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ANL-02/9

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ANL-02/9

ARGONNE NATIONAL LABORATORY
9700 South Cass Avenue
Argonne, Illinois 60439-4837

CORROSION TESTS WITH URANIUM- AND PLUTONIUM-LOADED CERAMIC WASTE FORMS

by

L. R. Morss, S. G. Johnson,* W. L. Ebert, T. DiSanto,* S. M. Frank, J. L. Holly, A. J. Kropf, C. J. Mertz, M. Noy,* T. P. O'Holleran,* M. K. Richmann, W. Sinkler,* Y. Tsai, and A. R. Warren*

Chemical Engineering Division

*Engineering Technology Division
Argonne National Laboratory-West
P.O. Box 2528
Idaho Falls, ID 83403

April 2002

CONTENTS

Page

ACKNOWLEDGEMENTS ix

NOMENCLATURE x

ABSTRACT xi

1. INTRODUCTION 1

2. MATERIAL PREPARATION 5
   2.1 HIP U,PU-LOADED CWF 5
   2.2 PC U,PU-LOADED CWF 5
   2.3 COMPOSITION 6
   2.4 MICROSTRUCTURE 6

3. DESCRIPTION OF CORROSION TESTS 10
   3.1. TEST PROCEDURE 10
   3.2 TEST MATRICES 13
   3.3 CALCULATION OF NORMALIZED ELEMENTAL MASS LOSS, NL(*i*) 14
      3.3.1 RWS Component of NL(*i*) 15
      3.3.2 Acid Soak Component of NL(*i*) 16
      3.3.3 450-nm, 100-nm, and 5-nm Filtrate Components of NL(*i*) 16
      3.3.4 CWF Surface Area and Water Volume 17
      3.3.5 Elemental Mass Fractions 18

4. CORROSION TESTS RESULTS 19
   4.1 RAPID WATER-SOLUBLE STEP 19
   4.2 TESTS WITH HIP U,PU-LOADED CWF 20
      4.2.1 Boron Concentrations in Different Filtrates 20
      4.2.2 Disposition of Nd, U, and Pu Between Colloidal, Dissolved, and Sorbed Fractions 21
      4.2.3 Comparison of NL(*i*) Values for Tests with HIP U,Pu-loaded CWF Materials 22
   4.3 TESTS WITH PC U,PU-LOADED CWF MATERIALS GPC00202 AND GPC0030M 23
      4.3.1 Disposition of Nd, U, and Pu Between Colloidal, Dissolved, and Sorbed Fractions 23
      4.3.2 Comparison of NL(*i*) for Tests with PC U,Pu-loaded CWF 24
   4.4 OTHER ANALYSES 24
      4.4.1 Examination of Coupons Recovered from Tests 24
      4.4.2 Comparison of Tests Conducted in Different Vessel Types 27
      4.4.3 Comparison of Parallel Tests Conducted at ANL-E and ANL-W 28
      4.4.4 Replicate Filtration with 5-nm Pore-Size Filters 29
      4.4.5 Sequential Acid Soaks 30

5. CHARACTERIZATION OF COLLOIDAL MATERIAL 31
   5.1 DYNAMIC LIGHT SCATTERING ANALYSIS 31
   5.2 TRANSMISSION ELECTRON MICROSCOPY OF PARTICLES FROM U,PU-LOADED CWF PCT SOLUTIONS 33
   5.3 X-RAY ABSORPTION FINE-STRUCTURE SPECTROSCOPY (XAFS) 34

CONTENTS (continued)

Page

6. DISCUSSION 36

7. SUMMARY 41

REFERENCES 42

APPENDIX A. CORROSION TEST PROCEDURE 109

APPENDIX B. U,Pu-LOADED HIP CWF COMPOSITIONS AND SOLUTION CONCENTRATIONS 114

FIGURES

Page

1a. X-ray Powder Diffraction Patterns of HIP U,Pu-loaded CWF Materials 237m, 238m, 239m, and 240m 44

1b. Comparison of the (111) Reflections from $(U,Pu)O_2$ for 239m and 240m 45

2. SEM Photomicrographs of HIP U,Pu-loaded Materials 238m and 240m 46

3. Images of HIP U,Pu-loaded CWF Material 239m and Pc U,Pu-loaded CWF Material GPC00202 47

4. Granules of the Salt-loaded Zeolite Used to Make Material 238m 48

5. TEM Photomicrographs Showing Sodalite, $(U,Pu)O_2$, and Halite Inclusions in the Binder Glass at Two Magnifications 49

6. TEM Photomicrographs Showing $(U,Pu)O_2$ Crystallites within the Sodalite Domain and Included in the Binder Glass 50

7. Rapid Water Soluble (RWS) Solution Concentrations for HIP and PC U,Pu-loaded CWF Materials 51

8. Comparison of Boron Concentrations Measured in the 450-, 100-, and 5-nm pore-size Filtrate Solutions for Tests Conducted with HIP U,Pu-loaded CWF 52

9. Amounts of Nd in Filter Size Ranges 450 to 100 nm, 100 to 5 nm, Dissolved and Fixed to Steel Vessel in Tests with HIP U,Pu-loaded CWF 54

10. Amounts of U in Filter Size Ranges 455 to 100 nm, 100 to 5 nm, Dissolved and Fixed to Steel Vessel in Tests with HIP U,Pu-loaded CWF 56

11. Amounts of Pu in Filter Size Ranges 5 to 100 nm, 100 to 450 nm, Less than 5 nm, and Fixed to Stainless Steel Vessel in Tests with HIP U, Pu-loaded CWF 58

12. Results of Tests with HIP U,Pu-loaded CWF Materials at a (a) 90°C, (b) 120°C at CWF/Water Mass Ratio of 1:10, and (c) 120°C at a CWF/Water Mass Ratio of 1:20 60

13. Normalized Mass Loss (NL) Values for Tests Conducted at 90 and 120°C at a CWF/Water Mass Ratio of 1:10 with Different CWF Materials 62

14. Normalized Mass Loss (NL) Values for Tests Conducted at 120°C at a CWF/Water Mass Ratios of 1:20 and 1:10 with Different CWF materials 64

15. Comparison of NL(Si), NL(U), and NL(Pu) for Tests with HIP U, Pu-loaded CWF 66

16. Amounts of (a) Nd, (b) U, and (c) Pu in Filter Size Ranges 5 to 100 nm, 100 to 450 nm Less than 5 nm, and Fixed to Stainless Steel Vessel in Tests with PC U,Pu-loaded CWF Material GPC0020m at 90°C and CWF/Water Mass Ratio 1:10 and GPC00202 at 90°C and 120°C and CWF/Water Mass Ratio 1:10 68

17. Results of Tests with PC U,Pu-loaded CWF Materials 70

FIGURES (continued)

Page

18. Comparison of NL(Si), NL(U), and NL(Pu) for Tests with PC U,Pu-loaded CWF at 90°C and CWF/Water Mass Ration 1:10 71

19. Concentrations of B in 5 nm Filtrates for Tests at ANL-E and ANL-W 72

20. Concentrations of U in 5 to 100 nm and <5 nm Fractions for Tests at ANL-E and ANL-W 74

21. Concentrations of Pu in 5 to 100 nm and <5 nm Fractions for Tests at ANL-E and ANL-W 76

22. Colloid Size Distribution in 450-nm Filtrate for PCPu90-7-202 Measured Six Days After Test Termination 78

23. Colloid Size Distribution in 450-nm Filtrate Solution for PCPu120-7-202 79

24. TEM Image of Colloid from Test PCPu120-28-0238 80

25. TEM Image of ~10-nm size Aluminosilicate Colloids 81

26. XAFS Pu L_{III} edge Scan of 5-nm Pore-Size Filter from PCPU120/1-225-240 82

27. Absorption XAFS Spectra of Pu L_{III} Edges of Particulate from 5 nm Filter for Test PC120/1-225-240 and Reference PuO_2 Standard 83

28. Comparison of Concentrations of Nd, U, and Pu in the 5-nm Filtrate Solutions with Estimated Solubility Limits at 25°C for Tests with HIP CWF Materials 84

29. Comparison of Concentrations of Nd, U, and Pu in the 5-nm Solutions with Estimated Solubility Limits at 25°C for Tests with PC CWF Materials in GPC0020 and GPC0030m at 120 and 90°C and 1:10 85

30. Comparison of Normalized Mass Losses of B, Si, U, and Pu from HIP U,Pu-loaded CWF Material 238m, HIP Ref CWF, and PC U,Pu-loaded CWF Material GPC0030m in PCT at 90°C and a 1:10 Mass Ratio 86

TABLES

Pages

1. HIP U,Pu-Loaded CWF Materials 88
2. PC U,Pu-Loaded CWF Materials 89
3. Compositions of HIP and PC U,Pu-Loaded CWF Materials, in Mass Fraction 90
4. Peak Assignments for XRD Spectra of HIP U, Pu-loaded CWF Materials 91
5. d-spacings for Reference Materials 93
6. Peak Assignments for XRD Spectrum for Non-radioactive Reference PC CWF 94
7. Corrosion Tests Matrix for HIP U,Pu-loaded CWF at ANL-E 95
8. Test Matrix for U,Pu-loaded CWF Samples 96
9. Test Results for HIP U,Pu-Loaded CWF 97
10. Test Results for PC U,Pu-Loaded CWF Material GPC00202 99
11. Test Results for PC U,Pu-loaded CWF Material GPC0030m 100
12. Plutonium Levels Found by Alpha-Particle Counting on Walls of PCT Vessels and on Coupons 101
13. Results of Tests in New, Used, and Teflon-Coated Type 304L Stainless Steel Vessels, in g/m^2 102
14. Results of Sequential Filtrations with 5-nm Pore-Size Filters, in μg/L 103
15. Results of Replicate Acid Soaks 104
16. Summary of DLS Analyses 105
17. Concentra6ions in 5-nm Filtrate Solutions, nM 106
18. Test Results for Non-Radioactive Reference HIP and PC CWF Materials 107
19. Results for 7-Day PCT 108

20B. Compositions of Salts, Zeolite 4A, Binder Glass, and CWF Materials, in mass % 116

21B. EXCEL worksheet “Test Data 117

22B. EXCEL Worksheet “Raw Conc.” 128

23B. EXCEL Worksheet “corr_conc.” 147

24B. EXCEL Worksheet “NL.summary” 166

ACKNOWLEDGEMENTS

The authors acknowledge the scientific collaboration and advice of K. J. Bateman, M. C. Hash, M. A. Lewis, Y. O. Vojta, J. Weist, and S. F. Wolf, and skillful technical support by L. D. Hafenrichter and M. K. Nole. This work was supported by the U.S. Department of Energy, Office of Nuclear Energy, Science and Technology, under contract W-31-109-ENG-38.

NOMENCLATURE

CWF	Ceramic waste form
DLS	Dynamic light scattering
EBR-II	Experimental Breeder Reactor-II
HIP	Hot isostatic press
HLW	High-level radioactive waste
ICP-MS	Inductively coupled plasma mass spectrometry
PC	Pressureless consolidation
PCT	Product Consistency Test
REE	Rare earth element
RWS	Rapid water-soluble
S/V	Surface area-to-volume (ratio)
SEM	Scanning electron microscope
SLZ	Salt-loaded zeolite
TEM	Transmission electron microscope
U:Pu	Mole ratio of U to Pu
WASRD	Waste Acceptance System Requirements Document
XAFS	X-ray absorption fine structure spectroscopy
XRD	X-ray diffraction

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ABSTRACT

Tests were conducted with ceramic waste form (CWF) materials that contained small amounts of uranium and plutonium to study their release behavior as the CWF corroded. Materials made using the hot isostatic press (HIP) and pressureless consolidation (PC) methods were examined and tested. Four different materials were made using the HIP method with two salts having different U:Pu mole ratios and two zeolite reagents having different residual water contents. Tests with the four HIP U,Pu-loaded CWF materials were conducted at 90 and 120°C, at CWF-to-water mass ratios of 1:10 and 1:20, and for durations between 7 and 365 days. Materials made using two PC processing conditions were also tested. Tests with the two PC U,Pu-loaded CWF materials were conducted at 90 and 120°C, at a CWF-to-water mass ratio of 1:10, and for durations between 7 and 182 days. The releases of matrix elements, U, and Pu in tests conducted under different test conditions and with different materials are compared to evaluate the effects of composition and processing conditions on the release behavior of U and Pu and the chemical durabilities of the different materials. The distributions of released elements among the fractions that were dissolved, in colloidal form in the solution, and fixed to test vessel walls were measured and compared. Characterization of Pu-bearing colloidal particles recovered from the test solutions using solids analysis techniques are also reported. The principal findings from this study are:

- The release of U and Pu is about 10X less than the release of Si and 50X less than the release of B under all test conditions. This implies that U and Pu are in a phase that is less soluble than the sodalite and binder glass matrix.
- Almost all of the plutonium that is released from U,Pu-loaded CWF is present either as colloidal-sized particles in the size range between 5 and 100 nm in the test solution (about 15% of the total) or becomes fixed on stainless steel test vessel walls (about 85% of the total). Work is in progress to determine the nature of the material fixed to the steel.
- The Pu in the colloidal particles is present as the dioxide PuO_2 or a mixed oxide $(U,Pu)O_2$. These particles are of dimensions and composition similar to the $(U,Pu)O_2$ particles that are present as inclusions in the CWF. They are often found associated with larger (100-nm size) aluminosilicate colloids.

- The degradation behaviors of U,Pu-loaded CWF processed by HIP and PC are the same with regard to the release of Si, U, and Pu. One difference is that B is released faster from the HIP CWF materials than from the PC CWF materials.
- The presence of U and Pu does not affect the durability of CWF materials.

1. INTRODUCTION

A glass-bonded sodalite ceramic waste form (CWF) has been developed to immobilize the radioactive electrorefiner salt waste generated during electrometallurgical treatment of spent sodium-bonded nuclear fuel [SIMPSON-2000]. Sodium and the majority of fission products and actinides that are released from the spent fuel during treatment accumulate in the molten LiCl-KCl eutectic salt electrolyte used in the process. The salt must be removed from the electrorefiner periodically and disposed as a high-level waste. The very low solubility of chloride salts in borosilicate glass precludes direct vitrification of the waste salt and requires the use of a non-standard waste form to immobilize the radioactive salt waste stream for disposal. The CWF is made by first occluding the waste salt within the cage structure of zeolite 4A and then consolidating the salt-loaded zeolite (SLZ) with a glass binder by heating. During heating, the SLZ converts to the mineral sodalite ($Na_8(AlSiO_4)_6Cl_2$) and thereby incorporates most of the salt into the sodalite structure. A small amount of nepheline ($NaAlSiO_4$) may also be formed. The binder glass encapsulates the sodalite, nepheline, and other phases that form in trace amounts. A small amount of salt not incorporated into sodalite forms small halite (NaCl) inclusions in the binder glass. The resulting CWF is a multiphase material containing approximately 70 mass % sodalite, 25 mass % binder glass, and 5 mass % total of halite, nepheline, and rare earth and actinide oxides and silicates that are present as inclusions in the glass. The actinide and rare earth element fission products are present as oxide inclusion in the binder glass (see below). Alkali metal and alkaline earth fission products are dissolved in the glass binder. A few percent of the iodine inventory is present in the halite crystals; most of the iodine is fixed in the sodalite.

Examination of the microstructure of CWF materials made with salts containing U and Pu has revealed the presence of $(U,Pu)O_2$ particles approximate ly 10-50 nm in diameter as inclusions in the binder glass at or near sodalite-glass domain boundaries [FRANK-2000, SINKLER-2000]. Rare earth elements also form oxide inclusions, and there is intermixing of actinides and rare earth elements in some of the oxide particles. These oxides have been detected at the outer surface of the SLZ granules used to make the U,Pu-loaded CWF materials. This observation implies that the oxide particles form when the electrorefiner salt is blended with the zeolite 4A, probably as the result of reaction between the actinide and rare earth element chlorides in the salt with residual water in zeolite 4A. Although it was expected during design of the waste form that Pu would become occluded within the zeolite 4A cages and then become fixed within the sodalite cages during processing of the CWF, the analyses of several Pu-containing CWF materials using several techniques have confirmed that Pu is instead present as

colloid-size oxide inclusions in the binder glass. This raised the concern that these radionuclides might be preferentially released during corrosion of the CWF. This concern was stated in one of the findings of the final report of the National Research Council Committee on Electrometallurgical Techniques [NRC-2000, page 6]: "It is possible that some of these colloidal-sized crystal inclusions may be leached from the grain boundaries and that some may become colloidal suspensions with mobility much greater than expected from their solubilities."

The CWF material in which the PuO_2 and other oxide inclusions were first detected was prepared with Pu-238 to study the effects of alpha recoil on the chemical durability of the CWF. These tests were conducted with CWF containing Pu-238 instead of Pu-239, which will be in the electrorefiner salt, to take advantage of the higher activity of Pu-238 and enhance the effect of recoil. In addition, a higher concentration of Pu-238 in the CWF than the anticipated Pu-239 concentrations in the actual CWF was added to enhance the effect. The Pu-238-loaded CWF material was made using a hot uniaxial pressing method. Because it was possible that the Pu distribution in that material was not representative of the distribution in actual CWF materials that were to be made with lower radionuclide contents and made using a hot isostatic pressing (HIP) process, four CWF materials that represented the range of CWF compositions to be produced and using the HIP process were made for further study. Two salt compositions based on the nominal "300 driver" salt composition were used. This is the expected salt composition after 300 driver assemblies have been processed, which is when the salt in the electrorefiner must be replaced due to the buildup of sodium and radionuclides. About half of the salt was doped with the anticipated maximum U and minimum Pu contents (U:Pu mole ratio of 3:1) and the other half was doped with the anticipated minimum U and maximum Pu contents (U:Pu mole ratio of 1:3).

The zeolite 4A used to make CWF was dried to a water content of about 1 mass % before being loaded with salt. This was done to remove water from the zeolite cages to increase the salt loading capacity. A small amount of residual water is required for the zeolite 4A to retain its structure. Two batches of zeolite 4A were used to make the U,Pu-loaded CWF materials for this study. One had a residual water content near the minimum. The other had a higher residual water content to represent incomplete zeolite drying. (The as-received zeolite can have a water content in excess of 20 mass %.) Zeolites with two residual water contents were used in this study because, in addition to its effect on salt-loading, the water content of the zeolite may affect the size and distribution of the actinide and rare earth element oxides formed during the salt-loading process. This may affect the release behavior of the U and Pu as the CWF corrodes. The use of two U- and Pu-doped salts and zeolites having two water contents resulted

in the production of four U,Pu-loaded CWF materials. These are intended to bound the anticipated range of CWF materials to be produced for disposal.

All CWF materials were made using a salt-loading of about 10.7 mass % salt in the zeolite (which results in a salt loading of about 8 mass % in the CWF). This provides about 3.8 equivalents of Cl^- per formula of zeolite, which is substoichiometric in Cl^- with regard to the reaction to form sodalite, which is given in Eq. 1:

$$Na_{12}(AlSiO_4)_{12} + 4\ NaCl \rightarrow 2\ Na_8(AlSiO_4)_6Cl_2 \qquad (1)$$

The salt loading is kept below the stoichiometric amount to reduce the amount of halite that forms during processing.

The testing approach was designed with the primary purpose of characterizing the release of U and Pu as the CWF materials corroded. Analyses of the test solutions (including several filtrates) and test components (including the reacted CWF particles and the vessel surfaces) were conducted. These results were used to quantify the extent of CWF corrosion, the fractional releases of U and Pu, and the distribution of U and Pu between different fractions, including dissolved, colloids in solution, flocculated colloids, sorbed colloids, etc.

Test conditions were selected (1) to be relevant to the conditions to which disposed waste will likely be exposed so that the phenomena that will affect waste form behavior in the disposal system affected the test response and (2) so that the amounts of U and Pu in dissolved and colloidal fractions could be quantified and characterized. Tests were conducted with crushed materials to expose a large surface area of the waste form to the solution. Although actual CWF to be disposed will be large monoliths, the solution chemistry will dominate its dissolution behavior, not the size of the CWF materials. The use of crushed CWF facilitates the generation of highly concentrated solutions in the tests similar to solutions expected in the disposal system after small amounts of water contact a large exposed surface area. Enough solution was used to provide aliquots for several analyses. Tests were conducted at 90 and 120°C. The results of tests conducted at 90°C can be compared with the results of tests conducted previously with nonradioactive CWF and with other high-level waste forms under similar conditions. Tests at 120°C were conducted to accelerate the corrosion reactions and ensure that detectable Pu concentrations would be generated. All tests at 90°C were conducted at a CWF-to-water mass ratio of 1:10. Two series of tests at 120°C were conducted at different CWF-to-water mass ratios: tests at a ratio of 1:20 were conducted to achieve a greater extent of alteration of the

CWF, whereas the tests at a ratio of 1:10 were expected to result in higher solution concentrations. The different test temperatures were also expected to affect the solubilities and possibly the distributions of U and Pu that had been released from the CWF.

After the test matrix with the HIP U,Pu-loaded CWF was initiated and while long-term tests were still in progress, the decision was made to use an ambient pressure process for the inventory reduction phase for EBR-II fuel. That process is referred to as "pressureless consolidation" (PC). Scoping tests and analyses with nonradioactive CWF materials made using the PC processing method showed that the durability of PC CWF was similar to that of HIP CWF and that the microstructures of CWF made using the two processing methods were similar. Several PC U,Pu-loaded CWF materials were made for examination and tested under the same conditions used in tests with HIP U,Pu-loaded CWF. These tests were used to determine if the release behavior and disposition of radionuclides was affected by how the CWF was consolidated. It was fully expected that the U and Pu would be present as oxide inclusions in the PC U,Pu-loaded CWF similar to what had been observed in the HIP U,Pu-loaded CWF. This is because the oxides are formed when the salt was mixed with the zeolite and because the same mixture of salt-loaded zeolite and binder glass was used to make the test materials using the HIP and PC processes. The PC U,Pu-loaded CWF materials used in testing were made under two different temperature-time conditions: the first set of PC CWF materials was processed at 875°C for 24 hours, whereas the later set was processed at 915°C for 16 hours. Higher temperatures and longer processing times were used to achieve higher densities and more durable waste forms [LEWIS-2002]. Tests were conducted with both sets of PC materials to provide insight into the sensitivity of the corrosion behavior and the release of U and Pu to the PC processing conditions. This is important because the processing temperature will vary slightly throughout the waste form due to heat transfer limitations within large CWF monoliths.

2. MATERIAL PREPARATION

2.1 HIP U,PU-LOADED CWF

Two batches of dehydrated clay-bonded zeolite 4A were dried to different extents to represent the range of water contents that may occur during production of CWF. The amount of residual water in the zeolite 4A is important because it reacts with the UCl_3 and $PuCl_3$ to form the oxides when the salt is mixed with the zeolite. The water contents of the two batches of zeolite 4A were measured to be 0.12 and 3.5 mass % H_2O. Half of each batch of dehydrated zeolite was mixed with a salt mixture that included chlorides of simulated fission products, uranium, and plutonium, with a U:Pu mole ratio of 3:1. The other half was mixed with a salt mixture that included chlorides of simulated fission products, uranium, and plutonium with a U:Pu mole ratio of 1:3. Each batch of SLZ was blended in a V mixer at about 500°C for about 15 hours to facilitate diffusion of the salt into the zeolite cages. The SLZ was cooled and mechanically mixed with binder glass in 3:1 SLZ/glass mass ratio. Each batch was then loaded into four HIP cans, each containing about 50 g. The sixteen HIP cans were welded shut, evacuated, and sealed. The can identification numbers and mixtures are summarized in Table 1. The loaded cans were shipped to ANL-W for HIP processing. The cans were tested for leaks and then processed at 14,500 psi and 850°C for 1 hour to produce the HIP U,Pu-loaded CWF materials. Can 2373 failed the leak test conducted prior to processing and can 2374 failed during processing; the materials in these cans were not used in the testing program. The remaining HIP cans were successfully processed.

The cans were cut open and core samples of the CWF materials were removed. Each core was cut into wafers to be used for examination and testing. The remaining materials were removed from the HIP cans and crushed for testing. The HIP U,Pu-loaded CWF materials were crushed in an agate mortar and sieved with mechanical sifters to isolate the –100+200 mesh (75-150 μm) size fraction. Crushed materials having the same composition (i.e., with the same U:Pu ratio and zeolite water content) but made in different cans were mixed together for testing. The sample mixtures are identified using the first three digits of the HIP can numbers that were consolidated followed by the letter "m" (see Table 1). (See Appendix A for procedural steps.)

2.2 PC U,PU-LOADED CWF

Four PC U,Pu-loaded CWF materials were made to correspond with the four HIP U,Pu-loaded CWF materials. The PC materials GPC00201, GPC00202, GPC00203, and GPC00204

were made using the same recipes as HIP materials 237m, 238m, 239m, and 240m (see Table 2 and compare with Table 1). These PC U,Pu-loaded CWF products were processed at 875°C for 24 hours in a purified argon atmosphere at atmospheric pressure. Only material from GPC00202 was used in corrosion tests.

The PC conditions used to make CWF were later changed to increase the density of the product: the processing temperature was increased to 915°C and the processing time was decreased 16 h. To measure the effect of the PC processing conditions on CWF durability, four identical 20-g samples of PC U,Pu-loaded CWF materials were prepared by heating at 915°C for 16 hours using SLZ from batch G0030. The as-batched composition of these four PC U,Pu-loaded CWF materials is essentially identical to that of HIP U,Pu-loaded CWF material 238m. The four individual U,Pu-loaded PC CWF products are identified as GPC00301, GPC00302, GPC00303, and GPC00304. These materials were crushed with a tool steel mortar and pestle and then mixed together for use in corrosion tests. The mixed material is referred to as GPC0030m. The recipes for the PC U,Pu-loaded CWF products are summarized in Table 2.

2.3 COMPOSITION

The compositions of the HIP and PC materials used in the corrosion tests were calculated using compositions of the salt, zeolite, and binder glass, and the mass fractions of each that were used to process each product. All materials were made with 25 mass % binder glass and 75 mass % SLZ, which is equivalent to 8.0 mass % salt, and 67.0 mass % zeolite in the CWF. (Note: We have excluded the mass of residual water in calculations of the CWF compositions. This is because a small amount of water will be consumed oxidizing the rare earth, lanthanide, and actinide chlorides and the rest will evaporate during processing.) Differences in compositions of the CWF products are due only to the differences in the salt compositions. The as-batched CWF compositions are given in Table 3. Previous comparisons of the measured and as-batched compositions of nonradioactive CWF materials showed the as-batched compositions are reliable for these U-Pu-loaded CWF materials [LEWIS-2002]. The separate compositions of the salts, zeolite, and binder glass that were used to calculate the as-batched compositions are given in Appendix B, Table 20B. The different water contents in the SLZ materials are assumed not to affect the CWF compositions.

2.4 MICROSTRUCTURE

Examination of these CWF specimens by scanning electron microscopy (SEM) and transmission electron microscopy (TEM), and X-ray diffraction (XRD) indicated that all materials consisted of sodalite granules embedded in glass, with a few mass per cent of halite, other aluminosilicates, uranium-plutonium oxide $(U,Pu)O_2$, and mixed rare earth-actinide oxides, and trace amounts of mixed rare earth-actinide silicates. Representative X-ray diffraction spectra for powdered samples of the four materials are shown together in Fig. 1a. The spectra for the different materials are almost indistinguishable. The diffraction peaks for the four materials are identified in Table 4 by comparison with the reference spectra summarized in Table 5. Sodalite is the major crystalline phase in all the HIP materials, with minor amounts of halite, nepheline, and $(U,Pu)O_2$. The relative intensities of peaks due to halite (d = 2.82 Å) in the spectra of materials 239m and 240m were about twice the intensities of peaks for materials 237m and 238m. This indicates that more halite was generated for materials made using the zeolite with the higher residual water content. The portions of the spectra for materials 239m and 240m between 2θ values of 28 and 29 are shown overlayed in Fig. 1b; these are the [111] peaks for the $(U,Pu)O_2$ phases. The peak occurs at a slightly higher 2θ values (slightly lower d-spacings) for materials 238m and 240m than for materials 237m and 239m because the $(U,Pu)O_2$ phase has a higher Pu content in materials 238m and 240m than in materials 237m and 239m. The [111] peak occurs at $2\theta = 28.28°$ (d = 3.153 Å) in pure UO_2 and at $2\theta = 28.63°$ (d = 3.115 Å) in pure PuO_2.

The results of XRD analysis of a non-radioactive reference PC CWF material are shown in Table 6. Only peaks assigned to sodalite and halite are observed. The presence of U and Pu does not affect the peak locations of the sodalite and halite phases. Except for the 100% peak for sodalite at 6.303 Å, the relative intensities of all the sodalite and halite peaks are about 2X higher in the spectrum of the nonradioactive CWF than in the spectra of the four HIP U,Pu-loaded CWF materials. This is probably due to an error in the intensity of the 6.303 Å peak in the spectrum of the nonradioactive PC CWF material. The ratios for the relative intensities in the spectra of the HIP U,Pu-loaded CWF are in good agreement with the reference spectra.

The cores removed from HIP cans of each material were cut to prepare radial and axial cross-section samples for SEM examination to determine the uniformity of the microstructure and composition of the CWF within the HIP can. Typical photomicrographs of HIP U,Pu-loaded materials 239m and 240m are shown in Fig. 2. The similarities of the electron densities of the sodalite and binder glass make it difficult to distinguish these phases. The binder glass

appears slightly darker and smoother than the sodalite phases in the micrographs in Fig. 2. Several clusters of rare earth element (REE) oxides and $(U,Pu)O_2$ particles can be seen distributed throughout the CWF. In the opinion of the analyst, more of these clusters appeared "fuzzy" in the CWF made with the zeolite with the low residual water content than in the CWF made with zeolite having the high residual water content. This may indicate a small difference in the local distribution of the oxide inclusions. No differences in the microstructure were observed in scanning the materials in radial or axial directions. The relative amounts of sodalite, binder glass, and oxide inclusions and their distributions remained constant based on visual observation. In addition, there was not a significant change in the concentrations of Al, Cl, K, Na, and Si measured in an area of about 0.2 mm^2 at regular intervals with energy dispersive X-ray emission spectroscopy. This indicates that the relative amounts of sodalite and binder glass remain essentially constant at this scale.

Photomicrographs of HIP and PC U,Pu-loaded CWF materials are shown in Fig. 3. In both materials, the sodalite appears as "islands" fixed in the glass. The texture of the sodalite is visually rougher than the binder glass. The contrast of the sodalite and binder glass is different in the two materials: in the HIP material, the sodalite appears lighter than the glass, whereas in the PC material, the sodalite appears darker than the glass. The difference may be due to slight differences in the degree to which the glass has infiltrated the sodalite in the two materials. The texture of the sodalite phases may also affect the contrast. The PC material is visually less dense than the HIP material (note the presence of pores in the PC material). Clusters of $(U,Pu)O_2$ particles appear as bright spots in the glass around the perimeters of the sodalite domains in the HIP CWF. The $(U,Pu)O_2$ particles appear to be more evenly distributed in the glass in the PC CWF. Several pores can be seen in the glass near the sodalite in the HIP CWF and throughout the PC CWF. Some of these pores had probably contained halite, which was dissolved during preparation of the polished cross-section SEM specimen.

Two SEM images of cross-section samples of the SLZ used to make HIP material 238m and the PC material GPC00202 are shown in Fig. 4. The top image shows the aggregated grains of zeolite with bright spots in various locations at the perimeter and the bottom image shows a high magnification image of the perimeter. A thin veneer of bright particles can be seen coating the outer surface of the zeolite. The bright rectangular feature in the lower region of the bottom figure is a crystallite of halite that formed on the cross-sectioned sample by efflorescence. The observation that the $(U,Pu)O_2$ particles are slightly removed from the sodalite in the CWF materials indicates that glass flowed between the $(U,Pu)O_2$ particles and the zeolite granules during processing. This is more clearly shown in the TEM examinations described

below. Whereas the $(U,Pu)O_2$ particles are observed primarily around the perimeter of the sodalite domains in the HIP U,Pu-loaded CWF, they are distributed fairly uniformly throughout the glass phase in the PC U,Pu-loaded CWF. The difference in the distribution of the $(U,Pu)O_2$ particles is probably due to the higher temperature and longer processing time used in the PC process, which results in a more fluid glass melt and a greater extent of mixing. That the $(U,Pu)O_2$ particles are not segregated at the glass/sodalite interface in the PC CWF materials is an asset of the PC process, because the glass near the sodalite boundary has been observed to dissolve preferentially in tests with nonradioactive CWF [LEWIS-2002].

Samples were prepared for TEM examination by both ion milling and ultramicrotomy. A cluster of $(U,Pu)O_2$ particles near sodalite is shown at higher magnification in Fig. 5. This sample was prepared by ion milling. The polycrystalline nature of the sodalite can be seen in the photo. Also seen in the bottom photo of Fig. 5 is a "spherical" halite inclusion. The inclusion is spherical because the NaCl remained molten after the glass had solidified when the temperature was lowered at the end of the process. The halite then crystallized within the pore after the temperature decreased further. Electron diffraction analysis of several halite inclusions in the HIP and PC CWF materials indicated they are single crystals. High magnification images of the $(U,Pu)O_2$ particles are shown in Fig. 6. The photo on the top shows $(U,Pu)O_2$ particles that appear to be distributed among the sodalite grains and the photo on the bottom shows particles that are included within the glass. The lower photo was taken for a sample prepared by ultramicrotomy. The $(U,Pu)O_2$ particles appear as dense dark spheres and typically have a diameter between 20 and 50 nm.

3. DESCRIPTION OF CORROSION TESTS

The primary objectives of the corrosion tests were to (1) characterize the release behavior of U and Pu during degradation of the CWF, (2) determine if corrosion of the CWF is affected by the presence of U and Pu, or by the water content of the zeolite 4A used to make the CWF, and (3) determine if the release behavior of U and Pu from HIP and PC CWF materials was similar enough that insight and data from tests with HIP CWF could be used to support qualification of PC CWF. To address the first objective, we determined the amounts of U and Pu in the following fractions at the end of a test:

- dissolved,
- associated with large (100 to 450 nm) or small (5 to 100 nm) colloids,
- fixed on steel vessel walls, and
- retained on the surface of the CWF.

The second objective was addressed by comparing the release of matrix components of the CWF (primarily Al, B, Na, and Si) in tests with CWF materials with and without added U and Pu under the same conditions. The third objective was addressed by comparing the results of tests with U,Pu-loaded CWF made using the HIP and PC processes, including the dissolution of halite and matrix components, and the release of Nd, U, and Pu. The release of Nd was tracked as a chemical surrogate for trivalent actinides, such as Am^{3+}.

3.1 TEST PROCEDURE

The corrosion tests conducted in this study generally followed the Product Consistency Test Method B procedure with a variety of test parameter values [ASTM-1999]. These are static batch tests conducted with crushed material in which the extent of reaction is measured by the amounts of material components released into the test solution. The test method is solution-controlled in the sense that high solution concentrations are generated after a relatively small amount of material dissolves and the solution chemistry influences the continued corrosion behavior of both the binder glass and sodalite phases. This method was selected because it meets the need of generating sufficiently concentrated solutions within a relatively short test period. It is also relevant to anticipated disposal conditions, where large surface areas of waste forms may be contacted by small volumes of water.

The PCT Method A is used to monitor the consistency of high-level glass waste forms for product acceptance. The PCT Method A test is conducted under specific conditions of 90°C, –100+200 mesh size fraction, 1:10 glass/water mass ratio, Type 304L stainless steel vessel, and

7 day test duration. The PCT Method B procedure is a generic static crushed glass test that provides flexibility in the test temperature, size fraction, mass ratio, duration, etc. In this report, the phrase "PCT" is used to indicate the PCT Method B procedure. The responses in 7-day tests conducted with the PC and HIP U,Pu-loaded CWF at a 1:10 glass/water mass ratio can be compared with the responses of other CWF materials and waste glass in PCT Method A tests to gauge the durability of the CWF materials.

Corrosion tests with CWF were conducted in two steps: the RWS step and the PCT step. (Detailed procedural steps for the RWS are provided in Appendix A; see also [LEWIS-2000].) The RWS step addresses the need to analyze the water wash solution used to remove fines in the PCT procedure if the material being tested is suspected to contain a soluble phase. The CWF contains about 3-5 mass % halite inclusions in the binder glass that are generated when the SLZ converts to sodalite during processing. The amount of waste salt that is occluded in the zeolite 4A will be controlled to limit the amount of halite that forms. The RWS is conducted to provide a measure of the amount of halite in the CWF and monitor salt loading. Halite at the surface of the crushed CWF will dissolve immediately when contacted by water. The RWS step was developed for tests with CWF to measure the amount of halite that dissolves during the washing step. In the RWS step, the CWF materials are first washed with absolute ethanol to remove fines without dissolving halite. The CWF materials are then washed with demineralized water to dissolve that halite that is exposed at the surface of the crushed material. The amount of dissolved halite is proportional to the amount of halite in the CWF. The RWS step is done at room temperature and for a short duration (about 2 minutes), so that a negligible amount of sodalite and binder glass dissolve. For each mixture of HIP U,Pu-loaded CWF, the RWS step was done with 3-g batches of material with about 30 mL of water to facilitate operations in a glove box. (Small volumes of water were easier to handle in the glove box and hot cell.) Aliquots of one of the RWS solutions for each material were analyzed with a chloride ion selective electrode and with inductively coupled plasma mass spectrometry (ICP-MS).

After the RWS step, the materials were dried and then pre-measured into vials for individual tests for the PCT step. For materials 238m, 239m, and 240m, approximately 1 g of CWF material was used for tests conducted at a mass ratio of 1:10, and approximately 0.5 g of CWF material was used for tests conducted at a mass ratio of 1:20. Smaller amounts of material 237m were used in each test due to the limited amount of that material that was available for testing (only two HIP cans of material 237m were successfully processed). A mass of demineralized either 10 X or 20 X the mass of CWF was added to the vessel for PCT at CWF/water mass ratios of 1:10 and 1:20, respectively. The masses of CWF and demineralized

water used in each test are given in Appendix B Table 21B. After the CWF and water were added, the vessels were sealed using Teflon gaskets and compression fittings. The total mass of the assembled vessel was measured before the vessel was placed in the oven and at the end of the test to determine the amount of water that leaked from the vessel during the test. Those masses are given in Appendix B Table 21B, along with the calculated mass loss. The mass losses for most tests were within the uncertainty of two measurements, which is estimated to be ± 0.003 g.

After the prescribed test durations, vessels were removed from the oven and allowed to cool for about 15 minutes. The vessels were then weighed and opened. The test solutions were analyzed to measure the total amounts of components released from the CWF into the dissolved and colloidal fractions, and the amounts that became fixed to the vessels during the test. Aliquots of the test solution were analyzed directly for pH, chloride, and iodide ions without being filtered. The pH of the test solution was measured using a combination electrode and the chloride ion concentration was measured using a chloride ion selective electrode. Both electrodes were calibrated with appropriate standards before use. The iodide concentration in the test solution was measured with ICP-MS. The rest of the test solution was passed through a series of filters sequentially to separate various colloidal size fractions and dissolved material. A microcentrifuge was used to facilitate the filtration. The filters used for sequential filtrations were:

450-nm filter:	25-mm surfactant-free cellulose acetate syringe filter (Nalgene 190-2545), or Ultrafree-MC Centrifugal Filter Unit 0.45-μm pore-size low-binding Durapore (Millipore UFC3 OHV)
100-nm filter:	Ultrafree-MC Centrifugal Filter Unit 0.1-μm pore-size low-binding Durapore (Millipore UFC3 OVV)
5-nm filter:	Ultrafree-MC Centrifugal Filter Unit 30,000 NMWL polysulfone (Millipore UFC3 TTK)

Filtrate solutions are referred to by the filter size. That is, the solution recovered from the 450-nm filter is referred to as the 450-nm filtrate solution. Aliquots of each filtrate solution were acidified with a few drops of concentrated nitric acid and then analyzed with ICP-MS.

After the test solution and reacted CWF were removed, the test vessel was filled with an amount of nitric acid solution (approximately 2% by volume) similar to the amount of test solution that was removed. The vessel was resealed and heated at 90°C overnight to dissolve components that had become fixed to the stainless steel during the test. The resulting solution is referred to as the acid soak solution. An aliquot of the acid soak solution was analyzed with

ICP-MS. Note that the small amount of the vessel that dissolves during the acid soak is not expected to affect the test results because the major components of the steel (i.e., Fe and Cr) are not present in the CWF, except perhaps at trace contamination levels.

3.2 TEST MATRICES

The matrix of corrosion tests conducted with the HIP U,Pu-loaded CWF is shown in Table 7. Tests were conducted in demineralized water at 90°C and 120°C and at CWF/water mass ratios of 1:10 and 1:20. All tests were conducted in 22-mL Type 304L stainless steel vessels (Parr Instrument Co., Moline, IL) that were sealed with polytetrafluoroethylene (PTFE) Teflon gaskets. Most tests were conducted in vessels that had been used previously in tests with radioactive materials. Although the vessels had been cleaned so that the radioactivity in the vessels was at background levels, the vessel surfaces had become roughened due to repeated exposures to nitric acid solutions. A few tests were conducted in new vessels and in new vessels that had been Teflon-coated. The gamma-radiation fields were sufficiently low that they were not expected to cause the release of fluoride from the Teflon. Test conditions of 90°C and a CWF/water mass ratio of 1:10 have been used in previous tests with nonradioactive CWF materials made using the HIP and PC consolidation processes. The results of those tests can be compared directly with the results of tests in the present study to assess the effects of U and Pu on the chemical durability of the CWF. These conditions have also been used for tests conducted with other waste forms for the same durations. Therefore, the results of the PC U,Pu-loaded CWF can be compared with the results of similar tests with other radioactive waste forms.

Some tests were conducted at 120°C to accelerate CWF degradation and generate relatively high Pu concentrations in the test solutions to facilitate analysis. Tests at 120°C were conducted at mass ratios of 1:10 and 1:20. The tests at a 1:10 mass ratio were conducted to generate higher solution concentrations than tests at a 1:20 mass ratio, whereas the tests at a 1:20 mass ratio were conducted to achieve a greater extent of corrosion of the CWF than tests at a 1:10 mass ratio. This was done to facilitate the analysis of changes in the solution and changes in the CWF, respectively. One blank test with demineralized water was conducted in parallel with the tests with CWF under most test conditions. Blanks were conducted using the same type of vessel used in the tests with CWF (i.e., Type 304L stainless steel vessels that had been used previously, were new, or had been Teflon-coated). The amounts of water used in the blank tests were similar to the amounts of water used in the tests with CWF so that a similar vessel

area was contacted by water in the tests with CWF and the blank tests. The results of the blank tests were used as background concentrations for the tests with CWF.

Corrosion tests were conducted with the PC U,Pu-loaded CWF materials GPC00202 and GPC0030m for direct comparison with the results of the tests conducted with HIP U,Pu-loaded CWF material 238m. These materials were chosen for comparison because they were all made with low water-content zeolite, which is similar to the water content in zeolite expected during CWF production, and with a high Pu content, which maximizes the likelihood of finding Pu-containing colloids. These tests were conducted to compare the release behavior of U and Pu from waste forms made using the HIP and PC processes, to determine if the PC processing conditions (i.e., temperature and time) affect the durability of PC CWF, and to determine whether insight gained regarding the release of U and Pu from the HIP U,Pu-loaded CWF can be applied to their release from CWF made using the PC process. The matrix for tests with PC U,Pu-loaded CWF is shown in Table 8.

3.3 CALCULATION OF NORMALIZED ELEMENTAL MASS LOSS, *NL(i)*

The test response is measured by the solution concentrations in the various filtrate solutions and the acid soak solutions. Test results were normalized to the CWF surface area to compare the solution results of tests conducted at different CWF/water mass ratios and to the CWF compositions to compare the results of tests with different CWF materials and the relative releases of different elements. This is done by calculating normalized mass loss (*NL*) values. The *NL* value calculated for a particular test provides a measure of the amount of CWF that has dissolved based on the solution concentration of a particular element. In the calculation of *NL*, the solution concentration results are normalized to the surface area of CWF exposed in the test and the mass fraction of the element *i* used to calculate *NL(i)* that is in the CWF material used in the test. The *NL(i)* values allow for direct comparison of tests conducted at different mass ratios, temperatures, with different CWF materials, and for different elements *i*. The normalized elemental mass loss *NL(i)* was calculated from the measured solution concentration of element *i* by using Eq. 2:

$$NL(i) = \{C(i)-C^{\circ}(i)\} / \{(S/V) \bullet f(i)\} \qquad (2)$$

where

NL(i) = normalized elemental mass loss of element *i* (g/m^2)

C(i) = concentration of element *i* in the RWS, 450-nm filtrate, or acid soak solution (mg/L)

$C°(i)$ = concentration of element i in the RWS, 450-nm filtrate, or acid soak solution of appropriate blank test (mg/L)
S = surface area of CWF material in the test (m^2)
V = volume of RWS, 450-filtrate, or acid soak solution (m^3)
f_i = mass fraction of element i in the CWF material

It is important to note that the value of *NL(i)* gives the **mass of CWF** that dissolves per unit surface area exposed to water, not the mass of element *i*. Differences in the values of *NL(i)* calculated for the same test using different elements *i* indicate that the material does not dissolve congruently. Because the CWF is a multiphase material, it is not expected to dissolve congruently, although each component phase (sodalite, binder glass, halite, PuO_2, etc.) may itself dissolve congruently. Note also that the concentrations were background-corrected based on the measured concentrations rather than the measured masses of element *i*. This was done to take into account the analytical uncertainty for both analysis of the test solution and the blank solution. Because similar amounts of water were used in the tests and blanks, the difference between correcting concentrations and correcting masses is small.

3.3.1 RWS Component of NL(*i*)

The total response of the CWF material in a test is the sum of the values calculated with the RWS, PCT, and acid soak solution concentrations of element *i*. How the presence of halite and the RWS step is handled in the analysis needs to be addressed. The RWS step is conducted to distinguish the amounts of Na and Cl released due to dissolution of halite from the amounts released to dissolution of sodalite and binder glass for the purposes of product consistency testing and process control. The RWS results for a particular CWF material can be added to the results of the PCT step for all tests conducted with that material. Any halite that was not exposed at surface of the CWF material and did not dissolve during the RWS step, but did dissolve during the PCT step will contribute to the Na and Cl concentrations of the PCT. Dissolution of binder glass and sodalite will also contribute Na and Cl to the PCT solution. Whether or not the amount of a component in the RWS solution is included in the calculation of the total *NL(i)* depends on the intended use of the calculated value. For example, several tests with HIP CWF without added U and Pu were conducted before the RWS procedure was used. Those materials were repeatedly washed with absolute ethanol to remove fines, but were not washed with water. Therefore, the halite at the surface of those materials dissolved during the PCT step. The RWS part must be included for comparisons with those tests.

For other purposes, including the RWS part to the test response may be unnecessary or may even introduce added uncertainty. This is because release measured in the RWS step is a transient phenomenon that only occurs when water first contacts the surface of the test material. A similar transient effect will occur when water first contacts the surface of CWF waste forms in the disposal system, so it is important to take this effect into account when modeling the behavior of the CWF in a disposal system. However, use of PCT results to calculate long-term corrosion rates of the CWF materials should exclude the RWS part because that transient behavior may unnecessarily obfuscate or belie its long-term degradation behavior.

In practice, the contribution of the RWS solution to the total measure of CWF degradation is only significant for Na and Cl, and these elements are not used to determine the long-term degradation behavior and rate of CWF. The elements that are used to measure the long-term degradation behavior, namely, B and Si, are not released to a significant extent in the RWS step. In the present study, the RWS parts are excluded from the test results when they are used to determine the release behavior of U and Pu and the long-term degradation of the CWF matrix materials.

3.3.2 Acid Soak Component of *NL(i)*

How material that was removed from the surface of the vessel during the acid soak is taken into account also needs to be addressed. The material that is dissolved from the vessel had been released from the CWF, but was not stable in solution as either a colloidal or solvated species. The acid soak solution may contain components that became reduced to metallic form and plated onto the steel surfaces as well as materials that are strongly sorbed onto the steel. Materials that were weakly sorbed to the vessel are expected to have been removed when the leachate solution and reacted CWF was removed at the end of the test. At the end of the tests, the vessels were rinsed with demineralized water and wiped with a swab to removed adhering CWF prior to the acid soak. Although the chemical form of the material that is released from the vessel during the acid soak is not known, it is expected to have adhered to the vessel fairly tenaciously during the test and when the vessel was swabbed. Because the value of *NL(i)* is intended to represent the total mass of CWF that has dissolved, not just the amount of CWF that remains in the solution, the amount of an element in the acid soak solution is included in the total of *NL(i)*.

3.3.3 450-nm, 100-nm, and 5-nm Filtrate Components of *NL(i)*

In the PCT procedure, the test solution is passed through a 450-nm pore-size filter to remove suspended test material before analysis. Material removed by passing the solution through the 450-nm filter was assumed to be suspended particles of CWF, but not material released due to degradation. The 450-nm filtrate solutions contained colloids and dissolved fractions of material released from the CWF. The acid soak solution contained material that was released from the CWF and became fixed to the steel vessel during the test. The solution concentrations in the 450-nm filtrate and the acid soak solution provided a measure of material released from the CWF during the PCT step. The 100-nm and 5-nm filtrates were used to distinguish colloid fractions and dissolved materials in the 450-nm filtrate solutions. These are excluded from the calculation of the total test response to avoid double-counting the colloidal and dissolved fractions. The concentrations measured in the 450-nm filtrates and the acid soak solutions were used to calculate *NL(i)* values for the sum of the colloidal + dissolved fraction and the sorbed fraction, respectively. The sum of the RWS, 450-nm, and acid soak parts gives the total *NL(i)* value for each test. We note that *NL(i)* values do not account for any material that was released from the CWF but flocculated from solution or sorbed onto the reacted CWF granules and was removed with the CWF granules at the end of the test. Such materials will likely be detected during examination of the reacted CWF solids. Values of *NL(i)* were calculated for several elements *i* to distinguish the releases of elements likely to be contained in flocculants, such as Al and Si, from elements that are not likely to be contained in flocculants, such as B.

3.3.4 CWF Surface Area and Water Volume

The surface area of the CWF sample was calculated by assuming a specific surface area of 0.023 m^2/g for the –100 +200 mesh size fraction of all materials. The specific surface area was calculated by modeling the particles as spheres having diameter equal to the arithmetic average of the sieve openings (112 μm) and a density of 2.3 g/cm^3. That is the density measured for crushed HIP CWF and PC CWF materials [LEWIS-2002]. For each test, the same surface area was used to calculate *NL(i)* for the 450-nm and acid soak parts. This is because, even though CWF was not present in the vessel during the acid soak, the material fixed to the vessel had been released from the same surface area of CWF during the test.

The mass of CWF used in each of the three RWS procedures performed for the HIP U,Pu-loaded materials was not measured because a balance was not available in the glove box

used to perform the RWS. The HIP material was divided into three samples of the same approximate amounts for the RWS procedure. The solution volume used to calculate *NL(i)* for the RWS solution was measured directly using a graduated cylinder. Therefore, the values of both the surface area of CWF and volume of water needed for the *NL(i)* calculations of the RWS solutions are only approximate. The RWS parts for the different materials indicate that the halite contents are within the expected range, but they are deemed not to be sufficiently accurate for comparative purposes and are not included when comparing the *NL(i)* values for any of the tests in the study. Greater accuracy will be required for RWS conducted as part of PCT run for product acceptance. For the purposes of the present study, the inaccuracy of the RWS parts does not detract from the usefulness of the 450-nm and acid soak parts of *NL(i)* for comparing either the release behaviors of U and Pu or the degradation behaviors of the matrix phases for the different CWF materials. However, the high uncertainty in the RWS results does limit the reliability of comparisons between the amounts of halite present in the four HIP U,Pu-loaded CWF materials.

The solution volume used to calculate *NL(i)* for the 450-nm solution was determined by subtracting the mass loss of the assembled test vessel over the test duration (due to loss of water) from the mass of water added at the start of the test. Solution volumes were calculated from measured masses using a density of 1.00 g/mL for all test solutions. The solution volume used to calculate *NL(i)* for the acid soak solution was calculated from the mass of nitric acid solution added to the vessel. As mentioned earlier, the surface area of the sample of CWF used in the test was used to calculate *NL(i)* for the acid soak solution, even though the CWF was not present in the vessel during the acid soak step. In this way, the mass of material fixed to the vessel wall is normalized to the surface area from which it was released.

3.3.5 Elemental Mass Fractions

Values of f_i for the various U,Pu-loaded CWF materials based on the as-batched compositions are given in Table 3 and Appendix B, Table 20B.

4. CORROSION TEST RESULTS

The results of PCT conducted with all CWF materials are given in Appendix B. The tables in Appendix B were generated as separate spreadsheets using Microsoft Excel:Mac 2001 software and a Macintosh G3 personal computer. Definitions of variables in the tables and the calculations performed using the spreadsheets are included in the Appendix with sample calculations. The data relevant to test execution are provided in Appendix B, Table 21B. That table includes the masses of CWF and demineralized water used in each test, the calculated surface area and surface area/water volume ratios, aliquot volumes, calculated dilution factors, measured vessel masses, etc. The analytical results for the analyzed solutions are given in Appendix B, Table 22B. Adjustment of these results for the minor dilution due to acidification of the aliquots and background subtraction are given in Appendix B, Table 23B. Finally, the normalized mass losses calculated from the adjusted solution concentrations and test data are given in Appendix B, Table 24B.

Although a parallel matrix of tests with HIP U,Pu-loaded CWF materials was conducted at ANL-W, this report focuses primarily on the results of tests conducted at ANL-E to characterize the corrosion behavior of the CWF materials and the disposition of U and Pu released in the tests. This is because (1) a more extensive battery of analyses were conducted using solution and solid components from tests at ANL-E, and (2) tests with PC U,Pu-loaded CWF and HIP Reference CWF were only conducted at ANL-E. Selected results from tests at ANL-W are used to evaluate the interlaboratory test precision. Unless stated otherwise, the results discussed in the report are for tests conducted at ANL-E.

4.1 RAPID WATER-SOLUBLE STEP

The materials used in the tests were washed in three separate batches so that the RWS could be conducted at a CWF/water mass ratio of 1:10. The RWS were conducted at that mass ratio so that the concentrations in the RWS solution could be added directly to the concentrations in the 450-nm filtrate and acid soak solutions in the PCT step to calculate the total test response in the 7–day test for monitoring product consistency. One of the three RWS solutions was analyzed for each of the HIP U,Pu-loaded CWF materials. All three RWS solutions were analyzed for the two PC U,Pu-loaded materials that were used in corrosion tests. The results of the RWS are shown in Fig. 7 for the HIP and PC U,Pu-loaded CWF materials. (The analytical results for the RWS solutions are given in Appendix B, Table 22B). The concentrations of Na and Cl in the RWS with HIP materials 239m and 240m are about twice the

concentrations in the RWS with HIP materials 237m and 238m. This suggests that fewer halite inclusions are generated in HIP CWF made with the zeolite 4A having the lower water content. (This difference is probably greater than the uncertainty in the RWS results due to inexact measurements of CWF mass and water volume; see Section III.C.4.) Both the Na and Cl concentrations are significantly higher for the PC material GPC00202 than for the HIP materials. The Cl concentration for the PC material GPC0030m is higher than for the HIP materials, but the Na concentration is similar to that for the HIP materials. Since dissolution of halite dominates the RWS solution composition, the Na/Cl mole ratio should be near one. The mole ratios calculated from the averages of the HIP and the PC materials GPC00202 and GPC0030m are 1.3, 0.88, and 0.24, respectively. Although there is high uncertainty in the CWF/water mass ratio of the RWS step, this will not affect the Na/Cl ratio. The RWS conducted with nonradioactive CWF have resulted in Na/Cl ratios very close to one [LEWIS-2002]. Clearly, the sodium concentrations for RWS solutions for PC material GPC0030m are in error.

4.2 TESTS WITH HIP U,PU-LOADED CWF

4.2.1 Boron Concentrations in Different Filtrates

The boron concentrations measured in the 450-, 100-, and 5-nm filtrates are shown in Fig.8. That no one filtrate size fraction has a consistently higher or lower boron concentration indicates the differences are due to testing and analytical uncertainty rather than there being a greater amount of boron in one of the filtrates. Comparison of the concentrations measured in the different filtrates from the same tests provides a measure of the combined uncertainty due to filtration and analysis of the solutions. Because the solutions were filtered sequentially, the concentrations are expected to either decrease or remain nearly constant as the pore-size decreases. However, the concentrations in the filtrates of many tests *increase* as the pore-size decreases. The two greatest variances are seen for tests PCPu120-7-238 and PCPu120/1-28-238. The boron concentrations for the 450-, 100-, and 5-nm filtrates for test 120-7-238 (see Fig. 8b) are 36.8, 42.6, and 50.8 mg/L, respectively. These concentrations vary by more than 27%, which is about twice the expected analytical uncertainty of about 15%. The boron concentrations for the 450-, 100-, and 5-nm filtrates for test 120/1-28-238 (see Fig. 8c) are 35.5, 42.7, and 33.7 mg/L, respectively. The boron concentrations in the 450-nm and 100-nm solutions differ by more than 20%. The differences in concentrations in filtrates generated by sequential filtration may simply be due to the accumulation of uncertainties for two solution analyses, but probably include uncertainty due to the efficiencies of the different filtration steps.

Inspection of the concentrations measured in the 100- and 5-nm filtrates for blank tests in Appendix B, Table 22B shows extremely high concentrations of most components. This is probably contamination from the filters, although it is surprising that so many components have high concentrations. (The filters were not washed before use.) Part of the variance in the boron concentrations could be due to differences in the level of contamination by different filters.

4.2.2 Disposition of Nd, U, and Pu Between Colloidal, Dissolved, and Sorbed Fractions

The concentrations measured in the 450-nm, 100-nm, and 5-nm filtrate solutions and the concentrations measured in the acid soak solutions were used to calculate (1) the masses of Nd, U, and Pu in colloid size fractions 450 nm to 100 nm and 100 nm to 5 nm, (2) the masses that were dissolved, which was that passing through the 5 nm filter, and (3) the masses that had been stripped from the stainless steel vessel surfaces by the acid soak. The concentrations measured in the 450-nm, 100-nm, and 5-nm filtrates were multiplied by the volume of water at the end of the test (i.e., the amount added at test initiation minus the mass loss of the test vessel) to calculate the total mass of material in each fraction. The concentrations measured in the acid soak solution were multiplied by the volume of acid solution added to the vessel for the acid soak step. The distribution of Nd is shown in Figs. 9a, b, and c for tests conducted with HIP-U,Pu-loaded CWF materials at 90°C and a CWF/water mass ratio of 1:10, 120°C and a CWF/water mass ratio of 1:10, and at 120°C and a CWF/water mass ratio of 1:20, respectively. The Nd released from the CWF is present primarily in colloids in the size fraction 100 nm to 5 nm and fixed to the steel vessel under all test conditions. Very little Nd is either associated with large colloids (i.e., > 100 nm) or dissolved (i.e., < 5 nm) in tests with any of the HIP CWF materials. In general, the total amount of Nd released increases only slightly with test duration.

The distribution of U is shown in Figs. 10a, b, and c. Although most of the U was fixed to the vessel, appreciable amounts were dissolved and associated with colloids under all test conditions and for all HIP CWF materials. In general, the total amount of U released increases only slightly with test duration.

The distribution of Pu is shown in Figs. 11a, b, and c. Like Nd, most of the Pu was fixed to the vessel or associated with colloids in the size fraction 100 nm to 5 nm under all test conditions and for all HIP CWF materials. In fact, the greatest amounts of dissolved Nd and Pu were both found in test PCPu120-91-237m. In general, the total amount of Pu released was nearly constant with test duration.

4.2.3 Comparison of *NL(i)* Values for Tests with HIP U,Pu-loaded CWF Materials

The sums of *NL(i)* values calculated from the concentrations in the 450-nm and acid soak solutions were used to compare the extents of reaction of the different HIP U,Pu-loaded CWF materials. The contribution of the RWS solution was excluded because of its high uncertainty. Exclusion of the RWS solution has a negligible effect on the values of *NL(i)* for components other than Na and Cl. The results are provided in Appendix B, Table 24B. The normalized mass losses based on B, Si, Pu, and U are summarized in Table 9 for tests conducted with the four HIP U,Pu-loaded CWF materials under different test conditions. The release of boron and silicon provide the best measures of the extent of dissolution of the sodalite and binder glass phases. Boron is only present in the binder glass, whereas silicon is present in both phases. Boron is highly soluble and is not commonly sequestered in alteration phases. Silicon is less soluble than boron and is commonly sequestered in alteration phases. Boron is commonly released from borosilicate glasses preferentially relative to silicon.

The values of *NL(Al), NL(B), NL(Na),* and *NL(Si)* for the four HIP U,Pu-loaded CWF compositions are compared in Figs. 12a, b, and c for tests conducted at 90 and 120°C at a CWF/water mass ratio of 1:10 and at 120°C at a CWF/water mass ratio of 1:20, respectively. The values of *NL(B)* are significantly higher than the values of *NL(Al), NL(Na),* and *NL(Si)* for all test conditions; the values of *NL(B)*/5 are plotted for ease of comparison. That is, the values of *NL(B)* read from the table must be multiplied by 5. The values of *NL(B)* are greatest for material 238m in all tests except for test PCPu120/1-7-240. The poorer durability of material 238m cannot be attributed to either the water content of the zeolite, which was 0.12 mass % in both materials 237m and 238m, or the relative amounts of U and Pu, which were 1:3 in both materials 238m and 240m. The values of *NL(Si), NL(U),* and *NL(Pu)* indicate that none of these elements are preferentially released from any of the four materials.

The values of *NL(B), NL(Si), NL(U),* and *NL(Pu)* are plotted against the reaction time in Figs. 13 a, b, c, and d for tests conducted at 90 and 120 °C at a CWF/water mass ratios of 1:10. The values of *NL(B)* increase with time in a root-time fashion. The values of *NL(Si), NL(U),* and *NL(Pu)* increase over the first 91 days, but become nearly constant at longer durations. The test temperature has a small but significant effect on the *NL(B), NL(Si), NL(Pu)* and *NL(U)* values: higher values are attained in tests at the higher temperature for tests conducted for the same duration. The values for tests conducted at 120 °C at a CWF/water mass ratios of 1:10 and 1:20 are plotted in Fig. 14. Tests at a mass ratio of 1:10 were only conducted for 7, 28, and 91 days. Except for the 7-day tests, the *NL(B)* values of HIP material 238m are higher than the

values for tests with materials 237m, 239m, and 240m at both mass ratios and for all durations. It was anticipated that the *NL* values for tests at a mass ratio of 1:20 would be higher than the *NL* values for tests at a mass ratio of 1:10 for all materials and all test durations. This is because lower solution concentrations were expected at a mass ratio of 1:20, particularly silica, which has a slowing effect on glass dissolution. Higher *NL* values are observed for tests at a mass ratio of 1:20 in almost all cases.

The values of *NL(Si), NL(U)*, and *NL(Pu)* for tests with HIP U,Pu-loaded CWF are compared in Fig. 15. Note that the values of *NL(Si)* were divided by 5 before plotting. The values of *NL(U)* and *NL(Pu)* are about 5X lower than values of *NL(Si)* in most tests. The values of NL(Si) were seen to be about 5X lower than the values of NL(B) in Fig. 12. The fact that *NL(B)* and *NL(Si)* provide good measures of the extent of corrosion of the binder glass and sodalite phases in the CWF indicates that U and Pu are released from the CWF more slowly than either sodalite or binder glass dissolves. This means that the U and Pu are either accumulating at the surface of the corroding CWF or are present in discrete phases that were removed with the corroded CWF at the end of the test; for example, flocculated colloids.

4.3 TESTS WITH PC U,PU-LOADED CWF MATERIALS GPC00202 AND GPC0030M

4.3.1 Disposition of Nd, U, and Pu Between Colloidal, Dissolved, and Sorbed Fractions

As was done for the tests with HIP U,Pu-loaded CWF materials, the concentrations measured in the filtrate and acid soak solutions were used to calculate the masses of Nd, U, and Pu that were associated with colloids, dissolved, and fixed to the stainless steel vessel surfaces in tests with the PC U,Pu-loaded CWF materials. The distributions of Nd, U, and Pu in tests conducted with GPC0030m at 90°C and a CWF/water mass ratio of 1:10 and with GPC00202 at 90°C and 120°C at a CWF/water mass ratio of 1:10 are shown in Fig. 16. The Nd released from the CWF is associated with colloids in the size fraction 100 nm to 5 nm and fixed to the steel vessel. Released U is fairly evenly distributed between the colloidal, dissolved, and sorbed fractions. The released Pu is almost entirely found associated with small colloids. The total amounts of Nd, U, and Pu released from these PC CWF materials increases slightly with test duration.

4.3.2 Comparison of *NL(i)* for Tests with PC U,Pu-loaded CWF

The normalized mass loss values based on B, Si, Pu, and U for tests with PC U,Pu-loaded CWF materials GPC0020 and GPC0030m are summarized in Tables 10 and 11, respectively. The values of the means and standard deviations for replicate tests are included in the tables. The two PC U,Pu-loaded CWF materials have essentially the same 7-day responses in tests at 90°C. The concentrations of matrix and trace elements in the filtrate and acid soak solutions of tests with each PC U,Pu-loaded CWF PCT (corrected for dilution and background subtraction) are given in Appendix B, Table 23B.

The values of *NL(Al), NL(B), NL(Na),* and *NL(Si)* are compared for each PC U,Pu-loaded CWF material in Figs. 17a and b for tests conducted at a CWF/water mass ratio of 1:10 and at 90 and 120°C. In contrast to the tests conducted with the HIP materials, the value of *NL(B)* is *not* always higher than the values of *NL(Al), NL(Na),* and *NL(Si)*. Instead, the PC CWF materials dissolve more congruently than the HIP CWF materials. Comparison of the results of the 7-day tests at 90°C indicates materials GPC00202 and GPC0030m have approximately the same chemical durability. The values of NL(Si), NL(U), and NL(Pu) are compared in Fig. 18. As was seen in tests with HIP U,Pu-loaded CWF, the release of Si from the PC U,Pu-loaded CWF is much greater than the release of U and Pu.

4.4 OTHER ANALYSES

4.4.1 Examination of Coupons Recovered from Tests

After the first two sets of tests with HIPed U,Pu-loaded CWF were completed, it was noticed that the greatest fractions of released U and Pu were the fractions deposited on vessel walls (i.e., in the acid soak fractions). All the tests with HIPed U,Pu-loaded CWF were carried out with stainless steel vessels that had been used previously in PCT with radioactive materials. The acid soaks conducted as part of those tests to remove radioactive-isotopes from the vessel surface caused surface roughness and small pits on the vessel walls. Because the values of the acid soak release fractions had larger scatter than the values of the other fractions, and because the acid soak fractions from parallel PCTs at ANL-W conducted in new stainless steel vessels were smaller (see Section 4.4.3), it was hypothesized that pits in the vessels reduced the efficiency of removing CWF particles from the vessel after the test, and that those particles were being dissolved during the acid soaks. This was supported by the observation that the acid soak fractions contained significant concentrations of matrix elements.

Six additional tests were conducted to identify the form of Pu that was deposited on stainless steel surfaces and to help resolve the question of whether more Pu became fixed on the rough surfaces of previously used stainless steel vessels than on smooth surfaces of new stainless steel vessels. Coupons of new Type 304L stainless steel and PFA Teflon were made to be placed in the test vessels along with the CWF when the tests were initiated. The expectation was that some of the Pu would become fixed to the coupon in the same way it became fixed to the steel vessel, and that the coupon could be easily analyzed when the test was completed. Analysis of the surface of the coupon would be much easier than analysis of the vessel. Each coupon was bent into an L-shape. The base of the L was a square approximately 1 cm x 1 cm that rested horizontally on the vessel bottom and was surrounded by particles of CWF. This is referred to as the horizontal leg of the coupon. The other part of the L was a square approximately a 1 cm x 1 cm that extended vertically in the test vessel, but was entirely immersed in test solution. This is referred to as the vertical leg of the coupon. Two tests were conducted in new Type 304L stainless steel vessels that were free of pits to evaluate the effect of the pits. Type 304L stainless steel coupons were placed in both of these tests. Two tests were conducted in Type 304L stainless steel vessels that had been coated with PFA Teflon. An L-shaped coupon made of PFA Teflon was placed in each of the PFA Teflon-coated test vessels.

Samples of CWF and appropriate amounts of demineralized water were added to the vessels in which the coupons had been placed and the PCTs were conducted normally. Test conditions are given in Table 12. (Note that tests PCPu120/1-225-239a and PCPu120/1-225-240a were originally listed as PCPu120/1-TBD-239a and PCPu120/1-TBD-240a, where TBD means the reaction time was "to be determined." The tests were conducted for 225 days, so the TBD in the test name was changed to 225.) The coupons were removed when the test was completed. They were rinsed with demineralized water, allowed to dry, and then assayed for total alpha-radioactivity levels. The vertical and horizontal segments of the L-shaped coupons were separated by breaking the coupon at the bend. Each leg was analyzed individually to determine if the Pu content differed depending on if the coupon was surrounded by CWF particles or was contacted only by the solution. The test vessels were acid soaked following the standard procedure and the acid soak solutions were analyzed for Pu using ICP-MS. The concentrations of Pu on the vessel and coupons per unit surface area were calculated. The surface areas of the coupons were calculated from the measured dimensions. The surface areas of the vessels were estimated from the inside diameter and the height to which the solution filled the vessel during the test. The amounts of radioisotopes fixed to both halves of the coupons were determined by gross alpha counting and alpha particle spectrometry. The latter technique,

often described as "pulse height analysis," determines not only the total alpha radioactivity deposited on the coupon surface, but also distinguishes the alpha particles by their energies, so that the relative and absolute amounts of different alpha-emitting radioisotopes can be determined. Both of these counting techniques are non-destructive. The Pu levels measured on the coupons and on the vessels are given in Table 12. The values of *NL(Si)* are included in the table to compare the extents of dissolution of sodalite and the binder glass.

The amounts of Pu per unit surface area on the walls of previously-used Type 304L stainless steel vessels are *lower* than the Pu levels on the stainless steel coupons in the same test vessels, whereas the amounts of Pu per unit surface area on the walls of new stainless steel vessel are similar to the amounts of Pu per unit surface area on the stainless steel surfaces of coupons in the same test vessels. Lower Pu concentrations were found on the vertical legs of the coupons than on the horizontal legs. About twice the amount of Pu was found on the coupon halves from test PCPu120/1-225-240a as was found on the halves from test PCPu120/1-225-239a. This is consistent with the fact that material 240m contains about 3X as much Pu as material 239m. However, similar amounts of Pu are found on the vessel walls for those tests. The corrosion of the two HIP CWF materials was about the same, as indicated by the similar values of *NL(Si)*.

Similar Pu concentrations were found on the horizontal legs of the coupons and surfaces of new vessels, but higher concentrations were found on the vertical legs. The concentrations on the new steel and Teflon-coated steel surfaces were higher for the longer test durations. Higher Pu concentrations were found on the Teflon coupons than on the Teflon-coated vessel walls. Less Pu was deposited on Teflon surfaces than on steel surfaces. Based on the values of *NL(Si)*, the extent of degradation was slightly lower in tests conducted in Teflon-coated vessels than in new steel vessels under the same test conditions.

After analysis, the coupons were archived with the intent of examining them with SEM to ascertain if the Pu is present as colloidal-sized PuO_2crystallites or in another form. Although the individual PuO_2 crystals are too small to be imaged with SEM, the clusters of crystals that form in the CWF are readily detected with SEM. The SEM examinations completed to date have failed to detect clusters of Pu on the coupon. This suggests that either the crystallites do not cluster or the Pu is present in another form (e.g., elemental) homogeneously distributed on the coupon. Additional work is in progress to examine the coupons with autoradiography and with TEM.

4.4.2 Comparison of Tests Conducted in Different Vessel Types

Comparison of short-term test results with the results of parallel tests conducted at ANL-W indicated that the Pu concentrations in acid soak solutions measured in the tests at ANL-E were about 1.7X higher than those measured at ANL-W (see Section 4.4.3). One difference in the test procedure was that the vessels used for tests at ANL-E had been previously used and cleaned by acid soaking many times, whereas the vessels used at ANL-W were new. The vessels used in the tests at ANL-E had been thoroughly cleaned by filling the vessel with 2% HNO_3(aq) and soaking overnight at 90˚C to dissolved any radionuclides that were fixed to the vessel. Each vessel was soaked again overnight with a fresh amount of 2% HNO_3(aq), which was then analyzed for alpha radioactivity. The acid soak procedure was repeated until the level of radioactivity was at background (5□ disintegrations/minute/mL). The vessel walls become roughened and pitted as a result of the repeated acid soaks and cleaning of the vessels. It was suspected that particles of reacted CWF materials were not being removed from these pits prior to filling the vessel with nitric acid solution for the acid soak. Subsequent tests were carried out by first removing the test solution with a pipette and then removing corroded CWF as a water slurry. After all visible CWF was removed, the vessels were rinsed with demineralized water three times and the vessel sides and bottoms were wiped gently with a moist cotton applicator. The applicators were typically discolored and radioactively contaminated with corroded CWF particles that must have lodged on the pitted wall surfaces. Wiping the vessel bottom with a second applicator did not show any discoloration or radioactive contamination on the applicator.

These results suggested that small amounts of corroded CWF remained trapped in the pits present in used vessels despite vigorous swirling of water after removing all visible CWF particles, and even after gentle wiping with wet cotton applicators. Therefore, the concentrations in the acid soak solutions are probably too high due to carry over of a small amount of reacted CWF particles. The relatively high concentrations in the acid soak solutions of soluble CWF components that are not usually observed to be fixed to the vessel, such as boron and silicon, provide additional evidence that CWF particles are being retained in pits in the vessels. Although the concentrations of boron and silicon in the acid soak solution could be used to estimate the amounts of Nd, U, Pu, and other components in the acid soak solution due to dissolution of CWF particles that were carried over, this was not done because of the high uncertainty of the resulting values and because using the measured concentrations provides conservative upper bounds to the amounts of each component that were fixed to the vessel.

A few tests and analyses were conducted to assess the significance of this issue for the evaluation of the present test results and possible procedural modifications for future tests. A series of surface roughness tracings of new stainless steel vessels revealed that even new vessels have a surface that is sufficiently rough that fines or corroded particles might not be washed off the surface simply by swirling water inside the vessel. Tests were conducted to compare the degree of sample carry-over in previously used vessels, new stainless steel vessels, and Teflon-coated stainless steel vessels. Although vessels made entirely of Teflon have been used for testing in the past, safety considerations mandate the use of stainless steel vessels for tests with radioactive materials. Therefore, three new stainless steel vessels were sent to a DuPont-licensed Teflon applicator to have the interior surfaces coated with a 10-mil film of PFA Teflon. A small number of tests were conducted in parallel in previously used and in new Type 304L stainless steel vessels and in Teflon-coated vessels to measure the relative amounts of actinide elements that become fixed on stainless steel and Teflon corrosion test vessels during the test. Tests were conducted with HIP U,Pu-loaded CWF material 238m and PC U,Pu-loaded CWF material GPC0030m.

The values of *NL(i)* for the 450-nm filtrate and acid soak solutions for *i* = Si, Nd, U, and Pu are summarized in Table 13. The ratios of the results for the different test vessels are used to compare the effect of the vessel on the extent of reaction and the retention of material on the vessel walls. The *NL(Si)* results for the 450-nm filtrates provide a measure of the extent to which the CWF matrix materials degrade in different vessel types under the same test conditions. The values of *NL(Si)* for materials in the used vessels were slightly higher than for the materials in the new vessels, and the values for materials in the new vessels were slightly higher than for the materials in the Teflon-coated vessels. Although the differences show a trend, they are within the uncertainty of conducting the tests and analyzing the solutions. The vessel surface is not expected to affect the release of Si directly, although any effect of the vessel on the test solution could affect *NL(Si)*. The values of *NL(Nd), NL(U),* and *NL(Pu)* in the 450-nm filtrate and acid soak solutions show the same trend. The differences in *NL(i)* for Nd, U, and Pu exceed the differences in the extents of reaction that are indicated by the values of *NL(Si)*. The observation that the differences for Nd, U, and Pu exceed the differences for Si indicates that those differences are significant with respect to testing uncertainty.

4.4.3 Comparison of Parallel Tests Conducted at ANL-E and ANL-W

A parallel matrix of tests with HIP U,Pu-loaded CWF was conducted at ANL-W. The boron concentrations in the 5 nm filtrate solutions are compared in Figs. 19 a, b, and c for tests

conducted at ANL-E and ANL-W at 90°C and a CWF/water mass ratio of 1:10, at 120°C and a CWF/water mass ratio of 1:10, and at 120°C and a CWF/water mass ratio of 1:20, respectively. The boron concentration is used as an indicator of the extent of dissolution of the binder glass. The same trends are seen with regard to test duration and test conditions in tests conducted at ANL-E and ANL-W, although the agreement in the absolute concentrations for corresponding tests is poor. If it is assumed that the analytical uncertainty is 15% for each test, then the relative difference between the results for tests conducted at ANL-E and ANL-W, as {(ANL-E)-(ANL-W)}/(ANL-E), exceeds 30% for 13 of the 43 tests that can be directly compared.

The amounts of U and Pu found in the 5 to 100 nm size fraction, the <5 nm size fraction (which is the dissolved fraction), and fixed to the steel vessel are compared in Figs. 20 and 21. Few general trends can be seen within the data sets of either tests conducted at ANL-E or tests conducted at ANL-W with regard to material, test duration, or test conditions. One observation is that higher concentrations of U and Pu were usually found in tests conducted at ANL–E than in tests at ANL–W. This was discussed previously as a possible indication that reacted CWF particles were being retained on the vessel walls and carried over in the acid soak solutions. This may also have occurred in some tests conducted at ANL-W. For example, the amount of U fixed to the vessel in test PCPu90-91-239 (Fig. 20a) conducted at ANL-W is higher than in comparable tests conducted under the same condition for different durations, such as PCPu90-28-239 and PCPu90-365-239, or for the same duration at a higher temperature, such asPCPu120-91-239. Alternatively, these results may simply be an indication that the test uncertainty in measuring the release and disposition of U and Pu is similar to the differences seen between tests.

4.4.4 Replicate Filtration with 5-nm Pore-Size Filters

The possibility that the polysulfone filter medium was retaining dissolved species other than by size, e.g., by sorption, was evaluated by analyzing the filtrate of a solution that was passed through a 5-nm pore-size filter, then passing the filtrate through a second 5-nm pore-size filter. The 5-nm filtrate solution from test PuPC90-28-239 was passed through a second 5-nm pore-size filter to determine if the filter was retaining dissolved U, Pu, or other elements. The results for the two filtrations are shown in Table 14. The ratio of the concentration of U after the first and second filtrations was 0.96, which indicates that U is not sorbed onto the polysulfone filter medium. The concentrations of other analytes are also the same in the two filtrates.

4.4.5 Sequential Acid Soaks

The test procedure calls for a single acid soak of the used test vessel to dissolve material that became fixed to the vessel during the test. The test vessels used for the first three sets of tests that were conducted were subjected to sequential acid soaks to measure the efficiency of a single acid soak step for dissolving Pu fixed to the vessel. Four test vessels were subjected to four sequential soaks and eight test vessels were subjected to two acid soaks. The soak solutions were analyzed for Pu with ICP-MS. The results are shown in Table 15. The Pu concentrations in the third and fourth acid soak solutions are similar to the background concentrations measured in blank tests. Neglecting the third and fourth soaks, the Pu concentrations in the second acid soak solutions range from 2 to 14% of the concentrations in the first acid soak solutions. These are within the uncertainty of the reported Pu concentrations from the first acid soak. The results presented in the tables in Appendix B are for a single acid soak for each test.

5. CHARACTERIZATION OF COLLOIDAL MATERIAL

Three methods were used to characterize colloid-size material in the test solutions: sequential filtration followed by chemical analysis, dynamic light scattering, and direct examination by transmission electron microscopy. Some filtrant particles were analyzed using X-ray absorption fine-structure spectroscopy (XAFS). Sequential filtration results were discussed previously.

5.1 DYNAMIC LIGHT SCATTERING ANALYSIS

Several of the 450-nm filtrate solutions from tests with HIP U,Pu-loaded CWF materials 238m and 240m at 90 or 120°C were analyzed with laser dynamic light scattering (DLS) to measure the size distribution of the colloidal particles in the test solutions. Knowledge of the size of radiocolloids is important because it will affect their transport in the disposal system. The solutions recovered from the vessels were not analyzed directly because of the likelihood that CWF particulates were suspended in those solutions. These would interfere with the DLS analysis. The 450-nm filtrates are assumed to include all the colloidal material generated by CWF degradation during the test, but to be free of suspended CWF particulate material. A few 100-nm and 5-nm filtrate solutions were also analyzed. The solutions had cooled to near room temperature prior to being sampled, and large colloids may have settled out of solution during this time. Aliquots of the filtrate solutions were placed in glass sample vials immediately after filtration and were stored at 25°C until DLS measurements were made.

The DLS apparatus consists of a modified 4700c Photon Correlation Spectrometer (Malvern Instruments, Ltd.) with a variable power output (3 to 75 mW) argon ion laser. The sample cell is placed in the sample chamber, which is housed in a temperature-controlled water bath. All optical components of the system are mounted on an optical table. A correlator records the scattering intensity from small scattering volumes in time intervals as short as 50 ns. Particle sizing data were analyzed using commercial software supplied with the unit. Calibration of the entire system for particle size determination was performed using polystyrene latex standards having nominal sizes of 30, 70, 100 and 300 nm that were obtained from Duke Scientific or the National Institute of Standards and Technology (NIST).

The CONTIN analysis package provided with the DLS software was used to determine the size distributions for the polydisperse systems examined in this study. CONTIN is commonly used to analyze data for which a large number of analytical solutions are possible

[PROVENCHER-1984]. A small number of possible analytical solutions that are consistent with the data are provided by CONTIN by minimizing the residual between the autocorrelation functions derived from the measured DLS spectrum and from a computer-generated spectrum for each analytical solution. The analytical solutions are selected based upon several statistical constraints within CONTIN software, and by accounting for *a priori* knowledge of the experimenter and parsimony (the choice of the simplest solution among those not eliminated by other constraints). Some of the possible CONTIN solutions were rejected because the data were over-fit (e.g., the identification of too many particle size ranges were identified) or because of poor agreement between the calculated function and the experimental data. Multiple DLS measurements were performed on each sample by varying experimental parameters (e.g., sample age and collection time) to gain confidence in the analytical solution. The size distributions for the chosen solutions are in excellent agreement with multiple DLS measurements made on a sample. The size distributions (the analytic solutions) are reproducible and indicate a stable colloidal system.

The plot of a typical bimodal analytic solution is shown in Fig. 22 as intensity weighted distributions. The plot has the particle size (i.e., the effective diameter of the colloid) on the abscissa and the relative intensity (roughly the percent of the total number of colloids that has that particular size) as the ordinate. Two peaks are seen in Fig. 22. The first peak has a maximum at about 4 nm. The full width at half the maximum intensity (FWHM) is used to define the peak width and the size range of the colloids. For peak 1 in Fig. 22, the peak width is 7 nm (from about 2 nm to 9 nm). The results of DLS analysis of several filtrate solutions are given in Table 16 in terms of mean colloid diameter and peak width. The relative abundance of colloids in the size range of a particular peak is also given in the table as % peak area. Mean values are given for replicate analyses of the same filtrate.

