuff Repository and the Effects on Regulatory Compliance," UCRL-93735, April 1986.

3. Bates, J. K., Gerding, T. J., Abrajano, T. A. and Ebert, W., "NNWSI Waste Form Testing at Argonne National Laboratory, UCRL-15801, March 1986.

NNWSI --

Category 1 -- Reports currently being reviewed

1. HEDL-TME 85-22, "Results from Cycles 1 and 2 of NNWSI Series 2 Spent Fuel Dissolution Tests," May 1987.

2. UCRL-21019, SAN-662,-027, "Recent Results from NNWSI Spent Fuel Leaching/Dissolution Tests," April 1987.

3. UCRL-21013, "Summary of Results from the Series 2 and Series 3 NNWSI Bare Fuel Dissolution Tests," November 1987.

4. UCRL-53761, "Waste Package Performance Assessment: Deterministic System Model Program Scope and Specification," October 1986.

5. UCRL-95961, "Copper Corrosion in Irradiated Environments. The Influence of H_2O_2 on the Electrochemistry of Copper Dissolution in HCl Electrolyte," December 1986.

6. UCID-20450, "Concept of Waste Package Environment Tests in the Yucca Mountain Exploratory Shaft," May 1985.

7. UCRL-52658, "Calculation of Chemical Equilibrium between Aqueous Solution and Minerals: the EQ3/6 Software Package," February 1979.

8. UCID-21323, "Preliminary Technique Assessment for Nondestructive Evaluation Certification of the NNWSI Disposal Container Closure," November 1987.

9. Ringas, C. and Robinson, F., "Corrosion of Stainless Steel by Sulfate-Reducing Bacteria - Total Immersion Test Results," NACE, Corrosion, Vol. 44(9), September 1988.

Category 1 (continued) - Status of Reviews not yet sent to NRC and WERB

Document No.	Assigned to Reviewer	First Draft Completed	Lead Worker	Program Manager
HEDL-TME 85-22	x			
UCRL-21019	x			
UCRL-21013	x			
UCRL-53761				x
UCRL-95961	x			
UCID-20450	x			
UCRL-52658				x
UCID-21323	x			

Category 2 -- Review as time permits

1. UCRL-95962, "Hydrogen Speciation in Hydrated Layers on Nuclear Waste Glass," January 1987.

2. UCRL-94658, "Integrated Testing of the SRL-165 Glass Waste Form," December 1986.

3. UCRL-91258, "Leaching Savannah River Plant Nuclear Waste Glass in a Saturated Tuff Environment," November 1984.

4. ANL-84-81, "NNWSI Phase II Materials Interaction Test Procedures and Preliminary Results," January 1985.

5. HEDL-7540, "Technical Test Description of Activities to Determine the Potential for Spent Fuel Oxidation in a Tuff Repository," June 1985.

6. HEDL-SA-3627, "Predicting Spent Fuel Oxidation States in a Tuff Repository," April 1987.

7. UCRL-15976, SANL-522-006, "Microstructural Characteristics of PWR Spent Fuel Relative to its Leaching Behavior", April 1985.

8. UCRL-96702, "Geochemical Simulation of Reaction Between Spent Fuel Waste Form and J-13 Water at 25°C and 90°C," November 1987.

9. UCRL-53702, "Spent Fuel Test - Climax: An Evaluation of the Technical Feasibility of Geologic Storage of Spent Nuclear Fuel in Granite," March 1986.

10. UCID-21274, "Plan for Integrated Testing for NNWSI Non EQ3/6 Data Base Portion," May 1987.

11. UCRL-94721, "Leaching of Actinide-Doped Nuclear Waste Glass in a Tuff-Dominated System," UCRL-94721, January 1987.

12. UCRL-90044, Ballou, L. B., "Waste Package for a Repository Located in Tuff," November 1983.

13. UCRL-89475, Knauss, K. G., Oversby, V. M., and Wolery, T. J., "Post Emplacement Environment of Waste Packages," November 1983.

14. UCID-21323, Day, R. A., "Preliminary Technique Assessment for Nondestructive Evaluation Certification of the NNWSI Disposal Container Closure," November 1987.

15. WHC-EP-0107, Woodley, R. E., Einzinger, R. E., and Buchanan, H. C., "Measurement of the Oxidation of Spent Fuel Between 140° and 225°C by Thermogravimetric Analysis," September 1988.

Category 3 -- File and cross reference

None this month.

