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Parametric Testing of a DWPF Glass

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Parametric Testing of a DWPF Glass

Abstract

A series of tests has been performed to characterize the chemical stability of a DWPF borosilicate glass sample as part of the Waste Package Task of the Nevada Nuclear Waste Storage Investigations (NNWSI) Project. This material was prepared at the Savannah River Laboratory for the purpose of testing the 165-frit matrix doped with a simulated nonradioactive waste. All tests were conducted at 90°C using deionized water and J-13 water (a tuffaceous formation ground water). In the deionized water tests, both monoliths and crushed glass were tested at various ratios of surface area of the sample to volume of water in order to compare leach rates for different sample geometries or leaching times. Effects on the leach rates as a result of the presence of crushed tuff and stainless steel material were also investigated in the tests with J-13 water.

Introduction

Parametric testing is important because it helps us to understand the behavior of a particular waste form under different experimental conditions. By optimizing these conditions, one can presumably design relatively short tests to establish the chemical stability of waste forms such as the DWPF borosilicate glass. The parameters investigated were leachant composition, ratios of waste-form surface area to water volume (SA/V), effects of the presence of crushed tuff in some tests and of crushed tuff and stainless steel in others, and leaching times ranging from 1 to 56 days. All tests were conducted at 90°C and were of a static nature.

Four series of leaching tests were conducted.

These were:

- I. Glass monoliths and crushed glass with deionized water at SA/V ratios of 0.1, 0.3, 0.5, and 1.0 cm^{-1} for 1, 3, 7, 14, 28, and 56 days.
- II. Glass monoliths with J-13 water at SA/V ratios of 0.3, and 0.5 cm^{-1} for 3, 7, 14, 28, and 56 days.
- III. Glass monoliths with J-13 water and crushed tuff at SA/V ratios of 0.1 and 0.3 cm^{-1} for 7, 14, 28, 56, 91, and 182 days.
- IV. Glass monoliths with J-13 water, crushed tuff, and stainless steel at SA/V ratios of 0.3 and 0.5 cm^{-1} for 3, 7, 14, 28, 56, and 91 days.

Experimental

To perform the parametric testing, the following materials were obtained: a borosilicate glass (DWPF) from the Savannah River Laboratory, crushed Topopah Spring tuff rock from an outcrop located at Fran Ridge (Nevada Test Site), J-13 ground water from a well near the Yucca Mountain Site at the Nevada Test Site, and 304 L stainless steel coupons. The compositions of the glass, tuff, and J-13 ground water are given in Tables 1, 2, and 3, respectively. The rock and water localities and composition are described by Knauss (1984) and Oversby (1984).

Table 1 lists the nominal composition of the glass as supplied to LLNL by SRL and the average of the results of electron microprobe analyses performed at LLNL on five samples of the glass. For each sample, 10 spot analyses were performed and the data were averaged. The uncertainty estimates in Table 1 are based on the standard deviation of the average of the five sample averages. The SRL data giving the results of a partial analysis by x-ray fluorescence are also shown for comparison.

Table 1. DWPF glass (simulated waste) composition.

Component	Nominal ^a (wt%)	LLNL ^b (wt%)	SRL ^{a,c} (wt%)
SiO ₂	53.47	54.9 ± 2.1	
Na ₂ O	11.40	9.74 ± 0.54	
Li ₂ O	5.04		
B ₂ O ₃	7.20		
MgO	0.72	0.72 ± 0.04	0.65
ZrO ₂	0.72	0.66 ± 0.07	0.58
Fe ₂ O ₃	10.53	10.6 ± 0.7	10.2
MnO ₂	2.35	2.72 ± 0.13	2.6
CaO	1.37	1.51 ± 0.32	1.2
NiO	1.06	1.84 ± 0.24	0.83
Al ₂ O ₃	3.78	5.13 ± 0.18	
Zeolite	1.68		
CeO ₂	0.42		
K ₂ O	0.14		
SrO	0.10		
RuO ₂	0.036		
Ca ₂ O	0.0028		

^a Data from Bibler, SRL, personal communication.

^b Lawrence Livermore National Laboratory.

^c Savannah River Laboratory.

Table 2. Topopah Spring Tuff composition.^a

Na (%)	2.809 ± 0.087
K (%)	3.931 ± 0.354
Ca (%)	0.902 ± 0.116
Fe (%)	0.621 ± 0.009
Sc (ppm)	2.257 ± 0.019
Cr (ppm)	1.548 ± 0.996
Co (ppm)	0.164 ± 0.026
Ni (ppm)	nd ^b
Zn (ppm)	42.88 ± 2.97
Ga (ppm)	nd ^b
As (ppm)	4.609 ± 1.005
Rb (ppm)	187.8 ± 2.8
Sr (ppm)	nd ^b
Zr (ppm)	153.6 ± 25.5
Mo (ppm)	24.00 ± 5.78
Ag (ppm)	nd ^b
Sb (ppm)	0.333 ± 0.035
Cs (ppm)	3.821 ± 0.081
Ba (ppm)	52.56 ± 14.24
La (ppm)	35.76 ± 0.38
Ce (ppm)	65.47 ± 0.86
Nd (ppm)	30.88 ± 4.82
Sm (ppm)	5.900 ± 0.133
Eu (ppm)	0.275 ± 0.018
Gd (ppm)	6.921 ± 3.084
Tb (ppm)	0.768 ± 0.018
Yb (ppm)	3.014 ± 0.067
Lu (ppm)	0.518 ± 0.014
Hf (ppm)	4.991 ± 0.081
Ta (ppm)	1.331 ± 0.031
W (ppm)	nd ^b
Au (ppm)	nd ^b
Th (ppm)	22.10 ± 0.15
U (ppm)	4.274 ± 0.197

^a Neutron Activation Data from K. G. Knauss, UCRL-53558 (1984).

^b nd = no data.

Table 3. J-13 Ground water chemical composition.

Element	Non-equilibrated (mg/l)			Equilibrated (mg/l)		
Al	0.372	<0.008	<0.008	0.512	0.011	0.012
B	0.148	0.127	0.131	0.220	0.228	0.227
Cu	0.036	0.069	0.021	0.011	0.035	0.038
Fe	0.017	0.007	0.004	0.008	0.059	0.013
Li	0.035	0.039	0.041	0.046	0.046	0.046
Mn	<0.001	<0.001	<0.001	0.002	0.002	0.002
Mo	0.024	0.013	0.012	0.012	0.011	0.012
Ni	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
P	0.824	<0.056	<0.056	0.070	0.088	0.062
Pb	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016
Si	27.8	25.6	26.3	38.9	38.8	38.3
Sr	<0.01	0.022	0.021	0.047	0.035	0.038
U	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Zn	0.034	0.009	<0.005	0.026	0.029	0.025
Ca	11.7	12.2	12.9	12.0	12.3	12.8
K	6.56	4.52	4.66	12.8	13.1	12.6
Mg	1.80	1.85	1.89	0.153	0.153	0.155
Na	42.1	40.9	43.6	46.6	47.6	46.7

DWPF Glass Preparation

The glass sample was prepared by the Savannah River Laboratory under the direction of the Waste Solidification Technology Division (Bibler, 1983). The process was to slurry-feed a mixture of 165-frit and simulated waste to a small joule-heated melter. The final composition was 72 wt% frit and 28 wt% simulated waste. The glass was

melted at 1150°C and poured into a 500-cm³ stainless steel beaker with a surface temperature of approximately 600°C. The filling process took approximately 4 hours, which corresponds to a glass residence time in the melter of 10 hours. No annealing procedures were performed. A photograph of the glass and stainless steel can is shown in Fig. 1. Removal of the glass sample from the stainless steel can was only possible after cutting



Figure 1. DWPF glass in steel can.

the can along three different lengths, as shown in Fig. 2. During this procedure, the glass broke into several pieces, as shown in Fig. 3. These pieces were later used to prepare the monoliths for the various tests.

The glass was black to olive-gray in color with well-developed conchoidal patterns. We also noticed locally developed banding alternating from black to olive-gray, and regions of frothy

and vesicular mass at the top and center of the core. All surfaces were smooth, and there was no evidence of crystalline phenocrysts. Representative samples from the above were analyzed by electron microprobe; the results of these analyses are shown in Table 1 and indicate that, despite its physical appearance suggesting a heterogeneous chemical composition, the glass material was very uniform based on the electron microprobe results.