The stability of some filtrates were evaluated by analyzing solutions after they sat for different lengths of time after the test. The results for analyses of the 450-nm filtrate from test PCPu120-7-202 that were performed 6 days and 22 days after the test was completed and the aliquot was taken are shown in Fig. 23. The mean diameters and size ranges are about the same for the two peaks in the two measurements, but the relative amounts of colloids in each size range changes. After 6 days, about 76% of the colloids have a mean diameter of about 4.7 nm and 24% have a mean diameter of 129 nm. After 22 days, about 29% of the colloids have a mean diameter of about 5 nm and 71% have a mean diameter of 166 nm. These measurements do not provide a measure of the total amounts of colloids in the two size fractions, only the relative amounts. The proportion of small colloids may have decreased due to aggregation to

form large colloids. If aggregation is occurring, it is surprising that the population of colloids does not span the range between about 5 nm and 166 nm. It may be that the colloid sizes that are observed are the two stable size ranges.

5.2 TRANSMISSION ELECTRON MICROSCOPY OF PARTICLES FROM U,PU-LOADED CWF PCT SOLUTIONS

Samples of colloidal material were prepared for examination with transmission electron microscopy (TEM) by wicking solutions though holey carbon TEM grids. The TEM grids have a thin carbon film with randomly located holes that overlay a copper grid. These were used to isolate colloidal particles by drawing a drop of the 450-nm filtrate solution through the holey carbon TEM grids and using the holes in the carbon film to filter out colloids. The grid was then examined to locate and characterize colloids, particularly colloids with associated $(U,Pu)O_2$ crystallites.

Although an abundance of aluminosilicate colloids were isolated using this procedure, very few Pu-bearing colloids could be located. Several alternative procedures were tried to increase the amount of Pu-bearing colloids on the TEM grid, and some success was had using centrifugation. An epoxy jig was made to hold a holey carbon TEM grid at a 45° angle in a microcentrifuge tube so that the grid would be perpendicular to the centrifugal force during centrifugation. In this way, a larger volume of solution could be passed through the holey carbon grid and more colloids would be collected.

A TEM photomicrograph of a $(U,Pu)O_2$ crystallite associated with large aluminosilicate colloids is shown in Fig. 24. This sample was prepared by wicking and shows an important artifact of the wicking method, namely, that colloids aggregate at the pores during the wicking procedure. The photo shows that the U and Pu are present as $(U,Pu)O_2$ crystallites approximately 35 nm in diameter. This is similar in size to the crystallites present in the CWF. The photo does not reveal whether the $(U,Pu)O_2$ crystallites were associated with a larger alumiosilicate colloid in solution, or if they aggregated with the aluminosilicates during sample preparation (i.e., during wicking).

Shortly before this report was written, development of a new technique began that employs a Butvar substrate fixed on a TEM grid. The Butvar substrate is hydrophilic and retains colloids by sorption rather than by filtration. Samples are prepared by placing a small drop of solution on the Butvar surface and then wicking the solution from the top edge of the grid to draw and absorb water away from the Butvar surface. Many colloids remain attached to

the Butvar as the water is withdrawn. Success was had in isolating colloids from nonradioactive solutions in developmental tests and several samples were made with archived filtrate solutions from tests with U,Pu-loaded CWF materials. A TEM photomicrograph of a small cluster of ~10-nm size aluminosilicate colloids and several individual colloids isolated using a Butvar grid are shown in Fig. 25. Several large clusters were also seen. Work is in progress to detect Pu-bearing colloids on Butvar grids to determine if they exist as discrete colloids in solution or are associated with large aluminosilicate colloids. This will impact their transport behavior in a disposal system.

The identification of the released particles as $(U,Pu)O_2$ and their sizes using TEM are consistent with sequential filtration results, which showed that most of the plutonium in solution was associated with colloids 5-100 nm. The TEM images confirm that some of the $(U,Pu)O_2$ particles in the U,Pu-loaded HIP CWF are released as colloids. However, most of the Pu that was released from CWF was found in the acid soak solution, which gives the fraction fixed to the steel vessels. It is currently uncertain whether Pu was deposited onto the vessel as $(U,Pu)O_2$ or as another Pu-species. The stainless steel coupons that were immersed in test vessels in some tests are being analyzed to determine the speciation of Pu that becomes fixed to stainless steel. The sequential filtration and TEM information we have obtained, coupled with evidence of the nature of Pu adsorbed on stainless steel surfaces, will be important for modeling CWF performance in a repository because it may indicate that the primary release mode of plutonium from CWF is in the form of colloidal $(U,Pu)O_2$ particles.

5.3 X-RAY ABSORPTION FINE-STRUCTURE SPECTROSCOPY (XAFS)

A sample of filtrant material was analyzed with XAFS to confirm that the plutonium was present as PuO_2. The 5-nm pore-size centrifugal filter test PCPu120/1-225-240 was cut out of its support and fixed in an XAFS sample holder with epoxy. This filter was selected for analysis because analyses of filtrate solutions before and after passing through that filter indicated that it had retained the greatest amount of Pu,. The holder was placed in the beam line at ANL Advanced Photon Source and XAFS scans were collected at the Pu L_{III} edge. An area scan showing Pu-containing colloidal particles that collected at the periphery of the filter is shown in Fig. 26. That area was presumably the upper edge of the filter as it was oriented in the microcentrifuge, which would have had the highest centrifugal force during centrifugation. The microcentrifuge holds filters at a 45° angle from horizontal, so the upper edge of the filter as it sits in the centrifuge tube is subjected to the greatest centrifugal force. Unlike the holders made to produce TEM grids that were described previously for collection of colloids for TEM

examination, a jig was not used to hold the filter in the centrifuge tube during sequential filtration.

The near-edge spectrum of these particles is shown in Fig. 27 superimposed with the spectrum of a reference PuO_2 sample. The similarity of the two spectra indicates that the material on the filter contains tetravalent plutonium, which is consistent with that of the PuO_2 crystallites found on TEM grids. The Pu L_{III} edge spectra of HIP Pu-loaded CWF were previously identified as being consistent with PuO_2 [RICHMANN-2001]. This indicates that the PuO_2 crystallites in the CWF are released intact.

6. DISCUSSION

The primary purpose of the corrosion tests described in this report was to study the release behavior of Nd, U, and Pu during degradation of CWF materials made using the HIP and PC processes. This information is needed to support qualification of the CWF for disposal in the federal high-level waste repository. These elements are present in the CWF primarily as oxide inclusions within the binder glass phase. In the HIP CWF materials, most of the oxide inclusions are located near sodalite domains, whereas the oxide inclusions are fairly evenly distributed throughout the glass phase in the PC materials. This is important because tests with HIP CWF materials have shown the glass adjacent to the sodalite dissolves preferentially under some conditions [LEWIS-2002]. This is probably due to the high concentrations of halite inclusions and pores that occur at that interface and increase the available surface area. It is an asset of the PC CWF materials that a smaller fraction of the oxide inclusions are near the sodalite domains.

The contribution of radionuclides released as CWF materials degrade to the total dose must be taken into account when evaluating the performance of the disposal system. The same approach that is used to account for contributions of radionuclides released from high-level radioactive waste (HLW) glasses can be used to account for radionuclides released from the CWF. In the case of HLW glass, radionuclides are conservatively assumed to be released at the same rate that the glass matrix dissolves, as measured by the release of boron. Many of the radionuclides released as glass dissolves are associated with colloids. These tests show that most of the Nd, U, and Pu released from CWF materials that remains in solution is associated with colloids. Only small amounts of Nd and Pu were found to be dissolved in the test solution (i.e., remained in the 5-nm filtrate). This is probably due to the low solubility limits for these elements. A greater fraction of the released U was dissolved.

The measured concentrations of Nd, U, and Pu in the 5-nm filtrates can be compared with the solubilities of the phases presumed to control the concentrations under the test conditions (i.e., temperature, pH, pO_2). The solubility limits of Nd, U, and Pu were estimated by assuming that (1) these elements are present in the test solutions primarily in the oxidation states Nd(III), U(VI), and Pu(IV), and (2) the test solutions were in equilibrium with atmospheric CO_2 at 25°C when passed through the 5-nm filter. The first assumption is realistic for Nd(III), which cannot be in any other oxidation state in solution, and for uranium, which is oxidized from any lower oxidation state to U(VI) in aerated water. The assumption is less certain for Pu(IV), because Pu(IV) and Pu(V) exist in equilibrium in highly dilute near-neutral aerated solutions,

with Pu(IV) typically predominating [NITSCHE-1991]. Some Pu(V) is expected to be present because the test solutions were exposed to air during filtration. The second assumption is needed to estimate the concentrations of bicarbonate and carbonate ions under test conditions, because these ions form complexes with Nd(III), U(VI), and Pu(IV). The solubility limit of Pu(IV) is higher in carbonate-containing alkaline solutions than in carbonate-free solutions due to formation of carbonate complexes. For example, the solubility limit of [Pu(IV)] is ~ 1 x 10^{-9} M in pH 9.4 solution having a carbonate concentration of 0.001 M [YAMAGUCHI-1994], whereas the solubility limit of [Pu(IV)] is = 2.9 x 10^{-7} M in a pH 8.5 solution having a carbonate concentration of about 0.003 M [NITSCHE-1992]. Complexation by carbonate increases the solubility of Pu(IV) by about 300 times. Because Pu(V) is expected to be in equilibrium with Pu(IV) in the filtrate solutions, the solubility values cited above provide lower limits for the present tests. Nitsche found a distribution of Pu(III), Pu(IV), Pu(V), and Pu(VI) in J-13 groundwater at pH 8.5 with only 6% as Pu(IV) [NITSCHE-1991]. We estimate the total [Pu] that can exist in the solutions from tests with U,Pu–loaded CWF to be [Pu(IV)] + [Pu(V)] = 1 x 10^{-8} M.

There is no comprehensive study of the solubility of rare earth ions in carbonate-saturated water (i.e., in water in equilibrium with 0.0001539 atm CO_2(g) in N_2(g) at 25°C). Rai et al. measured [Nd^{3+}] = 1 x 10^{-8} M after equilibrating Nd^{3+} with a borosilicate glass doped with rare earth elements in CO_2-saturated water [RAI-1992]. They proposed the controlling solid phase to be $NdOHCO_3$(c), but did not observe this or any other Nd-bearing phase. The behavior of Am(III) is expected to be the same as that of Nd(III) because of their similar ionic radii, hydroxide solubilities, and ion-interaction parameters. The Am concentration measured at pH 8 and P(CO_2) = 10^{-3} atm is [Am(total)] = 3 x 10^{-9} M, and the solid phase in equilibrium with Am^{3+} in carbonate-containing water is Am(OH)(CO_3) [FELMY-1990]. This value is used as an estimate for Nd^{3+} solubility limit in the present test solutions: [Nd(III)] = 3 x 10^{-9} M.

The aqueous ion UO_2^{2+} exists in equilibrium with schoepite, $UO_3 \bullet 2H_2O$. Bruno and Sandino determined the solubility of amorphous and crystalline schoepite in water at 25 °C at pH 6.5-9.0 [BRUNO-1989]. The solution had $NaClO_4$ as supporting electrolyte but was carbonate-free. The solubility of U(VI) in equilibrium with amorphous schoepite had a V-shaped pH-dependence, with a minimum [U(VI)] = 1 x 10^{-4} M at pH 7.7 and [U(VI)] = 1 x 10^{-3} M at pH 8.5. Many carbonato complexes of U(VI) have been identified and characterized. We presume UO_2^{2+} exists as $(UO_2)_2CO_3(OH)_3^-$ and $UO_2(OH)_2$(aq) in equilibrium with schoepite in the test solutions, and estimate the U(VI) solubility limit to be U(VI) = 2 x 10^{-3} M in the test solutions.

The concentrations measured in the 5-nm filtrates are summarized in Table 17. The concentrations of Nd, U, and Pu measured in the 5-nm filtrate solutions for tests with HIP U,Pu-loaded CWF materials 237m, 238m, 239m, and 240 m and for blank tests are compared with the predicted solubility limits of Nd and Pu in Fig. 28a for tests conducted at 90°C and a CWF/water mass ratio of 1:10, and in Fig. 28b for tests conducted at 120°C and a CWF/water mass ratio of 1:20. The estimated solubility limits at 25°C are shown by the blue line for Nd (3×10^{-9} M) and by the red line for Pu (1×10^{-8} M). The estimated solubility limit for U (1×10^{-3} M) is not shown on the plots because all of the measured concentrations are several orders of magnitude lower than the estimated value. Note that the concentrations of U are plotted as 1/20 of the measured values. Although the concentrations of Nd and Pu measured in the filtrate solutions are less than the estimated solubility limits for most of the tests, they exceed the estimated solubility limits in a few cases; the values that exceed the estimated solubility limits are shown in bold font in Table 17). This may indicate that the solutions had not equilibrated at 25°C prior to filtration. This is probably not the case for tests PPuPC90-182 or PPuPC90-365, which exceed the solubility limit by more than two orders of magnitude.

The concentrations of Nd, U, and Pu measured in the 5-nm filtrate solutions for tests with PC U,Pu-loaded CWF materials GPC00202 and GPC0030m are compared with the predicted solubility limits of Nd and Pu in Fig. 29. The plot includes the results of tests conducted with GPC00202 at 120°C and with GPC0030m conducted at 90°C, both at a CWF/water mass ratio of 1:10. The concentrations in tests conducted through 56 days are well below the predicted solubility limits for Nd, U, and Pu, but the concentrations in tests conducted for 182 and 365 days far exceed the predicted limits (see Table 17).

The present test results show that the release of matrix components can be used as a conservative upper bound to the release of radionuclides from the CWF. The release of Si is shown in Figs. 15 and 18 to be significantly greater than the release of U and Pu from the HIP and PC CWF materials, and the release of B is shown to be significantly greater than the release of Si Figs. 12 and 17. The release of boron is commonly used as an upper bound to the glass dissolution rate. Boron is only present in the binder glass of the CWF, so the release of boron provides an upper bound to the dissolution rate of the glass. Silicon is present in both the glass and sodalite phases.

Tests with non-radioactive CWF materials have shown that sodalite dissolves faster than the binder glass in dilute solutions, whereas the binder glass dissolves faster in the more

concentrated solutions that are generated in PCTs. This is because sodalite is much less soluble than the binder glass. (Although glass is thermodynamically unstable, it is modeled to have an effective solubility due to its very slow dissolution kinetics in concentrated solutions.) The solubility limits of silica (SiO_2) during dissolution of separate sodalite and binder glass materials were measured to be about 34 mg/L and 230 mg/L at 90°C, respectively. As is the case for co-dissolution of stable and unstable solids, the solubility limit of the CWF lies between the solubility limits of the sodalite and binder glass weighted by their dissolution rates. The measured Si solubility limit of non-radioactive reference PC CWF is about 210 mg/L H_4SiO_4 [LEWIS-2002]. The responses of the CWF in the tests discussed in this report are primarily due to dissolution of the binder glass. This is because only small amounts of sodalite and binder glass need to dissolve to generate silica concentration greater than 34 mg/L under these test conditions. Tuff groundwater contacting CWF in the disposal system is likewise expected to be saturated with respect to sodalite because the concentration of silica in groundwater equilibrated with tuff rock is about 62 mg/L SiO_2. The degradation behaviors of the CWF materials in the PCT conducted in this study are relevant to corrosion in the disposal system because the degradation is dominated by the dissolution of binder glass in both systems.

A secondary purpose of these tests was to compare the relative durabilities of CWF materials made using the HIP and PC processes, and of CWF materials made with and without U and Pu under repository-relevant conditions. The *NL(i)* values of tests with the HIP U,Pu-loaded CWF material 238m conducted at 90°C and a CWF/water mass ratio of 1:10 are compared to the *NL(i)* values for tests with PC U,Pu-loaded CWF material GPC0030m for i = B, Si, Pu, and U in Fig. 30. The results for tests with HIP material 238m and PC material GPC0030m are used in the comparison because they have essentially the same compositions. Also included in Fig. 30 are the average *NL(i)* values for duplicate tests conducted with non-radioactive reference HIP CWF and non-radioactive reference PC CWF materials that were made with the same 300 driver salt composition as the U,Pu-loaded CWF materials, but without added U and Pu, and with the same mass ratio of SLZ/binder glass that was used to make the HIP and PC U,Pu-loaded CWF materials. The results for tests with the reference HIP and PC CWF materials are reproduced in Table 18; these values were taken from [LEWIS-2002]. Those results are included in the comparison to determine if the presence of U and Pu affect the dissolution of the CWF matrix, that is, the sodalite and binder glass phases.

This comparison indicates that the release of boron was significantly greater from the HIP CWF materials than from the PC CWF materials, whereas the release of silicon was similar for the four materials. The releases of both B and Si are about 2X higher from the HIP U,Pu

CWF than from the non-radioactive reference HIP CWF, but are about the same for the PC U,Pu-loaded CWF and non-radioactive reference PC CWF. The difference in the results of tests with the HIP CWF materials may indicate that the presence of U and Pu lowers the durability of materials made with the HIP process, whereas the similarity in the results of tests with the PC CWF materials indicates that the presence of U and Pu does *not* affect the durability of materials made with the PC process. It is not obvious why the impact of U and Pu would depend on the process used to make the CWF material.

The values of *NL(U)* and *NL(Pu)* are not significantly different for tests with HIP and PC U,Pu-loaded CWF materials. The trends in *NL(i)* values with test duration differs somewhat for B, Si, U, and Pu: the values of *NL(B)* and *NL(Pu)* increase with time for all materials, but at a decreasing rate; the values of *NL(Si)* increase only slightly with time; the values of *NL(U)* are initially high initially, then decrease with time.

Although the 7-day tests conducted in this study did not meet the requirements for PCT A (parallel tests were not conducted with a standard glass, not all materials were tested in triplicate, etc.), the measured test response is expected to be essentially the same as the response in PCT A. The results of 7-day tests conducted with the HIP and PC U,Pu-loaded CWF materials at 90°C and at a CWF/water mass ratio of 1:10 are compared with the results of tests conducted with reference HIP and PC CWF materials, reference HLW glasses, and the Environmental Assessment (EA) glass in Table 19 to determine (1) if the response of U,Pu-loaded CWF are similar to the responses of non-radioactive reference CWF and (2) if the PC CWF are likely to meet the requirement for chemical durability specified for HLW in the Waste Acceptance System Requirements document (WASRD) [DOE-1999 (see Section 4.2.3)]. The responses for all of the CWF materials are similar to each other and to the responses of the HLW reference glasses, and the responses are all significantly below that of the EA glass. This comparison indicates that the response of radioactive CWF in PCT-A will be less than the response of the EA glass and so meet the WASRD requirement for product consistency. The present work shows that the PCT response of U,Pu-loaded CWF is well-represented by the responses of non-radioactive reference CWF materials.

7. SUMMARY

This study has resulted in the following observations and conclusions:

- The release of U and Pu during the corrosion of CWF materials is about 10X less than the release of Si and 50X less than the release of B under all test conditions.
- Almost all of the plutonium that is released from U,Pu-loaded CWF is present either associated with colloidal-sized particles in the size range between 5 and 100 nm in the test solution (about 15% of the total) or becomes fixed on stainless steel test vessel walls (about 85% of the total). Work is in progress to determine the nature of the material fixed to the steel.
- The Pu in the colloidal particles is present as the mixed oxide $(U,Pu)O_2$. These particles are of dimensions and composition similar to the $(U,Pu)O_2$ particles that are present as inclusions in the CWF. They are often found associated with larger (100-nm size) aluminosilicate colloids.
- The relative amounts of U and Pu in the dioxide inclusions correlate with their relative concentrations in the salt.
- The degradation behaviors of U,Pu-loaded CWF materials made using the HIP and PC process methods are the same with regard to the release of Si, U, and Pu. One difference is that B is released more slowly from the PC CWF materials than from the HIP CWF materials.
- The degradation processes are the same for CWF materials made using the HIP and PC processes, so insight gained from tests conducted with HIP CWF can be used in developing the degradation model for PC CWF materials.
- The presence of U and Pu does not affect the durability of CWF materials. Insight gained from tests conducted with non-radioactive CWF materials can be used in developing the degradation model for radioactive PC CWF materials.
- The durabilities of CWF materials measured in a 7-day PCT are similar to the durabilities of reference HLW glasses and exceed the durability of the Environmental Assessment glass under the same test conditions.
- Higher residual water contents in the zeolite used to make CWF materials result in the formation of more halite inclusions.

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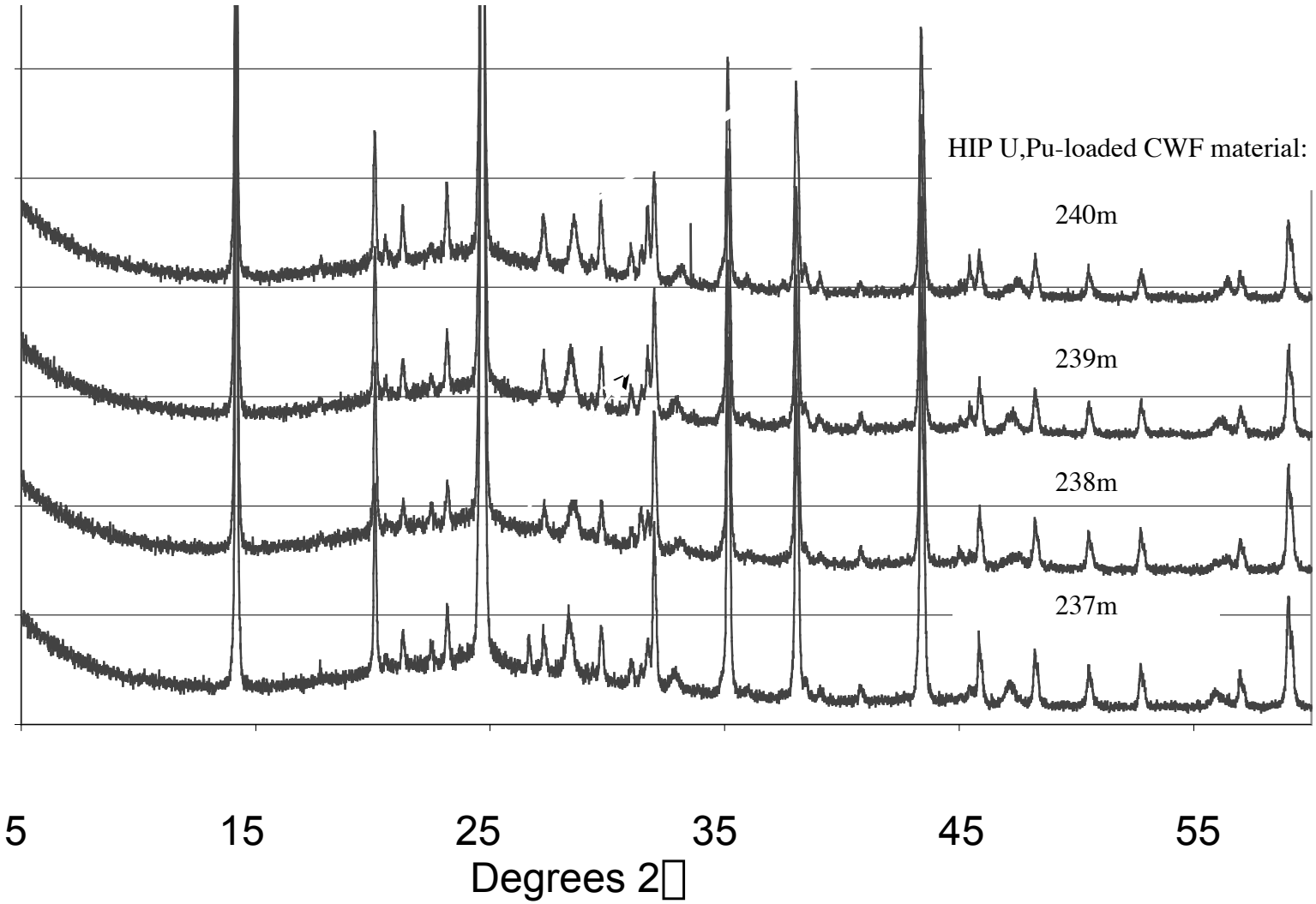


Fig. 1a. X-ray Powder Diffraction Patterns of (from bottom to top) HIP U,Pu-loaded CWF Materials 237m, 238m, 239m, and 240m

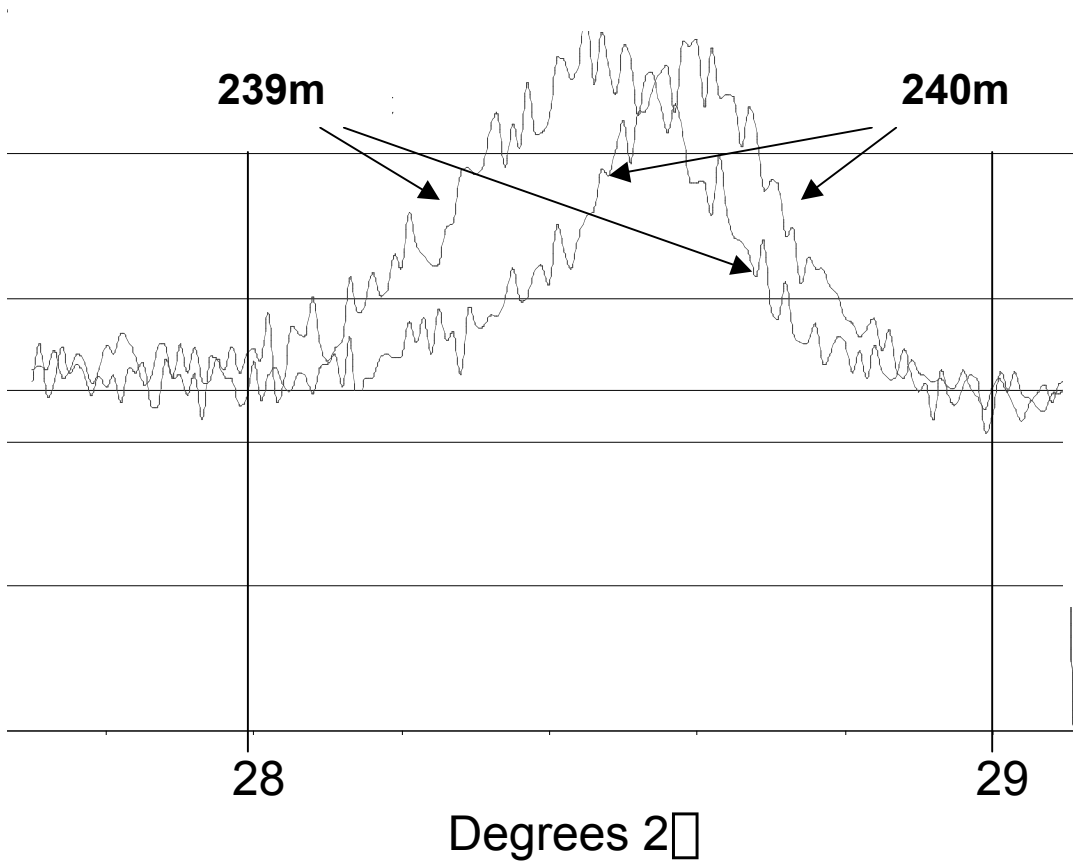
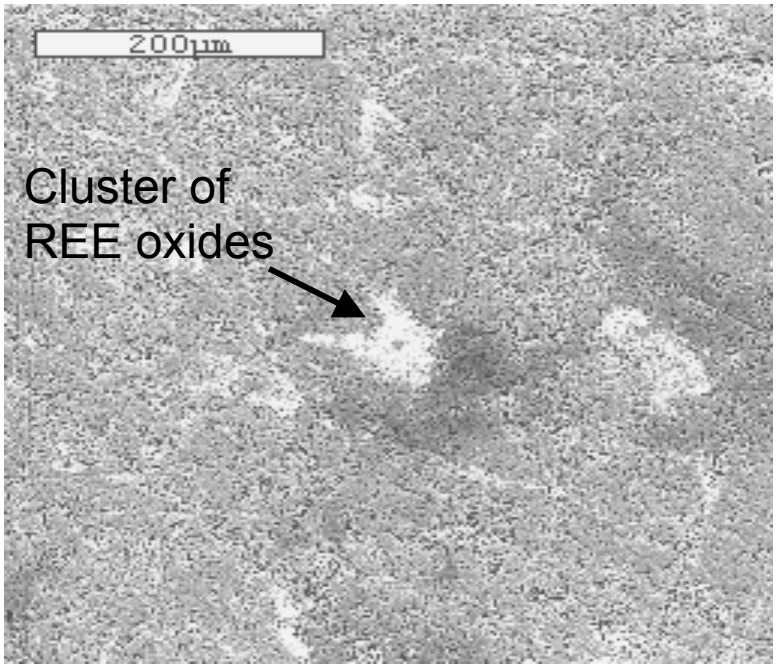


Fig. 1b. Comparison of the (111) Reflections from $(U,Pu)O_2$ for 239m and 240m. The peak occurs at higher 2 for material 240mdue to greater amount of Pu.



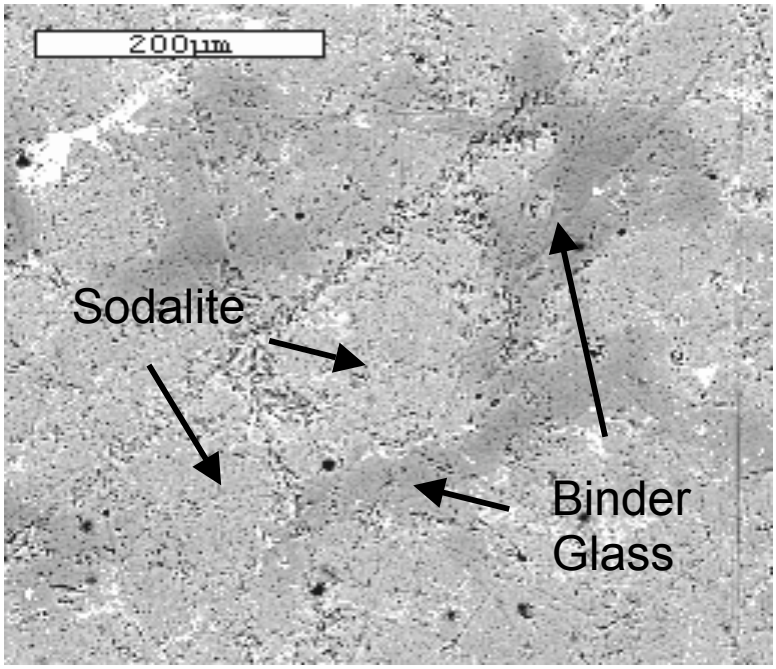


Fig. 2. SEM Photomicrographs of HIP U,Pu-loaded Materials 238m (top) and 240m (bottom).

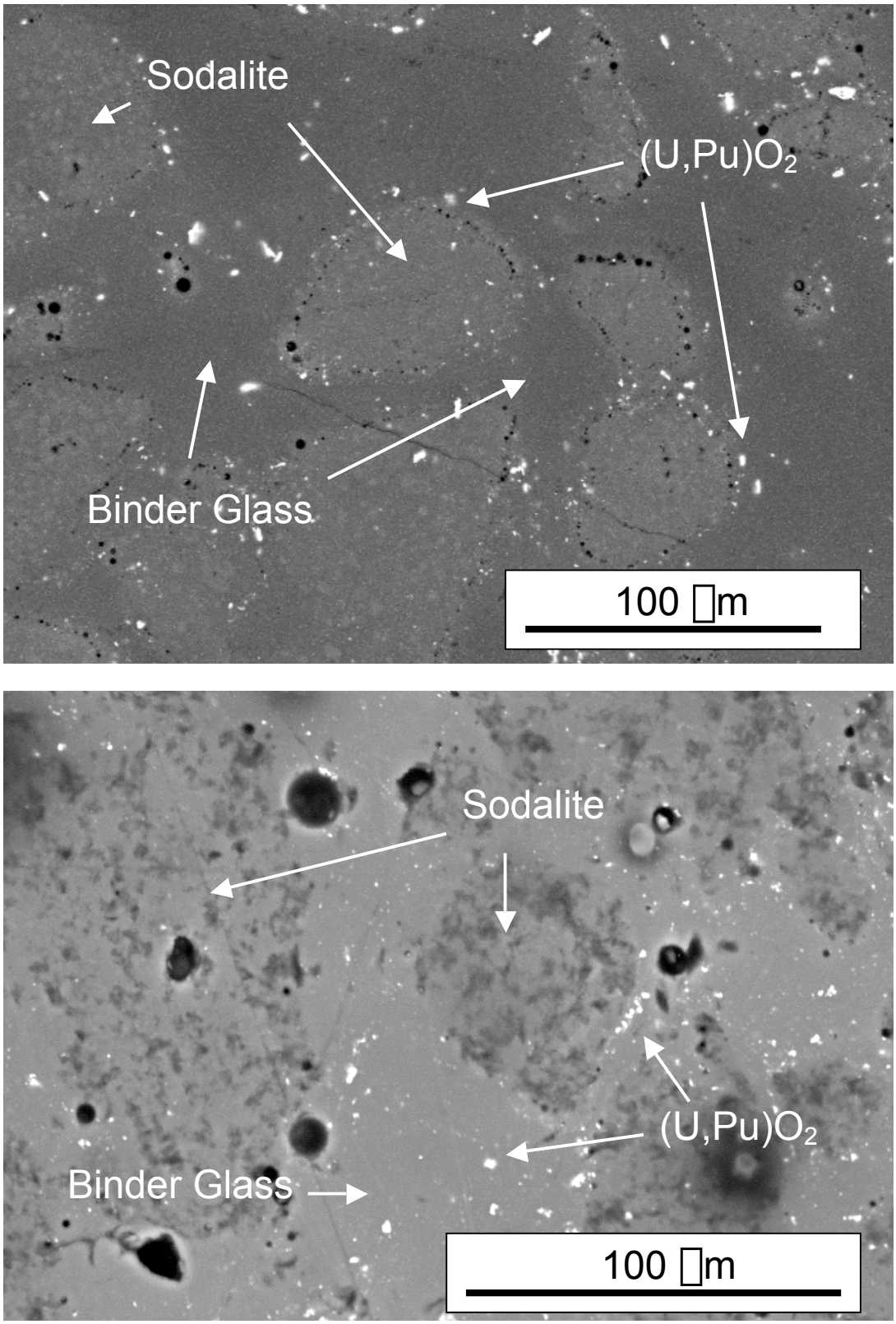


Fig. 3. Images of (top) HIP U,Pu-loaded CWF Material 239m and (bottom) PC U,Pu-loaded CWF Material GPC00202.

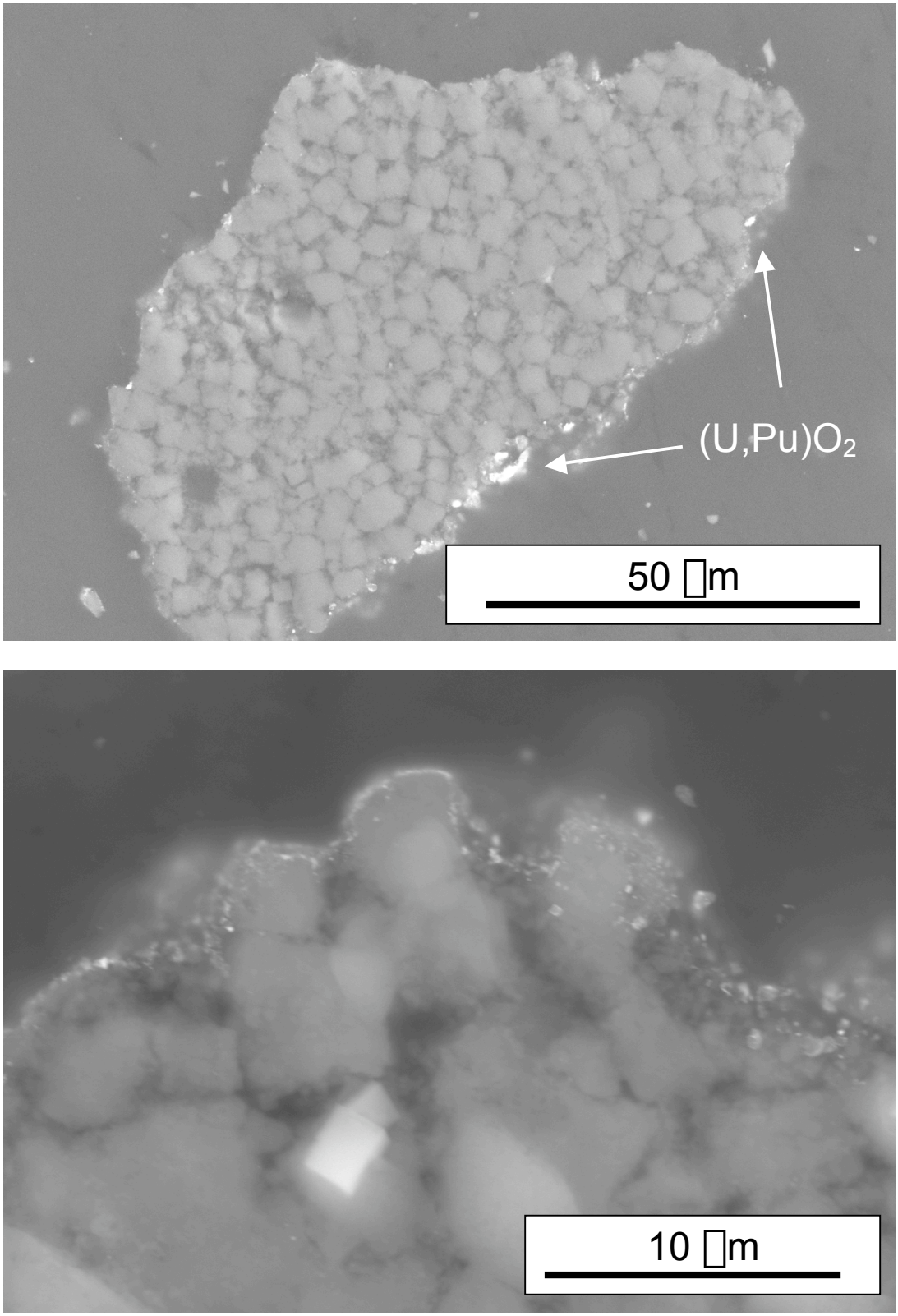


Fig. 4. Granules of the Salt-loaded Zeolite Used to Make Material 238m.

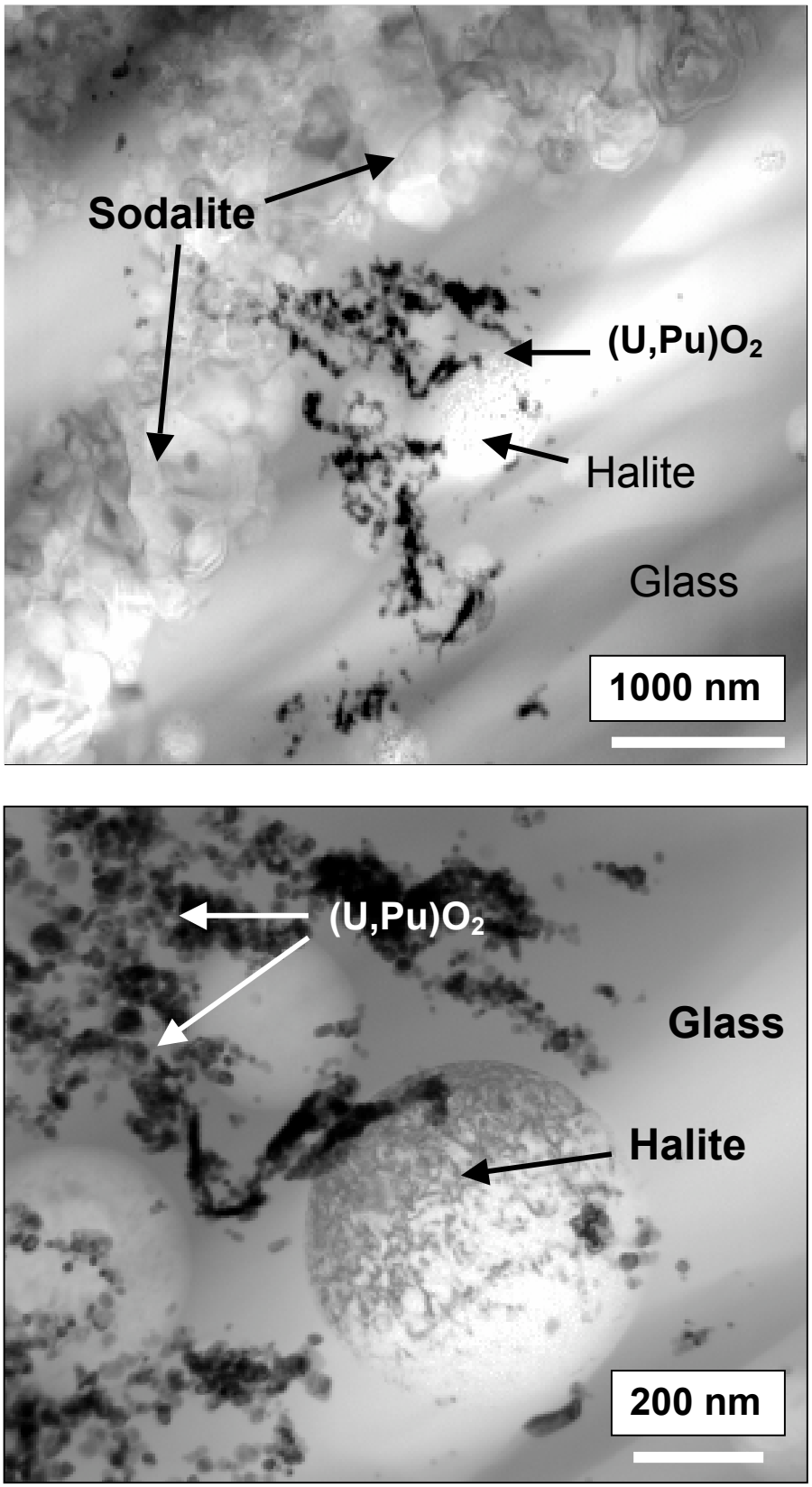


Fig. 5. TEM Photomicrographs Showing Sodalite, $(U,Pu)O_2$, and Halite Inclusions in the Binder Glass at Two Magnifications.

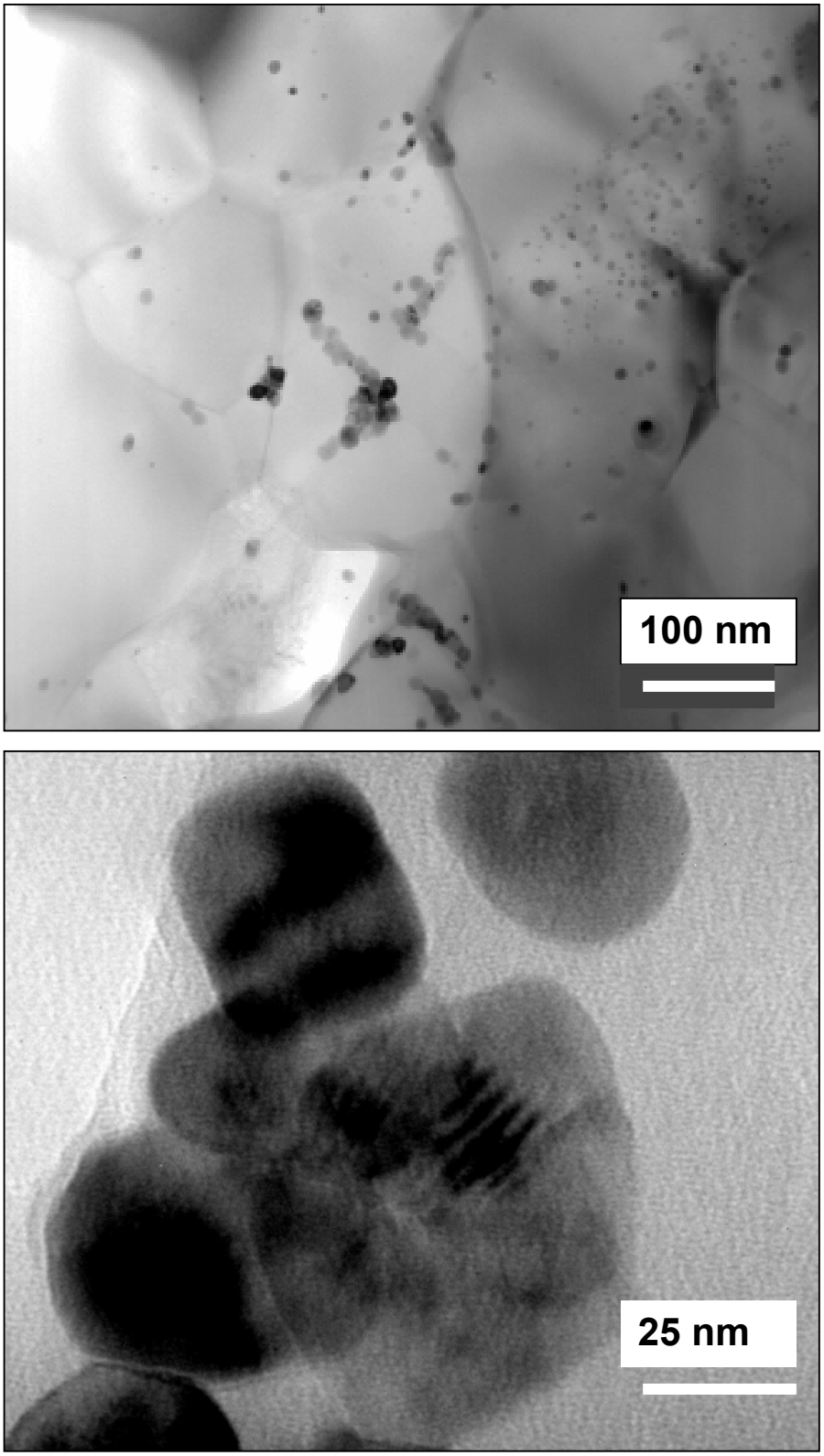


Fig. 6. TEM Photomicrographs Showing $(U,Pu)O_2$ Crystallites within the Sodalite Domain (top) and Included in the Binder Glass (bottom).

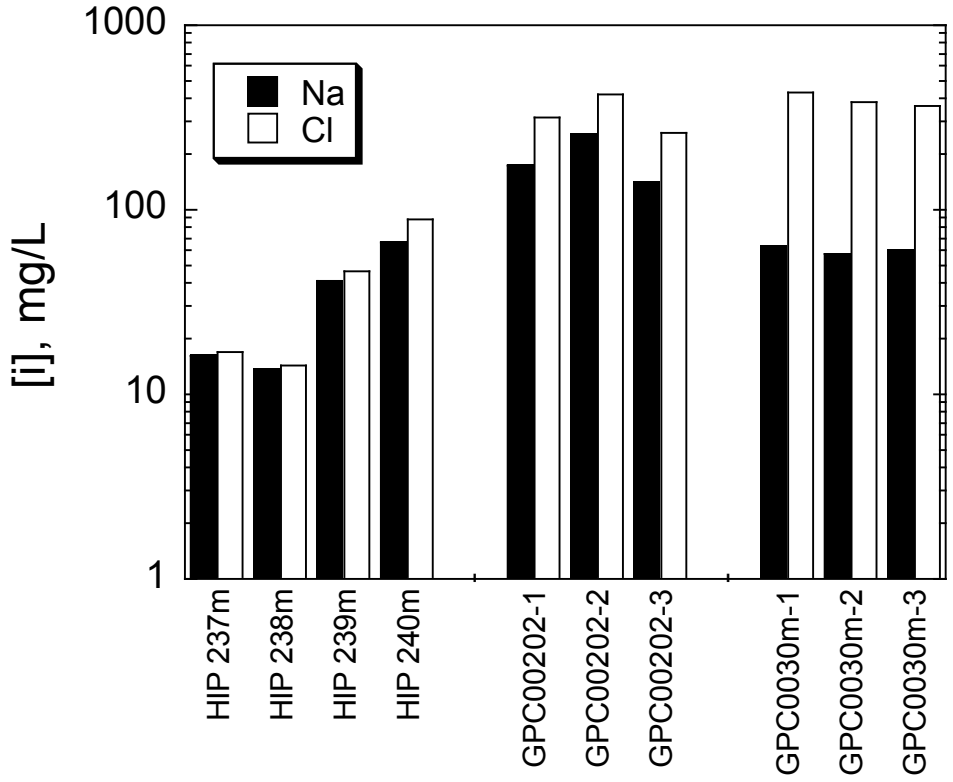
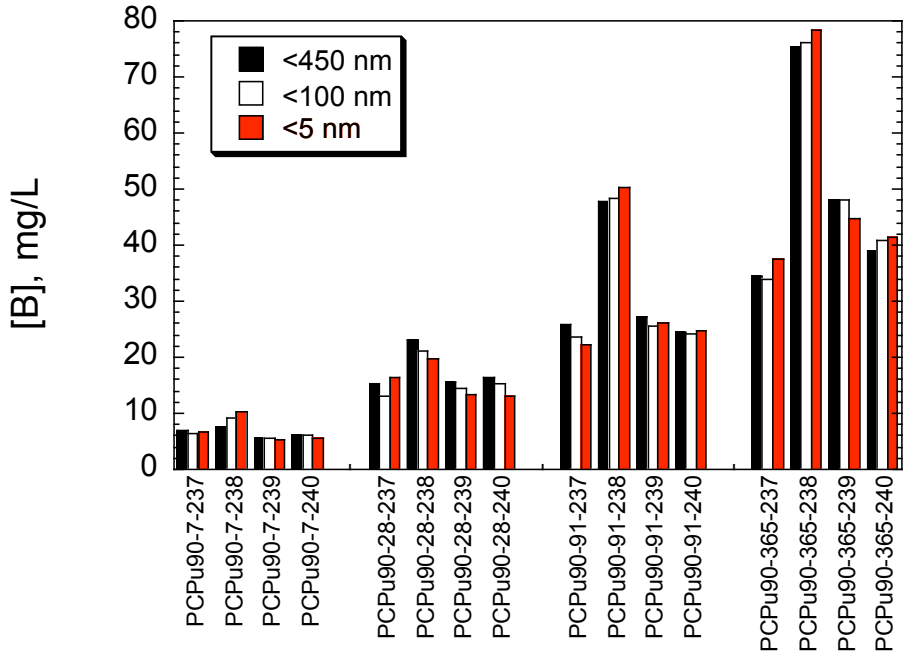
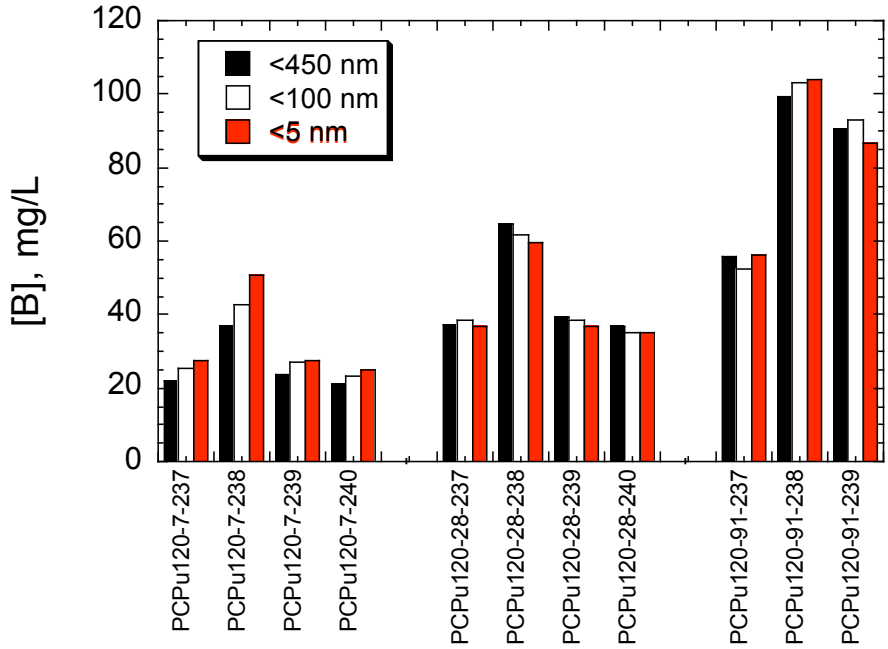


Fig. 7. Rapid Water Soluble (RWS) Solution Concentrations for HIP and PC U,Pu-loaded CWF Materials.

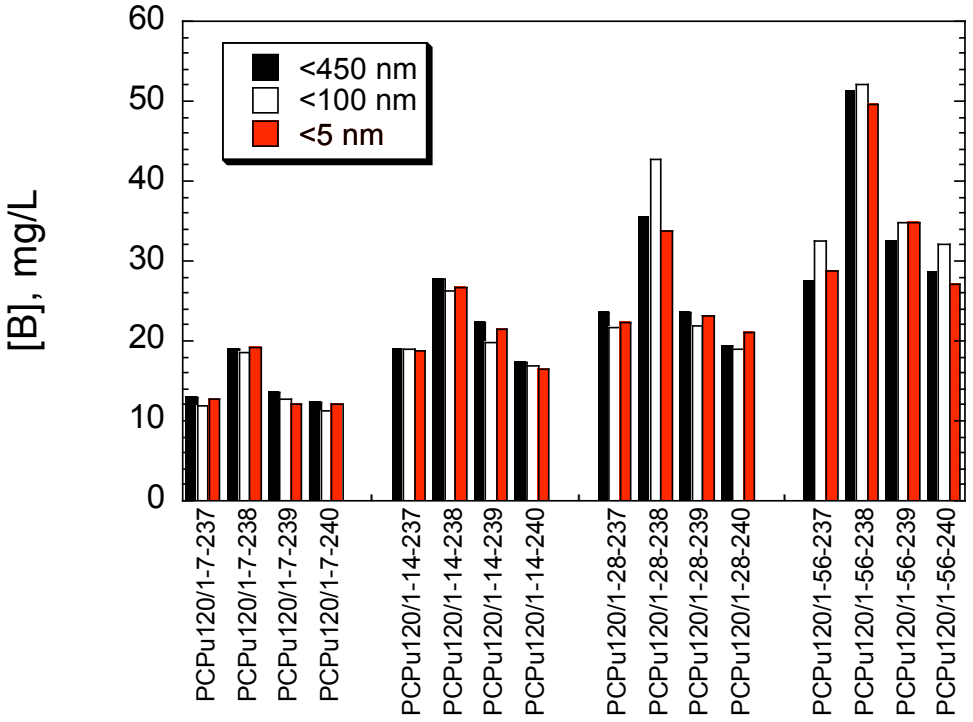


(a)



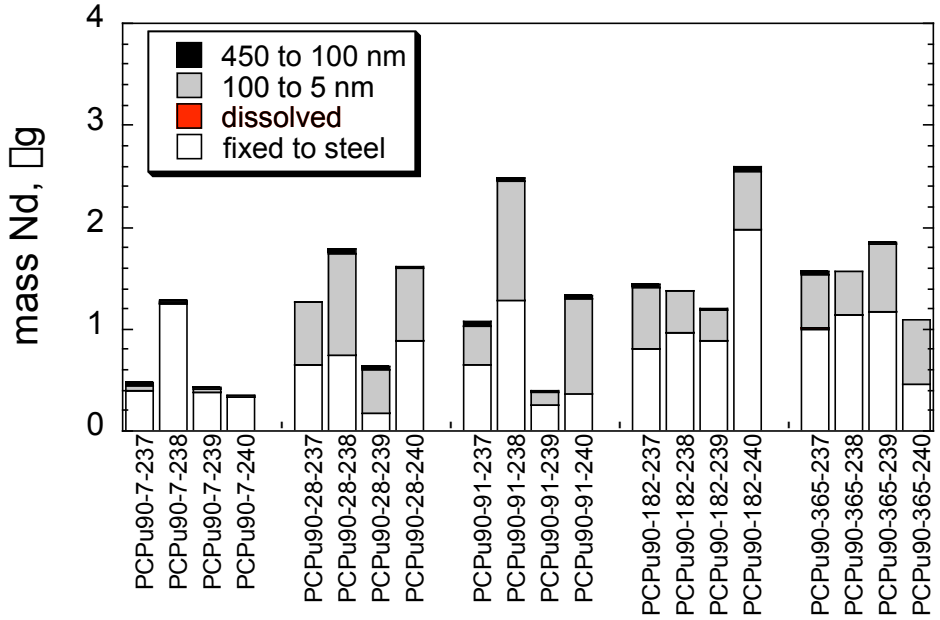
(b)

Fig. 8. Comparison of Boron Concentrations Measured in the 450-, 100-, and 5-nm pore-size Filtrate Solutions for Tests Conducted with HIP U,Pu-loaded CWF at (a) 90 °C and 1:10 CWF/water mass ratio for 7, 28, 91, and 365 days, (b) 120 °C and 1:10 CWF/water mass ratio for 7, 28, and 91 days, and (c) 120 °C and 1:20 CWF/water mass ratio for 7, 14, 28, and 56 days.

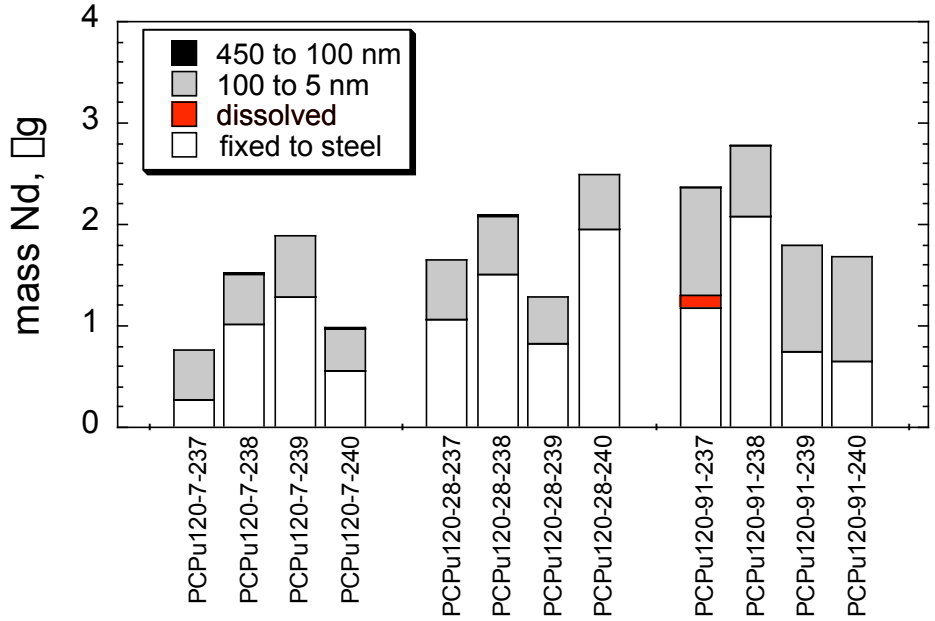

60
50
40
30
20
10
0
[B], mg/L
<450 nm
<100 nm
<5 nm
PCPu120/1-7-237
PCPu120/1-7-238
PCPu120/1-7-239
PCPu120/1-7-240
PCPu120/1-14-237
PCPu120/1-14-238
PCPu120/1-14-239
PCPu120/1-14-240
PCPu120/1-28-237
PCPu120/1-28-238
PCPu120/1-28-239
PCPu120/1-28-240
PCPu120/1-56-237
PCPu120/1-56-238
PCPu120/1-56-239
PCPu120/1-56-240

(c)

Fig. 8. (Cont.)

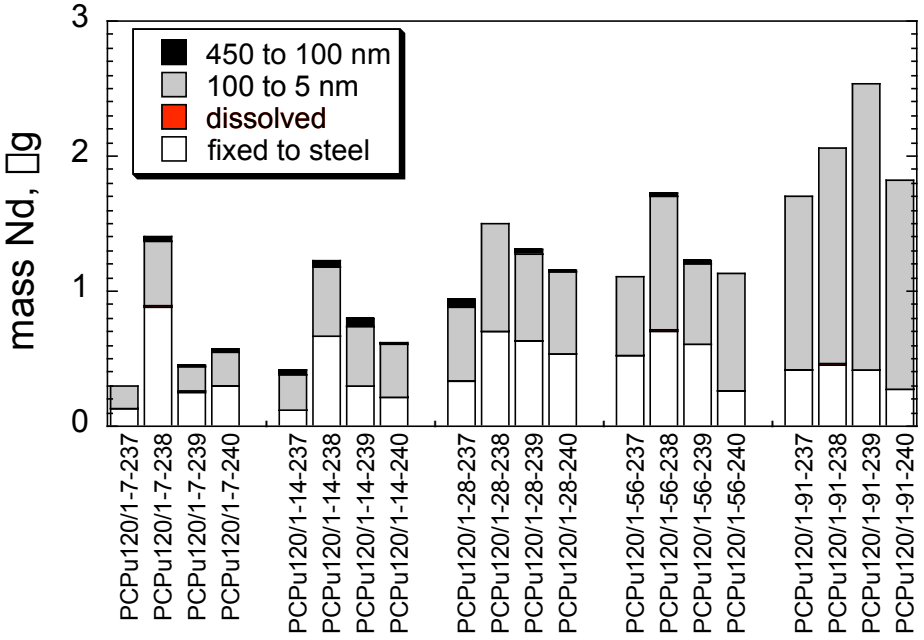


(a)



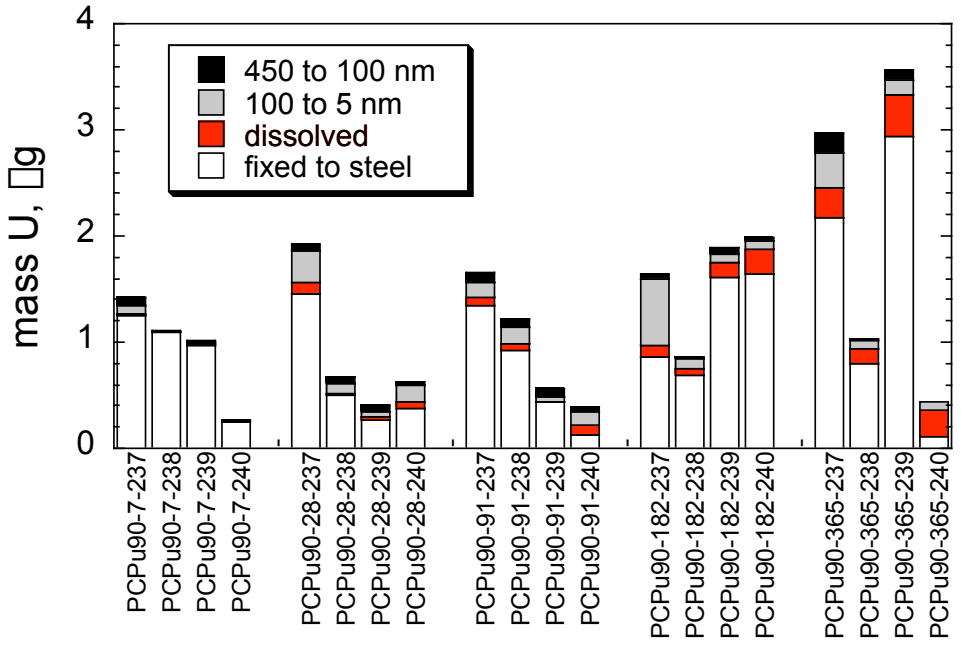
(b)

Fig. 9. Amounts of Nd in Filter Size Ranges 450 to 100 nm, 100 to 5 nm, dissolved (less than 5 nm), and Fixed to Steel Vessel in Tests with HIP U,Pu-loaded CWF (a) at 90°C and CWF/Water Mass Ratio 1:10, (b) 120°C and CWF/Water Mass Ratio 1:10, and (c) 120°C and CWF/Water Mass Ratio 1:20.

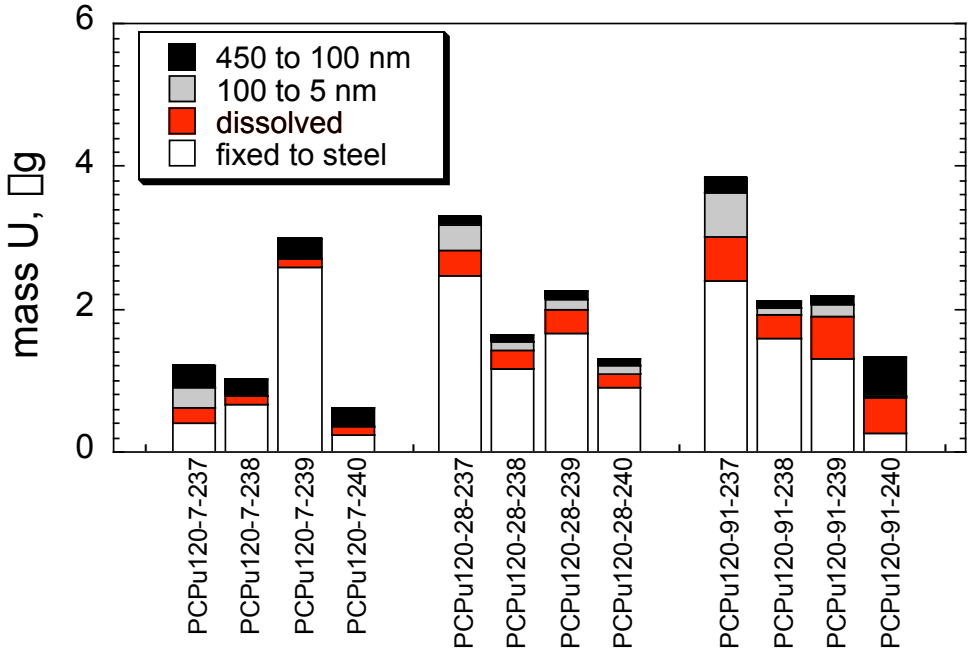

450 to 100 nm
100 to 5 nm
dissolved
fixed to steel
mass Nd, g
0
1
2
3
PCPu120/1-7-237
PCPu120/1-7-238
PCPu120/1-7-239
PCPu120/1-7-240
PCPu120/1-14-237
PCPu120/1-14-238
PCPu120/1-14-239
PCPu120/1-14-240
PCPu120/1-28-237
PCPu120/1-28-238
PCPu120/1-28-239
PCPu120/1-28-240
PCPu120/1-56-237
PCPu120/1-56-238
PCPu120/1-56-239
PCPu120/1-56-240
PCPu120/1-91-237
PCPu120/1-91-238
PCPu120/1-91-239
PCPu120/1-91-240

(c)

Fig. 9. (cont.)

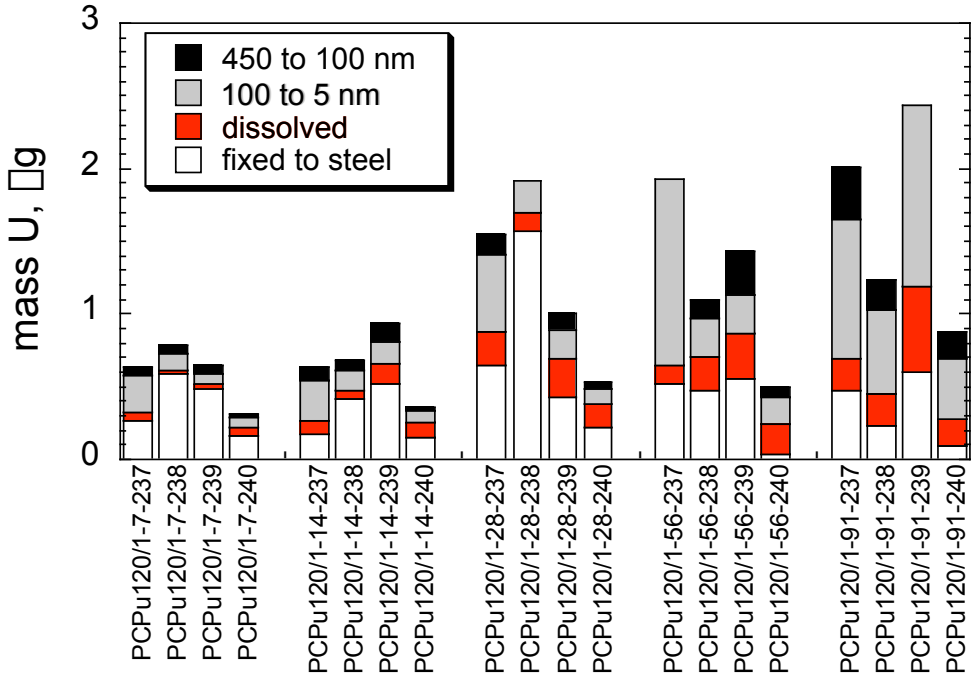


(a)



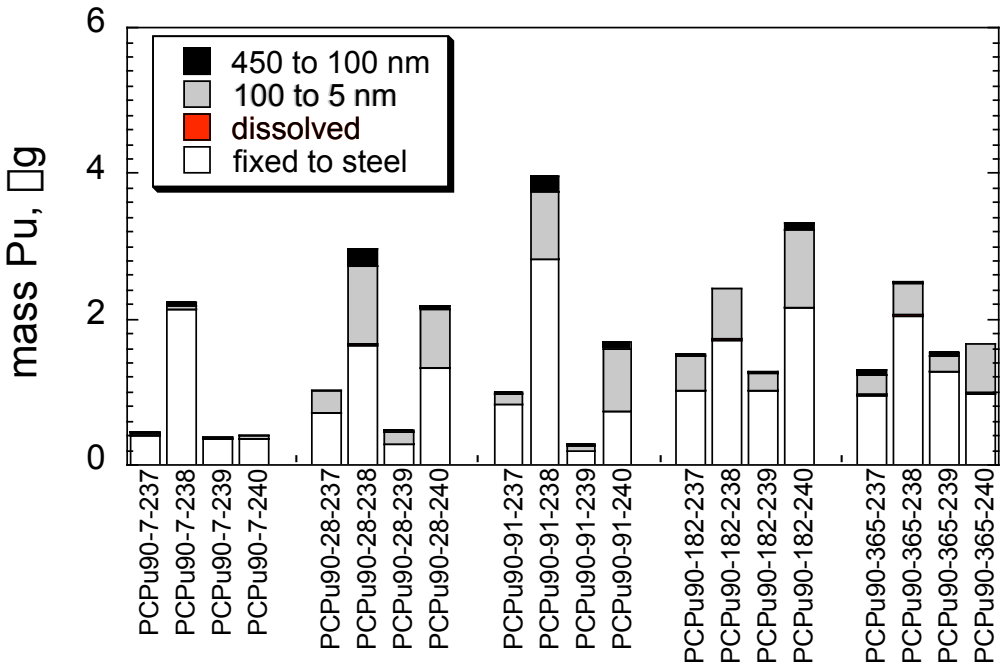
(b)

Fig. 10. Amounts of U in Filter Size Ranges 450 to 100 nm, 100 to 5 nm, Dissolved (less than 5 nm), and Fixed to Steel Vessel in Tests with HIP U,Pu-loaded CWF (a) at 90°C and CWF/Water Mass Ratio 1:10, (b) 120°C and CWF/Water Mass Ratio 1:10, and (c) 120°C and CWF/Water Mass Ratio 1:20.

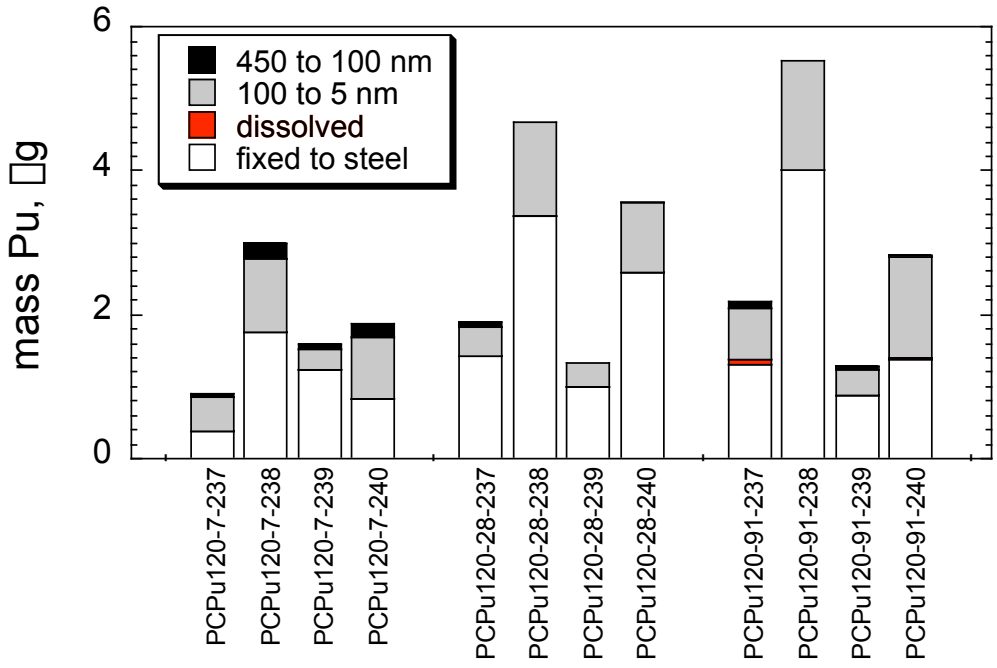

450 to 100 nm
100 to 5 nm
dissolved
fixed to steel
mass U, g
0
1
2
3
PCPu120/1-7-237
PCPu120/1-7-238
PCPu120/1-7-239
PCPu120/1-7-240
PCPu120/1-14-237
PCPu120/1-14-238
PCPu120/1-14-239
PCPu120/1-14-240
PCPu120/1-28-237
PCPu120/1-28-238
PCPu120/1-28-239
PCPu120/1-28-240
PCPu120/1-56-237
PCPu120/1-56-238
PCPu120/1-56-239
PCPu120/1-56-240
PCPu120/1-91-237
PCPu120/1-91-238
PCPu120/1-91-239
PCPu120/1-91-240

(c)

Fig. 10. (cont.)

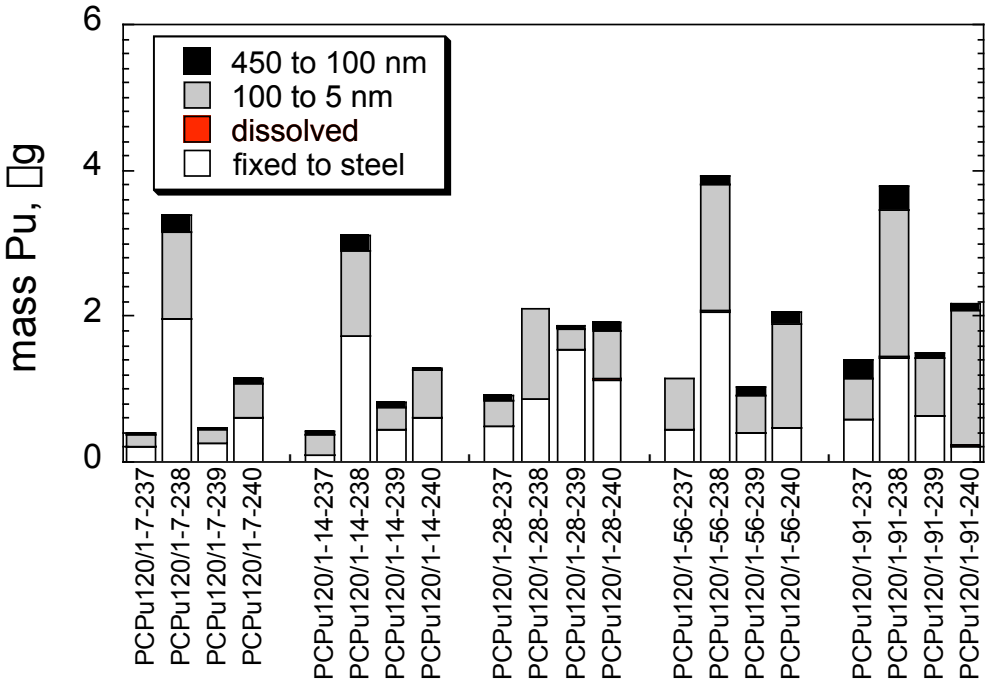


(a)



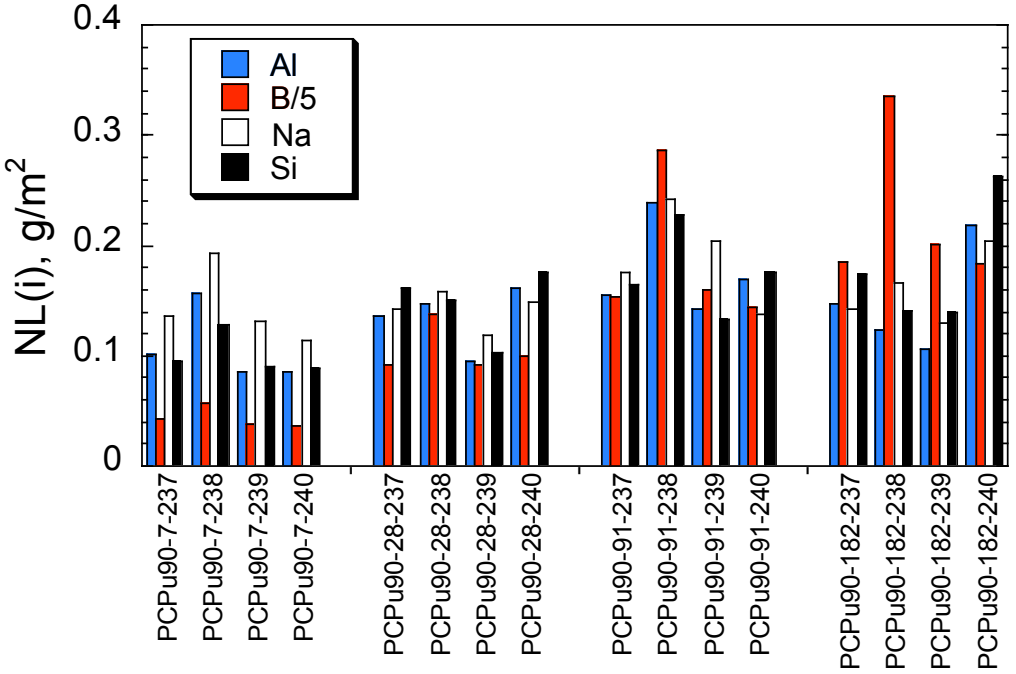
(b)

Fig. 11. Amounts of Pu in Filter Size Ranges 5 to 100 nm, 100 to 450 nm, Less than 5 nm (dissolved), and Fixed to Stainless Steel Vessel in Tests with HIP U,Pu-loaded CWF (a) at 90°C and CWF/Water Mass Ratio 1:10, (b) 120°C and CWF/water Mass Ratio 1:10, and (c) 120°C and CWF/Water Mass Ratio 1:20.

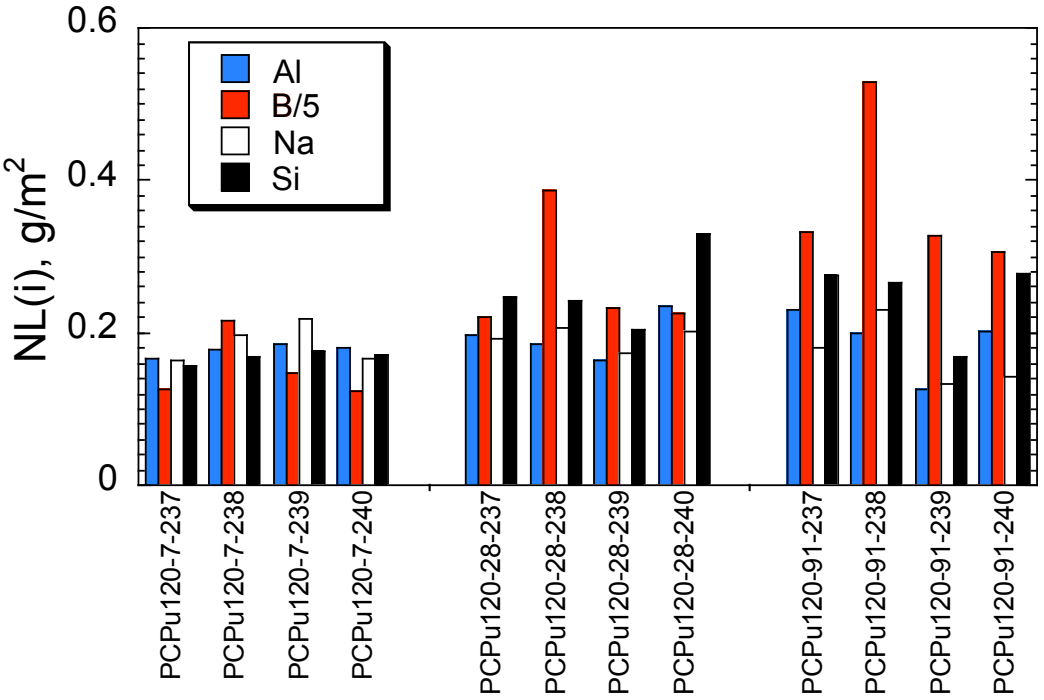

450 to 100 nm
100 to 5 nm
dissolved
fixed to steel
mass Pu, g
0
2
4
6
PCPu120/1-7-237
PCPu120/1-7-238
PCPu120/1-7-239
PCPu120/1-7-240
PCPu120/1-14-237
PCPu120/1-14-238
PCPu120/1-14-239
PCPu120/1-14-240
PCPu120/1-28-237
PCPu120/1-28-238
PCPu120/1-28-239
PCPu120/1-28-240
PCPu120/1-56-237
PCPu120/1-56-238
PCPu120/1-56-239
PCPu120/1-56-240
PCPu120/1-91-237
PCPu120/1-91-238
PCPu120/1-91-239
PCPu120/1-91-240

(c)

Fig. 11. (cont.)

