Characterization of the Low Level Waste Reference Glass (LRM)

by

D. Peeler

Westinghouse Savannah River Company
Savannah River Site
Aiken, South Carolina 29808

A. D. Cozzi

D. R. Best

C. J. Coleman

I. A. Reamer

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D.K. Peeler, A.D. Cozzi, D.R. Best, C.J. Coleman, and I.A. Reamer
Westinghouse Savannah River Company
Savannah River Technology Center

Approved by:

D.A. Crowley
Manager
Glass Formulation and Melter Technology

Westinghouse Savannah River Company
Savannah River Site
Aiken, SC 29808

ABSTRACT

The Savannah River Technology Center (SRTC) has participated in a round robin testing program which was conducted under the auspices of the Department of Energy's (DOE) Tanks Focus Area (TFA) for Immobilization. The round robin, lead by Argonne National Laboratory (ANL), focused on data regarding the chemical composition and durability (as defined by ASTM C 1285, Product Consistency Test (PCT)) of the TFA reference glass (referred to as "LRM"). The LRM glass is a borosilicate glass that contains about 20 mass percent Na_2O and small amounts of other components that are either present in DOE waste streams or may be added to the low activity waste (LAW) to facilitate immobilization.

ANL provided SRTC with two vials of LRM glass. Each vial contained approximately 17 grams of glass which was sufficient to measure both chemical composition and durability (at 40° and 90°C) on each. The two LRM samples are referred to as LRM-a and LRM-b.

The SRTC-Mobile Laboratory (STRC-ML) and the SRTC Analytical Development Section (ADS) provided support for the chemical composition and durability analysis. Chemical composition of the LRM glasses (LRM-a and LRM-b) were measured by both the SRTC-ML and ADS using a combination of dissolution/fusion preparations ($LiBO_2/HNO_3$, Na_2O_2/NaOH/HCl, CsOH, and microwave) and analytical techniques (ICP-AES, AA, IC, and ISE). The oxide values from each laboratory, based on the recommended analytical technique, are reported in oxide mass percents for both LRM-a and LRM-b.

Durability was evaluated on the LRM-a and LRM-b glasses using ASTM C 1285. Tests at 40°C and 90°C were conducted in triplicate for each glass. Blanks, reference glasses (when applicable), and solution standards were used for control purposes. The SRTC-ML provided support for the solution analysis. The results of the leachate analyses were corrected for the dilution/acidification of the leachate. The corrected values were averaged for the triplicate samples and reported in ppm.

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INTRODUCTION

The Savannah River Technology Center (SRTC) has participated in a round robin testing program which was conducted under the auspices of the Department of Energy's (DOE) Tanks Focus Area (TFA) for Immobilization. The round robin is being lead by Argonne National Laboratory (ANL) and is focused on data regarding the chemical composition and durability (as defined by ASTM C 1285, Product Consistency Test (PCT)) of the TFA reference glass (referred to as "LRM"). The LRM glass is a borosilicate glass that contains about 20 mass percent Na_2O and small amounts of other components that are either present in DOE waste streams or may be added to the immobilized low activity waste (ILAW). The LRM glass also contains small amounts of the RCRA metals Ba, Cd, Cr, and Pb. Table I shows the targeted composition of the LRM glass. The glass has been shown to be non-hazardous per the Toxicity Characteristic Leach Procedure (TCLP) [EBERT 1998].

Ferro Corporation produced a 1000 lb. supply of the LRM glass for ANL from which the round robin was conducted. ANL mixed, crushed, sieved, and washed the glass to supply a single source of glass for testing. Sufficient glass was supplied to SRTC to complete both phases of the round robin; chemical analysis of the glass and inter-laboratory precision of a test method when conducted with a "standardized" test material (in an effort to document the response of the LRM glass to the PCT). The PCT was performed at 40°C and 90°C. This report describes the experimental procedures, analytical techniques utilized, and the results obtained for the LRM-a and LRM-b samples.