OTHER REPORTS ON VITRIFIED WASTE FORM --

Category 1 -- Reports currently being reviewed

1. PNL-5157, "Final Report of the Defense High-Level Waste Leaching Mechanisms Program," August 1984.

Chapter 4, "Dissolution of Specific Radionuclides," has been assigned and no draft has been received to date. Chapter 6, "Phenomenological Models of Nuclear Waste Glass Leaching" has been assigned and a first draft has been received and is being reviewed by the lead worker. The other chapters of PNL-5157 have already been reviewed by NBS.

2. DP-MS-87-157, "Prediction of Glass Durability as a Function of Glass Composition and Test Conditions: Thermodynamics and Kinetics", a paper proposed for Presentation at the Conference on Advances in the Fusion of Glass, Alfred, NY, June 14-17, 1988.

Status of Reviews not yet sent to NRC and WERB

Document No.	Assigned to Reviewer	First Draft Completed	Lead Worker	Program Manager
PNL-5157 Chapter 4	x			
PNL-5157 Chapter 6			x	
DP-MS-87-157		x		

Category 2 -- Review as time permits

1. "Large Scale Leach Testing of DWPF Canister Sections," Proceedings of the Materials Research Society Symposium, "Scientific Basis for Nuclear Waste Management X," December 1986.

2. "Waste Glass Leaching: Chemistry and Kinetics," Proceedings of the Materials Research Society Symposium, "Scientific Basis for Nuclear Waste Management X," December 1986.

3. PNL-6353, "Comprehensive Data Base of High-Level Nuclear Waste Glasses: September 1987 Status Report: Volume 2, Additional Appendices," December 1987.

4. DOE/NE/44139--34, "Preliminary Results of Durability Testing with Borosilicate Glass Composition," January 1987.

Category 3 -- File and cross reference

None this month.

TASK 3 -- LABORATORY TESTING

A. Title of Study: Evaluation of Methods for Detection of Stress Corrosion Crack Propagation in Fracture Mechanics Samples.
Principal Investigator: Charles Interrante

Precracking was done on three additional test specimens: Longitudinal test specimen (LT orientation) 6/1c was precracked only to train the operator on the precracking technique. Specimens ST5v, ST6v, and ST7v were then precracked. These three test specimens are of the short-transverse orientation as is that of ST2v, which was tested earlier. The "v" designation in this series of test specimens is given to indicate that the root radius of a 45-degree groove -- which runs along the sides of the test specimen and is used both to promote triaxiality of stress in the test specimen and to control the direction of crack advance during the test -- was 0.007 inches instead of the value of 0.025 inches used previously. This sharp root-radius was inadvertently machined into these specimens and, due to this, it was not certain that these specimens would prove to be satisfactory.

The testing of Specimen ST2v was completed. Optical examination of the test specimen revealed that cracking of this specimen did not proceed in the desired direction. Rather, a branch crack, which formed just beyond the fatigue precrack, propagated into one of the legs of the test specimen. This branch cracking rendered the data taken on this specimen unsuitable for the types of analyses that are being made in this experiment. Our analysis indicates that branch cracking of this test specimen is due to the combination of the high hardness of the test specimen (Rockwell C 35 to 38) and the low root radius (0.007 inches). Thus, plans were made to test specimens of lower hardness, and specimen ST5v was selected for use in the next test. Preparation of this specimen and check out of the apparatus was completed this month.

B. Title of Study: Effect of Resistivity and Transport on Corrosion of Waste Package Materials.
Principal Investigator: Edward Escalante

The simulated soil used in the corrosion cells was prepared for the "second experiment" as follows. Silica sand, prepared in accordance with ASTM C-190 and C-109, was sieved and separated into several size groups (e.g., 30-40 mesh, 40-50 mesh, 50-60 mesh, and 60-100 mesh). After sieving, the sand is washed in flowing tap water and then is given a final rinse in distilled water before drying. The sand particles have been characterized by manually measuring the width and length of approximately 100 particles within each mesh group. In this way, the particle size distribution is determined. Unfortunately, this is a very slow, time consuming process, and we are looking into the possibility of using a scanning electron microscope coupled to an instrument that can automatically count particles and determine their size distribution. An earlier attempt at crushing large sand particles (20-30 mesh) in a ball mill to make smaller particles did not prove successful due to contamination of the sand.