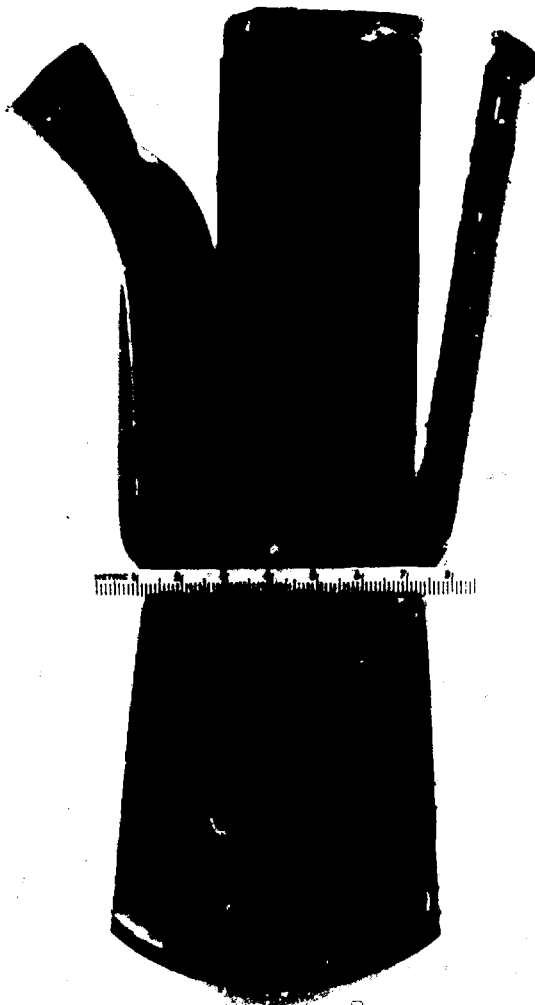


Figure 2. Stainless steel can.

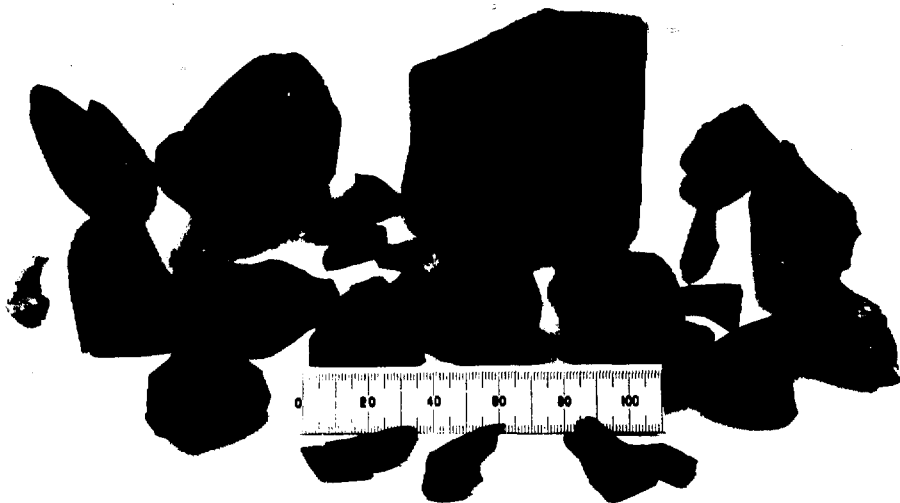


Figure 3. DWPF glass.

Glass Sample Preparation

Glass samples were prepared as monoliths and particles according to MCC-1 and MCC-3 procedures (*Nuclear Waste Materials Handbook Test Methods*, 1983). A saw with diamond wheel was used to cut monoliths in the form of rectangular prisms approximately 1 × 2 cm long and 2–3 mm thick. Care was exercised not to use glass pieces that had been in contact with the stainless steel can. After cutting, the surface area of each monolith was measured with calipers, and then the glass was cleaned in an ultrasonic bath with deionized water and ethanol. Depending on the ratio of the specimen surface area to the leachant volume, samples with a surface area of 200–600 mm² were used for the leaching.

The glass particles, 40–80 mesh size, were obtained by crushing pieces of glass, not suitable for monolith cutting, in a steel mortar and pestle. The crushed particles were sieved with the appropriate size screens and also cleaned in an ultrasonic bath with water and ethanol. The surface area of the particles was calculated from the average spherical size of each particle (298.5×10^{-6} m) using the following algorithm:

$$SA = \frac{6 m_s}{\rho \bar{D}_p}$$

where

m_s = mass of sample, g,

ρ = sample density, g/m³, and

\bar{D}_p = mean particle diameter, m.

Rock Sample Preparation

The crushed tuff material was prepared by crushing small pieces of outcrop rock with a small ceramic plate jaw crusher, followed by further crushing with a plate grinder. The plates are made of high purity alumina. The rock powder from the plate grinder was sieved through 60 and 100 mesh screens on a mechanical sieve shaker. Finally, the rock powder was homogenized in a drum mixer for 24 hours before use in the leaching tests (Oversby, 1984), and pretreated to remove the caliche. This procedure consisted of washing the crushed rock with deionized water, twice at room temperature by shaking, letting the tuff settle, and decanting the wash water, and once at 90°C by heating for 12 hours, letting it cool, and again decanting the wash water.

Stainless Steel Supports

In the fourth series of parametric testing, stainless steel supports were used to hold the glass monoliths. These supports were made from 2.2×2.2 cm squares of 0.16-cm-thick 304 L stainless steel coupons. The corners of the squares were bent downward to allow approximately 0.5 cm of space between the waste form and the crushed tuff resting at the bottom of the leaching container. Furthermore, the surface of the support was perforated with nine 0.318-cm-diameter holes to allow a free path for water mixing around the waste form.

Leaching Procedures

Following is the analytical procedure used to conduct the four series of parametric testing described in the introduction.

In Test I, monoliths were placed on Teflon supports during the leaching period following procedures recommended by the MCC-1 leaching test (1983). In the case of the crushed glass experiments, the procedures were those recommended by the MCC-3 leaching test. In Test II, only monoliths were used in the same manner as in Test I. In Test III, the crushed tuff was placed on the base of the leaching container and the glass monoliths rested on Teflon supports above the tuff (there was no contact between glass and tuff). The ratio

of J-13 water volume to tuff weight was 20 ml to 1 g. In Test IV, stainless steel supports were substituted for the Teflon supports, but the glass-tuff configuration was the same as in Test III. Appropriate blank samples (glass omitted) were run in each case to make background corrections.

The Teflon containers used in Tests I, II, and III were those recommended in the MCC-1 test (40-cm³ capacity). The Teflon containers used in Test IV were 25 cm³ in capacity, but were made of the same material as the 40-cm³ capsules used in the first three tests. The reduction in size was necessary because of the size of stainless steel support.

At the conclusion of each leaching period, the solutions were cooled and the pH was measured within a few hours. In the tests involving glass particles and crushed tuff, the solutions were passed through a 45- μ m filter before measuring the pH. The solutions were then acidified by adding concentrated ultrex nitric acid in amounts equal to 1% of the original volume. After acidification, all solutions were heated for 12 hours at 90°C. At the end of this period, the solutions were cooled and aliquots were removed for ICP elemental analysis. Inductively complex plasma (ICP) data were obtained for lithium, boron, sodium, magnesium, aluminum, silicon, potassium, calcium, manganese, iron, nickel, strontium, and zirconium. These data are shown in Appendices A-E.

Results and Discussion

As we have described, four series of parametric tests were conducted to evaluate the chemical stability of the DWPF glass under different experimental conditions of leachant composition, ratios of surface area of the glass sample to leachant volume, and effects on leach rates caused by the addition of tuff and or stainless steel to the system. These four tests generated an enormous amount of data, as shown in Appendices A-E. However, only some of the results will be discussed in this report.

The results to be discussed in Test I are those shown for lithium, boron, sodium, and silicon in Appendices A and B. Normalized elemental leach rates were calculated using the elemental concentrations in the leachates as determined by ICP. The algorithm to calculate leach rates can be expressed as

$$\text{leach rate} = \frac{(C_x)(V)}{(f_x)(SA)(t)}$$

where

C_x = concentration of element x in leach solution, g/cm³,

V = volume of leach solution, cm³,

f_x = mass fraction of element x in the unleached specimen,

SA = specimen surface area, m², and

t = leaching time, d.

The leach rate values are shown in Table 4 for the monolith samples and in Table 5 for the crushed glass samples. We have taken the leach rate values from Tables 4 and 5 for samples run at SA/V ratios of 0.3 and 0.5 cm⁻¹ and compared them

Table 4. Test I: DWPF glas (monoliths)—deionized water.