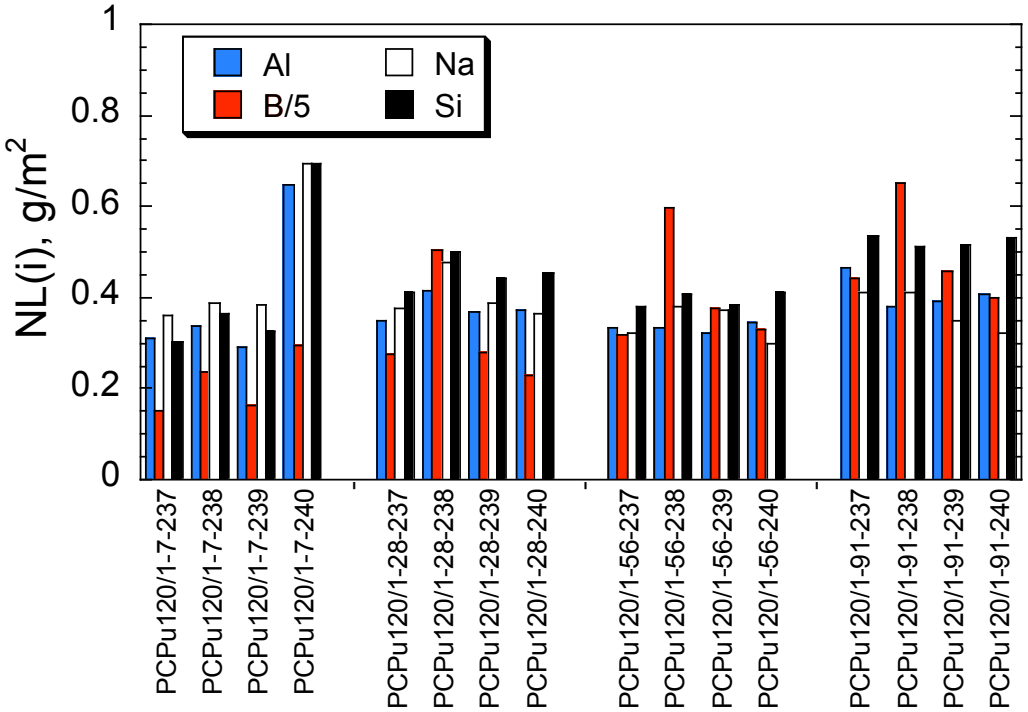


(a)



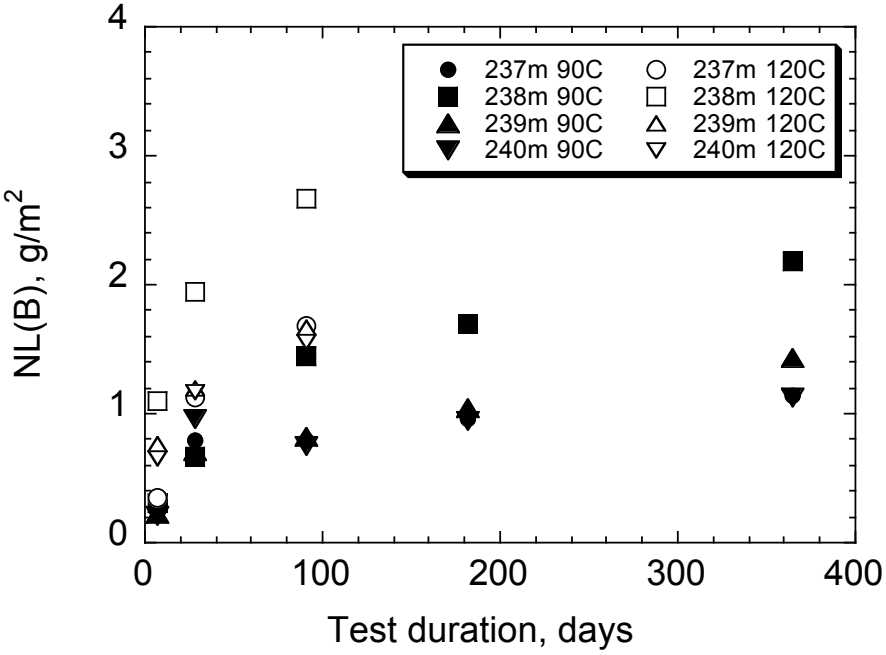
(b)

Fig. 12. Results of Tests with HIP U,Pu-loaded CWF Materials at (a) 90°C, (b) 120°C at a CWF/Water Mass Ratio of 1:10, and (c) 120°C at a CWF/Water Mass Ratio of 1:20.

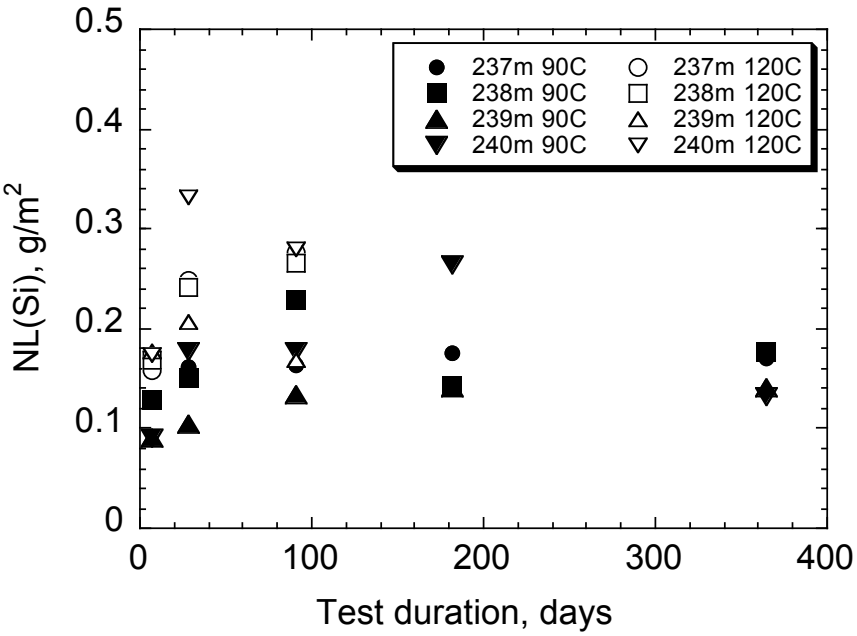

Al
B/5
Na
Si
NL(i), g/m2
1
0.8
0.6
0.4
0.2
0
PCPu120/1-7-237
PCPu120/1-7-238
PCPu120/1-7-239
PCPu120/1-7-240
PCPu120/1-28-237
PCPu120/1-28-238
PCPu120/1-28-239
PCPu120/1-28-240
PCPu120/1-56-237
PCPu120/1-56-238
PCPu120/1-56-239
PCPu120/1-56-240
PCPu120/1-91-237
PCPu120/1-91-238
PCPu120/1-91-239
PCPu120/1-91-240

(c)

Fig. 12. (cont.)

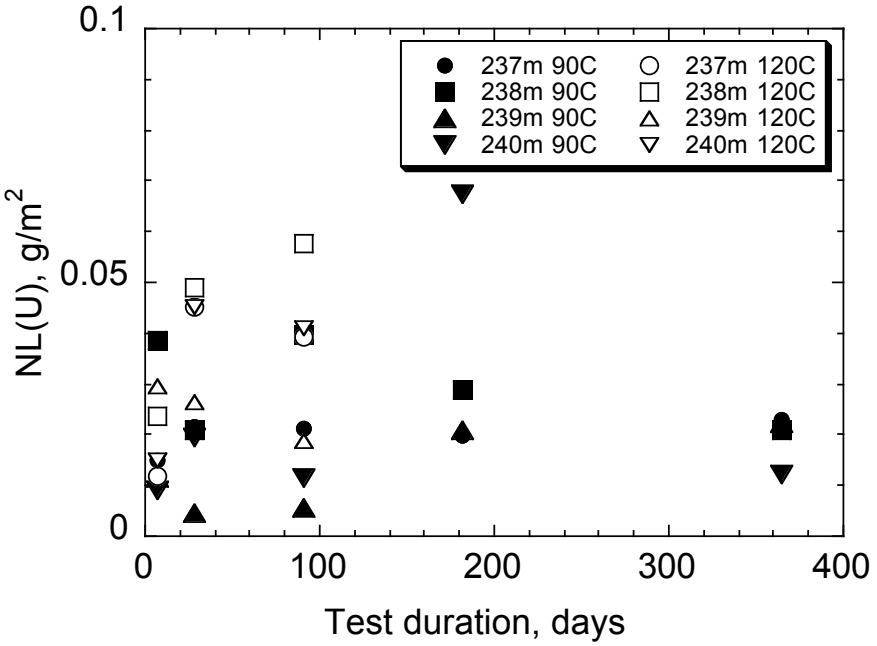


(a)

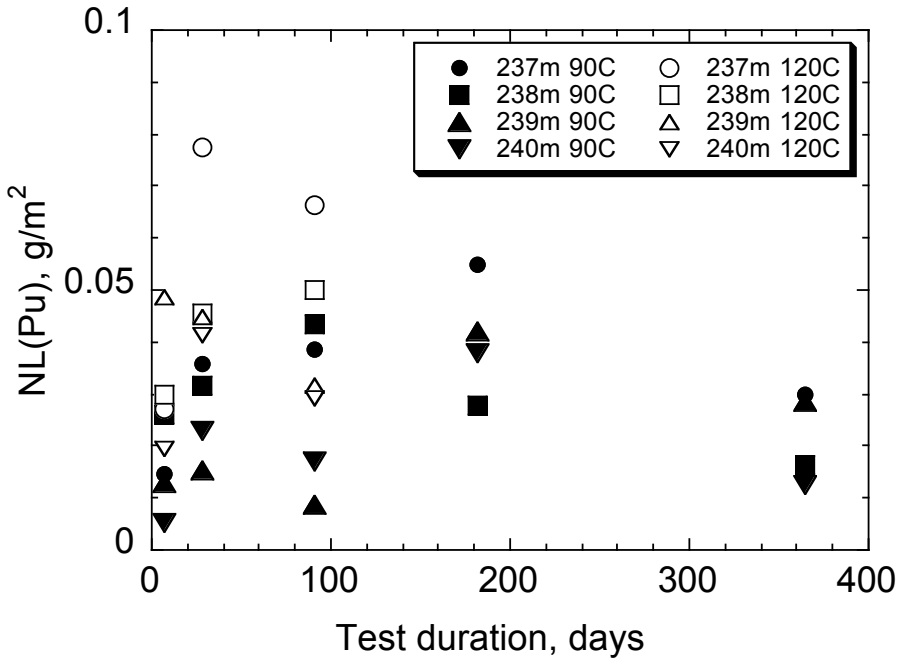


(b)

Fig. 13. Normalized Mass Loss (NL) Values of (a) B, (b) Si, (c) U, and (d) Pu for Tests Conducted at 90 and 120 °C at a CWF/Water Mass Ratio of 1:10 with Different CWF Materials.

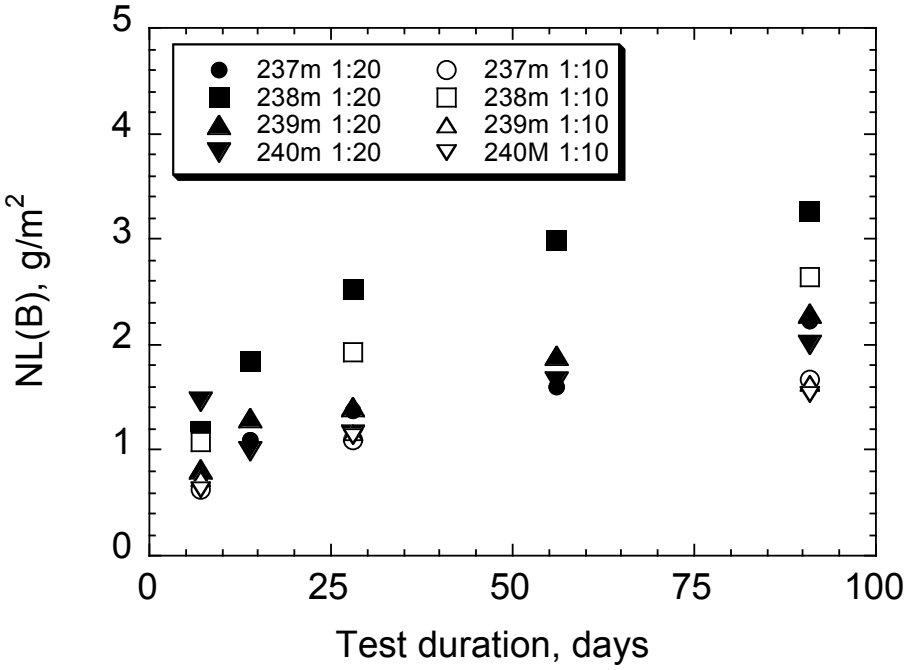


(c)

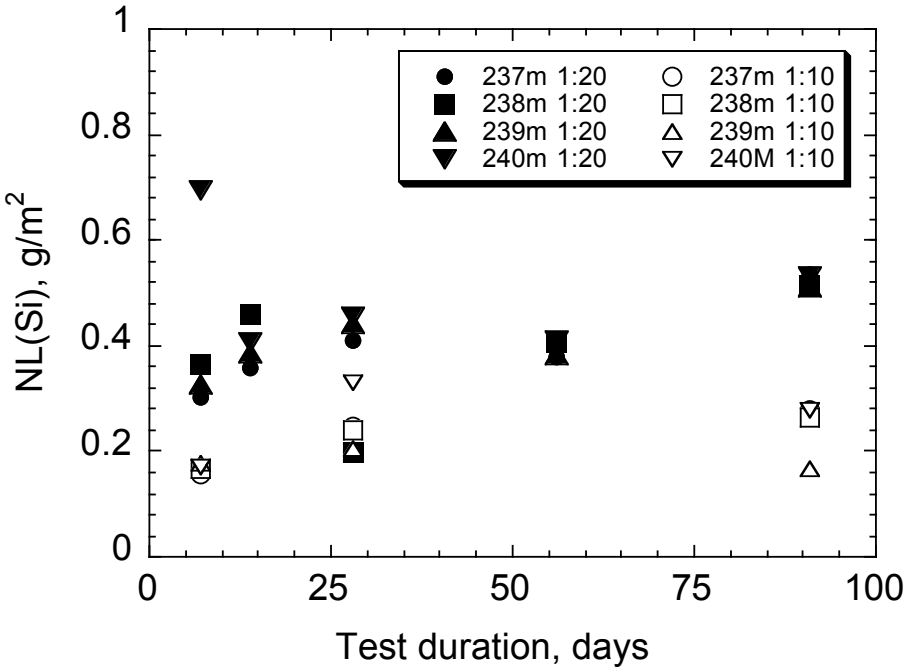


(d)

Fig. 13. (cont.)

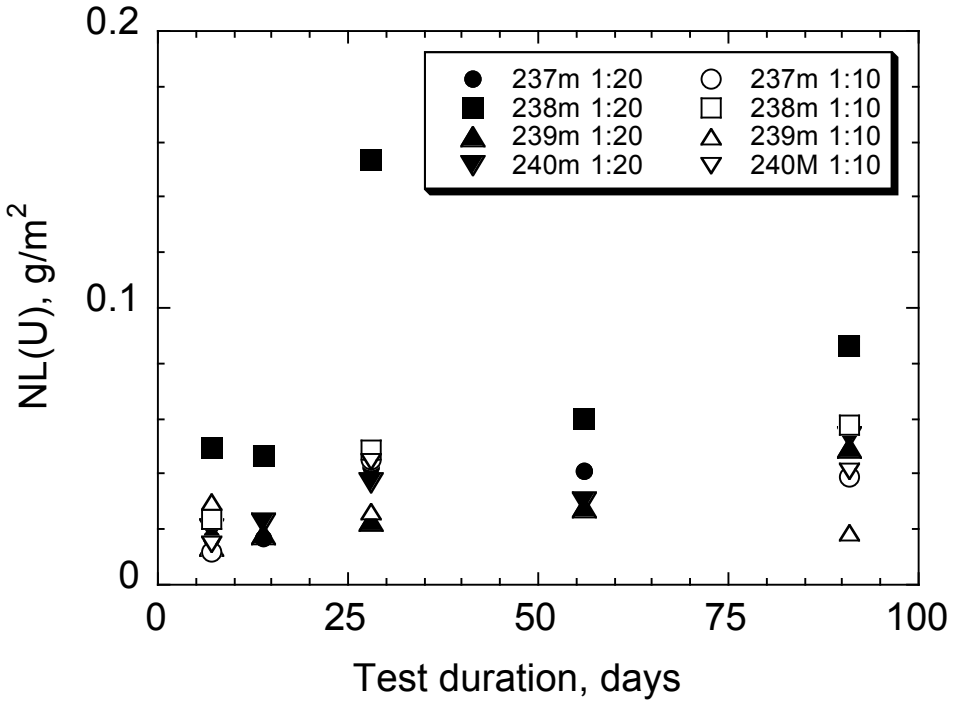


(a)

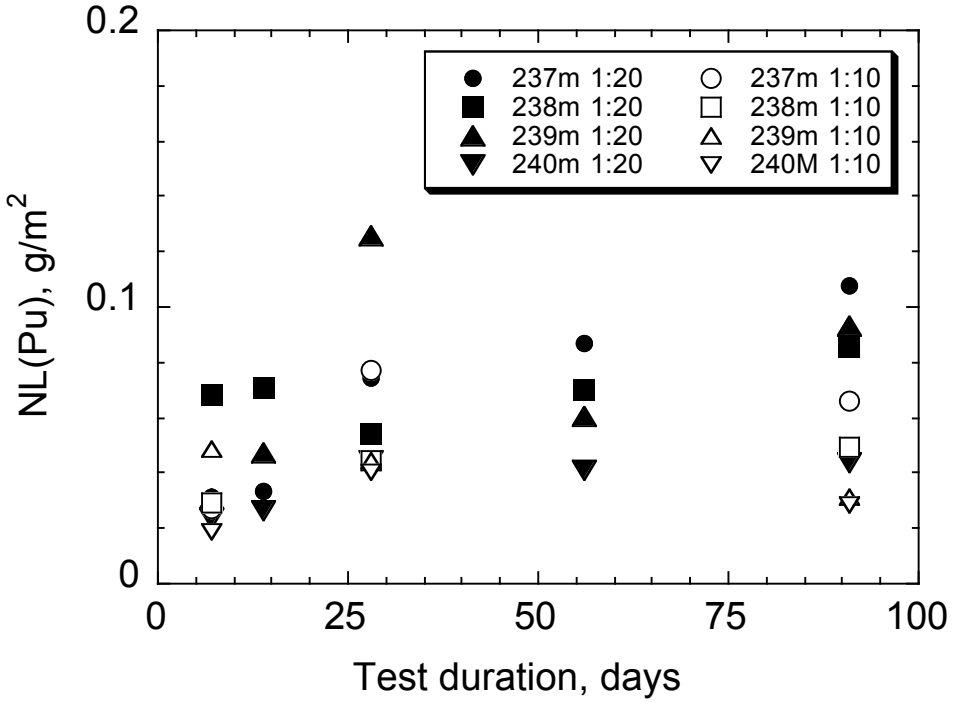


(b)

Fig. 14. Normalized Mass Loss (NL) Values of (a) B, (b) Si, (c) U, and (d) Pu for Tests Conducted at 120 °C at a CWF/Water Mass Ratios of 1:20 and 1:10 with Different CWF Materials.

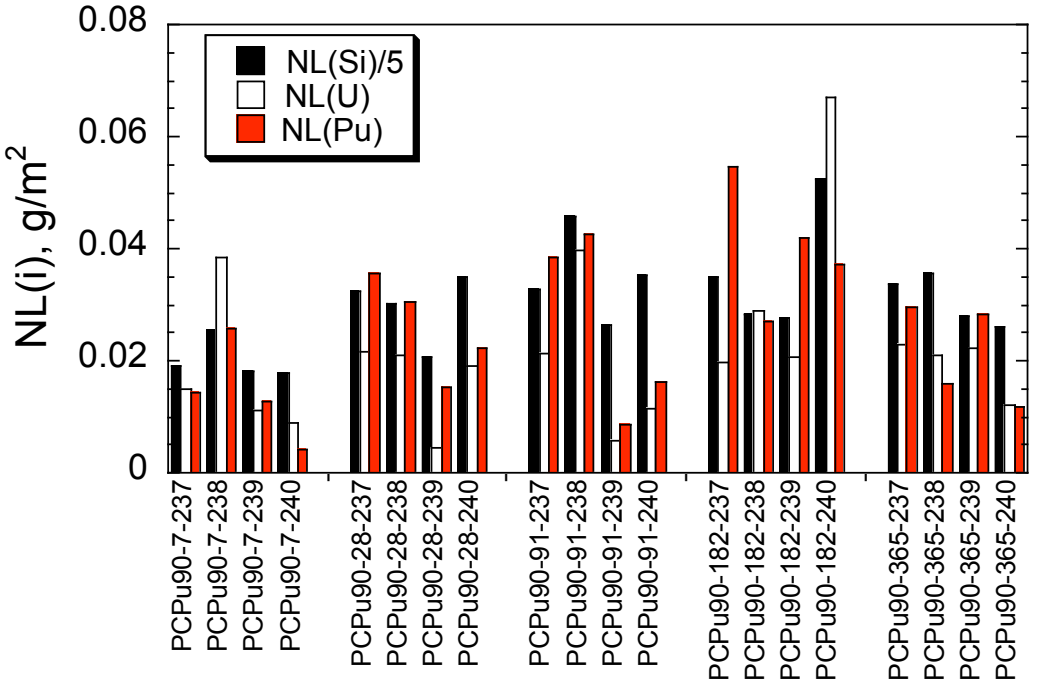


(c)

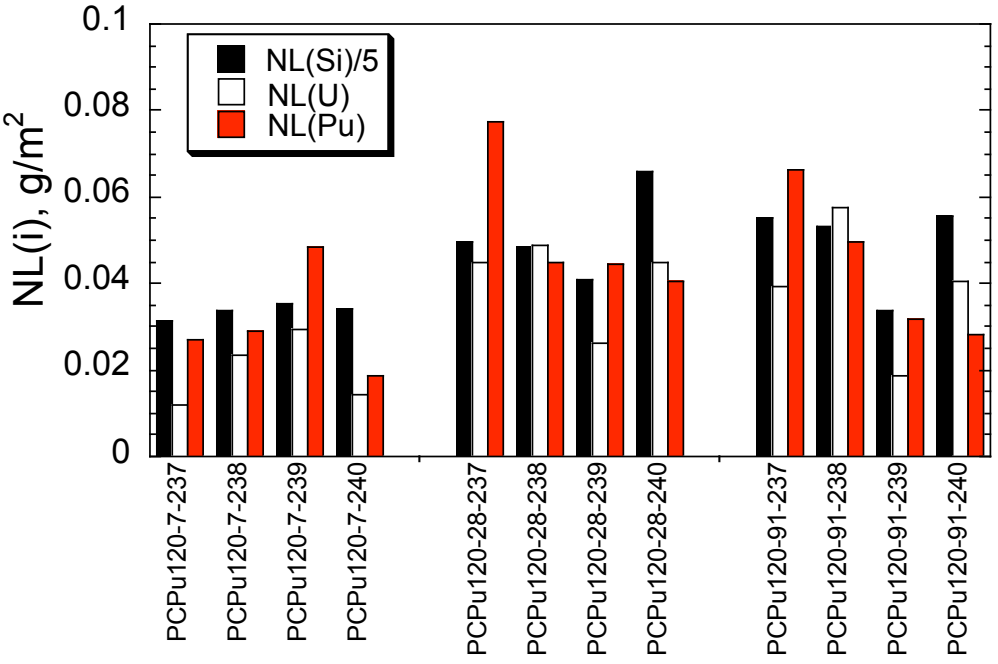


(d)

Fig. 14. (cont.)

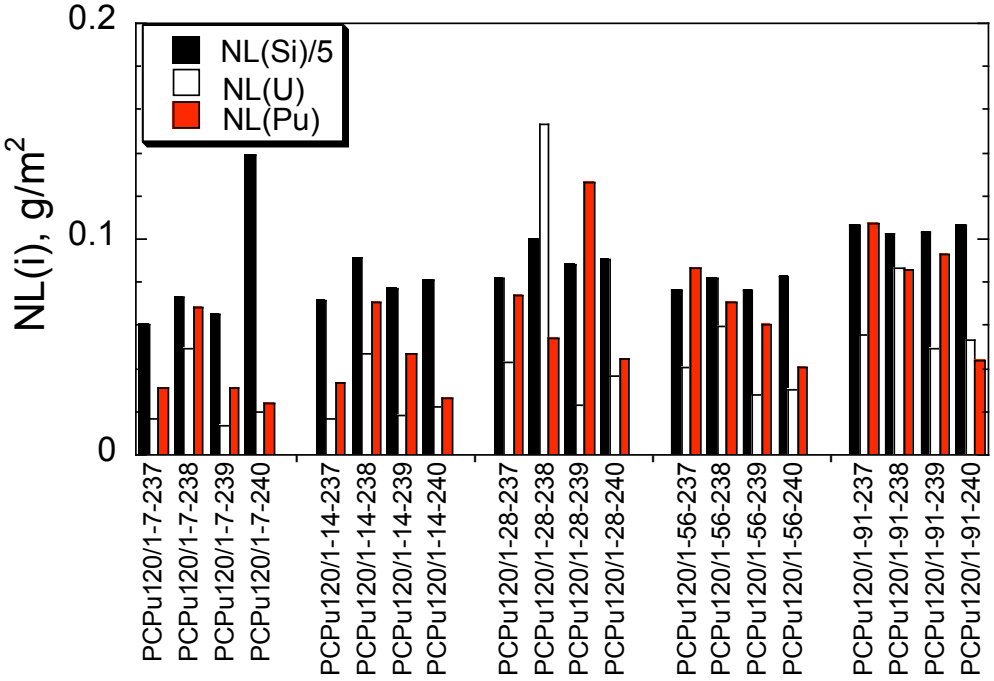


(a)



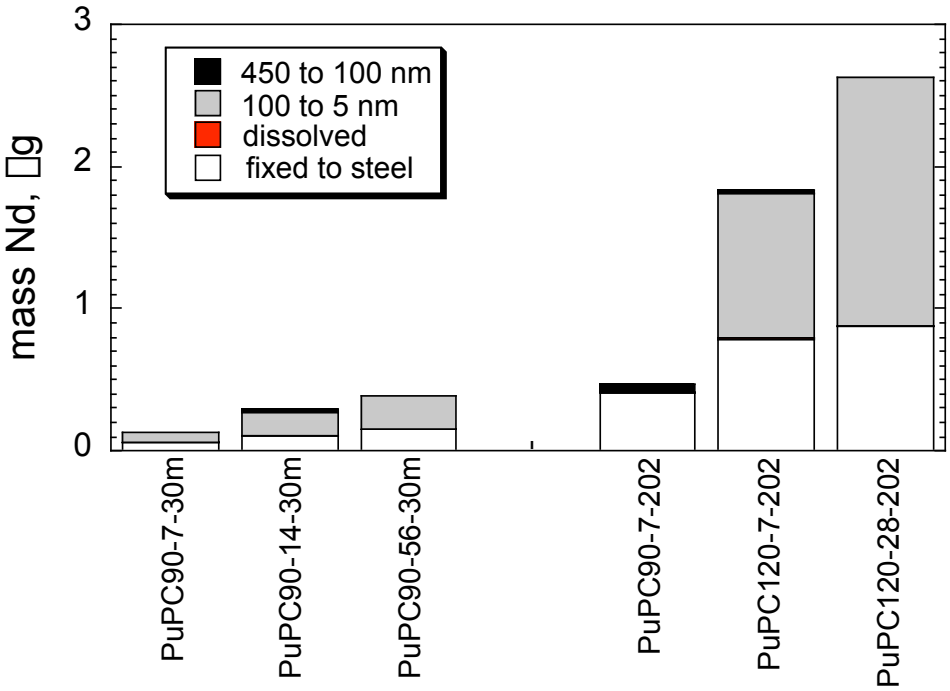
(b)

Fig. 15. Comparison of NL(Si), NL(U), and NL(Pu) for Tests with HIP U,Pu-loaded CWF at (a) 90°C and CWF/Water Mass Ratio 1:10, (b) 120°C and CWF/Water Mass Ratio 1:10, and (c) at 120°C and CWF/Water Mass Ratio 1:20, and (d) with PC U,Pu-loaded CWF at 90°C and CWF/Water Mass Ratio 1:10.

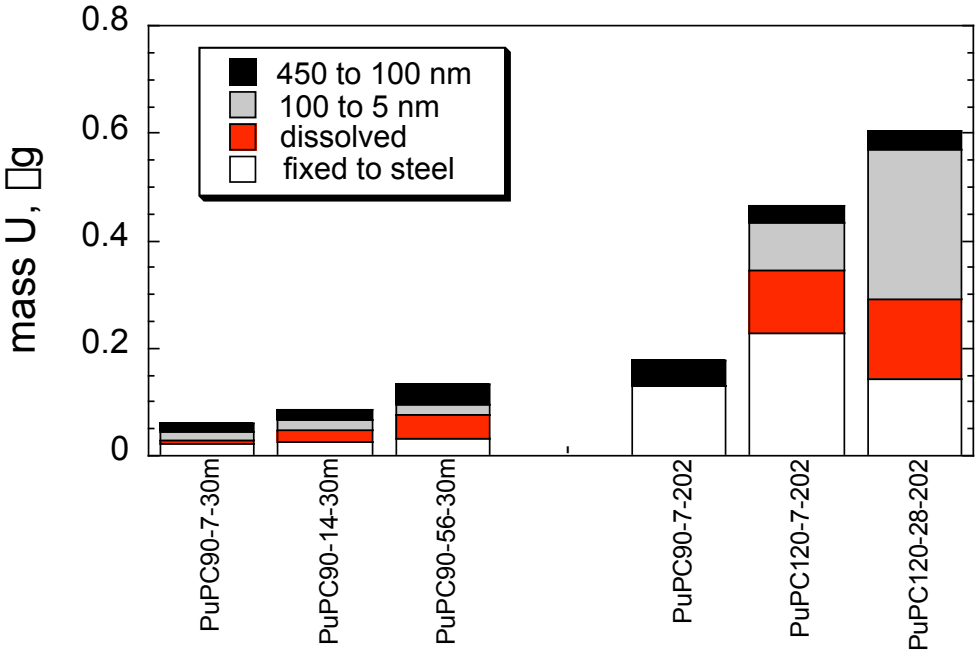

NL(Si)/5
NL(U)
NL(Pu)
NL(i), g/m2
0.2
0.1
0
PCPu120/1-7-237
PCPu120/1-7-238
PCPu120/1-7-239
PCPu120/1-7-240
PCPu120/1-14-237
PCPu120/1-14-238
PCPu120/1-14-239
PCPu120/1-14-240
PCPu120/1-28-237
PCPu120/1-28-238
PCPu120/1-28-239
PCPu120/1-28-240
PCPu120/1-56-237
PCPu120/1-56-238
PCPu120/1-56-239
PCPu120/1-56-240
PCPu120/1-91-237
PCPu120/1-91-238
PCPu120/1-91-239
PCPu120/1-91-240

(c)

Fig. 15. (cont.)

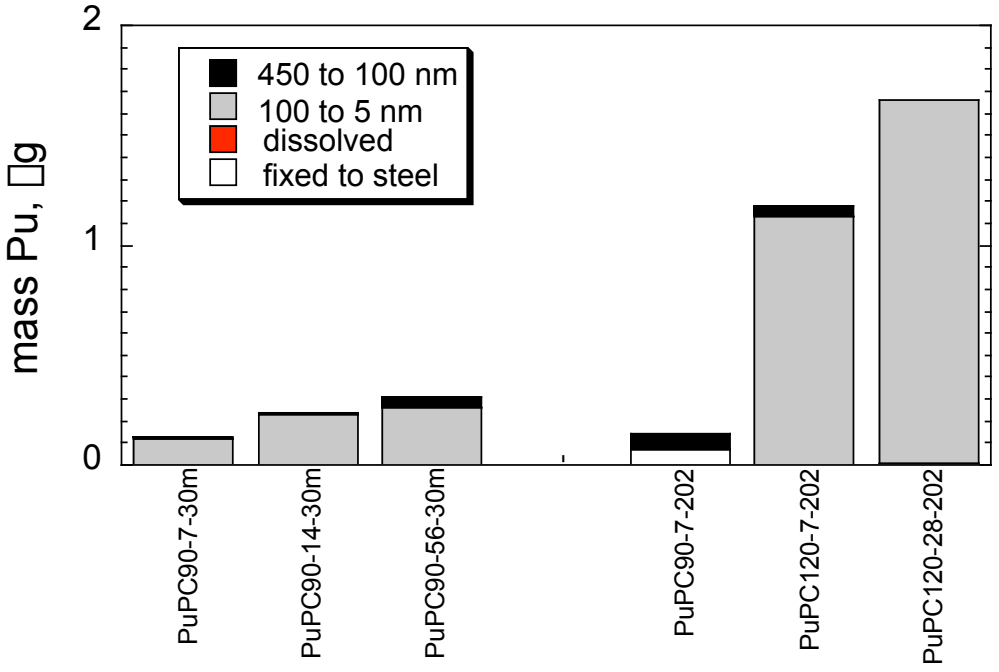


(a)



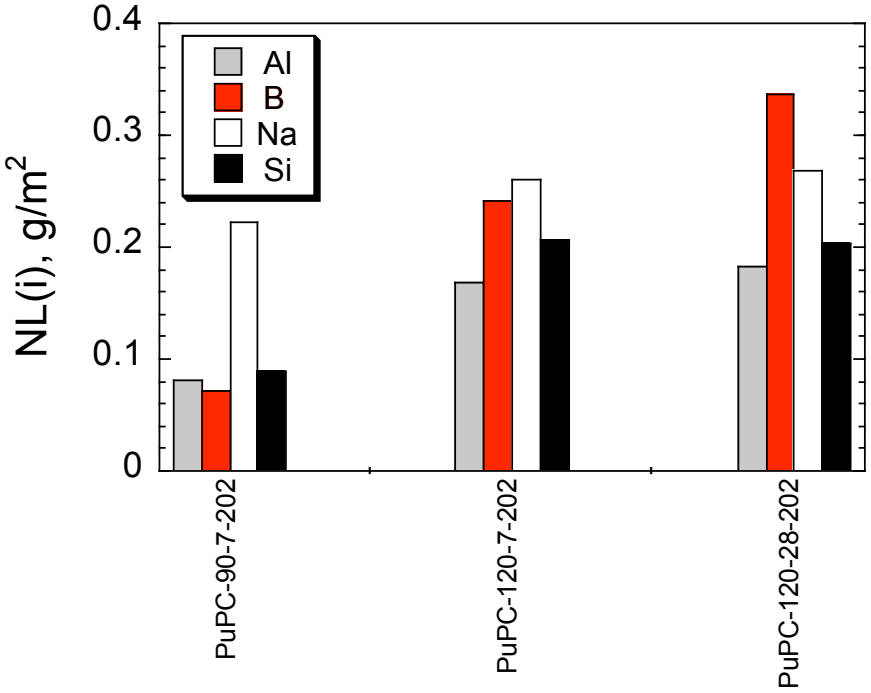
(b)

Fig. 16. Amounts of (a) Nd, (b) U, and (c) Pu in Filter Size Ranges 5 to 100 nm, 100 to 450 nm, Less than 5 nm (dissolved), and Fixed to Stainless Steel Vessel in Tests with PC U,Pu-loaded CWF Material GPC0030m at 90°C and CWF/Water Mass Ratio 1:10 and CPC00202 at 90°C and 120°C and CWF/Water Mass Ratio 1:10.

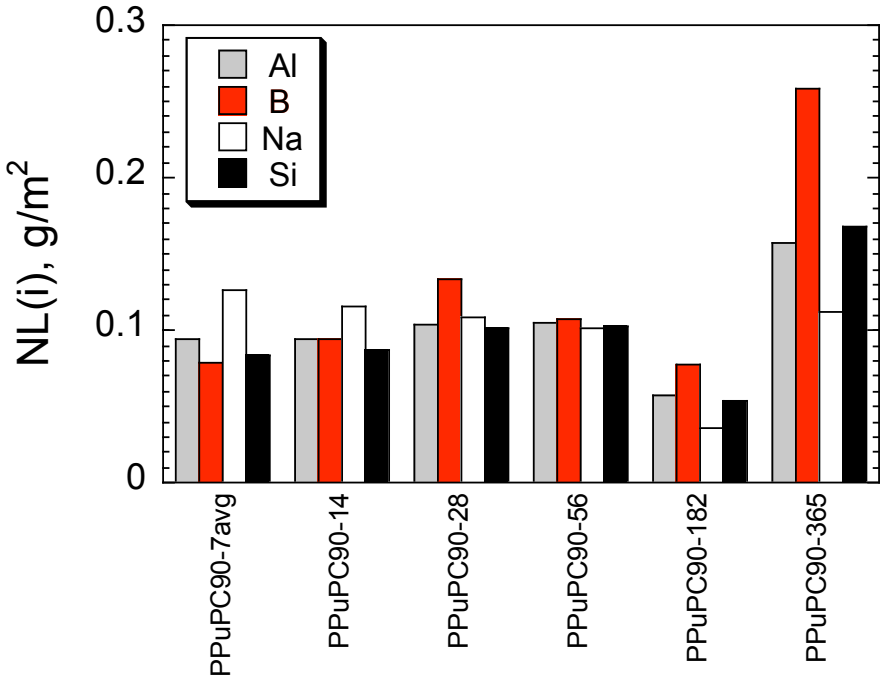

2
1
0
mass Pu, g
450 to 100 nm
100 to 5 nm
dissolved
fixed to steel
PuPC90-7-30m
PuPC90-14-30m
PuPC90-56-30m
PuPC90-7-202
PuPC120-7-202
PuPC120-28-202

(c)

Fig. 16. (cont.)



(a)



(b)

Fig. 17. Results of Tests with PC U,Pu-loaded CWF Materials (a) GPC00202 at 90°C and 120°C, and (b) GPC0030m at 90°C and CWF/water Mass Ratio of 1:10.

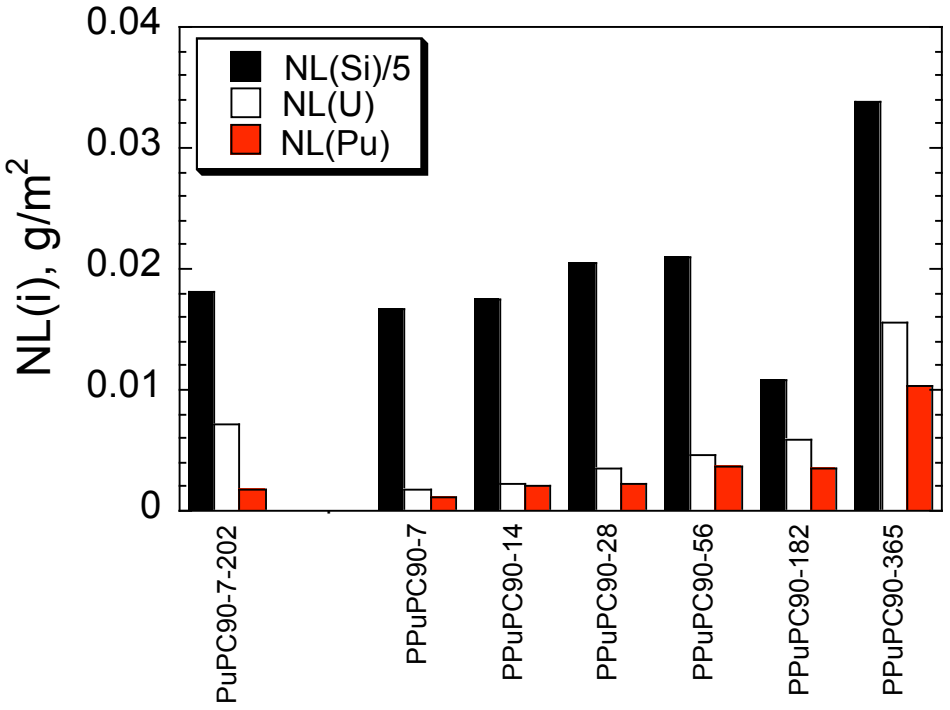
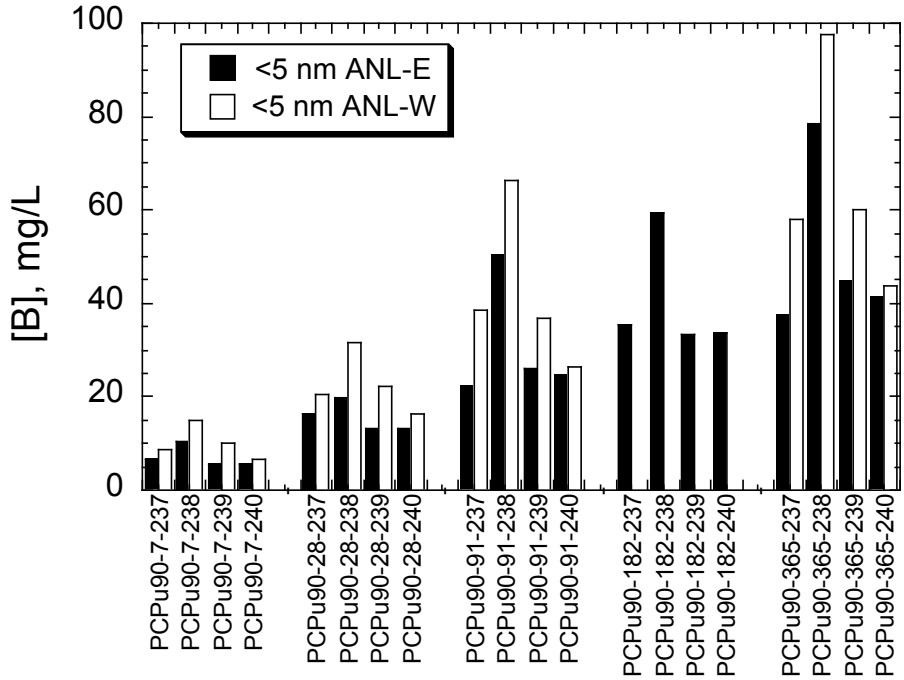
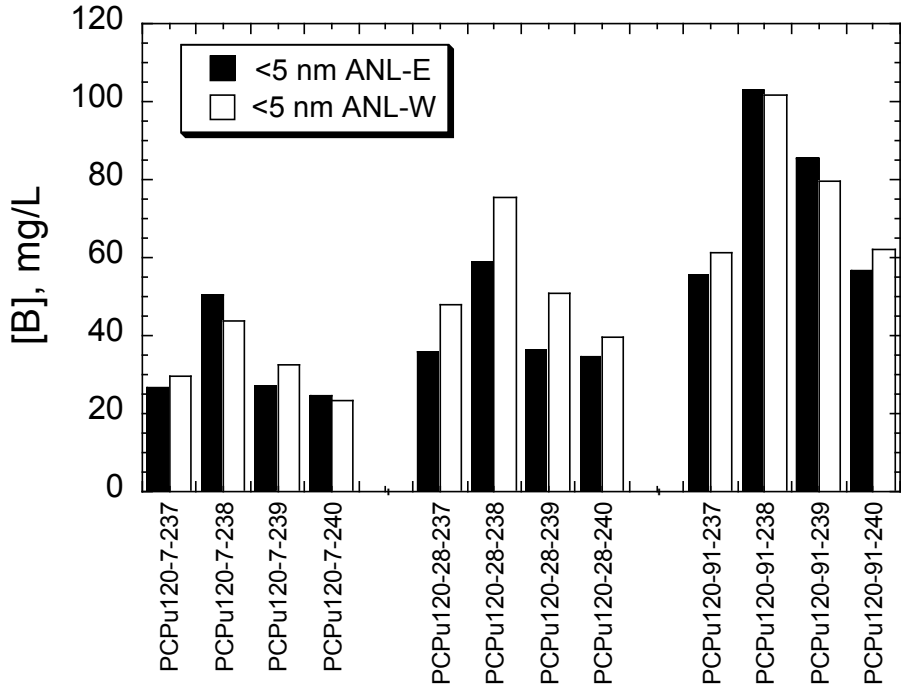


Fig. 18. Comparison of NL(Si), NL(U), and NL(Pu) for Tests with PC U,Pu-loaded CWF at 90°C and CWF/Water Mass Ratio 1:10.

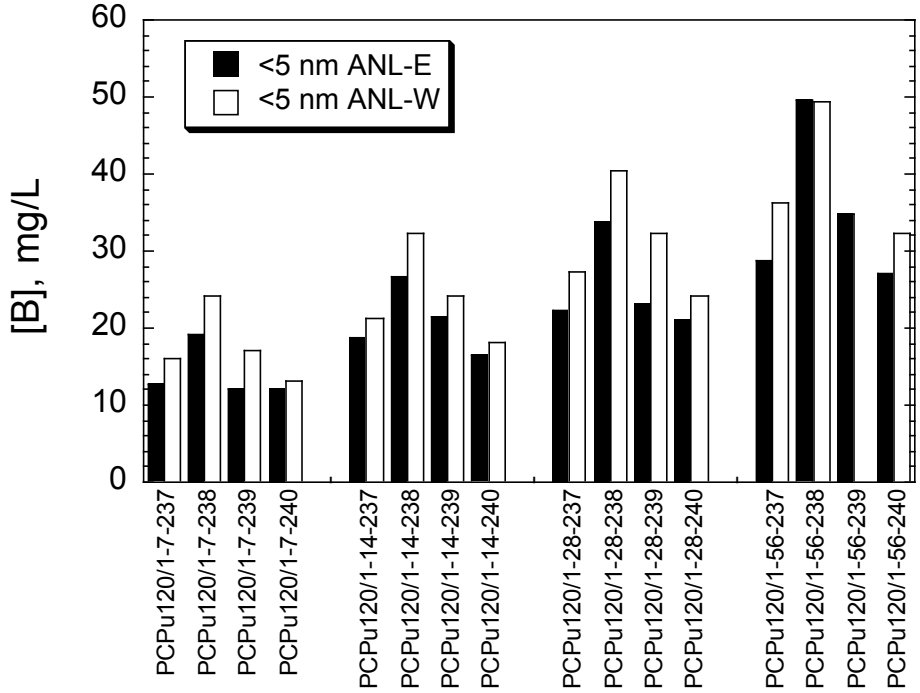


(a)



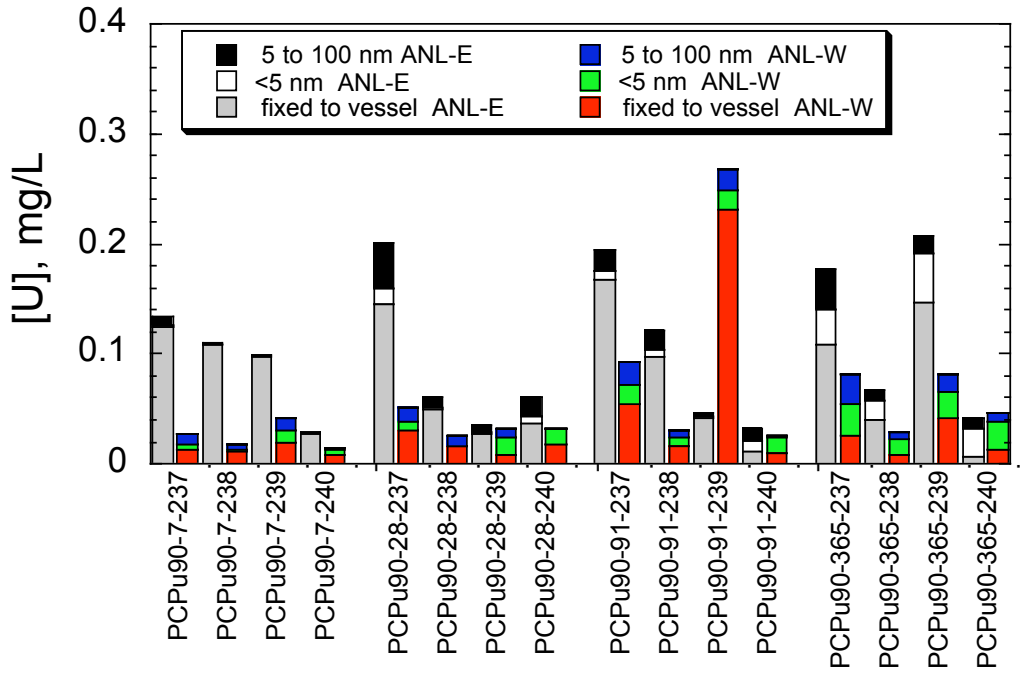
(b)

Fig. 19. Concentrations of B in 5 nm Filtrates for Tests at ANL-E and ANL-W: (a) 90°C at CWF/Water Mass Ratio 1:10, (b) 120°C at CWF/Water Mass Ratio 1:10, and (c) 120°C at CWF/Water Mass Ratio 1:20.

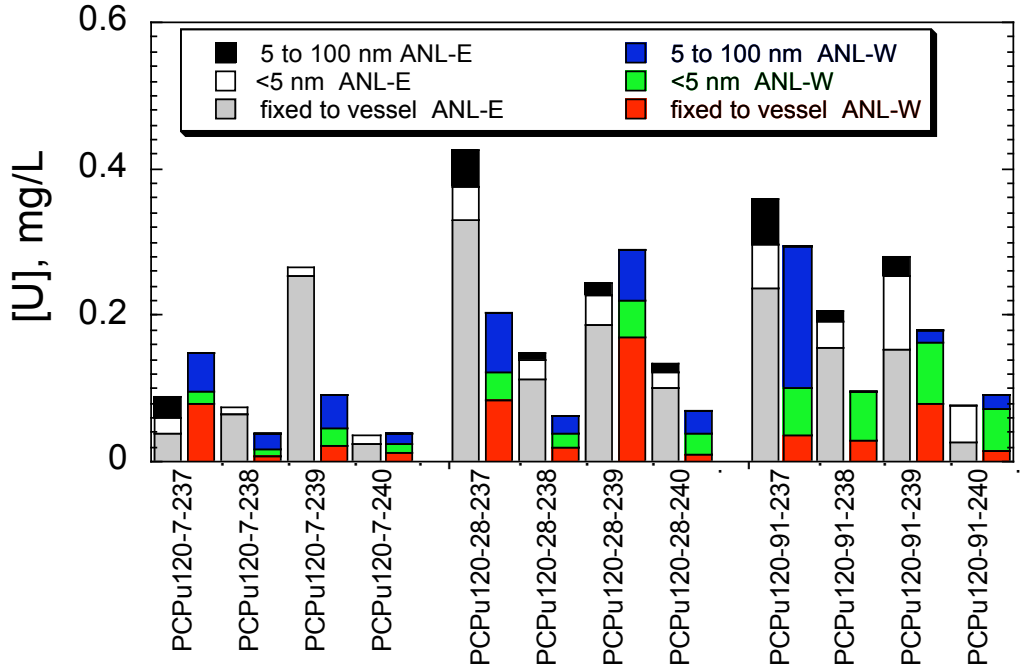

60
50
40
30
20
10
0
[B], mg/L
<5 nm ANL-E
<5 nm ANL-W
PCPu120/1-7-237
PCPu120/1-7-238
PCPu120/1-7-239
PCPu120/1-7-240
PCPu120/1-14-237
PCPu120/1-14-238
PCPu120/1-14-239
PCPu120/1-14-240
PCPu120/1-28-237
PCPu120/1-28-238
PCPu120/1-28-239
PCPu120/1-28-240
PCPu120/1-56-237
PCPu120/1-56-238
PCPu120/1-56-239
PCPu120/1-56-240

(c)

Fig. 19. (cont.)

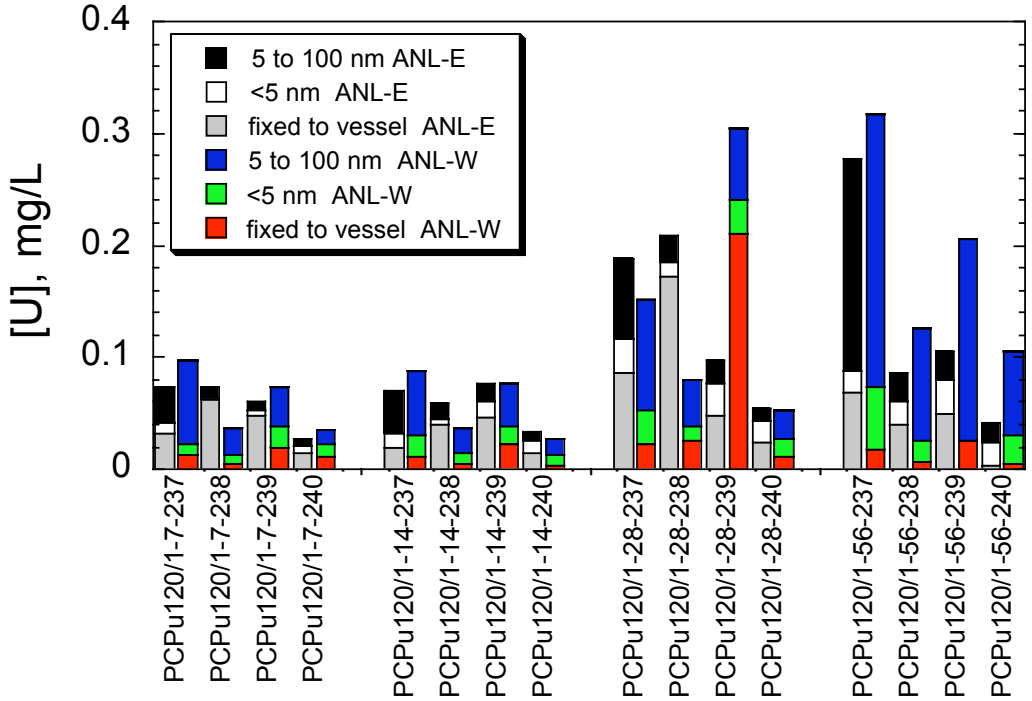


(a)



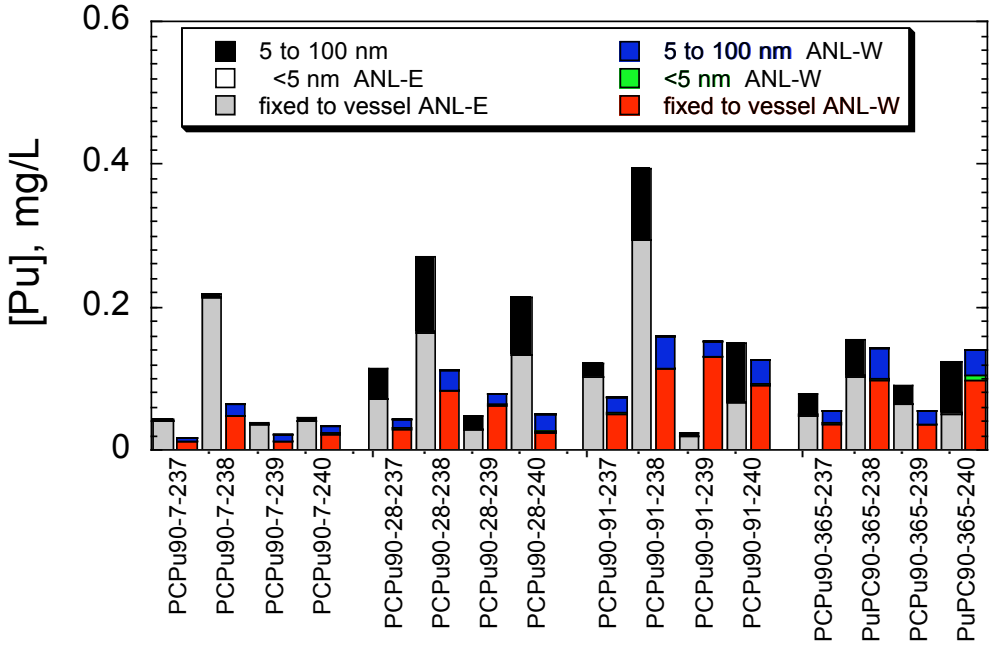
(b)

Fig. 20. Concentrations of U in 5 to 100 nm and <5 nm Fractions for Tests at ANL-E and ANL-W: (a) 90°C at CWF/Water Mass Ratio 1:10, (b) 120°C at CWF/Water Mass Ratio 1:10, and (c) 120°C at CWF/Water Mass Ratio 1:20.

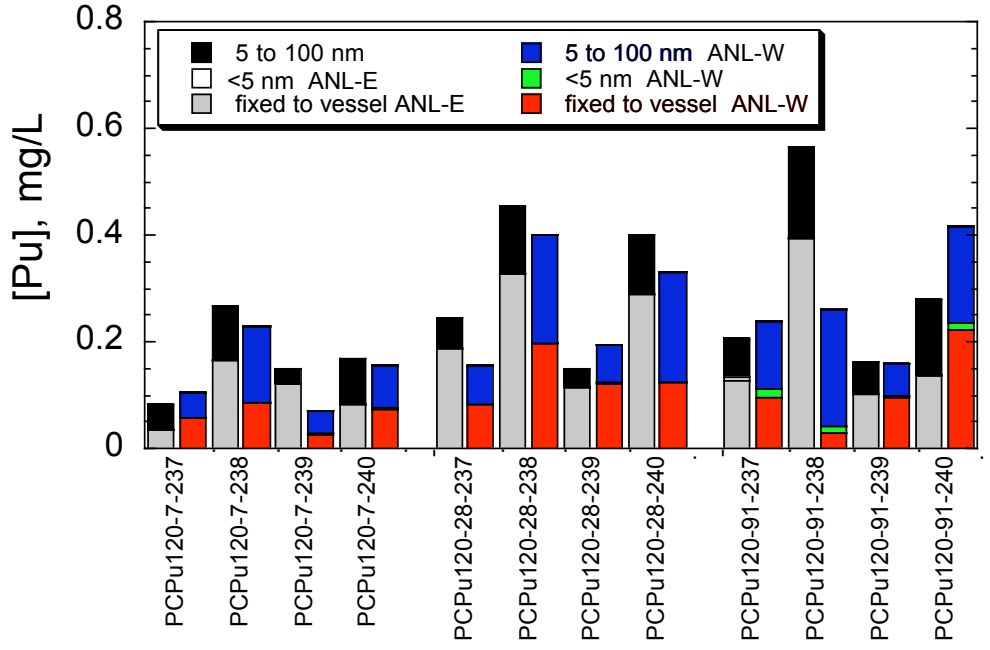

0.4
0.3
0.2
0.1
0
[U], mg/L
5 to 100 nm ANL-E
<5 nm ANL-E
fixed to vessel ANL-E
5 to 100 nm ANL-W
<5 nm ANL-W
fixed to vessel ANL-W
PCPu120/1-7-237
PCPu120/1-7-238
PCPu120/1-7-239
PCPu120/1-7-240
PCPu120/1-14-237
PCPu120/1-14-238
PCPu120/1-14-239
PCPu120/1-14-240
PCPu120/1-28-237
PCPu120/1-28-238
PCPu120/1-28-239
PCPu120/1-28-240
PCPu120/1-56-237
PCPu120/1-56-238
PCPu120/1-56-239
PCPu120/1-56-240

(c)

Fig. 20. (cont.)

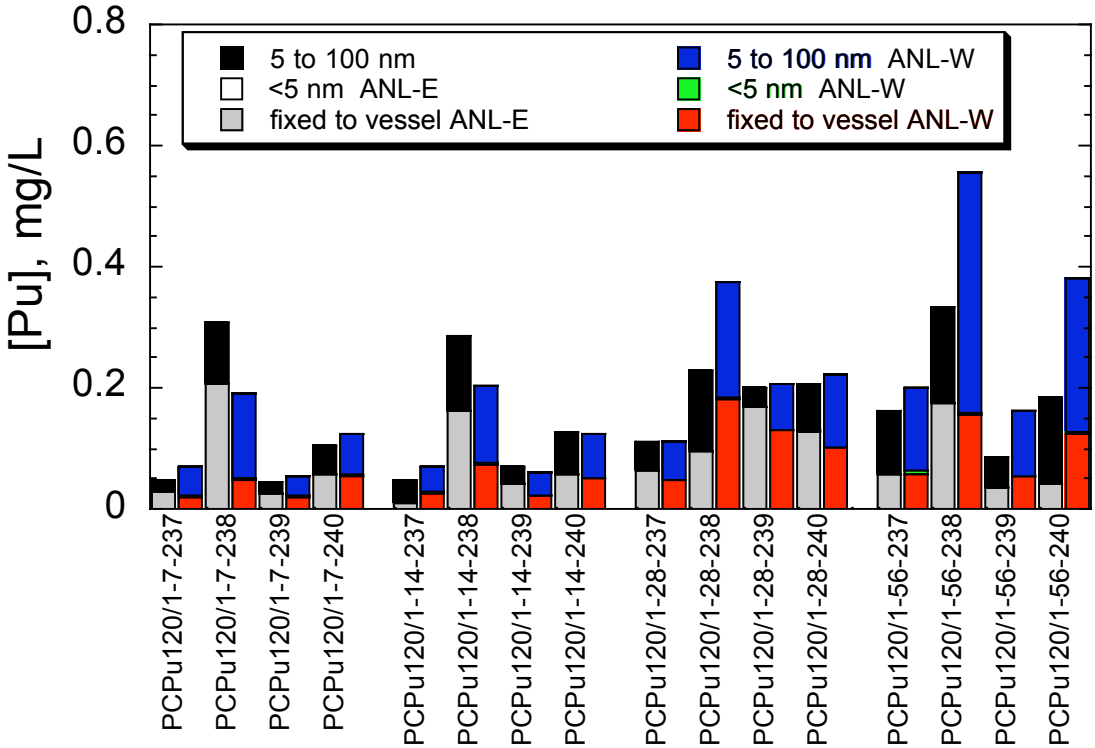


(a)



(b)

Fig. 21. Concentrations of Pu in 5 to 100 nm and <5 nm Fractions for Tests at ANL-E and ANL-W: (a) 90°C at CWF/Water Mass Ratio 1:10, and (b) 120°C at CWF/Water Mass Ratio 1:10.


0.8
0.6
0.4
0.2
0
[Pu], mg/L
5 to 100 nm
<5 nm ANL-E
fixed to vessel ANL-E
5 to 100 nm ANL-W
<5 nm ANL-W
fixed to vessel ANL-W
PCPu120/1-7-237
PCPu120/1-7-238
PCPu120/1-7-239
PCPu120/1-7-240
PCPu120/1-14-237
PCPu120/1-14-238
PCPu120/1-14-239
PCPu120/1-14-240
PCPu120/1-28-237
PCPu120/1-28-238
PCPu120/1-28-239
PCPu120/1-28-240
PCPu120/1-56-237
PCPu120/1-56-238
PCPu120/1-56-239
PCPu120/1-56-240

(c)

Fig. 21. (cont.)

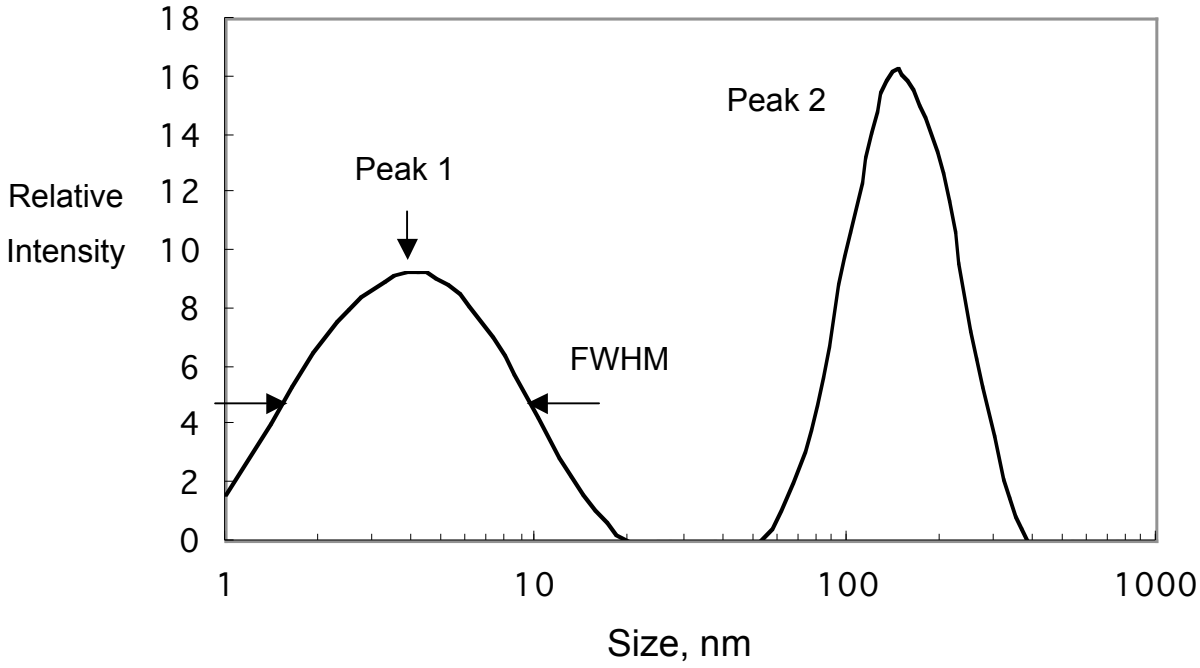


Fig. 22. Colloid Size Distribution in 450-nm Filtrate for PCPu90-7-202 Measured Six days After Test Termination (analysis number 3). The arrows identify the center and the full width at half maximum (FWHM) for peak 1.

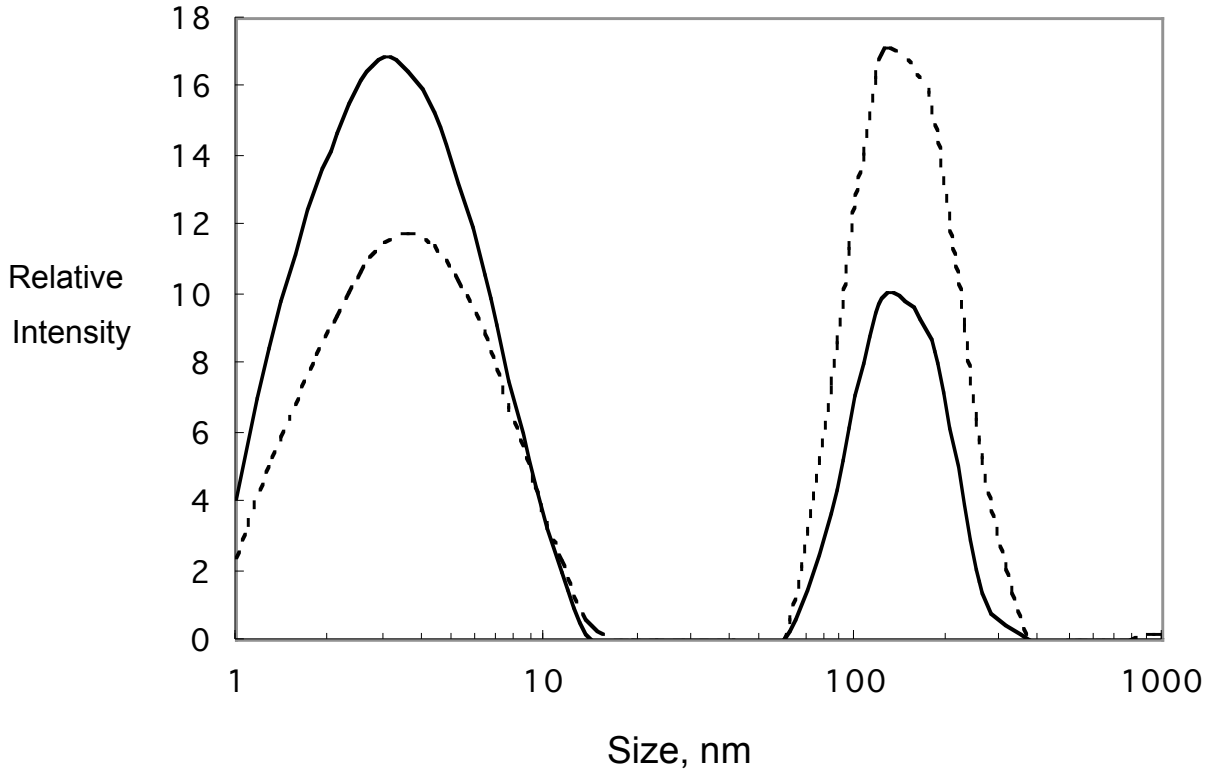


Fig. 23. Colloid Size Distribution in 450-nm Filtrate Solution for PCPu120-7-202. DLS Measurements were performed 6 days (solid curve) and 22 days (dashed curve) after test termination.

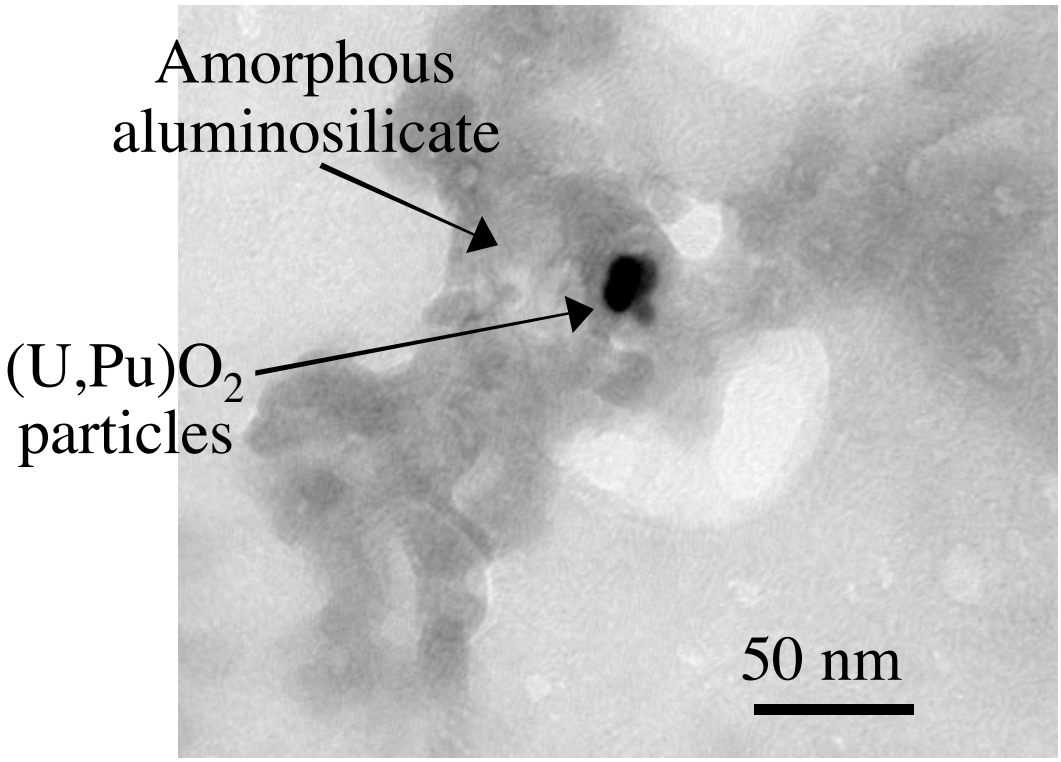


Fig. 24. TEM Image of Colloid from Test PCPu120-28-238 (on lacy carbon substrate).

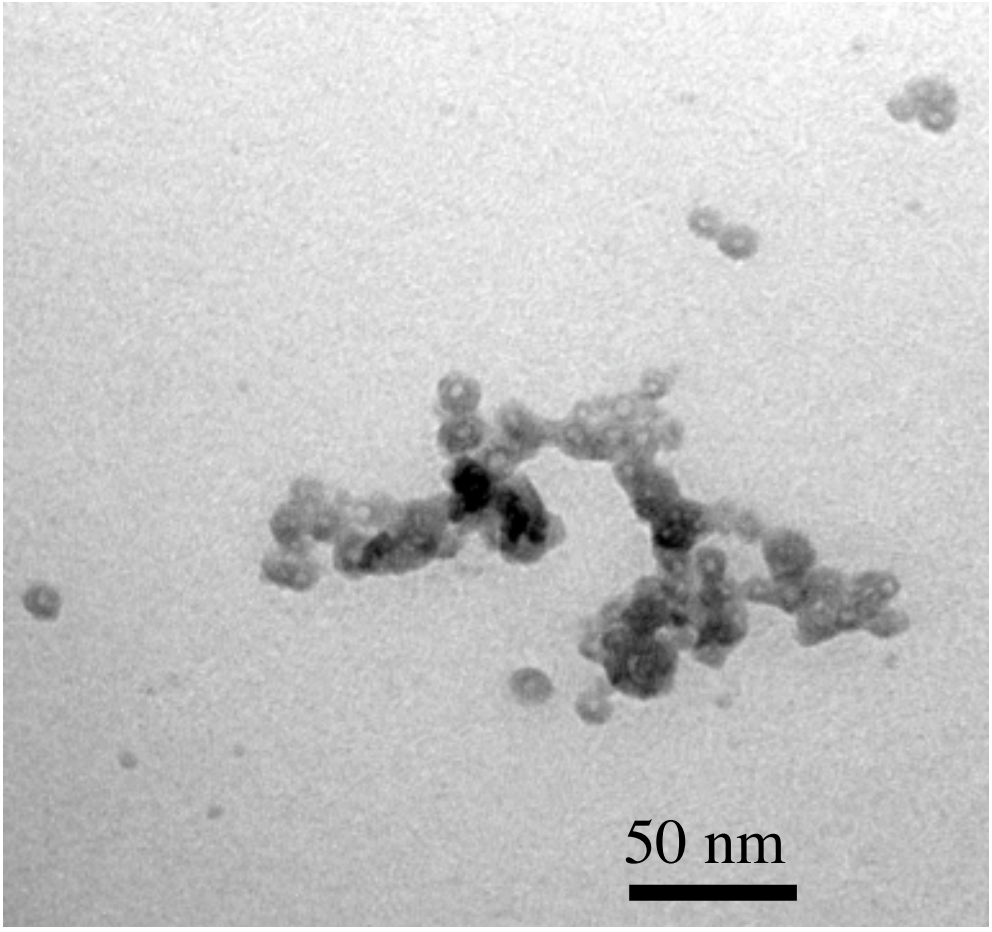


Fig. 25. TEM Image of ~10-nm size Aluminosilicate Colloids (on Butvar substrate).

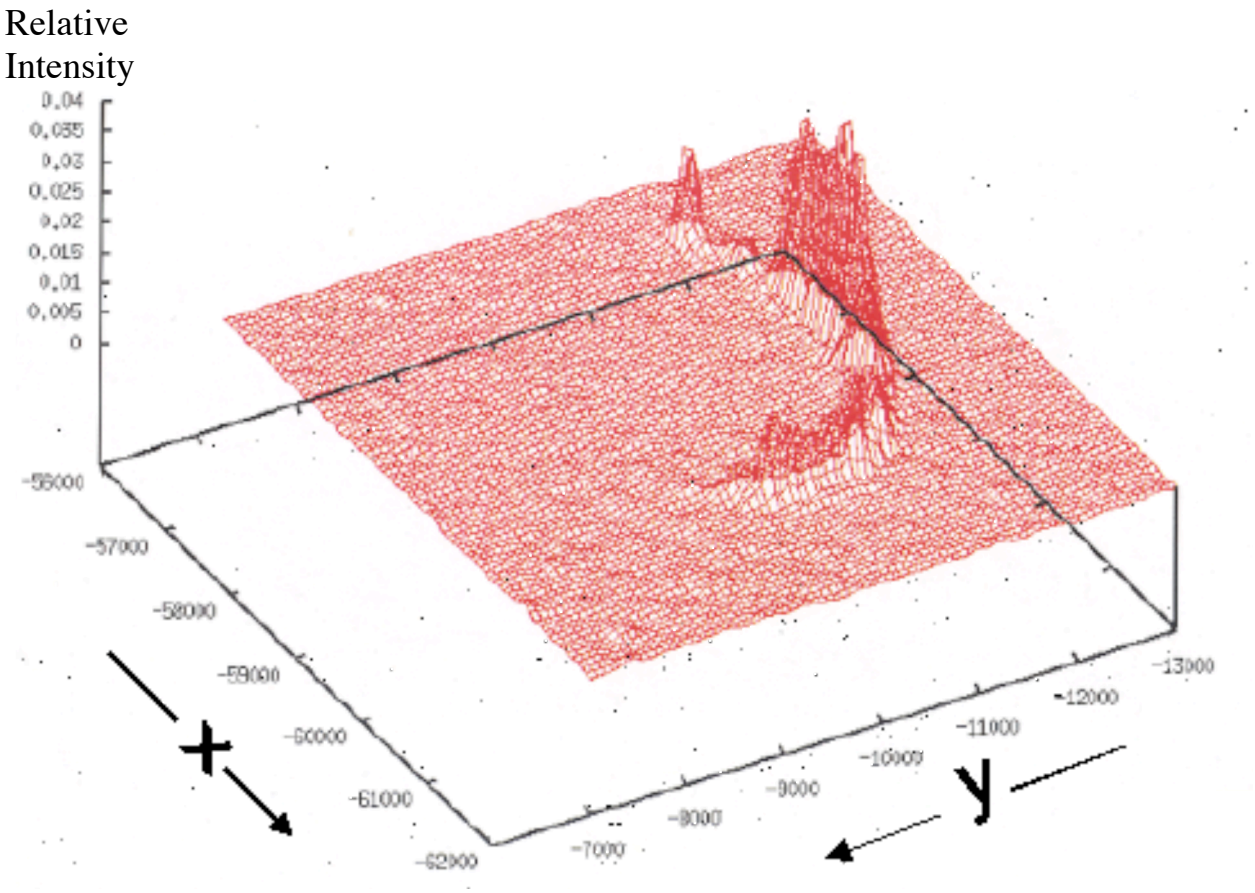


Fig. 26. XAFS Pu L_{III} edge Scan of 5-nm Pore-Size Filter from PCPu120/1-225-240.

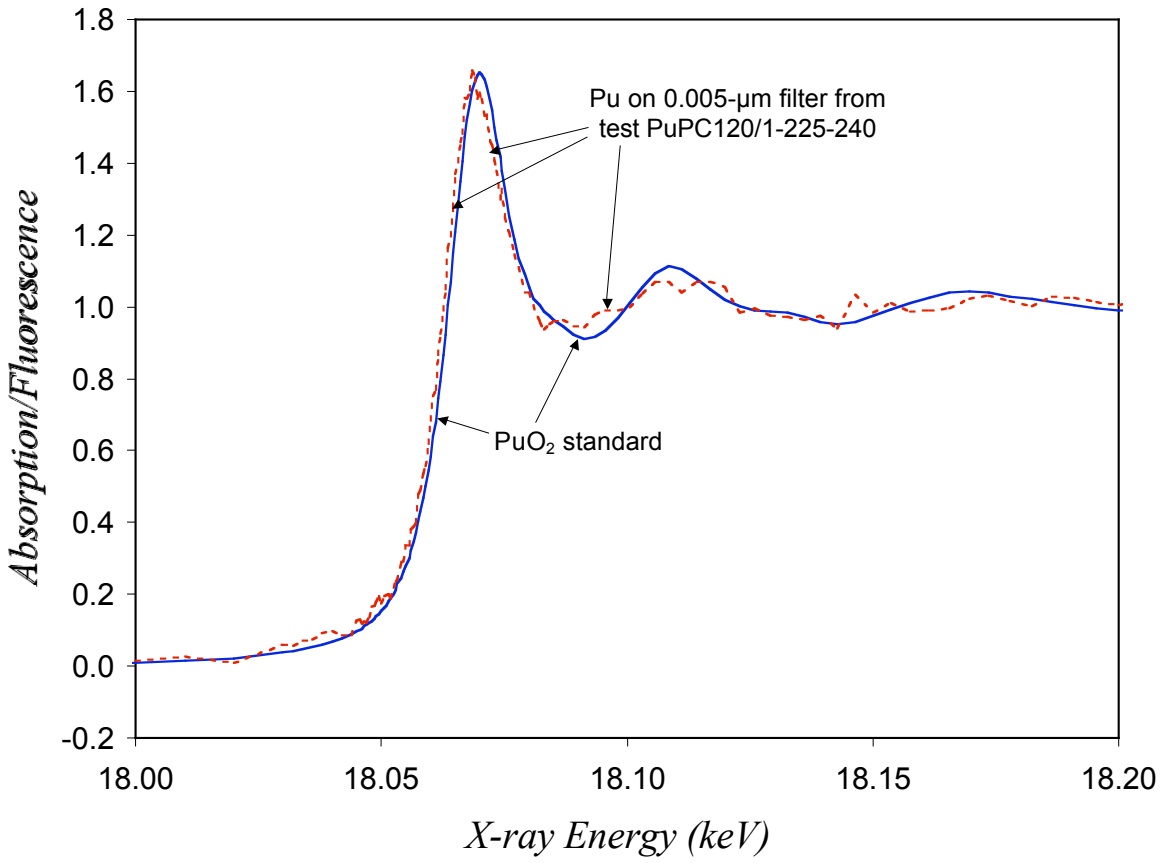
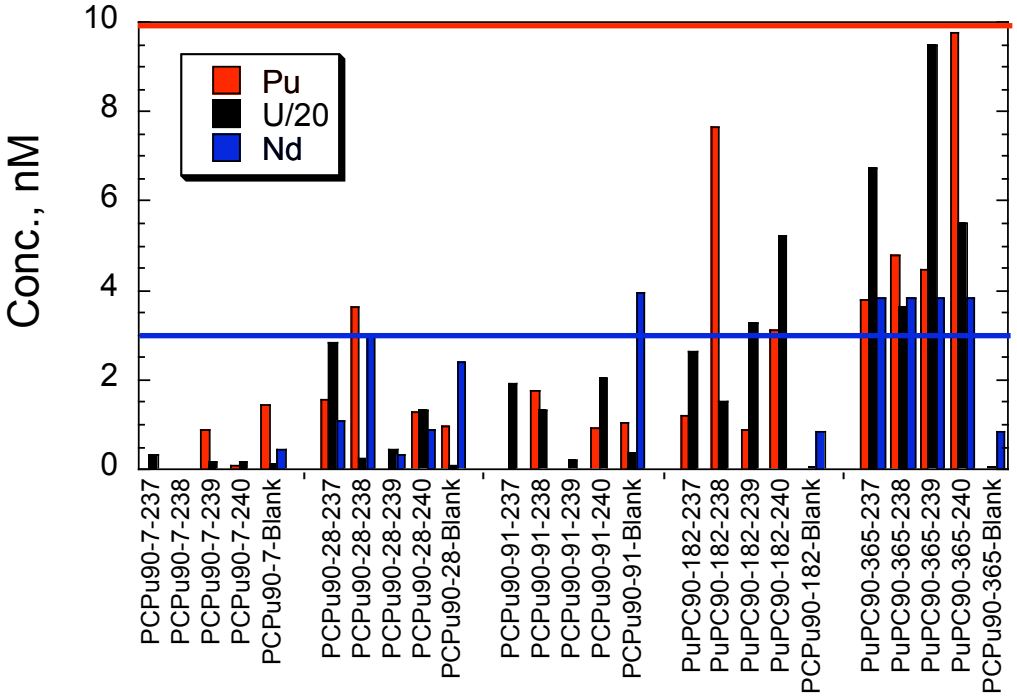
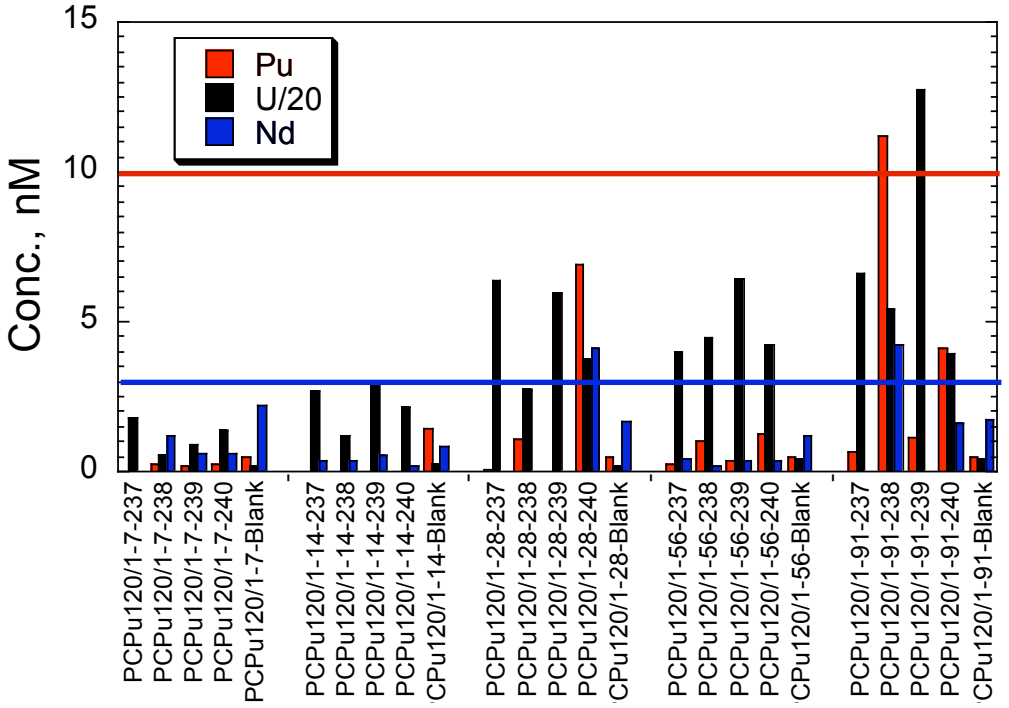


Fig. 27. Absorption XAFS Spectra of Pu L_{III} Edges of Particulate from 5 nm filter for Test PC120/1-225-240 (dashed red curve) and Reference PuO_2 Standard (smooth blue curve).