Table I. Targeted Composition of LRM Glass (in oxide mass %). [EBERT 1998]

Oxide	LRM	Oxide	LRM
Al_2O_3	10	MgO	0.1
B_2O_3	8	MnO	0.1
BaO	0.005	MoO_3	0.1
CaO	0.5	Na_2O	20
CdO	0.2	NiO	0.1
Cl	0.8	P_2O_5	0.5
Cr_2O_3	0.2	PbO_2	0.1
F	1	SO_3	0.2
Fe_2O_3	1	SiO_2	54.37
HgO	0.002	SnO_2	0.1
I	0.002	TiO_2	0.1
K_2O	1.5	ZrO_2	1
La_2O_3	0.009		
Li_2O	0.1	Total	100

EXPERIMENTAL

Receipt of Glass

SRTC received two small vials (labeled GS713) each containing approximately 17 grams of the LRM glass from ANL. For internal tracking purposes at SRTC, the two vials were labeled upon receipt as LRM-a and LRM-b. Information accompanying these samples indicated that each vial contained –100, +200 mesh size fractions which had been washed to removed the fines. The quantity of LRM glass in each vial allowed for both chemical composition and PCT (in triplicate) to be performed on both LRM-a and LRM-b. Therefore, it was decided to provide chemical composition and durability (as defined by the PCT) results on both LRM-a and LRM-b as individual glasses (i.e., two sets of data will be reported in this document).

Chemical Composition Analysis

Compositional analysis was performed by both the SRTC Mobile Laboratory (SRTC-ML) and the SRTC's Analytical Development Services (ADS) Division for both LRM-a and LRM-b. Dissolution/digestion techniques as well as analytical techniques utilized are reported.

SRTC-ML Glass Preparation Methods

A ~4 g sample of LRM-a and LRM-b was obtained from each vial, placed in an appropriately labeled glass vials, and submitted to the SRTC Mobile Laboratory (SRTC-ML) for elemental analysis. The LRM glasses were prepared for compositional analysis using two fusion techniques: (1) Na_2O_2/NaOH/HCl and (2) $LiBO_2/HNO_3$. Table II identifies the elements analyzed, method of analysis, and the estimated detection limit.[a] For tracking purposes, sample submission forms and chain-of-custody forms are a part of the records package.

Na_2O_2/NaOH/HCl Fusion Preparation

Approximately 0.25 ± 0.01 g of crushed LRM glass was fused with 1.5 g Na_2O_2 and 1.0 g NaOH at 600°C for 15 minutes in a Pt crucible. The fused sample was dissolved in water and 25ml of HCl acid. The fused sample was diluted to 250 ml with deionized water.

Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES) was used to measure for B, Si, Al, and Li in the Na_2O_2/NaOH/HCl fusion preparation. Prior to running the solution through the ICP-AES, a 1/10 dilution on the final 250ml solution was performed. Calibration standards were matrix matched.

$LiBO_2/HNO_3$ Fusion Preparation

Approximately 0.1 ± 0.01 grams of crushed LRM glass was fused with 0.3 g of $LiBO_2$ at 900°C for 15 minutes in a Pt crucible. The fused sample was dissolved in a 4% HNO_3 solution. The dissolved sample was diluted to a final volume of 250 ml. No further dilutions were made prior to running this solution through the ICP-AES.

[a] No restrictions were placed on the method(s) used to dissolve the glass for chemical analysis, except the method(s) be reported.

Again, calibration standards were matrix matched. Anions (F, Cl, and SO_3) and Hg were not analyzed by the SRTC-ML as indicated ("-") in Table II.

Table II. Elemental Analysis Based on Dissolution Procedure and Analytical Technique for the SRTC-ML.