Leach time	Normalized elemental leach rate (g/m ² ·d)				
	SA/V	Li	B	Na	Si
1	0.1	0.95	0.86	0.90	0.93
3	0.1	1.59	1.48	1.65	1.47
7	0.1	1.07	1.01	1.12	0.93
14	0.1	0.79	0.74	0.83	0.65
28	0.1	0.50	0.48	0.53	0.40
56	0.1	0.30	0.28	0.31	0.24
1	0.3	1.61	1.45	1.66	1.44
3	0.3	1.22	1.05	1.27	1.05
7	0.3	0.76	0.70	0.80	0.59
14	0.3	0.53	0.43	0.48	0.35
28	0.3	0.26	0.24	0.27	0.19
56	0.3	0.15	0.13	0.15	0.10
1	0.5	1.53	1.45	1.58	1.37
3	0.5	0.94	0.80	0.97	0.77
7	0.5	0.55	0.53	0.58	0.43
14	0.5	0.32	0.31	0.34	0.25
28	0.5	0.18	0.18	0.19	0.14

Table 5. Test I: DWPF glass (crushed)—deionized water.

Leach time	Normalized elemental leach rate (g/m ² ·d)				
	SA/V	Li	B	Na	Si
3	0.3	1.13	1.14	1.18	0.93
7	0.3	0.80	0.80	0.82	0.62
14	0.3	0.47	0.47	0.48	0.36
28	0.3	0.31	0.30	0.33	0.23
56	0.3	0.16	0.16	0.16	0.12
3	0.5	0.91	0.91	0.94	0.72
7	0.5	0.57	0.57	0.59	0.44
14	0.5	0.37	0.37	0.38	0.28
28	0.5	0.21	0.21	0.22	0.16
56	0.5	0.11	0.11	0.11	0.086
1	1.0	1.19	1.17	1.26	0.93
3	1.0	0.66	0.65	0.69	0.50
7	1.0	0.39	0.37	0.40	0.29
14	1.0	0.23	0.23	0.24	0.17
28	1.0	0.14	0.14	0.15	0.10

graphically in Figs. 4-7. In general, there is good agreement between the two forms of glass for all four elements. In examining the leach rate values in Tables 4 and 5, the lithium, boron, and sodium values agree very well for each particular leaching period, thus suggesting congruent dissolution of

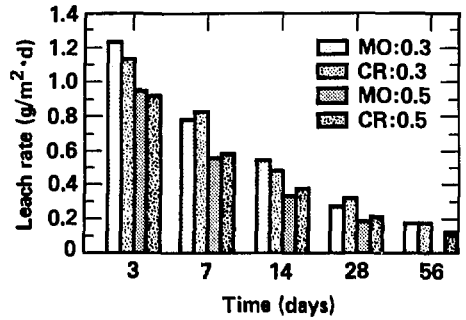


Figure 4. Lithium leach rate: monolith vs crushed glass.

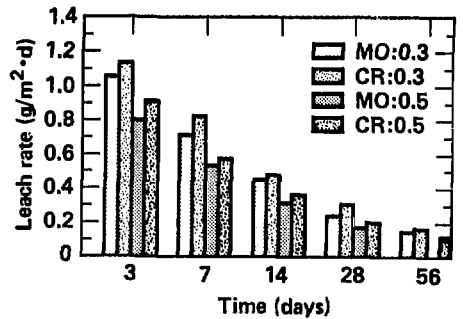


Figure 5. Boron leach rate: monolith vs crushed glass.

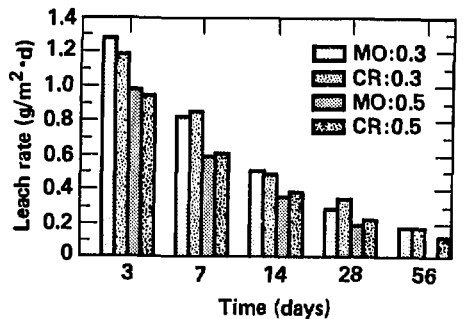


Figure 6. Sodium leach rate: monolith vs crushed glass.

the glass. However, the silicon values are correspondingly lower by as much as 30%, suggesting perhaps that the leaching mechanism is affected by precipitation of insoluble phases or saturation of certain elements such as silicon.

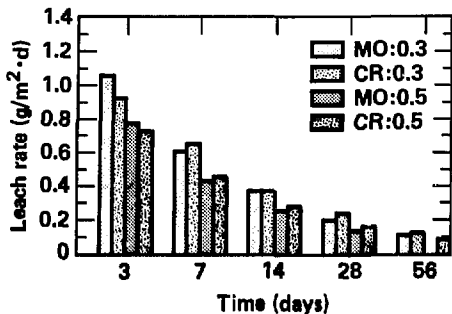


Figure 7. Silicon leach rate: monolith vs crushed glass.

We have also plotted the leach rate data for the crushed glass samples in Figs. 8–11. Each one of these plots represents a comparison of the three sets of data corresponding to SA/V ratios of 0.3, 0.5, and 1.0 cm^{-1} . This comparison is possible when the SA/V ratios are multiplied by the leaching time. As seen in the graphs, the lithium, boron, sodium, and silicon data are all consistent and prove that, for the range studied of 0.3 to 1.0 cm^{-1} , the leach rates are comparable regardless of the surface area of the sample and the volume of the leachant, so long as they are compared at the same value of $(SA/V)(t)$.

As stated previously, Tests II, III, and IV were different from Test I in that J-13 water was the leachant. Furthermore, Tests III and IV were complicated by using crushed tuff in Test III and crushed tuff and stainless steel in Test IV. The data from these tests appear in Appendices C, D, and E. J-13 is a tuffaceous formation ground water that contains 0.14, 27, and 42 ppm of boron, silicon, and sodium, respectively, based on the average of three separate analyses (unequilibrated J-13), as shown in Table 3. Before Tests II, III, and IV were conducted, the J-13 water was equilibrated with powdered tuff (pretreated tuff) at a ratio of 20 ml to 1 g of tuff for 30 days at 90°C . During this equilibration time, the elemental concentrations in J-13 changed as shown in Table 3; based on the average of three separate analyses, the boron, silicon, and sodium concentrations increased to 0.22, 39, and 47 ppm, respectively. In examining the ICP data from Tests II, III, and IV, we decided that the boron, silicon, and sodium data were not suitable for calculation of leach rates because, in most instances, the data for the real samples and for the blank samples were of the same magnitude. In a few cases, the blanks

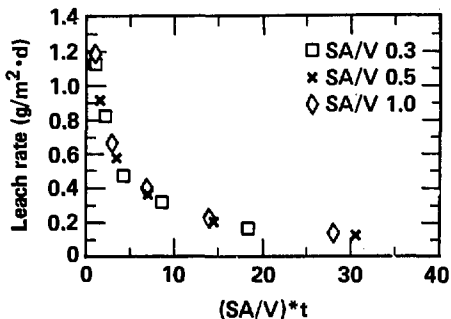


Figure 8. SA/V test: lithium.

were slightly higher than the samples but this artifact may be attributable to statistical variations in the measurements.

In view of the above circumstances surrounding the boron, sodium, and silicon data, only the lithium data from Tests II, III, and IV appear to be useful in assessing the durability of the DWPF glass from test to test. We have tabulated in Table 6 the calculated leach rates for lithium for all tests at SA/V ratios of 0.3 and 0.5 cm^{-1} . The data columns are ordered according to the complexity of the tests to show differences in the values from test to test. First, it appears that glass behavior depends very much on the type of leachant since the leach rates in deionized water are about one order of magnitude higher than in J-13 water. Second, it is not clear that the additions of tuff in Test III and tuff and stainless steel in Test IV have any effect on the lithium leach rates; these appear to be about the same as in Test II with the exception of the day-3 samples. The data for the day-28 and day-41 samples are shown

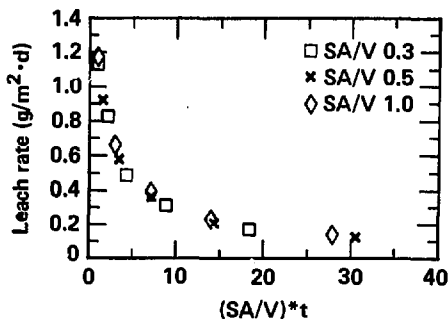


Figure 9. SA/V test: boron.

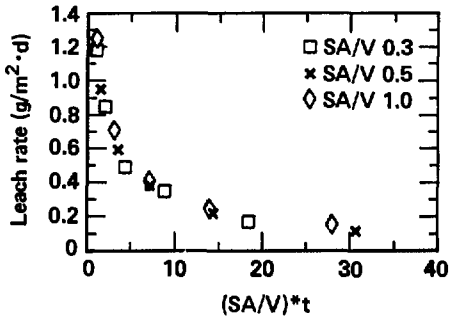


Figure 10. SA/V test: sodium.

with an uncertainty that represents the standard deviation of the average of two separate samples.