(a)



(b)

Fig. 28. Comparison of Concentrations of Nd, U, and Pu in the 5-nm Filtrate Solutions with Estimated Solubility Limits at 25°C (shown by red line for Pu and blue line for Nd) for Tests with HIP CWF Materials at (a) 90°C at 1:10 and (b) 120°C at 1:20.

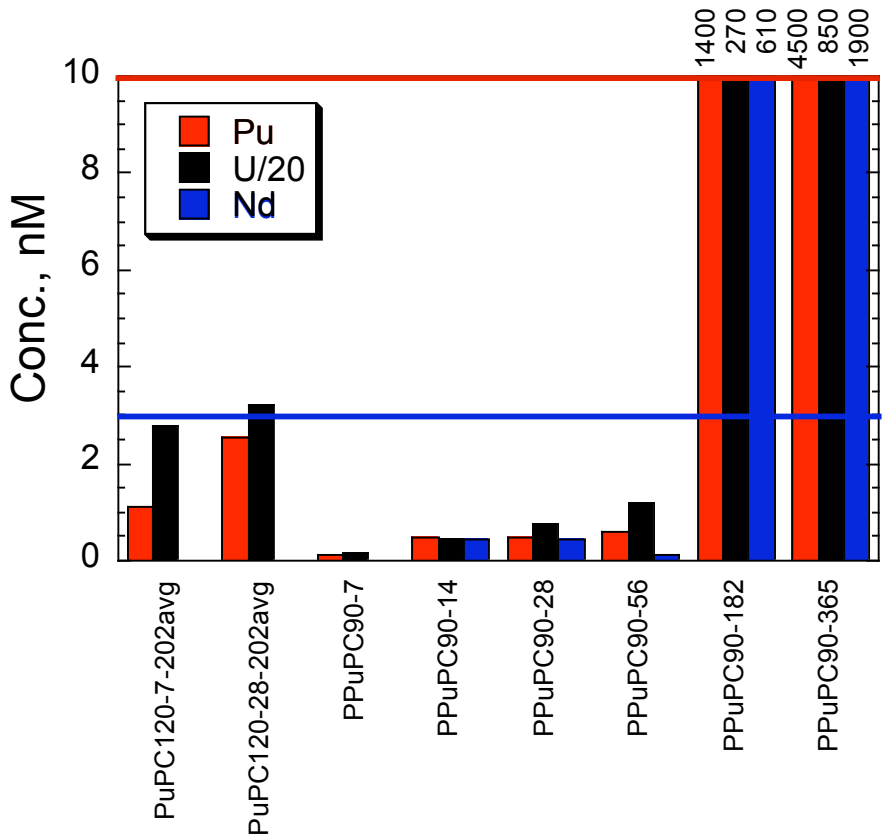


Fig. 29. Comparison of Concentrations of Nd, U, and Pu in the 5-nm Filtrate Solutions with Estimated Solubility Limits at 25°C (shown by red line for Pu and blue line for Nd) for tests with PC CWF Materials GPC00202 and GPC0030m at 120 and 90°C and 1:10. The concentrations of Pu, U, and Nd greatly exceed the estimated solubility limits in tests PPuPC90-182 and PPuPC90-365; the concentrations in nM are given above the bars for these tests.

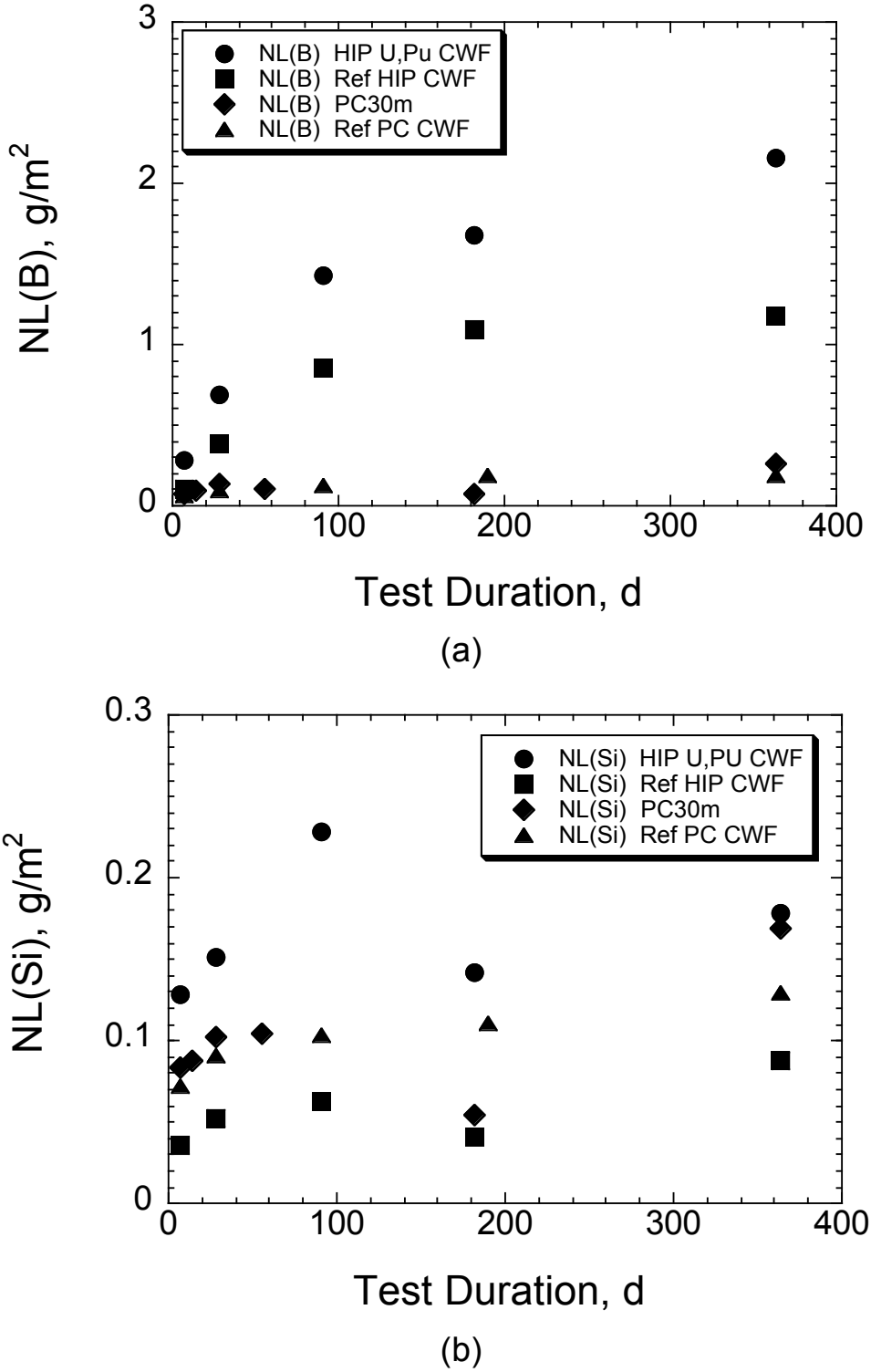
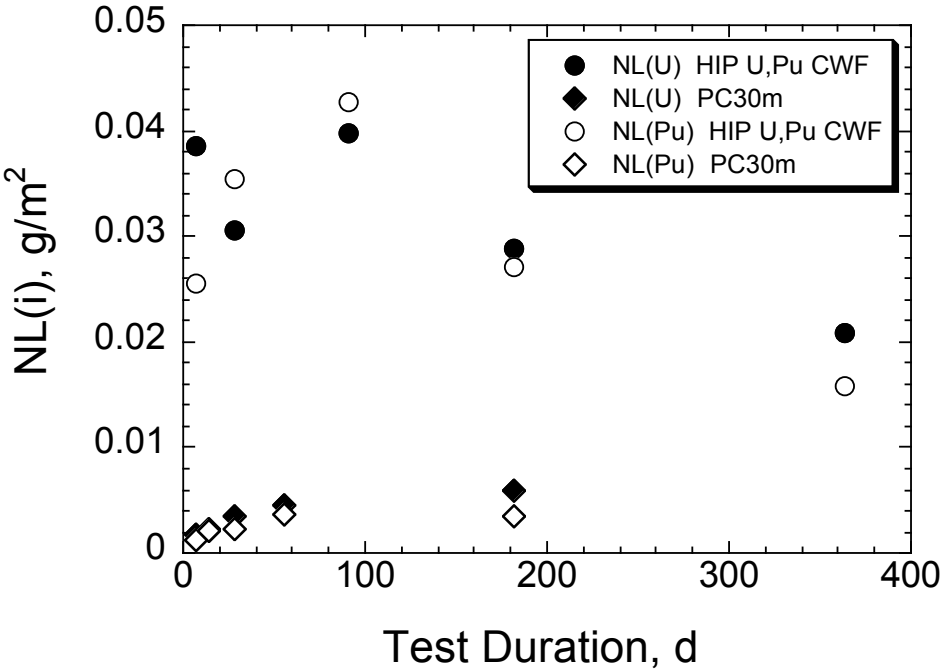


Fig. 30. Comparison of Normalized Mass Losses of B, Si, U, and Pu from HIP U,Pu-loaded CWF Material 238m, HIP Ref CWF, and PC U,Pu-loaded CWF Material GPC0030m in PCT at 90˚C and a 1:10 Mass Ratio.


0.05
0.04
0.03
0.02
0.01
0
NL(i), g/m2
0
100
200
300
400
Test Duration, d
NL(U) HIP U,Pu CWF
NL(U) PC30m
NL(Pu) HIP U,Pu CWF
NL(Pu) PC30m

(c)

Fig. 30. (cont.)

Table 1. HIP U,Pu-Loaded CWF Materials

Sample mixture[1]	HIP cans [1]	Water in zeolite, mass %	U content, mass %	Pu content, mass %
237m	2371, 2372 [2]	0.12	0.44	0.15
238m	2381, 2382, 2383, 2384	0.12	0.15	0.44
239m	2391, 2392, 2393, 2394	3.5	0.44	0.15
240m	2401, 2402, 2403, 2404	3.5	0.15	0.44

[1] Four 50-g HIP cans were prepared of each of the four batches of CWF. The CWF from the four cans was mixed for use in PCTs. A sample mixture identification such as "238m" refers to a mixture of CWF materials from the four HIP cans 2381, 2382, 2383, and 2384.

[2] HIP cans 2373 and 2374 leaked during processing. Materials from these cans were not included in the consolidated mixture 237m.

Table 2. PC U,Pu-Loaded CWF Materials

Product Number	Processing Temperature & Time	Water in zeolite, mass %	U content, mass %	Pu content, mass %
GPC00201	875 °C & 24 h	0.15	0.42	0.14
GPC00202	875 °C & 24 h	0.15	0.14	0.42
GPC00203	875 °C & 24 h	3.2	0.42	0.14
GPC00204	875 °C & 24 h	3.2	0.14	0.42
GPC00301	915 °C & 16 h	0.12	0.15	0.44
GPC00302	915 °C & 16 h	0.12	0.15	0.44
GPC00303	915 °C & 16 h	0.12	0.15	0.44
GPC00304	915 °C & 16 h	0.12	0.15	0.44

Table 3. Compositions of HIP and PC U,Pu-loaded CWF materials, in mass fraction

element	237m and 239m	238m and 240m	GPC00202	GPC0030m
Al	0.136	0.136	0.136	0.136
B	0.0150	0.0150	0.0150	0.0150
Ba	0.00038	0.00068	0.00068	0.00068
Ca	0.0026	0.0026	0.0026	0.0026
Ce	0.00090	0.00090	0.00090	0.00090
Cl	0.0459	0.0458	0.0458	0.0458
Cr	0.00003	0.00003	0.00003	0.00003
Cs	0.00014	0.0014	0.0014	0.0014
Cu	0.00001	0.00001	0.00001	0.00001
Eu	0.00002	0.00002	0.00002	0.00002
Fe	0.00067	0.00067	0.00067	0.00067
I	0.00008	0.00008	0.00008	0.00008
K	0.0158	0.0158	0.0158	0.0158
La	0.00047	0.00047	0.00047	0.00047
Li	0.00389	0.00389	0.00389	0.00389
Mg	0.00053	0.00053	0.00053	0.00053
Mn	0.00001	0.00001	0.00001	0.00001
Na	0.116	0.116	0.116	0.116
Nd	0.00153	0.00153	0.00153	0.00153
Ni	0.00001	0.00001	0.00001	0.00001
Pr	0.00045	0.00045	0.00045	0.00045
Pu	0.00141	0.00426	0.00426	0.00385
Rb	0.00016	0.00016	0.00016	0.00016
Si	0.199	0.199	0.199	0.199
Sm	0.00027	0.00027	0.00027	0.00027
Sr	0.00045	0.00045	0.00045	0.00045
Ti	0.00117	0.00117	0.00117	0.00117
U	0.00421	0.00141	0.00141	0.00112
Y	0.00022	0.00022	0.00022	0.00022
Zn	0.00132	0.00132	0.00132	0.00132
Zr	0.00132	0.00132	0.00132	0.00132

Table 4. Peak Assignments for XRD Spectra of HIP U,Pu-loaded CWF Materials

237m											
Sodalite			Nepheline			Halite			$(U,Pu)O_2$		
2□	d (Å)	I (%)	2□	d (Å)	I (%)	2□	d (Å)	I (%)	2□	d (Å)	I (%)
14.16	6.25	30	20.53	4.32	0.6	27.39	3.25	0.6	28.35	3.14	1.8
20.07	4.42	7.1	21.26	4.18	1.0	31.70	2.82	1.4	32.84	2.72	0.5
22.48	3.95	0.7	23.15	3.84	1.8	45.44	1.99	0.6	47.12	1.92	0.5
24.65	3.61	100	27.26	3.27	1.5				55.91	1.64	0.4
31.98	2.80	6.6	29.37	3.04	0.7						
35.13	2.55	15	29.72	3.00	1.9						
38.04	2.36	14	31.00	2.88	0.8						
40.78	2.21	0.5	38.44	2.34	0.5						
43.38	2.08	18	39.06	2.30	0.5						
45.85	1.98	2.6									
48.23	1.88	2.2									
50.52	1.80	1.6									
52.74	1.73	1.7									
56.98	1.61	1.3									
59.04	1.56	4.7									
238m											
Sodalite			Nepheline			Halite			U/PuO_2		
2□	d (Å)	I (%)	2□	d (Å)	I (%)	2□	d (Å)	I (%)	2□	d (Å)	I (%)
14.17	6.25	34	20.52	4.32	0.7	27.39	3.26	0.4	28.52	3.13	1.3
20.08	4.42	7.8	21.27	4.17	1.1	31.71	2.82	1.6	33.10	2.70	0.6
22.47	3.95	0.8	23.16	3.84	1.8	45.45	1.99	0.8	47.39	1.92	0.3
24.65	3.61	100	27.29	3.26	1.1				56.99	1.61	1.6
31.99	2.80	7.5	29.37	3.04	0.8						
35.13	2.55	17	29.73	3.00	0.8						
38.05	2.36	16	31.02	2.88	0.8						
40.79	2.21	0.8	38.44	2.34	0.8						
43.38	2.08	21	39.04	2.30	0.4						
45.86	1.98	7.3									
48.23	1.88	2.4									
50.52	1.80	1.9									
52.74	1.73	2.2									
56.99	1.61	1.6									
59.04	1.56	5.8									

Table 4. (contd.)

239m											
Sodalite			Nepheline			Halite			U/PuO_2		
2□	d (Å)	I (%)	2□	d (Å)	I (%)	2□	d (Å)	I (%)	2□	d (Å)	I (%)
14.16	6.25	32	20.46	4.33	0.7	27.36	3.27	0.6	28.42	3.14	2.3
20.07	4.42	7.8	21.26	4.17	1.6	31.70	2.82	3.1	32.90	2.72	0.8
22.47	3.95	1.2	23.14	3.84	3.4	45.45	1.99	1.3	47.28	1.92	0.7
24.64	3.61	100	27.26	3.27	2.1				56.12	1.64	0.4
31.98	2.80	6.9	29.37	3.04	0.9						
35.13	2.55	15	29.72	3.00	3.1						
38.04	2.36	15	31.00	2.88	1.0						
40.81	2.21	0.6	38.42	2.34	1.1						
43.38	2.08	19	39.10	2.31	0.5						
45.86	1.98	2.8									
48.22	1.88	2.4									
50.52	1.80	1.7									
52.74	1.73	1.8									
56.99	1.61	1.6									
59.04	1.56	5.0									
240m											
Sodalite			Nepheline			Halite			U/PuO_2		
2□	d (Å)	I (%)	2□	d (Å)	I (%)	2□	d (Å)	I (%)	2□	d (Å)	I (%)
14.15	6.25	34	20.51	4.33	1.0	27.26	3.36	0.8	28.56	3.12	2.5
20.06	4.42	7.2	21.25	4.18	2.7	31.70	2.82	4.4	33.12	2.70	1.7
22.44	3.96	0.6	23.14	3.84	4.0	45.44	1.99	2.0	48.23	1.88	2.1
24.64	3.61	100	27.26	3.27	2.8				56.42	1.61	1.4
31.97	2.80	6.4	29.37	3.04	0.9						
35.12	2.55	16	29.71	3.00	4.6						
38.04	2.36	14	30.99	2.88	1.4						
40.79	2.21	0.5	38.41	2.34	1.5						
43.37	2.08	18	39.05	2.30	0.7						
45.84	1.98	2.4									
48.23	1.88	2.1									
50.51	1.80	1.8									
52.74	1.73	1.5									
56.98	1.61	1.4									
59.04	1.56	5.1									

Table 5. d-spacings for Reference Materials (PDF card numbers)

Sodalite		Nepheline		Halite		PuO_2		UO_2	
PDF 37-0476		PDF 35-0424		PDF 05-0628		PDF 41-1170		PDF 41-1422	
d (Å)	I (%)	d (Å)	I (%)	d (Å)	I (%)	d (Å)	I (%)	d (Å)	I (%)
6.28	40.0								
4.44	5.0								
		4.32	35.0						
		4.16	80.0						
		3.83	100.0						
3.624	100.0								
		3.27	70.0						
								3.153	100.0
						3.115	100.0		
		3.00	100.0						
				2.821	100.0				
2.807	8.0								
								2.733	50.0
						2.698	37		
2.563	16.0	2.570	50.0						
2.373	16.0								
		2.336	35.0						
		2.304	25.0						
2.219	1.0								
2.03	20.0								
				1.994	55.0				
1.985	3.0								
								1.933	50.0
						1.908	48		
1.893	3.0								
1.812	2.0								
1.741	2.0								
								1.647	45.0
				1.628	15.0	1.627	45		
1.621	2.0								
1.570	5.0								
1.523	3.0								
1.480	4.0								
1.440	5.0								

Table 6. Peak Assignments for XRD Spectrum for Non-radioactive Reference PC CWF

Sodalite		Halite	
d (Å)	I (%)	d (Å)	I (%)
6.303	25.0		
4.448	6.0		
3.629	100.0		
		2.824	5.2
2.808	9.0		
2.562	20.8		
2.372	20.7		

Sodalite		Halite	
d (Å)	I (%)	d (Å)	I (%)
2.219	1.3		
2.092	28.8		
		1.998	2.2
1.984	4.6		
1.892	3.9		
1.811	3.5		
1.740	3.6		
1.619	2.5		
1.568	10.6		
1.521	5.3		
1.478	7.9		

Table 7. Corrosion Test Matrix for HIP U,Pu-loaded CWF at ANL-E

CWF/water mass ratio	Temperature (˚C)	Duration (days)	Tests with 237m	Tests with 238m	Tests with 239m	Tests with 240m
1:10	90	7	PCPu90-7-237	PCPu90-7-238	PCPu90-7-239	PCPu90-7-240
		28	PCPu90-28-237	PCPu90-28-238	PCPu90-28-239	PCPu90-28-240
		91	PCPu90-91-237	PCPu90-91-238	PCPu90-91-239	PCPu90-91-240
		182	PCPu90-182-237	PCPu90-182-238	PCPu90-182-239	PCPu90-182-240
		365	PCPu90-365-237	PCPu90-365-238	PCPu90-365-239	PCPu90-365-240
1:20	120	7	PCPu120/1-7-237	PCPu120/1-7-238	PCPu120/1-7-239	PCPu120/1-7-240
		14	PCPu120/1-14-237	PCPu120/1-14-238	PCPu120/1-14-239	PCPu120/1-14-240
		28	PCPu120/1-28-237	PCPu120/1-28-238	PCPu120/1-28-239	PCPu120/1-28-240
		56	PCPu120/1-56-237	PCPu120/1-56-238	PCPu120/1-56-239	PCPu120/1-56-240
		91	PCPu120/1-91-237	PCPu120/1-91-238	PCPu120/1-91-239	PCPu120/1-91-240
1:10	120	7	PCPu120-7-237	PCPu120-7-238	PCPu120-7-239	PCPu120-7-240
		28	PCPu120-28-237	PCPu120-28-238	PCPu120-28-239	PCPu120-28-240
		91	PCPu120-91-237	PCPu120-91-238	PCPu120-91-239	PCPu120-91-240
1:10	90	7	PCPu90-7a-237	PCPu90-7a-238	PCPu90-7a-239	PCPu90-7a-240
1:20	120	225	PCPu120/1-225-237	PCPu120/1-225-238	PCPu120/1-225-239	PCPu120/1-225-240

Table 8. Test Matrix for U,Pu-Loaded CWF Samples

Material	Test Number	Temperature (˚C)	CWF/water mass ratio	Test duration (d)
GPC00202	PCPu90-7-202a	90	1:10	7
GPC00202	PCPu90-7-202b	90	1:10	7
GPC00202	PCPu90-7-202c	90	1:10	7
GPC00202	PCPu120-7-202a	120	1:10	7
GPC00202	PCPu120-7-202b	120	1:10	7
GPC00202	PCPu120-7-202c	120	1:10	7
GPC00202	PCPu120-28-202a	120	1:10	28
GPC00202	PCPu120-28-202b	120	1:10	28
GPC00202	PCPu120-28-202c	120	1:10	28
GPC0030m	PPuPC90-7a	90	1:10	7
GPC0030m	PPuPC90-7b	90	1:10	7
GPC0030m	PPuPC90-7c	90	1:10	7
GPC0030m	PPuPC90-14	90	1:10	14
GPC0030m	PPuPC90-28	90	1:10	28
GPC0030m	PPuPC90-56	90	1:10	56
GPC0030m	PPuPC90-182	90	1:10	182
GPC0030m	PPuPC90-365	90	1:10	365
	PPuPC90-Blank7	90		7
	PPuPC90-Blank56	90		56

Table 9. Test Results for HIP U,Pu-loaded CWF

Test Number	NL(B)	NL(Si)	NL(Pu)	NL(U)
(90 °C and 1:10 CWF/Water Mass Ratio)				
PCPu90-7-237	0.22	0.095	0.017	0.015
PCPu90-7-238	0.29	0.13	0.029	0.039
PCPu90-7-239	0.19	0.090	0.015	0.011
PCPu90-7-240	0.18	0.089	0.005	0.009
PCPu90-28-237	0.46	0.17	0.050	0.027
PCPu90-28-238	0.69	0.15	0.035	0.021
PCPu90-28-239	0.46	0.10	0.018	0.005
PCPu90-28-240	0.50	0.18	0.076	0.019
PCPu90-91-237	0.63	0.14	0.044	0.021
PCPu90-91-238	1.36	0.22	0.050	0.041
PCPu90-91-239	0.77	0.13	0.010	0.006
PCPu90-91-240	0.70	0.17	0.019	0.012
PCPu90-182-237	0.92	0.17	0.062	0.020
PCPu90-182-238	1.7	0.14	0.031	0.029
PCPu90-182-239	1.0	0.14	0.048	0.021
PCPu90-182-240	0.91	0.26	0.042	0.068
PCPu90-365-237	1.1	0.18	0.039	0.058
PCPu90-365-238	2.1	0.19	0.039	0.035
PCPu90-365-239	1.4	0.16	0.042	0.062
PCPu90-365-240	1.1	0.14	0.015	0.020

Table 9. (cont.)

Test Number	NL(B)	NL(Si)	NL(Pu)	NL(U)
(120 °C and 1:10 CWF/Water Mass Ratio)				
PCPu120-7-237	0.63	0.16	0.032	0.013
PCPu120-7-238	1.08	0.17	0.034	0.026
PCPu120-7-239	0.73	0.18	0.056	0.030
PCPu120-7-240	0.62	0.17	0.021	0.016
PCPu120-28-237	1.1	0.25	0.089	0.045
PCPu120-28-238	1.9	0.24	0.051	0.049
PCPu120-28-239	1.2	0.21	0.051	0.026
PCPu120-28-240	1.1	0.33	0.046	0.045
PCPu120-91-237	1.6	0.27	0.076	0.040
PCPu120-91-238	2.6	0.27	0.062	0.065
PCPu120-91-239	1.6	0.17	0.045	0.023
PCPu120-91-240	1.5	0.28	0.033	0.043
(120 °C and 1:20 CWF/Water Mass Ratio)				
PCPu120/1-7-237	0.74	0.29	0.036	0.017
PCPu120/1-7-238	1.1	0.34	0.067	0.041
PCPu120/1-7-239	0.79	0.32	0.037	0.015
PCPu120/1-7-240	1.03	0.34	0.038	0.017
PCPu120/1-14-237	1.8	0.44	0.082	0.048
PCPu120/1-14-238	1.7	0.38	0.051	0.014
PCPu120/1-14-239	1.2	0.36	0.055	0.018
PCPu120/1-14-240	0.99	0.40	0.032	0.024
PCPu120/1-28-237	1.3	0.40	0.084	0.043
PCPu120/1-28-238	2.1	0.41	0.051	0.13
PCPu120/1-28-239	1.4	0.43	0.14	0.023
PCPu120/1-28-240	1.1	0.45	0.051	0.039
PCPu120/1-56-237	1.6	0.38	0.10	0.042
PCPu120/1-56-238	2.9	0.40	0.083	0.061
PCPu120/1-56-239	1.8	0.37	0.070	0.028
PCPu120/1-56-240	1.5	0.38	0.045	0.029
PCPu120/1-91-237	2.0	0.44	0.076	0.042
PCPu120/1-91-238	3.2	0.45	0.064	0.071
PCPu120/1-91-239	2.2	0.46	0.061	0.036
PCPu120/1-91-240	1.9	0.47	0.044	0.046

Table 10. Test Results for PC U,Pu-loaded CWF material GPC00202
(90 and 120 °C and 1:10 CWF/Water Mass Ratio)

Test Number	NL(B)	NL(Si)	NL(Pu)	NL(U)
PCPu90-7-202a	0.063	0.073	0.0057	0.0074
PCPu90-7-202b	0.061	0.085	0.0042	0.0051
PCPu90-7-202c	0.087	0.11	0.010	0.0089
mean ± s	0.070 ± 0.015	0.089 ± 0.018	0.0066 ± 0.0030	0.0071 ± 0.0019
PCPu120-7-202a	0.22	0.18	0.016	0.011
PCPu120-7-202b	0.25	0.22	0.026	0.019
PCPu120-7-202c	0.26	0.22	0.024	0.019
mean ± s	0.24 ± 0.016	0.21 ± 0.02	0.022 ± 0.0053	0.016 ± 0.005
PCPu120-28-202a	0.34	0.21	0.022	0.020
PCPu120-28-202b	0.32	0.20	0.021	0.019
PCPu120-28-202c	0.35	0.20	0.019	0.019
mean ± s	0.34 ± 0.015	0.20 ± 0.00	0.021 ± 0.002	0.019 ± 0.001

Table 11. Test Results for PC U,Pu-loaded CWF Material GPC0030m
(90 °C and 1:10 CWF/Water Mass Ratio)

Test Number	NL(B)	NL(Si)	NL(Pu)	NL(U)
PPuPC90-7a	0.063	0.080	0.0031	0.0016
PPuPC90-7b	0.082	0.085	0.0034	0.0022
PPuPC90-7c	0.085	0.079	0.0034	0.0019
mean ± s	0.077 ± 0.012	0.081 ± 0.003	0.0033 ± 0.0002	0.0019 ± 0.0003
PPuPC90-14	0.093	0.086	0.0050	0.0026
PPuPC90-28	0.13	0.10	0.0065	0.0039
PPuPC90-56	0.057	0.10	0.0088	0.0051
PPuPC90-182	0.077	0.054	0.013	0.0067
PPuPC90-365	0.26	0.17	0.012	0.018

Table 12. Plutonium Levels Found by Alpha-Particle Counting on Walls of PCT Vessels and on Coupons.

Test ID	Test Conditions[a]	Vessel[b]	Coupon material	*NL(Si)*, g/m^2	Pu, $\mu g/cm^2$		
					Horizontal leg	Vertical leg	Vessel
PCPu120/1-225-239a	225 d, 120°C, 1:20	Used	Type 304L	0.47	0.16	0.055	0.048
PCPu120/1-225-240a	225 d, 120°C, 1:20	Used	Type 304L	0.50	0.31	0.15	0.046
PPuPC90-28	28 d, 90°C, 1:10	New	Type 304L	0.10	0.014	0.030	0.018
PPuPC90T-28	28 d, 90°C, 1:10	PFA	PFA Teflon	0.079	0.0059	0.0094	0.0006
PPuPC90-56	56 d, 90°C, 1:10	New	Type 304L	0.10	0.022	0.036	0.022
PPuPC90T-56	56 d, 90°C, 1:10	PFA	PFA Teflon	0.081	0.010	0.0060	0.0017

[a]Test duration, temperature, CWF/water mass ratio.

[b]Used= Used Type 304L stainless steel, New=New Type 304L stainless steel, PFA=Type 304L stainless steel coated with PFA Teflon.

Table 13. Results of Tests in New, Used, and Teflon-Coated Type 304LStainless Steel Vessels, in g/m^2

		NL(Si)		*NL(Nd)*		*NL(U)*		*NL(Pu)*	
Test Number	Vessel Type	450 nm[a]	AS[b]	450 nm	AS[b]	450 nm	AS	450 nm	AS
PCPu120/1-14-238	Used	0.417	0.0400	0.0368	0.0408	0.0190	0.0277	0.0328	0.0378
PCPu120/1-14-238R	New	0.388	0.0057	0.0317	0.0186	0.0135	0.0009	0.0249	No value
ratio	Used/New	1.07	7.02	1.16	2.19	1.41	30.8	1.32	--
PPuPC90-28	New	0.0994	0.0031	0.0064	0.0050	0.0023	0.0012	0.0023	No value
PPuPC90T-28R	Teflon-coated	0.0732	0.0004	0.0011	0.0004	0.0009	0.0001	0.0005	No value
ratio	Used/Teflon	1.36	7.75	5.82	12.5	2.56	12.0	4.60	--
PPuPC90-56	New	0.102	0.0030	0.0076	0.0061	0.0040	0.0011	0.0040	0.0048
PPuPC90T-56	Teflon-coated	0.080	0.0017	0.0027	0.0021	0.0024	0.0003	0.0021	0.0004
ratio	Used/Teflon	1.28	1.76	2.81	2.90	1.67	3.67	1.9	12.0

[a] *NL(i)* for 450 nm filtrate solution.
[b] *NL(i)* for acid soak solution.

Table 14. Results of Sequential Filtrations with 5-nm Pore-Size Filters, in μg/L

Element	First Filtration	Second Filtration	Ratio
Li	5.71E+03	6.61E+03	1.16E+00
B	1.37E+04	1.71E+04	1.25E+00
Na	2.91E+04	3.30E+04	1.13E+00
Mg	407	405	9.95E-01
Al	1.37E+04	1.55E+04	1.13E+00
Si	3.09E+04	3.73E+04	1.21E+00
K	3.60E+03	4.06E+03	1.13E+00
Ca	1.89E+03	2.38E+03	1.26E+00
Rb	14.4	14.8	1.03E+00
Sr	2.49	2.76	1.11E+00
Y	0.285	0.239	8.39E-01
Cs	58	57.7	9.95E-01
Ba	3.18	2.39	7.52E-01
La	0.371	0.494	1.33E+00
Ce	<0.1	<0.1	1.00E+00
Pr	<0.1	<0.1	1.00E+00
Nd	0.64	0.792	1.24E+00
Sm	<0.3	<0.3	1.00E+00
Eu	0.178	0.179	1.01E+00
U	2.53	2.43	9.60E-01
Pu	<0.2	<0.2	1.00E+00

Table 15. Results of Replicate Acid Soaks

Test	Soak 1	Soak 2	Soak 3	Soak 4
PCPu90-7-237	39.9	2.29	3.21	3.24
PCPu90-7-238	214	14.6	1.42	1.87
PCPu90-7-239	35.4	7.38	0.75	0.46
PCPu90-7-240	39.6	1.3	0.56	1.23
PCPu90-28-237	72.0	1.34	--	--
PCPu90-28-238	165.	5.89	--	--
PCPu90-28-239	27.9	4.52	--	--
PCPu90-28-240	133	5.02	--	--
PCPu90-182-237	103	11.7	--	--
PCPu90-182-238	96	13.4	--	--
PCPu90-182-239	76	9.36	--	--
PCPu90-182-240	157	15.8	--	--

Table 16. Summary of DLS Analyses

Sample Number	Peak No.	Analysis No.	Mean Size, nm	Peak Width, nm	Peak Area, %
PCPu90-7-238a	1	1	8	15	65
analyzed 5 days after test termination		2	8	15	70
		mean	*8*	*15*	*67.5*
	2	1	130	140	35
		2	110	120	30
		mean	*120*	*130*	*32.5*
PCPu90-7-202	1	1	5	9	44
analyzed 6 days after test termination		2	5	8	51
		3	4	7	61
		4	5	9	38
		5	7	15	57
		mean	*5.2*	*9.6*	*50.2*
	2	1	170	190	56
		2	160	160	49
		3	150	120	39
		4	160	130	62
		5	140	130	43
		mean	*156*	*146*	*49.8*
PCPu90-365-238a	1	1	18	37	76
analyzed day of test termination		2	22	27	79
		mean	*20*	*32*	*77.5*
	2	1	110	110	24
		2	89	56	21
		mean	*99.5*	*83*	*22.5*
PCPU120-7-202	1	1	4	6	76
analyzed 6 days after test termination		2	4	6	84
		3	6	13	67
		mean	*4.7*	*8.3*	*75.7*
	2	1	145	127	24
		2	111	88	16
		3	132	147	33
		mean	*129.3*	*120.7*	*24.3*
PCPu120-7-202	1	1	5	8	20
analyzed 22 days after test termination		2	5	8	38
		mean	*5*	*8*	*29*
	2	1	162	219	80
		2	170	184	62
		mean	*166*	*201.5*	*71*

Table 17. Concentrations in 5-nm Filtrate Solutions, nM

Test Number	Nd	U	Pu	Test Number	Nd	U	Pu
HIP CWF at 90°C and 1:10				HIP CWF at 120°C and 1:20			
PCPu90-7-237	0	6.8	0	PCPu120/1-7-237	0.030	36	0
PCPu90-7-238	0	0	0	PCPu120/1-7-238	1.2	11	0.27
PCPu90-7-239	0	3.2	0.88	PCPu120/1-7-239	0.62	17	0.21
PCPu90-7-240	0	3.5	0.073	PCPu120/1-7-240	0.59	28	0.24
PCPu90-7-Blank	0.43	2.1	1.5	PCPu120/1-7-Blank	2.2	3.4	0.48
PCPu90-28-237	1.1	57	1.6	PCPu120/1-14-237	0.35	54	0
PCPu90-28-238	3.0	5.2	3.6	PCPu120/1-14-238	0.35	24	0
PCPu90-28-239	0.34	9.1	0	PCPu120/1-14-238R	0.82	20	0
PCPu90-28-240	0.90	26	1.3	PCPu120/1-14-239	0.57	60	0
PCPu90-28-Blank	2.4	1.7	0.97	PCPu120/1-14-240	0.19	43	0
PCPu90-91-237	0	38	0	PCPu120/1-14-Blank	0.84	5.5	1.4
PCPu90-91-238	0	26	1.8	PCPu120/1-28-237	0	130	0.057
PCPu90-91-239	0	4.4	0	PCPu120/1-28-238	0	56	1.1
PCPu90-91-240	0	41	0.92	PCPu120/1-28-239	0	120	0.010
PCPu90-91-Blank	**3.9**	7.1	1.1	PCPu120/1-28-240	**4.1**	75	6.9
PuPC90-182-237	0	53	1.2	PCPu120/1-28-Blank	1.7	3.8	0.48
PuPC90-182-238	0	30	7.6	PCPu120/1-56-237	0.43	80	0.24
PuPC90-182-239	0	65	0.88	PCPu120/1-56-238	0.19	89	1.0
PuPC90-182-240	0	110	3.1	PCPu120/1-56-239	0.38	130	0.34
PCPu90-182-Blank	0.85	0.85	0	PCPu120/1-56-240	0.34	85	1.3
PuPC90-365-237	**3.8**	140	3.8	PCPu120/1-56-Blank	1.2	8.4	0.48
PuPC90-365-238	**3.8**	73	4.8	PCPu120/1-91-237	0	130	0.67
PuPC90-365-239	**3.8**	190	4.4	PCPu120/1-91-238	**4.2**	110	**11**
PuPC90-365-240	**3.8**	110	9.8	PCPu120/1-91-239	0	250	1.1
PCPu90-365-Blank	0.85	0.85	0	PCPu120/1-91-240	1.60	79	4.1
				PCPu120/1-91-Blank	1.7	8.4	0.48
HIP CWF at 120°C and 1:10				PC CWF at 90°C and 1:10			
PCPu120-7-237	0	92	0	PuPC120-7-202a	1.3	44	1.6
PCPu120-7-238	0	44	1.8	PuPC120-7-202b	1.9	55	1.0
PCPu120-7-239	0	52	0	PuPC120-7-202c	1.67	68	0.69
PCPu120-7-240	0	46	0	PuPC120-7-Blank	2.7	1.0	0.58
PCPu120-7-Blank	1.7	5.4	1.5	PuPC120-28-202a	0.96	61	1.1
PCPu120-28-237	0	19	0	PuPC120-28-202b	0	77	1.4
PCPu120-28-238	0	100	0	PuPC120-28-202c	**4.5**	55	5.2
PCPu120-28-239	0	16	0	PuPC120-28-Blank	0.85	10	0.97
PCPu120-28-240	0	93	0	PPuPC90-7a	0	4.2	0.12
PCPu120-28-Blank	0.85	8.1	5.8	PPuPC90-7b	0	2.4	0.12
PCPu120-91-237	**49**	260	**27**	PPuPC90-7c	0	3.5	0.12
PCPu120-91-238	0	150	4.9	PPuPC90-Blank7	1.7	2.1	0.85
PCPu120-91-239	0.60	420	3.1	PPuPC90-14	0.44	8.9	0.48
PCPu120-91-240	0.37	220	2.6	PPuPC90-28	0.44	15	0.48
PCPu120-91-Blank	1.7	11	0.48	PPuPC90T-28	0.44	8.3	4.0
				PPuPC90-56	0.12	24	0.59
				PPuPC90T-56	0.038	14	3.1
				PPuPC90-56Blank	1.3	2.6	0.48
				PPuPC90-182	**1400**	270	**610**
				PPuPC90-365	**4500**	850	**1900**

Table 18. Test Results for Non-Radioactive Reference HIP and PC CWF Materials[a]
(90°C and 1:10 CWF/Water Mass Ratio)

Test Number	NL(B)	NL(Si)	Test Number	NL(B)	NL(Si)
PRD-7-1	0.110	0.031	LTPPCD-7-1	0.063	0.072
PRD-7-2	0.107	0.037			
PRD-7-3-1	0.097	0.040			
PRD-7-3-2	0.093	0.036			
PRD-7-4	0.108	0.034			
PRD-28-1	0.384	0.051	LTPPCD-28-1	0.096	0.091
PRD-28-2	0.394	0.054			
PRD-91-1	0.868	0.062	LTPPCD-91-1	0.130	0.102
PRD-91-2	0.865	0.063	LTPPCD-91-2	0.119	0.103
PRD-182-1	1.101	0.041	LTPPCD-182-1	0.179	0.114
PRD-182-2	1.083	0.040	LTPPCD-182-2	0.194	0.107
PRD-364-1	1.173	0.081	LTPPCD-364-1	0.191	0.130
PRD-364-1	0.618	0.094	LTPPCD-364-2	0.189	0.127

[a]Values taken from[LEWIS-2002]

Table 19. Results for 7-Day PCT

Test Number	NL(B)	NL(Na)	NL(Si)
HIP CWF			
PCPu90-7-237	0.22	0.14	0.095
PCPu90-7-238	0.29	0.19	0.13
PCPu90-7-239	0.19	0.13	0.090
PCPu90-7-240	0.18	0.11	0.090
HIP Reference CWF[a]	0.11	0.28	0.034
PC CWF			
PuPC90-7-202[b]	0.073	0.23	0.091
PPuPC90-7 [b]	0.078	0.13	0.083
PC Reference CWF[c]	0.079	0.13	0.083
Reference HLW Glasses			
SRL 202 [b]	0.30	0.37	0.23
SRL 165 [b]	0.31	0.33	0.20
Hanford D [b]	0.36	0.53	0.18
WV Reference 6	0.27	0.28	0.13
EA glass [d]	8.5	6.7	2.0

[a]Average from five tests [LEWIS-2002; see Table 18].
[b]Average of triplicate tests.
[c]Average from interlaboratory study.

APPENDIX A.

CORROSION TEST PROCEDURE

THE FOLLOWING STEPS WERE FOLLOWED FOR PREPARATION OF THE HIP AND PC CWF TEST MATERIALS AND EXECUTION OF THE RWS AND PCT STEPS.

Remove HIP U,Pu-loaded CWF material from HIP can:

1. Cut HIP can open near top with diamond saw. Use core drill to cut and remove a 1/2" core.

2. Collect fragments from core and annular fragments from around the core. Combine materials recovered from HIP cans of the same CWF materials.

Prepare crushed test samples:

3. Crush CWF with mortar and pestle in glovebox. Use a shroud to retain particles.

4. Sieve to collect approximately 25 g of –100 +200 mesh size fraction. Retain materials outside this size fraction for other uses or discard.

Conduct rapid-water-soluble (RWS) procedure:

5. Wash –100+200 mesh material with absolute ethanol to remove fines and with demineralized water using the following protocol:

    a. Label a clean 50-mL beaker, weigh it, and record the weight. Tare the beaker.
    b. Add about 3 g of sized material into the tared beaker and record the weight.
    c. Repeat steps 5a and 5b until all samples have been measured. Samples are usually run in triplicate, one sample per beaker.
    d. Prepare a clean 30-mL polypropylene bottle for each RWS fraction solution. Label each bottle with sample identification. Tare the bottle and add 30 g demineralized water. Record the weight. Repeat for each bottle.
    e. Wash material with fresh absolute ethanol. Forcibly add a total of 30 mL alcohol (10-mL ethanol per g sample) to the beaker and swirl for 15 seconds.
    f. Let the ethanol/sample mixture settle for about 45 seconds, then decant to remove fines suspended in ethanol.

g. Add the pre-weighed water from the polyethylene bottle that was prepared in step 5d. For the reference glass samples, add 10 mL demineralized water per g of glass.
h. Place the beaker into an ultrasonic bath for two minutes. Remove the beaker and allow material to settle for one minute.
i. Decant the water into a 30-mL syringe and pass through a 450-nm pore-size filter into the prepared polypropylene bottle. This is the RWS solution.
j. Perform steps 5e - 5i for each RWS sample.
k. Cover the beakers loosely with foil. Place into a 90°C oven and allow them to dry overnight.
l. Submit the RWS solutions for analysis.
m. Remove the beaker with the washed CWF material from the oven and allow to cool. Weigh the beaker and record the weight.

PCT Initiation:

6. Weigh clean vessel with cover.

7. Transfer 1 g crushed material to vessel. Reweigh.

8. Add appropriate amount of demineralized water to vessel to achieve desired CWF/water mass ratio (1:10 or 1:20). Reweigh vessel.

9. Place Teflon gasket on vessel and place closure fitting on vessel; tighten closure fitting with torque wrench to about 120 ft-lbs.

10. Prepare a blank test for each set of tests with four CWF materials following steps 6, 8 and 9; do not add CWF. Add an amount of demineralized water similar to what was added to tests with CWF.

11. Seal and weigh vessel, then place in 90˚C or 120˚C oven.

PCT Termination:

12. Remove from oven at termination date. Allow vessel to cool for ~15 minutes. Weigh vessel.

13. Open vessel and remove the following aliquots of the test solution:
    a. pH measurement (~0.5 mL, unfiltered)
    b. chloride analysis (1-3 mL, unfiltered)
    c. iodide analysis by ICP-MS (~0.5 ml, unfiltered and unacidified)

14. Perform sequential filtration:
    a. Place remaining test solution in a syringe fitted with a 450-nm pore-size filter.
    b. Manually force the solution through the filter into a labeled bottle.
    c. Transfer 0.4-mL aliquot of 450-nm filtrate to 100-nm pore-size centrifuge filter.
    d. Centrifuge.
    e. Repeat steps 14c and d with a second 0.4-mL aliquot.
    f. Transfer 100-nm filtrate to a 5-nm pore-size centrifuge filter.
    g. Centrifuge.
    h. Transfer 5-nm filtrate to a labeled bottle.
    i. Acidify 450-nm, 100-nm, and 5-nm filtrates with conc. nitric acid.

15. Prepare TEM grids
    a. Place one drop (approx. 5 μL) of 450-nm filtrate solution onto holey carbon TEM grid.
    b. Place several drops of absolute ethanol on the edge of a piece of filter paper.
    c. Touch the filter paper to the underside of the TEM grid so that the ethanol contacts the grid and wick the water through the grid.

16. Place about 0.5 mL of 450-nm filtrate solution in a clean labeled bottle for dynamic light scattering analysis.

17. Measure pH of aliquot with combination pH electrode and pH meter.

18. Measure chloride concentration of aliquot with calibrated specific ion electrode and pH meter.

19. Acidify samples for ICP-MS analysis (do not acidify aliquot for iodide analysis) with enough conc. high-purity HNO_3 to achieve approx. 1 vol. % solution.

20. Reweigh bottles containing 450-nm filtrate solution.

21. Remove all solid material from vessel as slurry with disposable plastic pipette. Place a small amount of reacted CWF in a labeled vial.

Perform Acid Soak:

22. Rinse vessel thoroughly. Remove visible particles using a cotton swab. Allow vessel to dry. Weigh vessel.

23. Fill vessel with 1% high-purity nitric acid to about the same level as test solution. Replace gasket and vessel lid, place in closure fitting and reseal. Reweigh. Place in oven overnight at same temperature as test was run.

24. Remove vessel from oven and allow to cool. Reweigh. Open and remove acid soak solution for analyses.

25. If needed to verify that acid soak has removed all adsorbed materials, repeat steps 23 and 24.

26. Rinse vessel several times with demineralized water.

APPENDIX B.

U,Pu-LOADED HIP CWF COMPOSITIONS AND SOLUTION CONCENTRATIONS (CORRECTED FOR DILUTION DURING ACIDIFICATION)

Table 20B. EXCEL worksheet "Ref. Comp"

Worksheet "Ref.Comp" gives calculated concentrations of CWF materials used in tests.

Glass 57 mass % measured elemental composition of binder glass, in mass %
average of ANL Analytical Chemistry Laboratory solution analysis numbers 98-0260-01 and 98-0260-02

Zeo. 4A mass % elemental composition of zeolite 4A, in mass %
average of ANL Analytical Chemistry Laboratory solution analysis numbers 98-0259-01, 98-0259-1D, and 98-0242-01

Corr U-Pu fiss salt% As-batched salt composition with 3:1 mole ratio of U:Pu, in mass %

U-Pu CWF Fraction As-batched salt composition with 3:1 mole ratio of U:Pu, in mass fraction

Corr Pu-U fiss salt% As-batched salt composition with 1:3 mole ratio of U:Pu, in mass %

Pu-U CWF Fraction As-batched salt composition with 1:3 mole ratio of U:Pu, in mass fraction

U-Pu CWF Fraction gives mass fraction of elements in HIP U,Pu-loaded CWF materials 237m and 239m

U-Pu CWF Fraction is calculated as
= {(0.25 * **glass 57 mass %**) + (0.0803 * **Corr U-Pu fiss salt%**) + (0.6697 * **Zeo. 4A mass %**)} / 100

sample calculation for Na: (0.25 * 4.83) + (0.0803 * 4.99)+ (0.670 * 14.9} / 100 = 0.1159

Pu-U CWF Fraction gives mass fraction of elements in HIP U,Pu-loaded CWF materials 238m and 240m and in PC U,Pu-loaded CWF materials GPC00202 and GPC0030m

Pu-U CWF Fraction is calculated as
= {(0.25 * **glass 57 mass %**) + (0.0803 * **Corr P-Uu fiss salt%**) + (0.6697 * **Zeo. 4A mass %**)} / 100

Table 20B. Compositions of Salts, Zeolite 4A, Binder Glass, and CWF Materials, in mass % (contd.)

element	3:1 Salt	1:3 Salt	GPC0030 Salt	Binder Glass	Zeolite 4A	237m and 239m	238m and 240m	GPC00202	GPC0030m
Al				3.95	18.83	13.6	13.6	13.6	13.6
B				5.99		1.50	1.50	1.50	1.50
Ba	6.71	6.71	6.71	0.022	0.013	3.8	0.068	0.068	0.068
Ca				0.975	0.025	0.26	0.26	0.26	0.26
Ce	1.12	1.12	1.12			0.090	0.090	0.090	0.090
Cl	57.1	57.1	57.1			4.59	4.58	4.58	4.58
Cr				0.0020	0.0041	0.003	0.003	0.003	0.003
Cs	1.68	1.68	1.68			0.014	0.14	0.14	0.14
Cu					0.0011	0.001	0.001	0.001	0.001
Eu	0.0235	0.0235	0.0235			0.002	0.002	0.002	0.002
Fe				0.0225	0.0920	0.067	0.067	0.007	0.067
I	0.10	0.10	0.10			0.008	0.008	0.008	0.008
K	18.22	18.22	18.22	0.37	0.04	1.58	1.58	1.58	1.58
La	0.587	0.587	0.587			0.047	0.047	0.047	0.047
Li	4.84	4.84	4.84		0.0010	0.389	0.389	0.389	0.389
Mg				0.0305	0.0673	0.053	0.053	0.053	0.053
Mn					0.0021	0.001	0.001	0.001	0.001
Na	4.99	4.99	4.99	4.83	14.87	11.6	11.6	11.6	11.6
Nd	1.9	1.9	1.9			0.153	0.153	0.153	0.153
Ni					0.0015	0.001	0.001	0.001	0.001
Pr	0.556	0.556	0.556			0.045	0.045	0.045	0.045
Pu	1.76	5.3	5.98			0.141	0.426	0.426	0.385
Rb	0.198	0.198	0.198			0.016	0.016	0.016	0.016
Si				29.50	18.70	19.9	19.9	19.9	19.9
Sm	0.342	0.342	0.342			0.027	0.027	0.027	0.027
Sr	0.475	0.475	0.475			0.045	0.045	0.045	0.045
Ti				0.010	0.171	0.117	0.117	0.117	0.117
U	5.25	1.76	1.99			0.421	0.141	0.141	0.112
Y	0.271	0.271	0.271			0.022	0.022	0.022	0.022
Zn				0.526	0.0014	0.132	0.132	0.132	0.132
Zr				0.523	0.0026	0.132	0.132	0.132	0.132

Table 21B. EXCEL Worksheet "Test Data"

The worksheet "Test Data" contains data for test execution.

Duration, d = duration of test, in days
S/V, m^{-1} = CWF surface area / water volume, in m^{-1}.
Temp., °C = nominal test temperature, in °C
Surface Area, cm^2 = surface area calculated for crushed CWF, in cm^2
Sample Mass, g = mass of crushed CWF used in test, in g
Water Mass, g = mass of demineralized water used in test, in g
Aliquot Mass, g (or mL) = mass of 0.45 µm filtrate and acid soak solution aliquots and volume of 0.1 µm and 5 nm filtrates aliquots submitted for analysis
Vessel Mass Change, g = change in vessel mass over test duration, in g
Added HNO_3, mL = volume of conc. nitric acid added to acidify 0.1-µm and 5 nm aliquots, in mL
Dilution Factor = factor for dilution of aliquots due to the addition of HNO_3
Acid Soak, mL = volume of 2% nitric acid solution used in acid soak of vessel, in mL
pH = pH of test solution measured at room temperature
Cl = Concentration of chloride ion measured with Cl ion selective electrode
LPE, g = mass of empty solution bottle with lid, in g
LPE + filtrate = mass of solution bottle with aliquot for analysis, with lid, in g
LPE + filtrate + HNO_3 = mass of solution bottle with aliquot for analysis, added HNO_3, and lid, in g
Vessel Mass In, g = Vessel mass prior to placing in oven at start of test, in g
Vessel Mass Out, g = Vessel mass after removing from oven at end of test, in g

Surface Area, cm^2 is calculated as = (**Sample mass, g** • 0.023 m^2/g) • (10 000 cm^2 / m^2)

Sample calculation for test PCPu90-7-237:
Surface Area, cm^2 = (**0.988** • 0.023 m^2/g) • (10 000 cm^2 / m^2) = 227.24 cm^2

S/V, m^{-1} = {(**Surface Area, cm^2** / (**Water Mass, g** + **Vessel Mass Change, g**)} • (1 g water / cm^3) • (100 m^{-1} / cm^{-1})

Sample calculation for test PCPu90-7-237:
S/V, m^{-1} ={(227.24 cm^2 / (10.10 g + -0.01, g)} • (1 g water / cm^3) • (100 m^{-1} / cm^{-1}) = 2252.13 m^{-1}

Vessel Mass Change, g = Vessel Mass Out, g – Vessel Mass In, g
Sample calculation for test PCPu90-7-237:
Vessel Mass Change, g = 323.985 g – 323.994 = -0.009 g round to –0.01

Aliquot Mass, g for 0.45-µm filtrate = {(**LPE + Filtrate**) – (**LPE, g**)}
Sample calculation for test PCPu90-7-237:
Aliquot Mass, g for 0.45-µm filtrate = 18.21 g – 11.04 g = 7.17 g

Dilution Factor for 0.45-μm filtrate = {(**LPE + Filtrate + HNO_3**) – (**LPE, g**)} / {(**LPE + Filtrate**) – (**LPE, g**)}

Mass after addition of HNO_3 was not reported for some tests. In those tests, it is assumed that 0.05 g of HNO3 was added and the dilution factor is calculated as:

Dilution Factor for 0.45-μm filtrate = {(**LPE + Filtrate) + 0.05 g** – **LPE, g**} / {(**LPE + Filtrate**) – (**LPE, g**)}

Sample calculation for test PCPu90-7-237:

Dilution Factor for 0.45-μm filtrate = {(18.21 g) + 0.05 g – 11.04, g} / {(18.21 g) – 11.04, g}

Sample calculation for test PCPu90-91-237:

Dilution Factor for 0.45-μm filtrate = (16.07 g – 10.99 g) / (15.12 g – 10.99 g) = 1.230

Dilution Factor for 0.1-μm and 5 nm filtrates = (**Aliquot Mass, mL + Added HNO_3, mL) / Aliquot Mass, mL**

Sample calculation for test PCPu90-7-237:

Dilution Factor for 0.1-μm filtrate = (0.40 mL + 0.005 mL) / 0.40 mL = 1.0125 round to 1.013

Table 21B. Test Data (contd.)

Test Number & Fraction	Time, d	Temp., °C	Sample Mass, g	Surface Area, cm^2	Water Mass, g	S/V, m^{-1}	Vessel Mass In, g	Vessel Mass Out, g	Vessel Mass Change g	LPE, g	LPE + 0.45 µm filtrate	Aliquot mass, g	LPE + filtrate + HNO_3	Added HNO_3, mL	Dilution Factor	pH	Cl, mg/L
PCPu90-7-237 RWS	7	90	3	690.0	30.00	2300						30.00		0.05	1.002		16800
PCPu90-7-238 RWS	7	90	3	690.0	30.00	2300						30.00		0.05	1.002		14300
PCPu90-7-239 RWS	7	90	3	690.0	30.00	2300						30.00		0.05	1.002		46000
PCPu90-7-240 RWS	7	90	3	690.0	30.00	2300						30.00		0.05	1.002		88700
HIP U,Pu-loaded CWF at 90 C and mass ratio 1:10																	
PCPu90-7-237 0.45 µm	7	90	0.988	227.2	10.10	2252	323.994	323.985	-0.01	11.04	18.21	7.17			1.007	9.17	19.7
PCPu90-7-237 0.1 µm												0.40		0.005	1.013		
PCPu90-7-237 5 nm												0.40		0.005	1.013		
PCPu90-7-237 AS					10.10	2252						10.10			1.000		
PCPu90-7-238 0.45 µm	7	90	0.885	203.6	9.99	2039	323.278	323.268	-0.01	10.86	17.91	7.05			1.007	9.22	15.1
PCPu90-7-238 0.1 µm												0.40		0.005	1.013		
PCPu90-7-238 5 nm												0.40		0.005	1.013		
PCPu90-7-238 AS					10.00	2039						10.00			1.000		
PCPu90-7-239 0.45 µm	7	90	0.926	213.0	10.01	2132	324.425	324.410	-0.01	11.00	18.22	7.22			1.007	9.11	19.5
PCPu90-7-239 0.1 µm												0.40		0.005	1.013		
PCPu90-7-239 5 nm												0.40		0.005	1.013		
PCPu90-7-239 AS					10.00	2132						10.00			1.000		
PCPu90-7-240 0.45 µm	7	90	0.954	219.4	8.91	2463	323.281	323.275	-0.01	10.91	17.74	6.83			1.007	9.15	19.5
PCPu90-7-240 0.1 µm												0.40		0.005	1.013		
PCPu90-7-240 5 nm												0.40		0.005	1.013		
PCPu90-7-240 AS					8.90	2463						8.90			1.000		
PCPu90-7-Blank 0.45 µm	7	90	---	---	9.94	---	323.544	323.544	0.00	11.04	18.85	7.81			1.006	7.86	0.7
PCPu90-7-Blank 0.1 µm												0.40		0.005	1.013		
PCPu90-7-Blank 5 nm												0.40		0.005	1.013		
PCPu90-7-Blank 5 AS					9.90							9.90			1.000		
PCPu90-28-237 0.45 µm	28	90	0.726	167.0	7.29	2291	321.802	321.800	0.00						1.007	8.98	30.0
PCPu90-28-237 0.1 µm												0.40		0.005	1.013		
PCPu90-28-237 5 nm												0.40		0.005	1.013		
PCPu90-28-237 AS					10.00	2291						10.00			1.000		
PCPu90-28-238 0.45 µm	28	90	0.996	229.1	10.04	2283	326.812	326.809	0.00						1.007	8.91	23.4
PCPu90-28-238 0.1 µm												0.40		0.005	1.013		
PCPu90-28-238 5 nm												0.40		0.005	1.013		
PCPu90-28-238 AS					10.00	2283						10.00			1.000		
PCPu90-28-239 0.45 µm	28	90	0.936	215.3	9.44	2281	323.191	323.191	0.00						1.007	8.75	33.7
PCPu90-28-239 0.1 µm												0.40		0.005	1.013		
PCPu90-28-239 5 nm												0.40		0.005	1.013		
PCPu90-28-239 AS					10.00	2281						10.00			1.000		
PCPu90-28-240 0.45 µm	28	90	1.017	233.9	10.03	2335	323.951	323.940	-0.01						1.007	9.06	31.9
PCPu90-28-240 0.1 µm												0.40		0.005	1.013		
PCPu90-28-240 5 nm												0.40		0.005	1.013		
PCPu90-28-240 AS					10.00	2335						10.00			1.000		
PCPu90-28-Blank 0.45 µm	28	90	---	---	10.00	---	322.592	322.587	0.00						1.007	4.85	0.7
PCPu90-28-Blank 0.1 µm												0.40		0.005	1.013		
PCPu90-28-Blank 5 nm												0.40		0.005	1.013		
PCPu90-28-Blank AS					10.00							10.00			1.000		
PCPu90-91-237 0.45 µm	91	90	0.782	179.9	7.83	2298	323.667	323.662	0.00	10.99	15.12	4.13	16.07		1.230	8.97	23.8
PCPu90-91-237 0.1 µm												0.40		0.005	1.013		
PCPu90-91-237 5 nm												0.40		0.005	1.013		

Table 21B. Test Data (contd.)

Test Number & Fraction	Time, d	Temp., °C	Sample Mass, g	Surface Area, cm^2	Water Mass, g	S/V, m^{-1}	Vessel Mass In, g	Vessel Mass Out, g	Vessel Mass Change g	LPE, g	LPE + 0.45 μm filtrate	Aliquot mass, g	LPE + filtrate + HNO_3	Added HNO_3, mL	Dilution Factor	pH	Cl, mg/L
PCPu90-91-237 AS					8.10	2298						8.10			1.000		
PCPu90-91-238 0.45 μm	91	90	0.913	210.0	9.14	2297	324.720	324.720	0.00	10.92	15.80	4.88	16.07		1.055	9.07	30.4
PCPu90-91-238 0.1 μm												0.40		0.005	1.013		
PCPu90-91-238 5 nm												0.40		0.005	1.013		
PCPu90-91-238 AS					9.60	2297						9.60			1.000		
PCPu90-91-239 0.45 μm	91	90	1.010	232.3	10.10	2300	324.778	324.773	0.00	10.90	17.07	6.17	17.33		1.042	9.01	40.5
PCPu90-91-239 0.1 μm												0.40		0.005	1.013		
PCPu90-91-239 5 nm												0.40		0.005	1.013		
PCPu90-91-239 AS					10.40	2300						10.40			1.000		
PCPu90-91-240 0.45 μm	91	90	1.037	238.5	10.44	2290	324.109	324.084	-0.02	11.06	17.21	6.15	17.41		1.033	9.13	29.2
PCPu90-91-240 0.1 μm												0.40		0.005	1.013		
PCPu90-91-240 5 nm												0.40		0.005	1.013		
PCPu90-91-240 AS					10.90	2290						10.90			1.000		
PCPu90-91-Blank 0.45 μm	91	90	---	---	10.10	---	325.412	325.402	-0.01	10.97	18.03	7.06	18.35		1.045	3.36	0.6
PCPu90-91-Blank 0.1 μm	91	90	---	---		---						0.40		0.005	1.013		
PCPu90-91-Blank 5 nm	91	90	---	---		---						0.40		0.005	1.013		
PCPu90-91-Blank AS					11.00							11.00			1.000		
PCPu90-182-237 0.45 μm	182	90	0.857	197.1	8.51	2317	321.702	321.696	-0.01	10.93	15.83	4.90	15.93		1.020	8.35	25.4
PCPu90-182-237 0.1 μm												0.40		0.004	1.010		
PCPu90-182-237 5 nm												0.40		0.004	1.010		
PCPu90-182-237 AS					8.50	2317						8.51			1.000		
PCPu90-182-238 0.45 μm	182	90	0.911	209.5	9.16	2290	323.262	323.249	-0.01	10.91	16.39	5.48	16.46		1.013	8.38	21.2
PCPu90-182-238 0.1 μm												0.40		0.004	1.010		
PCPu90-182-238 5 nm												0.40		0.004	1.010		
PCPu90-182-238 AS					9.20	2290						9.16			1.000		
PCPu90-182-239 0.45 μm	182	90	0.932	214.4	9.22	2354	323.213	323.100	-0.11	10.94	16.14	5.20	16.22		1.015	8.39	26.3
PCPu90-182-239 0.1 μm												0.40		0.004	1.010		
PCPu90-182-239 5 nm												0.40		0.004	1.010		
PCPu90-182-239 AS					9.20	2354						9.22			1.000		
PCPu90-182-240 0.45 μm	182	90	0.913	210.0	9.11	2307	322.922	322.915	-0.01	10.94	16.51	5.57	16.60		1.016	8.63	32.3
PCPu90-182-240 0.1 μm												0.40		0.004	1.010		
PCPu90-182-240 5 nm												0.40		0.004	1.010		
PCPu90-182-240 AS					9.10	2307						9.11			1.000		
PCPu90-182-Blank 0.45 μm	182	90	---	---	10.01	---	323.585	323.552	-0.03	10.91	17.75	6.84	17.95		1.029	7.45	0.6
PCPu90-182-Blank 0.1 μm			---	---								0.40		0.004	1.010		
PCPu90-182-Blank 5 nm			---	---								0.40		0.004	1.010		
PCPu90-182-Blank AS					10.01							10.01			1.000		
PCPu90-365-237 0.45 μm	365	90	0.786	180.8	8.84	2071	321.344	321.235	-0.11	10.94	15.89	4.95	16.07		1.036	8.75	38.0
PCPu90-365-237 0.1 μm												0.40		0.004	1.010		
PuPC90-365-237 5nm												0.40		0.004	1.010		
PuPC90-365-237 AS					20.00	2071						20.00			1.000		
PCPu90-365-238 0.45 μm	365	90	0.838	192.7	8.35	2339	323.800	323.691	-0.11	11.03	15.08	4.05	15.25		1.042	8.52	47.0
PCPu90-365-238 0.1 μm												0.40		0.004	1.010		
PuPC90-365-238 5nm												0.40		0.004	1.010		
PuPC90-365-238 AS					20.00	2339						20.00			1.000		
PCPu90-365-239 0.45 μm	365	90	0.876	201.5	8.76	2321	322.252	322.172	-0.08	10.99	16.16	5.17	16.39		1.044	8.41	38.3
PCPu90-365-239 0.1 μm												0.40		0.004	1.010		
PuPC90-365-239 5nm												0.40		0.004	1.010		
PuPC90-365-239 AS					20.00	2321						20.00			1.000		
PCPu90-365-240 0.45 μm	365	90	0.945	217.4	9.45	2377	324.343	324.038	-0.31	11.01	16.05	5.04	16.26		1.042	8.53	38.0

Table 21B. Test Data (contd.)

Test Number & Fraction	Time, d	Temp., °C	Sample Mass, g	Surface Area, cm^2	Water Mass, g	S/V, m^{-1}	Vessel Mass In, g	Vessel Mass Out, g	Vessel Mass Change g	LPE, g	LPE + 0.45 µm filtrate	Aliquot mass, g	LPE + filtrate + HNO_3	Added HNO_3, mL	Dilution Factor	pH	Cl, mg/L
PCPu90-365-240 0.1 µm												0.40		0.004	1.010		
PuPC90-365-240 5nm												0.40		0.004	1.010		
PuPC90-365-240 AS					20.00	2377						20.00			1.000		
PCPu90-365-Blank 0.45 µm	365	90	---	---	10.00	---	325.433	318.103	-7.33	10.98	13.20	2.22	13.40		1.090	Not done	0.65
PCPu90-365-Blank 0.1 µm			---	---								0.40		0.004	1.010		
PCPu90-365-Blank 5 nm			---	---								0.40		0.004	1.010		
PCPu90-365-Blank AS					20.00							20.00			1.000		
HIP U,Pu-loaded CWF at 120 C and mass ratio 1:10																	
PCPu120-7-237 0.45 µm	7	120	1.011	232.5	10.02	2321	323.120	323.120	0.00	10.76	17.01	6.25			1.008	9.76	22.9
PCPu120-7-237 0.1 µm												0.40		0.005	1.013		
PCPu120-7-237 5 nm												0.40		0.005	1.013		
PCPu120-7-237 AS					10.80	2321						10.80			1.000		
PCPu120-7-238 0.45 µm	7	120	1.012	232.8	10.01	2328	328.040	328.030	-0.01	10.93	17.52	6.59			1.008	9.17	21.1
PCPu120-7-238 0.1 µm												0.40		0.005	1.013		
PCPu120-7-238 5 nm												0.40		0.005	1.013		
PCPu120-7-238 AS					10.60	2328						10.60			1.000		
PCPu120-7-239 0.45 µm	7	120	0.990	227.7	10.05	2263	324.320	324.330	0.01	10.99	17.32	6.33			1.008	9.16	29.0
PCPu120-7-239 0.1 µm												0.40		0.005	1.013		
PCPu120-7-239 5 nm												0.40		0.005	1.013		
PCPu120-7-239 AS					10.20	2263						10.20			1.000		
PCPu120-7-240 0.45 µm	7	120	1.016	233.7	9.98	2341	325.580	325.580	0.00	11.03	17.77	6.74			1.007	9.27	27.4
PCPu120-7-240 0.1 µm												0.40		0.005	1.013		
PCPu120-7-240 5 nm												0.40		0.005	1.013		
PCPu120-7-240 AS					10.00	2341						10.00			1.000		
PCPu120-7-Blank 0.45 µm	7	120	---	---	10.00	---	325.890	325.890	0.00	10.91	18.65	7.74			1.006	7.70	0.7
PCPu120-7-Blank 0.1 µm												0.40		0.005	1.013		
PCPu120-7-Blank 5 nm												0.40		0.005	1.013		
PCPu120-7-Blank AS					10.20							10.20			1.000		
PCPu120-28-237 0.45 µm	28	120	0.757	174.1	7.51	2324	324.530	324.510	-0.02						1.007	8.71	40.0
PCPu120-28-237 0.1 µm												0.40		0.005	1.013		
PCPu120-28-237 5 nm												0.40		0.005	1.013		
PCPu120-28-237 AS					7.50	2324						7.50			1.000		
PCPu120-28-238 0.45 µm	28	120	1.034	237.8	10.30	2308	325.600	325.610	0.01						1.007	8.70	31.3
PCPu120-28-238 0.1 µm												0.40		0.005	1.013		
PCPu120-28-238 5 nm												0.40		0.005	1.013		
PCPu120-28-238 AS					10.30	2308						10.30			1.000		
PCPu120-28-239 0.45 µm	28	120	0.891	204.9	8.85	2321	324.410	324.390	-0.02						1.007	8.77	41.4
PCPu120-28-239 0.1 µm												0.40		0.005	1.013		
PCPu120-28-239 5 nm												0.40		0.005	1.013		
PCPu120-28-239 AS					8.80	2321						8.80			1.000		
PCPu120-28-240 0.45 µm	28	120	0.899	206.8	8.88	2326	326.490	326.500	0.01						1.007	8.93	38.0
PCPu120-28-240 0.1 µm												0.40		0.005	1.013		
PCPu120-28-240 5 nm												0.40		0.005	1.013		
PCPu120-28-240 AS					8.90	2326						8.90			1.000		
PCPu120-28-Blank 0.45 µm	28	120	---	---	9.88	---		325.050							1.007	6.29	0.4
PCPu120-28-Blank 0.1 µm												0.40		0.005	1.013		
PCPu120-28-Blank 5 nm												0.40		0.005	1.013		
PCPu120-28-Blank AS					9.90							9.90			1.000		
PCPu120-91-237 0.45 µm	91	120	1.002	230.5	9.90	2312	325.710	325.780	0.07	10.91	17.22	6.31	17.32		1.016	8.95	92.5

Table 21B. Test Data (contd.)

Test Number & Fraction	Time, d	Temp., °C	Sample Mass, g	Surface Area, cm^2	Water Mass, g	S/V, m^{-1}	Vessel Mass In, g	Vessel Mass Out, g	Vessel Mass Change g	LPE, g	LPE + 0.45 μm filtrate	Aliquot mass, g	LPE + filtrate + HNO_3	Added HNO_3, mL	Dilution Factor	pH	Cl, mg/L
PCPu120-91-237 0.1 μm												0.40			1.000		
PCPu120-91-237 5 nm												0.40			1.000		
PCPu120-91-237 AS					10.20	2312						10.20			1.000		
PCPu120-91-238 0.45 μm	91	120	1.016	233.7	8.90	2624	324.090	324.090	0.00	10.91	15.62	4.71	15.71		1.019	8.79	53.2
PCPu120-91-238 0.1 μm												0.40			1.000		
PCPu120-91-238 5 nm												0.40			1.000		
PCPu120-91-238 AS					10.20	2624						10.20			1.000		
PCPu120-91-239 0.45 μm	91	120	0.994	228.6	6.03	3794	327.980			11.01	13.60	2.59	13.66		1.023	8.64	68.3
PCPu120-91-239 0.1 μm												0.40			1.000		
PCPu120-91-239 5 nm												0.40			1.000		
PCPu120-91-239 AS					8.50	3794						8.50			1.000		
PCPu120-91-240 0.45 μm	91	120	1.000	230.0	9.85	2333	325.710	325.720	0.01	10.76	16.58	5.82	16.65		1.012	8.93	48.9
PCPu120-91-240 0.1 μm												0.40			1.000		
PCPu120-91-240 5 nm												0.40			1.000		
PCPu120-91-240 AS					10.20	2333						10.20			1.000		
PCPu120-91-Blank 0.45 μm	91	120	---	---	10.19	---	296.470			10.98	18.11	7.13	18.18		1.010	7.10	0.7
PCPu120-91-Blank 0.1 μm												0.40			1.000		
PCPu120-91-Blank 5 nm												0.40			1.000		
PCPu120-91-Blank AS					10.20							10.20			1.000		
HIP U,Pu-loaded CWF at 120 C and mass ratio 1:20																	
PCPu120/1-7-237 0.45 μm	7	120	0.386	88.8	7.74	1141	322.450	322.490	0.04	10.90	15.63	4.73	15.77		1.030	9.06	28.8
PCPu120/1-7-237 0.1 μm												0.40			1.000		
PCPu120/1-7-237 5 nm												0.40			1.000		
PCPu120/1-7-237 AS					8.00	1141						8.00			1.000		
PCPu120/1-7-238 0.45 μm	7	120	0.585	134.6	11.98	1119	329.580	329.630	0.05	10.98	19.59	8.61	19.90		1.036	9.03	22.5
PCPu120/1-7-238 0.1 μm												0.40			1.000		
PCPu120/1-7-238 5 nm												0.40			1.000		
PCPu120/1-7-238 AS					9.50	1119						9.50			1.000		
PCPu120/1-7-239 0.45 μm	7	120	0.448	103.0	8.95	1146	323.210	323.250	0.04	10.96	16.49	5.53	16.60		1.020	8.99	31.2
PCPu120/1-7-239 0.1 μm												0.40			1.000		
PCPu120/1-7-239 5 nm												0.40			1.000		
PCPu120/1-7-239 AS					10.00	1146						10.00			1.000		
PCPu120/1-7-240 0.45 μm	7	120	0.482	110.9	9.52	1113	326.860	327.300	0.44	10.99	17.26	6.27	17.43		1.027	9.12	29.4
PCPu120/1-7-240 0.1 μm												0.40			1.000		
PCPu120/1-7-240 5 nm												0.40			1.000		
PCPu120/1-7-240 AS					10.80	1113						10.80			1.000		
PCPu120/1-7-Blank 0.45 μm	7	120	---	---	9.82	---	321.870	322.990	1.12	10.93	17.82	6.89	17.91		1.013	4.37	0.7
PCPu120/1-7-Blank 0.1 μm												0.40			1.000		
PCPu120/1-7-Blank 5 nm												0.40			1.000		
PCPu120/1-7-Blank AS					10.00							10.00			1.000		
PCPu120/1-14-237 0.45 μm	14	120	0.365	84.0	7.31	1159	323.600	323.540	-0.06	11.12	14.97	3.85	15.23		1.068	9.08	28.5
PCPu120/1-14-237 0.1 μm												0.40			1.000		
PCPu120/1-14-237 5 nm												0.40			1.000		
PCPu120/1-14-237 AS					9.00	1159						9.00			1.000		
PCPu120/1-14-238 0.45 μm	14	120	0.432	99.4	9.84	1016	323.590	323.530	-0.06	11.01	17.26	6.25	17.57		1.050	8.91	21.7
PCPu120/1-14-238 0.1 μm												0.40			1.000		
PCPu120/1-14-238 5 nm												0.40			1.000		
PCPu120/1-14-238 AS					10.50	1016						10.50			1.000		
PCPu120/1-14-238R 0.45 μm	14	120	0.497	114.3	10.25	1116	324.340	324.330	-0.01	10.92	17.66	6.74	17.90		1.036	8.70	22.3
PCPu120/1-14-238R 0.1 μm												0.40			1.000		

Table 21B. Test Data (contd.)

Test Number & Fraction	Time, d	Temp., °C	Sample Mass, g	Surface Area, cm^2	Water Mass, g	S/V, m^{-1}	Vessel Mass In, g	Vessel Mass Out, g	Vessel Mass Change g	LPE, g	LPE + 0.45 µm filtrate	Aliquot mass, g	LPE + filtrate + HNO_3	Added HNO_3, mL	Dilution Factor	pH	Cl, mg/L
PCPu120/1-14-238R 5 nm												0.40			1.000		
PCPu120/1-14-238R AS					7.50	1116						7.50			1.000		
PCPu120/1-14-239 0.45 µm	14	120	0.503	115.7	10.10	1153	323.170	323.110	-0.06	10.96	17.26	6.30	17.77		1.081	8.83	28.5
PCPu120/1-14-239 0.1 µm												0.40			1.000		
PCPu120/1-14-239 5 nm												0.40			1.000		
PCPu120/1-14-239 AS					11.00	1153						11.00			1.000		
PCPu120/1-14-240 0.45 µm	14	120	0.466	107.2	9.32	1157	325.280	325.220	-0.06	10.92	16.82	5.90	16.91		1.015	9.02	29.0
PCPu120/1-14-240 0.1 µm												0.40			1.000		
PCPu120/1-14-240 5 nm												0.40			1.000		
PCPu120/1-14-240 AS					10.50	1157						10.50			1.000		
PCPu120/1-14-Blank 0.45 µm	14	120	---	---	9.90	---	296.090	296.030	-0.06	11.00	17.52	6.52	17.68		1.025	6.40	0.3
PCPu120/1-14-Blank 0.1 µm												0.40			1.000		
PCPu120/1-14-Blank 5 nm												0.40			1.000		
PCPu120/1-14-Blank AS					10.00							10.00			1.000		
PCPu120/1-28-237 0.45 µm	28	120	0.376	86.5	7.52	1152	323.720	323.710	-0.01	11.07	15.61	4.54	15.68		1.015	8.95	32.4
PCPu120/1-28-237 0.1 µm												0.40			1.000		
PCPu120/1-28-237 5 nm												0.40			1.000		
PCPu120/1-28-237 AS					7.50	1152						7.50			1.000		
PCPu120/1-28-238 0.45 µm	28	120	0.457	105.1	9.14	955	323.890	325.760	1.87	10.89	17.11	6.22	17.18		1.011	8.86	27.7
PCPu120/1-28-238 0.1 µm												0.40			1.000		
PCPu120/1-28-238 5 nm												0.40			1.000		
PCPu120/1-28-238 AS					9.14	955						9.14			1.000		
PCPu120/1-28-239 0.45 µm	28	120	0.455	104.7	9.10	1150	325.760	325.760	0.00	10.98	16.90	5.92	16.98		1.014	8.99	33.5
PCPu120/1-28-239 0.1 µm												0.40			1.000		
PCPu120/1-28-239 5 nm												0.40			1.000		
PCPu120/1-28-239 AS					9.10	1150						9.10			1.000		
PCPu120/1-28-240 0.45 µm	28	120	0.440	101.2	8.80	1151	324.540	324.530	-0.01	11.04	16.74	5.70	16.82		1.014	8.99	31.4
PCPu120/1-28-240 0.1 µm												0.40			1.000		
PCPu120/1-28-240 5 nm												0.40			1.000		
PCPu120/1-28-240 AS					8.80	1151						8.80			1.000		
PCPu120/1-28-Blank 0.45 µm	28	120	---	---	8.96	---	324.970	324.970	0.00	10.94	17.17		17.25		1.013	7.10	0.4
PCPu120/1-28-Blank 0.1 µm												0.40			1.000		
PCPu120/1-28-Blank 5 nm												0.40			1.000		
PCPu120/1-28-Blank AS					8.96							8.96			1.000		
PCPu120/1-56-237 0.45 µm	56	120	0.338	77.7	6.76	1157	271.990	271.950	-0.04	10.96	14.15	3.19	14.23		1.025	9.08	25.4
PCPu120/1-56-237 0.1 µm												0.40			1.000		
PCPu120/1-56-237 5 nm												0.40			1.000		
PCPu120/1-56-237 AS					7.50	1157						7.50			1.000		
PCPu120/1-56-238 0.45 µm	56	120	0.547	125.8	10.94	1151	323.750	323.740	-0.01	10.90	18.12	7.22	18.35		1.032	8.78	23.0
PCPu120/1-56-238 0.1 µm												0.40			1.000		
PCPu120/1-56-238 5 nm												0.40			1.000		
PCPu120/1-56-238 AS					11.80	1151						11.80			1.000		
PCPu120/1-56-239 0.45 µm	56	120	0.511	117.5	10.22	1153	274.590	274.560	-0.03	10.92	17.61	6.69	17.91		1.045	8.97	27.5
PCPu120/1-28-239 0.1 µm												0.40			1.000		
PCPu120/1-56-239 5 nm												0.40			1.000		
PCPu120/1-56-239 AS					11.20	1153						11.20			1.000		
PCPu120/1-56-240 0.45 µm	56	120	0.505	116.2	10.10	1152	327.080	327.060	-0.02	10.94	17.62	6.68	18.09		1.070	9.07	26.5
PCPu120/1-56-240 0.1 µm												0.40			1.000		
PCPu120/1-56-240 5 nm												0.40			1.000		
PCPu120/1-56-240 AS					11.00	1152						11.00			1.000		

Table 21B. Test Data (contd.)