C. Title of Study: Pitting Corrosion of Steel Used for Nuclear Waste Storage.
Principal Investigator: Anna C. Fraker

It was reported in September that some results of the studies of the corrosion behavior of mild steel were to be presented at the symposium on Corrosion of Nuclear Waste Containers at the Electrochemical Society Meeting in Chicago, Illinois on October 13, 1988, and this was done. The interactions with other scientists who were studying corrosion of materials considered for use in nuclear waste storage were valuable and interesting.

It has been discussed in earlier reports that the open-circuit electrode potential of the A27 steel, upon immersion in water with neutral or alkaline pH at 21°C or at 95°C, is negative vs. SCE and drops to a more negative value indicating that the metal is corroding. Applying the ASTM stimulation test, F-746 for Pitting and Crevice Corrosion Susceptibility, does not result in the establishment of a pitting potential. The current was always high and there was no indication of an additional sharp increase in current or in passivation. Localized corrosion in this material is related to the cementite (more noble component) of the pearlitic regions and to impurities of discontinuities in the microstructure.

D. Title of Study: Corrosion Behavior of Zircaloy Nuclear Fuel Cladding
Principal Investigator: Anna C. Fraker

Specimens of Zircaloy-2 were prepared and mounted for conducting the 95°C tests. Specimens were welded to a titanium lead, which was sealed off with epoxy and coated with silicone. Zircaloy-2 and Zircaloy-4 materials were cut in preparation for additional cutting and specimen preparation.

Future plans include studies of long term exposure, studies of welded materials, electrochemical studies of the surface oxide, effects of solution pH, effects of various ions and application of additional testing to study localized corrosion.

TASK 4 - GENERAL TECHNICAL ASSISTANCE

Dr. Charles Interrante attended Materials Research Society Fall Meeting to participate in the International Symposium on the Scientific Basis for Nuclear Waste Management in Berlin, Germany on October 8-14, 1988. A trip report will be sent under separate cover.

See also Task 3, Laboratory Testing; Mr. Edward Escalante and Dr. Anna Fraker presented papers (on their laboratory testing studies) at the October 1988 meeting of the Electrochemical Society.

D R A F T

NIST Review of Technical Reports on the High-Level Waste Package for Nuclear Waste Storage

DATA SOURCE

(a) Organization Producing Data

Lawrence Livermore National Laboratory, Livermore, CA. For the NNWSI Project, U.S. DOE.

(b) Author(s), Reference, Reference Availability

Shaw, H. F., "Plan for Spent Fuel Waste Form Testing for NNWSI," UCID-21272, November, 1987.

DATE REVIEWED: 12/6/88.

PURPOSE

The purpose of this report is to explain the purposes and objectives of spent-fuel waste-form testing, to give a rationale for studies conducted and quality assurance level assignments, to describe tests, analyses and characterization of spent fuel, to generate models for radionuclide release from spent fuel and to discuss application of results and how test plans support the study plan. "The report is based on the Waste Form Spent Fuel Scientific Investigation Plan (SIP) for WBS element 1.2.2.3.1 for NNWSI. This SIP should be used as a reference document."

"... to address directly...information needs taken from the NNWSI Project Issues Hierarchy (version dated 8/7/86): Issue 1.5, Will the waste package and repository engineered barriers meet the performance objective for radionuclide release as required by 10-CFR-60.113?. 1.5.1 Waste package design features that affect the rate of radionuclide release. 1.5.2 Material properties of the waste forms. 1.5.3 Scenarios and models needed to predict the rate of radionuclide release from the waste package and engineered barrier system. ... the results of the spent fuel activities sill provide data to help resolve information needs 1.4.4, 1.5.4 and 1.5.5 and issues 1.1, 1.4 1.9 1.10 and 1.11. The structure of this ... SIP closely parallels the information needs listed above and the discussion in Chapt. 8 of the NNWSI Project SCP."

KEY WORDS

Planned work, spent fuel, corrosion, oxidation, Zircaloy, stainless steel, uranium dioxide.

CONTENTS

This report consists of 30 pages:

AMOUNT OF DATA

This is a test plan. There is no data. There are a number of activities, D-20-(40-52) deal with integration of information, testing, meeting information needs and quality assurance level. Previously issued test plans and additional test plans are listed.