Element	Dissolution Technique	Analytical Technique	Detection Limit (μg/ml)
Al	Na_2O_2/NaOH/HCl	ICP-AES	< 0.200
B	Na_2O_2/NaOH/HCl	ICP-AES	< 0.180
Ba	$LiBO_2$/HNO_3	ICP-AES	< 0.01
Ca	$LiBO_2$/HNO_3	ICP-AES	< 0.010
Cd	$LiBO_2$/HNO_3	ICP-AES	< 0.020
Cl	-	-	-
Cr	$LiBO_2$/HNO_3	ICP-AES	< 0.030
F	-	-	-
Fe	$LiBO_2$/HNO_3	ICP-AES	< 0.020
Hg	-	-	-
K	$LiBO_2$/HNO_3	ICP-AES	< 0.600
La	$LiBO_2$/HNO_3	ICP-AES	< 0.030
Li	Na_2O_2/NaOH/HCl	ICP-AES	< 0.020
Mg	$LiBO_2$/HNO_3	ICP-AES	< 0.001
Mn	$LiBO_2$/HNO_3	ICP-AES	< 0.001
Mo	$LiBO_2$/HNO_3	ICP-AES	< 0.080
Na	$LiBO_2$/HNO_3	ICP-AES	< 0.530
Ni	$LiBO_2$/HNO_3	ICP-AES	< 0.060
P	$LiBO_2$/HNO_3	ICP-AES	< 0.640
Pb	$LiBO_2$/HNO_3	ICP-AES	< 0.220
Si	Na_2O_2/NaOH/HCl	ICP-AES	< 0.180
SO_3	-	-	-
Sn	$LiBO_2$/HNO_3	ICP-AES	< 0.260
Ti	$LiBO_2$/HNO_3	ICP-AES	< 0.001
Zr	$LiBO_2$/HNO_3	ICP-AES	< 0.080

ADS Glass Preparation Methods

CsOH Fusion Dissolution

Approximately 0.25 g of powdered LRM glass was combined with 2.5 g of CsOH·H_2O in either a Zr or Ni crucible (with lid) and placed in a muffle furnace pre-heated to 500°C. The mixture was heated for 5 minutes and then removed from the furnace. After cooling, de-ionized water containing 3 – 4 drops of 30% H_2O_2 was added to dissolve the flux pellet and this slurry transferred to a 250 ml plastic volumetric flask. Twenty-five (25) ml of concentrated HNO_3 was then added to dissolve the slurry.

De-ionized water was added to bring the volume to 250 ml and the solution mixed by capping the flask and inverting several times.

Na_2O_2/NaOH Fusion Dissolution
Approximately 0.25 g of powdered glass was combined with 1.5 g of Na_2O_2 and 1.0 g of NaOH in either a Zr or Ni crucible (with lid) and placed in a muffle furnace pre-heated to 675°C. The mixture was heated for 5 minutes and then removed from the furnace. After cooling, de-ionized water containing 3 – 4 drops of 30% H_2O_2 was added to dissolve the flux pellet and this slurry transferred to a 250 ml plastic volumetric flask. Twenty-five (25) ml of concentrated HNO_3 was then added to dissolve the slurry. The de-ionized water was added to bring the volume to 250 ml and the solution mixed by capping the flask and inverting several times.

Microwave Dissolution
Approximately 0.25 grams of powdered glass was combined with 5 ml of concentrated HF and 5 ml of concentrated HNO_3 in a Teflon pressure vessel. The vessel was capped and heated at 60% power for 12 minutes. After cooling, 40 ml of 0.6M H_3BO_3 and 5 ml concentrated HCl were added and the mixture heated again at 60% power for 12 minutes. After cooling, the solution was transferred to a plastic volumetric flask and diluted with de-ionized water to bring the volume to 250 ml. The solution was mixed by capping the flask and inverting several times.

Table III identifies the dissolution procedure and analytical technique used for each elemental analysis. Estimated detection limits for each technique is also provided. Analytical techniques utilized by ADS include ICP-ES, Atomic Absorption (AA), and Ion Chromatography (IC), and Ion Selective Electrode (ISE).

Glass Durability (PCT) Analysis

The round robin instructions stated that "the procedure for PCT Method A is to be followed for tests at both 40° and 90°C".[b] The glass "as-received" required no additional sample preparation prior to initiating the PCTs (i.e., grinding, sieving, and washing performed by ANL). For tests at 40°C and 90°C, 1.5 grams of –100, +200 mesh glass was placed into an unsensitized Type 304L stainless steel vessel (~22 ml capacity). Fifteen (15) ml of ASTM Type I water (exactly 10 times the mass of glass used) was added to each LRM glass. PCTs for both the LRM-a and LRM-b glasses were performed in triplicate at both temperatures. Duplicate blank tests with ASTM Type I water were also run within each test. Although a standard reference material was not required, the Environmental Assessment (EA) [JANTZEN 1992] and Approved Reference Material (ARM-1) glasses were included with the 90°C test. PCT data sheets were utilized to record the vessel identification number, sample ID, weight of vessel (empty), weight of vessel with glass, and the weight of vessel with glass and water. The data sheets are also a part of the record package.