Test Number & Fraction	Time, d	Temp., °C	Sample Mass, g	Surface Area, cm^2	Water Mass, g	S/V, m^{-1}	Vessel Mass In, g	Vessel Mass Out, g	Vessel Mass Change g	LPE, g	LPE + 0.45 µm filtrate	Aliquot mass, g	LPE + filtrate + HNO_3	Added HNO_3, mL	Dilution Factor	pH	Cl, mg/L
PCPu120/1-56-Blank 0.45 µm	56	120	---	---	9.93	---	275.520	275.450	-0.07	10.94	17.36	6.42	17.50		1.022	4.00	0.3
PCPu120/1-56-Blank 0.1 µm												0.40			1.000		
PCPu120/1-56-Blank 5 nm												0.40			1.000		
PCPu120/1-56-Blank AS					10.30							10.30			1.000		
PCPu120/1-91-237 0.45 µm	91	120	0.345	79.4	6.90	1152	320.060	320.050	-0.01	10.96	13.31	2.35	13.56		1.106	8.96	34.0
PCPu120/1-91-237 0.1 µm												0.40		0.004	1.010		
PCPu120/1-91-237 5 nm												0.40		0.004	1.010		
PCPu120/1-91-237 AS					10.00	1152						10.00			1.000		
PCPu120/1-91-238 0.45 µm	91	120	0.424	97.5	8.48	1154	323.140	323.110	-0.03	11.13	15.20	4.07	15.33		1.032	8.65	29.0
PCPu120/1-91-238 0.1 µm												0.40		0.004	1.010		
PCPu120/1-91-238 5 nm												0.40		0.004	1.010		
PCPu120/1-91-238 AS					10.00	1154						10.00			1.000		
PCPu120/1-91-239 0.45 µm	91	120	0.482	110.9	9.64	1152	326.280	326.260	-0.02	10.94	15.97	5.03	16.12		1.030	8.86	32.3
PCPu120/1-91-239 0.1 µm												0.40		0.004	1.010		
PCPu120/1-91-239 5 nm												0.40		0.004	1.010		
PCPu120/1-91-239 AS					10.00	1152						10.00			1.000		
PCPu120/1-91-240 0.45 µm	91	120	0.507	116.6	10.14	1151	326.520	326.510	-0.01	10.83	16.40	5.57	16.68		1.050	9.07	31.3
PCPu120/1-91-240 0.1 µm												0.40		0.004	1.010		
PCPu120/1-91-240 5 nm												0.40		0.004	1.010		
PCPu120/1-91-240 AS					10.00	1151						10.00			1.000		
PCPu120/1-91-Blank 0.45 µm	91	120	---	---	10.00	---	322.120	322.100	-0.02	11.00	18.02	7.02	18.26		1.034	8.30	0.3
PCPu120/1-91-Blank 0.1 µm												0.40		0.004	1.010		
PCPu120/1-91-Blank 5 nm												0.40		0.004	1.010		
PCPu120/1-91-Blank AS					10.00							10.00			1.000		
PC U,Pu-loaded CWF GPC00202 at 90 and 120C and mass ratio 1:10																	
RWS 1 (PC CWF 202)	N/A	N/A	3.000	691.8	30.00	2306						30.00			1.010		318000
RWS 2 (PC CWF 202)	N/A	N/A	3.000	691.8	30.00	2306						30.00			1.010		421000
RWS 3 (PC CWF 202)	N/A	N/A	3.000	691.8	30.00	2306						30.00			1.010		264000
PuPC90-7-202a 0.45 µm	7	90	0.464	106.7	4.59	2329	321.016	321.009	-0.01	10.94	13.38	2.44	13.54		1.066	8.41	114.0
PuPC90-7-202a 0.1µm												0.40		0.004	1.010		
PuPC90-7-202a 0.005µm												0.40		0.004	1.010		
PuPC90-7-202a AS					4.60	2329						4.60			1.000		
PuPC90-7-202b 0.45 µm	7	90	0.699	160.8	6.93	2322	319.658	319.651	-0.01	10.94	15.61	4.67	15.84		1.049	8.57	52.0
PuPC90-7-202b 0.1µm												0.40		0.004	1.010		
PuPC90-7-202b 0.005µm												0.40		0.004	1.010		
PuPC90-7-202b AS					7.00	2322						7.00			1.000		
PuPC90-7-202c 0.45 µm	7	90	1.055	242.7	10.04	2420	324.015	324.006	-0.01	11.00	17.80	6.80	18.08		1.041	8.55	50.4
PuPC90-7-202c 0.1µm												0.40		0.004	1.010		
PuPC90-7-202c 0.005µm												0.40		0.004	1.010		
PuPC90-7-202c AS					10.10	2420						10.10			1.000		
PuPC90-7-Blank a 0.45 µm	7	90	0.000	---	10.02	---	324.407	324.400	-0.01	10.88	18.71	7.83	18.89		1.023	8.70	1.2
PuPC90-7-Blank a 0.1µm												0.40		0.004	1.010		
PuPC90-7-Blank a 0.005µm												0.40		0.004	1.010		
PuPC90-7-Blank a AS					10.20							10.20			1.000		
PuPC120-7-202a 0.45 µm	7	120	0.886	203.8	8.82	2307	321.590	321.600	0.01	10.95	15.62	4.67	15.96		1.073	8.77	87.3
PuPC120-7-202a 0.1um												0.40		0.004	1.010		
PuPC120-7-202a 5nm												0.40		0.004	1.010		
PuPC120-7-202a AS					9.20	2307						9.20			1.000		

Table 21B. Test Data (contd.)

Test Number & Fraction	Time, d	Temp., °C	Sample Mass, g	Surface Area, cm^2	Water Mass, g	S/V, m^{-1}	Vessel Mass In, g	Vessel Mass Out, g	Vessel Mass Change g	LPE, g	LPE + 0.45 µm filtrate	Aliquot mass, g	LPE + filtrate + HNO_3	Added HNO_3, mL	Dilution Factor	pH	Cl, mg/L
PuPC120-7-202b 0.45 µm	7	120	0.858	197.3	8.60	2294	324.370	324.370	0.00	10.93	15.92	4.99	16.12		1.040	8.74	90.4
PuPC120-7-202b 0.1um												0.40		0.004	1.010		
PuPC120-7-202b 5nm												0.40		0.004	1.010		
PuPC120-7-202b AS					9.00	2294						9.00			1.000		
PuPC120-7-202c 0.45 µm	7	120	0.901	207.2	8.94	2321	324.200	324.190	-0.01	10.87	16.40	5.53	16.68		1.051	8.76	87.7
PuPC120-7-202c 0.1um												0.40		0.004	1.010		
PuPC120-7-202c 5nm												0.40		0.004	1.010		
PuPC120-7-202c AS					9.30	2321						9.30			1.000		
PuPC120-7-Blank a 0.45 µm	7	120	0.000	---	9.20	---	322.020	322.010	-0.01	10.85	17.05	6.20	17.31		1.042	9.10	0.4
PuPC120-7-Blank a 0.1um												0.40		0.004	1.010		
PuPC120-7-Blank a 5nm												0.40		0.004	1.010		
PuPC120-7-Blank a AS					9.20							9.20			1.000		
PuPC120-28-202a 0.45 µm	28	120	0.936	215.3	9.46	2280	326.450	326.430	-0.02	10.86	16.66	5.80	16.86		1.034	8.84	92.3
PuPC120-28-202a 0.1µm												0.40		0.004	1.010		
PuPC120-28-202a 0.005µm												0.40		0.004	1.010		
PuPC120-28-202a AS					9.60	2280						9.60			1.000		
PuPC120-28-202b 0.45 µm	28	120	0.980	225.4	9.91	2277	333.030	333.020	-0.01	10.95	16.68	5.73	17.00		1.056	8.88	87.5
PuPC120-28-202b 0.1µm												0.40		0.004	1.010		
PuPC120-28-202b 0.005µm												0.40		0.004	1.010		
PuPC120-28-202b AS					10.30	2277						10.30			1.000		
PuPC120-28-202c 0.45 µm	28	120	0.954	219.4	9.49	2316	275.240	275.230	-0.01	10.92	16.63	5.71	16.83		1.035	8.95	91.9
PuPC120-28-202c 0.1µm												0.40		0.004	1.010		
PuPC120-28-202c 0.005µm												0.40		0.004	1.010		
PuPC120-28-202c AS					9.60	2316						9.60			1.000		
PuPc120-28-Blank a 0.45 µm	28	120	0.000	---	9.88	---	324.310	324.310	0.00	10.93	18.26	7.33	18.44		1.025	8.30	0.8
PuPC120-28-Blank a 0.1µm												0.40		0.004	1.010		
PuPC120-28-Blank a 0.005µm												0.40		0.004	1.010		
PuPC120-28-Blank a AS					10.20							10.20			1.000		
PC U,Pu-loaded CWF GPC0030m at 90C and mass ratio 1:10																	
RWS AX	N/A	N/A	3.133	722.5	31.30	2308						31.30			1.000		434000
RWS AY	N/A	N/A	3.350	772.5	33.50	2280						33.50			1.000		387000
RWS scint	N/A	N/A	3.567	822.6	35.70	2304						35.70			1.000		368000
PPuPC90-7a 0.45 µm	7	90	0.976	224.5	9.77	2300	325.720	325.710	-0.01	10.94	14.03	3.09	14.08		1.016	9.30	32.5
PPuPC90-7a 0.1µm												0.40		0.004	1.010		
PPuPC90-7a 0.005µm												0.40		0.004	1.010		
PPuPC90-7a AS					10.05	2300						10.05			1.000		
PPuPC90-7b 0.45 µm	7	90	0.880	202.4	8.82	2297	323.220	323.210	-0.01	11.10	13.25	2.15	13.30		1.023	9.36	32.0
PPuPC90-7b 0.1µm												0.40		0.004	1.010		
PPuPC90-7b 0.005µm												0.40		0.004	1.010		
PPuPC90-7b AS					9.13	2297						9.13			1.000		
PPuPC90-7c 0.45 µm	7	90	1.028	236.4	10.11	2339	323.410	323.410	0.00	10.99	13.98	2.99	14.10		1.040	9.17	28.5
PPuPC90-7c 0.1µm												0.40		0.004	1.010		
PPuPC90-7c 0.005µm												0.40		0.004	1.010		
PPuPC90-7c AS					10.73	2339						10.73			1.000		
PPuPC90-Blank7 0.45 µm	7	90	0.000	---	8.72	---	324.670	324.660	-0.01	10.90	19.62	8.72	19.80		1.021	Not meas	0.7
PPuPC90-Blank7 0.1µm												0.40		0.004	1.010		
PPuPC90-Blank7 0.005µm												0.40		0.004	1.010		
PPuPC90-Blank7 AS					10.43							10.43			1.000		

Table 21B. Test Data (contd.)

Test Number & Fraction	Time, d	Temp., °C	Sample Mass, g	Surface Area, cm^2	Water Mass, g	S/V, m^{-1}	Vessel Mass In, g	Vessel Mass Out, g	Vessel Mass Change g	LPE, g	LPE + 0.45 μm filtrate	Aliquot mass, g	LPE + filtrate + HNO_3	Added HNO_3, mL	Dilution Factor	pH	Cl, mg/L
PPuPC90-14 0.45 µm	7	90	1.022	235.1	10.22	2307	324.930	324.900	-0.03	10.88	16.73	5.85	16.85		1.021	9.10	29.4
PPuPC90-14 0.1µm												0.40		0.004	1.010		
PPuPC90-14 0.005µm												0.40		0.004	1.010		
PPuPC90-14 AS					10.23	2307						10.23			1.000		
PPuPC90-28 0.45 µm	7	90	0.779	179.2	7.75	2312	324.880	324.880	0.00	10.94	12.91	1.97	12.94		1.015	9.27	28.0
PPuPC90-28 0.1µm												0.40		0.004	1.010		
PPuPC90-28 0.005µm												0.40		0.004	1.010		
PPuPC90-28 AS					7.91	2312						7.91			1.000		
PPuPC90T-28 0.45 µm	7	90	0.701	161.2	7.07	2287	321.300	321.280	-0.02	11.10	12.70	1.60	12.72		1.013	9.34	26.5
PPuPC90T-28 0.1µm												0.40		0.004	1.010		
PPuPC90T-28 0.005µm												0.40		0.004	1.010		
PPuPC90T-28 AS					7.20	2287						7.20			1.000		
PPuPC90T-28R 0.45 µm	28	90	1.280	294.4	12.80	2302	327.580	327.570	-0.01	10.82	21.13	10.31	21.26		1.013	9.43	13.8
PPuPC90T-28R AS					11.00	2302						11.00			1.000		
PPuPC90-56 0.45 µm	56	90	0.775	178.3	7.77	2297	324.360	324.350	-0.01	11.05	14.94	3.89	15.06		1.031	9.48	27.9
PPuPC90-56 0.1µm												0.40		0.004	1.010		
PPuPC90-56 0.005µm												0.40		0.004	1.010		
PPuPC90-56 AS					8.25	2297						8.25			1.000		
PPuPC90T-56 0.45 µm	56	90	0.796	183.1	8.16	2249	323.560	323.540	-0.02	10.97	15.24	4.27	15.34		1.023	9.36	26.4
PPuPC90T-56 0.1µm												0.40		0.004	1.010		
PPuPC90T-56 0.005µm												0.40		0.004	1.010		
PPuPC90T-56 AS					8.83	2249						8.83			1.000		
PPuPC90Bl-56 0.45 µm	56	90	0.000	---	10.23	---	322.270	322.160	-0.11	10.83	17.93	7.10	18.04		1.015	10.30	0.7
PPuPC90-56Blank 0.1 um												0.40		0.004	1.010		
PPuPC90-56Blank 0.005µm												0.40		0.004	1.010		
PPuPC90-56Blank AS															1		
PPuPC90-182 0.45um	182	90	1.021	234.8	10.22	2300	325.130	325.120	-0.01	10.86	18.16	7.30	18.26		1.014	8.31	
PPuPC90-182 0.1 um												0.40		0.004	1.010		
PPuPC90-182 5 nm												0.40		0.004	1.010		
PPuPC90-182 AS					10.60	2300						10.60			1.000		
PPuPC90-365 0.45um	182	90	1.052	242.0	10.30	2354	325.100	325.080	-0.02	10.93	18.51	7.58	18.61		1.013	8.19	
PPuPC90-365 0.1 um												0.40		0.004	1.010		
PPuPC90-365 5 nm												0.40		0.004	1.010		
PPuPC90-365 AS					10.70	2354						10.70			1.000		
HIP U,Pu-loaded CWF at 90 C and mass ratio 1:10																	
PCPu90-7-237a 0.45 µm	7	90	0.793	182.4	8.02	2278	321.894	321.877	-0.02	10.79	14.59	3.80	14.79		1.053	8.68	20.9
PCPu90-7-237a 0.1 µm												0.40		0.004	1.010		
PCPu90-7-237a 5 nm												0.40		0.004	1.010		
PCPu90-7-237a AS					8.50	2278									1.000		
PCPu90-7-238a 0.45 µm	7	90	1.723	396.3	17.25	2299	333.326	333.315	-0.01	10.88	20.05	9.17	20.31		1.028	8.62	16.0
PCPu90-7-238a 0.1 µm			0.075									0.40		0.004	1.010		
PCPu90-7-238a 5 nm			0.075									0.40		0.004	1.010		
PCPu90-7-238a AS					17.70	2299									1.000		
PCPu90-7-239a 0.45 µm	7	90	1.739	400.0	17.48	2297	334.030	333.962	-0.07	10.85	22.61	11.76	22.91		1.026	8.59	18.5

Table 21B. Test Data (contd.)

Test Number & Fraction	Time, d	Temp., °C	Sample Mass, g	Surface Area, cm^2	Water Mass, g	S/V, m^{-1}	Vessel Mass In, g	Vessel Mass Out, g	Vessel Mass Change g	LPE, g	LPE + 0.45 μm filtrate	Aliquot mass, g	LPE + filtrate + HNO_3	Added HNO_3, mL	Dilution Factor	pH	Cl, mg/L
PCPu90-7-239a 0.1 μm			0.059									0.40		0.004	1.010		
PCPu90-7-239a 5 nm			0.059									0.40		0.004	1.010		
PCPu90-7-239a AS					18.00	2297									1.000		
PCPu90-7-240a 0.45 μm	7	90	1.474	339.0	14.54	2349	328.146	328.043	-0.10	10.89	19.98	9.09	20.31		1.036	8.66	18.3
PCPu90-7-240a 0.1 μm			0.065									0.40		0.004	1.010		
PCPu90-7-240a 5 nm			0.065									0.40		0.004	1.010		
PCPu90-7-240a AS					15.00	2349									1.000		
PCPu90-7-Blanka 0.45 μm	7	90	---	---	10.01	---						6.00			1.010		0.7
PCPu90-7-Blanka 0.1 μm												0.40		0.004	1.010		
PCPu90-7-Blanka 5 nm												0.40		0.004	1.010		
PCPu90-7-Blanka AS															1.000		
HIP U,Pu-loaded CWF at 120 C and mass ratio 1:20																	
PCPu120/1-225-237a 0.45 μm	225	120	0.328	75.4	6.56	1157	320.290	320.250	-0.04	10.89	14.30	3.41	14.56		1.076	8.85	38.1
PCPu120/1-225-237a 0.1 μm			0.038									0.40		0.004	1.010		
PCPu120/1-225-237a 5 nm			0.038									0.40		0.004	1.010		
PCPu120/1-225-237a AS					6.78	1157									1.000		
PCPu120/1-225-238a 0.45 μm	225	120	0.548	126.0	10.96	1154	323.430	323.390	-0.04	10.88	17.94	7.06	18.20		1.037	8.53	34.4
PCPu120/1-225-238a 0.1 μm			0.031									0.40		0.004	1.010		
PCPu120/1-225-238a 5 nm			0.031									0.40		0.004	1.010		
PCPu120/1-225-238a AS					11.29	1154									1.000		
PCPu120/1-225-239a 0.45 μm	225	120	0.425	97.8	8.50	1154	327.640	327.610	-0.03	10.87	15.75	4.88	16.05		1.061	8.56	36.5
PCPu120/1-225-239a 0.1 μm			0.035									0.40		0.004	1.010		
PCPu120/1-225-239a 5 nm			0.035									0.40		0.004	1.010		
PCPu120/1-225-239a AS					8.77	1154									1.000		
PCPu120/1-225-240a 0.45 μm	225	120	0.500	115.0	10.00	1151	329.940	329.930	-0.01	10.92	17.09	6.17	17.31		1.036	8.86	38.0
PCPu120/1-225-240a 0.1 μm			0.032									0.40		0.004	1.010		
PCPu120-225-240a 5 nm			0.032									0.40		0.004	1.010		
PCPu120-225-240a AS					10.33	1151									1.000		
PCPu120/1-225-Blanka 0.45 μm	225	120	---	---	10.07		324.230	321.200	-3.03	10.94	18.15	7.21	18.34		1.026	8.80	0.4
PCPu120/1-225-Blanka 0.1 μm												0.40		0.004	1.010		
PCPu120/1-225-Blanka 5 nm												0.40		0.004	1.010		
PCPu120/1-225-Blanka AS																	

Table 22B. EXCEL Worksheet "Raw Conc."

The worksheet "Raw Conc." tabulates the analytical results for analysis of submitted aliquots of test solutions, filtrate solutions, and acid soak solutions. All concentrations are given in units μg/L (ppb). The aliquot is given following the test number as:

0.45 μm = aliquot of filtrate from 0.45-μm pore-size filtration
0.1 μm = aliquot of filtrate from 0.1-μm pore-size filtration
5 nm = aliquot of filtrate from 5-nm pore-size filtration
AS = aliquot of acid soak solution

The chloride and iodine concentrations were measured in aliquots of test solutions that were not filtered. The Cl concentration was measured immediately after the test was terminated using a Cl-ion selective electrode. The I concentration was measured by ICP-MS. The concentrations of Cl and I in the test solution are listed on the 0.45 μm line for convenience.

The concentration of Pu-239 was measured using ICP-MS. The total concentration of plutonium is the sum of the ^{239}Pu and ^{240}Pu isotopes, and ^{239}Pu is assumed to be 87.4 % of the total plutonium concentration. The measured concentration of^{239}Pu is given in the column labeled^{239}Pu. The total concentration of ^{239}Pu + ^{239}Pu is given in the column with that label. The total Pu concentration is calculated as:

Pu total = ^{239}Pu / 0.874

Tests PCPu120/1-225-237, PCPu120/1-225-238, PCPu120/1-225-239, and PCPu120/1-225-240 were listed in the test plan as PCPu120/1-TBD-237, PCPu120/1- TBD -238, PCPu120/1- TBD -239, and PCPu120/1- TBD –240. The designator 225 is used instead of TBD because the tests were conducted for 225 days.

Table 22B: Measured Solution Concentrations, in μg/L (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PCPu90-7-237 RWS	668	830	16300	11	21	262	1130	2240	1.81	4.40	0.20	25.90
PCPu90-7-238 RWS	657	606	13800	11	21	72	892	1730	1.21	7.50	0.21	13.90
PCPu90-7-239 RWS	719	1050	41500	11	21	333	1210	1670	3.28	8.53	0.20	47.30
PCPu90-7-240 RWS	783	1030	66800	49	351	761	1450	2350	5.68	7.56	0.52	55.60
HIP U,Pu-loaded CWF at 90 C and mass ratio 1:10												
PCPu90-7-237 0.45 μm	3440	6850	31500	16	25800	35500	2150	317	12.10	3.13	0.93	63.50
PCPu90-7-237 0.1 μm	2910	6820	33800	128	24500	35400	2730	2610	11.00	3.21	0.66	54.10
PCPu90-7-237 5 nm	2880	6920	34100	11	16600	28400	2570	2260	9.94	3.22	0.20	42.60
PCPu90-7-237 AS	91	401	4410	36	5060	7010	636	211	4.91	16.40	11.50	50.80
PCPu90-7-238 0.45 μm	3110	7460	31600	14	25000	34900	2140	315	9.77	1.55	0.50	30.60
PCPu90-7-238 0.1 μm	2750	9510	32400	53	23300	33700	2740	2110	9.58	2.34	0.46	33.50
PCPu90-7-238 5 nm	2690	10600	33800	11	15300	27100	2800	2220	7.64	4.92	0.20	24.50
PCPu90-7-238 AS	362	1260	14300	53	18100	16800	1760	460	13.40	46.60	19.20	137.00
PCPu90-7-239 0.45 μm	3170	5660	29400	19	20700	33300	1920	361	12.30	1.56	0.38	79.00
PCPu90-7-239 0.1 μm	2810	5800	31900	287	22700	35200	2530	2630	12.10	3.35	0.48	69.00
PCPu90-7-239 5 nm	2710	5770	31400	11	13400	26500	2460	1710	10.10	4.63	0.20	55.50
PCPu90-7-239 AS	78	357	3440	38	3770	4720	532	314	4.70	16.40	8.26	44.00
PCPu90-7-240 0.45 μm	4110	6190	29000	26	23500	36300	1890	386	10.30	1.31	0.39	59.80
PCPu90-7-240 0.1 μm	4460	6400	32500	72	25300	38500	2470	1870	9.64	2.67	0.41	50.70
PCPu90-7-240 5 nm	3320	6030	32300	11	16700	30100	2280	1420	8.31	3.33	0.20	43.90
PCPu90-7-240 AS	82	438	3590	43	4830	7100	552	230	4.37	15.10	5.10	40.40
PCPu90-7-Blank 0.45 μm	0.91	11	239	60	14	51	73	562	0.36	1.58	0.08	0.11
PCPu90-7-Blank 0.1 μm	599	411	1090	195	21	26	564	2090	0.30	4.75	0.20	0.60
PCPu90-7-Blank 0.005μm	597	405	1180	232	21	116	613	2400	0.30	9.33	0.20	0.53
PCPu90-7-Blank AS	0.91	11	239	60	14	51	73	562	0.36	1.58	0.08	0.11
PCPu90-28-237 0.45 μm	6310	15100	33400	81	36700	64400	4420	844	26.10	29.30	14.90	136.00
PCPu90-28-237 0.1 μm	6160	13600	32800	643	35200	57400	5210	2790	27.00	30.90	15.90	130.00
PCPu90-28-237 5 nm	6200	16800	33300	380	18500	43500	4730	1630	19.20	2.77	0.28	70.90
PCPu90-28-237 AS	94	497	4410	131	5690	8850	785	923	5.58	20.30	27.20	52.60
PCPu90-28-238 0.45 μm	5060	22800	34800	114	37300	56200	4330	789	23.10	34.30	15.80	97.90
PCPu90-28-238 0.1 μm	5580	21400	33000	642	35800	58000	5280	2250	24.50	35.50	16.50	93.60
PCPu90-28-238 5 nm	3930	20000	31300	362	12300	33400	4170	1620	14.90	2.57	0.31	42.30
PCPu90-28-238 AS	156	689	6990	79	8030	12100	899	416	6.76	25.40	9.31	61.70
PCPu90-28-239 0.45 μm	5480	15500	30700	71	27700	44400	3200	842	19.50	19.00	7.93	108.00
PCPu90-28-239 0.1 μm	6300	14900	31400	586	28600	48600	4350	2410	21.50	18.80	7.96	102.00
PCPu90-28-239 5 nm	5710	13700	29100	407	13700	30900	3600	1890	14.40	2.49	0.29	58.00
PCPu90-28-239 AS	23	122	838	62	1490	2330	117	267	0.98	4.86	7.24	9.33
PCPu90-28-240 0.45 μm	7720	16300	32400	77	41900	65900	3810	772	23.80	22.00	13.20	147.00
PCPu90-28-240 0.1 μm	8500	15700	31800	629	41300	72600	4900	2550	25.00	24.10	14.10	145.00
PCPu90-28-240 5 nm	7090	13600	28600	414	16800	44300	3920	2390	15.70	3.64	0.23	64.30
PCPu90-28-240 AS	214	1000	8120	139	9200	15300	1160	518	9.11	31.40	23.20	84.70
PCPu90-28-Blank 0.45 μm	0.61	10	119	17	17	78	9.1	163	0.03	1.18	0.10	0.02
PCPu90-28-Blank 0.1 μm	888	547	925	572	584	221	841	1550	0.31	2.73	0.23	0.39
PCPu90-28-Blank 0.005μm	889	550	1140	555	425	443	905	1710	0.35	2.86	0.25	0.39
PCPu90-28-Blank AS	0.91	11	239	60	14	51	73	562	0.36	1.58	0.08	0.11
PCPu90-91-237 0.45 μm	7500	21100	34400	43	32800	51900	4050	348	22	18.9	9.03	94.5
PCPu90-91-237 0.1 μm	8400	25200	39000	404	38100	59100	5790	1490	23.6	20.2	9.92	102
PCPu90-91-237 5 nm	7590	23700	36200	275	20900	40000	5080	1230	16.4	2.4	<0.2	56.8
PCPu90-91-237 AS	183	546	5090	87	8280	12000	819	272	6.77	23.1	32.8	60.7
PCPu90-91-238 0.45 μm	10600	45200	53100	159	57700	81800	6610	690	36.3	65.4	18.7	166
PCPu90-91-238 0.1 μm	11000	49600	57900	573	62000	86900	8980	2210	35.8	66.8	19.5	155

Table 22B: Measured Solution Concentrations, in μg/L (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	^{239}Pu	Total $^{239}Pu+^{240}Pu$	Cl	I
PCPu90-7-237 RWS	0.62	10.00	5.41	8.69	0.10	0.30	0.15	0.50	0.393	0.45	16800	
PCPu90-7-238 RWS	0.60	9.82	5.94	8.95	1.14	0.53	0.24	0.50	1.68	1.92	14300	
PCPu90-7-239 RWS	0.60	9.58	5.38	8.70	0.10	0.30	0.24	0.50	0.364	0.42	46000	
PCPu90-7-240 RWS	0.76	10.00	6.58	9.17	1.17	0.74	0.54	2.47	2.12	2.43	88700	
HIP U,Pu-loaded CWF at 90 C												
PCPu90-7-237 0.45 μm	6.22	2.00	5.19	1.91	7.43	4.11	0.14	17.40	5.3	6.06	19700	19.7
PCPu90-7-237 0.1 μm	0.60	10.60	8.02	9.63	3.85	2.34	0.20	9.97	3.27	3.74		
PCPu90-7-237 5 nm	0.60	9.55	5.26	8.68	0.10	0.30	0.14	2.10	0.3	0.34		
PCPu90-7-237 AS	30.40	12.70	26.10	11.40	39.90	23.60	0.62	124.00	34.9	39.93		
PCPu90-7-238 0.45 μm	2.34	0.99	2.51	0.97	3.79	2.14	0.06	2.41	7.06	8.08	15100	20.2
PCPu90-7-238 0.1 μm	0.60	10.20	6.94	9.32	2.54	1.46	0.15	1.30	4.83	5.53		
PCPu90-7-238 5 nm	0.60	9.52	5.24	8.67	0.10	0.30	0.16	0.50	0.3	0.34		
PCPu90-7-238 AS	88.10	42.10	80.40	37.70	125.00	0.01	0.00	109.00	187	213.96		
PCPu90-7-239 0.45 μm	2.70	0.92	2.57	0.97	3.75	2.01	0.09	4.12	2.65	3.03	19500	75.2
PCPu90-7-239 0.1 μm	0.60	10.40	7.36	9.53	3.03	1.72	0.20	2.55	2.38	2.72		
PCPu90-7-239 5 nm	0.60	9.56	5.38	8.72	0.10	0.30	0.21	1.25	0.482	0.55		
PCPu90-7-239 AS	29.90	12.40	24.70	10.90	38.50	22.80	0.65	97.70	30.9	35.35		
PCPu90-7-240 0.45 μm	2.09	0.74	2.31	0.90	3.49	1.87	0.10	3.15	5.01	5.73	19500	138
PCPu90-7-240 0.1 μm	2.83	10.20	7.20	9.47	2.99	1.71	0.18	2.10	5.05	5.78		
PCPu90-7-240 5 nm	0.60	9.54	5.33	8.71	0.10	0.30	0.19	1.33	0.315	0.36		
PCPu90-7-240 AS	27.30	12.00	24.00	10.60	36.70	20.90	0.55	27.90	34.6	39.59		
PCPu90-7-Blank 0.45 μm	2.69	0.02	0.04	0.02	0.05	0.03	0.00	0.13	0.037	0.04	650	
PCPu90-7-Blank 0.1 μm	12.20	9.61	5.42	8.74	0.10	0.30	0.19	0.50	0.3	0.34		
PCPu90-7-Blank 0.005μm	0.83	10.50	5.44	8.71	0.10	0.30	0.22	0.50	0.3	0.34		
PCPu90-7-Blank AS	2.69	0.02	0.04	0.02	0.05	0.03	0.00	0.13	0.037	0.04		
PCPu90-28-237 0.45 μm	85.10	28.20	52.90	25.80	85.00	12.40	1.72	62.70	37.4	42.79	30000	42.5
PCPu90-28-237 0.1 μm	86.20	29.50	51.90	25.90	84.60	12.60	1.73	54.40	36.1	41.30		
PCPu90-28-237 5 nm	3.88	0.49	0.16	0.10	0.81	0.30	0.16	13.70	0.523	0.60		
PCPu90-28-237 AS	50.20	21.80	40.10	19.30	64.70	9.12	0.88	146.00	62.9	71.97		
PCPu90-28-238 0.45 μm	91.20	36.40	61.30	32.10	104.00	14.90	2.19	17.30	115	131.58	23400	36.8
PCPu90-28-238 0.1 μm	88.40	37.10	56.90	31.00	98.60	14.90	2.21	10.70	92.5	105.84		
PCPu90-28-238 5 nm	3.42	0.42	0.12	0.10	1.26	0.30	0.20	1.62	0.945	1.08		
PCPu90-28-238 AS	47.00	26.10	46.50	22.40	74.20	10.30	1.02	50.20	144	164.76		
PCPu90-28-239 0.45 μm	64.60	15.00	29.00	14.40	47.10	7.04	1.01	14.90	18.4	21.05	33700	48.5
PCPu90-28-239 0.1 μm	59.70	14.30	27.30	13.30	45.20	6.75	1.02	8.75	17	19.45		
PCPu90-28-239 5 nm	3.18	0.37	0.10	0.10	0.64	0.30	0.18	2.53	0.2	0.23		
PCPu90-28-239 AS	17.40	5.98	10.70	5.44	18.00	2.44	0.25	27.20	24.4	27.92		
PCPu90-28-240 0.45 μm	65.80	21.90	44.80	21.80	72.70	10.70	1.52	25.60	75.2	86.04	31900	70.5
PCPu90-28-240 0.1 μm	66.30	22.60	44.10	21.60	70.10	10.80	1.59	22.80	69.4	79.41		
PCPu90-28-240 5 nm	4.77	0.47	0.10	0.10	0.77	0.30	0.15	6.55	0.461	0.53		
PCPu90-28-240 AS	57.00	32.20	56.80	27.50	88.80	12.00	1.21	37.40	116	132.72		
PCPu90-28-Blank 0.45 μm	0.69	0.01	0.01	0.01	0.03	0.02	0.01	0.01	0.02	0.02	740	6.44
PCPu90-28-Blank 0.1 μm	4.39	0.37	0.10	0.10	0.44	0.30	0.17	0.40	0.2	0.23		
PCPu90-28-Blank 0.005μm	2.29	0.46	0.10	0.10	0.56	0.30	0.18	0.40	0.2	0.23		
PCPu90-28-Blank AS	2.69	0.02	0.04	0.02	0.05	0.03	0.00	0.13				
PCPu90-91-237 0.45 μm	51.3	14.9	28	13.5	43.6	6.52	0.948	31.7	15.8	18.08	23800	37.7
PCPu90-91-237 0.1 μm	53.6	16	30.1	14.4	46.5	7.42	1.19	28.1	15.1	17.28		
PCPu90-91-237 5 nm	2.7	0.108	0.531	0.296	0.551	<0.2	0.229	10.7	0.1	0.11		
PCPu90-91-237 AS	53.6	27.3	50.3	24.9	81.4	12.1	1.12	168	90.2	103.20		
PCPu90-91-238 0.45 μm	143	44.8	86.1	38.3	124	17.8	2.65	30.3	102	116.70	30400	42.8
PCPu90-91-238 0.1 μm	135	47.6	80.3	39	127	18.3	2.84	24.6	86.4	98.86		

Table 22B: Measured Solution Concentrations, in μg/L (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PCPu90-91-238 5 nm	9440	51400	56300	218	14700	49100	6420	1070	19.3	3.16	<0.2	53.5
PCPu90-91-238 AS	380	1560	8720	80	14100	19100	1340	275	10.6	42.6	21.5	91.7
PCPu90-91-239 0.45 μm	8710	26100	50800	17	34200	50100	3920	276	19.6	8.76	2.06	93.7
PCPu90-91-239 0.1 μm	8810	27100	53800	384	35700	51600	5320	1540	19.6	9.9	2.11	90.3
PCPu90-91-239 5 nm	8390	27400	51100	301	19400	35900	4730	1210	15.4	1.92	<0.2	59.4
PCPu90-91-239 AS	150	345	2020	108	8950	9390	347	569	2.67	38.5	3.71	21.2
PCPu90-91-240 0.45 μm	11400	23800	33800	69	47300	73300	4080	367	23.3	24.8	15.6	137
PCPu90-91-240 0.1 μm	11400	25600	34900	434	50500	76800	5650	1640	23.8	25.3	16.5	126
PCPu90-91-240 5 nm	10200	26200	30800	228	23000	49500	4350	1070	13.1	2	<0.2	47.5
PCPu90-91-240 AS	129	281	2120	74	3970	5420	331	206	2.38	9.89	4.26	20.5
PCPu90-91-Blank 0.45 μm	2.7	23	236	33	23	584	57	162	0.16	1.06	0.062	0.206
PCPu90-91-Blank 0.1 μm	252	1770	2110	527	20	2620	1410	1750	0.518	3.00	0.241	0.302
PCPu90-91-Blank 5 nm	302	1680	2510	302	226	3240	1540	1270	0.756	2.67	0.324	1.11
PCPu90-91-Blank AS	5.0	74	317	38	254	359	57	95	0.101	0.578	1.84	0.54
PCPu90-182-237 0.45 μm	8340	31800	27400	6	20300	45800	5150	1150	27.8	14.2	14.5	133
PCPu90-182-237 0.1 μm	8530	33600	29100	6	21600	46900	5560	994	26.6	13.6	13.8	128
PuPC90-182-237 5 nm	8560	35600	28000	6	12700	35700	4730	802	14.6	<0.4	<0.2	40.8
PCPu90-182-237 AS	1250	565	12400	396	25800	35300	3400	805	24.7	20	15.6	138
PCPu90-182-238 0.45 μm	10600	56300	37700	6	26800	46600	5500	840	19.9	17	6.92	66.1
PCPu90-182-238 0.1 μm	11000	58900	39700	116	28100	48200	5280	1340	18.2	17.3	6.97	65.7
PuPC90-182-238 5 nm	10300	59600	38300	6	11400	31800	4660	997	13.9	1.09	0.393	36.6
PCPu90-182-238 AS	499	1220	8380	235	11500	19000	1510	653	11.3	38.5	23.8	81.9
PCPu90-182-239 0.45 μm	11500	35000	31300	6	26100	53900	4480	1020	17.9	7.55	5.32	71
PCPu90-182-239 0.1 μm	11700	36500	31400	93	26600	54600	4510	1260	17.6	7.2	5.02	70
PuPC90-182-239 5 nm	10600	33600	29800	18	15200	40700	3960	1530	14.6	1.77	<0.2	47.4
PCPu90-182-239 AS	203	750	5950	167	7800	12100	887	398	7.93	28.3	15.3	74
PCPu90-182-240 0.45 μm	14000	30200	40800	6	48800	92300	5240	1120	22.3	16.9	10.3	109
PCPu90-182-240 0.1 μm	14700	31900	41500	85	50000	92100	5390	1380	22.5	16	9.68	108
PuPC90-182-240 5 nm	14800	33900	41800	6	33200	75400	4560	1010	16	1.5	<0.2	58.7
PCPu90-182-240 AS	597	1870	15300	205	19000	28400	2090	876	18.9	84.7	34.4	160
PCPu90-182-Blank 0.45 μm	195	680	2160	183	26	1495	674	1605	1.625	4.78	0.11	1.98
PCPu90-182-Blank 0.1 μm	255	641	2940	19	37	1270	1800	1520	1.55	4.35	<0.2	1.68
PCPu90-182-Blank 5 nm	255	641	2940	19	37	1270	1800	1520	1.55	4.35	<0.2	1.68
PCPu90-182-Blank AS	4.1	64	110	36	184	184	18	127	0.064	0.725	0.351	0.159
PCPu90-365-237 0.45 μm	13800	34200	40800	77	41600	64800	9400	1740	28.4	17.7	10.5	115
PuPC90-365-237 0.1 μm	13600	34300	43300	258	43800	67400	9980	2270	28.3	17.9	9.8	118
PuPC90-365-237 5 nm	13900	37800	42700	101	32000	56500	8730	1870	21.8	<0.5	<0.3	66.9
PCPu90-365-237 AS	109	201	2700	38	4820	4850	456	167	3.75	13.6	7.22	31.4
PCPu90-365-238 0.45 μm	18500	73400	65500	141	55500	77300	12600	2230	45	70.6	7.44	181
PuPC90-365-238 0.1 um	19200	76000	68200	138	56400	73800	12900	1980	45.4	73	7.58	193
PuPC90-365-238 5 nm	18300	78200	65000	70	31000	55800	10100	1910	22.8	0.621	<0.3	50.6
PCPu90-365-238 AS	89	336	2640	37	4390	4670	399	132	3.79	12.7	7.64	28.8
PCPu90-365-239 0.45 μm	15500	47100	34500	77	33100	56600	8520	1650	22.9	15.3	12.7	108
PuPC90-365-239 0.1 μm	15800	48200	34600	204	33100	54700	8450	1800	22.6	15.1	12.9	108
PuPC90-365-239 5 nm	13800	45000	30700	81	16200	36200	7190	1690	13.2	<0.5	<0.3	45.6
PCPu90-365-239 AS	171	590	5040	27	6240	8150	688	189	5.69	18.2	7.32	52.1
PCPu90-365-240 0.45 μm	17300	38300	27700	60	35100	59000	7470	1550	16.9	8.35	11.2	81.2
PuPC90-365-240 0.1 μm	18500	41200	30400	269	38000	63600	7930	2060	19	8.18	11.7	89
PuPC90-365-240 5 nm	17400	41700	30300	94	26200	55100	7570	1850	13.5	<0.5	<0.3	47.9
PCPu90-365-240 AS	80	163	1110	77	1810	2270	171	101	1.41	4.32	8.1	11.9
PCPu90-365-Blank 0.45 μm	115	989	4480	161	2350	2000	4570	1670	<2.4	3.5	4.06	5.18
PCPu90-365-Blank 0.1 μm	255	641	2940	19	37	1270	1800	1520	1.55	4.35	<0.2	1.68

Table 22B: Measured Solution Concentrations, in µg/L (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	^{239}Pu	Total ^{239}Pu+^{240}Pu	Cl	I
PCPu90-91-238 5 nm	3.22	<0.1	0.63	0.337	0.802	0.236	0.24	7.85	0.583	0.67		
PCPu90-91-238 AS	79.1	47.6	89.1	40.5	134	19.1	1.76	97.9	258	295.19		
PCPu90-91-239 0.45 µm	27.4	4.65	7.96	4.04	12.9	1.94	0.269	11.6	7.34	8.40	40500	56.2
PCPu90-91-239 0.1 µm	28.5	4.48	7.43	4.06	12.2	2.01	0.538	6	4.55	5.21		
PCPu90-91-239 5 nm	2.36	<0.1	0.606	0.295	0.512	<0.2	0.226	2.69	0.119	0.14		
PCPu90-91-239 AS	83.4	13.3	16.1	7.63	24.9	3.38	0.415	43	17.7	20.25		
PCPu90-91-240 0.45 µm	71.9	28.4	50.7	26.8	88.2	13.5	1.85	25	77.2	88.33	29200	69.5
PCPu90-91-240 0.1 µm	70.7	28.1	50.1	26.7	87.7	13.6	2.17	22.5	71.4	81.69		
PCPu90-91-240 5 nm	2.32	0.12	0.522	0.296	0.526	<0.2	0.221	11.2	0.407	0.47		
PCPu90-91-240 AS	23.3	12.4	23.7	11	34.4	4.69	0.497	12.1	59.5	68.08		
PCPu90-91-Blank 0.45 µm	2.14	0.061	0.071	0.022	0.07	<0.02	<0.01	<0.08	0.01	0.01	630	<1.15
PCPu90-91-Blank 0.1 µm	2.5	<0.1	0.57	0.312	0.533	<0.2	0.226	1.19	0.1	0.11		
PCPu90-91-Blank 5 nm	3.53	0.293	0.809	0.512	0.92	0.217	0.318	1.66	0.218	0.25		
PCPu90-91-Blank AS	4.34	4.44	0.39	0.172	0.603	0.087	<0.01	1.06	0.613	0.70		
PCPu90-182-237 0.45 µm	41.5	21.8	44	21.8	73.5	11.2	1.72	90.5	50.1	57.32		47.6
PCPu90-182-237 0.1 µm	38.4	21.1	42.4	21.2	70.7	10.6	1.72	85.4	47.8	54.69		
PuPC90-182-237 5 nm	1.93	<0.1	<0.1	<0.1	<0.2	<0.3	0.327	12.7	<0.249	0.28		
PCPu90-182-237 AS	63.3	31	58.1	29.4	96.4	14	1.64	103	106	121.28	14	
PCPu90-182-238 0.45 µm	37.1	15.2	33.7	14.1	45.6	6.65	1.24	18.2	66.8	76.43		39.4
PCPu90-182-238 0.1 µm	38	15.3	33.3	14.3	45.1	6.54	1.26	16.5	67.3	77.00		
PuPC90-182-238 5 nm	2.63	<0.1	<0.1	<0.1	<0.2	<0.3	0.324	7.39	<1.58	1.81		
PCPu90-182-238 AS	80.5	37.2	64.2	32.4	106	14.9	1.62	76.8	164	187.64	27.5	
PCPu90-182-239 0.45 µm	22.9	10.2	25.9	10.5	33	4.82	1.05	29.9	24.9	28.49		87.7
PCPu90-182-239 0.1 µm	23	9.73	24.5	9.95	32.2	4.91	0.975	24.3	23.7	27.12		
PuPC90-182-239 5 nm	5.08	<0.1	<0.1	<0.1	<0.2	<0.3	0.333	15.6	<0.181	0.21		
PCPu90-182-239 AS	68.6	32.3	58.3	29.9	98	14.2	1.41	177	96.9	110.87	12.9	
PCPu90-182-240 0.45 µm	41.6	20.2	46.2	20.2	65.9	10.2	1.57	37.2	109	124.71		65.8
PCPu90-182-240 0.1 µm	39.6	18.2	43.4	18.8	61.7	9.41	1.63	33.7	102	116.70		
PuPC90-182-240 5 nm	3.28	<0.1	<0.1	<0.1	<0.2	<0.3	0.333	24.9	<0.64	0.73		
PCPu90-182-240 AS	144	71.9	117	63.6	219	30.4	3.25	183	208	237.99	36.7	
PCPu90-182-Blank 0.45 µm	5.315	0.1925	0.058	0.055	0.11	0.165	0.172	0.136	0.055	0.06	630	8.71
PCPu90-182-Blank 0.1 µm	5.57	<0.1	<0.1	<0.1	<0.2	<0.3	0.34	<0.2	<0.1	0.11		
PCPu90-182-Blank 5 nm	5.57	<0.1	<0.1	<0.1	<0.2	<0.3	0.34	<0.2		0.00		
PCPu90-182-Blank AS	3.42	0.67	0.828	0.401	1.36	0.147	0.017	1.72	0.568	0.65	0.075	
PCPu90-365-237 0.45 µm	46	21.1	42.7	19.5	63.4	9.57	1.42	87.9	33.1	37.87		
PuPC90-365-237 0.1 µm	46.5	20	39.4	18	59.5	9.79	1.4	67.4	27.3	31.24		
PuPC90-365-237 5 nm	<0.7	<0.1	0.48	0.176	<1.1	<0.8	<0.4	31.9	0.78	0.89		
PCPu90-365-237 AS	30.4	19.6	30.2	16	50.6	7.35	0.776	110	42.4	48.51		
PCPu90-365-238 0.45 µm	151	20.5	29.4	15.4	49.5	7.04	1.21	28.9	46.4	53.09		
PuPC90-365-238 0.1 um	158	21.1	31.6	16.6	50.8	8.18	1.09	27	45.5	52.06		
PuPC90-365-238 5 nm	<0.7	<0.1	<0.3	<0.1	<1.1	<0.8	<0.4	17.3	0.987	1.13		
PCPu90-365-238 AS	24.4	20.9	34	17.8	57.4	8.43	0.853	40.9	90.1	103.09		
PCPu90-365-239 0.45 µm	48.5	26	48.9	24.1	76.4	12.6	1.57	68.7	24.7	28.26		
PuPC90-365-239 0.1 µm	46	26.2	48.5	23	76.6	12.9	1.63	60.2	21.8	24.94		
PuPC90-365-239 5 nm	<0.7	1.13	1.65	0.298	<1.1	<0.8	<0.4	44.9	0.921	1.05		
PCPu90-365-239 AS	31.1	19.6	38.4	18.1	59	8.96	0.811	148	56.5	64.65		
PCPu90-365-240 0.45 µm	23.9	18.1	37.1	17.9	60.8	10.5	1.42	34.2	59.1	67.62		
PuPC90-365-240 0.1 µm	24.5	19.3	40.2	19.6	67.2	12.2	1.45	34.9	63.5	72.65		
PuPC90-365-240 5 nm	<0.7	<0.1	0.419	0.105	<1.1	<0.8	<0.4	26.2	2.02	2.31		
PCPu90-365-240 AS	10.3	7.59	14.8	7.45	23.5	3.41	0.366	6.92	43.2	49.43		
PCPu90-365-Blank 0.45 µm	6.07	<0.1	0.317	<0.1	<1.1	<0.8	<0.4	<0.8		<0.5	391	
PCPu90-365-Blank 0.1 µm	5.57	<0.1	<0.1	<0.1	<0.2	<0.3	0.34	<0.2		0.00		

Table 22B: Measured Solution Concentrations, in μg/L (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PCPu90-365-Blank 5 nm	255	641	2940	19	37	1270	1800	1520	1.55	4.35	<0.2	1.68
PCPu90-365-Blank AS	3.2	19	123	65	235	119	93	124	<0.24	0.313	10.3	0.232
HIP U,Pu-loaded CWF at 120 C and mass ratio 1:10												
PCPu120-7-237 0.45 μm	9490	21700	42500	20	49500	68500	5540	740	25.80	4.71	7.59	123.00
PCPu120-7-237 0.1 μm	9690	24800	46600	12	56200	95000	6190	2240	28.40	6.00	9.50	128.00
PCPu120-7-237 0.005μm	9490	27000	43600	12	36600	69800	5280	2750	21.00	2.30	9.50	86.40
PCPu120-7-237 AS	73	181	1500	26	2350	3560	232	106	1.70	5.96	4.31	15.30
PCPu120-7-238 0.45 μm	9950	36600	45700	21	47600	63700	5880	513	23.60	5.42	7.34	85.10
PCPu120-7-238 0.1 μm	10000	42100	49800	12	53400	91600	6410	2060	23.30	6.46	9.50	84.40
PCPu120-7-238 0.005μm	10900	50200	53500	12	33700	72100	6320	2960	20.50	3.00	9.50	63.30
PCPu120-7-238 AS	217	869	7150	43	8470	13700	1120	212	8.50	29.60	44.80	67.20
PCPu120-7-239 0.45 μm	10300	23500	45300	16	43200	58500	4700	478	24.40	5.49	5.66	122.00
PCPu120-7-239 0.1 μm	10100	26800	47700	12	49800	90700	6030	1570	26.10	5.72	9.50	121.00
PCPu120-7-239 0.005μm	9770	27200	45200	12	30900	67800	5320	2440	20.20	2.20	9.50	88.80
PCPu120-7-239 AS	427	1350	11800	46	13800	20800	1530	308	12.70	40.40	17.40	103.00
PCPu120-7-240 0.45 μm	12000	21100	40600	16	51800	70300	4410	518	22.00	3.47	6.08	120.00
PCPu120-7-240 0.1 μm	11700	23000	40700	12	55400	100000	5320	1960	22.40	3.90	9.50	116.00
PCPu120-7-240 0.005μm	11400	24800	42000	12	45700	83900	4740	2160	19.10	1.82	9.50	91.60
PCPu120-7-240 AS	211	600	4080	32	5280	9010	816	146	5.53	16.10	11.90	51.10
PCPu120-7-Blank 0.45 μm	36	125	181	92	1	59	379	877	0.25	2.62	0.60	0.12
PCPu120-7-Blank 0.1 μm	643	669	733	12	20	127	2000	1810	0.57	2.19	9.50	0.30
PCPu120-7-Blank 0.005μm	639	558	1120	12	20	262	1060	2410	0.49	3.13	9.50	0.30
PCPu120-7-Blank AS	2.8	33	18	11	13	31	20	77	0.04	0.06	1.43	0.04
PCPu120-28-237 0.45 μm	13400	36900	39700	36	47400	88900	4700	482	24.00	11.50	13.10	127.00
PCPu120-28-237 0.1 μm	13600	37900	40100	381	46800	86000	5610	2010	23.10	12.80	14.80	113.00
PCPu120-28-237 0.005μm	12300	36200	35900	181	24200	62800	4570	1270	16.40	1.42	0.40	61.50
PCPu120-28-237 AS	250	1290	11600	69	14200	25300	1900	339	15.70	40.70	39.10	166.00
PCPu120-28-238 0.45 μm	13600	64200	42900	18	43700	83800	4720	477	21.40	5.78	8.77	80.70
PCPu120-28-238 0.1 μm	13200	61000	41400	346	40600	79400	5410	1640	19.00	6.33	9.23	72.20
PCPu120-28-238 0.005μm	13000	58800	39000	193	22300	60100	4960	1370	15.60	1.20	0.40	51.20
PCPu120-28-238 AS	387	2070	12100	74	14300	26600	1870	413	15.30	42.20	20.90	144.00
PCPu120-28-239 0.45 μm	12900	39300	40000	19	43900	80200	3760	458	20.90	6.04	8.30	99.20
PCPu120-28-239 0.1 μm	13800	38200	39200	358	44300	84300	4850	1660	19.90	7.02	9.06	95.60
PCPu120-28-239 0.005μm	12700	36300	35300	253	23800	62700	4190	1780	15.30	2.19	0.40	61.10
PCPu120-28-239 AS	149	992	6190	42	7490	14000	825	269	8.24	23.60	12.90	79.70
PCPu120-28-240 0.45 μm	16800	36500	33500	19	50000	107000	3700	557	17.00	3.43	9.43	87.00
PCPu120-28-240 0.1 μm	15600	34800	31800	370	48900	94700	4150	1940	16.30	4.63	10.70	82.20
PCPu120-28-240 0.005μm	15500	34600	30800	236	36600	80900	3970	1710	13.20	1.82	0.70	58.40
PCPu120-28-240 AS	784	2730	20600	61	24100	45200	3120	513	26.00	72.90	24.80	261.00
PCPu120-28-Blank 0.45 μm	0.89	30	117	13	14	102	15	138	0.03	0.58	0.03	0.02
PCPu120-28-Blank 0.1 μm	825	503	986	369	478	2030	769	1340	0.20	2.10	0.40	0.20
PCPu120-28-Blank 0.005μm	847	577	1230	385	296	2870	789	1230	0.20	1.65	0.40	0.20
PCPu120-28-Blank AS	2.8	33	18	11	13	31	20	77	0.04	0.06	1.43	0.04
PCPu120-91-237 0.45 μm	22100	55700	38800	43	60000	112000	5390	406	26.6	8.69	22.3	131
PCPu120-91-237 0.1 μm	21900	52400	37700	178	57900	104000	6450	1760	27.4	9.77	23.9	122
PCPu120-91-237 5 nm	20900	56400	36500	24	41500	85000	5540	1260	19.8	1.89	2.64	74.1
PCPu120-91-237 AS	490	1020	8920	30	11200	13700	1140	238	9.08	28.5	29.8	78.5
PCPu120-91-238 0.45 μm	25200	99400	49100	34	47800	97500	5670	411	24.7	5.09	11.5	91.2
PCPu120-91-238 0.1 μm	26500	103000	51400	165	51100	98400	7000	1720	25.4	5.91	12.4	92
PCPu120-91-238 5 nm	25600	104000	49300	84	34000	76300	6610	1360	20.9	1.24	<0.3	66.4
PCPu120-91-238 AS	810	2670	20300	33	22400	39700	2360	350	19.4	61.9	25.3	185

Table 22B: Measured Solution Concentrations, in μg/L (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	^{239}Pu	Total ^{239}Pu+^{240}Pu	Cl	I
PCPu90-365-Blank 5 nm	5.57	<0.1	<0.1	<0.1	<0.2	<0.3	0.34	<0.2		0.00		
PCPu90-365-Blank AS	2.8	0.279	0.452	0.214	0.652	0.118	<0.04	1.14	0.352	0.40		
HIP U,Pu-loaded CWF at 120 (												
PCPu120-7-237 0.45 μm	8.75	11.10	31.50	13.90	46.20	7.54	0.96	82.50	46.7	53.43	22900	57.7
PCPu120-7-237 0.1 μm	2.70	11.30	31.40	13.60	48.10	7.33	1.07	74.60	42	48.05		
PCPu120-7-237 0.005μm	0.70	0.10	0.60	0.10	0.40	0.30	0.10	22.90	<0.3	0.34		
PCPu120-7-237 AS	10.90	7.65	14.90	7.80	25.60	3.83	0.44	37.70	30.2	34.55		
PCPu120-7-238 0.45 μm	8.78	12.80	35.20	15.20	49.50	7.80	1.07	16.80	107	122.43	21100	51.4
PCPu120-7-238 0.1 μm	2.44	12.30	32.90	14.00	47.60	6.83	1.06	15.60	88.2	100.92		
PCPu120-7-238 0.005μm	0.70	0.10	1.31	0.10	0.40	0.30	0.10	11.70	0.665	0.76		
PCPu120-7-238 AS	48.80	36.60	54.20	30.50	96.70	13.90	1.47	64.10	145	165.90		
PCPu120-7-239 0.45 μm	12.10	10.80	28.70	12.60	40.30	6.27	0.88	31.60	30.7	35.13	29000	65.8
PCPu120-7-239 0.1 μm	4.62	36.00	126.00	18.90	59.10	5.42	0.88	25.10	25.5	29.18		
PCPu120-7-239 0.005μm	0.70	0.10	0.75	0.10	0.40	0.30	0.10	13.50	0.3	0.34		
PCPu120-7-239 AS	67.00	41.30	69.50	39.30	127.00	18.60	1.84	254.00	105	120.14		
PCPu120-7-240 0.45 μm	7.14	9.63	30.20	12.70	42.50	6.75	0.91	26.60	91.4	104.58	27400	91.5
PCPu120-7-240 0.1 μm	0.70	9.28	28.20	11.90	41.10	6.24	0.91	22.80	74.1	84.78		
PCPu120-7-240 0.005μm	0.70	0.10	0.74	0.10	0.40	0.30	0.10	12.00	0.3	0.34		
PCPu120-7-240 AS	27.70	19.40	36.20	17.90	56.30	8.05	0.86	25.00	71.8	82.15		
PCPu120-7-Blank 0.45 μm	4.40	0.04	0.46	0.00	0.12	0.08	0.04	3.45	0.04	0.05	391	6.97
PCPu120-7-Blank 0.1 μm	0.70	0.10	0.69	0.10	0.40	0.30	0.10	25.10	0.3	0.34		
PCPu120-7-Blank 0.005μm	0.70	0.10	0.88	0.10	0.40	0.30	0.10	1.26	<0.3	0.34		
PCPu120-7-Blank AS	0.21	0.22	0.01	0.00	0.14	0.02	0.01	0.32	<0.19	0.00		
PCPu120-28-237 0.45 μm	31.50	23.30	52.30	23.30	76.40	11.60	1.57	110.00	56.5	64.65	40000	57
PCPu120-28-237 0.1 μm	31.70	25.00	50.90	23.60	78.00	12.30	1.51	95.90	48.3	55.26		
PCPu120-28-237 0.005μm	1.92	0.10	0.20	0.10	0.20	0.40	0.10	47.50	1.2	1.37		
PCPu120-28-237 AS	73.50	46.50	91.00	42.60	142.00	21.30	1.93	330.00	165	188.79		
PCPu120-28-238 0.45 μm	12.00	14.30	38.50	17.00	56.70	9.00	1.29	45.70	99	113.27	31300	47.8
PCPu120-28-238 0.1 μm	11.60	14.20	35.90	16.30	54.70	9.25	1.24	37.00	110	125.86		
PCPu120-28-238 0.005μm	1.98	0.10	0.20	0.10	0.20	0.40	0.10	25.70	1.2	1.37		
PCPu120-28-238 AS	68.90	47.70	93.00	44.20	147.00	21.40	2.11	114.00	285	326.09		
PCPu120-28-239 0.45 μm	18.10	13.90	34.10	15.20	50.60	7.80	1.09	68.80	28.2	32.27	41400	67.3
PCPu120-28-239 0.1 μm	18.30	14.80	33.70	15.30	51.90	8.10	0.97	57.10	31	35.47		
PCPu120-28-239 0.005μm	25.60	0.10	0.20	0.10	0.20	0.40	0.10	40.70	1.2	1.37		
PCPu120-28-239 AS	46.40	29.50	56.80	27.70	94.00	13.50	1.28	188.00	99.5	113.84		
PCPu120-28-240 0.45 μm	8.75	14.50	42.40	17.80	59.50	9.39	1.29	46.20	94.9	108.58	38000	88.4
PCPu120-28-240 0.1 μm	9.28	15.00	40.20	17.70	61.50	9.95	1.06	36.00	93.9	107.44		
PCPu120-28-240 0.005μm	2.27	0.10	0.20	0.10	0.20	0.40	0.10	23.70	1.2	1.37		
PCPu120-28-240 AS	121.00	75.40	149.00	65.40	219.00	30.50	2.96	101.00	254	290.62		
PCPu120-28-Blank 0.45 μm	0.63	0.40	0.06	0.01	0.03	0.04	0.01	0.10	0.06	0.07	391	6.04
PCPu120-28-Blank 0.1 μm	2.50	0.10	0.20	0.10	0.20	0.40	0.10	1.90	0.1	0.11		
PCPu120-28-Blank 0.005μm	1.74	0.10	0.20	0.10	0.20	0.40	0.10	1.90	1.2	1.37		
PCPu120-28-Blank AS	0.21	0.22	0.01	0.00	0.14	0.02	0.01	0.32		0.00		
PCPu120-91-237 0.45 μm	20.4	34.3	78.5	36.1	118	18.9	2.55	150	75.8	86.73	92500	44.5
PCPu120-91-237 0.1 μm	20.5	34.9	75.1	35.2	120	19.9	2.84	131	69.4	79.41		
PCPu120-91-237 5 nm	3.69	3.41	7.69	3.67	12.1	1.82	0.519	63.8	5.77	6.60		
PCPu120-91-237 AS	45.2	37.4	70.8	35.3	116	16.8	1.69	236	112	128.15		
PCPu120-91-238 0.45 μm	8.86	21.6	57	24.1	77.4	11.6	1.67	62.9	138	157.89	53200	61.4
PCPu120-91-238 0.1 μm	9.84	22.5	56.2	24.3	78.7	11.6	2.04	57.3	150	171.62		
PCPu120-91-238 5 nm	<1.8	0.221	0.838	0.311	<0.4	<0.3	0.238	38.9	1.13	1.29		
PCPu120-91-238 AS	97.1	70.3	129	68.6	204	29.1	2.86	156	343	392.45		

Table 22B: Measured Solution Concentrations, in μg/L (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PCPu120-91-239 0.45 μm	32300	90500	53200	320	54700	117000	6360	675	38	29.1	26.7	220
PCPu120-91-239 0.1 μm	34800	93000	55100	465	56800	109000	7870	2000	39.3	30.7	29.6	221
PCPu120-91-239 5 nm	30800	86500	50000	33	20800	80800	5870	1330	20.8	1.92	0.315	70.9
PCPu120-91-239 AS	378	719	4510	77	9200	7600	676	239	5.52	25.4	14.8	47.9
PCPu120-91-240 0.45 μm	24500	52400	34600	39	59200	121000	4010	485	22.6	5.28	18.7	116
PCPu120-91-240 0.1 μm	26300	56000	36800	213	62300	119000	5500	1760	22.6	6.26	20.4	117
PCPu120-91-240 5 nm	25900	57600	36000	24	48000	102000	4910	1440	17.8	1.32	0.313	76.4
PCPu120-91-240 AS	219	484	3310	17	4300	7150	524	123	4.22	14	9.5	39
PCPu120-91-Blank 0.45 μm	0.41	23	103	10	6	204	19	94	0.067	0.725	0.013	0.036
PCPu120-91-Blank 0.1 μm	163	887	1570	179	647	1470	947	1380	0.437	2.06	<0.3	<0.3
PCPu120-91-Blank 5 nm	156	906	1780	207	69	1800	941	1630	0.452	2.26	<0.3	<0.3
PCPu120-91-Blank AS	1.0	20	48	5	28	111	9	32	0.047	0.081	0.019	0
HIP U,Pu-loaded CWF at 120 C and mass ratio 1:20												
PCPu120/1-7-237 0.45 μm	5690	12600	45600	16	44600	64500	3080	283	16.7	4.16	3.85	76.1
PCPu120/1-7-237 0.1 μm	6010	12100	45600	310	44000	62400	4060	1510	17.8	4.99	5.11	78.5
PCPu120/1-7-237 5 nm	5850	13000	44400	172	29500	47600	5340	966	14.6	0.952	0.855	61.6
PCPu120/1-7-237 AS	62	100	1020	24	2430	3100	195	37	1.64	4.25	2.83	13.3
PCPu120/1-7-238 0.45 μm	5490	18300	41900	16	41500	67900	4060	345	19.4	2.84	6.12	72.9
PCPu120/1-7-238 0.1 μm	5520	18800	40800	304	41100	65500	4700	1350	19.2	3.44	6.84	70.4
PCPu120/1-7-238 5 nm	5320	19400	39300	192	28900	52300	4250	1230	16.5	1.56	0.94	57.1
PCPu120/1-7-238 AS	237	866	6850	14	8390	11500	922	119	7.51	25.8	12.6	70.9
PCPu120/1-7-239 0.45 μm	6050	13400	48300	14	39600	67200	3320	316	19	4.11	3.32	102
PCPu120/1-7-239 0.1 μm	6220	13100	46600	330	38000	63400	4140	1530	19.6	4.84	4.32	94.4
PCPu120/1-7-239 5 nm	5450	12300	41000	204	24400	46100	3570	1110	15.3	1.22	0.906	69.8
PCPu120/1-7-239 AS	85	283	1670	19	4880	6630	321	131	2.55	10.1	3.55	24
PCPu120/1-7-240 0.45 μm	7380	12100	44200	12	48400	76200	3020	338	15	3.84	4.63	75.5
PCPu120/1-7-240 0.1 μm	7560	11600	42800	318	46400	71400	3870	1580	14.9	5.01	5.82	74.1
PCPu120/1-7-240 5 nm	7400	12300	41900	204	35200	58600	3390	1200	13	1.58	0.907	58.3
PCPu120/1-7-240 AS	7380	12100	44200	12	48400	76200	3020	338	15	3.84	4.63	75.5
PCPu120/1-7-Blank 0.45 μm	3.5	28	139	11	11	323	19	50	<0.04	0.684	<0.01	<0.03
PCPu120/1-7-Blank 0.1 μm	101	270	1280	359	227	1330	721	1350	<0.4	2.14	0.884	<0.3
PCPu120/1-7-Blank 5 nm	106	278	1570	370	224	1630	841	1620	<0.4	2.43	0.886	<0.3
PCPu120/1-7-Blank AS	3.0	24	61	9.0	77	215	14	60	0.096	0.222	0.027	<0.03
PCPu120/1-14-237 0.45 μm	7290	17800	53000	29	48000	73200	6240	1470	23.8	8.01	7.14	120
PCPu120/1-14-237 0.1 μm	7440	19600	51200	208	51600	78500	6260	1630	25.3	7.52	6.89	122
PCPu120/1-14-237 5 nm	6940	19400	46400	21	28500	53900	5580	1050	18.7	1.25	<0.2	82.2
PCPu120/1-14-237 AS	71	78	871	21	4430	4370	143	100	1.36	5.26	1.88	10.9
PCPu120/1-14-238 0.45 μm	6580	26500	46300	16	48200	80500	4840	315	24.4	3.61	8.64	116
PCPu120/1-14-238 0.1 μm	6900	26900	46600	154	48000	80100	6770	1400	25.2	4.31	8.35	102
PCPu120/1-14-238 5 nm	6530	27400	44100	16	27700	56300	6240	992	19.9	0.87	<0.2	75.7
PCPu120/1-14-238 AS	116	296	3230	25	5320	8230	510	127	4.02	14.7	9.06	37.6
PCPu120/1-14-238R 0.45 μm	7230	28800	48400	15	52000	83400	5420	277	27.8	3.58	8.17	137
PCPu120/1-14-238R 0.1 μm	8910	35600	62000	214	64800	101000	8690	1870	35.3	5.33	10.8	152
PCPu120/1-14-238R 5 nm	7180	28800	47100	16	25900	52500	6590	1210	22.9	1.16	<0.2	90.5
PCPu120/1-14-238R AS	6	63	247	30	701	1390	90	104	0.366	1.47	4.16	0.953
PCPu120/1-14-239 0.45 μm	7300	20700	45600	21	45700	78500	4430	368	27.2	10.5	7.88	167
PCPu120/1-14-239 0.1 μm	7890	20500	46500	152	43600	73600	6590	1530	26.9	10.7	7.58	144
PCPu120/1-14-239 5 nm	7490	22200	45600	103	25700	57500	5850	1480	22	2.46	<0.2	103
PCPu120/1-14-239 AS	35	117	1260	53	2840	4070	218	171	2.02	5.99	3.74	18.4
PCPu120/1-14-240 0.45 μm	8680	17000	45500	14	57400	89200	4000	303	23.5	6	7.4	155
PCPu120/1-14-240 0.1 μm	8920	17500	46800	177	57900	88900	5890	1550	23.9	7.1	7.74	138
PCPu120/1-14-240 5 nm	8470	17100	42800	28	36500	64200	5210	1360	18.1	1.61	<0.2	95.4

Table 22B: Measured Solution Concentrations, in µg/L (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	^{239}Pu	Total ^{239}Pu+^{240}Pu	Cl	I
PCPu120-91-239 0.45 µm	71.5	57.9	109	51.3	163	24.1	3.31	148	57.6	65.90	68300	84.8
PCPu120-91-239 0.1 µm	72.9	61.7	109	53.3	175	25.5	3.36	135	52.5	60.07		
PCPu120-91-239 5 nm	2.2	0.293	0.98	0.353	0.541	<0.3	0.227	102	0.741	0.85		
PCPu120-91-239 AS	44.4	29.6	55.5	26.1	88.1	11.9	1.2	153	89.3	102.17		
PCPu120-91-240 0.45 µm	13.5	28.2	70.7	31.7	104	16.8	2.15	114	126	144.16	48900	80.9
PCPu120-91-240 0.1 µm	14	28.4	67.7	30.9	106	16.9	2.37	60.5	125	143.02		
PCPu120-91-240 5 nm	2.09	0.25	0.977	0.356	0.488	<0.3	0.233	53.6	0.64	0.73		
PCPu120-91-240 AS	22.3	22.4	38.2	19.7	63.5	8.97	0.989	25.5	119	136.16		
PCPu120-91-Blank 0.45 µm	0.93	0.011	0.027	0.015	<0.03	<0.02	<0.02	6.53	0.01	0.01	730	3.83
PCPu120-91-Blank 0.1 µm	4.32	0.208	0.772	0.301	<0.4	<0.3	0.269	8.08	0.1	0.11		
PCPu120-91-Blank 5 nm	<1.8	0.172	0.717	0.276	<0.4	<0.3	0.239	2.51	0.1	0.11		
PCPu120-91-Blank AS	0.879	0.05	0.046	0.006	<0.03	<0.02	<0.02	<1.03	<0.01	0.00		
HIP U,Pu-loaded CWF at 120 (												
PCPu120/1-7-237 0.45 µm	9.72	6.06	13.8	6.45	21.7	3.33	0.415	47	19.3	22.08	28800	32.9
PCPu120/1-7-237 0.1 µm	10.1	6.24	13.1	6.4	22.9	4.04	0.595	41.7	16.9	19.34		
PCPu120/1-7-237 5 nm	1.23	0.203	<0.3	0.144	0.53	<0.3	0.164	9.25	0.1	0.11		
PCPu120/1-7-237 AS	8.69	5.17	9.97	4.81	16.2	2.4	0.22	33.8	24.2	27.69		
PCPu120/1-7-238 0.45 µm	5.37	10.1	30.3	12.5	41.8	6.38	0.869	16.1	100	114.42	32500	27.7
PCPu120/1-7-238 0.1 µm	5.2	9.75	27.7	12.3	41	6.16	1.04	13.2	87.3	99.89		
PCPu120/1-7-238 5 nm	8.63	0.227	<0.3	0.21	0.807	0.367	0.187	3.46	0.156	0.18		
PCPu120/1-7-238 AS	41.9	30.8	57.4	28.2	93.5	13.5	1.35	62.7	181	207.09		
PCPu120/1-7-239 0.45 µm	10.3	5.91	14	6.5	21.4	3.21	0.452	17.6	20.7	23.68	31200	38.5
PCPu120/1-7-239 0.1 µm	10.7	5.87	13	6.27	21.3	3.75	0.617	12.8	18	20.59		
PCPu120/1-7-239 5 nm	1.71	0.22	<0.3	0.154	0.67	0.307	0.161	4.95	0.143	0.16		
PCPu120/1-7-239 AS	19.3	8.93	16.7	7.82	25.7	3.9	0.378	49.5	22.4	25.63		
PCPu120/1-7-240 0.45 µm	10.2	6.82	18.7	8.27	27.8	4.48	0.619	16.1	49	56.06	29400	50.5
PCPu120/1-7-240 0.1 µm	10.5	6.81	17.5	8.08	27	4.63	0.797	13.7	43.4	49.66		
PCPu120/1-7-240 5 nm	1.87	0.389	<0.3	0.169	0.662	0.31	0.171	7.36	0.15	0.17		
PCPu120/1-7-240 AS	10.2	6.82	18.7	8.27	27.8	4.48	0.619	16.1	49	56.06		
PCPu120/1-7-Blank 0.45 µm	0.574	<0.01	<0.03	<0.01	0.011	<0.03	<0.01	0.082	0.01	0.01	660	3.7
PCPu120/1-7-Blank 0.1 µm	2.08	0.204	<0.3	0.147	0.537	0.301	0.161	<0.8	0.1	0.11		
PCPu120/1-7-Blank 5 nm	2.13	0.218	<0.3	0.154	0.523	<0.3	0.175	<0.8	0.1	0.11		
PCPu120/1-7-Blank AS	1.31	0.174	0.118	0.013	0.144	<0.03	<0.01	1.17	0.102	0.12		
PCPu120/1-14-237 0.45 µm	18.4	11.4	24.4	11.8	38	5.97	0.808	60	35.8	40.96	28500	40.3
PCPu120/1-14-237 0.1 µm	17.5	10.7	23.1	10.7	35.8	6.02	0.845	52.9	32.3	36.96		
PCPu120/1-14-237 5 nm	2.61	0.357	1.11	0.745	0.282	0.324	0.148	14	0.3	0.34		
PCPu120/1-14-237 AS	11.9	5.06	8.59	3.83	13.3	1.72	0.209	19.1	9.79	11.20		
PCPu120/1-14-238 0.45 µm	7.38	14.2	37.1	15.9	54.4	8.02	1.1	26.1	118	135.01	21700	31.4
PCPu120/1-14-238 0.1 µm	8.32	13.9	35.4	15.6	52.1	8.69	1.2	20.9	106	121.28		
PCPu120/1-14-238 5 nm	1.83	0.348	1.1	0.717	0.284	0.343	0.135	6.98	0.3	0.34		
PCPu120/1-14-238 AS	24.7	21.9	39.2	19.2	63.2	9.18	0.983	39.9	143	163.62		
PCPu120/1-14-238R 0.45 µm	7.06	14.1	36.1	15.3	52.1	7.86	1.03	20.7	99.7	114.07	22300	36.6
PCPu120/1-14-238R 0.1 µm	10.9	17.6	44.5	19.6	64.7	10.5	1.36	29.2	151	172.77		
PCPu120/1-14-238R 5 nm	2.22	0.385	1.18	0.777	0.395	0.342	0.154	5.98	0.3	0.34		
PCPu120/1-14-238R AS	4.99	12.6	32.5	9.67	31.7	4.07	0.571	1.6				
PCPu120/1-14-239 0.45 µm	31.1	14.5	30.4	13.9	46.1	6.94	0.896	38.5	29.2	33.41	28500	39.1
PCPu120/1-14-239 0.1 µm	30.7	14.2	29.4	13.8	44.5	7.01	1.05	30.4	25.2	28.83		
PCPu120/1-14-239 5 nm	3.94	0.5	1.53	0.743	0.334	0.342	0.146	15.5	0.3	0.34		
PCPu120/1-14-239 AS	12.5	8.4	16.7	7.89	26.9	3.85	0.389	47.1	35.7	40.85		
PCPu120/1-14-240 0.45 µm	18.6	11.6	27.7	12.2	41.8	6.52	0.852	21.8	62.3	71.28	29000	61.1
PCPu120/1-14-240 0.1 µm	19.5	11.9	28.5	12.9	42	7.2	1.04	20.4	60.1	68.76		
PCPu120/1-14-240 5 nm	3.33	0.38	1.1	0.736	0.244	0.369	0.149	11.5	0.3	0.34		

Table 22B: Measured Solution Concentrations, in µg/L (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PCPu120/1-14-240 AS	29	82	1000	49	1980	3180	198	116	1.55	3.93	2.84	14.5
PCPu120/1-14-Blank 0.45 µm	1.9	27	131	7.1	7.1	132	90	52	<0.03	0.505	<0.02	<0.02
PCPu120/1-14-Blank 0.1 µm	170	668	2130	192	71	1320	1780	1310	0.516	1.76	<0.2	0.423
PCPu120/1-14-Blank 5 nm	164	681	2260	223	71	1490	1800	1400	0.496	2.17	<0.2	0.366
PCPu120/1-14-Blank AS	2.5	27	84	4.7	17	132	90	32	0.069	0.065	<0.02	<0.02
PCPu120/1-28-237 0.45 µm	10100	23200	47400	39	47400	84900	4760	378	21.8	13.8	13.7	94.6
PCPu120/1-28-237 0.1 µm	10100	22600	47500	161	48200	82900	5450	1800	20.8	14.1	13.7	88.4
PCPu120/1-28-237 5 nm	9590	23200	45100	24	27800	61200	4760	1260	16	1.6	0.32	52.1
PCPu120/1-28-237 AS	172	190	2840	29	7260	9310	648	88	5.01	13.1	7.88	40.3
PCPu120/1-28-238 0.45 µm	9890	35100	47500	23	45900	81700	4430	334	18.2	12.2	11.7	65.4
PCPu120/1-28-238 0.1 µm	12300	43700	58300	194	57200	96700	6420	1810	22.9	15.4	14.7	78.5
PCPu120/1-28-238 5 nm	9320	34700	44100	24	24300	56500	4460	1200	13.4	1.61	<0.3	36.6
PCPu120/1-28-238 AS	214	696	5570	34	8200	13800	958	138	7.95	23.1	11.3	72.5
PCPu120/1-28-239 0.45 µm	10200	23300	47000	32	50100	90000	4400	435	22.9	15.6	11.4	119
PCPu120/1-28-239 0.1 µm	10100	22900	45400	219	48800	83600	5370	1710	22.7	15.9	12	112
PCPu120/1-28-239 5 nm	9920	24100	44900	24	29600	65700	4440	1500	16.3	1.9	<0.3	58.3
PCPu120/1-28-239 AS	213	597	4940	28	7610	11300	935	130	6.56	20.9	14.8	55.8
PCPu120/1-28-240 0.45 µm	11400	19100	43600	29	48200	89900	4050	422	21.1	14	11.5	118
PCPu120/1-28-240 0.1 µm	11900	20000	45200	133	50900	90500	5060	1590	21.1	15	12.8	116
PCPu120/1-28-240 5 nm	11900	22100	46000	24	32300	72700	4490	1680	15.3	2.38	0.477	61.1
PCPu120/1-28-240 AS	336	559	5140	29	10200	14600	1100	181	7.34	20	8.59	62.9
PCPu120/1-28-Blank 0.45 µm	3.2	19	155	7.5	2.2	38	13	28	<0.04	0.49	<0.03	<0.03
PCPu120/1-28-Blank 0.1 µm	153	999	1480	184	82	1190	888	1320	<0.4	1.46	<0.3	<0.3
PCPu120/1-28-Blank 5 nm	153	965	1780	165	70	1410	900	1500	0.446	1.99	<0.3	<0.3
PCPu120/1-28-Blank AS	17	77	821	4.6	884	1650	122	24	0.968	2.58	0.788	8.7
PCPu120/1-56-237 0.45 µm	11000	27000	39700	16	44500	85200	4100	295	17.3	5.34	13.4	65.4
PCPu120/1-56-237 0.1 µm	12500	33600	44400	512	50100	94800	6030	2740	18	8.67	17.9	66.9
PCPu120/1-56-237 5 nm	11600	29700	39000	226	27900	63900	5150	1300	13.4	1.48	0.531	41.9
PCPu120/1-56-237 AS	229	99	2400	23	6860	8000	687	110	5.5	22.4	10.2	44.3
PCPu120/1-56-238 0.45 µm	12500	49800	46200	27	45800	89900	4650	360	19.4	12.7	14.9	77
PCPu120/1-56-238 0.1 µm	13600	53100	49200	412	48000	92900	6600	2480	20.7	15.4	16	79.7
PCPu120/1-56-238 5 nm	11800	50500	42700	231	21300	58500	5060	1280	12.5	1.47	0.516	38.7
PCPu120/1-56-238 AS	145	204	3000	30	4870	8320	541	126	4.26	14.5	9.65	37.4
PCPu120/1-56-239 0.45 µm	12100	31300	46300	15	44500	86500	3890	327	18.8	4.91	10.4	78.8
PCPu120/1-28-239 0.1 µm	12900	35800	42100	359	49400	97100	5560	1670	18.9	5.83	11.4	79.5
PCPu120/1-56-239 5 nm	12000	35900	38700	230	30400	73000	4880	1340	14.1	1.27	0.496	50.9
PCPu120/1-56-239 AS	104	99	1780	14	3880	5280	364	96	2.86	14.6	7.57	25.8
PCPu120/1-56-240 0.45 µm	14300	26700	36900	21	49900	93700	3650	338	17	5.84	13.3	82.4
PCPu120/1-56-240 0.1 µm	16300	33000	43800	376	60700	114000	5700	1720	18.7	7.45	15.5	91.4
PCPu120/1-56-240 5 nm	13800	28000	35400	244	34700	73800	4490	1420	12.5	1.75	0.521	49.9
PCPu120/1-56-240 AS	17	99	394	69	987	1720	90	493	0.581	3.06	3.45	5.55
PCPu120/1-56-Blank 0.45 µm	2.7	99	124	10	15	5440	39	63	0.076	0.448	0.35	<0.02
PCPu120/1-56-Blank 0.1 µm	103	994	2060	440	305	6230	1420	1630	<0.3	1.97	0.528	<0.2
PCPu120/1-56-Blank 5 nm	102	994	2340	404	296	7070	1450	1650	0.335	2.16	0.484	<0.2
PCPu120/1-56-Blank AS	2.7	99	109	10	14	2180	39	63	0.044	0.076	<0.02	<0.02
PCPu120/1-91-237 0.45 µm	15700	34400	48100	107	61800	105000	8720	721	48.4	35.6	22	269
PCPu120/1-91-237 0.1 µm	16900	36000	50100	240	61900	107000	8640	1330	46.9	37.4	30	261
PCPu120/1-91-237 5 nm	15100	37800	46200	60	21700	65200	5360	578	19.2	1.47	0.116	71.4
PCPu120/1-91-237 AS	199	216	1550	31	4340	6550	387	117	3.300	9.29	4.45	26.900
PCPu120/1-91-238 0.45 µm	16600	54400	51600	82	54300	109000	7740	570	40.1	31.7	19.9	189