The lithium leach rates from Test I (deionized water) and from Test II (J-13 water) for monolith samples at SA/V ratios of 0.3 and 0.5 cm^{-1} have been plotted in Fig. 12 to show the comparison of the (SA/V)(t) relationship in deionized water and J-13 water. Aside from the fact that the J-13 leach rates are about an order of magnitude lower, the (SA/V)(t) relationship in J-13 water appears to be somewhat consistent with deionized water.

A summary of the pH data obtained in Tests I, II, III, and IV is presented in Table 7. These are final pH values only for the leachates from samples run at SA/V ratios of 0.3 and 0.5 cm^{-1} . There is no clear trend in the pH as a function of the complexity test in the 0.3- cm^{-1} samples, and only a slight decreasing trend is present in the 0.5- cm^{-1} samples. As a function of reaction time, the pH readings appear to increase slightly in both the 0.3- and 0.5- cm^{-1} samples.

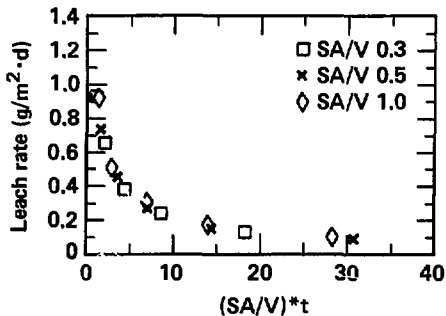


Figure 11. SA/V test: silicon.

Table 6. Normalized elemental leach rate ($\text{g}/\text{m}^2 \cdot \text{d}$).

Leach time	Lithium							
	SA/V = 0.3 cm^{-1}				SA/V = 0.5 cm^{-1}			
	I	II	III	IV	I	II	III	IV
3d	1.22	0.0075	—	0.035	0.094	0.15	—	0.066
7d	0.76	0.045	0.047	0.042	0.55	0.043	—	0.044
14d	0.53	0.031	0.038	0.037	0.32	0.022	—	0.042
28d	0.26	0.023	0.019	0.023	0.18	0.018	—	0.024
	$\pm 5\%$	$\pm 3\%$	$\pm 22\%$		$\pm 4\%$	$\pm 70\%$		$\pm 12\%$
56d	0.15	0.022	Lost	0.011	—	0.018	—	0.015
	$\pm 1\%$							
91d	—	—	0.012	0.010	—	—	—	0.010
			$\pm 7\%$	$\pm 3\%$				$\pm 8\%$
182d	—	—	0.008	—				

I = Glass + DI water

II = Glass + J-13 water

III = Glass + J-13 water + tuff

IV = Glass + J-13 water + tuff + stainless steel

Pertaining to mass loss of glass specimens during the leaching interval, we note that the mass loss for most samples is very small, usually less than 0.01%, so that conclusions based on mass loss are not possible. Pertaining to weight loss of the leachate during the same leaching intervals, we note that the losses for most leachates are on the order of a few percent (less than 10%). In a few cases, however, and particularly in the

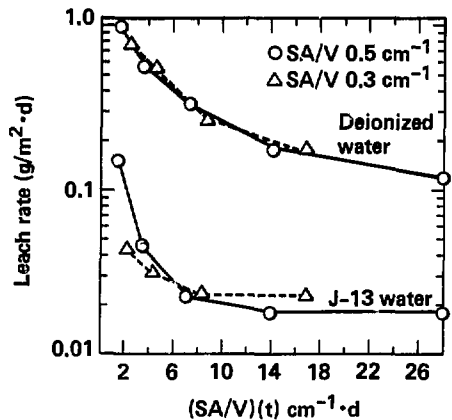


Figure 12. Comparison of deionized water and J-13 water (SA/V)(t) vs lithium leach rate.

Table 7. Summary of pH data in the leachates.

Leach time	SA/V = 0.3 cm ⁻¹				SA/V = 0.5 cm ⁻¹			
	I	II	III	IV	I	II	III	IV
3d	8.20	9.17	—	9.37	9.73	9.21	—	8.92
7d	9.25	9.21	9.08	9.45	9.76	9.32	—	9.29
14d	9.52	9.18	9.37	9.54	9.90	9.44	—	9.18
28d	9.74	9.45	9.35	9.63	9.80	9.50	—	9.62
56d	9.73	9.43	9.55	9.45	9.84	9.51	—	9.62
91d	—	—	9.28	9.45	—	—	—	9.45
182d	—	—	9.30	—	—	—	—	—

I = Glass + DI water
 II = Glass + J-13 water
 III = Glass + J-13 water + tuff
 IV = Glass + J-13 water + tuff + stainless steel

28-, 56-, and 91-day tests, we experienced losses from 10 to 64%. The data from these tests should be considered suspect, and we did not use them for any calculations. We attribute these large

losses to a defective leaching capsule or to the presence of tuff fines around the screw caps of the leaching capsules in the case of Tests III and IV.

Acknowledgments

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Appendix A.
Test I: DWPF Glass—Deionized Water Experiment,
Monolith Examples

TEST - I
 DEIONIZED WATER EXPERIMENT
 DWPF GLASS (MOLYBETH)

NO.	GLASS	SA ₂ (mm ²)	INITIAL MASS(g)	FINAL MASS(g)	MASS LOSS(g)	SA/V	INTERVAL TIME TIME(d)	TIME START	TIME STOP
1	133	208	0.3690	0.3668	0.0022	.1	1	8/ 1/83	8/ 2/83
2	136	207	0.3675	0.3668	0.0007	.1	3	7/29/83	8/ 1/83
3	139	206	0.3093	0.3079	0.0014	.1	7	7/28/83	8/ 4/83
4	141	205	0.2884	0.2862	0.0022	.1	14	"	8/11/83
5	143	209	0.2987	0.2956	0.0031	.1	28	"	8/25/83
6	147	203	0.2810	0.2783	0.0027	.1	28	"	"
7	148	207	0.3035	0.3000	0.0035	.1	56	"	9/22/83
8	150	186	0.3731	0.3702	0.0029	.1	56	"	"
9	101/107	444	0.8873	0.8864	0.0009	.3	1	8/ 1/83	8/ 2/83
10	102/108	459	0.9470	0.9457	0.0013	.3	3	7/29/83	8/ 1/83
11	103/115	455	0.9405	0.9387	0.0018	.3	7	7/28/83	8/ 4/83
12	104/116	456	0.9500	0.9477	0.0023	.3	14	"	8/11/83
13	105/106	448	0.9314	0.9293	0.0021	.3	28	"	8/25/83
14	109/110	450	0.9254	0.9232	0.0022	.3	28	"	"
15	111/112	450	0.9273	0.9244	0.0029	.3	56	"	9/22/83
16	113/114	450	0.9305	0.9278	0.0027	.3	56	"	"
17	118/129/140	748	1.4551	1.4541	0.0010	.5	1	8/ 1/83	8/ 2/83
18	119/121/131	741	1.3892	1.3869	0.0023	.5	3	7/29/83	8/ 1/83
19	120/122/132	748	1.5000	1.4978	0.0022	.5	7	7/28/83	8/ 4/83
20	123/124/145	743	1.4170	1.4141	0.0029	.5	14	"	8/11/83
21	125/130/144	749	1.5994	1.5963	0.0031	.5	14	"	"
22	126/146/149	751	1.5187	1.5162	0.0025	.5	28	"	8/25/83
23	117/127/128	736	1.4517	1.4484	0.0033	.5	28	"	"
24	BLANK						1	8/ 1/83	8/ 2/83
25	BLANK						1	"	"
26	BLANK						3	7/29/83	8/ 1/83
27	BLANK						3	"	"
28	BLANK						7	7/28/83	8/ 4/83
29	BLANK						7	"	"
30	BLANK						14	"	8/11/83
31	BLANK						14	"	"
32	BLANK						28	"	8/25/83
33	BLANK						28	"	"
34	BLANK						56	"	9/22/83
35	BLANK						56	"	"

TEST - I
DEIONIZED WATER EXPERIMENT
DWPf GLASS (MONOLITH)