[b] ASTM 1285 Method A prescribes a strict set of test conditions, one being that the test is be performed at 90 ± 2°C. ASTM 1285 Method B allows more flexibility in the test parameters including test temperature. Therefore, SRTC used Method B for the 40°C tests with all other tests parameters (such as glass mass, water mass, vessel type, etc) "equivalent" that that used for Method A.

After the 7-day test, vessels were allowed to cool to room temperature. The final weight of each vessel and the solution pH were recorded on the data sheet. Leachate solutions were then filtered through a 0.45 μm pore size filter. Six (6) ml of each leachate solution was then acidified with 4 ml of 0.4M HNO_3 to ensure that the cations remain in solution. Leachate solutions and blanks were then analyzed for Si, B, Na, and Li concentration by the SRTC-ML using ICP-AES. A solution standard was also submitted with the PCT leachates for control purposes.

Table III. Elemental Analysis Based on Dissolution Procedure and Analytical Technique for ADS.

Element	Dissolution Technique	Analytical Technique	Detection Limit (μg/ml)
Al	CsOH in Zr	ICP-ES	0.025
B	CsOH in Zr	ICP-ES	0.010
Ba	CsOH in Zr	ICP-ES	0.005
Ca	Microwave	ICP-ES	0.010
Cd	CsOH in Zr	ICP-ES	0.005
Cl	Na_2O_2/NaOH	ISE	1.000
Cr	Microwave	ICP-ES	0.005
F	Na_2O_2/NaOH	ISE	1.000
Fe	CsOH in Zr	ICP-ES	0.015
Hg	Microwave	Cold Vapor AA	0.001
K	Microwave	Flame AA	0.100
La	CsOH in Zr	ICP-ES	0.010
Li	Microwave	ICP-ES	0.020
Mg	CsOH in Zr	ICP-ES	0.010
Mn	CsOH in Zr	ICP-ES	0.010
Mo	CsOH in Zr	ICP-ES	0.010
Na	Microwave	ICP-ES	0.050
Ni	CsOH in Zr	ICP-ES	0.040
P	CsOH in Zr	ICP-ES	0.100
Pb	CsOH in Zr	ICP-ES	0.250
Si	CsOH in Zr	ICP-ES	0.025
SO_3	Na_2O_2/H_2O	IC	1.000 (SO_4)
Sn	CsOH in Zr	ICP-ES	0.250
Ti	Microwave	ICP-ES	0.015
Zr	CsOH in Ni	ICP-ES	0.040

RESULTS

Glass Composition Analysis

SRTC-ML Analysis

Table IV summarizes the SRTC-ML analytical results for the LRM-a and LRM-b glasses (in oxide mass percent). Also shown in Table IV is the "target" composition of the LRM glass as defined by Ebert et. al. [EBERT 1998]. The oxide values reported by the SRTC-ML are not averaged values but individual reads.

Based on the composition shown in Table I, the concentrations of Sn, Ba, La, and Mo in the $LiBO_2/HNO_3$ preparations were below the detection limits of the ICP-AES. Therefore, these elements were not analyzed ("NA") and their respective oxides are reported as such. As previously mentioned, anions (F, Cl, and SO_3) and Hg were not analyzed by the SRTC-ML as indicated ("NA").

ADS Analysis

Triplicate values were reported by ADS for each element. These values were converted to oxides and the averaged values for LRM-a and LRM-b (in oxide mass percentage) are reported in Table V. It should be noted that the elemental values reported for the initial replicate of LRM-b (i.e., LRM-b-1) based on the CsOH dissolution in Zr crucibles appeared to be inconsistent with the reported replicate (LRM-b-2 and LRM-b-3) data. Therefore, the values reported in Table V for Al, B, Ba, Cd, Fe, La, Mg, Mn, Mo, Ni, P, Pb, and Sn (i.e., those elements determined by the CsOH dissolution in Zr curicbles as shown in Table III) are averages of the second and third replicates only. All other oxide values for the LRM-b glass are averages of triplicate analyses. Also shown in Table V is the "target" composition of the LRM glass as defined by Ebert et. al. [EBERT 1998].