Table 22B: Measured Solution Concentrations, in μg/L (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	^{239}Pu	Total ^{239}Pu+^{240}Pu	Cl	I
PCPu120/1-14-240 AS	8.83	6.66	12.7	6.19	20.9	2.94	0.305	14.9	51.4	58.81		
PCPu120/1-14-Blank 0.45 μm	0.745	<0.01	<0.1	<0.01	<0.02	<0.03	<0.01	<0.13	0.03	0.03	270	1.15
PCPu120/1-14-Blank 0.1 μm	2.51	0.341	1.04	0.715	<0.2	0.316	0.147	<1.3	0.3	0.34		
PCPu120/1-14-Blank 5 nm	2.79	0.342	1.08	0.712	<0.2	0.315	0.154	<1.3	0.3	0.34		
PCPu120/1-14-Blank AS	0.918	0.016	<0.1	<0.01	<0.02	<0.03	<0.01	<0.13	<0.03	0.00		
PCPu120/1-28-237 0.45 μm	33.9	24.7	52.5	24.1	80.1	12.3	1.56	119	48	54.92	32400	39.6
PCPu120/1-28-237 0.1 μm	32.4	22.7	45.5	21.9	73	11.3	1.63	103	41.9	47.94		
PCPu120/1-28-237 5 nm	2.33	0.177	0.789	0.283	<0.4	<0.3	0.241	31.3	0.112	0.13		
PCPu120/1-28-237 AS	24.7	17	32.2	15.5	51.6	7.64	0.747	89.8	64.2	73.46		
PCPu120/1-28-238 0.45 μm	24.9	22.7	47.5	22	73.3	11.2	1.55	34.5	107	122.43	27700	33.7
PCPu120/1-28-238 0.1 μm	31.2	27	55.3	26.5	87.6	13.7	2.1	37.9	118	135.01		
PCPu120/1-28-238 5 nm	3.3	0.187	0.811	0.28	<0.4	<0.3	0.238	14.1	0.326	0.37		
PCPu120/1-28-238 AS	41.9	28.7	52.7	25.6	84.8	12.5	1.13	176	90.9	104.00		
PCPu120/1-28-239 0.45 μm	46.9	24.4	48.1	22.8	72.9	10.4	1.36	61.8	31	35.47	33500	45.6
PCPu120/1-28-239 0.1 μm	45.1	24.1	46	21.8	70.6	9.87	1.58	51.1	27.4	31.35		
PCPu120/1-28-239 5 nm	3	0.206	0.748	0.278	<0.4	<0.3	0.241	29.3	0.102	0.12		
PCPu120/1-28-239 AS	33.8	26.9	49.5	22.7	76.8	11.2	1.17	51.5	155	177.35		
PCPu120/1-28-240 0.45 μm	41.6	21.2	45.4	21.4	70.4	10.6	1.43	34.6	76.7	87.76	31400	60.8
PCPu120/1-28-240 0.1 μm	40.6	22.1	43.6	20.8	69.9	11.2	1.53	31.1	66.9	76.54		
PCPu120/1-28-240 5 nm	3.48	0.512	1.48	0.572	1.38	<0.3	0.268	18.8	1.54	1.76		
PCPu120/1-28-240 AS	37.9	23.5	43.5	21	67.8	9.54	0.958	28.8	120	137.30		
PCPu120/1-28-Blank 0.45 μm	0.286	<0.01	<0.01	0.001	<0.04	<0.03	<0.01	<0.09	0.01	0.01	420	4.31
PCPu120/1-28-Blank 0.1 μm	<1.8	0.168	0.792	0.265	<0.4	<0.3	0.223	<0.9	0.1	0.11		
PCPu120/1-28-Blank 5 nm	<1.8	0.186	0.74	0.265	<0.4	<0.3	0.229	<0.9	0.1	0.11		
PCPu120/1-28-Blank AS	4.63	2.57	4.66	2.16	7.32	0.932	0.087	3.95	7.42	8.49		
PCPu120/1-56-237 0.45 μm	10.6	19.8	47.7	21.6	71.8	11.6	1.4	128	70.9	81.12	25400	46
PCPu120/1-56-237 0.1 μm	14	24.3	55.8	26	86.9	15.2	1.77	211	90.5	103.55		
PCPu120/1-56-237 5 nm	1.84	0.459	<1.8	0.377	0.388	0.752	0.31	21	0.15	0.17		
PCPu120/1-56-237 AS	53.2	24.1	44.3	22.2	70	10	1.19	68.9	51.5	58.92		
PCPu120/1-56-238 0.45 μm	27	28.4	61.9	28.7	92.7	13.9	1.89	55.7	144	164.76	23000	38
PCPu120/1-56-238 0.1 μm	28.8	28.5	60.8	28.4	91	14.3	2.17	47.3	140	160.18		
PCPu120/1-56-238 5 nm	2.16	0.438	<1.8	0.344	0.33	0.761	0.311	23.2	0.308	0.35		
PCPu120/1-56-238 AS	25.7	21.5	38.1	18.7	60.1	8.37	0.935	40.5	153	175.06		
PCPu120/1-56-239 0.45 μm	12.6	17.4	42	18.8	61.5	9.52	1.18	82	52	59.50	27500	49
PCPu120/1-28-239 0.1 μm	13.1	17.3	40.5	18.5	59.2	9.82	1.44	58.3	42.9	49.08		
PCPu120/1-56-239 5 nm	1.75	0.434	<1.8	0.354	0.375	0.718	0.308	32.7	0.171	0.20		
PCPu120/1-56-239 AS	38.5	19.7	33.6	17.3	53.8	7.89	0.907	49.5	31.4	35.93		
PCPu120/1-56-240 0.45 μm	18.6	22	52	23.7	78.1	11.9	1.46	42.4	129	147.60	26500	68
PCPu120/1-56-240 0.1 μm	18.3	25.4	56.8	26.3	86.3	14	1.94	40.6	124	141.88		
PCPu120/1-56-240 5 nm	2.97	0.482	<1.8	0.371	0.366	0.761	0.316	22.2	0.364	0.42		
PCPu120/1-56-240 AS	9.09	8.11	17.2	7.9	24.2	3.65	0.405	3.87	36.5	41.76		
PCPu120/1-56-Blank 0.45 μm	0.79	1.07	1.85	0.876	2.85	0.416	0.042	<0.2	0.01	0.01	250	1
PCPu120/1-56-Blank 0.1 μm	1.59	0.427	<1.8	0.34	0.336	0.7	0.302	<2	0.1	0.11		
PCPu120/1-56-Blank 5 nm	1.78	0.428	<1.8	0.336	0.286	0.727	0.311	<2	0.1	0.11		
PCPu120/1-56-Blank AS	1.26	0.015	<0.18	0.009	0.029	<0.02	<0.01	<0.2	<0.01	0.00		
PCPu120/1-91-237 0.45 μm	99.1	54.8	111	49.8	162	22.9	2.8	201	91.8	105.03	34000	83.3
PCPu120/1-91-237 0.1 μm	94	63.3	125	53.6	184	26.2	3.27	171	70.6	80.78		
PCPu120/1-91-237 5 nm	2.55	4.66	0.2	3.63	0.4	0.1	0.17	33.1	0.239	0.27		
PCPu120/1-91-237 AS	18.100	12.300	27.100	11.600	42.3	5.79	0.627	47.9	51.6	59.04		
PCPu120/1-91-238 0.45 μm	72.2	48.2	100	45.7	154	21.9	2.87	114	236	270.02	29000	67

Table 22B: Measured Solution Concentrations, in µg/L (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PCPu120/1-91-238 0.1 µm	19300	64300	60100	283	59700	114000	9510	1420	45	36.5	27.9	210
PCPu120/1-91-238 5 nm	15900	61500	51200	77	17300	63400	5980	688	19.1	1.84	0.274	59.1
PCPu120/1-91-238 AS	132	306	1950	26	3660	5840	353	103	2.980	10.10	4.88	26.100
PCPu120/1-91-239 0.45 µm	16700	38400	44100	83	57000	111000	7020	634	44.3	27.1	19.3	253
PCPu120/1-91-239 0.1 µm	22700	51900	60700	331	76100	138000	9910	1560	55	37.1	34.5	314
PCPu120/1-91-239 5 nm	15500	42100	42500	60	22000	66700	4930	555	18.4	1.45	0.1	72.9
PCPu120/1-91-239 AS	80	152	1280	15	2460	4240	260	70	2.370	8.15	4.81	21.400
PCPu120/1-91-240 0.45 µm	18300	32600	40600	53	58400	113000	6210	481	37	18.3	17.6	224
PCPu120/1-91-240 0.1 µm	21100	38800	48400	266	66700	121000	7600	1330	40.7	21.1	25.9	246
PCPu120/1-91-240 5 nm	18200	33700	38600	60	25300	70400	4390	553	16.2	1.47	0.186	69.2
PCPu120/1-91-240 AS	91	133	632	31	2470	3550	163	101	1.580	8.72	2.95	14.50
PCPu120/1-91-Blank 0.45 µm	0.74	24	177	24	19	159	22	113	0.118	0.623	0.02	0.017
PCPu120/1-91-Blank 0.1 µm	17	111	933	214	515	760	597	845	0.1	1.32	0.117	0.1
PCPu120/1-91-Blank 5 nm	17	153	1190	217	515	1150	593	1080	0.1	1.76	0.10	0.137
PCPu120/1-91-Blank AS	0.74	10	27	7.2	19	214	22	29	0.144	0.12	0.04	0.022
PC U,Pu-loaded CWF GPC00202 at 90 and 120C and mass ratio 1:10												
RWS 1 (PC CWF 202)	282	575	172000	5.50	37	7330	1560	4130	2.31	6.31	0.20	105.00
RWS 2 (PC CWF 202)	339	620	255000	5.50	37	10000	1760	4560	3.39	7.32	0.20	129.00
RWS 3 (PC CWF 202)	268	396	140000	5.50	37	4910	1440	3190	2.64	6.88	0.20	85.30
PuPC90-7-202a 0.45 µm	5300	1710	73500	114	15200	25500	2270	300	16.80	6.73	1.84	134.00
PuPC90-7-202a 0.1µm												
PuPC90-7-202a 0.005µm												
PuPC90-7-202a AS	141	486	4470	111	5370	7730	591	201	5.50	20.50	34.50	46.00
PuPC90-7-202b 0.45 µm	4830	1750	43900	29	20600	33100	1810	217	14.60	4.16	1.69	120.00
PuPC90-7-202b 0.1µm												
PuPC90-7-202b 0.005µm												
PuPC90-7-202b AS	105	390	3280	140	4030	5810	469	237	4.87	18.70	11.50	37.90
PuPC90-7-202c 0.45 µm	5100	2140	44100	30	20700	35400	2100	237	18.20	7.91	2.06	150.00
PuPC90-7-202c 0.1µm												
PuPC90-7-202c 0.005µm												
PuPC90-7-202c AS	316	1040	8890	156	11300	16400	1280	357	12.70	45.40	17.50	90.70
PuPC90-7-Blank a 0.45 µm	0.91	11	239	60	14	51	73	562	0.36	1.58	0.08	0.11
PuPC90-7-Blank a 0.1µm	599	411	1090	195	21	26	564	2090	0.30	4.75	0.20	0.60
PuPC90-7-Blank a 0.005µm	597	405	1180	232	21	116	613	2400	0.30	9.33	0.20	0.53
PuPC90-7-Blank a AS	1.8	23	144	86	157	145	32	52	0.19	0.48	1.05	0.53
PCPu120-7-202a 0.45 µm	12000	7480	61500	9	39400	73900	5820	605	36.00	9.35	16.40	298.00
PuPC120-7-202a 0.1µm	12800	7890	67800	9	42600	81500	6550	1480	36.90	6.55	16.00	302.00
PuPC120-7-202a 0.005µm	12800	8080	65000	9	36800	71600	5840	903	33.20	2.37	0.10	263.00
PuPC120-7-202a AS	114	117	1500	37	5940	8380	352	173	3.44	20.10	6.90	43.20
PCPu120-7-202b 0.45 µm	11600	6860	60400	9	40200	73000	5900	629	39.70	5.25	18.50	344.00
PuPC120-7-202b 0.1µm	13100	7840	68900	9	46300	84900	6550	1180	41.10	5.42	19.30	384.00
PuPC120-7-202b 0.005µm	12800	7830	65800	9	39800	74300	6070	805	37.70	1.78	0.10	339.00
PuPC120-7-202b AS	386	1540	12000	77	14800	25400	1870	361	16.90	61.50	22.90	129.00
PCPu120-7-202c 0.45 µm	12400	7700	62500	9	44400	82200	6690	765	42.60	6.05	20.10	373.00
PuPC120-7-202c 0.1µm	13500	8310	66000	9	46900	87000	6250	1160	42.20	5.42	18.60	382.00
PuPC120-7-202c 0.005µm	13000	8180	65900	9	41100	76400	7110	947	40.70	3.45	0.10	361.00
PuPC120-7-202c AS	217	963	7620	50	9950	16500	1240	243	12.00	46.40	19.30	90.60
PCPu120-7-Blank a	14	29	289	16	12	51	79	76	0.04	1.00	0.01	0.03
PuPC120-7-Blank a 0.1µm	195	346	2300	14	33	115	864	955	0.40	1.88	0.10	0.30
PuPC120-7-Blank a 0.005µm	193	362	3030	8.9	33	115	1690	576	0.40	1.42	0.10	0.30
PuPC120-7-Blank a AS	14	21	207	10	12	169	53	37	0.08	0.43	0.27	0.03

Table 22B: Measured Solution Concentrations, in μg/L (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	^{239}Pu	Total ^{239}Pu+^{240}Pu	Cl	I
PCPu120/1-91-238 0.1 μm	81.1	61.8	127	54.8	188	26.4	3.64	95.1	208	237.99		
PCPu120/1-91-238 5 nm	3.82	4.97	0.2	3.94	1.39	0.163	0.166	27.6	2.41	2.76		
PCPu120/1-91-238 AS	17.500	13.500	28.200	12.400	45.5	6.21	0.704	23.7	125	143.02		
PCPu120/1-91-239 0.45 μm	78.9	48.3	98.3	45.3	153	21.3	2.62	173	74.7	85.47	32300	85.7
PCPu120/1-91-239 0.1 μm	99.9	73.8	146	63.8	218	30.9	3.87	190	71.7	82.04		
PCPu120/1-91-239 5 nm	4.93	4.63	0.2	3.6	0.4	0.1	0.143	62	0.335	0.38		
PCPu120/1-91-239 AS	16.000	12.100	25.200	11.400	42.2	6.03	0.577	60.9	55.8	63.84		
PCPu120/1-91-240 0.45 μm	55.2	35.6	77.6	34.5	126	18.6	2.28	74.1	161	184.21	31300	174
PCPu120/1-91-240 0.1 μm	59.8	49.1	96.7	44.4	152	23.4	2.76	60.9	158	180.78		
PCPu120/1-91-240 5 nm	4.39	4.77	0.2	3.76	0.774	0.1	0.158	20.6	0.945	1.08		
PCPu120/1-91-240 AS	18.900	8.320	16.900	7.580	27.200	3.740	0.42	9.34	19.5	22.31		
PCPu120/1-91-Blank 0.45 μm	0.985	0.01	0.01	0.003	0.02	0.02	0.01	0.1	0.01	0.01	250	<20.1
PCPu120/1-91-Blank 0.1 μm	4.22	4.63	0.2	3.6	0.4	0.1	0.18	2.19	0.1	0.11		
PCPu120/1-91-Blank 5 nm	1.7	4.59	0.2	3.58	0.4	0.1	0.146	1.97	0.1	0.11		
PCPu120/1-91-Blank AS	0.699	0.055	0.104	0.013	0.062	0.02	0.01	0.266	0.075	0.09		
PC U,Pu-loaded CWF GPC002												
RWS 1 (PC CWF 202)	68.70	0.10	0.10	0.10	0.20	0.30	0.35	0.20	<0.917	1.05	318000	513
RWS 2 (PC CWF 202)	78.60	0.10	0.10	0.10	0.20	0.30	0.38	0.20	<1.13	1.29	421000	679
RWS 3 (PC CWF 202)	58.30	0.10	0.10	0.10	0.20	0.30	0.34	0.20	<0.691	0.79	264000	414
PuPC90-7-202a 0.45 μm	78.00	2.69	4.38	2.12	6.03	0.74	0.20	5.06		5.79	114000	53.7
PuPC90-7-202a 0.1μm												
PuPC90-7-202a 0.005μm												
PuPC90-7-202a AS	103.00	17.40	28.00	12.70	39.80	4.86	0.74	19.60	5.06	5.79		
PuPC90-7-202b 0.45 μm	71.50	2.07	3.84	1.75	5.25	0.71	0.19	5.21		6.00	52000	41.2
PuPC90-7-202b 0.1μm												
PuPC90-7-202b 0.005μm												
PuPC90-7-202b AS	104.00	14.50	23.20	10.50	32.20	3.70	0.63	11.60	5.24	6.00		
PuPC90-7-202c 0.45 μm	225.00	3.98	8.68	3.59	10.70	1.41	0.36	7.43		14.19	50400	39.2
PuPC90-7-202c 0.1μm												
PuPC90-7-202c 0.005μm												
PuPC90-7-202c AS	242.00	37.40	58.80	27.60	83.60	9.60	1.45	23.10	12.4	14.19		
PuPC90-7-Blank a 0.45 μm	2.69	0.02	0.04	0.02	0.05	0.03	0.00	0.13		0.00	1200	7.39
PuPC90-7-Blank a 0.1μm	12.20	9.61	5.42	8.74	0.10	0.30	0.19	0.50		0.00		
PuPC90-7-Blank a 0.005μm	0.83	10.50	5.44	8.71	0.10	0.30	0.22	0.50		0.00		
PuPC90-7-Blank a AS	3.87	0.28	0.40	0.17	0.58	0.07	0.02	0.52		0.00		
PCPu120-7-202a 0.45 μm	92.70	32.90	89.60	39.10	107.00	12.70	3.59	24.00	118	135.01	87300	53.9
PuPC120-7-202a 0.1μm	57.10	30.80	86.60	37.60	103.00	12.90	3.43	18.60	116	132.72		
PuPC120-7-202a 0.005μm	31.60	0.10	0.33	5.94	0.94	0.20	0.30	10.70	0.455	0.52		
PuPC120-7-202a AS	120.00	13.00	18.60	10.00	31.90	3.92	0.88	10.80				
PCPu120-7-202b 0.45 μm	56.80	35.50	92.80	40.00	112.00	14.10	3.71	26.20	103	117.85	90400	49.3
PuPC120-7-202b 0.1μm	63.40	37.20	97.20	42.70	121.00	15.00	3.82	26.30	111	127.00		
PuPC120-7-202b 0.005μm	31.30	0.10	0.32	5.95	1.07	0.20	0.29	13.10	<0.332	0.38		
PuPC120-7-202b AS	357.00	57.20	84.70	42.00	130.00	15.70	2.74	32.60				
PCPu120-7-202c 0.45 μm	63.30	37.40	99.30	42.60	118.00	15.20	3.80	27.20	111	127.00	87700	50.5
PuPC120-7-202c 0.1μm	59.10	37.80	101.00	43.40	122.00	15.10	3.92	25.00	108	123.57		
PuPC120-7-202c 0.005μm	89.10	0.10	0.27	5.92	1.02	0.20	0.31	16.30	<0.261	0.30		
PuPC120-7-202c AS	245.00	42.10	64.30	30.40	96.90	11.70	2.11	32.40				
PCPu120-7-Blank a	35.30	0.01	0.02	0.01	0.03	0.02	0.01	0.01	0.01	0.01	440	7.76
PuPC120-7-Blank a 0.1μm	26.90	0.10	0.20	5.82	0.58	0.20	0.27	0.10	<0.1	0.11		
PuPC120-7-Blank a 0.005μm	29.10	0.10	0.20	5.82	0.63	0.20	0.31	0.24	<0.119	0.14		
PuPC120-7-Blank a AS	21.40	0.01	0.02	0.01	0.03	0.02	0.01	0.45		0.00		

Table 22B: Measured Solution Concentrations, in µg/L (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PuPC120-28-202a 0.45 µm	19700	11000	66500	34	52100	85100	4980	490	37.60	6.39	23.20	356.00
PuPC120-28-202a 0.1µm	17700	12100	67400	14	53400	86700	7150	1290	52.10	11.50	31.30	391.00
PuPC120-28-202a 0.005µm	18100	12400	66600	14	41400	69700	6920	930	45.50	5.21	0.23	317.00
PuPC120-28-202a AS	81	521	3310	63	4530	6810	1780	286	5.63	26.60	12.20	48.60
PuPC120-28-202b 0.45 µm	18500	10000	64000	18	49400	80900	4470	444	36.40	5.91	22.20	319.00
PuPC120-28-202b 0.1µm	19700	13100	74400	14	54300	91300	7440	1320	50.20	8.12	21.20	378.00
PuPC120-28-202b 0.005µm	17800	12000	67200	14	45400	75600	6660	1190	45.30	5.35	0.23	322.00
PuPC120-28-202b AS	133	621	4490	83	5720	9140	2250	424	7.19	28.30	14.00	54.50
PuPC120-28-202c 0.45 µm	18800	11400	67800	23	48100	82000	4440	502	38.20	4.75	15.80	310.00
PuPC120-28-202c 0.1µm	18200	12500	70100	14	54100	89000	7300	1420	50.20	9.24	31.40	389.00
PuPC120-28-202c 0.005µm	18000	11900	65200	14	44200	72200	6640	1120	44.00	5.30	0.40	315.00
PuPC120-28-202c AS	114	485	3590	56	7290	9110	1020	360	6.77	52.10	24.00	67.40
PuPc120-28-Blank a 0.45 µm	3.7	37	215	24	126	228	50	62	0.11	1.58	0.01	0.73
PuPC120-28-Blank a 0.1µm	74	1140	2280	14	2520	208	2060	1070	7.97	4.78	0.19	2.63
PuPC120-28-Blank a 0.005µm	74	1130	2450	14	2520	464	2000	924	7.18	4.62	0.15	2.51
PuPC120-28-Blank a AS	3.7	25	53	8.0	126	198	36	16	0.11	1.06	0.12	0.12
PC U,Pu-loaded CWF GPC0030m at 90C and mass ratio 1:10												
RWS AX	402	171	63100	11	223	526	1460	87	5.94	12.40	0.10	182.00
RWS AY	417	201	58100	14	237	561	1470	147	6.86	12.30	0.13	174.00
RWS scint	461	186	61100	18	380	665	1630	114	6.82	13.70	0.14	209.00
PPuPC90-7a 0.45 µm	4620	2200	32300	21	28100	36300	1700	384	12.70	1.88	1.25	137.00
PPuPC90-7a 0.1µm	4920	2980	32000	132	29000	37600	2820	1360	12.50	2.48	0.71	130.00
PPuPC90-7a 0.005µm	4340	3640	27700	6	19800	28200	2990	1160	11.20	1.59	0.10	112.00
PPuPC90-7a AS	4	42	124	20	290	343	46	351	0.12	1.15	0.71	0.91
PPuPC90-7b 0.45 µm	5470	2850	34100	24	28900	37700	2040	424	11.90	2.42	1.18	127.00
PPuPC90-7b 0.1µm	4770	3120	30600	97	28000	36100	2750	1170	11.90	2.68	0.71	128.00
PPuPC90-7b 0.005µm	4310	3710	27600	6	20800	29900	3090	1360	11.50	1.27	0.10	112.00
PPuPC90-7b AS	10	42	453	15	835	1210	102	345	0.64	3.24	1.36	4.81
PPuPC90-7c 0.45 µm	5630	3010	31700	9	27500	35900	2060	316	12.40	1.39	1.19	128.00
PPuPC90-7c 0.1µm	5890	4520	34600	111	32300	45100	3260	1070	12.90	1.75	0.82	127.00
PPuPC90-7c 0.005µm	4440	3270	28200	6	20600	28000	2670	807	11.40	0.62	0.10	106.00
PPuPC90-7c AS	9	42	382	10	670	907	82	264	0.46	2.42	1.01	3.36
PPuPC90-Blank7 0.45 µm	4.2	42	127	12	8.4	106	27	95	0.04	1.10	0.27	0.02
PPuPC90-Blank7 0.1µm	37	1390	923	155	213	361	1050	1170	0.30	1.92	0.10	0.30
PPuPC90-Blank7 0.005µm	37	1780	1280	213	213	939	1410	1270	1.13	2.53	0.10	0.30
PPuPC90-Blank7 AS	4.2	42	85	11	66	91	27	149	0.04	0.15	0.02	0.02
PPuPC90-14 0.45 µm	6240	3240	30600	25	28500	38500	1920	250	15.90	2.05	2.42	162.00
PPuPC90-14 0.1µm	6790	3860	31900	97	32000	45100	3410	1270	16.00	2.45	2.03	165.00
PPuPC90-14 0.005µm	6690	5410	30900	18	26900	39700	3640	1160	15.30	1.04	0.10	139.00
PPuPC90-14 AS	12	42	432	17	789	1110	79	107	0.69	3.15	1.86	5.60
PPuPC90-28 0.45 µm	7990	4610	28800	27	31700	45200	2500	404	17.40	3.35	3.19	166.00
PPuPC90-28 0.1µm	6840	4780	25900	90	28600	40200	2990	1490	17.10	7.31	2.92	156.00
PPuPC90-28 0.005µm	8350	6340	29200	6	24100	40700	3460	951	14.80	0.72	0.10	132.00
PPuPC90-28 AS	25	87	709	11	1070	1500	96	101	37.50	1.40	5.82	1.42
PPuPC90T-28 0.45 µm	7710	3820	29400	38	26500	35600	1920	423	11.70	3.87	1.30	108.00
PPuPC90T-28 0.1µm	7180	3790	28600	126	25400	34400	2600	1470	11.50	4.95	0.55	103.00
PPuPC90T-28 0.005µm	8530	5490	31200	6	21200	35500	3140	1290	10.80	1.09	0.10	89.20
PPuPC90T-28 AS												
PPuPC90T-28R	5580	1270	24000	26	28900	33300	1320	375	7.75	1.69	0.86	69.30

Table 22B: Measured Solution Concentrations, in µg/L (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PPuPC90T-28R AS	2	53	498	35	396	290	197	228	3.72	0.25	1.30	0.44
PPuPC90-56 0.45 µm	12000	3610	26300	36	31600	45200	2460	487	15.60	4.69	4.16	138.00
PPuPC90-56 0.1µm	9620	4500	27300	106	32200	46900	3750	1220	17.00	4.73	6.18	139.00
PPuPC90-56 0.005µm	9430	4810	26800	542	26000	39600	3570	2200	13.80	1.85	1.43	108.00
PPuPC90-56 AS	2	93	639	62	1080	1470	308	282	37.90	1.04	5.01	4.00
PPuPC90T-56 0.45 µm	11900	3670	24600	69	25100	35200	1760	449	11.20	4.56	1.95	91.90
PPuPC90T-56 0.1µm	9340	4080	26300	199	27100	37800	3100	1430	11.30	4.77	3.35	92.70
PPuPC90T-56 0.005µm	14500	6060	45800	161	21400	34600	3240	1370	9.54	0.83	1.42	65.10
PPuPC90T-56 AS	2	70	852	36	1200	867	214	287	10.60	0.57	2.69	2.20
PPuPC90Bl-56 0.45 µm	1.9	54	268	31	7.7	182	204	216	0.04	0.62	0.16	0.03
PPuPC90-56Blank 0.1 um	9.4	356	877	282	38	208	1500	1630	0.10	1.63	1.43	0.10
PPuPC90-56Blank 0.005µm	9.4	389	1440	148	38	642	1510	1460	0.10	1.75	1.45	0.10
PPuPC90-56Blank AS	4.2	42	85	11	66	91	27	149	0.04	0.15	0.02	0.02
PPuPC90-182 0.45um	4490	2660	9300	88	16600	22800	1770	735	16.10	23.80	16.30	138.00
PPuPC90-182 0.1 um	487	720	3990	6	6980	10200	1780	2640	8.18	47.50	23.00	84.60
PPuPC90-182 5 nm	14900	10000	34400	240	62600	89600	7180	3110	59.90	92.90	62.30	553.00
PPuPC90-182 AS	58	64	403	16	1240	1800	90	124	1.36	7.31	3.56	13.10
PPuPC90-365 0.45um	13400	7610	26300	175	47400	70700	4680	923	45.80	66.90	46.10	419.00
PPuPC90-365 0.1 um	12000	8900	28300	6	15400	44500	4330	2080	23.40	2.80	0.07	140.00
PPuPC90-365 5 nm	49100	29000	96800	754	178000	239000	18300	3950	182.00	286.00	182.00	1760.00
PPuPC90-365 AS	1740	1500	4210	6	2750	7760	542	124	4.06	0.72	0.01	25.50
note test duration 182 days												
HIP U,Pu-loaded CWF at 90 C and mass ratio 1:10												
PCPu90-7-237a** 0.45 µm	2880	5320	30700	47	20000	29700	1570	261	9.45	4.99	0.564	45.9
PCPu90-7-237a 0.1 µm	3490	6780	36200	39	26300	38000	3910	3090	13	13.1	0.119	52.7
PCPu90-7-237a 5 nm	3210	6460	33300	39	8650	21000	3590	3120	10.7	6.54	0.1	40.2
PCPu90-7-237a AS	1040	2550	31500	105	29700	39200	3390	513	32.4	96.6	42.6	285
PCPu90-7-238a 0.45 µm	3190	10500	31600	21	19900	30800	1960	199	10.4	3.42	0.485	36.8
PCPu90-7-238a 0.1 µm	3580	12100	35200	39	23600	35100	7670	3480	13	5.39	0.1	40.8
PCPu90-7-238a 5 nm	3320	12000	34100	39	10400	22100	3890	3400	11.7	19.7	0.1	33.3
PCPu90-7-238a AS	1420	4400	39300	38.8	43400	60800	6710	3450	41.7	146	46.8	350
PCPu90-7-239a 0.45 µm	3110	6230	28700	28	19000	30400	1820	232	12.9	1.87	0.27	75
PCPu90-7-239a 0.1 µm	3440	7290	32000	39	22500	34400	3990	3000	14.9	1.93	0.1	78.5
PCPu90-7-239a 5 nm	3360	7450	31200	39	8510	21000	3750	3060	13.1	5.71	0.1	64.4
PCPu90-7-239a AS	85.3	336	2380	146	3470	4490	349	305	3.7	12.9	7.63	33.7
PCPu90-7-240a 0.45 µm	3670	5750	28800	7	24100	36800	1360	221	7.75	2.47	0.728	39.1
PCPu90-7-240a 0.1 µm	4250	6810	33300	39	28200	42400	3510	3370	10.3	3.7	0.382	43.3
PCPu90-7-240a 5 nm	4110	6760	32100	39	14600	29600	3340	3240	9.24	1.31	0.1	34.5
PCPu90-7-240a AS	65.9	212	1820	95.5	2530	3450	222	299	2.23	9.91	3.56	20.8
PCPu90-7-Blanka 0.45 µm	4.1	31	246	66	21	179	88	145	0.196	2.29	0.765	0.805
PCPu90-7-Blanka 0.1 µm												
PCPu90-7-Blanka 5 nm												
PCPu90-7-Blanka AS												
HIP U,Pu-loaded CWF at 120 C and mass ratio 1:20												
PCPu120/1-225-237 0.45 µm	18800	46200	52800	192	70000	101000	12500	1640	77.6	81.6	61.4	515
PCPu120/1-225-237 0.1 µm	21900	53000	60300	274	73400	128000	14900	2420	86.9	90.9	60.5	568
PCPu120/1-225-237 5 nm	17700	47600	48300	67	17100	76500	7470	1310	27.8	2.02	0.1	92.5
PCPu120/1-225-237 AS	118	368	1100	24.2	3600	4610	323	101	2.86	9.18	5.64	26.6

Table 22B: Measured Solution Concentrations, in µg/L (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	^{239}Pu	Total ^{239}Pu+^{240}Pu	Cl	I
PPuPC90T-28R AS	1.51	6.72	1.14	0.57	1.32	0.08	0.02	0.57				
PPuPC90-56 0.45 µm	40.80	8.57	24.60	9.87	29.20	3.61	0.85	12.90	33.5	38.33	27900	68.4
PPuPC90-56 0.1µm	39.60	10.40	24.30	10.90	30.30	3.08	0.71	8.59	29.3	33.52		
PPuPC90-56 0.005µm	6.23	1.93	0.55	1.23	0.32	0.10	0.10	6.24	0.222	0.25		
PPuPC90-56 AS	8.52	32.60	10.70	5.94	18.00	2.11	0.38	3.84				
PPuPC90T-56 0.45 µm	25.40	3.67	8.62	4.03	12.00	1.45	0.34	7.53	17.7	20.25	26400	54.7
PPuPC90T-56 0.1µm	26.10	5.46	8.92	5.17	12.80	0.89	0.18	5.43	16.3	18.65		
PPuPC90T-56 0.005µm	6.58	1.90	0.50	1.22	0.31	0.10	0.10	3.90	0.749	0.86		
PPuPC90T-56 AS	4.00	12.60	3.44	1.67	4.60	0.51	0.10	1.42				
PPuPC90Bl-56 0.45 µm	2.11	0.22	0.08	0.14	0.04	0.02	0.02	0.12	<0.02	0.02	630	1.7
PPuPC90-56Blank 0.1 um	5.61	1.90	0.49	1.21	0.27	0.10	0.10	0.60	<0.1	0.11		
PPuPC90-56Blank 0.005µm	12.10	1.91	0.52	1.21	0.30	0.10	0.10	0.60	<0.1	0.11		
PPuPC90-56Blank AS	1.52	0.04	0.06	0.01	0.04	0.03	0.02	0.04		0.00		
PPuPC90-182 0.45um	162.00	31.60	43.00	26.20	85.10	10.10	1.91	17.90	33.6	38.44		
PPuPC90-182 0.1 um	307.00	71.00	90.00	61.40	184.00	20.20	2.97	28.90	570	652.17		
PPuPC90-182 5 nm	633.00	121.00	177.00	102.00	326.00	39.20	7.22	65.20	127	145.31		
PPuPC90-182 AS	43.80	11.00	14.00	9.53	29.50	3.53	0.60	3.71				
PPuPC90-365 0.45um	470.00	93.70	126.00	74.40	251.00	30.60	6.01	53.10	100	114.42		
PPuPC90-365 0.1 um	16.80	1.28	0.07	1.34	0.20	0.34	0.00	31.30	0.663	0.76		
PPuPC90-365 5 nm	2030.00	396.00	551.00	328.00	1050.00	130.00	24.80	200.00	388	443.94		
PPuPC90-365 AS	3.11	0.04	0.04	0.02	0.07	0.05	0.00	4.82				
note test duration 182 days												
HIP U,Pu-loaded CWF at 90 C												
PCPu90-7-237a** 0.45 µm	122	0.91	2.05	0.923	3.09	0.468	0.066	9.4	2.71	3.10	20900	37.3
PCPu90-7-237a 0.1 µm	599	0.588	1.41	0.478	2	0.2	0.1	8.67	1.89	2.16		
PCPu90-7-237a 5 nm	378	0.1	0.2	0.1	0.3	0.2	0.1	3.65	0.2	0.23		
PCPu90-7-237a AS	170	98.3	174	82.8	272	43.2	3.78	734	245	280.32		
PCPu90-7-238a 0.45 µm	124	0.64	1.35	0.624	1.98	0.326	0.034	1.57	4.24	4.85	16000	28.9
PCPu90-7-238a 0.1 µm	210	0.519	0.971	0.305	1.58	0.2	0.1	3.88	3.65	4.18		
PCPu90-7-238a 5 nm	117	0.1	0.2	0.1	0.3	0.2	0.1	3.5	0.389	0.45		
PCPu90-7-238a AS	220	116	213	97.5	309	43.9	4.23	264	436	498.86		
PCPu90-7-239a 0.45 µm	69.2	1.34	1.2	0.508	1.61	0.241	0.046	1.74	2.08	2.38	18500	36.1
PCPu90-7-239a 0.1 µm	90.7	0.472	0.987	0.312	1.48	0.2	0.1	3.87	2.14	2.45		
PCPu90-7-239a 5 nm	470	0.1	0.2	0.1	0.3	0.2	0.1	3.5	0.294	0.34		
PCPu90-7-239a AS	34.5	11.5	20.7	8.99	33.2	4.86	0.434	80.4	44.2	50.57		
PCPu90-7-240a 0.45 µm	86.6	1.21	3.11	1.34	4.36	0.727	0.143	3.03	7.59	8.68	18300	60
PCPu90-7-240a 0.1 µm	134	1	2.72	1.05	4.08	0.2	0.113	4.89	7.66	8.76		
PCPu90-7-240a 5 nm	55.2	0.1	0.2	0.1	0.3	0.2	0.1	4.61	0.297	0.34		
PCPu90-7-240a AS	20.2	7.18	12.8	5.57	19.3	2.6	0.276	10.8	25.2	28.83		
PCPu90-7-Blanka 0.45 µm	62.1	0.136	0.147	0.048	0.13	0.03	0.02	0.26	0.03	0.03	650	
PCPu90-7-Blanka 0.1 µm												
PCPu90-7-Blanka 5 nm												
PCPu90-7-Blanka AS										0.00		
HIP U,Pu-loaded CWF at 120 C												
PCPu120/1-225-237 0.45 µm	205	160	276	131	423	67.5	7.6	515	219	250.57		75.4
PCPu120/1-225-237 0.1 µm	209	157	271	127	406	63.2	6.97	412	179	204.81		
PCPu120/1-225-237 5 nm	2.5	0.1	0.1	0	0.1	0.2	0	91.1	1.17	1.34		
PCPu120/1-225-237 AS	23.1	18	38.2	16.5	51.2	7.46	0.758	46.6	108	123.57		

Table 22B: Measured Solution Concentrations, in µg/L (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PCPu120/1-225-238 0.45 µm	20400	74500	60700	187	66800	104000	13800	1920	79.8	90.9	64.3	439
PCPu120/1-225-238 0.1 µm	18700	70700	62200	136	61600	105000	14700	1690	83.3	95.8	64.9	487
PCPu120/1-225-238 5 nm	17900	76100	57600	67	18700	81900	8260	1420	30.5	10.6	6.62	114
PCPu120/1-225-238 AS	206	585	3720	36.1	5840	9050	805	132	6.38	21.5	14.4	53.9
PCPu120/1-225-239a 0.45 µm	22400	60300	54600	223	71600	94500	10200	1810	63.8	57.4	56.4	448
PCPu120/1-225-239a 0.1 µm	21100	56700	55100	411	68300	129000	10900	2370	65.5	58.8	52.6	416
PCPu120/1-225-239a 5 nm	18800	58300	51900	67	13200	85900	6670	1270	23.7	1.9	0.1	79.6
PCPu120/1-225-239a AS	196	325	2060	51	5800	7090	549	248	5.07	14.7	7.43	41
PCPu120/1-225-240a 0.45 µm	22200	49500	49900	150	73600	107000	11900	1550	79.1	72.1	60.8	565
PCPu120/1-225-240a 0.1 µm	21900	46400	50700	344	73400	126000	13000	2210	84.9	77.7	61.6	598
PCPu120/1-225-240a 5 nm	21000	50100	47500	67	18700	89800	6330	1370	22	1.9	0.1	79.2
PCPu120/1-225-240a AS	160	179	719	30.9	3390	4150	333	95.1	3.13	6.03	3.93	30.6
PCPu120/1-TBD-Blanka 0.45 µ	3.6	106	265	23	18	270	43	95	0.09	0.623	0.01	0.15
PCPu120/1-TBD-Blanka 0.1 µ	228	135	2260	247	99	534	999	1350	0.9	1.9	0.10	0.60
PCPu120/1-TBD-Blanka 5 nm	223	153	2810	276	99	980	1130	1660	0.9	1.9	0.10	0.60
PCPu120/1-TBD-Blanka AS												

Table 22B: Measured Solution Concentrations, in μg/L (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	^{239}Pu	Total $^{239}Pu+^{240}Pu$	Cl	I
PCPu120/1-225-238 0.45 μm	192	170	288	142	455	67.5	8.65	181	514	588.10		70.8
PCPu120/1-225-238 0.1 μm	198	174	289	144	477	73.1	9.2	157	454	519.45		
PCPu120/1-225-238 5 nm	16	18	29.4	14.5	47.7	7.1	0.685	52.1	51.1	58.47		
PCPu120/1-225-238 AS	40.8	40	75.3	37	125	18.9	1.78	98.9	390	446.22		
PCPu120/1-225-239a 0.45 μm	141	131	237	113	364	57.3	5.76	409	158	180.78		80.2
PCPu120/1-225-239a 0.1 μm	141	132	230	108	344	52.4	5.54	261	98.6	112.81		
PCPu120/1-225-239a 5 nm	2.5	0.1	0.1	0	0.1	0.2	0	147	2.01	2.30		
PCPu120/1-225-239a AS	32.3	25.7	48.4	24.3	75.8	11.4	1.05	85.6	85.8	98.17		
PCPu120/1-225-240a 0.45 μm	188	135	231	117	386	60.8	6.2	136	310	354.69		94.5
PCPu120/1-225-240a 0.1 μm	200	142	236	121	404	64.2	6.58	118	255	291.76		
PCPu120/1-225-240a 5 nm	2.5	0.126	0.628	0.039	0.216	0.2	0	65.8	6.8	7.78		
PCPu120/1-225-240a AS	16.2	14.1	29.3	13.3	42	6.2	0.594	10.7	83.7	95.77		
PCPu120/1-TBD-Blanka 0.45 μ	0.96	0.02	0.08	0.03	0.12	0.02	0.00	1.32	0.01	0.01	270	6.91
PCPu120/1-TBD-Blanka 0.1 μ	2.50	0.10	0.10	0.00	0.10	0.20	0.00	13.20	0.10	0.11		
PCPu120/1-TBD-Blanka 5 nm	2.50	0.10	0.10	0.00	0.10	0.20	0.00	13.20	0.10	0.11		
PCPu120/1-TBD-Blanka AS										0.00		

Table 23B. EXCEL Worksheet "corr_conc."

The worksheet "corr_conc." is used to adjust the measured solution concentrations for dilutions made during the test (e.g., by addition of HNO_3) and for background concentrations measured in the blank tests. The values of cells in the worksheet "corr_conc." are calculated using the measured concentrations for tests with CWF and blank tests in the worksheet "raw data" and the dilution factors for those solutions from the worksheet "test data." The same fractions (0.45 μm, 0.1 μm, 4 nm, or AS) for the blank test run for the same conditions as the test with CWF are used when available. Otherwise, a blank test run for similar duration at the same temperature is used. The values used are:

Concentrations of elements ***i*** from worksheet "Raw Conc."
Dilution Factor for each solution from worksheet "Test Data"

The corrected concentration for element *i* is calculated as:

= (concentration of *i* in aliquot of interest • dilution factor for aliquot of interest) - (raw concentration i for relevant blank test • dilution factor for relevant blank test)

Sample calculation for Li in test PCPu90-7-237 for the 0.45-μm filtrate
Relevant blank is PCPu90-7-Blank 0.45 μm

Corrected Li concentration = (3440 μg/L • 1.007) – (0.9 μg/L • 1.006) = 3463 μg/L

The RWS solutions were not filtered and were not analyzed for iodine.

Aliquots of test solutions were analyzed for Cl and I without acidification or dilution. Filtrate and acid soak solutions were not analyzed for Cl or I.

Only the total plutonium concentrations ($^{239}Pu + ^{240}Pu$) were dilution- and background-corrected.

Negative values indicate that the concentration in the blank was higher than the concentration in the test with CWF. The occurred frequently for the 0.1-μm and 5 nm filtrate solutions and is attributed to contamination of the filtrate solutions by the filters.

Table 23B: Dilution and Background Corrected Solution Concentrations, in μg/L (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PCPu90-7-237 RWS	669	831	16327	11	21	262	1132	2244	1.81	4.41	0.20	25.94
PCPu90-7-238 RWS	658	607	13823	11	21	72	893	1733	1.21	7.51	0.21	13.92
PCPu90-7-239 RWS	720	1052	41569	11	21	334	1212	1673	3.29	8.54	0.20	47.38
PCPu90-7-240 RWS	784	1032	66911	49	352	762	1452	2354	5.69	7.57	0.52	55.69
HIP U,Pu-loaded CWF at 90 C and mass ratio 1:10												
PCPu90-7-237 0.45 μm	3463	6887	31479	-45	25966	35696	2092	-246	11.82	1.56	0.86	63.83
PCPu90-7-237 0.1 μm	2340	6489	33119	-68	24785	35817	2193	527	10.83	-1.56	0.47	54.17
PCPu90-7-237 5 nm	2312	6596	33332	-223	16786	28638	1981	-142	9.76	-6.19	0.00	42.59
PCPu90-7-237 AS	90	390	4171	-24	5046	6959	563	-351	4.55	14.82	11.42	50.69
PCPu90-7-238 0.45 μm	3131	7502	31584	-46	25163	35096	2082	-248	9.48	-0.03	0.43	30.70
PCPu90-7-238 0.1 μm	2178	9213	31701	-144	23570	34095	2203	20	9.40	-2.44	0.26	33.32
PCPu90-7-238 5 nm	2119	10322	33028	-223	15470	27321	2214	-182	7.43	-4.47	0.00	24.27
PCPu90-7-238 AS	361	1249	14061	-8	18086	16749	1687	-102	13.04	45.02	19.12	136.89
PCPu90-7-239 0.45 μm	3191	5688	29363	-41	20829	33479	1860	-202	12.02	-0.02	0.30	79.43
PCPu90-7-239 0.1 μm	2239	5456	31195	93	22962	35614	1991	547	11.95	-1.42	0.28	69.26
PCPu90-7-239 5 nm	2139	5432	30598	-223	13546	26714	1870	-699	9.92	-4.76	0.00	55.65
PCPu90-7-239 AS	77	346	3201	-22	3756	4669	459	-248	4.34	14.82	8.18	43.89
PCPu90-7-240 0.45 μm	4139	6224	28972	-34	23658	36515	1830	-177	10.02	-0.27	0.32	60.13
PCPu90-7-240 0.1 μm	3909	6064	31803	-125	25595	38955	1930	-223	9.46	-2.11	0.22	50.73
PCPu90-7-240 5 nm	2757	5695	31509	-223	16887	30359	1688	-992	8.11	-6.08	0.00	43.91
PCPu90-7-240 AS	81	427	3351	-18	4816	7049	479	-332	4.01	13.52	5.02	40.29
PCPu90-7-Blank 0.45 μm	1	11	241	61	14	51	73	566	0.36	1.59	0.08	0.11
PCPu90-7-Blank 0.1 μm	606	416	1104	197	22	26	571	2116	0.30	4.81	0.20	0.60
PCPu90-7-Blank 5 nm	604	410	1195	235	22	117	621	2430	0.31	9.45	0.20	0.54
PCPu90-7-Blank AS	1	11	239	60	14	51	73	562	0.36	1.58	0.08	0.11
PCPu90-28-237 0.45 μm	6354	15196	33514	64	36940	64772	4442	686	26.25	28.32	14.90	136.93
PCPu90-28-237 0.1 μm	5338	13216	32273	72	35049	57894	4424	1256	27.03	28.52	15.86	131.23
PCPu90-28-237 5 nm	5377	16453	32562	-177	18301	43595	3873	-81	19.08	-0.09	0.03	71.39
PCPu90-28-237 AS	93	486	4171	71	5676	8799	712	361	5.22	18.72	27.12	52.49
PCPu90-28-238 0.45 μm	5095	22949	34924	98	37544	56515	4351	630	23.23	33.35	15.81	98.57
PCPu90-28-238 0.1 μm	4751	21114	32476	71	35656	58501	4494	709	24.49	33.18	16.47	94.38
PCPu90-28-238 5 nm	3079	19693	30537	-195	12023	33369	3306	-91	14.73	-0.29	0.05	42.43
PCPu90-28-238 AS	155	678	6751	19	8016	12049	826	-146	6.40	23.82	9.23	61.59
PCPu90-28-239 0.45 μm	5518	15598	30795	54	27877	44632	3213	684	19.61	17.94	7.88	108.74
PCPu90-28-239 0.1 μm	5480	14532	30856	14	28366	48984	3553	871	21.46	16.27	7.82	102.88
PCPu90-28-239 5 nm	4881	13314	28310	-150	13441	30838	2729	182	14.22	-0.37	0.03	58.33
PCPu90-28-239 AS	22	111	599	2	1476	2279	44	-295	0.62	3.28	7.16	9.22
PCPu90-28-240 0.45 μm	7773	16404	32507	61	42177	66282	3828	613	23.94	20.97	13.19	148.01
PCPu90-28-240 0.1 μm	7707	15342	31261	58	41225	73284	4110	1013	25.00	21.64	14.04	146.42
PCPu90-28-240 5 nm	6279	13213	27803	-143	16580	44405	3053	689	15.54	0.79	-0.02	64.71
PCPu90-28-240 AS	213	989	7881	79	9186	15249	1087	-44	8.75	29.82	23.12	84.59
PCPu90-28-Blank 0.45 μm	1	10	120	17	17	79	9	164	0.03	1.19	0.10	0.02
PCPu90-28-Blank 0.1 μm	899	554	937	579	591	224	852	1569	0.31	2.76	0.23	0.39
PCPu90-28-Blank 5 nm	900	557	1154	562	430	449	916	1731	0.36	2.90	0.26	0.40
PCPu90-28-Blank AS	1	11	239	60	14	51	73	562	0.36	1.58	0.08	0.11
PCPu90-91-237 0.45 μm	9222	25929	42066	19	40321	63228	4922	259	26.89	22.14	11.04	116.02
PCPu90-91-237 0.1 μm	8250	23723	37351	-125	38556	57186	4435	-263	23.37	17.42	9.80	102.97
PCPu90-91-237 5 nm	7379	22295	34111	-27	20932	37220	3584	-41	15.84	-0.27	-0.13	56.39
PCPu90-91-237 AS	178	472	4773	49	8026	11641	762	177	6.67	22.52	30.96	60.16
PCPu90-91-238 0.45 μm	11184	47676	55791	134	60869	85715	6916	559	38.14	67.91	19.67	174.97
PCPu90-91-238 0.1 μm	10882	48428	56487	47	62755	85334	7665	466	35.72	64.60	19.50	156.63
PCPu90-91-238 5 nm	9252	50342	54462	-85	14655	46433	4941	-203	18.78	0.50	-0.13	53.04

Table 23B: Dilution and Background Corrected Solution Concentrations, in μg/L (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	Pu	Cl	I
PCPu90-7-237 RWS	0.62	10.02	5.42	8.70	0.10	0.30	0.15	0.50	0.45	16800	
PCPu90-7-238 RWS	0.60	9.84	5.95	8.96	1.14	0.53	0.24	0.50	1.93	14300	
PCPu90-7-239 RWS	0.60	9.60	5.39	8.71	0.10	0.30	0.24	0.50	0.42	46000	
PCPu90-7-240 RWS	0.76	10.02	6.59	9.19	1.17	0.74	0.54	2.47	2.43	88700	
HIP U,Pu-loaded CWF at 90 C											
PCPu90-7-237 0.45 μm	3.56	1.99	5.18	1.91	7.44	4.11	0.14	17.39	6.06	20	19.7
PCPu90-7-237 0.1 μm	-11.75	1.00	2.63	0.90	3.80	2.07	0.01	9.59	3.44		
PCPu90-7-237 5 nm	-0.23	-0.96	-0.18	-0.03	0.00	0.00	-0.08	1.62	0.00		
PCPu90-7-237 AS	27.71	12.68	26.06	11.38	39.85	23.57	0.62	123.87	39.89		
PCPu90-7-238 0.45 μm	-0.35	0.97	2.49	0.96	3.77	2.13	0.06	2.29	8.09	15	20.2
PCPu90-7-238 0.1 μm	-11.75	0.60	1.54	0.59	2.47	1.17	-0.04	0.81	5.25		
PCPu90-7-238 5 nm	-0.23	-0.99	-0.20	-0.04	0.00	0.00	-0.06	0.00	0.00		
PCPu90-7-238 AS	85.41	42.08	80.36	37.68	124.95	-0.02	0.00	108.87	213.92		
PCPu90-7-239 0.45 μm	0.01	0.90	2.55	0.96	3.73	1.99	0.09	4.01	3.01	20	75.2
PCPu90-7-239 0.1 μm	-11.75	0.80	1.96	0.80	2.97	1.44	0.01	2.08	2.41		
PCPu90-7-239 5 nm	-0.23	-0.95	-0.06	0.01	0.00	0.00	-0.01	0.76	0.21		
PCPu90-7-239 AS	27.21	12.38	24.66	10.88	38.45	22.77	0.65	97.57	35.31		
PCPu90-7-240 0.45 μm	-0.60	0.72	2.29	0.88	3.47	1.85	0.10	3.04	5.73	20	138.0
PCPu90-7-240 0.1 μm	-9.49	0.60	1.80	0.74	2.93	1.43	-0.01	1.62	5.50		
PCPu90-7-240 5 nm	-0.23	-0.97	-0.11	0.00	0.00	0.00	-0.03	0.84	0.02		
PCPu90-7-240 AS	24.61	11.98	23.96	10.58	36.65	20.87	0.55	27.77	39.55		
PCPu90-7-Blank 0.45 μm	2.71	0.02	0.04	0.02	0.05	0.03	0.00	0.13	0.04	1	
PCPu90-7-Blank 0.1 μm	12.35	9.73	5.49	8.85	0.10	0.30	0.19	0.51	0.35		
PCPu90-7-Blank 5 nm	0.84	10.63	5.51	8.82	0.10	0.30	0.22	0.51	0.35		
PCPu90-7-Blank AS	2.69	0.02	0.04	0.02	0.05	0.03	0.00	0.13	0.04		
PCPu90-28-237 0.45 μm	85.00	28.39	53.26	25.97	85.56	12.47	1.72	63.13	43.07	30	42.5
PCPu90-28-237 0.1 μm	82.83	29.49	52.45	26.12	85.21	12.45	1.58	54.68	41.59		
PCPu90-28-237 5 nm	1.61	0.04	0.06	0.00	0.25	0.00	-0.02	13.47	0.37		
PCPu90-28-237 AS	47.51	21.78	40.06	19.28	64.65	9.09	0.87	145.87	71.97		
PCPu90-28-238 0.45 μm	91.14	36.64	61.72	32.31	104.70	14.98	2.20	17.41	132.48	23	36.8
PCPu90-28-238 0.1 μm	85.06	37.19	57.51	31.29	99.39	14.78	2.07	10.43	106.93		
PCPu90-28-238 5 nm	1.14	-0.03	0.02	0.00	0.71	0.00	0.02	1.24	0.86		
PCPu90-28-238 AS	44.31	26.08	46.46	22.38	74.15	10.27	1.02	50.07	164.76		
PCPu90-28-239 0.45 μm	64.36	15.09	29.19	14.49	47.40	7.07	1.01	14.99	21.18	34	48.5
PCPu90-28-239 0.1 μm	56.00	14.10	27.54	13.37	45.32	6.53	0.87	8.45	19.46		
PCPu90-28-239 5 nm	0.90	-0.09	0.00	0.00	0.08	0.00	0.00	2.16	0.00		
PCPu90-28-239 AS	14.71	5.96	10.66	5.42	17.95	2.41	0.25	27.07	27.92		
PCPu90-28-240 0.45 μm	65.57	22.04	45.10	21.94	73.18	10.75	1.52	25.77	86.62	32	70.5
PCPu90-28-240 0.1 μm	62.68	22.51	44.55	21.77	70.53	10.63	1.44	22.68	80.17		
PCPu90-28-240 5 nm	2.51	0.02	0.00	0.00	0.21	0.00	-0.03	6.23	0.30		
PCPu90-28-240 AS	54.31	32.18	56.76	27.48	88.75	11.97	1.21	37.27	132.72		
PCPu90-28-Blank 0.45 μm	0.69	0.01	0.01	0.01	0.03	0.02	0.01	0.01	0.02	1	6.4
PCPu90-28-Blank 0.1 μm	4.44	0.38	0.10	0.10	0.45	0.30	0.17	0.41	0.23		
PCPu90-28-Blank 5 nm	2.32	0.46	0.10	0.10	0.57	0.30	0.18	0.41	0.23		
PCPu90-28-Blank AS	2.69	0.02	0.04	0.02	0.05	0.03	0.00	0.13	0.00		
PCPu90-91-237 0.45 μm	60.86	18.26	34.37	16.58	53.56	8.00	1.16	38.91	22.22	24	37.7
PCPu90-91-237 0.1 μm	51.74	16.10	29.90	14.26	46.54	7.31	0.98	27.25	17.38		
PCPu90-91-237 5 nm	-0.84	-0.19	-0.28	-0.22	-0.37	-0.02	-0.09	9.15	-0.14		
PCPu90-91-237 AS	49.26	22.86	49.91	24.73	80.80	12.01	1.11	166.94	102.50		
PCPu90-91-238 0.45 μm	148.67	47.21	90.79	40.40	130.79	18.76	2.79	31.89	123.15	30	42.8
PCPu90-91-238 0.1 μm	134.16	48.09	80.73	39.17	128.05	18.33	2.65	23.70	99.98		
PCPu90-91-238 5 nm	-0.31	-0.20	-0.18	-0.18	-0.12	0.02	-0.08	6.27	0.42		

Table 23B: Dilution and Background Corrected Solution Concentrations, in g/L (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PCPu90-91-238 AS	375	1486	8403	42	13846	18741	1283	180	10.50	42.02	19.66	91.16
PCPu90-91-239 0.45 µm	9074	27175	52694	-17	35617	51601	4026	118	20.26	8.02	2.08	97.43
PCPu90-91-239 0.1 µm	8665	25647	52336	-145	36126	49592	3959	-213	19.32	6.99	1.89	91.12
PCPu90-91-239 5 nm	8189	26042	49197	-1	19414	33068	3230	-61	14.83	-0.76	-0.13	59.02
PCPu90-91-239 AS	145	271	1703	70	8696	9031	290	474	2.57	37.92	1.87	20.66
PCPu90-91-240 0.45 µm	11768	24550	34652	37	48814	75073	4153	210	23.89	24.50	16.04	141.24

Table 23B: Dilution and Background Corrected Solution Concentrations, in μg/L (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	Pu	Cl	I
PCPu90-91-238 AS	74.76	43.16	88.71	40.33	133.40	19.01	1.75	96.84	294.49		
PCPu90-91-239 0.45 μm	26.32	4.78	8.22	4.19	13.37	2.00	0.27	12.01	8.74	41	56.2
PCPu90-91-239 0.1 μm	26.33	4.43	6.95	3.79	11.81	1.83	0.32	4.87	5.16		
PCPu90-91-239 5 nm	-1.18	-0.20	-0.21	-0.22	-0.41	-0.02	-0.09	1.04	-0.11		
PCPu90-91-239 AS	79.06	8.86	15.71	7.46	24.30	3.29	0.41	41.94	19.55		
PCPu90-91-240 0.45 μm	72.00	29.26	52.27	27.65	91.00	13.92	1.90	25.73	91.19	29	69.5

Table 23B: Dilution and Background Corrected Solution Concentrations, in μg/L (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PCPu90-91-240 0.1 μm	11287	24128	33200	-94	51111	75107	4293	-111	23.57	22.58	16.46	127.27
PCPu90-91-240 5 nm	10022	24827	28644	-75	23059	46838	2845	-203	12.50	-0.68	-0.13	46.97
PCPu90-91-240 AS	124	207	1803	36	3716	5061	274	111	2.28	9.31	2.42	19.96
PCPu90-91-Blank 0.45 μm	3	24	247	34	24	610	59	169	0.17	1.11	0.06	0.22
PCPu90-91-Blank 0.1 μm	255	1792	2136	534	20	2653	1428	1772	0.52	3.04	0.24	0.31
PCPu90-91-Blank 5 nm	306	1701	2541	306	229	3281	1559	1286	0.77	2.70	0.33	1.12
PCPu90-91-Blank AS	5	74	317	38	254	359	57	95	0.10	0.58	1.84	0.54
PCPu90-182-237 0.45 μm	8310	31750	25736	-182	20687	45196	4561	-478	26.69	9.57	14.68	133.68
PCPu90-182-237 0.1 μm	8358	33289	26422	-14	21778	46086	3798	-531	25.30	9.34	13.74	127.58
PuPC90-182-237 5 nm	8388	35309	25311	-14	12789	34774	2959	-725	13.18	-3.99	0.00	39.51
PuPC90-182-237 AS	1246	502	12290	360	25616	35116	3382	678	24.64	19.28	15.25	137.84
PCPu90-182-238 0.45 μm	10535	56320	35958	-182	27115	45657	4877	-801	18.48	12.30	6.90	64.91
PCPu90-182-238 0.1 μm	10852	58842	37128	98	28343	47399	3515	-182	16.82	13.08	6.84	64.66
PuPC90-182-238 5 nm	10145	59549	35714	-14	11476	30835	2889	-528	12.47	-3.29	0.19	35.27
PuPC90-182-238 AS	495	1157	8270	199	11316	18816	1492	526	11.24	37.78	23.45	81.74
PCPu90-182-239 0.45 μm	11476	34839	29558	-182	26474	53191	3855	-616	16.50	2.75	5.29	70.05
PCPu90-182-239 0.1 μm	11559	36218	28745	74	26828	53863	2737	-263	16.21	2.88	4.87	69.00
PuPC90-182-239 5 nm	10448	33289	27129	-2	15314	39824	2182	10	13.18	-2.61	0.00	46.18
PuPC90-182-239 AS	199	687	5840	131	7616	11916	869	271	7.87	27.58	14.95	73.84
PCPu90-182-240 0.45 μm	14026	29989	39236	-182	49561	92253	4631	-514	20.99	12.25	10.35	108.72
PCPu90-182-240 0.1 μm	14589	31572	38946	67	50462	91738	3626	-141	21.16	11.77	9.57	107.38
PuPC90-182-240 5 nm	14690	33592	39249	-14	33494	74871	2788	-515	14.59	-2.88	0.00	57.59
PuPC90-182-240 AS	593	1807	15190	169	18816	28216	2072	749	18.84	83.98	34.05	159.84
PCPu90-182-Blank 0.45 μm	201	699	2223	188	27	1539	694	1652	1.67	4.92	0.11	2.04
PCPu90-182-Blank 0.1 μm	258	647	2969	19	38	1283	1818	1535	1.57	4.39	0.20	1.70
PCPu90-182-Blank 5 nm	258	647	2969	19	38	1283	1818	1535	1.57	4.39	0.20	1.70
PCPu90-182-Blank AS	4	64	110	36	184	184	18	127	0.06	0.73	0.35	0.16
PCPu90-365-237 0.45 μm	14176	34366	37400	-96	40551	64976	4760	-17	26.82	14.53	6.46	113.54
PuPC90-365-237 0.1 μm	13478	33996	40764	241	44200	66791	8262	758	27.02	13.69	9.70	117.48
PuPC90-365-237 5 nm	13781	37531	40158	83	32282	55782	6999	354	20.45	-3.89	0.10	65.87
PuPC90-365-237 AS	106	182	2577	-27	4585	4731	363	43	3.51	13.29	-3.08	31.17
PCPu90-365-238 0.45 μm	19151	75403	63366	-29	55268	78365	8147	503	44.27	69.75	3.33	182.95
PuPC90-365-238 0.1 um	19134	76113	65913	120	56926	73255	11211	465	44.29	69.34	7.45	193.23
PuPC90-365-238 5 nm	18225	78335	62681	51	31272	55075	8383	394	21.46	-3.77	0.10	49.41
PuPC90-365-238 AS	86	317	2517	-28	4155	4551	306	8	3.55	12.39	-2.66	28.57
PCPu90-365-239 0.45 μm	16064	48117	31151	-95	32011	56938	3917	-97	21.30	12.17	8.84	107.16
PuPC90-365-239 0.1 μm	15700	48035	31977	187	33393	53964	6717	283	21.26	10.86	12.83	107.38
PuPC90-365-239 5 nm	13680	44803	28038	62	16324	35279	5444	172	11.77	-3.89	0.10	44.36
PuPC90-365-239 AS	168	571	4917	-38	6005	8031	595	65	5.45	17.89	-2.98	51.87
PCPu90-365-240 0.45 μm	17895	38818	23971	-113	34001	59278	2800	-206	14.99	4.88	7.24	78.94
PuPC90-365-240 0.1 μm	18427	40965	27735	252	38342	62953	6191	545	17.62	3.87	11.62	88.19
PuPC90-365-240 5 nm	17316	41470	27634	76	26424	54368	5828	333	12.07	-3.89	0.10	46.68
PuPC90-365-240 AS	77	144	987	12	1575	2151	78	-23	1.17	4.01	-2.20	11.67
PCPu90-365-Blank 0.45 μm	125	1078	4884	176	2562	2180	4982	1820	2.62	3.82	4.43	5.65
PCPu90-365-Blank 0.1 μm	258	647	2969	19	38	1283	1818	1535	1.57	4.39	0.20	1.70
PCPu90-365-Blank 5 nm	258	647	2969	19	38	1283	1818	1535	1.57	4.39	0.20	1.70
PCPu90-365-Blank AS	3	19	123	65	235	119	93	124	0.24	0.31	10.30	0.23
HIP U,Pu-loaded CWF at 120 C and mass ratio 1:10												
PCPu120-7-237 0.45 μm	9529	21748	42658	-72	49895	68989	5203	-137	25.75	2.11	7.05	123.86
PCPu120-7-237 0.1 μm	9160	24433	46440	0	56882	96059	4242	435	28.18	3.86	0.00	129.30
PCPu120-7-237 5 nm	8962	26773	43011	0	37037	70407	4273	344	20.76	-0.84	0.00	87.18
PCPu120-7-237 AS	70	148	1482	16	2337	3529	212	29	1.66	5.90	2.88	15.26
PCPu120-7-238 0.45 μm	9989	36752	45865	-71	47960	64124	5543	-366	23.53	2.82	6.79	85.62

Table 23B: Dilution and Background Corrected Solution Concentrations, in μg/L (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	Pu	Cl	I
PCPu90-91-240 0.1 μm	69.05	28.35	50.15	26.72	88.26	13.57	1.97	21.58	82.60		
PCPu90-91-240 5 nm	-1.23	-0.18	-0.29	-0.22	-0.40	-0.02	-0.10	9.66	0.22		
PCPu90-91-240 AS	18.96	7.96	23.31	10.83	33.80	4.60	0.49	11.04	67.38		
PCPu90-91-Blank 0.45 μm	2.24	0.06	0.07	0.02	0.07	0.02	0.01	0.08	0.01	1	<1.15
PCPu90-91-Blank 0.1 μm	2.53	0.10	0.58	0.32	0.54	0.20	0.23	1.20	0.12		
PCPu90-91-Blank 5 nm	3.57	0.30	0.82	0.52	0.93	0.22	0.32	1.68	0.25		
PCPu90-91-Blank AS	4.34	4.44	0.39	0.17	0.60	0.09	0.01	1.06	0.70		
PCPu90-182-237 0.45 μm	36.88	22.05	44.84	22.19	74.89	11.26	1.58	92.21	58.43	25	47.6
PCPu90-182-237 0.1 μm	33.16	21.21	42.72	21.31	71.21	10.40	1.39	86.05	55.12		
PuPC90-182-237 5 nm	-3.68	0.00	0.00	0.00	0.00	0.00	-0.01	12.63	0.29		
PuPC90-182-237 AS	59.88	30.33	57.27	29.00	95.04	13.85	1.62	101.28	120.63		
PCPu90-182-238 0.45 μm	32.10	15.20	34.07	14.22	46.07	6.57	1.08	18.29	77.34	21	39.4
PCPu90-182-238 0.1 μm	32.75	15.35	33.53	14.34	45.35	6.30	0.93	16.46	77.66		
PuPC90-182-238 5 nm	-2.97	0.00	0.00	0.00	0.00	0.00	-0.02	7.26	1.83		
PuPC90-182-238 AS	77.08	36.53	63.37	32.00	104.64	14.75	1.60	75.08	186.99		
PCPu90-182-239 0.45 μm	17.78	10.16	26.24	10.60	33.39	4.72	0.89	30.22	28.86	26	87.7
PCPu90-182-239 0.1 μm	17.60	9.73	24.64	9.95	32.32	4.66	0.64	24.34	27.27		
PuPC90-182-239 5 nm	-0.49	0.00	0.00	0.00	0.00	0.00	-0.01	15.55	0.21		
PuPC90-182-239 AS	65.18	31.63	57.47	29.50	96.64	14.05	1.39	175.28	110.22		
PCPu90-182-240 0.45 μm	36.80	20.33	46.89	20.47	66.85	10.19	1.42	37.66	126.66	32	65.8
PCPu90-182-240 0.1 μm	34.37	18.28	43.73	18.89	62.12	9.20	1.30	33.84	117.76		
PuPC90-182-240 5 nm	-2.31	0.00	0.00	0.00	0.00	0.00	-0.01	24.95	0.74		
PuPC90-182-240 AS	140.58	71.23	116.17	63.20	217.64	30.25	3.23	181.28	237.34		
PCPu90-182-Blank 0.45 μm	5.47	0.20	0.06	0.06	0.11	0.17	0.18	0.14	0.06	1	8.7
PCPu90-182-Blank 0.1 μm	5.63	0.10	0.10	0.10	0.20	0.30	0.34	0.20	0.12		
PCPu90-182-Blank 5 nm	5.63	0.10	0.10	0.10	0.20	0.30	0.34	0.20	0.00		
PCPu90-182-Blank AS	3.42	0.67	0.83	0.40	1.36	0.15	0.02	1.72	0.65		
PCPu90-365-237 0.45 μm	41.06	21.76	43.91	20.10	64.51	9.05	1.04	90.22	38.70	38	0.0
PuPC90-365-237 0.1 μm	41.34	20.10	39.69	18.08	59.89	9.58	1.07	67.87	31.55		
PuPC90-365-237 5 nm	-4.92	0.00	0.38	0.08	0.91	0.51	0.06	32.02	0.90		
PuPC90-365-237 AS	27.60	19.32	29.75	15.79	49.95	7.23	0.74	108.86	48.11		
PCPu90-365-238 0.45 μm	150.72	21.25	30.29	15.94	50.38	6.46	0.82	29.24	54.77	47	0.0
PuPC90-365-238 0.1 um	153.95	21.21	31.82	16.67	51.11	7.96	0.76	27.07	52.58		
PuPC90-365-238 5 nm	-4.92	0.00	0.20	0.00	0.91	0.51	0.06	17.27	1.14		
PuPC90-365-238 AS	21.60	20.62	33.55	17.59	56.75	8.31	0.81	39.76	102.69		
PCPu90-365-239 0.45 μm	44.04	27.05	50.73	25.06	78.60	12.29	1.20	70.88	28.97	38	0.0
PuPC90-365-239 0.1 μm	40.83	26.36	48.88	23.13	77.16	12.73	1.30	60.60	25.19		
PuPC90-365-239 5 nm	-4.92	1.04	1.57	0.20	0.91	0.51	0.06	45.15	1.06		
PuPC90-365-239 AS	28.30	19.32	37.95	17.89	58.35	8.84	0.77	146.86	64.24		
PCPu90-365-240 0.45 μm	18.28	18.75	38.30	18.54	62.13	10.07	1.04	34.75	69.89	38	0.0
PuPC90-365-240 0.1 μm	19.12	19.39	40.50	19.70	67.67	12.02	1.12	35.05	73.38		
PuPC90-365-240 5 nm	-4.92	0.00	0.32	0.01	0.91	0.51	0.06	26.26	2.33		
PuPC90-365-240 AS	7.50	7.31	14.35	7.24	22.85	3.29	0.33	5.78	49.03		
PCPu90-365-Blank 0.45 μm	6.62	0.11	0.35	0.11	1.20	0.87	0.44	0.87	0.55	1	0.0
PCPu90-365-Blank 0.1 μm	5.63	0.10	0.10	0.10	0.20	0.30	0.34	0.20	0.00		
PCPu90-365-Blank 5 nm	5.63	0.10	0.10	0.10	0.20	0.30	0.34	0.20	0.00		
PCPu90-365-Blank AS	2.80	0.28	0.45	0.21	0.65	0.12	0.04	1.14	0.40		
HIP U,Pu-loaded CWF at 120 (											
PCPu120-7-237 0.45 μm	4.39	11.15	31.29	14.01	46.45	7.52	0.93	79.69	53.81	23	57.7
PCPu120-7-237 0.1 μm	2.03	11.34	31.10	13.67	48.30	7.12	0.98	50.12	48.31		
PCPu120-7-237 5 nm	0.00	0.00	-0.29	0.00	0.00	0.00	0.00	21.91	0.00		
PCPu120-7-237 AS	10.69	7.43	14.89	7.80	25.46	3.81	0.43	37.38	34.55		
PCPu120-7-238 0.45 μm	4.42	12.86	35.00	15.32	49.75	7.78	1.04	13.46	123.31	21	51.4

Table 23B: Dilution and Background Corrected Solution Concentrations, in μg/L (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PCPu120-7-238 0.1 μm	9474	41949	49680	0	54047	92616	4465	253	23.01	4.32	0.00	85.15
PCPu120-7-238 5 nm	10389	50263	53035	0	34101	72736	5326	557	20.26	-0.13	0.00	63.79
PCPu120-7-238 AS	214	836	7132	32	8457	13669	1100	135	8.46	29.54	43.37	67.16
PCPu120-7-239 0.45 μm	10345	23560	45476	-76	43540	58903	4356	-401	24.34	2.90	5.10	122.84
PCPu120-7-239 0.1 μm	9575	26458	47554	0	50402	91705	4080	-243	25.85	3.57	0.00	122.21
PCPu120-7-239 5 nm	9245	26975	44631	0	31266	68382	4313	30	19.95	-0.94	0.00	89.61
PCPu120-7-239 AS	424	1317	11782	36	13787	20769	1510	231	12.66	40.34	15.97	102.96
PCPu120-7-240 0.45 μm	12052	21131	40719	-76	52183	70763	4061	-361	21.91	0.86	5.52	120.77
PCPu120-7-240 0.1 μm	11195	22610	40467	0	56072	101121	3362	152	22.10	1.73	0.00	117.15
PCPu120-7-240 5 nm	10896	24545	41391	0	46251	84683	3726	-253	18.84	-1.33	0.00	92.44
PCPu120-7-240 AS	208	567	4062	22	5267	8979	796	69	5.49	16.04	10.47	51.06
PCPu120-7-Blank 0.45 μm	37	126	182	92	1	59	381	883	0.25	2.64	0.60	0.12
PCPu120-7-Blank 0.1 μm	651	677	742	12	20	129	2025	1833	0.58	2.22	9.62	0.30
PCPu120-7-Blank 5 nm	647	565	1134	12	20	265	1073	2440	0.50	3.17	9.62	0.30
PCPu120-7-Blank AS	3	33	18	11	13	31	20	77	0.04	0.06	1.43	0.04
PCPu120-28-237 0.45 μm	13493	37128	39860	23	47718	89420	4718	346	24.14	11.00	13.16	127.87
PCPu120-28-237 0.1 μm	12935	37864	39603	12	46901	85020	4902	678	23.19	10.83	14.58	114.21
PCPu120-28-237 5 nm	11596	36068	35103	-207	24203	60679	3828	41	16.40	-0.23	0.00	62.07
PCPu120-28-237 AS	247	1257	11582	59	14187	25269	1880	262	15.66	40.64	37.67	165.96
PCPu120-28-238 0.45 μm	13694	64620	43082	5	43992	84284	4738	341	21.52	5.24	8.80	81.24
PCPu120-28-238 0.1 μm	12530	61253	40919	-23	40624	78337	4699	304	19.04	4.28	8.94	72.90
PCPu120-28-238 5 nm	12305	58951	38242	-194	22279	57945	4223	142	15.59	-0.46	0.00	51.64
PCPu120-28-238 AS	384	2037	12082	63	14287	26569	1850	336	15.26	42.14	19.47	143.96
PCPu120-28-239 0.45 μm	12989	39545	40162	6	44194	80659	3771	322	21.02	5.50	8.33	99.87
PCPu120-28-239 0.1 μm	13137	38168	38692	-11	44370	83298	4132	324	19.95	4.98	8.77	96.59
PCPu120-28-239 5 nm	12001	36170	34496	-134	23798	60578	3444	557	15.29	0.55	0.00	61.66
PCPu120-28-239 AS	146	959	6172	31	7477	13969	805	192	8.20	23.54	11.47	79.66
PCPu120-28-240 0.45 μm	16917	36726	33617	6	50336	107646	3711	422	17.09	2.87	9.47	87.59
PCPu120-28-240 0.1 μm	14960	34726	31199	1	49027	93828	3423	608	16.30	2.56	10.43	83.03
PCPu120-28-240 5 nm	14836	34448	29940	-151	36758	79005	3221	486	13.16	0.17	0.30	58.93
PCPu120-28-240 AS	781	2697	20582	51	24087	45169	3100	436	25.96	72.84	23.37	260.96
PCPu120-28-Blank 0.45 μm	1	30	118	13	14	103	15	139	0.03	0.58	0.03	0.02
PCPu120-28-Blank 0.1 μm	835	509	998	374	484	2055	779	1357	0.20	2.13	0.41	0.20
PCPu120-28-Blank 5 nm	858	584	1245	390	300	2906	799	1245	0.20	1.67	0.41	0.20
PCPu120-28-Blank AS	3	33	18	11	13	31	20	77	0.04	0.06	1.43	0.04
PCPu120-91-237 0.45 μm	22450	56560	39311	33	60945	113569	5457	318	26.95	8.10	22.64	133.04
PCPu120-91-237 0.1 μm	21737	51513	36130	-1	57253	102530	5503	380	26.96	7.71	23.60	121.70
PCPu120-91-237 5 nm	20744	55494	34720	-183	41431	83200	4599	-370	19.35	-0.37	2.34	73.80
PCPu120-91-237 AS	489	1000	8872	25	11172	13589	1131	206	9.03	28.42	29.78	78.50
PCPu120-91-238 0.45 μm	25681	101276	49934	24	48708	99157	5759	324	25.10	4.46	11.71	92.91
PCPu120-91-238 0.1 μm	26337	102113	49830	-14	50453	96930	6053	340	24.96	3.85	12.10	91.70
PCPu120-91-238 5 nm	25444	103094	47520	-123	33931	74500	5669	-270	20.45	-1.02	0.00	66.10
PCPu120-91-238 AS	809	2650	20252	28	22372	39589	2351	318	19.35	61.82	25.28	185.00
PCPu120-91-239 0.45 μm	33048	92573	54328	317	55961	119504	6488	596	38.81	29.04	27.31	225.06
PCPu120-91-239 0.1 μm	34637	92113	53530	286	56153	107530	6923	620	38.86	28.64	29.30	220.70
PCPu120-91-239 5 nm	30644	85594	48220	-175	20731	79000	4929	-300	20.35	-0.34	0.02	70.60
PCPu120-91-239 AS	377	699	4462	72	9172	7489	667	207	5.47	25.32	14.78	47.90
PCPu120-91-240 0.45 μm	24794	53007	34912	29	59906	122249	4039	396	22.80	4.61	18.91	117.36
PCPu120-91-240 0.1 μm	26137	55113	35230	34	61653	117530	4553	380	22.16	4.20	20.10	116.70
PCPu120-91-240 5 nm	25744	56694	34220	-183	47931	100200	3969	-190	17.35	-0.94	0.01	76.10
PCPu120-91-240 AS	218	464	3262	12	4272	7039	515	91	4.17	13.92	9.48	39.00
PCPu120-91-Blank 0.45 μm	0	23	104	11	6	206	19	94	0.07	0.73	0.01	0.04
PCPu120-91-Blank 0.1 μm	163	887	1570	179	647	1470	947	1380	0.44	2.06	0.30	0.30
PCPu120-91-Blank 5 nm	156	906	1780	207	69	1800	941	1630	0.45	2.26	0.30	0.30

Table 23B: Dilution and Background Corrected Solution Concentrations, in μg/L (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	Pu	Cl	I
PCPu120-7-238 0.1 μm	1.76	12.35	32.62	14.07	47.79	6.61	0.97	-9.62	101.83		
PCPu120-7-238 5 nm	0.00	0.00	0.43	0.00	0.00	0.00	0.00	10.57	0.42		
PCPu120-7-238 AS	48.59	36.38	54.19	30.50	96.56	13.88	1.46	63.78	165.90		
PCPu120-7-239 0.45 μm	7.77	10.85	28.46	12.70	40.50	6.24	0.85	28.38	35.36	29	65.8
PCPu120-7-239 0.1 μm	3.97	36.35	126.88	19.04	59.43	5.18	0.78	0.00	29.19		
PCPu120-7-239 5 nm	0.00	0.00	-0.14	0.00	0.00	0.00	0.00	12.39	0.00		
PCPu120-7-239 AS	66.79	41.08	69.49	39.30	126.86	18.58	1.83	253.68	120.14		
PCPu120-7-240 0.45 μm	2.76	9.66	29.96	12.79	42.69	6.72	0.87	23.33	105.31	27	91.5
PCPu120-7-240 0.1 μm	0.00	9.29	27.86	11.95	41.21	6.01	0.82	-2.33	85.49		
PCPu120-7-240 5 nm	0.00	0.00	-0.14	0.00	0.00	0.00	0.00	10.87	0.00		
PCPu120-7-240 AS	27.49	19.18	36.19	17.90	56.16	8.03	0.85	24.68	82.15		
PCPu120-7-Blank 0.45 μm	4.43	0.04	0.46	0.00	0.12	0.08	0.04	3.47	0.05	1	7.0
PCPu120-7-Blank 0.1 μm	0.71	0.10	0.69	0.10	0.41	0.30	0.10	25.41	0.35		
PCPu120-7-Blank 5 nm	0.71	0.10	0.89	0.10	0.41	0.30	0.10	1.28	0.35		
PCPu120-7-Blank AS	0.21	0.22	0.01	0.00	0.14	0.02	0.01	0.32	0.00	0	
PCPu120-28-237 0.45 μm	31.09	23.07	52.61	23.45	76.90	11.64	1.57	110.67	65.03	40	57.0
PCPu120-28-237 0.1 μm	29.57	25.21	51.33	23.79	78.77	12.05	1.43	95.18	55.84		
PCPu120-28-237 5 nm	0.18	0.00	0.00	0.00	0.00	0.00	0.00	46.17	0.00		
PCPu120-28-237 AS	73.29	46.28	90.99	42.60	141.86	21.28	1.92	329.68	188.79		
PCPu120-28-238 0.45 μm	11.45	14.00	38.71	17.11	57.07	9.02	1.29	45.92	114.00	31	47.8
PCPu120-28-238 0.1 μm	9.21	14.28	36.15	16.40	55.18	8.96	1.15	35.54	127.32		
PCPu120-28-238 5 nm	0.24	0.00	0.00	0.00	0.00	0.00	0.00	24.10	0.00		
PCPu120-28-238 AS	68.69	47.48	92.99	44.20	146.86	21.38	2.10	113.68	326.09		
PCPu120-28-239 0.45 μm	17.60	13.60	34.28	15.30	50.92	7.81	1.09	69.18	32.42	41	67.3
PCPu120-28-239 0.1 μm	16.00	14.88	33.92	15.39	52.35	7.80	0.88	55.89	35.80		
PCPu120-28-239 5 nm	24.16	0.00	0.00	0.00	0.00	0.00	0.00	39.29	0.00		
PCPu120-28-239 AS	46.19	29.28	56.79	27.70	93.86	13.48	1.27	187.68	113.84		
PCPu120-28-240 0.45 μm	8.18	14.20	42.64	17.91	59.89	9.42	1.29	46.42	109.27	38	88.4
PCPu120-28-240 0.1 μm	6.86	15.09	40.50	17.82	62.07	9.67	0.97	34.53	108.66		
PCPu120-28-240 5 nm	0.54	0.00	0.00	0.00	0.00	0.00	0.00	22.07	0.00		
PCPu120-28-240 AS	120.79	75.18	148.99	65.40	218.86	30.48	2.95	100.68	290.62		
PCPu120-28-Blank 0.45 μm	0.63	0.40	0.06	0.01	0.03	0.04	0.01	0.10	0.07	0	6.0
PCPu120-28-Blank 0.1 μm	2.53	0.10	0.20	0.10	0.20	0.41	0.10	1.92	0.12		
PCPu120-28-Blank 5 nm	1.76	0.10	0.20	0.10	0.20	0.41	0.10	1.92	1.39		
PCPu120-28-Blank AS	0.21	0.22	0.01	0.00	0.14	0.02	0.01	0.32	0.00		
PCPu120-91-237 0.45 μm	19.78	34.83	79.72	36.66	119.84	19.18	2.57	145.78	88.09	93	44.5
PCPu120-91-237 0.1 μm	16.18	34.69	74.33	34.90	119.60	19.60	2.57	122.92	79.29		
PCPu120-91-237 5 nm	1.89	3.24	6.97	3.39	11.70	1.52	0.28	61.29	6.49		
PCPu120-91-237 AS	44.32	37.35	70.75	35.29	116.00	16.80	1.69	236.00	128.15		
PCPu120-91-238 0.45 μm	8.09	22.00	58.06	24.55	78.85	11.80	1.68	57.51	160.90	53	61.4
PCPu120-91-238 0.1 μm	5.52	22.29	55.43	24.00	78.30	11.30	1.77	49.22	171.51		
PCPu120-91-238 5 nm	0.00	0.05	0.12	0.04	0.00	0.00	0.00	36.39	1.18		
PCPu120-91-238 AS	96.22	70.25	128.95	68.59	204.00	29.10	2.86	156.00	392.45		
PCPu120-91-239 0.45 μm	72.22	59.23	111.50	52.47	166.75	24.64	3.37	144.83	67.42	68	84.8
PCPu120-91-239 0.1 μm	68.58	61.49	108.23	53.00	174.60	25.20	3.09	126.92	59.95		
PCPu120-91-239 5 nm	0.40	0.12	0.26	0.08	0.14	0.00	-0.01	99.49	0.73		
PCPu120-91-239 AS	43.52	29.55	55.45	26.09	88.10	11.90	1.20	153.00	102.17		
PCPu120-91-240 0.45 μm	12.72	28.53	71.52	32.07	105.22	16.98	2.16	108.78	145.89	49	80.9
PCPu120-91-240 0.1 μm	9.68	28.19	66.93	30.60	105.60	16.60	2.10	52.42	142.91		
PCPu120-91-240 5 nm	0.29	0.08	0.26	0.08	0.09	0.00	-0.01	51.09	0.62		
PCPu120-91-240 AS	21.42	22.35	38.15	19.69	63.50	8.97	0.99	25.50	136.16		
PCPu120-91-Blank 0.45 μm	0.94	0.01	0.03	0.02	0.03	0.02	0.02	6.59	0.01	1	3.8
PCPu120-91-Blank 0.1 μm	4.32	0.21	0.77	0.30	0.40	0.30	0.27	8.08	0.11		
PCPu120-91-Blank 5 nm	1.80	0.17	0.72	0.28	0.40	0.30	0.24	2.51	0.11		