TEST CONDITIONS

Some test conditions discussed in the plan include dissolution rate of irradiated spent fuel, radionuclide release rates from spent fuel, solution chemistry of water in contact with spent fuel and UO_2 in saturated, semi-static and in unsaturated conditions in J-13 water and in deionized water. Other studies involve the oxidation of UO_2, corrosion tests of cladding, carbon-14 inventory and release rate, developing techniques for test planning and design and generating models. Spent fuel data from vendors, utilities and other sources would be integrated. Referenced tests were conducted on specimens from pressurized water reactors (PWRs) and at ambient hot cell temperatures, 85°C and 25°C in silica reaction vessels with loose-fitting lids and in sealed 304 stainless steel vessels. Tests were conducted on bare fuel, and on fuel with and without defective cladding. Data used will be qualified at Quality Assurance (QA) Level I. Future tests are expected to use Approved Testing Materials (ATMs) provided by the Materials Characterization Center (MCC). Fuels also will include those from boiling water reactors and some stainless steel clad fuel.

UNCERTAINTIES IN DATA

None given by author.

DEFICIENCIES/LIMITATIONS IN DATABASE

None given by author.

CONCLUSIONS OF AUTHOR

None given by author.

COMMENTS OF REVIEWER

This plan coupled with the referenced SCP, addresses many of the questions that need to be considered in any determination of radionuclide release from spent fuel. Since this paper is a plan covering spent fuel, many issues, information needs and activities were cited, and each of these subjects, along with plans concerning it, would warrant a critical evaluation. Integration of information is planned, and quality assurance levels for the data are given.

The details of needed tests related to questions raised were not given, and it is not clear that the planned tests are the only tests needed to answer the questions. More information on the tests probably is available in the Waste Form Spent Fuel SIP, which is recommended as a reference document.

Some of the ten previously issued test plans relating to spent fuel have been critically reviewed and are in the NIST/NRC data base. There are seven additional test plans listed in the paper and the author states that other test plans will be added as the need arises. It will be evident from reading the reviewer's comments on the test plan in the data base that the tests, while providing useful data, are not sufficient to answer the question they address. An example of this is "Zircaloy spent fuel cladding electrochemical corrosion experiment at 170°C and 120 psia H_2O" by H. D. Smith, HEDL-7545. This is a well planned and useful test but does not provide needed electrochemical data.

Test method development, e.g., through the Materials Characterization Center (MCC), would be useful as well as peer review of planned tests.

RELATED HLW REPORTS

1. Yucca Mountain Site Characterization Plan (SCP)
2. Waste Form Spent Fuel Scientific Investigation Plan (SIP)
3. Wilson, C. N., "Test Plan for Series 2 Spent Fuel Cladding Containment Credit Tests," HEDL-TC-2353-3 (1984).
4. Wilson, C. N., "Test Plan for Cladding Containment Credit Tests," HEDL-TC-2353-2 (1983).
5. Smith, H. D., Zircaloy Spent Fuel Cladding Electrochemical Corrosion-Scoping Experiment," HEDL-TC-2562 (1984).
6. Einziger, R. E., "Technical Test Description of Activities to Determine the Potential for Spent Fuel Oxidation in a Tuff Repository," HEDL-7540 (1985).
7. Smith, H. D, "Zircaloy Cladding Corrosion Degradation in a Tuff Repository," HEDL-7455, Rev.1 (1985).
8. Einziger, R. E., "Test Plan for Series 2 Thermogravimetric Analyses of Spent Fuel Oxidation," HEDL-7556 (1986).

9. Smith, H. D., "C-Ring Stress Corrosion Cracking Scoping Experiment for Zircaloy Spent Fuel Cladding," HEDL-7546 (1986).
10. Smith, H. D., "Zircaloy Spent Fuel Cladding Electrochmical Corrosion Experiment at 170°C and 120 PSIA H_2O, " HEDL-7545 (1986).
11. Wilson, C. N., "Test Plan for Series 3 NNWSI Spent Fuel Leaching/Dissolution Test," HEDL-7577 (1986).
12. Einziger, R. E. and Woodley, R. E., "Test Plan for Long-Term, Low-Temperature Oxidation of Spent Fuel, Series 1, HEDL-7560 (1986).

APPLICABILITY OF DATA TO LICENSING
[Ranking: key data (X), supporting ( )]

(a) Relationship to Waste Package Performance Issues Already Identified

2.3.1 regarding physical, chamical and mechanical properties of the waste form and how these properties change and alter the ability of the waste form to contribute to the overall performance of the repository system.
2.3.2 regarding the solubility of the waste form under potential repository conditions.
2.3.5 regarding how corrosion products interact with the waste form.
2.3.6.1 regarding predicted rate of failure for failure mechanisms.
2.3.6 relating to spent fuel damage and failure mechanisms.
2.3.6.2 regarding predicted size of cladding breach associated with a given failure mechanism.
2.3.6.3 regarding how defects alter the retention capability of the spent-fuel waste form.