NO.	WATER(g)			LEACHANT	
		INITIAL WT. (g)	FINAL WT. (g)	LOSS(g)	LOSS(%)
1	20.8	104.55	104.48	0.07	0.34%
2	20.7	103.94	103.83	0.11	0.53%
3	20.6	104.52	104.35	0.17	0.83%
4	20.5	104.24	103.94	0.30	1.87%
5	20.9	104.55	103.91	0.64	3.71%
6	20.3	103.94	103.38	0.56	2.11%
7	20.7	104.31	102.31	2.00	9.11%
8	18.6	102.18	100.74	1.44	7.74%
9	14.8	98.96	98.88	0.08	0.54%
10	15.3	100.08	99.95	0.13	0.85%
11	15.2	98.90	98.63	0.27	1.78%
12	15.2	98.65	98.31	0.34	2.24%
13	14.9	99.01	98.53	0.48	3.22%
14	15.0	99.51	98.94	0.57	3.80%
15	15.0	99.17	98.10	1.07	7.13%
16	15.0	98.73	97.34	1.39	9.27%
17	15.0	99.85	99.73	0.12	0.80%
18	14.8	98.87	98.77	0.10	0.68%
19	15.0	99.08	98.89	0.19	1.27%
20	14.9	98.95	98.37	0.58	3.89%
21	15.0	99.86	99.55	0.31	2.07%
22	15.0	99.95	99.40	0.55	3.67%
23	14.7	99.77	99.23	0.54	3.67%
24	17.0	100.14	100.05	0.09	0.53%
25	17.0	99.86	99.79	0.07	0.41%
26	17.0	100.37	100.26	0.11	0.65%
27	17.0	99.77	99.67	0.10	0.59%
28	17.0	99.73	99.56	0.17	1.00%
29	17.0	99.67	99.44	0.23	1.35%
30	17.0	99.58	98.97	0.61	3.59%
31	17.0	100.30	99.86	0.44	2.59%
32	17.0	99.79	99.73	0.06	0.35%
33	17.0	99.59	99.13	0.46	2.71%
34	17.0	100.15	99.01	1.14	6.71%
35	17.0	100.33	99.31	1.02	6.00%

TEST I

DEIONIZED WATER EXPERIMENT

DWPF GLASS (MONOLITH)

DAY 1 - ICP Analysis

ELEM	DET. LIM.	SAMPLES			BLANKS	
		SA/V=0.1	0.3	0.5	24	25
		1	9	17		
Al	.008	.266	1.19	1.78	<.008	.014
B	.004	.195	.991	1.64	<.004	<.004
Fe	.002	.040	.150	.330	.003	.007
Li	.001	.225	1.15	1.81	.001	.001
Mn	.0003	.047	.071	.114	<.0003	<.0003
Ni	.008	.008	.015	.023	<.008	<.008
Si	.004	2.45	11.1	17.4	.092	.088
Sr	.012	.012	.030	.038	<.012	<.012
Zr	.002	.004	.004	.007	<.002	<.002
Ca	.004	.074	.398	.448	<.004	<.004
K	.260	.264	<.260	<.260	<.260	<.260
Mg	.0004	.126	.351	.040	.014	.034
Na	.004	.891	4.34	6.81	.047	.034

Note: Detection limit is 4 times the standard deviation of the blank.

Results are in micrograms per milliliter (or ppm).

TEST I

DEIONIZED WATER EXPERIMENT

DWPF GLASS (MONOLITH)

DAY 3 - ICP Analysis

ELEM	DET. LIM.	SAMPLES			BLANKS	
		SA/V=0.1	0.3	0.5	26	27
Al	.008	1.21	2.28	2.72	.019	.090
B	.004	.999	2.13	2.71	<.004	<.004
Fe	.002	.079	.357	.469	.011	.006
Li	.001	1.12	2.59	3.32	.001	<.001
Mn	.0003	.031	.132	.174	<.0003	<.0003
Ni	.003	.010	.025	.036	.002	.002
Si	.004	11.2	24.0	29.3	.110	.124
Sr	.012	.031	.032	.022	.003	.003
Zr	.002	.004	.006	.010	<.002	<.002
Ca	.004	.374	.402	.339	<.004	<.004
K	.260	<.260	.398	<.260	<.260	<.260
Mg	.0004	.203	.069	.070	.040	.029
Na	.004	4.24	9.74	12.4	.046	.026

TEST I

DEIONIZED WATER EXPERIMENT

DWPf GLASS (MONOLITH)

DAY 7 - ICP Analysis

ELEM	DET. LIM.	SA/V=0.1	0.3	0.5	BLANKS	
		3	11	19	28	29
Al	.008	1.66	2.95	3.47	.021	.005
B	.004	1.60	3.39	4.22	<.004	<.004
Fe	.002	.135	.410	.539	.013	.011
Li	.001	1.77	3.82	4.57	<.001	<.001
Mn	.0003	.085	.134	.145	<.0003	<.0003
Ni	.008	.017	.028	.031	<.008	<.008
Si	.004	16.6	32.2	38.8	.097	.104
Sr	.012	.026	.010	.008	<.012	<.012
Zr	.002	.002	.004	.015	<.002	<.002
Ca	.004	.410	.296	.189	<.004	<.004
K	.260	<.260	<.260	<.260	<.260	<.260
Mg	.0004	.134	.162	.074	.048	.030
Na	.004	6.80	14.6	17.4	.260	<.004

TEST I

DEIONIZED WATER EXPERIMENT

DWPF GLASS (MONOLITH)

DAY 14 - ICP Analysis

SAMPLES

ELEM	DET. LIM.	SA/V=0.1	0.3	0.5	0.5	BLANKS	
		4	12	20	21	30	31
Al	.008	2.17	3.50	3.85	3.97	.017	.013
B	.004	2.34	4.26	4.98	5.05	<.004	<.004
Fe	.002	.226	.639	.885	1.06	.012	.012
Li	.001	2.62	5.37	5.37	5.55	<.001	<.001
Mn	.0003	.077	.222	.222	.246	<.0003	<.0003
Ni	.008	.015	.033	.039	.042	<.008	<.008
Si	.004	23.0	39.1	44.4	45.3	.121	.118
Sr	.012	.022	.018	.014	.016	<.012	<.012
Zr	.002	.005	.017	.035	.041	<.002	<.002
Ca	.004	.383	.219	.184	.220	<.004	<.004
K	.260	<.260	.302	.271	.406	<.260	<.260
Mg	.0004	.059	.074	.081	.098	.033	.038
Na	.004	10.1	17.7	20.6	21.2	.008	.004

TEST I

DEIONIZED WATER EXPERIMENT

DWPf GLASS (MONOLITH)

DAY 28 - ICP Analysis

ELEM DET. LIM.	SAMPLES						BLANKS		
	SA/V=0.1	0.1	0.3	0.3	0.5	0.5	32	33	
	5	6	13	14	22	23			
Al	.008	2.72	2.62	3.33	3.63	3.96	4.04	.025	.025
B	.004	3.20	3.07	4.50	4.85	5.59	5.59	<.004	<.004
Fe	.002	.239	.334	1.29	1.14	1.63	1.94	.007	.011
Li	.001	3.51	3.26	5.18	5.46	6.04	5.88	<.001	<.001
Mn	.0003	.091	.105	.304	.267	.366	.423	<.0003	<.0003
Ni	.008	.019	.019	.040	.036	.047	.062	<.008	<.008
Si	.004	30.0	28.7	40.6	43.7	47.9	48.3	.141	.339
Sr	.012	.019	.024	.026	.022	.021	.023	<.012	<.012
Zr	.002	.007	.018	.039	.031	.048	.057	<.002	<.002
Ca	.004	.293	.349	.294	.321	.284	.308	<.004	<.004
K	.260	.268	<.260	<.260	<.260	.552	.429	<.260	<.260
Mg	.0004	.042	.065	NA	NA	.190	.159	.021	.034
Na	.004	13.6	12.5	19.1	20.0	23.1	22.6	.008	.011

Note: NA - elemental analysis not available.

TEST I

DEIONIZED WATER EXPERIMENT

DWPF GLASS (MONOLITH)

DAY 56 - ICP Analysis

		SAMPLES				BLANKS	
		SA/V=0.1	0.1	0.3	0.3		
ELEM	DET. LIM.	7	8	15	16	34	35
Al	.008	2.89	2.85	3.90	3.92	.210	.210
B	.004	3.78	3.73	5.67	5.72	<.004	<.004
Fe	.002	.364	.475	1.83	1.85	.008	.015
Li	.001	4.14	4.26	6.49	6.45	.001	.001
Mn	.0003	.142	.158	.441	.457	<.001	<.001
Ni	.008	.021	.022	.048	.047	<.010	<.010
Si	.004	35.1	37.8	49.1	49.5	.140	.250
Sr	.012	.026	.020	.023	.028	<.010	<.010
Zr	.002	.035	.038	.034	.035	<.010	<.010
Ca	.004	.243	.253	.299	.299	<.010	<.010
K	.260	<.260	<.260	<.260	<.260	<.260	<.260
Mg	.0004	NA	NA	NA	NA	NA	NA
Na	.004	15.2	15.7	23.8	23.6	.010	.010

Note: NA - elemental analysis not available.