Table 23B: Dilution and Background Corrected Solution Concentrations, in μg/L (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PCPu120-91-Blank AS	1	20	48	5	28	111	9	32	0.05	0.08	0.02	0.00
HIP U,Pu-loaded CWF at 120 C and mass ratio 1:20												
PCPu120/1-7-237 0.45 μm	5855	12945	46809	5	45909	66082	3152	240	17.15	3.59	3.95	78.32
PCPu120/1-7-237 0.1 μm	5909	11830	44320	-49	43773	61070	3339	160	17.40	2.85	4.23	78.20
PCPu120/1-7-237 5 nm	5744	12722	42830	-198	29276	45970	4499	-654	14.20	-1.48	-0.03	61.30
PCPu120/1-7-237 AS	59	76	959	15	2353	2885	181	-23	1.54	4.03	2.80	13.30
PCPu120/1-7-238 0.45 μm	5684	18931	43268	6	42983	70017	4187	306	20.06	2.25	6.33	75.49
PCPu120/1-7-238 0.1 μm	5419	18530	39520	-55	40873	64170	3979	0	18.80	1.30	5.96	70.10
PCPu120/1-7-238 5 nm	5214	19122	37730	-178	28676	50670	3409	-390	16.10	-0.87	0.05	56.80
PCPu120/1-7-238 AS	234	842	6789	5	8313	11285	908	59	7.41	25.58	12.57	70.90
PCPu120/1-7-239 0.45 μm	6167	13638	49120	3	40377	68209	3366	271	19.34	3.50	3.38	104.00
PCPu120/1-7-239 0.1 μm	6119	12830	45320	-29	37773	62070	3419	180	19.20	2.70	3.44	94.10
PCPu120/1-7-239 5 nm	5344	12022	39430	-166	24176	44470	2729	-510	14.90	-1.21	0.02	69.50
PCPu120/1-7-239 AS	82	259	1609	10	4803	6415	307	71	2.45	9.88	3.52	24.00
PCPu120/1-7-240 0.45 μm	7577	12400	45258	1	49701	77939	3082	296	15.37	3.25	4.75	77.52
PCPu120/1-7-240 0.1 μm	7459	11330	41520	-41	46173	70070	3149	230	14.50	2.87	4.94	73.80
PCPu120/1-7-240 5 nm	7294	12022	40330	-166	34976	56970	2549	-420	12.60	-0.85	0.02	58.00
PCPu120/1-7-240 AS	7377	12076	44139	3	48323	75985	3006	278	14.90	3.62	4.60	75.50
PCPu120/1-7-Blank 0.45 μm	4	28	141	11	11	327	20	51	0.04	0.69	0.01	0.03
PCPu120/1-7-Blank 0.1 μm	101	270	1280	359	227	1330	721	1350	0.40	2.14	0.88	0.30
PCPu120/1-7-Blank 5 nm	106	278	1570	370	224	1630	841	1620	0.40	2.43	0.89	0.30
PCPu120/1-7-Blank AS	3	24	61	9	77	215	14	60	0.10	0.22	0.03	0.00
PCPu120/1-14-237 0.45 μm	7780	18975	56445	24	51234	78008	6569	1516	25.38	8.03	7.60	128.08
PCPu120/1-14-237 0.1 μm	7270	18932	49070	16	51529	77180	4480	320	24.78	5.76	6.69	121.58
PCPu120/1-14-237 5 nm	6776	18719	44140	-202	28429	52410	3780	-350	18.20	-0.92	0.00	81.83
PCPu120/1-14-237 AS	69	51	787	17	4413	4238	53	68	1.29	5.20	1.86	10.88
PCPu120/1-14-238 0.45 μm	6904	27787	48462	10	50583	84358	4988	277	25.58	3.27	9.05	121.73
PCPu120/1-14-238 0.1 μm	6730	26232	44470	-38	47929	78780	4990	90	24.68	2.55	8.15	101.58
PCPu120/1-14-238 5 nm	6366	26719	41840	-207	27629	54810	4440	-408	19.40	-1.30	0.00	75.33
PCPu120/1-14-238 AS	114	269	3146	20	5303	8098	420	95	3.95	14.64	9.04	37.58
PCPu120/1-14-238R 0.45 μm	7485	29798	49989	8	53844	86234	5520	233	28.76	3.19	8.44	141.86
PCPu120/1-14-238R 0.1 μm	8740	34932	59870	22	64729	99680	6910	560	34.78	3.57	10.60	151.58
PCPu120/1-14-238R 5 nm	7016	28119	44840	-207	25829	51010	4790	-190	22.40	-1.01	0.00	90.13
PCPu120/1-14-238R AS	4	36	163	26	684	1258	0	72	0.30	1.41	4.14	0.93
PCPu120/1-14-239 0.45 μm	7889	22348	49157	15	49392	84720	4696	344	29.37	10.83	8.50	180.50
PCPu120/1-14-239 0.1 μm	7720	19832	44370	-40	43529	72280	4810	220	26.38	8.94	7.38	143.58
PCPu120/1-14-239 5 nm	7326	21519	43340	-120	25629	56010	4050	80	21.50	0.29	0.00	102.63
PCPu120/1-14-239 AS	32	90	1176	48	2823	3938	128	139	1.95	5.93	3.72	18.38
PCPu120/1-14-240 0.45 μm	8810	17232	46060	7	58268	90425	3969	254	23.83	5.57	7.49	157.34
PCPu120/1-14-240 0.1 μm	8750	16832	44670	-15	57829	87580	4110	240	23.38	5.34	7.54	137.58
PCPu120/1-14-240 5 nm	8306	16419	40540	-195	36429	62710	3410	-40	17.60	-0.56	0.00	95.03
PCPu120/1-14-240 AS	26	56	916	44	1963	3048	108	84	1.48	3.87	2.82	14.48
PCPu120/1-14-Blank 0.45 μm	2	27	134	7	7	135	93	53	0.03	0.52	0.02	0.02
PCPu120/1-14-Blank 0.1 μm	170	668	2130	192	71	1320	1780	1310	0.52	1.76	0.20	0.42
PCPu120/1-14-Blank 5 nm	164	681	2260	223	71	1490	1800	1400	0.50	2.17	0.20	0.37
PCPu120/1-14-Blank AS	2	27	84	5	17	132	90	32	0.07	0.07	0.02	0.02
PCPu120/1-28-237 0.45 μm	10253	23538	47974	32	48129	86171	4820	356	22.10	13.52	13.88	96.03
PCPu120/1-28-237 0.1 μm	9947	21601	46020	-23	48118	81710	4562	480	20.40	12.64	13.40	88.10
PCPu120/1-28-237 5 nm	9437	22235	43320	-141	27730	59790	3860	-240	15.55	-0.39	0.02	51.80
PCPu120/1-28-237 AS	155	113	2019	24	6376	7660	526	64	4.04	10.52	7.09	31.60
PCPu120/1-28-238 0.45 μm	9998	35476	47878	16	46414	82581	4466	310	18.36	11.84	11.80	66.11
PCPu120/1-28-238 0.1 μm	12147	42701	56820	10	57118	95510	5532	490	22.50	13.94	14.40	78.20
PCPu120/1-28-238 5 nm	9167	33735	42320	-141	24230	55090	3560	-300	12.95	-0.38	0.00	36.30

Table 23B: Dilution and Background Corrected Solution Concentrations, in μg/L (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	Pu	Cl	I
PCPu120-91-Blank AS	0.88	0.05	0.05	0.01	0.00	0.00	0.00	0.00	0.00		
HIP U,Pu-loaded CWF at 120 (											
PCPu120/1-7-237 0.45 μm	9.43	6.23	14.18	6.63	22.33	3.40	0.42	48.31	22.72	29	32.9
PCPu120/1-7-237 0.1 μm	8.02	6.04	12.80	6.25	22.36	3.74	0.43	40.90	19.22		
PCPu120/1-7-237 5 nm	-0.90	-0.02	0.00	-0.01	0.01	0.00	-0.01	8.45	0.00		
PCPu120/1-7-237 AS	7.38	5.00	9.85	4.80	16.06	2.40	0.22	32.63	27.57		
PCPu120/1-7-238 0.45 μm	4.98	10.45	31.36	12.94	43.29	6.58	0.89	16.60	118.52	23	27.7
PCPu120/1-7-238 0.1 μm	3.12	9.55	27.40	12.15	40.46	5.86	0.88	12.40	99.77		
PCPu120/1-7-238 5 nm	6.50	0.01	0.00	0.06	0.28	0.07	0.01	2.66	0.06		
PCPu120/1-7-238 AS	40.59	30.63	57.28	28.19	93.36	13.50	1.35	61.53	206.97		
PCPu120/1-7-239 0.45 μm	9.92	6.02	14.25	6.62	21.81	3.24	0.45	17.87	24.14	31	38.5
PCPu120/1-7-239 0.1 μm	8.62	5.67	12.70	6.12	20.76	3.45	0.46	12.00	20.48		
PCPu120/1-7-239 5 nm	-0.42	0.00	0.00	0.00	0.15	0.01	-0.01	4.15	0.05		
PCPu120/1-7-239 AS	17.99	8.76	16.58	7.81	25.56	3.90	0.38	48.33	25.51		
PCPu120/1-7-240 0.45 μm	9.90	6.99	19.18	8.48	28.54	4.57	0.63	16.45	57.57	29	50.5
PCPu120/1-7-240 0.1 μm	8.42	6.61	17.20	7.93	26.46	4.33	0.64	12.90	49.54		
PCPu120/1-7-240 5 nm	-0.26	0.17	0.00	0.02	0.14	0.01	0.00	6.56	0.06		
PCPu120/1-7-240 AS	8.89	6.65	18.58	8.26	27.66	4.48	0.62	14.93	55.94		
PCPu120/1-7-Blank 0.45 μm	0.58	0.01	0.03	0.01	0.01	0.03	0.01	0.08	0.01	1	3.7
PCPu120/1-7-Blank 0.1 μm	2.08	0.20	0.30	0.15	0.54	0.30	0.16	0.80	0.11		
PCPu120/1-7-Blank 5 nm	2.13	0.22	0.30	0.15	0.52	0.30	0.18	0.80	0.11		
PCPu120/1-7-Blank AS	1.31	0.17	0.12	0.01	0.14	0.00	0.00	1.17	0.12		
PCPu120/1-14-237 0.45 μm	18.88	12.16	25.95	12.59	40.55	6.34	0.85	63.92	43.69	29	40.3
PCPu120/1-14-237 0.1 μm	14.99	10.36	22.06	9.99	35.60	5.70	0.70	51.60	36.61		
PCPu120/1-14-237 5 nm	-0.18	0.02	0.03	0.03	0.08	0.01	-0.01	12.70	0.00		
PCPu120/1-14-237 AS	10.98	5.04	8.49	3.82	13.28	1.69	0.20	18.97	11.20		
PCPu120/1-14-238 0.45 μm	6.98	14.89	38.84	16.68	57.08	8.39	1.14	27.26	141.67	22	31.4
PCPu120/1-14-238 0.1 μm	5.81	13.56	34.36	14.89	51.90	8.37	1.05	19.60	120.94		
PCPu120/1-14-238 5 nm	-0.96	0.01	0.02	0.01	0.08	0.03	-0.02	5.68	0.00		
PCPu120/1-14-238 AS	23.78	21.88	39.10	19.19	63.18	9.15	0.97	39.77	163.62		
PCPu120/1-14-238R 0.45 μm	6.55	14.59	37.28	15.83	53.93	8.11	1.06	21.30	118.10	22	36.6
PCPu120/1-14-238R 0.1 μm	8.39	17.26	43.46	18.89	64.50	10.18	1.21	27.90	172.43		
PCPu120/1-14-238R 5 nm	-0.57	0.04	0.10	0.07	0.20	0.03	0.00	4.68	0.00		
PCPu120/1-14-238R AS	4.07	12.58	32.40	9.66	31.68	4.04	0.56	1.47	0.00		
PCPu120/1-14-239 0.45 μm	32.85	15.66	32.76	15.01	49.81	7.47	0.96	41.48	36.08	29	39.1
PCPu120/1-14-239 0.1 μm	28.19	13.86	28.36	13.09	44.30	6.69	0.90	29.10	28.49		
PCPu120/1-14-239 5 nm	1.15	0.16	0.45	0.03	0.13	0.03	-0.01	14.20	0.00		
PCPu120/1-14-239 AS	11.58	8.38	16.60	7.88	26.88	3.82	0.38	46.97	40.85		
PCPu120/1-14-240 0.45 μm	18.12	11.77	28.02	12.38	42.42	6.59	0.85	22.00	72.33	29	61.1
PCPu120/1-14-240 0.1 μm	16.99	11.56	27.46	12.19	41.80	6.88	0.89	19.10	68.42		
PCPu120/1-14-240 5 nm	0.54	0.04	0.02	0.02	0.04	0.05	-0.01	10.20	0.00		
PCPu120/1-14-240 AS	7.91	6.64	12.60	6.18	20.88	2.91	0.30	14.77	58.81		
PCPu120/1-14-Blank 0.45 μm	0.76	0.01	0.10	0.01	0.02	0.03	0.01	0.13	0.04	0	1.2
PCPu120/1-14-Blank 0.1 μm	2.51	0.34	1.04	0.72	0.20	0.32	0.15	1.30	0.34		
PCPu120/1-14-Blank 5 nm	2.79	0.34	1.08	0.71	0.20	0.32	0.15	1.30	0.34		
PCPu120/1-14-Blank AS	0.92	0.02	0.10	0.01	0.02	0.03	0.01	0.13	0.00		
PCPu120/1-28-237 0.45 μm	34.13	25.07	53.30	24.47	81.29	12.46	1.57	120.74	55.76	32	39.6
PCPu120/1-28-237 0.1 μm	30.60	22.53	44.71	21.64	72.60	11.00	1.41	102.10	47.83		
PCPu120/1-28-237 5 nm	0.53	-0.01	0.05	0.02	0.00	0.00	0.01	30.40	0.01		
PCPu120/1-28-237 AS	20.07	14.43	27.54	13.34	44.28	6.71	0.66	85.85	64.97		
PCPu120/1-28-238 0.45 μm	24.89	22.95	48.02	22.25	74.08	11.30	1.56	34.80	123.79	28	33.7
PCPu120/1-28-238 0.1 μm	29.40	26.83	54.51	26.24	87.20	13.40	1.88	37.00	134.90		
PCPu120/1-28-238 5 nm	1.50	0.00	0.07	0.02	0.00	0.00	0.01	13.20	0.26		

Table 23B: Dilution and Background Corrected Solution Concentrations, in μg/L (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PCPu120/1-28-238 AS	197	619	4749	29	7316	12150	836	114	6.98	20.52	10.51	63.80
PCPu120/1-28-239 0.45 μm	10335	23596	47478	25	50775	91178	4446	413	23.17	15.31	11.52	120.58
PCPu120/1-28-239 0.1 μm	9947	21901	43920	35	48718	82410	4482	390	22.30	14.44	11.70	111.70
PCPu120/1-28-239 5 nm	9767	23135	43120	-141	29530	64290	3540	0	15.85	-0.09	0.00	58.00
PCPu120/1-28-239 AS	196	520	4119	23	6726	9650	813	106	5.59	18.32	14.01	47.10
PCPu120/1-28-240 0.45 μm	11557	19349	44055	22	48874	91124	4093	400	21.36	13.70	11.63	119.63
PCPu120/1-28-240 0.1 μm	11747	19001	43720	-51	50818	89310	4172	270	20.70	13.54	12.50	115.70
PCPu120/1-28-240 5 nm	11747	21135	44220	-141	32230	71290	3590	180	14.85	0.39	0.18	60.80
PCPu120/1-28-240 AS	319	482	4319	24	9316	12950	978	157	6.37	17.42	7.80	54.20
PCPu120/1-28-Blank 0.45 μm	3	19	157	8	2	38	13	28	0.04	0.50	0.03	0.03
PCPu120/1-28-Blank 0.1 μm	153	999	1480	184	82	1190	888	1320	0.40	1.46	0.30	0.30
PCPu120/1-28-Blank 5 nm	153	965	1780	165	70	1410	900	1500	0.45	1.99	0.30	0.30
PCPu120/1-28-Blank AS	17	77	821	5	884	1650	122	24	0.97	2.58	0.79	8.70
PCPu120/1-56-237 0.45 μm	11273	27576	40569	6	45601	81778	4163	239	17.66	5.02	13.38	67.02
PCPu120/1-56-237 0.1 μm	12397	32606	42340	72	49795	88570	4610	1110	17.70	6.70	17.37	66.70
PCPu120/1-56-237 5 nm	11498	28706	36660	-178	27604	56830	3700	-350	13.07	-0.68	0.05	41.70
PCPu120/1-56-237 AS	226	0	2291	13	6846	5820	648	48	5.46	22.32	10.18	44.28
PCPu120/1-56-238 0.45 μm	12895	51285	47545	18	47244	87205	4758	308	19.94	12.65	15.02	79.43
PCPu120/1-56-238 0.1 μm	13497	52106	47140	-28	47695	86670	5180	850	20.40	13.43	15.47	79.50
PCPu120/1-56-238 5 nm	11698	49506	40360	-173	21004	51430	3610	-370	12.17	-0.69	0.03	38.50
PCPu120/1-56-238 AS	142	105	2891	20	4856	6140	502	64	4.22	14.42	9.63	37.38
PCPu120/1-56-239 0.45 μm	12640	32602	48250	5	46480	84820	4025	278	19.57	4.67	10.51	82.31
PCPu120/1-28-239 0.1 μm	12797	34806	40040	-81	49095	90870	4140	40	18.60	3.86	10.87	79.30
PCPu120/1-56-239 5 nm	11898	34906	36360	-174	30104	65930	3430	-310	13.77	-0.89	0.01	50.70
PCPu120/1-56-239 AS	101	0	1671	4	3866	3100	325	34	2.82	14.52	7.55	25.78
PCPu120/1-56-240 0.45 μm	15303	28477	39370	12	53395	94734	3867	298	18.12	5.79	13.88	88.18
PCPu120/1-56-240 0.1 μm	16197	32006	41740	-64	60395	107770	4280	90	18.40	5.48	14.97	91.20
PCPu120/1-56-240 5 nm	13698	27006	33060	-160	34404	66730	3040	-230	12.17	-0.41	0.04	49.70
PCPu120/1-56-240 AS	15	0	285	59	973	-460	51	431	0.54	2.98	3.43	5.53
PCPu120/1-56-Blank 0.45 μm	3	102	127	10	15	5559	40	64	0.08	0.46	0.36	0.02
PCPu120/1-56-Blank 0.1 μm	103	994	2060	440	305	6230	1420	1630	0.30	1.97	0.53	0.20
PCPu120/1-56-Blank 5 nm	102	994	2340	404	296	7070	1450	1650	0.34	2.16	0.48	0.20
PCPu120/1-56-Blank AS	3	99	109	10	14	2180	39	63	0.04	0.08	0.02	0.02
PCPu120/1-91-237 0.45 μm	17369	38035	53034	94	68354	116006	9624	681	53.43	38.74	24.32	297.60
PCPu120/1-91-237 0.1 μm	17052	36248	49659	26	61999	107302	8123	490	47.27	36.44	30.18	263.51
PCPu120/1-91-237 5 nm	15234	38023	45460	-159	21397	64691	4815	-507	19.29	-0.29	0.02	71.98
PCPu120/1-91-237 AS	198	206	1523	24	4321	6336	365	88	3.16	9.17	4.41	26.88
PCPu120/1-91-238 0.45 μm	17129	56113	53065	60	56014	112317	7964	471	41.26	32.07	20.51	195.02
PCPu120/1-91-238 0.1 μm	19476	64831	59759	70	59777	114372	9002	581	45.35	35.53	28.06	212.00
PCPu120/1-91-238 5 nm	16042	61960	50510	-141	16953	62873	5441	-396	19.19	0.08	0.18	59.55
PCPu120/1-91-238 AS	131	296	1923	18	3641	5626	331	74	2.84	9.98	4.84	26.08
PCPu120/1-91-239 0.45 μm	17197	39520	45232	61	58680	114146	7206	536	45.50	27.26	19.85	260.53
PCPu120/1-91-239 0.1 μm	22910	52307	60365	118	76341	138612	9406	722	55.45	36.14	34.73	317.04
PCPu120/1-91-239 5 nm	15638	42366	41723	-159	21700	66206	4380	-530	18.48	-0.31	0.00	73.49
PCPu120/1-91-239 AS	79	142	1253	8	2441	4026	238	42	2.23	8.03	4.77	21.38
PCPu120/1-91-240 0.45 μm	19219	34214	42458	31	61316	118516	6499	388	38.74	18.58	18.46	235.24
PCPu120/1-91-240 0.1 μm	21294	39076	47942	53	66847	121442	7073	490	41.01	19.98	26.04	248.36
PCPu120/1-91-240 5 nm	18365	33882	37784	-159	25033	69943	3835	-532	16.26	-0.29	0.09	69.75
PCPu120/1-91-240 AS	90	123	605	24	2451	3336	141	72	1.44	8.60	2.91	14.48
PCPu120/1-91-Blank 0.45 μm	1	25	183	24	20	164	23	117	0.12	0.64	0.02	0.02
PCPu120/1-91-Blank 0.1 μm	17	112	942	216	520	768	603	853	0.10	1.33	0.12	0.10
PCPu120/1-91-Blank 5 nm	17	155	1202	219	520	1162	599	1091	0.10	1.78	0.10	0.14
PCPu120/1-91-Blank AS	1	10	27	7	19	214	22	29	0.14	0.12	0.04	0.02

Table 23B: Dilution and Background Corrected Solution Concentrations, in μg/L (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	Pu	Cl	I
PCPu120/1-28-238 AS	37.27	26.13	48.04	23.44	77.48	11.57	1.04	172.05	95.51		
PCPu120/1-28-239 0.45 μm	47.24	24.72	48.74	23.11	73.84	10.51	1.37	62.54	35.94	34	45.6
PCPu120/1-28-239 0.1 μm	43.30	23.93	45.21	21.54	70.20	9.57	1.36	50.20	31.24		
PCPu120/1-28-239 5 nm	1.20	0.02	0.01	0.01	0.00	0.00	0.01	28.40	0.00		
PCPu120/1-28-239 AS	29.17	24.33	44.84	20.54	69.48	10.27	1.08	47.55	168.86		
PCPu120/1-28-240 0.45 μm	41.89	21.49	46.03	21.70	71.35	10.72	1.44	34.99	88.98	31	60.8
PCPu120/1-28-240 0.1 μm	38.80	21.93	42.81	20.54	69.50	10.90	1.31	30.20	76.43		
PCPu120/1-28-240 5 nm	1.68	0.33	0.74	0.31	0.98	0.00	0.04	17.90	1.65		
PCPu120/1-28-240 AS	33.27	20.93	38.84	18.84	60.48	8.61	0.87	24.85	128.81		
PCPu120/1-28-Blank 0.45 μm	0.29	0.01	0.01	0.00	0.04	0.03	0.01	0.09	0.01	0	4.3
PCPu120/1-28-Blank 0.1 μm	1.80	0.17	0.79	0.27	0.40	0.30	0.22	0.90	0.11		
PCPu120/1-28-Blank 5 nm	1.80	0.19	0.74	0.27	0.40	0.30	0.23	0.90	0.11		
PCPu120/1-28-Blank AS	4.63	2.57	4.66	2.16	7.32	0.93	0.09	3.95	8.49		
PCPu120/1-56-237 0.45 μm	10.06	19.20	47.01	21.25	70.69	11.47	1.39	131.01	83.14	25	46.0
PCPu120/1-56-237 0.1 μm	12.41	23.87	54.00	25.66	86.56	14.50	1.47	209.00	103.43		
PCPu120/1-56-237 5 nm	0.06	0.03	0.00	0.04	0.10	0.03	0.00	19.00	0.06		
PCPu120/1-56-237 AS	51.94	24.09	44.12	22.19	69.97	9.98	1.18	68.70	58.92		
PCPu120/1-56-238 0.45 μm	27.05	28.21	61.98	28.72	92.74	13.92	1.91	57.27	170.00	23	38.1
PCPu120/1-56-238 0.1 μm	27.21	28.07	59.00	28.06	90.66	13.60	1.87	45.30	160.07		
PCPu120/1-56-238 5 nm	0.38	0.01	0.00	0.01	0.04	0.03	0.00	21.20	0.24		
PCPu120/1-56-238 AS	24.44	21.49	37.92	18.69	60.07	8.35	0.93	40.30	175.06		
PCPu120/1-56-239 0.45 μm	12.36	17.09	41.99	18.75	61.35	9.52	1.19	85.47	62.15	28	49.4
PCPu120/1-28-239 0.1 μm	11.51	16.87	38.70	18.16	58.86	9.12	1.14	56.30	48.97		
PCPu120/1-56-239 5 nm	-0.03	0.01	0.00	0.02	0.09	-0.01	0.00	30.70	0.08		
PCPu120/1-56-239 AS	37.24	19.69	33.42	17.29	53.77	7.87	0.90	49.30	35.93		
PCPu120/1-56-240 0.45 μm	19.10	22.45	53.77	24.47	80.68	12.31	1.52	45.18	157.97	27	67.8
PCPu120/1-56-240 0.1 μm	16.71	24.97	55.00	25.96	85.96	13.30	1.64	38.60	141.76		
PCPu120/1-56-240 5 nm	1.19	0.05	0.00	0.04	0.08	0.03	0.01	20.20	0.30		
PCPu120/1-56-240 AS	7.83	8.10	17.02	7.89	24.17	3.63	0.40	3.67	41.76		
PCPu120/1-56-Blank 0.45 μm	0.81	1.09	1.89	0.90	2.91	0.43	0.04	0.20	0.01	0	1.0
PCPu120/1-56-Blank 0.1 μm	1.59	0.43	1.80	0.34	0.34	0.70	0.30	2.00	0.11		
PCPu120/1-56-Blank 5 nm	1.78	0.43	1.80	0.34	0.29	0.73	0.31	2.00	0.11		
PCPu120/1-56-Blank AS	1.26	0.02	0.18	0.01	0.03	0.02	0.01	0.20	0.00		
PCPu120/1-91-237 0.45 μm	108.62	60.62	122.80	55.09	179.21	25.32	3.09	222.28	116.20	34	83.3
PCPu120/1-91-237 0.1 μm	90.68	59.26	126.05	50.50	185.44	26.36	3.12	170.50	81.47		
PCPu120/1-91-237 5 nm	0.86	0.07	0.00	0.05	0.00	0.00	0.02	31.44	0.16		
PCPu120/1-91-237 AS	17.40	12.25	27.00	11.59	42.24	5.77	0.62	47.63	58.95		
PCPu120/1-91-238 0.45 μm	73.49	49.73	103.18	47.16	158.90	22.58	2.95	117.54	278.64	29	67.0
PCPu120/1-91-238 0.1 μm	77.65	57.74	128.07	51.71	189.48	26.56	3.49	93.84	240.25		
PCPu120/1-91-238 5 nm	2.14	0.38	0.00	0.36	1.00	0.06	0.02	25.89	2.67		
PCPu120/1-91-238 AS	16.80	13.45	28.10	12.39	45.44	6.19	0.69	23.43	142.93		
PCPu120/1-91-239 0.45 μm	80.23	49.73	101.22	46.65	157.54	21.91	2.69	178.06	88.01	32	85.7
PCPu120/1-91-239 0.1 μm	96.64	69.86	147.26	60.80	219.78	31.11	3.73	189.69	82.74		
PCPu120/1-91-239 5 nm	3.26	0.04	0.00	0.02	0.00	0.00	0.00	60.63	0.27		
PCPu120/1-91-239 AS	15.30	12.05	25.10	11.39	42.14	6.01	0.57	60.63	63.76		
PCPu120/1-91-240 0.45 μm	56.96	37.38	81.49	36.23	132.31	19.51	2.38	77.72	193.46	31	174.0
PCPu120/1-91-240 0.1 μm	56.14	44.91	97.47	41.21	153.12	23.53	2.61	59.30	182.47		
PCPu120/1-91-240 5 nm	2.72	0.18	0.00	0.18	0.38	0.00	0.01	18.82	0.98		
PCPu120/1-91-240 AS	18.20	8.27	16.80	7.57	27.14	3.72	0.41	9.07	22.23		
PCPu120/1-91-Blank 0.45 μm	1.02	0.01	0.01	0.00	0.02	0.02	0.01	0.10	0.01	0	20.1
PCPu120/1-91-Blank 0.1 μm	4.26	4.68	0.20	3.64	0.40	0.10	0.18	2.21	0.12		
PCPu120/1-91-Blank 5 nm	1.72	4.64	0.20	3.62	0.40	0.10	0.15	1.99	0.12		
PCPu120/1-91-Blank AS	0.70	0.06	0.10	0.01	0.06	0.02	0.01	0.27	0.09		

Table 23B: Dilution and Background Corrected Solution Concentrations, in µg/L (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PC U,Pu-loaded CWF GPC00202 at 90 and 120C and mass ratio 1:10												
RWS 1 (PC CWF 202)	285	581	173720	6	38	7403	1576	4171	2.33	6.37	0.20	106.05
RWS 2 (PC CWF 202)	342	626	257550	6	38	10100	1778	4606	3.42	7.39	0.20	130.29
RWS 3 (PC CWF 202)	271	400	141400	6	38	4959	1454	3222	2.67	6.95	0.20	86.15
PuPC90-7-202a 0.45 µm	5647	1811	78075	60	16182	27120	2344	-255	17.54	5.55	1.88	142.67
PuPC90-7-202a 0.1µm												
PuPC90-7-202a 0.005µm												
PuPC90-7-202a AS	139	463	4326	25	5213	7585	559	149	5.31	20.02	33.45	45.48
PuPC90-7-202b 0.45 µm	5067	1825	45818	-32	21600	34678	1825	-347	14.95	2.75	1.69	125.80
PuPC90-7-202b 0.1µm												
PuPC90-7-202b 0.005µm												
PuPC90-7-202b AS	103	367	3136	54	3873	5665	437	185	4.68	18.22	10.45	37.38
PuPC90-7-202c 0.45 µm	5309	2217	45671	-31	21538	36806	2112	-328	18.58	6.62	2.07	156.06
PuPC90-7-202c 0.1µm												
PuPC90-7-202c 0.005µm												
PuPC90-7-202c AS	314	1017	8746	70	11143	16255	1248	305	12.51	44.92	16.45	90.18
PuPC90-7-Blank a 0.45 µm	15	30	297	17	12	53	81	78	0.04	1.03	0.01	0.03
PuPC90-7-Blank a 0.1µm	197	349	2323	14	33	116	873	965	0.40	1.90	0.10	0.30
PuPC90-7-Blank a 0.005µm	195	366	3060	9	33	116	1707	582	0.40	1.43	0.10	0.30
PuPC90-7-Blank a AS	2	23	144	86	157	145	32	52	0.19	0.48	1.05	0.53
PCPu120-7-202a 0.45um	12859	7994	65676	-7	42256	79227	6162	570	38.58	8.99	17.58	319.66
PuPC120-7-202a 0.1um	12731	7619	66155	-5	42993	82199	5743	530	36.87	4.72	16.06	304.72
PuPC120-7-202a 5nm	12733	7795	62590	0	37135	72200	4192	330	33.13	0.96	0.00	265.33
PuPC120-7-202a AS	100	96	1293	28	5928	8211	300	136	3.36	19.67	6.63	43.17
PCPu120-7-202b 0.45um	12050	7105	62520	-8	41799	75872	6055	575	41.25	4.42	19.23	357.76
PuPC120-7-202b 0.1um	13034	7569	67266	-5	46730	85633	5743	227	41.11	3.58	19.39	387.54
PuPC120-7-202b 5nm	12733	7543	63398	0	40165	74927	4424	231	37.67	0.36	0.00	342.09
PuPC120-7-202b AS	372	1519	11793	68	14788	25231	1818	324	16.82	61.07	22.63	128.97
PCPu120-7-202c 0.45um	13013	8060	65363	-8	46636	86309	6947	725	44.71	5.32	21.11	391.85
PuPC120-7-202c 0.1um	13438	8044	64337	-5	47336	87754	5440	207	42.22	3.58	18.69	385.52
PuPC120-7-202c 5nm	12935	7896	63499	0	41478	77048	5474	375	40.70	2.05	0.00	364.31
PuPC120-7-202c AS	203	942	7413	40	9938	16331	1188	206	11.92	45.97	19.03	90.57
PCPu120-7-Blank a 0.45um	15	30	301	17	12	53	82	79	0.04	1.04	0.01	0.03
PuPC120-7-Blank a 0.1um	197	349	2323	14	33	116	873	965	0.40	1.90	0.10	0.30
PuPC120-7-Blank a 5nm	195	366	3060	9	33	116	1707	582	0.40	1.43	0.10	0.30
PuPC120-7-Blank a AS	14	21	207	10	12	169	53	37	0.08	0.43	0.27	0.03
PuPC120-28-202a 0.45 µm	20376	11341	68573	11	53767	87801	5100	444	38.78	4.99	23.99	367.52
PuPC120-28-202a 0.1µm	17802	11070	65771	0	51389	87357	5141	222	44.57	6.79	31.42	392.25
PuPC120-28-202a 0.005µm	18206	11383	64792	0	39269	69928	4969	6	38.70	0.60	0.08	317.63
PuPC120-28-202a AS	77	497	3257	55	4404	6612	1745	270	5.52	25.54	12.08	48.48
PuPC120-28-202b 0.45 µm	19529	10521	67354	-6	52030	85184	4668	406	38.32	4.62	23.43	336.06
PuPC120-28-202b 0.1µm	19822	12080	72841	0	52298	92003	5434	253	42.65	3.37	21.22	379.12
PuPC120-28-202b 0.005µm	17903	10979	65398	0	43309	75887	4707	269	38.50	0.74	0.07	322.68
PuPC120-28-202b AS	129	597	4437	75	5594	8942	2215	408	7.08	27.24	13.88	54.38
PuPC120-28-202c 0.45 µm	19455	11761	69955	-1	49656	84639	4544	457	39.42	3.30	16.35	320.11
PuPC120-28-202c 0.1µm	18307	11474	68498	0	52096	89680	5292	354	42.65	4.50	31.52	390.23
PuPC120-28-202c 0.005µm	18105	10878	63378	0	42097	72453	4686	198	37.19	0.69	0.25	315.61
PuPC120-28-202c AS	110	461	3537	48	7164	8912	985	344	6.66	51.04	23.88	67.28
PuPc120-28-Blank a 0.45 µm	4	38	220	25	129	234	51	63	0.12	1.62	0.01	0.75
PuPC120-28-Blank a 0.1µm	75	1151	2303	14	2545	210	2081	1081	8.05	4.83	0.19	2.66
PuPC120-28-Blank a 0.005µm	75	1141	2475	14	2545	469	2020	933	7.25	4.67	0.15	2.54
PuPC120-28-Blank a AS	4	25	53	8	126	198	36	16	0.11	1.06	0.12	0.12

Table 23B: Dilution and Background Corrected Solution Concentrations, in μg/L (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	Pu	Cl	I
PC U,Pu-loaded CWF GPC002											
RWS 1 (PC CWF 202)	69.39	0.10	0.10	0.10	0.20	0.30	0.36	0.20	1.06	318000	513.0
RWS 2 (PC CWF 202)	79.39	0.10	0.10	0.10	0.20	0.30	0.38	0.20	1.31	421000	679.0
RWS 3 (PC CWF 202)	58.88	0.10	0.10	0.10	0.20	0.30	0.34	0.20	0.80	264000	414.0
PuPC90-7-202a 0.45 μm	80.36	2.84	4.63	2.24	6.38	0.76	0.20	5.26	6.17	114	53.7
PuPC90-7-202a 0.1μm											
PuPC90-7-202a 0.005μm											
PuPC90-7-202a AS	99.13	17.12	27.60	12.53	39.22	4.80	0.72	19.08	5.79		
PuPC90-7-202b 0.45 μm	72.27	2.15	3.99	1.82	5.46	0.71	0.19	5.33	6.29	52	41.2
PuPC90-7-202b 0.1μm											
PuPC90-7-202b 0.005μm											
PuPC90-7-202b AS	100.13	14.22	22.80	10.33	31.62	3.64	0.61	11.08	6.00		
PuPC90-7-202c 0.45 μm	231.51	4.12	9.00	3.72	11.09	1.44	0.37	7.60	14.77	50	39.2
PuPC90-7-202c 0.1μm											
PuPC90-7-202c 0.005μm											
PuPC90-7-202c AS	238.13	37.12	58.40	27.43	83.02	9.54	1.43	22.58	14.19		
PuPC90-7-Blank a 0.45 μm	36.30	0.01	0.02	0.01	0.03	0.02	0.01	0.01	0.01	1	7.4
PuPC90-7-Blank a 0.1μm	27.17	0.10	0.20	5.88	0.59	0.20	0.27	0.10	0.12		
PuPC90-7-Blank a 0.005μm	29.39	0.10	0.20	5.88	0.64	0.20	0.31	0.24	0.14		
PuPC90-7-Blank a AS	3.87	0.28	0.40	0.17	0.58	0.07	0.02	0.52	0.00		
PCPu120-7-202a 0.45um	62.67	35.28	96.10	41.94	114.76	13.60	3.84	25.73	144.83	87	53.9
PuPC120-7-202a 0.1um	30.50	31.01	87.26	32.10	103.44	12.83	3.19	18.69	133.93		
PuPC120-7-202a 5nm	2.53	0.00	0.13	0.12	0.31	0.00	-0.01	10.57	0.39		
PuPC120-7-202a AS	98.60	12.99	18.58	9.99	31.87	3.90	0.87	10.35	0.00		
PCPu120-7-202b 0.45um	22.30	36.91	96.50	41.59	116.46	14.64	3.85	27.24	122.56	90	49.3
PuPC120-7-202b 0.1um	36.87	37.47	97.97	37.25	121.62	14.95	3.58	26.46	128.16		
PuPC120-7-202b 5nm	2.22	0.00	0.12	0.13	0.44	0.00	-0.01	12.99	0.25		
PuPC120-7-202b AS	335.60	57.19	84.68	41.99	129.97	15.68	2.73	32.15	0.00		
PCPu120-7-202c 0.45um	29.72	39.28	104.31	44.75	123.94	15.95	3.98	28.56	133.42	88	50.5
PuPC120-7-202c 0.1um	32.52	38.08	101.81	37.96	122.63	15.05	3.69	25.15	124.69		
PuPC120-7-202c 5nm	60.60	0.00	0.07	0.10	0.39	0.00	0.01	16.22	0.16		
PuPC120-7-202c AS	223.60	42.09	64.28	30.39	96.87	11.68	2.10	31.95	0.00		
PCPu120-7-Blank a 0.45um	36.78	0.01	0.02	0.01	0.03	0.02	0.01	0.01	0.01	0	7.8
PuPC120-7-Blank a 0.1um	27.17	0.10	0.20	5.88	0.59	0.20	0.27	0.10	0.12		
PuPC120-7-Blank a 5nm	29.39	0.10	0.20	5.88	0.64	0.20	0.31	0.24	0.14		
PuPC120-7-Blank a AS	21.40	0.01	0.02	0.01	0.03	0.02	0.01	0.45	0.00		
PuPC120-28-202a 0.45 μm	-9.88	53.37	143.78	62.58	175.85	22.75	5.06	49.01	160.96	92	73.7
PuPC120-28-202a 0.1μm	63.33	60.45	159.38	65.75	197.76	23.84	5.26	28.68	162.71		
PuPC120-28-202a 0.005μm	1.71	0.18	0.00	0.12	0.23	0.00	0.00	14.44	0.25		
PuPC120-28-202a AS	152.80	27.70	38.64	25.23	72.50	8.85	1.58	15.14	0.00		
PuPC120-28-202b 0.45 μm	42.35	49.72	139.36	59.65	180.54	22.58	5.24	46.55	142.54	88	66.8
PuPC120-28-202b 0.1μm	24.14	46.01	148.27	53.73	153.32	19.39	4.31	76.05	188.13		
PuPC120-28-202b 0.005μm	1.13	0.13	0.00	0.10	0.00	0.00	0.00	18.38	0.34		
PuPC120-28-202b AS	153.80	29.90	43.64	26.23	78.90	9.79	1.67	14.94	0.00		
PuPC120-28-202c 0.45 μm	-33.03	38.08	124.19	46.57	143.86	18.21	4.09	48.42	152.76	92	84.3
PuPC120-28-202c 0.1μm	42.42	59.44	162.41	66.56	195.74	23.23	5.50	26.46	166.18		
PuPC120-28-202c 0.005μm	2.07	0.57	0.29	0.57	1.07	0.00	0.00	13.13	1.24		
PuPC120-28-202c AS	292.80	45.90	57.44	40.53	116.40	14.40	2.74	13.84	0.00		
PuPc120-28-Blank a 0.45 μm	69.57	0.01	0.01	0.01	0.01	0.01	0.01	0.12	0.01	1	8.2
PuPC120-28-Blank a 0.1μm	0.81	1.67	0.20	0.00	0.20	0.20	0.00	2.42	0.23		
PuPC120-28-Blank a 0.005μm	0.81	1.67	0.20	0.00	0.20	0.20	0.00	2.42	0.23		
PuPC120-28-Blank a AS	68.20	0.20	0.46	0.17	0.60	0.10	0.03	3.56	0.00		

Table 23B: Dilution and Background Corrected Solution Concentrations, in µg/L (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PC U,Pu-loaded CWF GPC0030m at 90C and mass ratio 1:10												
RWS AX	402	171	63100	11	223	526	1460	87	6	12	0	182
RWS AY	417	201	58100	14	237	561	1470	147	7	12	0	174
RWS scint	461	186	61100	18	380	665	1630	114	7	14	0	209
PPuPC90-7a 0.45um	4691	2193	32693	9	28546	36779	1700	294	12.86	0.79	1.00	139.20
PPuPC90-7a 0.1µm	4932	1606	31388	-23	29075	37611	1788	192	12.32	0.57	0.61	131.00
PPuPC90-7a 0.005µm	4346	1879	26684	-209	19783	27534	1596	-111	10.17	-0.95	0.00	112.82
PPuPC90-7a AS	0	0	39	10	224	252	19	202	0.08	1.00	0.69	0.89
PPuPC90-7b 0.45um	5593	2874	34763	12	29564	38469	2060	337	12.14	1.35	0.93	129.93
PPuPC90-7b 0.1µm	4780	1747	29974	-58	28065	36096	1717	0	11.72	0.77	0.62	128.98
PPuPC90-7b 0.005µm	4316	1949	26583	-209	20793	29251	1697	91	10.47	-1.27	0.00	112.82
PPuPC90-7b AS	6	0	368	5	769	1119	75	196	0.60	3.09	1.34	4.79
PPuPC90-7c 0.45um	5852	3088	32843	-3	28595	37233	2116	232	12.86	0.32	0.96	133.12
PPuPC90-7c 0.1µm	5912	3161	34014	-44	32408	45186	2232	-101	12.73	-0.17	0.72	127.97
PPuPC90-7c 0.005µm	4447	1505	27189	-209	20591	27332	1273	-468	10.37	-1.93	0.00	106.76
PPuPC90-7c AS	5	0	297	-1	604	816	56	115	0.42	2.27	0.99	3.34
PPuPC90-Blank7 0.45um	4	43	130	12	9	108	27	97	0.04	1.12	0.27	0.02
PPuPC90-Blank7 0.1µm	37	1404	932	157	215	365	1061	1182	0.30	1.94	0.10	0.30
PPuPC90-Blank7 0.005µm	37	1798	1293	215	215	948	1424	1283	1.14	2.56	0.10	0.30
PPuPC90-Blank7 AS	4	42	85	11	66	91	27	149	0.04	0.15	0.02	0.02
PPuPC90-14 0.45um	6366	3252	30956	-6	29077	39105	1752	36	16.19	1.46	2.31	165.30
PPuPC90-14 0.1µm	6848	3539	31333	-187	32281	45341	1929	-364	16.06	0.83	0.61	166.55
PPuPC90-14 0.005µm	6747	5071	29755	-132	27130	39449	2151	-303	15.35	-0.72	-1.36	140.29
PPuPC90-14 AS	8	0	347	6	723	1019	52	-42	0.65	3.00	1.84	5.58
PPuPC90-28 0.45um	8110	4625	28966	-3	32175	45704	2331	191	17.63	2.77	3.08	168.50
PPuPC90-28 0.1µm	6899	4468	25273	-194	28847	40392	1505	-141	17.17	5.74	1.50	157.46
PPuPC90-28 0.005µm	8424	6011	28038	-144	24302	40459	1970	-514	14.85	-1.04	-1.36	133.22
PPuPC90-28 AS	21	45	624	1	1004	1409	70	-48	37.46	1.25	5.80	1.40
PPuPC90T-28 0.45um	7804	3813	29495	7	26823	35860	1737	209	11.81	3.29	1.15	109.32
PPuPC90T-28 0.1µm	7242	3468	28000	-158	25615	34534	1111	-162	11.51	3.35	-0.88	103.93
PPuPC90T-28 0.005µm	8606	5152	30058	-144	21373	35207	1646	-172	10.81	-0.67	-1.36	89.99
PPuPC90T-28 AS	not analyzed											
PPuPC90T-28R 0.45um	5648	1231	24030	-4	29257	33535	1129	160	7.81	1.08	0.70	70.15
PPuPC90T-28R AS	-2	11	413	24	330	199	170	79	3.68	0.10	1.28	0.42
PPuPC90-56 0.45um	12368	3667	26839	6	32567	46410	2329	283	16.04	4.20	4.13	142.23
PPuPC90-56 0.1µm	9707	4185	26687	-178	32483	47159	2273	-414	17.07	3.13	4.80	140.29
PPuPC90-56 0.005µm	9515	4465	25614	398	26221	39348	2081	747	13.84	0.10	-0.02	108.98
PPuPC90-56 AS	-2	51	554	52	1014	1379	281	133	37.86	0.89	4.99	3.98
PPuPC90T-56 0.45um	12177	3701	24904	40	25680	35840	1594	240	11.42	4.04	1.83	94.02
PPuPC90T-56 0.1µm	9424	3761	25677	-84	27332	37968	1616	-202	11.31	3.17	1.94	93.53
PPuPC90T-56 0.005µm	14636	5728	44804	13	21575	34298	1747	-91	9.53	-0.93	-0.03	65.65
PPuPC90T-56 AS	-2	28	767	26	1134	776	187	138	10.56	0.43	2.67	2.18
PPuPC90Bl-56 0.45um	2	55	272	31	8	185	207	219	0.04	0.63	0.16	0.03
PPuPC90-56Blank 0.1µm	9	360	886	285	39	210	1515	1646	0.10	1.65	1.44	0.10
PPuPC90-56Blank 0.005µm	9	393	1454	149	39	648	1525	1475	0.10	1.77	1.46	0.10
PPuPC90-56Blank AS	4	42	85	11	66	91	27	149	0	0	0	0
PPuPC90-182 0.45um	4550	2642	9155	58	16820	22928	1587	526	16.28	23.49	16.36	139.86
PPuPC90-182 0.1 um	482	368	3144	-279	7011	10092	283	1020	8.16	46.33	21.79	85.35
PPuPC90-182 5 nm	15040	9707	33290	93	63187	89848	5727	1667	60.40	92.06	61.46	558.43
PPuPC90-182 AS	54	22	318	6	1174	1709	63	-25	1.32	7.16	3.54	13.08

Table 23B: Dilution and Background Corrected Solution Concentrations, in μg/L (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	Pu	Cl	I
PC U,Pu-loaded CWF GPC003											
RWS AX	84	0	0	0	1	0	0	0	1	434000	0.0
RWS AY	79	0	1	0	1	0	0	1	1	387000	0.0
RWS scint	86	0	1	0	1	0	0	1	2	368000	0.0
PPuPC90-7a 0.45um	9.90	1.41	7.04	2.24	6.15	0.85	0.26	3.97	13.36	33	48.9
PPuPC90-7a 0.1μm	7.73	1.78	6.60	2.25	7.49	0.34	0.00	2.11	12.74		
PPuPC90-7a 0.005μm	0.74	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.03		
PPuPC90-7a AS	7.28	1.18	1.93	1.24	3.52	0.49	0.11	1.36	0.00		
PPuPC90-7b 0.45um	8.38	1.34	6.72	2.12	6.23	0.76	0.21	3.75	12.17	32	61.0
PPuPC90-7b 0.1μm	6.16	1.66	6.55	2.26	7.42	0.26	0.00	2.27	11.93		
PPuPC90-7b 0.005μm	-1.36	0.00	0.00	0.00	0.00	0.00	0.00	0.58	0.03		
PPuPC90-7b AS	20.68	2.90	4.82	2.68	7.76	0.88	0.16	3.21	0.00		
PPuPC90-7c 0.45um	9.34	1.96	7.49	2.34	6.41	0.81	0.25	4.11	14.87	29	45.1
PPuPC90-7c 0.1μm	5.34	1.75	7.59	2.26	8.30	0.37	0.00	2.44	13.67		
PPuPC90-7c 0.005μm	-1.52	0.00	0.00	0.00	0.00	0.00	0.00	0.83	0.03		
PPuPC90-7c AS	14.48	1.98	3.28	1.88	5.52	0.75	0.13	2.08	0.00		
PPuPC90-Blank7 0.45um	1.68	0.88	1.13	0.85	2.77	0.36	0.04	0.04	0.01	1	0.0
PPuPC90-Blank7 0.1μm	2.78	0.10	0.51	0.10	0.40	0.71	0.30	0.51	0.20		
PPuPC90-Blank7 0.005μm	4.02	0.10	0.51	0.10	0.40	0.71	0.30	0.51	0.20		
PPuPC90-Blank7 AS	1.52	0.04	0.06	0.01	0.04	0.03	0.02	0.04	0.00		
PPuPC90-14 0.45um	13.47	4.16	15.94	6.02	18.12	2.40	0.60	5.91	23.45	29	64.9
PPuPC90-14 0.1μm	9.18	2.01	14.46	3.81	15.78	2.07	0.20	4.03	22.77		
PPuPC90-14 0.005μm	-9.19	-1.83	-0.02	-1.12	0.10	0.61	0.20	2.11	0.12		
PPuPC90-14 AS	22.18	3.60	5.96	3.56	10.36	1.20	0.24	2.61	0.00		
PPuPC90-28 0.45um	19.28	5.60	20.02	7.59	22.50	2.77	0.62	8.37	26.00	28	52.8
PPuPC90-28 0.1μm	15.64	3.34	18.80	5.42	20.94	2.95	0.27	6.73	28.20		
PPuPC90-28 0.005μm	-9.65	-1.83	-0.02	-1.12	0.10	0.61	0.20	3.55	0.12		
PPuPC90-28 AS	9.48	37.07	11.04	6.21	17.76	2.21	0.39	4.39	0.00		
PPuPC90T-28 0.45um	17.20	2.20	5.62	2.54	7.93	0.93	0.13	5.44	10.24	27	49.7
PPuPC90T-28 0.1μm	8.27	-0.47	3.27	0.29	5.39	0.61	0.20	3.10	10.11		
PPuPC90T-28 0.005μm	-9.71	-1.83	-0.02	-1.12	0.10	0.61	0.20	1.98	0.95		
PPuPC90T-28 AS											
PPuPC90T-28R 0.45um	9.70	1.30	2.63	1.32	3.97	0.40	0.07	3.63	5.11	14	0.0
PPuPC90T-28R AS	-0.01	6.69	1.08	0.56	1.28	0.05	0.00	0.53	0.00		
PPuPC90-56 0.45um	39.92	8.61	25.28	10.04	30.06	3.70	0.85	13.18	39.49	28	68.4
PPuPC90-56 0.1μm	34.33	8.59	24.05	9.79	30.33	3.01	0.62	8.07	33.74		
PPuPC90-56 0.005μm	-5.93	0.02	0.03	0.02	0.03	0.00	0.00	5.70	0.14		
PPuPC90-56 AS	7.00	32.57	10.64	5.93	17.96	2.08	0.36	3.80	0.00		
PPuPC90T-56 0.45um	23.85	3.53	8.74	3.99	12.24	1.46	0.33	7.58	20.70	26	54.7
PPuPC90T-56 0.1μm	20.69	3.60	8.52	4.00	12.65	0.80	0.08	4.88	18.72		
PPuPC90T-56 0.005μm	-5.58	-0.01	-0.03	0.01	0.01	0.00	0.00	3.33	0.75		
PPuPC90T-56 AS	2.48	12.57	3.38	1.66	4.56	0.48	0.08	1.38	0.00		
PPuPC90Bl-56 0.45um	2.14	0.22	0.08	0.14	0.04	0.02	0.02	0.12	0.02	1	1.7
PPuPC90-56Blank 0.1μm	5.67	1.92	0.49	1.22	0.27	0.10	0.10	0.61	0.12		
PPuPC90-56Blank 0.005μm	12.22	1.93	0.53	1.22	0.30	0.10	0.10	0.61	0.12		
PPuPC90-56Blank AS	2	0	0	0	0	0	0	0	0		
PPuPC90-182 0.45um	162.08	31.81	43.51	26.42	86.22	10.22	1.92	18.02	38.95	29	
PPuPC90-182 0.1 um	304.40	69.79	90.41	60.79	185.57	20.30	2.90	28.58	658.58		
PPuPC90-182 5 nm	627.11	120.28	178.24	101.80	328.96	39.49	7.19	65.25	146.65		
PPuPC90-182 AS	42.28	10.97	13.94	9.52	29.46	3.50	0.58	3.67	0.00		

Table 23B: Dilution and Background Corrected Solution Concentrations, in □g/L (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PPuPC90-365 0.45um	13575	7656	26375	146	48018	71448	4535	716	46.37	67.15	46.55	424.50
PPuPC90-365 0.1 um	12111	8629	27697	-279	15515	44735	2858	455	23.53	1.18	-1.38	141.30
PPuPC90-365 5 nm	49582	28897	96314	612	179741	240742	16958	2515	183.72	287.09	182.36	1777.50
PPuPC90-365 AS	1736	1458	4125	-5	2684	7669	515	-25	4.02	0.58	-0.01	25.48
HIP U,Pu-loaded CWF at 90 C and mass ratio 1:10												
PCPu90-7-237a** 0.45 µm	3027	5557	32186	37	21044	31155	1625	178	9.91	4.13	0.32	48.30
PCPu90-7-237a 0.1 µm	3488	5444	35630	-117	26348	38015	2889	1939	12.83	11.29	0.02	52.92
PCPu90-7-237a 5 nm	3205	4727	32340	-176	8521	20262	2202	1869	9.67	4.05	0.00	40.30
PCPu90-7-237a AS	1036	2508	31415	95	29634	39109	3363	364	32.36	96.45	42.58	284.98
PCPu90-7-238a 0.45 µm	3276	10755	32366	9	20456	31565	1988	108	10.65	2.39	0.22	37.82
PCPu90-7-238a 0.1 µm	3578	10817	34620	-117	23621	35086	6686	2333	12.83	3.50	0.00	40.91
PCPu90-7-238a 5 nm	3316	10322	33148	-176	10289	21373	2505	2151	10.68	17.34	0.00	33.33
PCPu90-7-238a AS	1416	4358	39215	28	43334	60709	6683	3301	41.66	145.85	46.78	349.98
PCPu90-7-239a 0.45 µm	3185	6346	29303	16	19476	31067	1839	141	13.19	0.79	0.00	76.89
PCPu90-7-239a 0.1 µm	3437	5959	31388	-117	22510	34379	2969	1848	14.75	0.01	0.00	78.98
PCPu90-7-239a 5 nm	3356	5727	30219	-176	8380	20262	2363	1808	12.09	3.21	0.00	64.74
PCPu90-7-239a AS	81	294	2295	136	3404	4399	322	156	3.66	12.75	7.61	33.68
PCPu90-7-240a 0.45 µm	3799	5916	29716	-5	24966	38028	1382	132	7.99	1.44	0.48	40.50
PCPu90-7-240a 0.1 µm	4255	5474	32701	-117	28267	42459	2485	2222	10.10	1.80	0.28	43.43
PCPu90-7-240a 5 nm	4114	5030	31128	-176	14531	28948	1949	1990	8.19	-1.23	0.00	34.54
PCPu90-7-240a AS	62	170	1735	85	2464	3359	195	150	2.19	9.76	3.54	20.78
PCPu90-7-Blanka 0.45 µm												
PCPu90-7-Blanka 0.1 µm												
PCPu90-7-Blanka 5 nm												
PCPu90-7-Blanka AS												
HIP U,Pu-loaded CWF at 120 C and mass ratio 1:20												
PCPu120/1-225-237 0.45 µm	20229	49680	56696	194	75329	108593	13426	1668	83.48	86.70	65.81	554.25
PCPu120/1-225-237 0.1 µm	22082	52126	59971	120	73919	128915	13989	1263	87.47	89.87	61.00	573.38
PCPu120/1-225-237 5 nm	17840	46278	47490	-148	17056	76317	6121	40	26.94	-0.52	0.00	93.12
PCPu120/1-225-237 AS	114	326	1015	14	3534	4519	296	-48	2.82	9.03	5.62	26.58
PCPu120/1-225-238 0.45 µm	21147	77201	62806	181	69252	107722	14281	1894	82.70	93.12	66.39	455.15
PCPu120/1-225-238 0.1 µm	18850	70003	61890	-19	62001	105685	13787	525	83.83	94.82	65.45	491.57
PCPu120/1-225-238 5 nm	18042	75063	56883	-148	18672	81771	6919	152	29.66	8.15	6.59	114.84
PCPu120/1-225-238 AS	202	543	3635	26	5774	8959	778	-17	6.34	21.35	14.38	53.88
PCPu120/1-225-239a 0.45 µm	23773	63964	57827	224	75993	100201	10800	1825	67.68	59.81	59.59	475.52
PCPu120/1-225-239a 0.1 µm	21274	55863	54719	259	68768	129925	9949	1212	65.85	57.45	53.03	419.86
PCPu120/1-225-239a 5 nm	18951	57085	51126	-148	13117	85811	5313	0	22.80	-0.64	0.00	80.09
PCPu120/1-225-239a AS	192	283	1975	41	5734	6999	522	99	5.03	14.55	7.41	40.98
PCPu120/1-225-240a 0.45 µm	22987	51222	51550	143	76216	110707	12297	1509	81.88	73.55	62.69	585.13
PCPu120/1-225-240a 0.1 µm	22082	45460	50275	191	73919	126895	12070	1050	85.45	76.54	62.12	603.68
PCPu120/1-225-240a 5 nm	21173	48803	46682	-148	18672	89750	4969	101	21.08	-0.64	0.00	79.69
PCPu120/1-225-240a AS	156	137	634	20	3324	4059	306	-54	3.09	5.88	3.91	30.58
PCPu120/1-225-Blanka 0.45 µm												
PCPu120/1-225-Blanka 0.1 µm												
PCPu120/1-225-Blanka 5 nm												
PCPu120/1-225-Blanka AS												

Table 23B: Dilution and Background Corrected Solution Concentrations, in µg/L (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	Pu	Cl	I
PPuPC90-365 0.45um	474.06	94.71	127.58	75.24	254.27	30.98	6.07	53.68	115.90	29	
PPuPC90-365 0.1 um	11.30	-0.63	-0.43	0.13	-0.07	0.24	-0.10	31.01	0.65		
PPuPC90-365 5 nm	2038.08	398.03	555.98	330.06	1060.20	131.20	24.95	201.39	448.26		
PPuPC90-365 AS	1.59	0.01	-0.02	0.01	0.03	0.02	-0.02	4.78	0.00		
HIP U,Pu-loaded CWF at 90 C											
PCPu90-7-237a** 0.45 µm	126.74	0.07	1.02	0.13	0.49	0.13	0.03	9.85	3.25	21	37.3
PCPu90-7-237a 0.1 µm	602.21	0.49	0.92	0.38	1.62	-0.51	-0.20	8.25	1.98		
PCPu90-7-237a 5 nm	377.76	0.00	-0.30	0.00	-0.10	-0.51	-0.20	3.18	0.03		
PCPu90-7-237a AS	168.48	98.27	173.94	82.79	271.96	43.17	3.76	733.96	280.32		
PCPu90-7-238a 0.45 µm	125.83	-0.23	0.26	-0.20	-0.73	-0.03	0.00	1.57	4.98	16	28.9
PCPu90-7-238a 0.1 µm	209.32	0.42	0.48	0.21	1.19	-0.51	-0.20	3.41	4.02		
PCPu90-7-238a 5 nm	114.15	0.00	-0.30	0.00	-0.10	-0.51	-0.20	3.03	0.25		
PCPu90-7-238a AS	218.48	115.97	212.94	97.49	308.96	43.87	4.21	263.96	498.86		
PCPu90-7-239a 0.45 µm	69.28	0.49	0.10	-0.32	-1.11	-0.12	0.01	1.74	2.43	19	36.1
PCPu90-7-239a 0.1 µm	88.83	0.38	0.49	0.21	1.09	-0.51	-0.20	3.40	2.27		
PCPu90-7-239a 5 nm	470.68	0.00	-0.30	0.00	-0.10	-0.51	-0.20	3.03	0.14		
PCPu90-7-239a AS	32.98	11.47	20.64	8.98	33.16	4.83	0.41	80.36	50.57		
PCPu90-7-240a 0.45 µm	88.06	0.37	2.09	0.54	1.75	0.39	0.11	3.10	8.99	18	60.0
PCPu90-7-240a 0.1 µm	132.56	0.91	2.24	0.96	3.72	-0.51	-0.19	4.43	8.65		
PCPu90-7-240a 5 nm	51.73	0.00	-0.30	0.00	-0.10	-0.51	-0.20	4.15	0.14		
PCPu90-7-240a AS	18.68	7.15	12.74	5.56	19.26	2.57	0.26	10.76	28.83		
PCPu90-7-Blanka 0.45 µm											
PCPu90-7-Blanka 0.1 µm											
PCPu90-7-Blanka 5 nm											
PCPu90-7-Blanka AS											
HIP U,Pu-loaded CWF at 120 C											
PCPu120/1-225-237 0.45 µm	218.95	171.32	295.91	140.14	452.49	72.28	8.14	554.23	269.67	38	75.4
PCPu120/1-225-237 0.1 µm	208.31	158.47	273.21	128.17	409.66	63.13	6.74	415.62	206.65		
PCPu120/1-225-237 5 nm	-1.49	0.00	-0.40	-0.10	-0.30	-0.51	-0.30	91.51	1.15		
PCPu120/1-225-237 AS	21.58	17.97	38.14	16.49	51.16	7.43	0.74	46.56	123.57		
PCPu120/1-225-238 0.45 µm	197.39	175.38	297.47	146.38	468.99	69.62	8.93	187.62	609.75	34	70.8
PCPu120/1-225-238 0.1 µm	197.20	175.64	291.39	145.34	481.37	73.12	8.99	158.07	524.44		
PCPu120/1-225-238 5 nm	12.14	18.08	29.19	14.54	47.77	6.46	0.39	52.12	58.85		
PCPu120/1-225-238 AS	39.28	39.97	75.24	36.99	124.96	18.87	1.76	98.86	446.22		
PCPu120/1-225-239a 0.45 µm	147.98	138.17	250.44	119.10	383.61	60.46	6.08	434.10	191.88	37	80.2
PCPu120/1-225-239a 0.1 µm	139.63	133.22	231.80	108.98	347.04	52.22	5.29	263.11	113.74		
PCPu120/1-225-239a 5 nm	-1.49	0.00	-0.40	-0.10	-0.30	-0.51	-0.30	147.97	2.12		
PCPu120/1-225-239a AS	30.78	25.67	48.34	24.29	75.76	11.37	1.03	85.56	98.17		
PCPu120/1-225-240a 0.45 µm	193.02	138.93	238.10	120.33	397.00	62.60	6.38	140.81	367.33	38	94.5
PCPu120/1-225-240a 0.1 µm	199.22	143.32	237.86	122.11	407.64	64.14	6.34	118.68	294.48		
PCPu120/1-225-240a 5 nm	-1.49	0.03	0.13	-0.06	-0.19	-0.51	-0.30	65.95	7.66		
PCPu120/1-225-240a AS	14.68	14.07	29.24	13.29	41.96	6.17	0.57	10.66	95.77		
PCPu120/1-225-Blanka 0.45 µm											
PCPu120/1-225-Blanka 0.1 µm											
PCPu120/1-225-Blanka 5 nm											
PCPu120/1-225-Blanka AS											

Table 24B. EXCEL Worksheet "NL.Summary"

The spreadsheet "NL.summary" provides calculations of normalized mass loss using the results from the "corr_conc." and "Test Data" spreadsheets for the concentrations in the RWS, 0.45-μm filtrate, and acid soak solutions. The normalize mass loss calculated for each of these solutions based on the concentration of element *i* is calculated using the following formula:

$$NL(i) = C(i) / \{(S/V) \bullet f(i)\}$$

where C(*i*) is the dilution- and background-corrected concentration of element *i* in the test solution, S/V is the CWF surface / water volume ratio used in the test, and f(*i*) is the mass ratio of element *i* in the CWF material used in the test.

C(*i*) is the dilution- and background-corrected concentration taken from the worksheet "corr_conc."
S/V is the CWF surface area/water volume ratio taken from the worksheet "Test Data"
f(*i*) is the mass fraction of element *i* in the CWF, taken from the worksheet "Ref.Comp"

The composition given as U-Pu CWF Fraction is used for tests with HIP U,Pu-CWF materials 237m and 239m. The composition given as Pu-U CWF Fraction is used for tests with HIP U,Pu-CWF materials 238m and 240m and with PC U,Pu-CWF materials GPC00202 and GPC0030m.

Sample calculation for *Li* in test PCPu90-7-237 for the 0.45-μm filtrate:

C(*Li*) = 3463 μg/L from "corr_conc." worksheet
S/V = 2252 m^{-1} from "Test Data" worksheet
f(*Li*) = 0.00389 from "Ref.Comp" worksheet U-Pu CWF Fraction

$$NL(Li) = \{3463\ \mu g/L \bullet (1\ mg/L / 1000\ \mu g/L)\} / (2252\ m^{-1} \bullet 0.00389\ g\ Li / g\ CWF)$$
$$= 0.3953\ g / m^2$$

Note that the units of NL(*i*) are g CWF/m^2, not g of element *i*. Normalized mass loss values are calculated for the RWS solutions, the 0.45-μm filtrate solutions, and the acid soak solutions. The sum of these three parts gives the total NL(*i*) for a test. The same RWS contribution is added for all tests with a particular material.

Sample calculation for *Li* in test PCPu90-7-237
NL(*Li*) for the RWS fraction for 237m: 0.0747 g/m^2
NL(*Li*) for the 0.45-μm filtrate solution: 0.3950 g/m^2
NL(*Li*) for the acid soak (AS) solution: 0.0103 g/m^2

RWS + 0.45-μm + AS = 0.0747 + 0.3950 + 0.0103 = 0.4800 g/m^2

Note that the concentration of Cl was not measured in the acid soak solution and the concentration of I was not measured in either the 0.45-μm filtrate or acid soak solutions; the total values of NL(*Cl*) and NL(*I*) were calculated by assuming these concentrations were zero.

Table 24B. Normalized Mass Loss, g/m^2 (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PCPu90-7-237 RWS	0.0747	0.0241	0.0614	0.0094	0.0001	0.0006	0.0311	0.3745	0.0050	0.0043	0.0004	0.0084
PCPu90-7-238 RWS	0.0735	0.0176	0.0520	0.0094	0.0001	0.0002	0.0246	0.2892	0.0033	0.0073	0.0004	0.0045
PCPu90-7-239 RWS	0.0804	0.0305	0.1563	0.0094	0.0001	0.0007	0.0333	0.2792	0.0090	0.0083	0.0004	0.0153
PCPu90-7-240 RWS	0.0876	0.0300	0.2515	0.0405	0.0011	0.0017	0.0399	0.3929	0.0156	0.0074	0.0010	0.0179
HIP U,Pu-loaded CWF at 90 C and mass ratio 1:10												
PCPu90-7-237 0.45µm	0.3950	0.2042	0.1208	-0.0375	0.0848	0.0797	0.0587	-0.0420	0.0330	0.0016	0.0018	0.0210
PCPu90-7-237 AS	0.0103	0.0116	0.0160	-0.0206	0.0165	0.0155	0.0158	-0.0598	0.0127	0.0147	0.0233	0.0167
0.45-µm +AS	**0.4053**	**0.2158**	**0.1369**	**-0.0581**	**0.1013**	**0.0952**	**0.0745**	**-0.1018**	**0.0457**	**0.0163**	**0.0251**	**0.0377**
PCPu90-7-238 0.45 µm	0.3944	0.2457	0.1339	-0.0430	0.0907	0.0865	0.0645	-0.0468	0.0292	0.0000	0.0010	0.0112
PCPu90-7-238 AS	0.0455	0.0409	0.0596	-0.0073	0.0652	0.0413	0.0523	-0.0192	0.0402	0.0494	0.0431	0.0498
0.45-µm +AS	**0.4399**	**0.2866**	**0.1935**	**-0.0502**	**0.1560**	**0.1278**	**0.1168**	**-0.0660**	**0.0695**	**0.0494**	**0.0440**	**0.0609**
PCPu90-7-239 0.45 µm	0.3845	0.1782	0.1191	-0.0368	0.0719	0.0789	0.0551	-0.0364	0.0355	0.0000	0.0007	0.0276
PCPu90-7-239 AS	0.0093	0.0108	0.0130	-0.0198	0.0130	0.0110	0.0136	-0.0447	0.0128	0.0156	0.0176	0.0153
0.45-µm +AS	**0.3938**	**0.1890**	**0.1321**	**-0.0566**	**0.0848**	**0.0899**	**0.0688**	**-0.0811**	**0.0483**	**0.0155**	**0.0183**	**0.0429**
PCPu90-7-240 0.45 µm	0.4316	0.1687	0.1017	-0.0263	0.0706	0.0745	0.0470	-0.0276	0.0256	-0.0002	0.0006	0.0181
PCPu90-7-240 AS	0.0084	0.0116	0.0118	-0.0136	0.0144	0.0144	0.0123	-0.0517	0.0102	0.0123	0.0094	0.0121
0.45-µm +AS	**0.4401**	**0.1803**	**0.1135**	**-0.0399**	**0.0850**	**0.0889**	**0.0593**	**-0.0793**	**0.0358**	**0.0120**	**0.0100**	**0.0302**
average 0.45-µm +AS	0.4198	0.2179	0.1440	-0.0512	0.1068	0.1004	0.0798	-0.0820	0.0498	0.0233	0.0243	0.0429
PCPu90-28-237 0.45 µm	0.7122	0.4428	0.1264	0.0533	0.1186	0.1421	0.1225	0.1149	0.0721	0.0277	0.0299	0.0443
PCPu90-28-237 AS	0.0104	0.0142	0.0157	0.0585	0.0182	0.0193	0.0196	0.0605	0.0143	0.0183	0.0544	0.0170
0.45-µm +AS	**0.7226**	**0.4570**	**0.1422**	**0.1119**	**0.1368**	**0.1614**	**0.1421**	**0.1754**	**0.0864**	**0.0460**	**0.0843**	**0.0613**
PCPu90-28-238 0.45 µm	0.5731	0.6711	0.1322	0.0814	0.1209	0.1244	0.1204	0.1060	0.0640	0.0327	0.0318	0.0320
PCPu90-28-238 AS	0.0174	0.0198	0.0256	0.0155	0.0258	0.0265	0.0229	-0.0245	0.0176	0.0234	0.0186	0.0200
0.45-µm +AS	**0.5905**	**0.6910**	**0.1578**	**0.0968**	**0.1467**	**0.1509**	**0.1433**	**0.0814**	**0.0816**	**0.0561**	**0.0504**	**0.0520**
PCPu90-28-239 0.45 µm	0.6215	0.4568	0.1167	0.0451	0.0899	0.0984	0.0890	0.1151	0.0541	0.0176	0.0159	0.0353
PCPu90-28-239 AS	0.0025	0.0033	0.0023	0.0017	0.0048	0.0050	0.0012	-0.0497	0.0017	0.0032	0.0144	0.0030
0.45-µm +AS	**0.6239**	**0.4600**	**0.1190**	**0.0467**	**0.0947**	**0.1034**	**0.0903**	**0.0654**	**0.0558**	**0.0208**	**0.0303**	**0.0383**
PCPu90-28-240 0.45 µm	0.8551	0.4691	0.1204	0.0495	0.1328	0.1426	0.1036	0.1008	0.0645	0.0201	0.0260	0.0470
PCPu90-28-240 AS	0.0234	0.0283	0.0292	0.0639	0.0289	0.0328	0.0294	-0.0072	0.0236	0.0286	0.0455	0.0269
0.45-µm +AS	**0.8785**	**0.4974**	**0.1495**	**0.1134**	**0.1618**	**0.1755**	**0.1330**	**0.0936**	**0.0880**	**0.0487**	**0.0715**	**0.0738**
average 0.45-µm +AS	0.7039	0.5263	0.1421	0.0922	0.1350	0.1478	0.1272	0.1040	0.0780	0.0429	0.0591	0.0564
PCPu90-91-237 0.45 µm	1.0310	0.7536	0.1583	0.0154	0.1291	0.1383	0.1354	0.0432	0.0736	0.0216	0.0221	0.0374
PCPu90-91-237 AS	0.0199	0.0137	0.0180	0.0405	0.0257	0.0255	0.0210	0.0296	0.0183	0.0219	0.0619	0.0194
0.45-µm +AS	**1.0509**	**0.7673**	**0.1762**	**0.0559**	**0.1547**	**0.1638**	**0.1564**	**0.0728**	**0.0919**	**0.0435**	**0.0840**	**0.0568**
PCPu90-91-238 0.45 µm	1.2506	1.3861	0.2100	0.1105	0.1949	0.1875	0.1903	0.0934	0.1044	0.0662	0.0394	0.0565
PCPu90-91-238 AS	0.0419	0.0432	0.0316	0.0344	0.0443	0.0410	0.0353	0.0301	0.0287	0.0410	0.0393	0.0294
0.45-µm +AS	**1.2925**	**1.4293**	**0.2416**	**0.1449**	**0.2392**	**0.2285**	**0.2256**	**0.1235**	**0.1332**	**0.1072**	**0.0787**	**0.0859**
PCPu90-91-239 0.45 µm	1.0132	0.7889	0.1980	-0.0137	0.1139	0.1127	0.1106	0.0197	0.0554	0.0078	0.0042	0.0314
PCPu90-91-239 AS	0.0162	0.0079	0.0064	0.0578	0.0278	0.0197	0.0080	0.0791	0.0070	0.0369	0.0037	0.0067
0.45-µm +AS	**1.0294**	**0.7967**	**0.2044**	**0.0441**	**0.1417**	**0.1325**	**0.1186**	**0.0988**	**0.0624**	**0.0447**	**0.0079**	**0.0381**
PCPu90-91-240 0.45 µm	1.3199	0.7159	0.1308	0.0305	0.1568	0.1647	0.1146	0.0351	0.0656	0.0240	0.0322	0.0457
PCPu90-91-240 AS	0.0139	0.0060	0.0068	0.0298	0.0119	0.0111	0.0076	0.0186	0.0063	0.0091	0.0049	0.0065
0.45-µm +AS	**1.3338**	**0.7219**	**0.1376**	**0.0603**	**0.1687**	**0.1759**	**0.1222**	**0.0537**	**0.0719**	**0.0331**	**0.0370**	**0.0522**
average 0.45-µm +AS	1.1766	0.9288	0.1900	0.0763	0.1761	0.1752	0.1557	0.0872	0.0898	0.0571	0.0519	0.0582
PCPu90-182-237 0.45 µm	0.9213	0.9151	0.0960	-0.1492	0.0657	0.0980	0.1244	-0.0793	0.0725	0.0092	0.0291	0.0428
PuPC90-182-237 AS	0.1381	0.0145	0.0459	0.2946	0.0813	0.0762	0.0922	0.1123	0.0669	0.0186	0.0302	0.0441
0.45-µm +AS	**1.0594**	**0.9296**	**0.1419**	**0.1454**	**0.1470**	**0.1742**	**0.2167**	**0.0331**	**0.1394**	**0.0279**	**0.0594**	**0.0869**
PCPu90-182-238 0.45 µm	1.1814	1.6420	0.1357	-0.1509	0.0871	0.1002	0.1346	-0.1343	0.0508	0.0120	0.0138	0.0210
PuPC90-182-238 AS	0.0555	0.0337	0.0312	0.1646	0.0363	0.0413	0.0412	0.0882	0.0309	0.0369	0.0470	0.0265
0.45-µm +AS	**1.2369**	**1.6757**	**0.1669**	**0.0137**	**0.1234**	**0.1415**	**0.1757**	**-0.0461**	**0.0816**	**0.0489**	**0.0609**	**0.0475**