(b) New Licensing Issues

(c) General Comments on Licensing

NIST Review of Technical Reports on the High-Level Waste Package for Nuclear Waste Storage

DATA SOURCE

(a) Organization Producing Report

Lawrence Livermore National Laboratory, Livermore CA. For the NNWSI Project, U.S. DOE.

(b) Author(s), Reference, Reference Availability

Glass, R. S., Van Konynenburg, R. A., and Overturf, G. E., "Corrosion Processes of Austenitic Stainless Steels and Copper-Base Materials in Gamma-Irradiated Aqueous Environments," UCRL-92941, September 1985.

DATE REVIEWED: 11/29/88; Revised 12/12/88; 12/20/88.

PURPOSE

This paper presents old data (from UCRL-92311) on the electrochemical behavior of austenitic stainless steel in the presence of γ-irradiation and H_2O_2, together with similar data concerning pure copper (CDA-102).

KEY WORDS

Experimental data, scoping test, electrochemical, laboratory, J-13 water, gamma radiation field, ambient pressure, ambient temperature, copper base, stainless steel, 316L stainless steel, CDA102 copper, open circuit potential, corrosion (irradiation).

CONTENTS

Text: 7 pages, 6 figures, of which only 3 are new. 2 Tables, both old.

TEST CONDITIONS

J-13 water + γ-irradiation (3.3 Mrd/h), or + addition of a drop of 30% hydrogen peroxide. Temperature = 30°C.

AMOUNT OF DATA

Apart from repeating data on stainless steel, the paper contains:

Fig. 4. Open circuit potential vs. time for Cu/J-13 water: effect of switching γ-irradiation on and off.

Fig. 5. Open circuit potential vs. time for Cu/J-13 water: effect of adding one drop of 30% H_2O_2.

Fig. 6. Photograph of CDA 102 rod after irradiation at 3 Mrd/h for 15 days, half immersed in J-13 water, half in contact with moist air.

UNCERTAINTIES IN DATA

None given.

DEFICIENCIES/LIMITATIONS IN DATABASE

None given.

CONCLUSIONS OF AUTHOR

"Gamma irradiation increases the oxidizing nature of the aqueous solutions used in this study through production of •OH and H_2O_2. These species probably account for the observed positive corrosion potential shifts for stainless steels, copper, and copper alloys. The observed corrosion potentials are mixed potentials, resulting from a complex superposition of all the cathodic processes (e.g., reduction of •OH, O_2, and H_2O_2) and anodic processes (e.g., metal dissolution) occurring at the metal surface."

"Copper and its alloys are known to be very catalytic towards the decomposition of H_2O_2, a radiolytic product. In solution, the surfaces of copper and its alloys appear to be more affected (oxidized) in irradiated environments than those of stainless steels. With regard to corrosion potential shifts under irradiation, the same general behavior as for stainless steels (positive corrosion potential shifts) is observed initially. However, the corrosion potentials then decline to relatively less positive values. This may be related to a decreased efficiency for catalytic decomposition of H_2O_2, resulting from surface oxidation or adsorption of intermediate species."

"In addition to the work reported above, preliminary results from other experiments involving stainless steels, copper, and copper alloys in J-13 well water and its concentrated forms (to 100x), show that the positive corrosion potential shifts observed under irradiation are not sufficient to shift the metal into the pitting corrosion regime. Detailed studies are currently underway to evaluate the effect of irradiation on localized corrosion susceptibility (e.g., to pitting and crevice corrosion) of prospective nuclear waste container materials."

COMMENTS OF REVIEWER

The report contains no section called "Conclusions". The part reported in the preceding section of this review is called "Summary". Therefore, it is not surprising that the first two paragraphs are essentially a restatement of the results, which look quite reasonable. They show that for Cu, they are qualitatively in agreement with the belief that the principal effect of γ-irradiation is to provide a local, oxidizing environment, dominated by the presence of hydrogen peroxide. However, these data do not yet lead to an estimation of the corrosion rate in the repository, nor do they give any information on the likelihood of localized attack.