TEST I

DEIONIZED WATER EXPERIMENT

DWPF GLASS (MONOLITH)

RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 1

Analytical Results

SAMPLE ID	1	9	17
Start Experiment	8/1/83	8/1/83	8/1/83
Stop Interval	8/2/83	8/2/83	8/2/83
Initial pH	5.4	5.4	5.4
Final pH	5.5	5.6	5.9
Diff (pH)	0.1	0.2	0.5
Spec SA (mm ²)	208.	444.	748.
Volume (ml)	20.8	14.8	15.0
SA/V	0.1	0.3	0.5
Temp (°C)	90.0	90.0	90.0
Initial Weight(g)	104.55	98.96	99.85
Final Weight(g)	104.48	98.88	99.73
Weight Loss(g)	0.07	0.08	0.12
%Leach Loss	0.34%	0.54%	0.08%
Initial Spec Wt(g)	0.3690	0.8873	1.4551
Final Spec Wt(g)	0.3668	0.8864	1.4541
Spec Wt Loss(g)	0.0022	0.0009	0.0010

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result			Corrected for Blank		
	1	9	17	C1	C9	C17
Al	0.266	1.19	1.78	0.266	1.19	1.78
B	0.195	0.991	1.64	0.195	0.991	1.64
Fe	0.040	0.150	0.330	0.035	0.145	0.325
Li	0.225	1.15	1.81	0.224	1.14	1.80
Mn	0.047	0.071	0.114	0.047	0.071	0.114
Ni	0.008	0.015	0.023	0.008	0.015	0.023
Si	2.45	11.1	17.4	2.36	11.0	17.3
Sr	0.012	0.030	0.038	0.012	0.030	0.038
Zr	0.004	0.004	0.007	0.004	0.004	0.007
Ca	0.074	0.398	0.448	0.074	0.398	0.448
K	0.264	<.260	<.260	0.264	<.260	<.260
Mg	0.126	0.351	0.040	0.102	0.327	0.016
Na	0.891	4.34	5.81	0.85	4.30	6.77

TEST I

DEIONIZED WATER EXPERIMENT

DWPF GLASS (MONOLITH)

RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 3

Analytical Result

SAMPLE ID	2	10	18
Start Experiment	7/29/83	7/29/83	7/29/83
Stop Interval	8/1/83	8/1/83	8/1/83
Initial pH	5.4	5.4	5.4
Final pH	5.9	6.6	6.6
Diff (pH)	0.5	1.2	1.2
Spec SA (mm ²)	207.	459.	741.
Volume (ml)	20.7	15.3	14.8
SA/V	0.1	0.3	0.5
Temp (°C)	90.0	90.0	90.0
Initial Weight(g)	103.94	100.08	98.87
Final Weight(g)	103.83	99.95	98.77
Weight Loss(g)	0.11	0.13	0.10
%Leach Loss	0.53%	0.85%	0.68%
Initial Spec Wt(g)	0.3675	0.9470	1.3892
Final Spec Wt(g)	0.3668	0.9457	1.3869
Spec Wt Loss(g)	0.0007	0.0013	0.0023

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result			Corrected for Blank		
	2	10	18	C2	C10	C18
Al	1.21	2.28	2.72	1.16	2.22	2.67
B	0.999	2.13	2.71	0.999	2.13	2.71
Fe	0.079	0.357	0.469	0.071	0.349	0.461
Li	1.12	2.59	3.32	1.12	2.59	3.32
Mn	0.037	0.132	0.174	0.031	0.132	0.174
Ni	0.010	0.025	0.036	0.080	0.023	0.034
Si	11.2	24.0	29.3	11.1	23.9	29.2
Sr	0.031	0.032	0.022	0.028	0.029	0.019
Zr	0.004	0.006	0.010	0.004	0.006	0.010
Ca	0.374	0.402	0.334	0.374	0.402	0.339
K	<.260	.398	<.260	<.260	.398	<.260
Mg	0.203	0.064	0.070	0.169	0.035	0.036
Na	4.24	9.74	12.4	4.20	9.70	12.0

TEST I
 DEIONIZED WATER EXPERIMENT
 DWPF GLASS (MONOLITH)
 RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 7

Analytical Results

SAMPLE ID	3	11	19
Start Experiment	7/28/83	7/28/83	7/28/83
Stop Interval	8/4/83	8/4/83	8/4/83
Initial pH	5.4	5.4	5.4
Final pH	5.9	6.2	6.6
Diff (pH)	0.5	0.8	1.2
Spec SA (mm ²)	206.	455.	748.
Volume (g)	20.6	15.2	15.0
SA/V	0.1	0.3	0.5
Temp (°C)	90.0	90.0	90.0
Initial Weight(g)	104.52	98.90	99.08
Final Weight(g)	104.35	98.63	98.89
Weight Loss(g)	0.17	0.27	0.19
%Leach Loss	0.83%	1.78%	1.27%
Initial Spec Wt(g)	0.3093	0.9405	1.5000
Final Spec Wt(g)	0.3079	0.9387	1.4978
Spec Wt Loss(g)	0.0014	0.0018	0.0022

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result			Corrected for Blank		
	3	11	19	C3	C11	C19
Al	1.66	2.95	3.47	1.65	2.94	3.46
B	1.60	3.39	4.22	1.60	3.39	4.22
Fe	0.135	0.410	0.539	0.123	0.398	0.527
Li	1.77	3.82	4.57	1.77	3.82	4.57
Mn	0.085	0.134	0.145	0.085	0.134	0.145
Ni	0.017	0.028	0.031	0.017	0.028	0.031
Si	16.6	32.2	38.8	16.5	32.1	38.7
Sr	0.026	0.010	0.008	0.026	0.010	0.008
Zr	0.002	0.004	0.015	0.002	0.004	0.015
Ca	0.410	0.296	0.189	0.410	0.296	0.189
K	<.260	<.260	<.260	<.260	<.260	<.260
Mg	0.134	0.162	0.074	0.095	0.123	0.035
Na	6.80	14.6	17.4	6.54	14.3	17.1

TEST I
 DEIONIZED WATER EXPERIMENT
 DWPf GLASS (MONOLITH)
 RAW DATA TABULATION - LEACHATE ANALYSIS
 DAY 14

Analytical Results

SAMPLE ID	4	12	20	21
Start Experiment	7/28/83	7/28/83	7/28/83	7/28/83
Stop Interval	8/11/83	8/11/83	8/11/83	8/11/83
Initial pH	5.4	5.4	5.4	5.4
Final pH	6.3	6.7	6.8	6.9
Diff (pH)	0.9	1.3	1.4	1.5
Spec SA (mm ²)	205.	456.	743.	749.
Volume (g)	20.5	15.2	14.9	15.0
SA/V	0.1	0.3	0.5	0.5
Temp (°C)	90.0	90.0	90.0	90.0
Initial Weight(g)	104.24	98.65	98.95	99.86
Final Weight(g)	103.94	98.31	98.37	99.55
Weight Loss(g)	0.30	0.34	0.58	0.31
%Leach Loss	1.46%	2.24%	3.89%	2.07%
Initial Spec Wt(g)	0.2884	0.9500	1.4170	1.5994
Final Spec Wt(g)	0.2862	0.9477	1.4141	1.5963
Spec Wt Loss(g)	0.0022	0.0023	0.0029	0.0031

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result				Corrected for Blank			
	4	12	20	21	C4	C12	C20	C21
Al	2.17	3.50	3.85	3.97	2.16	3.49	3.84	3.96
B	2.34	4.26	4.98	5.05	2.34	4.26	4.98	5.05
Fe	0.226	0.639	0.885	1.06	0.214	0.627	0.873	1.05
Li	2.62	5.37	5.37	5.55	2.62	5.37	5.37	5.55
Mn	0.077	0.222	0.222	0.246	0.077	0.222	0.222	0.246
Ni	0.015	0.033	0.039	0.042	0.015	0.033	0.039	0.042
Si	23.0	39.1	44.4	45.3	22.9	39.1	44.4	45.3
Sr	0.022	0.018	0.014	0.016	0.022	0.018	0.014	0.016
Zr	0.005	0.017	0.035	0.041	0.005	0.017	0.035	0.041
Ca	0.383	0.219	0.184	0.220	0.383	0.219	0.184	0.220
K	<.260	0.302	0.271	0.406	<.260	0.302	0.271	0.406
Mg	0.059	0.074	0.081	0.098	0.023	0.038	0.041	0.062
Na	10.1	17.7	20.6	21.2	10.1	17.7	20.6	21.2