Table IV. SRTC-ML Comparison of Target and "As-Measured" LRM Glass Compositions (in oxide mass %).

Oxide	Target Composition	LRM-a (measured)	LRM-b (measured)
Al_2O_3	10	10.1	10.0
B_2O_3	8	8.07	8.39
BaO	0.005	NA	NA
CaO	0.5	0.490	0.486
CdO	0.2	0.156	0.152
Cl	0.8	-	-
Cr_2O_3	0.2	0.177	0.169
F	1	-	-
Fe_2O_3	1	1.39	1.39
HgO	0.002	-	-
K_2O	1.5	1.31	1.32
La_2O_3	0.009	NA	NA
Li_2O	0.1	0.168	0.167
MgO	0.1	0.096	0.090
MnO	0.1	0.081	0.076
MoO_3	0.1	NA	NA
Na_2O	20	20.6	20.2
NiO	0.1	0.182	0.164
P_2O_5	0.5	0.559	0.540
PbO	0.1	0.123	0.090
SO_3	0.2	-	-
SiO_2	54.37	54.5	53.9
SnO_2	0.1	NA	NA
TiO_2	0.1	0.087	0.090
ZrO_2	1	0.864	0.867
Total	100.00	99.0	98.0

Table V. ADS Comparison of Target and "As-Measured" LRM Glass Compositions (in oxide mass %).

Oxide	Target Composition	LRM-a (measured)	LRM-b (measured)
Al_2O_3	10	9.85	9.53
B_2O_3	8	7.99	7.73
BaO	0.005	BDL	BDL
CaO	0.5	0.52	0.52
CdO	0.2	0.17	0.17
Cl	0.8	0.17	0.13
Cr_2O_3	0.2	0.21	0.20
F	1	0.67	0.72
Fe_2O_3	1	1.54	1.48
HgO	0.002	BDL	BDL
K_2O	1.5	1.28	1.26
La_2O_3	0.009	BDL	BDL
Li_2O	0.1	0.08	0.07
MgO	0.1	0.11	0.11
MnO	0.1	0.08	0.07
MoO_3	0.1	0.11	0.11
Na_2O	20	20.49	19.91
NiO	0.1	0.19	0.19
P_2O_5	0.5	0.55	0.56
PbO	0.1	0.08	0.08
SO_3	0.2	0.40	0.47
SiO_2	54.37	56.29	54.25
SnO_2	0.1	BDL	BDL
TiO_2	0.1	0.10	0.09
ZrO_2	1	1.00	1.01
Total	100.00	101.87	98.65

GLASS DURABILITY (PCT) ANALYSIS

Tables VI and VII summarize the initial weight (vessel, glass, and water), final weight, % loss, and final pH for the 40° and 90°C tests respectively. The % loss was calculated based on water loss alone (i.e., vessel weight was not considered). All tests are considered valid based on the loss percentage (i.e., < 5%) with the exception of the initial replicate of LRM-a (i.e., LRM-a-1) at 40°C which had a total loss of 5.79%.

Table VI. Vessel Weights, % Loss and Final pH for the 40°C tests.

Vessel #	Sample ID	Initial Weight (g)	Final Weight (g)	% Loss	PH
P185	Blank-1	14.992	14.668	2.16%	6.78
P186	Blank-2	14.993	14.774	1.46%	6.76
P191	LRM-a-1	16.496	15.541	5.79%	9.91
P192	LRM-a-2	16.494	16.086	2.47%	9.98
P193	LRM-a-3	16.504	16.082	2.56%	9.96
P194	LRM-b-1	16.493	15.889	3.66%	9.95
P195	LRM-b-2	16.493	16.157	2.04%	9.99
P196	LRM-b-3	16.498	16.02	2.90%	10.00

Table VII. Vessel Weights, % Loss and Final pH for the 90°C tests.