Table 24B. Normalized Mass Loss, g/m^2 (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	^{239}Pu+^{240}Pu	Cl	Iodine
PCPu90-7-237 RWS	0.0004	0.0092	0.0026	0.0085	0.0000	0.0005	0.0033	0.0001	0.0001	0.1593	0.0000
PCPu90-7-238 RWS	0.0004	0.0091	0.0029	0.0087	0.0003	0.0008	0.0055	0.0001	0.0006	0.1356	0.0000
PCPu90-7-239 RWS	0.0004	0.0089	0.0026	0.0085	0.0000	0.0005	0.0054	0.0001	0.0001	0.4362	0.0000
PCPu90-7-240 RWS	0.0005	0.0092	0.0032	0.0089	0.0003	0.0012	0.0125	0.0003	0.0007	0.8411	0.0000
HIP U,Pu-loaded CWF at 90 C a											
PCPu90-7-237 0.45µm	0.0023	0.0019	0.0026	0.0019	0.0022	0.0066	0.0033	0.0018	0.0019	0.0002	0.1089
PCPu90-7-237 AS	0.0181	0.0119	0.0129	0.0113	0.0116	0.0381	0.0146	0.0130	0.0125		
0.45-µm +AS	**0.0204**	**0.0138**	**0.0154**	**0.0132**	**0.0138**	**0.0448**	**0.0178**	**0.0149**	**0.0144**	**0.0002**	**0.1089**
PCPu90-7-238 0.45 µm	-0.0003	0.0010	0.0014	0.0011	0.0012	0.0038	0.0016	0.0008	0.0009	0.0002	0.1234
PCPu90-7-238 AS	0.0615	0.0438	0.0438	0.0414	0.0402	0.0000	-0.0001	0.0378	0.0246		
0.45-µm +AS	**0.0613**	**0.0448**	**0.0452**	**0.0424**	**0.0414**	**0.0038**	**0.0015**	**0.0386**	**0.0256**	**0.0002**	**0.1234**
PCPu90-7-239 0.45 µm	0.0000	0.0009	0.0013	0.0010	0.0011	0.0034	0.0022	0.0004	0.0010	0.0002	0.4393
PCPu90-7-239 AS	0.0187	0.0123	0.0129	0.0114	0.0118	0.0389	0.0161	0.0109	0.0117		
0.45-µm +AS	**0.0188**	**0.0132**	**0.0142**	**0.0124**	**0.0130**	**0.0423**	**0.0183**	**0.0113**	**0.0127**	**0.0002**	**0.4393**
PCPu90-7-240 0.45 µm	-0.0004	0.0006	0.0010	0.0008	0.0009	0.0027	0.0021	0.0009	0.0005	0.0002	0.6977
PCPu90-7-240 AS	0.0147	0.0103	0.0108	0.0096	0.0098	0.0309	0.0117	0.0080	0.0038		
0.45-µm +AS	**0.0143**	**0.0109**	**0.0118**	**0.0104**	**0.0107**	**0.0336**	**0.0139**	**0.0088**	**0.0043**	**0.0002**	**0.6977**
average 0.45-µm +AS	0.0287	0.0207	0.0217	0.0196	0.0197	0.0311	0.0129	0.0184	0.0143	0.0002	0.3423
PCPu90-28-237 0.45 µm	0.0545	0.0263	0.0258	0.0254	0.0245	0.0198	0.0398	0.0065	0.0133	0.0003	0.2310
PCPu90-28-237 AS	0.0305	0.0202	0.0194	0.0188	0.0185	0.0144	0.0202	0.0151	0.0222		
0.45-µm +AS	**0.0849**	**0.0464**	**0.0453**	**0.0442**	**0.0430**	**0.0343**	**0.0600**	**0.0216**	**0.0355**	**0.0003**	**0.2310**
PCPu90-28-238 0.45 µm	0.0586	0.0340	0.0301	0.0317	0.0301	0.0239	0.0509	0.0054	0.0136	0.0002	0.2007
PCPu90-28-238 AS	0.0285	0.0242	0.0226	0.0220	0.0213	0.0164	0.0236	0.0155	0.0170		
0.45-µm +AS	**0.0871**	**0.0583**	**0.0527**	**0.0537**	**0.0513**	**0.0403**	**0.0745**	**0.0209**	**0.0306**	**0.0002**	**0.2007**
PCPu90-28-239 0.45 µm	0.0414	0.0140	0.0142	0.0142	0.0136	0.0113	0.0234	0.0016	0.0066	0.0003	0.2648
PCPu90-28-239 AS	0.0095	0.0055	0.0052	0.0053	0.0052	0.0038	0.0057	0.0028	0.0087		
0.45-µm +AS	**0.0509**	**0.0196**	**0.0194**	**0.0196**	**0.0188**	**0.0151**	**0.0291**	**0.0044**	**0.0152**	**0.0003**	**0.2648**
PCPu90-28-240 0.45 µm	0.0412	0.0200	0.0215	0.0210	0.0205	0.0168	0.0345	0.0078	0.0087	0.0003	0.3760
PCPu90-28-240 AS	0.0342	0.0292	0.0270	0.0264	0.0249	0.0187	0.0274	0.0113	0.0134		
0.45-µm +AS	**0.0754**	**0.0493**	**0.0485**	**0.0474**	**0.0455**	**0.0354**	**0.0619**	**0.0191**	**0.0221**	**0.0003**	**0.3760**
average 0.45-µm +AS	0.0746	0.0434	0.0415	0.0412	0.0396	0.0313	0.0564	0.0165	0.0259	0.0003	0.2681
PCPu90-91-237 0.45 µm	0.0389	0.0169	0.0166	0.0162	0.0153	0.0127	0.0267	0.0040	0.0068	0.0002	0.2043
PCPu90-91-237 AS	0.0315	0.0211	0.0242	0.0241	0.0230	0.0190	0.0256	0.0172	0.0316		
0.45-µm +AS	**0.0704**	**0.0380**	**0.0408**	**0.0403**	**0.0383**	**0.0317**	**0.0523**	**0.0213**	**0.0384**	**0.0002**	**0.2043**
PCPu90-91-238 0.45 µm	0.0951	0.0436	0.0439	0.0394	0.0373	0.0297	0.0643	0.0098	0.0126	0.0003	0.2320
PCPu90-91-238 AS	0.0478	0.0399	0.0429	0.0393	0.0381	0.0301	0.0404	0.0298	0.0301		
0.45-µm +AS	**0.1429**	**0.0835**	**0.0869**	**0.0787**	**0.0754**	**0.0599**	**0.1047**	**0.0397**	**0.0427**	**0.0003**	**0.2320**
PCPu90-91-239 0.45 µm	0.0168	0.0044	0.0040	0.0041	0.0038	0.0032	0.0062	0.0012	0.0027	0.0004	0.3042
PCPu90-91-239 AS	0.0505	0.0082	0.0076	0.0073	0.0069	0.0052	0.0093	0.0043	0.0060		
0.45-µm +AS	**0.0673**	**0.0126**	**0.0116**	**0.0113**	**0.0107**	**0.0084**	**0.0155**	**0.0056**	**0.0087**	**0.0004**	**0.3042**
PCPu90-91-240 0.45 µm	0.0462	0.0271	0.0254	0.0270	0.0260	0.0221	0.0440	0.0079	0.0094	0.0003	0.3779
PCPu90-91-240 AS	0.0122	0.0074	0.0113	0.0106	0.0097	0.0073	0.0113	0.0034	0.0069		
0.45-µm +AS	**0.0583**	**0.0345**	**0.0367**	**0.0376**	**0.0357**	**0.0294**	**0.0552**	**0.0114**	**0.0163**	**0.0003**	**0.3779**
average 0.45-µm +AS	0.0847	0.0421	0.0440	0.0420	0.0400	0.0324	0.0569	0.0195	0.0265	0.0003	0.2796
PCPu90-182-237 0.45 µm	0.0234	0.0202	0.0215	0.0215	0.0212	0.0177	0.0361	0.0094	0.0178	0.0002	0.2559
PuPC90-182-237 AS	0.0380	0.0278	0.0275	0.0280	0.0269	0.0218	0.0371	0.0104	0.0368		
0.45-µm +AS	**0.0613**	**0.0480**	**0.0490**	**0.0495**	**0.0481**	**0.0395**	**0.0732**	**0.0198**	**0.0547**	**0.0002**	**0.2559**
PCPu90-182-238 0.45 µm	0.0206	0.0141	0.0165	0.0139	0.0132	0.0104	0.0250	0.0057	0.0079	0.0002	0.2142
PuPC90-182-238 AS	0.0494	0.0338	0.0308	0.0313	0.0299	0.0235	0.0371	0.0232	0.0192		
0.45-µm +AS	**0.0700**	**0.0479**	**0.0473**	**0.0452**	**0.0431**	**0.0339**	**0.0620**	**0.0288**	**0.0271**	**0.0002**	**0.2142**

Table 24B. Normalized Mass Loss, g/m^2 (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PCPu90-182-239 0.45 µm	1.2525	0.9885	0.1086	-0.1469	0.0827	0.1136	0.1035	-0.1005	0.0441	0.0026	0.0103	0.0221
PuPC90-182-239 AS	0.0217	0.0195	0.0215	0.1054	0.0238	0.0254	0.0233	0.0442	0.0210	0.0262	0.0292	0.0233
0.45-µm +AS	**1.2742**	**1.0080**	**0.1300**	**-0.0415**	**0.1065**	**0.1390**	**0.1268**	**-0.0563**	**0.0651**	**0.0288**	**0.0395**	**0.0453**
PCPu90-182-240 0.45 µm	1.5615	0.8680	0.1470	-0.1498	0.1580	0.2010	0.1269	-0.0855	0.0572	0.0119	0.0206	0.0349
PuPC90-182-240 AS	0.0660	0.0523	0.0569	0.1388	0.0600	0.0615	0.0567	0.1246	0.0514	0.0815	0.0678	0.0514
0.45-µm +AS	**1.6275**	**0.9203**	**0.2040**	**-0.0111**	**0.2180**	**0.2624**	**0.1836**	**0.0391**	**0.1086**	**0.0934**	**0.0884**	**0.0863**
average 0.45-µm +AS	1.2995	1.1334	0.1607	0.0266	0.1487	0.1793	0.1757	-0.0076	0.0987	0.0498	0.0621	0.0665
PCPu90-365-237 0.45 µm	1.7584	1.1082	0.1561	-0.0879	0.1440	0.1577	0.1453	-0.0032	0.0814	0.0157	0.0143	0.0406
PuPC90-365-237 AS	0.0131	0.0059	0.0108	-0.0248	0.0163	0.0115	0.0111	0.0080	0.0107	0.0144	-0.0068	0.0112
0.45-µm +AS	**1.7715**	**1.1141**	**0.1669**	**-0.1127**	**0.1603**	**0.1692**	**0.1564**	**0.0048**	**0.0921**	**0.0301**	**0.0075**	**0.0518**
PCPu90-365-238 0.45 µm	2.1033	2.1529	0.2342	-0.0232	0.1738	0.1684	0.2201	0.0826	0.1191	0.0668	0.0065	0.0580
PuPC90-365-238 AS	0.0094	0.0091	0.0093	-0.0230	0.0131	0.0098	0.0083	0.0013	0.0095	0.0119	-0.0052	0.0091
0.45-µm +AS	**2.1127**	**2.1620**	**0.2435**	**-0.0461**	**0.1868**	**0.1782**	**0.2284**	**0.0839**	**0.1286**	**0.0786**	**0.0013**	**0.0670**
PCPu90-365-239 0.45 µm	1.7774	1.3841	0.1160	-0.0779	0.1014	0.1233	0.1066	-0.0160	0.0577	0.0117	0.0175	0.0342
PuPC90-365-239 AS	0.0186	0.0164	0.0183	-0.0310	0.0190	0.0174	0.0162	0.0107	0.0148	0.0173	-0.0059	0.0166
0.45-µm +AS	**1.7960**	**1.4006**	**0.1343**	**-0.1089**	**0.1204**	**0.1406**	**0.1228**	**-0.0053**	**0.0725**	**0.0290**	**0.0116**	**0.0508**
PCPu90-365-240 0.45 µm	1.9340	1.0907	0.0872	-0.0904	0.1052	0.1253	0.0744	-0.0333	0.0397	0.0046	0.0140	0.0246
PuPC90-365-240 AS	0.0083	0.0041	0.0036	0.0097	0.0049	0.0045	0.0021	-0.0037	0.0031	0.0038	-0.0043	0.0036
0.45-µm +AS	**1.9423**	**1.0947**	**0.0908**	**-0.0807**	**0.1101**	**0.1299**	**0.0765**	**-0.0370**	**0.0428**	**0.0084**	**0.0097**	**0.0283**
average 0.45-µm +AS	1.9056	1.4428	0.1589	-0.0871	0.1444	0.1545	0.1460	0.0116	0.0840	0.0365	0.0075	0.0495
HIP U,Pu-loaded CWF at 120 C and mass ratio 1:10												
PCPu120-7-237 0.45 µm	1.0546	0.6257	0.1589	-0.0586	0.1581	0.1494	0.1417	-0.0226	0.0698	0.0020	0.0140	0.0396
PCPu120-7-237 AS	0.0077	0.0043	0.0055	0.0128	0.0074	0.0076	0.0058	0.0048	0.0045	0.0057	0.0057	0.0049
0.45-µm +AS	**1.0623**	**0.6300**	**0.1644**	**-0.0458**	**0.1655**	**0.1570**	**0.1474**	**-0.0179**	**0.0743**	**0.0077**	**0.0197**	**0.0444**
PCPu120-7-238 0.45 µm	1.1021	1.0542	0.1703	-0.0581	0.1515	0.1384	0.1505	-0.0603	0.0636	0.0027	0.0134	0.0273
PCPu120-7-238 AS	0.0236	0.0240	0.0265	0.0262	0.0267	0.0295	0.0299	0.0222	0.0229	0.0284	0.0856	0.0214
0.45-µm +AS	**1.1257**	**1.0782**	**0.1968**	**-0.0319**	**0.1782**	**0.1679**	**0.1803**	**-0.0381**	**0.0864**	**0.0311**	**0.0990**	**0.0486**
PCPu120-7-239 0.45 µm	1.1739	0.6951	0.1737	-0.0641	0.1415	0.1308	0.1216	-0.0680	0.0676	0.0029	0.0104	0.0402
PCPu120-7-239 AS	0.0481	0.0389	0.0450	0.0301	0.0448	0.0461	0.0422	0.0391	0.0352	0.0399	0.0324	0.0337
0.45-µm +AS	**1.2221**	**0.7339**	**0.2187**	**-0.0340**	**0.1863**	**0.1769**	**0.1638**	**-0.0288**	**0.1028**	**0.0428**	**0.0428**	**0.0740**
PCPu120-7-240 0.45 µm	1.3227	0.6029	0.1504	-0.0617	0.1640	0.1519	0.1097	-0.0592	0.0589	0.0008	0.0108	0.0382
PCPu120-7-240 AS	0.0228	0.0162	0.0150	0.0174	0.0165	0.0193	0.0215	0.0113	0.0148	0.0153	0.0206	0.0162
0.45-µm +AS	**1.3455**	**0.6191**	**0.1654**	**-0.0442**	**0.1805**	**0.1712**	**0.1312**	**-0.0479**	**0.0736**	**0.0162**	**0.0314**	**0.0544**
PCPu120-28-237 0.45 µm	1.4915	1.0670	0.1483	0.0190	0.1510	0.1934	0.1283	0.0572	0.0653	0.0106	0.0260	0.0408
PCPu120-28-237 AS	0.0273	0.0361	0.0431	0.0481	0.0449	0.0547	0.0511	0.0433	0.0424	0.0392	0.0745	0.0529
0.45-µm +AS	**1.5188**	**1.1031**	**0.1914**	**0.0671**	**0.1959**	**0.2480**	**0.1794**	**0.1005**	**0.1077**	**0.0498**	**0.1005**	**0.0937**
PCPu120-28-238 0.45 µm	1.5243	1.8700	0.1614	0.0045	0.1402	0.1836	0.1298	0.0568	0.0587	0.0051	0.0175	0.0261
PCPu120-28-238 AS	0.0428	0.0589	0.0453	0.0520	0.0455	0.0579	0.0507	0.0559	0.0416	0.0409	0.0388	0.0462
0.45-µm +AS	**1.5671**	**1.9289**	**0.2067**	**0.0564**	**0.1857**	**0.2414**	**0.1804**	**0.1127**	**0.1002**	**0.0460**	**0.0563**	**0.0723**
PCPu120-28-239 0.45 µm	1.4374	1.1377	0.1496	0.0049	0.1400	0.1746	0.1027	0.0533	0.0569	0.0053	0.0165	0.0319
PCPu120-28-239 AS	0.0162	0.0276	0.0230	0.0254	0.0237	0.0302	0.0219	0.0317	0.0222	0.0227	0.0227	0.0254
0.45-µm +AS	**1.4536**	**1.1653**	**0.1726**	**0.0303**	**0.1637**	**0.2049**	**0.1246**	**0.0850**	**0.0792**	**0.0280**	**0.0392**	**0.0573**
PCPu120-28-240 0.45 µm	1.8684	1.0545	0.1250	0.0046	0.1592	0.2326	0.1008	0.0696	0.0462	0.0028	0.0187	0.0279
PCPu120-28-240 AS	0.0863	0.0774	0.0765	0.0415	0.0762	0.0976	0.0842	0.0719	0.0702	0.0701	0.0462	0.0832
0.45-µm +AS	**1.9547**	**1.1320**	**0.2015**	**0.0461**	**0.2353**	**0.3302**	**0.1851**	**0.1416**	**0.1164**	**0.0729**	**0.0649**	**0.1111**
PCPu120-91-237 0.45 µm	2.4941	1.6336	0.1470	0.0274	0.1939	0.2469	0.1492	0.0528	0.0733	0.0078	0.0450	0.0427
PCPu120-91-237 AS	0.0543	0.0289	0.0332	0.0205	0.0355	0.0295	0.0309	0.0342	0.0246	0.0275	0.0592	0.0252
0.45-µm +AS	**2.5484**	**1.6625**	**0.1802**	**0.0479**	**0.2294**	**0.2764**	**0.1801**	**0.0870**	**0.0979**	**0.0354**	**0.1042**	**0.0678**
PCPu120-91-238 0.45 µm	2.5134	2.5769	0.1645	0.0175	0.1365	0.1899	0.1387	0.0475	0.0602	0.0038	0.0205	0.0262
PCPu120-91-238 AS	0.0792	0.0674	0.0667	0.0202	0.0627	0.0758	0.0566	0.0465	0.0464	0.0527	0.0443	0.0523
0.45-µm +AS	**2.5926**	**2.6444**	**0.2312**	**0.0378**	**0.1992**	**0.2657**	**0.1953**	**0.0940**	**0.1065**	**0.0565**	**0.0648**	**0.0785**

Table 24B. Normalized Mass Loss, g/m^2 (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	^{239}Pu+^{240}Pu	Cl	Iodine
PCPu90-182-239 0.45 µm	0.0111	0.0092	0.0124	0.0101	0.0093	0.0073	0.0200	0.0030	0.0087	0.0002	0.4640
PuPC90-182-239 AS	0.0407	0.0285	0.0272	0.0281	0.0269	0.0217	0.0314	0.0177	0.0331		
0.45-µm +AS	**0.0518**	**0.0377**	**0.0395**	**0.0382**	**0.0362**	**0.0291**	**0.0514**	**0.0207**	**0.0418**	**0.0002**	**0.4640**
PCPu90-182-240 0.45 µm	0.0234	0.0187	0.0226	0.0199	0.0190	0.0161	0.0326	0.0116	0.0129	0.0003	0.3552
PuPC90-182-240 AS	0.0895	0.0655	0.0560	0.0614	0.0618	0.0477	0.0743	0.0556	0.0242		
0.45-µm +AS	**0.1129**	**0.0842**	**0.0786**	**0.0812**	**0.0808**	**0.0638**	**0.1068**	**0.0671**	**0.0371**	**0.0003**	**0.3552**
average 0.45-µm +AS	0.0740	0.0544	0.0536	0.0535	0.0521	0.0416	0.0734	0.0341	0.0402	0.0002	0.3223
PCPu90-365-237 0.45 µm	0.0291	0.0223	0.0236	0.0217	0.0204	0.0159	0.0265	0.0103	0.0132	0.0004	0.0000
PuPC90-365-237 AS	0.0196	0.0198	0.0160	0.0171	0.0158	0.0127	0.0188	0.0125	0.0164		
0.45-µm +AS	**0.0487**	**0.0421**	**0.0395**	**0.0388**	**0.0362**	**0.0286**	**0.0453**	**0.0228**	**0.0297**	**0.0004**	**0.0000**
PCPu90-365-238 0.45 µm	0.0946	0.0193	0.0144	0.0153	0.0141	0.0101	0.0187	0.0088	0.0055	0.0004	0.0000
PuPC90-365-238 AS	0.0136	0.0187	0.0159	0.0168	0.0159	0.0129	0.0184	0.0120	0.0103		
0.45-µm +AS	**0.1082**	**0.0380**	**0.0303**	**0.0321**	**0.0300**	**0.0230**	**0.0371**	**0.0209**	**0.0158**	**0.0004**	**0.0000**
PCPu90-365-239 0.45 µm	0.0279	0.0247	0.0243	0.0242	0.0222	0.0193	0.0275	0.0072	0.0088	0.0004	0.0000
PuPC90-365-239 AS	0.0179	0.0177	0.0182	0.0173	0.0165	0.0139	0.0176	0.0150	0.0196		
0.45-µm +AS	**0.0458**	**0.0424**	**0.0425**	**0.0414**	**0.0387**	**0.0331**	**0.0451**	**0.0222**	**0.0284**	**0.0004**	**0.0000**
PCPu90-365-240 0.45 µm	0.0113	0.0167	0.0179	0.0175	0.0171	0.0154	0.0233	0.0103	0.0069	0.0003	0.0000
PuPC90-365-240 AS	0.0046	0.0065	0.0067	0.0068	0.0063	0.0050	0.0073	0.0017	0.0048		
0.45-µm +AS	**0.0159**	**0.0233**	**0.0246**	**0.0243**	**0.0234**	**0.0205**	**0.0305**	**0.0121**	**0.0118**	**0.0003**	**0.0000**
average 0.45-µm +AS	0.0547	0.0364	0.0343	0.0342	0.0321	0.0263	0.0395	0.0195	0.0214	0.0004	0.0000
HIP U,Pu-loaded CWF at 120 C											
PCPu120-7-237 0.45 µm	0.0028	0.0102	0.0150	0.0135	0.0131	0.0118	0.0213	0.0081	0.0164	0.0002	0.3096
PCPu120-7-237 AS	0.0068	0.0068	0.0071	0.0075	0.0072	0.0060	0.0099	0.0038	0.0105		
0.45-µm +AS	**0.0095**	**0.0170**	**0.0221**	**0.0210**	**0.0203**	**0.0178**	**0.0312**	**0.0120**	**0.0269**	**0.0002**	**0.3096**
PCPu120-7-238 0.45 µm	0.0028	0.0117	0.0167	0.0147	0.0140	0.0122	0.0236	0.0041	0.0124	0.0002	0.2749
PCPu120-7-238 AS	0.0307	0.0332	0.0259	0.0293	0.0272	0.0217	0.0332	0.0194	0.0167		
0.45-µm +AS	**0.0334**	**0.0449**	**0.0426**	**0.0441**	**0.0412**	**0.0339**	**0.0569**	**0.0235**	**0.0292**	**0.0002**	**0.2749**
PCPu120-7-239 0.45 µm	0.0050	0.0102	0.0140	0.0126	0.0117	0.0100	0.0198	0.0030	0.0111	0.0003	0.3620
PCPu120-7-239 AS	0.0433	0.0385	0.0341	0.0389	0.0367	0.0299	0.0428	0.0266	0.0376		
0.45-µm +AS	**0.0484**	**0.0487**	**0.0481**	**0.0515**	**0.0485**	**0.0399**	**0.0627**	**0.0296**	**0.0486**	**0.0003**	**0.3620**
PCPu120-7-240 0.45 µm	0.0017	0.0088	0.0142	0.0122	0.0120	0.0105	0.0198	0.0071	0.0106	0.0003	0.4868
PCPu120-7-240 AS	0.0172	0.0174	0.0172	0.0171	0.0157	0.0125	0.0192	0.0075	0.0082		
0.45-µm +AS	**0.0190**	**0.0261**	**0.0314**	**0.0294**	**0.0277**	**0.0229**	**0.0390**	**0.0145**	**0.0188**	**0.0003**	**0.4868**
PCPu120-28-237 0.45 µm	0.0197	0.0211	0.0252	0.0226	0.0217	0.0182	0.0358	0.0113	0.0198	0.0004	0.3055
PCPu120-28-237 AS	0.0463	0.0423	0.0435	0.0411	0.0400	0.0333	0.0438	0.0337	0.0575		
0.45-µm +AS	**0.0660**	**0.0633**	**0.0687**	**0.0637**	**0.0617**	**0.0516**	**0.0796**	**0.0450**	**0.0773**	**0.0004**	**0.3055**
PCPu120-28-238 0.45 µm	0.0073	0.0129	0.0187	0.0166	0.0162	0.0142	0.0296	0.0141	0.0116	0.0003	0.2580
PCPu120-28-238 AS	0.0437	0.0437	0.0448	0.0429	0.0417	0.0337	0.0482	0.0349	0.0332		
0.45-µm +AS	**0.0510**	**0.0565**	**0.0635**	**0.0595**	**0.0579**	**0.0480**	**0.0778**	**0.0489**	**0.0448**	**0.0003**	**0.2580**
PCPu120-28-239 0.45 µm	0.0111	0.0124	0.0164	0.0148	0.0144	0.0123	0.0248	0.0071	0.0099	0.0004	0.3611
PCPu120-28-239 AS	0.0292	0.0268	0.0272	0.0267	0.0265	0.0211	0.0290	0.0192	0.0347		
0.45-µm +AS	**0.0404**	**0.0392**	**0.0436**	**0.0415**	**0.0409**	**0.0334**	**0.0538**	**0.0262**	**0.0446**	**0.0004**	**0.3611**
PCPu120-28-240 0.45 µm	0.0052	0.0130	0.0204	0.0173	0.0169	0.0147	0.0294	0.0141	0.0110	0.0004	0.4734
PCPu120-28-240 AS	0.0763	0.0686	0.0712	0.0630	0.0617	0.0477	0.0672	0.0306	0.0294		
0.45-µm +AS	**0.0814**	**0.0815**	**0.0916**	**0.0802**	**0.0786**	**0.0625**	**0.0966**	**0.0448**	**0.0404**	**0.0004**	**0.4734**
PCPu120-91-237 0.45 µm	0.0126	0.0320	0.0383	0.0355	0.0340	0.0302	0.0589	0.0150	0.0270	0.0009	0.2397
PCPu120-91-237 AS	0.0282	0.0343	0.0340	0.0342	0.0329	0.0265	0.0387	0.0242	0.0392		
0.45-µm +AS	**0.0407**	**0.0662**	**0.0724**	**0.0697**	**0.0669**	**0.0567**	**0.0976**	**0.0392**	**0.0662**	**0.0009**	**0.2397**
PCPu120-91-238 0.45 µm	0.0045	0.0178	0.0246	0.0209	0.0197	0.0164	0.0340	0.0155	0.0144	0.0004	0.2914
PCPu120-91-238 AS	0.0538	0.0568	0.0546	0.0585	0.0509	0.0404	0.0577	0.0421	0.0351		
0.45-µm +AS	**0.0584**	**0.0746**	**0.0792**	**0.0795**	**0.0706**	**0.0567**	**0.0917**	**0.0576**	**0.0495**	**0.0004**	**0.2914**

Table 22B: Measured Solution Concentrations, in µg/L (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	^{239}Pu	Total ^{239}Pu+^{240}Pu	Cl	I
PuPC120-28-202a 0.45 µm	57.70	51.60	139.00	60.50	170.00	22.00	4.90	47.50	136	155.61	92300	73.7
PuPC120-28-202a 0.1µm	63.50	61.50	158.00	65.10	196.00	23.80	5.21	30.80	141	161.33		
PuPC120-28-202a 0.005µm	2.49	1.83	0.20	0.12	0.43	0.20	0.00	16.70	0.417	0.48		
PuPC120-28-202a AS	221.00	27.90	39.10	25.40	73.10	8.95	1.60	18.70				
PuPC120-28-202b 0.45 µm	106.00	47.10	132.00	56.50	171.00	21.40	4.97	44.20	118	135.01	87500	66.8
PuPC120-28-202b 0.1µm	24.70	47.20	147.00	53.20	152.00	19.40	4.27	77.70	163	186.50		
PuPC120-28-202b 0.005µm	1.92	1.78	0.20	0.10	0.20	0.20	0.00	20.60	0.498	0.57		
PuPC120-28-202b AS	222.00	30.10	44.10	26.40	79.50	9.89	1.69	18.50				
PuPC120-28-202c 0.45 µm	35.30	36.80	120.00	45.00	139.00	17.60	3.96	46.90	129	147.60	91900	84.3
PuPC120-28-202c 0.1µm	42.80	60.50	161.00	65.90	194.00	23.20	5.45	28.60	144	164.76		
PuPC120-28-202c 0.005µm	2.85	2.21	0.48	0.56	1.26	0.20	0.00	15.40	1.27	1.45		
PuPC120-28-202c AS	361.00	46.10	57.90	40.70	117.00	14.50	2.76	17.40				
PuPc120-28-Blank a 0.45 µm	67.90	0.01	0.01	0.01	0.01	0.01	0.01	0.12	0.01	0.01	800	8.2
PuPC120-28-Blank a 0.1µm	0.80	1.65	0.20	0.00	0.20	0.20	0.00	2.40	0.2	0.23		
PuPC120-28-Blank a 0.005µm	0.80	1.65	0.20	0.00	0.20	0.20	0.00	2.40	0.2	0.23		
PuPC120-28-Blank a AS	68.20	0.20	0.46	0.17	0.60	0.10	0.03	3.56		0.00		
PC U,Pu-loaded CWF GPC003												
RWS AX	83.50	0.24	0.35	0.17	0.50	0.07	0.03	0.46	1.23	1.41	434000	
RWS AY	78.60	0.33	0.53	0.25	0.71	0.08	0.03	0.55	1.3	1.49	387000	
RWS scint	85.60	0.36	0.55	0.26	0.75	0.10	0.03	0.70	1.78	2.04	368000	
PPuPC90-7a 0.45 µm	11.40	2.26	8.04	3.04	8.77	1.19	0.30	3.95	11.5	13.16	32500	48.9
PPuPC90-7a 0.1µm	10.40	1.86	7.03	2.33	7.82	1.04	0.30	2.59	11.2	12.81		
PPuPC90-7a 0.005µm	4.71	0.10	0.50	0.10	0.40	0.70	0.30	1.49	<0.2	0.23		
PPuPC90-7a AS	8.80	1.21	1.99	1.25	3.56	0.52	0.13	1.40				
PPuPC90-7b 0.45 µm	9.84	2.17	7.67	2.90	8.79	1.10	0.25	3.70	10.4	11.90	32000	61
PPuPC90-7b 0.1µm	8.85	1.74	6.99	2.34	7.75	0.96	0.30	2.75	10.5	12.01		
PPuPC90-7b 0.005µm	2.63	0.10	0.50	0.10	0.40	0.70	0.30	1.07	<0.2	0.23		
PPuPC90-7b AS	22.20	2.93	4.88	2.69	7.80	0.91	0.18	3.25				
PPuPC90-7c 0.45 µm	10.60	2.73	8.29	3.06	8.82	1.13	0.28	3.99	12.5	14.30	28500	45.1
PPuPC90-7c 0.1µm	8.04	1.83	8.01	2.34	8.62	1.07	0.30	2.92	12	13.73		
PPuPC90-7c 0.005µm	2.48	0.10	0.50	0.10	0.40	0.70	0.30	1.32	<0.2	0.23		
PPuPC90-7c AS	16.00	2.01	3.34	1.89	5.56	0.78	0.15	2.12				
PPuPC90-Blank7 0.45 µm	1.65	0.87	1.11	0.83	2.71	0.36	0.04	0.04		0.01	630	
PPuPC90-Blank7 0.1µm	2.75	0.10	0.50	0.10	0.40	0.70	0.30	0.50		0.20		
PPuPC90-Blank7 0.005µm	3.98	0.10	0.50	0.10	0.40	0.70	0.30	0.50		0.20		
PPuPC90-Blank7 AS	1.52	0.04	0.06	0.01	0.04	0.03	0.02	0.04		0.00		
PPuPC90-14 0.45 µm	15.30	4.30	15.70	6.04	17.80	2.37	0.60	5.91	20.1	23.00	29400	64.9
PPuPC90-14 0.1µm	14.70	3.89	14.80	4.98	15.90	2.15	0.30	4.59	19.8	22.65		
PPuPC90-14 0.005µm	3.00	0.10	0.50	0.10	0.40	0.70	0.30	2.69	<0.2	0.23		
PPuPC90-14 AS	23.70	3.63	6.02	3.57	10.40	1.23	0.26	2.65				
PPuPC90-28 0.45 µm	21.10	5.74	19.80	7.61	22.20	2.75	0.63	8.36	22.4	25.63	28000	52.8
PPuPC90-28 0.1µm	21.10	5.21	19.10	6.58	21.00	3.02	0.36	7.26	24.5	28.03		
PPuPC90-28 0.005µm	2.55	0.10	0.50	0.10	0.40	0.70	0.30	4.11	<0.2	0.23		
PPuPC90-28 AS	11.00	37.10	11.10	6.22	17.80	2.24	0.41	4.43				
PPuPC90T-28 0.45 µm	19.10	2.39	5.63	2.65	7.87	0.94	0.15	5.49	8.86	10.14	26500	49.7
PPuPC90T-28 0.1µm	13.80	1.43	3.73	1.50	5.61	0.70	0.30	3.67	8.85	10.13		
PPuPC90T-28 0.005µm	2.49	0.10	0.50	0.10	0.40	0.70	0.30	2.56	0.925	1.06		
PPuPC90T-28 AS												
PPuPC90T-28R	11.70	1.50	2.68	1.44	3.96	0.41	0.09	3.71	4.43	5.07	13800	

Table 24B. Normalized Mass Loss, g/m^2 (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PCPu120-91-239 0.45 µm	2.2374	1.6294	0.1238	0.1584	0.1085	0.1583	0.1081	0.0603	0.0643	0.0171	0.0331	0.0440
PCPu120-91-239 AS	0.0255	0.0123	0.0102	0.0360	0.0178	0.0099	0.0111	0.0210	0.0091	0.0149	0.0179	0.0094
0.45-µm +AS	**2.2630**	**1.6417**	**0.1340**	**0.1944**	**0.1263**	**0.1682**	**0.1192**	**0.0813**	**0.0734**	**0.0321**	**0.0510**	**0.0533**
PCPu120-91-240 0.45 µm	2.7302	1.5175	0.1294	0.0233	0.1889	0.2634	0.1094	0.0652	0.0615	0.0044	0.0373	0.0373
PCPu120-91-240 AS	0.0240	0.0133	0.0121	0.0098	0.0135	0.0152	0.0140	0.0150	0.0113	0.0134	0.0187	0.0124
0.45-µm +AS	**2.7542**	**1.5307**	**0.1415**	**0.0331**	**0.2023**	**0.2785**	**0.1234**	**0.0802**	**0.0727**	**0.0178**	**0.0559**	**0.0497**
HIP U,Pu-loaded CWF at 120 C and mass ratio 1:20												
PCPu120/1-7-237 0.45 µm	1.3186	0.7579	0.3548	0.0085	0.2960	0.2912	0.1746	0.0809	0.0946	0.0070	0.0159	0.0509
PCPu120/1-7-237 AS	0.0133	0.0044	0.0073	0.0249	0.0152	0.0127	0.0100	-0.0078	0.0085	0.0079	0.0113	0.0086
0.45-µm +AS	**1.3318**	**0.7624**	**0.3621**	**0.0335**	**0.3112**	**0.3039**	**0.1847**	**0.0731**	**0.1031**	**0.0150**	**0.0272**	**0.0595**
PCPu120/1-7-238 0.45 µm	1.3048	1.1298	0.3343	0.0097	0.2825	0.3145	0.2365	0.1051	0.1127	0.0045	0.0260	0.0500
PCPu120/1-7-238 AS	0.0537	0.0503	0.0525	0.0085	0.0546	0.0507	0.0513	0.0202	0.0417	0.0512	0.0516	0.0470
0.45-µm +AS	**1.3586**	**1.1801**	**0.3868**	**0.0182**	**0.3371**	**0.3652**	**0.2877**	**0.1254**	**0.1544**	**0.0557**	**0.0776**	**0.0970**
PCPu120/1-7-239 0.45 µm	1.3823	0.7948	0.3706	0.0055	0.2591	0.2991	0.1857	0.0909	0.1061	0.0068	0.0135	0.0673
PCPu120/1-7-239 AS	0.0184	0.0151	0.0121	0.0166	0.0308	0.0281	0.0169	0.0238	0.0135	0.0193	0.0141	0.0155
0.45-µm +AS	**1.4007**	**0.8099**	**0.3827**	**0.0221**	**0.2899**	**0.3273**	**0.2026**	**0.1146**	**0.1196**	**0.0261**	**0.0277**	**0.0828**
PCPu120/1-7-240 0.45 µm	1.7481	0.7438	0.3515	0.0024	0.3283	0.3518	0.1750	0.1021	0.0868	0.0065	0.0196	0.0516
PCPu120/1-7-240 AS	1.7020	0.7244	0.3428	0.0051	0.3192	0.3430	0.1706	0.0958	0.0842	0.0073	0.0190	0.0503
0.45-µm +AS	**3.4501**	**1.4681**	**0.6942**	**0.0075**	**0.6475**	**0.6948**	**0.3456**	**0.1980**	**0.1710**	**0.0138**	**0.0386**	**0.1019**
PCPu120/1-14-237 0.45 µm	1.7247	1.0935	0.4211	0.0394	0.3252	0.3383	0.3583	0.5022	0.1377	0.0155	0.0301	0.0819
PCPu120/1-14-237 AS	0.0152	0.0029	0.0059	0.0271	0.0280	0.0184	0.0029	0.0224	0.0070	0.0100	0.0074	0.0070
0.45-µm +AS	**1.7399**	**1.0965**	**0.4270**	**0.0665**	**0.3532**	**0.3567**	**0.3611**	**0.5246**	**0.1448**	**0.0256**	**0.0375**	**0.0889**
PCPu120/1-14-238 0.45 µm	1.7452	1.8261	0.4123	0.0181	0.3661	0.4172	0.3102	0.1047	0.1583	0.0072	0.0409	0.0888
PCPu120/1-14-238 AS	0.0287	0.0177	0.0268	0.0380	0.0384	0.0400	0.0261	0.0358	0.0245	0.0322	0.0409	0.0274
0.45-µm +AS	**1.7739**	**1.8438**	**0.4391**	**0.0561**	**0.4045**	**0.4572**	**0.3363**	**0.1405**	**0.1828**	**0.0395**	**0.0818**	**0.1162**
PCPu120/1-14-238R 0.45 µm	1.7229	1.7831	0.3873	0.0135	0.3548	0.3883	0.3126	0.0803	0.1621	0.0064	0.0348	0.0942
PCPu120/1-14-238R AS	0.0008	0.0022	0.0013	0.0436	0.0045	0.0057	0.0000	0.0247	0.0017	0.0028	0.0170	0.0006
0.45-µm +AS	**1.7237**	**1.7852**	**0.3885**	**0.0571**	**0.3593**	**0.3940**	**0.3126**	**0.1049**	**0.1638**	**0.0092**	**0.0518**	**0.0948**
PCPu120/1-14-239 0.45 µm	1.7580	1.2948	0.3687	0.0244	0.3151	0.3694	0.2575	0.1147	0.1603	0.0210	0.0339	0.1161
PCPu120/1-14-239 AS	0.0072	0.0052	0.0088	0.0796	0.0180	0.0172	0.0070	0.0462	0.0106	0.0115	0.0148	0.0118
0.45-µm +AS	**1.7652**	**1.3000**	**0.3775**	**0.1040**	**0.3331**	**0.3866**	**0.2645**	**0.1609**	**0.1709**	**0.0326**	**0.0487**	**0.1279**
PCPu120/1-14-240 0.45 µm	1.9560	0.9946	0.3442	0.0110	0.3704	0.3928	0.2168	0.0843	0.1295	0.0108	0.0298	0.1008
PCPu120/1-14-240 AS	0.0058	0.0032	0.0068	0.0719	0.0125	0.0132	0.0059	0.0278	0.0081	0.0075	0.0112	0.0093
0.45-µm +AS	**1.9618**	**0.9978**	**0.3510**	**0.0829**	**0.3829**	**0.4060**	**0.2227**	**0.1121**	**0.1376**	**0.0183**	**0.0410**	**0.1101**
PCPu120/1-28-237 0.45 µm	2.2869	1.3650	0.3602	0.0522	0.3074	0.3761	0.2645	0.1186	0.1207	0.0263	0.0554	0.0618
PCPu120/1-28-237 AS	0.0346	0.0065	0.0152	0.0400	0.0407	0.0334	0.0289	0.0213	0.0221	0.0205	0.0283	0.0203
0.45-µm +AS	**2.3215**	**1.3715**	**0.3753**	**0.0922**	**0.3481**	**0.4095**	**0.2934**	**0.1400**	**0.1428**	**0.0467**	**0.0837**	**0.0822**
PCPu120/1-28-238 0.45 µm	2.6900	2.4815	0.4336	0.0315	0.3575	0.4347	0.2957	0.1246	0.1210	0.0278	0.0568	0.0513
PCPu120/1-28-238 AS	0.0530	0.0433	0.0430	0.0576	0.0564	0.0640	0.0553	0.0458	0.0460	0.0481	0.0506	0.0495
0.45-µm +AS	**2.7430**	**2.5247**	**0.4766**	**0.0891**	**0.4139**	**0.4987**	**0.3510**	**0.1704**	**0.1670**	**0.0759**	**0.1074**	**0.1009**
PCPu120/1-28-239 0.45 µm	2.3083	1.3701	0.3569	0.0406	0.3247	0.3985	0.2443	0.1378	0.1267	0.0298	0.0460	0.0777
PCPu120/1-28-239 AS	0.0438	0.0302	0.0310	0.0381	0.0430	0.0422	0.0447	0.0354	0.0306	0.0357	0.0560	0.0304
0.45-µm +AS	**2.3521**	**1.4003**	**0.3879**	**0.0787**	**0.3677**	**0.4406**	**0.2890**	**0.1732**	**0.1573**	**0.0655**	**0.1020**	**0.1081**
PCPu120/1-28-240 0.45 µm	2.5783	1.1223	0.3308	0.0361	0.3122	0.3978	0.2247	0.1334	0.1167	0.0266	0.0464	0.0770
PCPu120/1-28-240 AS	0.0712	0.0279	0.0324	0.0399	0.0595	0.0565	0.0537	0.0523	0.0348	0.0339	0.0311	0.0349
0.45-µm +AS	**2.6495**	**1.1502**	**0.3633**	**0.0760**	**0.3717**	**0.4543**	**0.2784**	**0.1857**	**0.1515**	**0.0605**	**0.0776**	**0.1119**
PCPu120/1-56-237 0.45 µm	2.5030	1.5918	0.3032	0.0103	0.2899	0.3553	0.2274	0.0792	0.0960	0.0097	0.0531	0.0429
PCPu120/1-56-237 AS	0.0502	0.0000	0.0171	0.0214	0.0435	0.0253	0.0354	0.0158	0.0297	0.0432	0.0404	0.0284
0.45-µm +AS	**2.5532**	**1.5918**	**0.3203**	**0.0317**	**0.3334**	**0.3805**	**0.2628**	**0.0949**	**0.1257**	**0.0529**	**0.0936**	**0.0713**
PCPu120/1-56-238 0.45 µm	2.8776	2.9753	0.3571	0.0292	0.3018	0.3807	0.2612	0.1026	0.1090	0.0246	0.0600	0.0512

Table 24B. Normalized Mass Loss, g/m^2 (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	^{239}Pu+^{240}Pu	Cl	Iodine
PCPu120-91-239 0.45 µm	0.0280	0.0331	0.0327	0.0310	0.0288	0.0236	0.0470	0.0091	0.0126	0.0004	0.2784
PCPu120-91-239 AS	0.0168	0.0165	0.0163	0.0154	0.0152	0.0114	0.0168	0.0096	0.0191		
0.45-µm +AS	**0.0448**	**0.0496**	**0.0489**	**0.0464**	**0.0440**	**0.0351**	**0.0638**	**0.0186**	**0.0316**	**0.0004**	**0.2784**
PCPu120-91-240 0.45 µm	0.0080	0.0259	0.0341	0.0308	0.0296	0.0265	0.0490	0.0330	0.0147	0.0005	0.4319
PCPu120-91-240 AS	0.0135	0.0203	0.0182	0.0189	0.0178	0.0140	0.0225	0.0077	0.0137		
0.45-µm +AS	**0.0215**	**0.0463**	**0.0523**	**0.0497**	**0.0474**	**0.0405**	**0.0714**	**0.0407**	**0.0284**	**0.0005**	**0.4319**
HIP U,Pu-loaded CWF at 120 C											
PCPu120/1-7-237 0.45 µm	0.0121	0.0116	0.0138	0.0130	0.0128	0.0108	0.0194	0.0100	0.0141	0.0006	0.3592
PCPu120/1-7-237 AS	0.0095	0.0093	0.0096	0.0094	0.0092	0.0077	0.0102	0.0068	0.0171		
0.45-µm +AS	**0.0216**	**0.0209**	**0.0234**	**0.0224**	**0.0221**	**0.0185**	**0.0296**	**0.0168**	**0.0312**	**0.0006**	**0.3592**
PCPu120/1-7-238 0.45 µm	0.0065	0.0198	0.0312	0.0259	0.0254	0.0214	0.0422	0.0105	0.0249	0.0004	0.3083
PCPu120/1-7-238 AS	0.0533	0.0581	0.0569	0.0564	0.0547	0.0439	0.0639	0.0389	0.0435		
0.45-µm +AS	**0.0598**	**0.0779**	**0.0881**	**0.0823**	**0.0800**	**0.0653**	**0.1061**	**0.0494**	**0.0684**	**0.0004**	**0.3083**
PCPu120/1-7-239 0.45 µm	0.0127	0.0111	0.0138	0.0129	0.0125	0.0103	0.0209	0.0037	0.0149	0.0006	0.4184
PCPu120/1-7-239 AS	0.0231	0.0162	0.0161	0.0153	0.0146	0.0124	0.0175	0.0100	0.0158		
0.45-µm +AS	**0.0358**	**0.0274**	**0.0299**	**0.0282**	**0.0271**	**0.0227**	**0.0383**	**0.0137**	**0.0307**	**0.0006**	**0.4184**
PCPu120/1-7-240 0.45 µm	0.0131	0.0133	0.0192	0.0171	0.0168	0.0150	0.0298	0.0105	0.0122	0.0006	0.5649
PCPu120/1-7-240 AS	0.0117	0.0127	0.0186	0.0166	0.0163	0.0147	0.0295	0.0095	0.0118		
0.45-µm +AS	**0.0248**	**0.0260**	**0.0377**	**0.0337**	**0.0331**	**0.0296**	**0.0592**	**0.0199**	**0.0240**	**0.0006**	**0.5649**
PCPu120/1-14-237 0.45 µm	0.0239	0.0223	0.0249	0.0243	0.0229	0.0199	0.0390	0.0131	0.0267	0.0005	0.4331
PCPu120/1-14-237 AS	0.0139	0.0092	0.0081	0.0074	0.0075	0.0053	0.0091	0.0039	0.0068		
0.45-µm +AS	**0.0378**	**0.0315**	**0.0330**	**0.0317**	**0.0304**	**0.0252**	**0.0481**	**0.0170**	**0.0335**	**0.0005**	**0.4331**
PCPu120/1-14-238 0.45 µm	0.0101	0.0311	0.0425	0.0368	0.0368	0.0301	0.0597	0.0190	0.0328	0.0005	0.3848
PCPu120/1-14-238 AS	0.0344	0.0457	0.0428	0.0423	0.0408	0.0328	0.0507	0.0277	0.0378		
0.45-µm +AS	**0.0445**	**0.0768**	**0.0853**	**0.0791**	**0.0776**	**0.0628**	**0.1104**	**0.0467**	**0.0706**	**0.0005**	**0.3848**
PCPu120/1-14-238R 0.45 µm	0.0086	0.0277	0.0371	0.0318	0.0317	0.0265	0.0502	0.0135	0.0249	0.0004	0.4084
PCPu120/1-14-238R AS	0.0054	0.0239	0.0323	0.0194	0.0186	0.0132	0.0266	0.0009	0.0000		
0.45-µm +AS	**0.0140**	**0.0517**	**0.0694**	**0.0512**	**0.0503**	**0.0396**	**0.0768**	**0.0144**	**0.0249**	**0.0004**	**0.4084**
PCPu120/1-14-239 0.45 µm	0.0419	0.0288	0.0316	0.0292	0.0283	0.0236	0.0441	0.0085	0.0221	0.0005	0.4224
PCPu120/1-14-239 AS	0.0148	0.0154	0.0160	0.0153	0.0153	0.0121	0.0174	0.0097	0.0251		
0.45-µm +AS	**0.0566**	**0.0443**	**0.0476**	**0.0445**	**0.0436**	**0.0357**	**0.0615**	**0.0182**	**0.0472**	**0.0005**	**0.4224**
PCPu120/1-14-240 0.45 µm	0.0230	0.0216	0.0269	0.0240	0.0240	0.0207	0.0392	0.0135	0.0147	0.0005	0.6577
PCPu120/1-14-240 AS	0.0100	0.0122	0.0121	0.0120	0.0118	0.0092	0.0135	0.0090	0.0119		
0.45-µm +AS	**0.0330**	**0.0338**	**0.0390**	**0.0359**	**0.0359**	**0.0299**	**0.0527**	**0.0225**	**0.0266**	**0.0005**	**0.6577**
PCPu120/1-28-237 0.45 µm	0.0435	0.0462	0.0515	0.0476	0.0463	0.0394	0.0724	0.0249	0.0343	0.0006	0.4283
PCPu120/1-28-237 AS	0.0256	0.0266	0.0266	0.0259	0.0252	0.0212	0.0304	0.0177	0.0399		
0.45-µm +AS	**0.0691**	**0.0728**	**0.0781**	**0.0735**	**0.0715**	**0.0606**	**0.1028**	**0.0426**	**0.0742**	**0.0006**	**0.4283**
PCPu120/1-28-238 0.45 µm	0.0383	0.0510	0.0559	0.0522	0.0509	0.0431	0.0864	0.0258	0.0305	0.0006	0.4396
PCPu120/1-28-238 AS	0.0573	0.0581	0.0560	0.0550	0.0532	0.0441	0.0579	0.1275	0.0235		
0.45-µm +AS	**0.0956**	**0.1091**	**0.1119**	**0.1072**	**0.1041**	**0.0872**	**0.1443**	**0.1533**	**0.0540**	**0.0006**	**0.4396**
PCPu120/1-28-239 0.45 µm	0.0603	0.0456	0.0471	0.0450	0.0421	0.0333	0.0630	0.0129	0.0221	0.0006	0.4938
PCPu120/1-28-239 AS	0.0373	0.0449	0.0434	0.0400	0.0396	0.0325	0.0499	0.0098	0.1039		
0.45-µm +AS	**0.0976**	**0.0905**	**0.0905**	**0.0850**	**0.0817**	**0.0658**	**0.1130**	**0.0227**	**0.1260**	**0.0006**	**0.4938**
PCPu120/1-28-240 0.45 µm	0.0534	0.0396	0.0445	0.0422	0.0406	0.0339	0.0663	0.0215	0.0182	0.0006	0.6577
PCPu120/1-28-240 AS	0.0424	0.0386	0.0375	0.0367	0.0344	0.0272	0.0401	0.0153	0.0263		
0.45-µm +AS	**0.0959**	**0.0782**	**0.0820**	**0.0789**	**0.0750**	**0.0611**	**0.1064**	**0.0368**	**0.0444**	**0.0006**	**0.6577**
PCPu120/1-56-237 0.45 µm	0.0128	0.0352	0.0452	0.0411	0.0401	0.0361	0.0638	0.0269	0.0509	0.0005	0.4952
PCPu120/1-56-237 AS	0.0659	0.0442	0.0424	0.0430	0.0396	0.0314	0.0541	0.0141	0.0360		
0.45-µm +AS	**0.0787**	**0.0794**	**0.0876**	**0.0841**	**0.0797**	**0.0675**	**0.1178**	**0.0409**	**0.0869**	**0.0005**	**0.4952**
PCPu120/1-56-238 0.45 µm	0.0345	0.0520	0.0599	0.0559	0.0528	0.0440	0.0878	0.0352	0.0347	0.0004	0.4122

Table 24B. Normalized Mass Loss, g/m^2 (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PCPu120/1-56-238 AS	0.0317	0.0061	0.0217	0.0334	0.0310	0.0268	0.0276	0.0212	0.0230	0.0281	0.0384	0.0241
0.45-μm +AS	**2.9094**	**2.9813**	**0.3788**	**0.0626**	**0.3329**	**0.4075**	**0.2888**	**0.1238**	**0.1320**	**0.0527**	**0.0984**	**0.0752**
PCPu120/1-56-239 0.45 μm	2.8149	1.8876	0.3617	0.0079	0.2964	0.3696	0.2205	0.0925	0.1067	0.0091	0.0419	0.0529
PCPu120/1-56-239 AS	0.0226	0.0000	0.0125	0.0073	0.0247	0.0135	0.0178	0.0113	0.0154	0.0282	0.0301	0.0166
0.45-μm +AS	**2.8374**	**1.8876**	**0.3742**	**0.0152**	**0.3210**	**0.3831**	**0.2383**	**0.1037**	**0.1220**	**0.0373**	**0.0719**	**0.0695**
PCPu120/1-56-240 0.45 μm	3.4113	1.6503	0.2954	0.0202	0.3408	0.4132	0.2121	0.0993	0.0989	0.0113	0.0553	0.0567
PCPu120/1-56-240 AS	0.0032	0.0000	0.0021	0.0970	0.0062	-0.0020	0.0028	0.1434	0.0029	0.0058	0.0137	0.0036
0.45-μm +AS	**3.4145**	**1.6503**	**0.2975**	**0.1172**	**0.3470**	**0.4112**	**0.2149**	**0.2427**	**0.1018**	**0.0171**	**0.0690**	**0.0603**
PCPu120/1-91-237 0.45 μm	3.8739	2.2054	0.3981	0.1550	0.4365	0.5062	0.5281	0.2269	0.2918	0.0753	0.0970	0.1915
PCPu120/1-91-237 AS	0.0442	0.0119	0.0114	0.0390	0.0276	0.0276	0.0200	0.0294	0.0172	0.0178	0.0176	0.0173
0.45-μm +AS	**3.9181**	**2.2173**	**0.4096**	**0.1940**	**0.4641**	**0.5339**	**0.5481**	**0.2564**	**0.3090**	**0.0932**	**0.1146**	**0.2088**
PCPu120/1-91-238 0.45 μm	3.8124	3.2468	0.3975	0.0990	0.3569	0.4891	0.4361	0.1568	0.2249	0.0622	0.0817	0.1253
PCPu120/1-91-238 AS	0.0292	0.0171	0.0144	0.0302	0.0232	0.0245	0.0181	0.0247	0.0155	0.0194	0.0193	0.0167
0.45-μm +AS	**3.8416**	**3.2639**	**0.4119**	**0.1292**	**0.3801**	**0.5136**	**0.4542**	**0.1815**	**0.2403**	**0.0816**	**0.1010**	**0.1420**
PCPu120/1-91-239 0.45 μm	3.8331	2.2901	0.3393	0.1004	0.3745	0.4978	0.3952	0.1786	0.2483	0.0530	0.0792	0.1676
PCPu120/1-91-239 AS	0.0176	0.0082	0.0094	0.0127	0.0156	0.0176	0.0130	0.0138	0.0121	0.0156	0.0190	0.0138
0.45-μm +AS	**3.8507**	**2.2983**	**0.3487**	**0.1130**	**0.3900**	**0.5153**	**0.4082**	**0.1924**	**0.2605**	**0.0686**	**0.0982**	**0.1813**
PCPu120/1-91-240 0.45 μm	4.2884	1.9848	0.3189	0.0519	0.3917	0.5174	0.3568	0.1295	0.2117	0.0361	0.0737	0.1515
PCPu120/1-91-240 AS	0.0201	0.0071	0.0045	0.0399	0.0157	0.0146	0.0077	0.0241	0.0078	0.0167	0.0116	0.0093
0.45-μm +AS	**4.3086**	**1.9919**	**0.3234**	**0.0917**	**0.4074**	**0.5320**	**0.3645**	**0.1536**	**0.2195**	**0.0529**	**0.0853**	**0.1608**
PC U,Pu-loaded CWF GPC00202 at 90 and 120C and mass ratio 1:10												
RWS 1 (PC CWF 202)	0.0317	0.0168	0.6513	0.0046	0.0001	0.0161	0.0432	0.6944	0.0064	0.0062	0.0004	0.0341
RWS 2 (PC CWF 202)	0.0381	0.0181	0.9656	0.0046	0.0001	0.0220	0.0487	0.7667	0.0093	0.0072	0.0004	0.0419
RWS 3 (PC CWF 202)	0.0302	0.0116	0.5301	0.0046	0.0001	0.0108	0.0399	0.5364	0.0073	0.0067	0.0004	0.0277
GPC00202 RWS average	0.0333	0.0155	0.7157	0.0046	0.0001	0.0163	0.0439	0.6658	0.0077	0.0067	0.0004	0.0346
PuPC90-7-202a 0.45 μm	0.6228	0.0519	0.2899	0.0487	0.0511	0.0585	0.0636	-0.0421	0.0474	0.0053	0.0037	0.0454
PuPC90-7-202a AS	0.0154	0.0133	0.0161	0.0204	0.0165	0.0164	0.0152	0.0245	0.0143	0.0193	0.0660	0.0145
0.45-μm +AS	**0.6382**	**0.0652**	**0.3059**	**0.0692**	**0.0676**	**0.0749**	**0.0788**	**-0.0176**	**0.0617**	**0.0246**	**0.0697**	**0.0599**
PuPC90-7-202b 0.45 μm	0.5606	0.0525	0.1706	-0.0259	0.0684	0.0751	0.0497	-0.0574	0.0405	0.0027	0.0034	0.0402
PuPC90-7-202b AS	0.0114	0.0106	0.0117	0.0442	0.0123	0.0123	0.0119	0.0305	0.0127	0.0176	0.0207	0.0119
0.45-μm +AS	**0.5720**	**0.0631**	**0.1823**	**0.0183**	**0.0807**	**0.0873**	**0.0616**	**-0.0269**	**0.0532**	**0.0202**	**0.0240**	**0.0521**
PuPC90-7-202c 0.45 μm	0.5635	0.0612	0.1631	-0.0242	0.0654	0.0764	0.0551	-0.0521	0.0483	0.0061	0.0039	0.0478
PuPC90-7-202c AS	0.0333	0.0281	0.0312	0.0549	0.0339	0.0338	0.0326	0.0483	0.0325	0.0416	0.0312	0.0276
0.45-μm +AS	**0.5968**	**0.0892**	**0.1944**	**0.0307**	**0.0993**	**0.1102**	**0.0877**	**-0.0037**	**0.0808**	**0.0477**	**0.0352**	**0.0754**
average 0.45-μm +AS	0.6023	0.0725	0.2275	0.0394	0.0825	0.0908	0.0760	-0.0161	0.0652	0.0308	0.0430	0.0625
PuPC120-7-202a 0.45μm	1.4318	0.2314	0.2461	-0.0061	0.1347	0.1726	0.1688	0.0949	0.1052	0.0087	0.0350	0.1027
PuPC120-7-202a AS	0.0111	0.0028	0.0048	0.0227	0.0189	0.0179	0.0082	0.0226	0.0092	0.0191	0.0132	0.0139
0.45-μm +AS	**1.4429**	**0.2342**	**0.2510**	**0.0165**	**0.1536**	**0.1905**	**0.1770**	**0.1175**	**0.1143**	**0.0278**	**0.0482**	**0.1166**
PuPC120-7-202b 0.45μm	1.3491	0.2068	0.2356	-0.0064	0.1340	0.1662	0.1668	0.0963	0.1131	0.0043	0.0385	0.1156
PuPC120-7-202b AS	0.0416	0.0442	0.0444	0.0559	0.0474	0.0553	0.0501	0.0542	0.0461	0.0596	0.0453	0.0417
0.45-μm +AS	**1.3908**	**0.2510**	**0.2801**	**0.0496**	**0.1814**	**0.2215**	**0.2169**	**0.1505**	**0.1592**	**0.0639**	**0.0839**	**0.1573**
PuPC120-7-202c 0.45μm	1.4402	0.2319	0.2435	-0.0062	0.1478	0.1869	0.1892	0.1199	0.1212	0.0051	0.0418	0.1252
PuPC120-7-202c AS	0.0224	0.0271	0.0276	0.0331	0.0315	0.0354	0.0323	0.0341	0.0323	0.0443	0.0377	0.0289
0.45-μm +AS	**1.4626**	**0.2590**	**0.2711**	**0.0268**	**0.1793**	**0.2223**	**0.2215**	**0.1539**	**0.1535**	**0.0495**	**0.0795**	**0.1541**
average 0.45-μm +AS	1.4321	0.2481	0.2674	0.0310	0.1714	0.2114	0.2051	0.1406	0.1423	0.0471	0.0705	0.1426
PuPC120-28-202a 0.45 μm	2.2959	0.3322	0.2601	0.0090	0.1735	0.1936	0.1414	0.0748	0.1070	0.0049	0.0484	0.1195
PuPC120-28-202a AS	0.0087	0.0145	0.0124	0.0454	0.0142	0.0146	0.0484	0.0455	0.0152	0.0251	0.0244	0.0158
0.45-μm +AS	**2.3046**	**0.3468**	**0.2724**	**0.0544**	**0.1877**	**0.2081**	**0.1898**	**0.1203**	**0.1222**	**0.0300**	**0.0727**	**0.1353**
PuPC120-28-202b 0.45 μm	2.2032	0.3086	0.2558	-0.0050	0.1681	0.1880	0.1296	0.0684	0.1059	0.0045	0.0473	0.1094

Table 24B. Normalized Mass Loss, g/m^2 (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	^{239}Pu+^{240}Pu	Cl	Iodine
PCPu120/1-56-238 AS	0.0312	0.0396	0.0366	0.0364	0.0342	0.0264	0.0426	0.0248	0.0357		
0.45-μm +AS	**0.0657**	**0.0916**	**0.0965**	**0.0923**	**0.0870**	**0.0704**	**0.1304**	**0.0600**	**0.0704**	**0.0004**	**0.4122**
PCPu120/1-56-239 0.45 μm	0.0157	0.0314	0.0405	0.0364	0.0349	0.0301	0.0547	0.0176	0.0381	0.0005	0.5334
PCPu120/1-56-239 AS	0.0474	0.0362	0.0322	0.0336	0.0306	0.0248	0.0412	0.0101	0.0220		
0.45-μm +AS	**0.0632**	**0.0676**	**0.0727**	**0.0700**	**0.0654**	**0.0549**	**0.0959**	**0.0277**	**0.0602**	**0.0005**	**0.5334**
PCPu120/1-56-240 0.45 μm	0.0243	0.0413	0.0519	0.0476	0.0459	0.0389	0.0699	0.0277	0.0322	0.0005	0.7327
PCPu120/1-56-240 AS	0.0100	0.0149	0.0164	0.0153	0.0137	0.0115	0.0182	0.0023	0.0085		
0.45-μm +AS	**0.0343**	**0.0562**	**0.0683**	**0.0629**	**0.0596**	**0.0504**	**0.0881**	**0.0300**	**0.0407**	**0.0005**	**0.7327**
PCPu120/1-91-237 0.45 μm	0.1385	0.1117	0.1186	0.1072	0.1020	0.0800	0.1421	0.0458	0.0714	0.0006	0.9007
PCPu120/1-91-237 AS	0.0222	0.0226	0.0261	0.0225	0.0240	0.0182	0.0284	0.0098	0.0362		
0.45-μm +AS	**0.1607**	**0.1342**	**0.1446**	**0.1297**	**0.1260**	**0.0983**	**0.1705**	**0.0556**	**0.1076**	**0.0006**	**0.9007**
PCPu120/1-91-238 0.45 μm	0.0935	0.0914	0.0994	0.0915	0.0902	0.0712	0.1355	0.0721	0.0567	0.0005	0.7230
PCPu120/1-91-238 AS	0.0214	0.0247	0.0271	0.0240	0.0258	0.0195	0.0319	0.0144	0.0291		
0.45-μm +AS	**0.1149**	**0.1161**	**0.1265**	**0.1156**	**0.1160**	**0.0908**	**0.1674**	**0.0864**	**0.0858**	**0.0005**	**0.7230**
PCPu120/1-91-239 0.45 μm	0.1023	0.0916	0.0977	0.0907	0.0896	0.0692	0.1236	0.0367	0.0540	0.0006	0.9261
PCPu120/1-91-239 AS	0.0195	0.0222	0.0242	0.0221	0.0240	0.0190	0.0261	0.0125	0.0391		
0.45-μm +AS	**0.1218**	**0.1137**	**0.1219**	**0.1128**	**0.1136**	**0.0882**	**0.1497**	**0.0491**	**0.0932**	**0.0006**	**0.9261**
PCPu120/1-91-240 0.45 μm	0.0727	0.0689	0.0787	0.0705	0.0753	0.0617	0.1098	0.0478	0.0395	0.0006	1.8824
PCPu120/1-91-240 AS	0.0232	0.0152	0.0162	0.0147	0.0155	0.0118	0.0189	0.0056	0.0045		
0.45-μm +AS	**0.0959**	**0.0841**	**0.0949**	**0.0852**	**0.0908**	**0.0735**	**0.1286**	**0.0534**	**0.0440**	**0.0006**	**1.8824**
PC U,Pu-loaded CWF GPC0020.											
RWS 1 (PC CWF 202)	0.0442	0.0001	0.0000	0.0001	0.0001	0.0005	0.0082	0.0001	0.0001	3.0076	2.7704
RWS 2 (PC CWF 202)	0.0506	0.0001	0.0000	0.0001	0.0001	0.0005	0.0088	0.0001	0.0001	3.9817	3.6669
RWS 3 (PC CWF 202)	0.0375	0.0001	0.0000	0.0001	0.0001	0.0005	0.0079	0.0001	0.0001	2.4969	2.2358
GPC00202 RWS average	0.0441	0.0001	0.0000	0.0001	0.0001	0.0005	0.0083	0.0001	0.0001	3.1620	2.8910
PuPC90-7-202a 0.45 μm	0.0507	0.0026	0.0022	0.0022	0.0018	0.0012	0.0047	0.0016	0.0006	0.0011	0.2872
PuPC90-7-202a AS	0.0625	0.0156	0.0132	0.0121	0.0110	0.0075	0.0163	0.0058	0.0006		
0.45-μm +AS	**0.1132**	**0.0182**	**0.0154**	**0.0142**	**0.0128**	**0.0087**	**0.0209**	**0.0074**	**0.0012**	**0.0011**	**0.2872**
PuPC90-7-202b 0.45 μm	0.0457	0.0020	0.0019	0.0018	0.0015	0.0011	0.0044	0.0016	0.0006	0.0005	0.2210
PuPC90-7-202b AS	0.0633	0.0130	0.0109	0.0100	0.0089	0.0057	0.0139	0.0034	0.0006		
0.45-μm +AS	**0.1091**	**0.0150**	**0.0128**	**0.0117**	**0.0105**	**0.0068**	**0.0183**	**0.0050**	**0.0012**	**0.0005**	**0.2210**
PuPC90-7-202c 0.45 μm	0.1405	0.0036	0.0041	0.0034	0.0030	0.0022	0.0082	0.0022	0.0014	0.0005	0.2017
PuPC90-7-202c AS	0.1445	0.0325	0.0268	0.0254	0.0225	0.0143	0.0313	0.0066	0.0014		
0.45-μm +AS	**0.2850**	**0.0362**	**0.0310**	**0.0288**	**0.0255**	**0.0165**	**0.0395**	**0.0088**	**0.0028**	**0.0005**	**0.2017**
average 0.45-μm +AS	0.1691	0.0231	0.0197	0.0183	0.0163	0.0107	0.0263	0.0071	0.0018	0.0007	0.2366
PuPC120-7-202a 0.45μm	0.0399	0.0324	0.0463	0.0407	0.0326	0.0215	0.0882	0.0079	0.0148	0.0008	0.2910
PuPC120-7-202a AS	0.0628	0.0119	0.0090	0.0097	0.0091	0.0062	0.0199	0.0032	0.0000		
0.45-μm +AS	**0.1027**	**0.0444**	**0.0553**	**0.0504**	**0.0417**	**0.0276**	**0.1082**	**0.0111**	**0.0148**	**0.0008**	**0.2910**
PuPC120-7-202b 0.45μm	0.0143	0.0341	0.0468	0.0406	0.0333	0.0232	0.0889	0.0084	0.0126	0.0009	0.2676
PuPC120-7-202b AS	0.2149	0.0529	0.0410	0.0410	0.0371	0.0249	0.0631	0.0099	0.0000		
0.45-μm +AS	**0.2291**	**0.0870**	**0.0878**	**0.0816**	**0.0704**	**0.0481**	**0.1520**	**0.0183**	**0.0126**	**0.0009**	**0.2676**
PuPC120-7-202c 0.45μm	0.0188	0.0359	0.0500	0.0432	0.0350	0.0250	0.0909	0.0087	0.0135	0.0008	0.2710
PuPC120-7-202c AS	0.1415	0.0385	0.0308	0.0293	0.0274	0.0183	0.0479	0.0097	0.0000		
0.45-μm +AS	**0.1603**	**0.0744**	**0.0808**	**0.0725**	**0.0624**	**0.0433**	**0.1389**	**0.0184**	**0.0135**	**0.0008**	**0.2710**
average 0.45-μm +AS	0.1640	0.0686	0.0746	0.0682	0.0581	0.0397	0.1330	0.0159	0.0136	0.0008	0.2765
PuPC120-28-202a 0.45 μm	-0.0064	0.0497	0.0701	0.0615	0.0506	0.0363	0.1177	0.0152	0.0166	0.0009	0.4026
PuPC120-28-202a AS	0.0984	0.0258	0.0188	0.0248	0.0208	0.0141	0.0366	0.0047	0.0000		
0.45-μm +AS	**0.0921**	**0.0755**	**0.0890**	**0.0863**	**0.0714**	**0.0505**	**0.1543**	**0.0199**	**0.0166**	**0.0009**	**0.4026**
PuPC120-28-202b 0.45 μm	0.0273	0.0463	0.0681	0.0587	0.0520	0.0361	0.1220	0.0145	0.0147	0.0008	0.3654

Table 24B. Normalized Mass Loss, g/m^2 (contd.)

Sample Name	Li	B	Na	Mg	Al	Si	K	Ca	Rb	Sr	Y	Cs
PuPC120-28-202b AS	0.0146	0.0175	0.0168	0.0623	0.0181	0.0197	0.0615	0.0688	0.0196	0.0268	0.0280	0.0177
0.45-□m +AS	**2.2178**	**0.3261**	**0.2726**	**0.0573**	**0.1861**	**0.2078**	**0.1910**	**0.1373**	**0.1254**	**0.0313**	**0.0753**	**0.1271**
PuPC120-28-202c 0.45 µm	2.1581	0.3392	0.2612	-0.0008	0.1577	0.1837	0.1240	0.0757	0.1071	0.0032	0.0324	0.1025
PuPC120-28-202c AS	0.0122	0.0133	0.0132	0.0395	0.0228	0.0193	0.0269	0.0571	0.0181	0.0494	0.0474	0.0215
0.45-□m +AS	**2.1703**	**0.3525**	**0.2744**	**0.0387**	**0.1805**	**0.2030**	**0.1509**	**0.1328**	**0.1252**	**0.0525**	**0.0798**	**0.1240**
average 0.45-□m +AS	2.2309	0.3418	0.2731	0.0501	0.1848	0.2063	0.1772	0.1301	0.1243	0.0380	0.0760	0.1288
PC U,Pu-loaded CWF GPC0030m at 90C and mass ratio 1:10												
RWS AX	0.0447	0.0049	0.2363	0.0087	0.0007	0.0011	0.0400	0.0145	0.0162	0.0120	0.0002	0.0584
RWS AY	0.0470	0.0059	0.2203	0.0113	0.0008	0.0012	0.0407	0.0248	0.0189	0.0121	0.0003	0.0566
RWS scint	0.0514	0.0054	0.2293	0.0148	0.0012	0.0015	0.0447	0.0190	0.0186	0.0133	0.0003	0.0672
GPC0030m RWS average	0.0477	0.0054	0.2286	0.0116	0.0009	0.0013	0.0418	0.0194	0.0179	0.0125	0.0002	0.0608
PPuPC90-7a	0.5238	0.0637	0.1229	0.0076	0.0913	0.0804	0.0467	0.0490	0.0352	0.0008	0.0020	0.0449
PPuPC90-7a AS	0.0000	0.0000	0.0001	0.0079	0.0007	0.0006	0.0005	0.0337	0.0002	0.0010	0.0014	0.0003
0.45-□m +AS	0.5238	0.0637	0.1230	0.0155	0.0920	0.0809	0.0473	0.0827	0.0354	0.0017	0.0034	0.0451
PPuPC90-7b 0.45µm	0.6253	0.0835	0.1308	0.0100	0.0946	0.0841	0.0567	0.0564	0.0332	0.0013	0.0019	0.0419
PPuPC90-7b AS	0.0007	0.0000	0.0014	0.0037	0.0025	0.0024	0.0021	0.0328	0.0016	0.0030	0.0027	0.0015
0.45-□m +AS	**0.6260**	**0.0835**	**0.1322**	**0.0137**	**0.0971**	**0.0866**	**0.0587**	**0.0891**	**0.0349**	**0.0043**	**0.0045**	**0.0435**
PPuPC90-7c 0.45µm	0.6427	0.0882	0.1214	-0.0025	0.0899	0.0800	0.0572	0.0381	0.0346	0.0003	0.0019	0.0422
PPuPC90-7c AS	0.0005	0.0000	0.0011	-0.0006	0.0019	0.0018	0.0015	0.0189	0.0011	0.0022	0.0019	0.0011
0.45-□m +AS	**0.6432**	**0.0882**	**0.1225**	**-0.0031**	**0.0918**	**0.0818**	**0.0587**	**0.0570**	**0.0357**	**0.0025**	**0.0038**	**0.0433**
average 0.45-□m +AS	0.5977	0.0785	0.1259	0.0087	0.0936	0.0831	0.0549	0.0763	0.0353	0.0029	0.0039	0.0440
PPuPC90-14 0.45µm	0.7089	0.0941	0.1160	-0.0047	0.0927	0.0852	0.0480	0.0060	0.0441	0.0014	0.0046	0.0531
PPuPC90-14 AS	0.0009	0.0000	0.0013	0.0050	0.0023	0.0022	0.0014	-0.0070	0.0018	0.0029	0.0037	0.0018
0.45-□m +AS	**0.7097**	**0.0941**	**0.1173**	**0.0003**	**0.0950**	**0.0874**	**0.0494**	**-0.0010**	**0.0459**	**0.0043**	**0.0083**	**0.0549**
PPuPC90-28 0.45µm	0.9010	0.1336	0.1083	-0.0028	0.1023	0.0994	0.0637	0.0317	0.0480	0.0027	0.0061	0.0540
PPuPC90-28 AS	0.0023	0.0013	0.0023	0.0006	0.0032	0.0031	0.0019	-0.0080	0.1019	0.0012	0.0115	0.0004
0.45-□m +AS	**0.9034**	**0.1349**	**0.1107**	**-0.0023**	**0.1055**	**0.1024**	**0.0656**	**0.0237**	**0.1499**	**0.0039**	**0.0176**	**0.0545**
PPuPC90T-28 0.45µm	0.8766	0.1113	0.1115	0.0058	0.0863	0.0788	0.0480	0.0351	0.0325	0.0032	0.0023	0.0354
PPuPC90T-28 AS												
0.45-□m +AS	**0.8766**	**0.1113**	**0.1115**	**0.0058**	**0.0863**	**0.0788**	**0.0480**	**0.0351**	**0.0325**	**0.0032**	**0.0023**	**0.0354**
PPuPC90T-28R 0.45µm	0.6303	0.0357	0.0903	-0.0037	0.0935	0.0732	0.0310	0.0267	0.0213	0.0011	0.0014	0.0226
PPuPC90T-28R AS	-0.0003	0.0003	0.0016	0.0199	0.0011	0.0004	0.0047	0.0132	0.0101	0.0001	0.0026	0.0001
0.45-□m +AS	**0.6301**	**0.0360**	**0.0918**	**0.0162**	**0.0945**	**0.0737**	**0.0357**	**0.0399**	**0.0314**	**0.0012**	**0.0040**	**0.0227**
PPuPC90-56 0.45µm	1.3830	0.1066	0.1010	0.0046	0.1043	0.1015	0.0641	0.0472	0.0439	0.0041	0.0083	0.0459
PPuPC90-56 AS	-0.0003	0.0015	0.0021	0.0425	0.0032	0.0030	0.0077	0.0222	0.1037	0.0009	0.0100	0.0013
0.45-□m +AS	**1.3828**	**0.1081**	**0.1031**	**0.0472**	**0.1075**	**0.1046**	**0.0718**	**0.0695**	**0.1476**	**0.0050**	**0.0182**	**0.0472**
PPuPC90T-56 0.45µm	1.3906	0.1099	0.0957	0.0335	0.0840	0.0801	0.0448	0.0410	0.0319	0.0040	0.0037	0.0310
PPuPC90T-56 AS	-0.0003	0.0008	0.0029	0.0218	0.0037	0.0017	0.0053	0.0236	0.0295	0.0004	0.0055	0.0007
0.45-□m +AS	**1.3904**	**0.1107**	**0.0987**	**0.0553**	**0.0877**	**0.0818**	**0.0501**	**0.0645**	**0.0615**	**0.0044**	**0.0092**	**0.0317**
PPuPC90-182 0.45um	0.5080	0.0767	0.0344	0.0478	0.0538	0.0501	0.0436	0.0877	0.0445	0.0229	0.0327	0.0451
PPuPC90-182 AS	0.0060	0.0006	0.0012	0.0049	0.0038	0.0037	0.0017	-0.0042	0.0036	0.0070	0.0071	0.0042
0.45-□m +AS	**0.5141**	**0.0773**	**0.0356**	**0.0526**	**0.0575**	**0.0538**	**0.0453**	**0.0836**	**0.0481**	**0.0298**	**0.0398**	**0.0493**
PPuPC90-365 0.45um	1.4811	0.2172	0.0969	0.1178	0.1500	0.1525	0.1217	0.1167	0.1239	0.0639	0.0909	0.1337
PPuPC90-365 AS	0.1894	0.0414	0.0152	-0.0037	0.0084	0.0164	0.0138	-0.0041	0.0107	0.0005	0.0000	0.0080
0.45-□m +AS	**1.6705**	**0.2585**	**0.1120**	**0.1141**	**0.1584**	**0.1689**	**0.1356**	**0.1127**	**0.1346**	**0.0644**	**0.0908**	**0.1417**

Table 24B. Normalized Mass Loss, g/m^2 (contd.)

Sample Name	Ba	La	Ce	Pr	Nd	Sm	Eu	U	^{239}Pu+^{240}Pu	Cl	Iodine
PuPC120-28-202b AS	0.0992	0.0279	0.0213	0.0258	0.0227	0.0157	0.0388	0.0046	0.0000		
0.45-μm +AS	**0.1265**	**0.0742**	**0.0894**	**0.0845**	**0.0747**	**0.0518**	**0.1608**	**0.0191**	**0.0147**	**0.0008**	**0.3654**
PuPC120-28-202c 0.45 μm	-0.0210	0.0349	0.0596	0.0450	0.0407	0.0286	0.0937	0.0148	0.0155	0.0009	0.4534
PuPC120-28-202c AS	0.1857	0.0421	0.0276	0.0392	0.0329	0.0226	0.0626	0.0042	0.0000		
0.45-μm +AS	**0.1648**	**0.0769**	**0.0872**	**0.0843**	**0.0737**	**0.0513**	**0.1563**	**0.0190**	**0.0155**	**0.0009**	**0.4534**
average 0.45-μm +AS	0.1278	0.0755	0.0885	0.0850	0.0733	0.0512	0.1571	0.0193	0.0156	0.0009	0.4071
PC U,Pu-loaded CWF GPC0030											
RWS AX	0.0531	0.0002	0.0002	0.0002	0.0001	0.0001	0.0007	0.0001	0.0001	4.1007	0.0000
RWS AY	0.0506	0.0003	0.0003	0.0002	0.0002	0.0001	0.0007	0.0002	0.0001	3.7019	0.0000
RWS scint	0.0546	0.0003	0.0003	0.0003	0.0002	0.0002	0.0007	0.0002	0.0002	3.4834	0.0000
GPC0030m RWS average	0.0528	0.0003	0.0002	0.0002	0.0002	0.0001	0.0007	0.0002	0.0001	3.7620	0.0000
PPuPC90-7a	0.0063	0.0013	0.0034	0.0022	0.0018	0.0013	0.0061	0.0011	0.0012	0.0003	0.2648
PPuPC90-7a AS	0.0046	0.0011	0.0009	0.0012	0.0010	0.0008	0.0025	0.0004	0.0000		
0.45-μm +AS	0.0110	0.0024	0.0043	0.0034	0.0028	0.0021	0.0085	0.0015	0.0012	0.0003	0.2648
PPuPC90-7b 0.45μm	0.0054	0.0012	0.0033	0.0021	0.0018	0.0012	0.0050	0.0010	0.0011	0.0003	0.3307
PPuPC90-7b AS	0.0132	0.0027	0.0023	0.0026	0.0022	0.0014	0.0037	0.0009	0.0000		
0.45-μm +AS	**0.0186**	**0.0039**	**0.0056**	**0.0047**	**0.0040**	**0.0026**	**0.0086**	**0.0019**	**0.0011**	**0.0003**	**0.3307**
PPuPC90-7c 0.45μm	0.0059	0.0018	0.0036	0.0022	0.0018	0.0013	0.0058	0.0011	0.0013	0.0003	0.2402
PPuPC90-7c AS	0.0091	0.0018	0.0016	0.0018	0.0015	0.0012	0.0030	0.0006	0.0000		
0.45-μm +AS	**0.0150**	**0.0036**	**0.0051**	**0.0040**	**0.0033**	**0.0024**	**0.0088**	**0.0017**	**0.0013**	**0.0003**	**0.2402**
average 0.45-μm +AS	0.0148	0.0033	0.0050	0.0040	0.0034	0.0024	0.0087	0.0017	0.0012	0.0003	0.2785
PPuPC90-14 0.45μm	0.0086	0.0038	0.0077	0.0058	0.0051	0.0038	0.0137	0.0016	0.0021	0.0003	0.3504
PPuPC90-14 AS	0.0141	0.0033	0.0029	0.0035	0.0029	0.0019	0.0056	0.0007	0.0000		
0.45-μm +AS	**0.0227**	**0.0071**	**0.0106**	**0.0093**	**0.0081**	**0.0057**	**0.0193**	**0.0023**	**0.0021**	**0.0003**	**0.3504**
PPuPC90-28 0.45μm	0.0122	0.0051	0.0096	0.0074	0.0064	0.0044	0.0142	0.0023	0.0023	0.0003	0.2844
PPuPC90-28 AS	0.0060	0.0340	0.0053	0.0060	0.0050	0.0035	0.0089	0.0012	0.0000		
0.45-μm +AS	**0.0183**	**0.0392**	**0.0149**	**0.0134**	**0.0114**	**0.0078**	**0.0231**	**0.0035**	**0.0023**	**0.0003**	**0.2844**
PPuPC90T-28 0.45μm	0.0110	0.0020	0.0027	0.0025	0.0023	0.0015	0.0030	0.0015	0.0009	0.0003	0.2706
PPuPC90T-28 AS											
0.45-μm +AS	**0.0110**	**0.0020**	**0.0027**	**0.0025**	**0.0023**	**0.0015**	**0.0030**	**0.0015**	**0.0009**	**0.0003**	**0.2706**
PPuPC90T-28R 0.45μm	0.0062	0.0012	0.0013	0.0013	0.0011	0.0006	0.0017	0.0010	0.0005	0.0001	0.0000
PPuPC90T-28R AS	0.0000	0.0062	0.0005	0.0005	0.0004	0.0001	0.0000	0.0001	0.0000		
0.45-μm +AS	**0.0062**	**0.0074**	**0.0018**	**0.0018**	**0.0015**	**0.0007**	**0.0017**	**0.0011**	**0.0005**	**0.0001**	**0.0000**
PPuPC90-56 0.45μm	0.0255	0.0080	0.0122	0.0098	0.0086	0.0059	0.0197	0.0036	0.0036	0.0003	0.3708
PPuPC90-56 AS	0.0045	0.0301	0.0051	0.0058	0.0051	0.0033	0.0083	0.0010	0.0000		
0.45-μm +AS	**0.0300**	**0.0380**	**0.0174**	**0.0156**	**0.0137**	**0.0092**	**0.0280**	**0.0046**	**0.0036**	**0.0003**	**0.3708**
PPuPC90T-56 0.45μm	0.0156	0.0033	0.0043	0.0040	0.0036	0.0024	0.0078	0.0021	0.0019	0.0003	0.3029
PPuPC90T-56 AS	0.0016	0.0119	0.0017	0.0017	0.0013	0.0008	0.0018	0.0004	0.0000		
0.45-μm +AS	**0.0172**	**0.0152**	**0.0060**	**0.0056**	**0.0049**	**0.0031**	**0.0096**	**0.0025**	**0.0019**	**0.0003**	**0.3029**
PPuPC90-182 0.45um	0.1035	0.0293	0.0210	0.0257	0.0246	0.0162	0.0441	0.0049	0.0035	0.0003	0.0000
PPuPC90-182 AS	0.0270	0.0101	0.0067	0.0093	0.0084	0.0055	0.0134	0.0010	0.0000		
0.45-μm +AS	**0.1305**	**0.0395**	**0.0278**	**0.0350**	**0.0330**	**0.0217**	**0.0576**	**0.0059**	**0.0035**	**0.0003**	**0.0000**
PPuPC90-365 0.45um	0.2958	0.0854	0.0603	0.0716	0.0708	0.0479	0.1366	0.0143	0.0103	0.0003	0.0000
PPuPC90-365 AS	0.0010	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0004	0.0013	0.0000		
0.45-μm +AS	**0.2967**	**0.0854**	**0.0602**	**0.0716**	**0.0708**	**0.0480**	**0.1362**	**0.0155**	**0.0103**	**0.0003**	**0.0000**

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