TEST I
DEIONIZED WATER EXPERIMENT
DWPF GLASS (MONOLITH)
RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 28

Analytical Results

SAMPLE ID	5	6
Start Experiment	7/28/83	7/28/83
Stop Interval	8/25/83	8/25/83
Initial pH	5.4	5.4
Final pH	7.5	7.5
Diff (pH)	2.1	2.1
Spec SA (mm ²)	209.	203.
Volume (g)	20.9	20.3
SA/V	0.1	0.1
Temp (°C)	90.0	90.0
Initial Weight(g)	104.55	103.94
Final Weight(g)	103.91	103.38
Weight Loss(g)	0.64	0.56
%Leach Loss	3.06%	2.76%
Initial Spec Wt(g)	0.2987	0.2810
Final Spec Wt(g)	0.2956	0.2783
Spec Wt Loss(g)	0.0031	0.0027

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Results		Corrected for Blank	
	5	6	C5	C6
Al	2.72	2.62	2.69	2.59
B	3.20	3.07	3.20	3.07
Fe	0.239	0.334	0.230	0.325
Li	3.51	3.26	3.51	3.26
Mn	0.091	0.105	0.091	0.105
Ni	0.019	0.019	0.019	0.019
Si	30.0	28.7	29.8	28.5
Sr	0.019	0.024	0.019	0.024
Zr	0.007	0.018	0.007	0.018
Ca	0.293	0.349	0.293	0.349
K	0.268	<.260	0.268	<.260
Mg	0.042	0.065	0.014	0.038
Na	13.6	12.5	13.6	12.5

TEST I
 DEIONIZED WATER EXPERIMENT
 DMPF GLASS (MONOLITH)
 RAW DATA TABULATION - LEACHATE ANALYSIS
 DAY 28
 Analytical Results

SAMPLE ID	13	14
Start Experiment	7/28/83	7/28/83
Stop Interval	8/25/83	8/25/83
Initial pH	5.4	5.4
Final pH	8.0	8.0
Diff (pH)	2.6	2.6
Spec SA (mm ²)	448.	450.
Volume (g)	14.9	15.0
SA/V	0.3	0.3
Temp (°C)	90.0	90.0
Initial Weight(g)	99.01	99.51
Final Weight(g)	98.53	98.94
Weight Loss(g)	0.48	0.57
%Leach Loss	3.22%	3.80%
Initial Spec Wt(g)	0.9314	0.9254
Final Spec Wt(g)	0.9293	0.9232
Spec Wt Loss(g)	0.0021	0.0022

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Results		Corrected for Blank	
	13	14	C13	C14
Al	3.33	3.63	3.30	3.60
B	4.50	4.85	4.50	4.85
Fe	1.29	1.14	1.28	1.13
Li	5.18	5.46	5.18	5.46
Mn	0.304	0.267	0.304	0.267
Ni	0.040	0.036	0.040	0.036
Si	40.6	43.7	40.4	43.5
Sr	0.026	0.022	0.026	0.022
Zr	0.039	0.031	0.039	0.031
Ca	0.294	0.321	0.294	0.321
K	<.260	<.260	<.260	<.260
Mg	NA	NA	NA	NA
Na	19.1	20.0	19.1	20.0

Note: NA - elemental analysis not available.

TEST I
DEIONIZED WATER EXPERIMENT
DWPF GLASS (MONOLITH)
RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 28

Analytical Result

SAMPLE ID	22	23
Start Experiment	7/28/83	7/28/83
Stop Interval	8/25/83	8/25/83
Initial pH	5.4	5.4
Final pH	8.5	8.5
Diff (pH)	3.1	3.1
Spec SA (mm ²)	751.	736.
Volume (g)	15.0	14.7
SA/V	0.5	0.5
Temp (°C)	90.0	90.0
Initial Weight(g)	99.95	99.77
Final Weight(g)	99.40	99.23
Weight Loss(g)	0.55	0.54
%Leach Loss	3.67%	3.67%
Initial Spec Wt(g)	1.5187	1.4517
Final Spec Wt(g)	1.5162	1.4484
Spec Wt Loss(g)	0.0025	0.0033

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result		Corrected for Blank	
	22	23	C22	C23
Al	3.96	4.04	3.93	4.01
B	5.59	5.59	5.59	5.59
Fe	1.63	1.94	1.62	1.93
Li	6.04	5.88	6.04	5.88
Mn	0.366	0.423	0.366	0.423
Ni	0.047	0.062	0.047	0.062
Si	47.9	48.3	47.7	48.1
Sr	0.021	0.023	0.021	0.023
Zr	0.048	0.057	0.048	0.057
Ca	0.284	0.308	0.284	0.308
K	.552	.429	.552	.429
Mg	0.190	0.159	0.163	0.132
Na	23.1	22.6	23.1	22.6

TEST I
 DEIONIZED WATER EXPERIMENT
 DWPf GLASS (MONOLITH)
 RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 56

Analytical Result

SAMPLE ID	7	8
Start Experiment	7/28/83	7/28/83
Stop Interval	9/22/83	9/22/83
Initial pH	5.4	5.4
Final pH	6.8	6.8
Diff (pH)	1.4	1.4
Spec SA (mm ²)	207.	186.
Volume (g)	20.7	18.6
SA/V	0.1	0.1
Temp (°C)	90.0	90.0
Initial Weight(g)	104.31	102.18
Final Weight(g)	102.31	100.74
Weight Loss(g)	2.00	1.44
%Leach Loss	9.66%	7.74%
Initial Spec Wt(g)	0.3035	0.3731
Final Spec Wt(g)	0.3000	0.3702
Spec Wt Loss(g)	0.0035	0.0029

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Results		Corrected for Blank	
	7	8	C5	C6
Al	2.89	2.85	2.69	2.64
B	3.78	3.73	3.78	3.73
Fe	0.364	0.475	0.353	0.460
Li	4.14	4.26	4.14	4.26
Mn	0.142	0.158	0.142	0.158
Ni	0.021	0.022	0.021	0.022
Si	35.1	37.8	34.9	37.6
Sr	0.026	0.020	0.026	0.020
Zr	0.035	0.038	0.035	0.038
Ca	0.243	0.253	0.243	0.253
K	<.260	<.260	<.260	<.260
Mg	NA	NA	NA	NA
Na	15.2	15.7	15.2	15.7

Note: NA - elemental analysis not available.

TEST I
 DEIONIZED WATER EXPERIMENT
 DWPf GLASS (MONOLITH)
 RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 56

Analytical Result

SAMPLE ID	15	16
Start Experiment	7/28/83	7/28/83
Stop Interval	9/22/83	9/22/83
Initial pH	5.4	5.4
Final pH	7.3	7.3
Diff (pH)	1.9	1.9
Spec SA (mm ²)	450.	450.
Volume (g)	15.0	15.0
SA/V	0.3	0.3
Temp (°C)	90.0	90.0
Initial Weight(g)	99.17	98.73
Final Weight(g)	98.10	97.34
Weight Loss(g)	1.07	1.39
%Leach Loss	7.13%	9.27%
Initial Spec Wt(g)	0.9273	0.9305
Final Spec Wt(g)	0.9244	0.9278
Spec Wt Loss(g)	0.0029	0.0027

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Results		Corrected for Blank	
	15	16	C15	C16
Al	3.90	3.92	3.69	3.71
B	5.67	5.72	5.67	5.72
Fe	1.83	1.85	1.82	1.84
Li	6.49	6.45	6.49	6.45
Mn	0.441	0.457	0.441	0.457
Ni	0.048	0.047	0.048	0.047
Si	49.1	49.5	49.0	49.4
Sr	0.023	0.028	0.023	0.028
Zr	0.034	0.035	0.034	0.035
Ca	0.299	0.299	0.299	0.299
K	<.260	<.260	<.260	<.260
Mg	NA	NA	NA	NA
Na	23.8	23.6	23.8	23.6

Note: NA - elemental analysis not available.