Vessel #	Sample ID	Initial Weight	Final Weight	% Loss	PH
P1	Blank-1	14.996	14.698	1.99%	6.72
P2	Blank-2	14.995	14.829	1.11%	6.82
P3	LRM-a-1	16.494	15.993	3.04%	11.02
P4	LRM-a-2	16.497	16.314	1.11%	11.02
P5	LRM-a-3	16.496	16.307	1.15%	11.04
P6	LRM-b-1	16.496	16.289	1.25%	11.04
P7	LRM-b-2	16.499	16.101	2.41%	11.06
P8	LRM-b-3	16.505	16.245	1.58%	11.06
P24	EA-1	16.51	15.928	3.53%	11.83
P40	EA-2	16.503	16.255	1.50%	11.84
P46	EA-3	16.495	16.18	1.91%	11.86

The results of the leachate analyses were corrected for the dilution/acidification of the leachate performed prior to submittal to the SRTC-ML for analysis. The corrected values were averaged for the triplicate samples and reported in ppm. These values are presented in Table VIII for the samples tested at 40°C and Table IX for the samples tested at 90°C.

Table VIII. Averaged Concentrations of B, Si, Na, and Li (in ppm) from 40°C PCT Test Corrected for Dilution Factor.

Sample ID	B (ppm)	Si (ppm)	Na (ppm)	Li (ppm)	pH (average)
LRM-a	2.59	13.47	22.28	0.00	9.95
LRM-b	2.47	13.06	21.62	0.00	9.98
Blanks	< 0.180	< 0.180	< 0.530	< 0.100	6.78

Table IX. Averaged Concentrations of B, Si, Na, and Li (in ppm) from 90°C PCT Test Corrected for Dilution Factor.

Sample ID	B (ppm)	Si (ppm)	Na (ppm)	Li (ppm)	pH (average)
LRM-a	29.228	84.128	169.478	0.196	11.03
LRM-b	29.673	84.295	170.256	0.199	11.05
EA	627.348	983.296	1822.587	195.595	11.84
Blanks	< 0.180	< 0.180	< 0.530	< 0.100	6.77

Jantzen, et al. [Jantzen 1995], control charted the leachate concentrations for B, Si, Na, and Li obtained by the PCT procedure on ARM-1 glasses over a six year span. From these data, an upper control limit (UCL) and lower control limit (LCL) were identified for each of the elements and the pH of the leachate. The leachate concentrations for B, Si, Na, and Li and the pH are compared the LCL and UCL in Table X to validate the PCT test conditions.

Table X. Comparison of ARM-1 Glass from LRM Work to Control Charted ARM-1 Results.

	This Study	Mean	LCL	UCL
B	19.78	19.03	11.58	26.48
Si	67.85	65.22	41.84	88.60
Na	41.62	40.69	20.08	61.30
Li	15.75	15.12	7.66	22.59
PH	10.46	10.17	9.29	11.05

Elemental values (ppm) for the solution standard are compared to averaged measured values (see Appendix A for individual measurements) reported by the SRTC-ML in Table XI. The three solution standards were intermittently run with the PCT solutions during the ICP-AES analysis for control purposes.

Table XI. Comparison of the Solution Standard and Measured Elemental Concentrations (in ppm).

Element	Solution Standard (ppm)	Average Value (40°C) (ppm)	Average Value (90°C) (ppm)
B	20	21.4	21.2
Si	50	50.3	49.6
Na	81	79.4	81.1
Li	10	9.8	9.91

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APPENDIX A

PCT Raw Data

Raw Elemental Data (ug/ml) From ICP-AES (40°C PCT)

	STD1	BLK1	BLK2
B	20.9	0.181	<0.180
Si	51.1	<0.180	<0.180
Na	78.3	0.698	<0.530
Li	10.0	<0.100	<0.100

	STD2	LRM-a-1	LRM-a-2	LRM-a-3
B	21.4	1.66	1.52	1.49
Si	51.1	8.30	7.71	8.23
Na	78.7	13.9	12.8	13.4
Li	9.59	<0.100	<0.100	<0.100

	LRM-b-1	LRM-b-2	LRM-b-3	STD3
B	1.54	1.42	1.48	22.1
Si	8.22	7.05	7.28	48.7
Na	12.8	12.7	13.4	81.1
Li	<0.100	<0.100	<0.100	9.82