In the last paragraph, the authors mention that "preliminary results" indicate that γ-irradiation does not seem to increase the danger of pitting. However, no data are presented. If these "encouraging results" are nothing more than the two curves in Fig. 11 of UCRL-92311, this reviewer does not think that there is anything to be encouraged about.

RELATED HLW REPORTS

1. Glass, R. S., Overturf, G. E., Van Konynenburg, R. A., McCright, R. D., "Gamma Radiation Effects on Corrosion: I Electrochemical Mechanisms for the Aqueous Corrosion Processes of Austenitic Stainless Steels," UCRL-92311 (1985).
2. Reed, D. T., "Effect of Ionizing Radiation on Moist Air Systems," UCRL-97936 (1987).

APPLICABILITY OF DATA TO LICENSING
[Ranking: key data ( ), supporting (x)]

(a) Relationship to Waste Package Performance Issues Already Identified

2.2.4.2 Effects of radiation on the corrosion failure modes and associated corrosion rates for the waste package container

(b) New Licensing Issues

(c) General Comments

SDI006, UD 8822, SER. DD016

File(s) searched:

File 6:NTIS - 64-88/ISS22
(COPR. 1988 NTIS)

Sets selected:

Set	Items	Description
1	1	WASTE(W)PACKAGE?
2	1	CANISTER?
3	46	CORROSION
4	11	LEACHING
5	59	GLASS
6	5	VITRIFICATION
7	107	S3-S6/OR
8	7	HIGH(W)LEVEL(W)WASTE?
9	57	RADIOACTIVE(W)WASTE?
10	9	NUCLEAR(W)WASTE?
11	1	(S1 OR S2) AND S7 AND (S8 OR S9 OR S10)
12	0	ANNA FRAKER RM. B-106 BLDG. 223 X6009
13	0	JILL RUSPI

Prints requested ('*' indicates user print cancellation) :

Date	Time	Description
23oct	23:47EST	PR 11/5/1-25 (items 1-1)

Total items to be printed: 1

SDI008, UD 8810, SER. DD001

File(s) searched:

File 8:COMPENDEX PLUS - 70-88/OCT COPR. ENGINEERING INFO INC. 1988)

Sets selected:

Set	Items	Description
1	0	WASTE()PACKAGE?
2	3	CANISTER?
3	588	CORROSION
4	33	LEACHING
5	366	GLASS
6	3	VITRIFICATION
7	960	CORROSION OR LEACHING OR GLASS OR VITRIFICATION
8	1595	METAL?
9	1073	STEEL?
10	4	ZIRCALOY
11	154	TITANIUM
12	303	COPPER
13	2403	METAL? OR STEEL? OR ZIRCALOY OR TITANIUM OR COPPER
14	4	ZIRCALOY?
15	2403	S13-S14/OR
16	0	HIGH()LEVEL()WASTE?
17	27	RADIOACTIVE()WASTE?
18	10	NUCLEAR()WASTE?
19	0	(1OR2) AND (S7 AND S15) AND (S16 OR S17 OR S18)
20	2	(S1 OR S2) AND (S7 AND S15)
21	2	S20 AND (S16 OR S17 OR S18)
22	2	S21/1984-1988
23	2	S22/1986-1988
24	0	ANNA FRAKER BLDG. 223 RM. B244 X6009

Prints requested ('*' indicates user print cancellation) :

Date	Time	Description
26oct	08:17EST	PR S21/5/ALL (items 1-2)

Total items to be printed: 2

SDI103, UD 8820, SER. DD017

File(s) searched:

File 103:DOE ENERGY - 83-88/OCT(ISS20)

Sets selected:

Set	Items	Description
1	4	WASTE(W)PACKAGE?
2	9	CANISTER?
3	161	CORROSION (1974 DEC)
4	36	LEACHING (1974 DEC)
5	93	GLASS (1974 DEC)
6	26	VITRIFICATION (1974 DEC)
7	276	S3-S6/OR
8	13	HIGH(W)LEVEL(W)WASTE?
9	226	RADIOACTIVE(W)WASTE?
10	41	NUCLEAR(W)WASTE?
11	1	(S1 OR S2) AND S7 AND (S8 OR S9 OR S10)
12	0	ANNA FRAKER RM. B-106 BLDG. 223 X6009
13	0	JILL RUSPI

Prints requested ('*' indicates user print cancellation) :

Date	Time	Description
27oct	21:29EST	PR 11/5/1-25 (items 1-1)

Total items to be printed: 1