Raw Elemental Data (ug/ml) From ICP-AES (90°C PCT)

	STD1	BLK1	BLK2
B	20.9	<0.180	<0.180
Si	50.1	<0.180	<0.180
Na	78.4	0.842	<0.530
Li	9.81	<0.100	<0.100

	EA-1	EA-2	EA-3
B	376	362	391
Si	591	572	607
Na	1090	1050	1030
Li	120	115	117

	LRM-a-1	LRM-a-2	LRM-a-3	STD-2
B	17.5	17.1	18.0	21.6
Si	49.6	51.4	50.4	49.9
Na	101	102	102	82.5
Li	0.111	0.115	0.126	9.93

	LRM-b-1	LRM-b-2	LRM-b-3	STD-3
B	18.1	17.8	17.5	21.0
Si	49.6	50.8	51.3	48.7
Na	97.4	104	105	82.3
Li	0.120	0.116	0.123	9.99

OSR 14-357# (Rev 12-11-96)
Stores: 26-12801.00

Westinghouse Savannah River Company
Document Approval Sheet

Document No.
WSRC-TR-99-00095, Rev. 0

Title
Characterization of the Low Level Waste Reference Glass (LRM)

Primary Author/Contact (Must be WSRC)	Location	Phone No.	Position	User ID
David Peeler	773-43A	5-0623	Senior Research Sci.	L6814

Organization Code	Organization (No Abbreviations)
L3100	Immobilization Technology Section

Other Authors
A.D. Cozzi, D.R. Best, C.J. Coleman, and I.A. Reamer

Deadline Date for Approval
~~4/30/99~~ 5/28/99

Has an invention disclosure been submitted related to this information? ☐ Yes ☒ No

Disclosure No. (If Known) _____ Title _____ Date Submitted _____

Do you intend to submit an invention disclosure? ☐ Yes ☒ No If yes, projected date _____

Information Product Description

☒ Report Type
- ☐ Quarterly ☐ Annual ☐ Final ☐ Other_____
- ☐ Semiannual ☒ Technical ☐ Topical

Report Dates_____ thru _____

☐ Conference Type
- ☐ Abstract ☐ Published Proceedings
- ☐ Conf Paper ☐ Other_____
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☐ Software (Additional forms are required (ESTSC F1 and F2)).

Conference/Meeting/Presentation

Meeting Title (No Abbreviations)

Meeting Address (City, State, Country)

Meeting Date(s)

_____ (m/d/y) thru _____ (m/d/y)

References OK
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David Peeler — Author's Signature

4-9-99 — Date

Approvals by Author's Organization

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Keywords: see Records form

Westinghouse
Savannah River Company

P.O. Box 616
Aiken, SC 29802

April 27, 1999

WSRC-TR-99-00095, Rev. 0
MSD-STI-97-4218

Ms. W. F. Perrin, Technical Information Officer
U. S. Department of Energy - Savannah River Operations Office

Dear Ms. Perrin:

REQUEST FOR APPROVAL TO RELEASE SCIENTIFIC/TECHNICAL INFORMATION

The attached document is submitted for classification and technical approvals for the purpose of external release. Please complete Part II of this letter and return the letter to the undersigned by 5/28/99. The document has been reviewed for classification and export control by a WSRC Classification staff member and has been determined to be Unclassified.

Pat Dominey for
Kevin J. Schmidt, WSRC STI Program Manager

I. DETAILS OF REQUEST FOR RELEASE

Document Number: WSRC-TR-99-00095, Rev. 0
Author's Name: D. Peeler
Location: 773-43A Phone 5-0623
Department: Immobilization Technology Section
Document Title: Characterization of the Low Level Waste Reference Glass (LRM)

Presentation/Publication:
Meeting/Journal:

Location:
Meeting Date:

OSTI Reportable

II. DOE-SR ACTION

Date Received by TIO 04/27/99

☒ Approved for Release ☐ Not Approved
☐ Approved Upon Completion of Changes ☐ Revise and Resubmit to DOE-SR
☐ Approved with Remarks

Remarks: _____

W. F. Perrin, Technical Information Officer, DOE-SR

5/10/99
Date

OSR 25-82-W# (4-89)
Stores: 26-15460.00

DOE F 241.1
(7-98) p. 1 of 2
(Formerly DOE F 1332.15)
(All other versions are obsolete)

US DEPARTMENT OF ENERGY

ANNOUNCEMENT OF U. S. DEPARTMENT OF ENERGY (DOE) SCIENTIFIC AND TECHNICAL INFORMATION (STI)

OMB Control No.
1910-1400

RECORD STATUS (select one):
X New ..... Revised Data ..... Revised STI Product

Part I: STI PRODUCT DESCRIPTION

A. STI PRODUCT TYPE (select one)

X 1. **Technical Report**
a. Type: ☐ **Topical** ☐ **Semiannual** ☐ **Annual** ☒ **Final** Other (**specify**) .....
b. Reporting Period *(mm/dd/yyyy)* ..... thru .....

..... 2. **Conference**
a. Product Type: ..... Conference Proceedings ..... Conference Paper or Other (*abstracts, excerpts, etc.*) ___
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..... 4. **Journal Article**
a. Type: X Announcement citation only ___ Preprint ___ Postprint
b. Journal Name .....
c. Volume_____ d. Issue _____ e. Serial identifier (*e.g., ISSN or CODEN*) _____

..... 5. **S&T Accomplishment Report**

..... 6. **Book**

..... 7. **Patent Application**
a. Date Filed *(mm/dd/yyyy)* ___/___/___
b. Date Priority *(mm/dd/yyyy)* ___/___/___
c. Patent Assignee _____

..... 8. **Thesis/Dissertation**

B. **STI PRODUCT TITLE** Characterization of the Low Level Waste Reference Glass (LRM)

C. **AUTHOR(s)** D. ..... Peeler
E-mail Address(*es*):

D. **STI PRODUCT IDENTIFIER**
___ 1. Report Number(s) WSRC-TR-99-00095, Rev. 0
___ 2. DOE Contract Number(s) DE-AC09-96SR18500
___ 3. R&D Project ID(s)
___ 4. Other Identifying Number(s)

E. **ORIGINATING RESEARCH ORGANIZATION** Savannah River Site

F. **DATE OF PUBLICATION** *(mm/dd/yyyy)* .....

G. **LANGUAGE** (***if non-English***) English

(*Grantees and Awardees: Skip to Description/Abstract section at the end of Part I*)

H. **SPONSORING ORGANIZATION**

I. **PUBLISHER NAME AND LOCATION (if other than research organization)**

Availability *(refer requests to [if applicable])*

J. **SUBJECT CATEGORIES** *(list primary one first)* 05

Keywords PCT, Chemical Composition, TFA

K. **DESCRIPTION/ABSTRACT**

The Savannah River Technology Center (SRTC) has participated in a round robin testing program which was conducted under the auspices of the Department of Energy's (DOE) Tanks Focus Area (TFA) for Immobilization.

US DEPARTMENT OF ENERGY

ANNOUNCEMENT OF U. S. DEPARTMENT OF ENERGY (DOE) SCIENTIFIC AND TECHNICAL INFORMATION (STI)

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..... 9. **Protected data** _____ CRADA _____Other (specify) _____ Release date (mm/dd/yyyy) .....

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..... 11. **Program-Directed Special Handling** (*specify*) _____

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..... 13. **Unclassified Controlled Nuclear Information** (*UCNI*) _____

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B. OTHER *(information useful to include in published announcement record which is not suited for any other field on this form)*

C. CONTACT AND RELEASING OFFICIAL

1. Contact (*if appropriate, the organization or site contact to include in published citations who would receive any external questions about the content of the STI Product or the research information contained therein*)
   Name and/or Position K.J. Schmidt, Manager STI Program & Site Support
   E-mail _____ Phone (803) 725-2321
   Organization Westinghouse Savannah River Company

2. Releasing Official X I verify that all necessary reviews have been completed (e.g. Patent, Copyright, ECI, UCNI, etc.)
   Released by (*name*) K. J. Schmidt Date (*mm/dd/yyyy*) .....
   E-Mail _____ Phone _____ (803) 725-7373