Appendix B.
Test I: DWPF Glass—Deionized Water Experiment,
Crushed Samples

TEST - I
 DEIONIZED WATER EXPERIMENT
 DWPf GLASS (CRUSHED)

NO.	SA ₂ (cm ²)	INITIAL MASS(g)	SA/V	INTERVAL TIME(d)	TIME START	TIME STOP
1	20.01	0.2990	1.0	1	6/ 4/84	6/ 5/84
2	20.01	0.2990	1.0	3	6/ 1/84	6/ 4/84
3	20.01	0.2990	1.0	7	6/ 4/84	6/11/84
4	20.01	0.2990	1.0	14	"	6/18/84
5	20.01	0.2990	1.0	28	"	7/ 2/84
6	20.01	0.2990	1.0	28	"	"
9	6.025	0.0900	.3	3	6/24/84	6/27/84
10	6.025	0.0900	.3	7	6/20/84	"
11	6.360	0.0950	.3	14	6/24/84	7/ 8/84
12	6.025	0.0900	.3	28.9	6/20/84	7/19/84
13	6.025	0.0900	.3	61	"	8/20/84
14	10.04	0.1500	.5	3	6/24/84	6/27/84
15	10.04	0.1500	.5	7	6/20/84	"
16	10.37	0.1550	.5	14	6/24/84	7/ 8/84
17	10.04	0.1500	.5	28.9	6/20/84	7/19/84
18	10.04	0.1500	.5	61	"	8/20/84

TEST - I
 DEIONIZED WATER EXPERIMENT
 DWPf GLASS (CRUSHED)

NO.	WATER(g)	INITIAL WT.(g)	FINAL WT.(g)	LEACHANT LOSS(g) LOSS(%)		FINAL pH
1	20.0	99.29	99.22	0.07	0.35%	8.33
2	20.0	98.08	97.97	0.11	0.55%	10.05
3	20.0	99.26	99.11	0.15	0.75%	9.98
4	20.0	98.75	98.47	0.28	1.40%	9.49
5	20.0	99.83	99.31	0.52	2.60%	9.51
6	20.0	98.46	98.07	0.39	1.95%	10.00
9	20.0	97.09	96.98	0.11	0.55%	8.20
10	20.0	97.49	96.72	0.77	3.85%	9.25
11	20.0	98.20	97.91	0.29	1.45%	9.52
12	20.0	97.38	96.83	0.55	2.75%	9.74
13	20.0	98.33	97.30	1.03	5.15%	9.73
14	20.0	97.45	97.33	0.12	0.60%	9.73
15	20.0	99.32	99.15	0.17	0.85%	9.76
16	20.0	97.65	97.36	0.29	1.45%	9.91
17	20.0	97.01	96.49	0.52	2.60%	9.80
18	20.0	99.33	98.46	0.87	4.35%	9.84

TEST I
DEIONIZED WATER EXPERIMENT
DWPF GLASS (CRUSHED)
RAW DATA TABULATION - LEACHATE ANALYSIS
DAY 1
Analytical Results

SAMPLE ID	1
Start Experiment	6/4/84
Stop Interval	6/5/84
Initial pH	6.00
Final pH	8.33
Diff (pH)	2.33
Spec SA (mm ²)	2000.
Volume (ml)	20.0
SA/V	1.0
Temp (°C)	90.0
Initial Weight(g)	99.29
Final Weight(g)	99.22
Weight Loss(g)	0.07
%Leach Loss	0.35%
Initial Spec Wt(g)	0.2990
Final Spec Wt(g)	-
Spec Wt Loss(g)	-

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result	Corrected for Blank
	1	C1
Al	2.75	2.73
B	2.61	2.59
Fe	0.652	0.632
Li	2.79	2.79
Mn	0.175	0.173
Ni	0.039	0.038
Si	23.2	23.1
Sr	<0.002	<0.002
Zr	0.014	0.012
Cu	0.346	0.346
Mg	0.154	0.150
Na	10.7	10.3

TEST I

DEIONIZED WATER EXPERIMENT

DWPF GLASS (CRUSHED)

RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 3

Analytical Results

SAMPLE ID	9	14	2
Start Experiment	6/24/84	6/24/84	6/1/84
Stop Interval	6/27/84	6/27/84	6/11/84
Initial pH	6.0	6.0	6.0
Final pH	8.20	9.73	10.05
Diff (pH)	2.20	3.73	4.05
Spec SA (mm ²)	603.	1004.	2001.
Volume (ml)	20.0	20.0	20.0
SA/V	0.3	0.5	1.0
Temp (°C)	90.0	90.0	90.0
Initial Weight(g)	97.09	97.45	98.08
Final Weight(g)	96.98	97.33	97.97
Weight Loss(g)	0.11	0.12	0.11
%Leach Loss	0.55%	0.60%	0.55%
Initial Spec Wt(g)	0.0900	0.1500	0.2990
Final Spec Wt(g)	-	-	-
Spec Wt Loss(g)	-	-	-

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result			Corrected for Blank		
	9	14	2	C9	C14	C2
Al	2.34	2.95	4.37	2.32	2.93	4.35
B	2.31	3.10	4.44	2.29	3.08	4.42
Fe	0.888	0.820	1.37	0.868	0.800	1.35
Li	2.40	3.24	4.68	2.40	3.24	4.68
Mn	0.275	0.227	0.378	0.273	0.225	0.376
Ni	0.047	0.039	0.058	0.046	0.038	0.057
Si	21.0	27.3	38.4	20.9	27.2	38.3
Sr	0.015	0.012	<0.002	0.015	0.012	<0.002
Zr	0.053	0.050	0.083	0.051	0.048	0.081
Ca	0.289	0.191	0.293	0.289	0.191	0.293
Mg	0.074	0.051	0.117	0.070	0.047	0.113
Na	9.01	12.1	17.7	8.80	11.9	17.5

TEST I
 DEIONIZED WATER EXPERIMENT
 DMPF GLASS (CRUSHED)
 RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 7

Analytical Result

SAMPLE ID	10	15	3	-
Start Experiment	6/20/84	6/20/84	6/4/84	
Stop Interval	6/27/84	6/27/84	6/11/84	
Initial pH	6.00	6.00	6.00	
Final pH	9.25	9.76	9.98	
Diff (pH)	3.25	3.76	3.98	
Spec SA (mm ²)	603.	1004.	2001.	
Volume (g)	20.0	20.0	20.0	
SA/V	0.3	0.5	1.0	
Temp (°C)	90.0	90.0	90.0	
Initial Weight(g)	97.49	99.32	99.11	
Final Weight(g)	96.72	99.15	99.26	
Weight Loss(g)	0.77	0.17	0.15	
%Leach Loss	3.85%	0.85%	0.75%	
Initial Spec Wt(g)	0.0900	0.1500	0.2990	
Final Spec Wt(g)	-	-	-	
Spec Wt Loss(g)	-	-	-	

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result			Corrected for Blank		
	10	15	3	C10	C15	C3
Al	3.63	4.21	5.72	3.61	4.19	5.70
B	3.90	4.52	6.13	3.88	4.50	6.11
Fe	1.15	2.36	2.62	1.13	2.34	2.60
Li	4.09	4.77	6.49	4.09	4.77	6.49
Mn	0.300	0.619	0.637	0.298	0.617	0.635
Ni	0.045	0.095	0.084	0.044	0.094	0.083
Si	34.4	39.7	52.0	34.2	39.5	51.8
Sr	0.005	0.018	<.002	0.005	0.018	<.002
Zr	0.092	0.167	0.207	0.090	0.165	0.205
Ca	0.212	0.288	0.327	0.212	0.288	0.327
Mg	0.059	0.167	0.186	0.055	0.163	0.182
Na	15.2	17.7	24.5	15.0	17.5	24.3

TEST I
DEIONIZED WATER EXPERIMENT
DWPF GLASS (CRUSHED)
RAW DATA TABULATION - LEACHATE ANALYSIS
DAY 14

Analytical Results

SAMPLE ID	11	16	4
Start Experiment	6/24/84	6/24/84	6/4/84
Stop Interval	7/8/84	7/8/84	6/18/84
Initial pH	6.00	6.00	6.00
Final pH	9.52	9.90	9.99
Diff (pH)	3.52	3.90	3.99
Spec SA (mm ²)	636.	1037.	2001.
Volume (g)	20.0	20.0	20.0
SA/V	0.3	0.5	1.0
Temp (°C)	90.0	90.0	90.0
Initial Weight(g)	98.20	97.65	98.75
Final Weight(g)	97.91	97.36	98.47
Weight Loss(g)	0.29	0.29	0.28
%Leach Loss	1.45%	1.45%	1.40%
Initial Spec Wt(g)	0.0950	0.1550	0.2990
Final Spec Wt(g)	-	-	-
Spec Wt Loss(g)	-	-	-

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result			Corrected for Blank		
	11	16	4	C11	C16	C4
Al	4.24	5.28	6.21	4.22	5.26	6.19
B	4.80	6.01	7.23	4.78	5.99	7.21
Fe	1.69	3.07	3.17	1.67	3.05	3.15
Li	4.99	6.29	7.57	4.99	6.29	7.57
Mn	0.422	0.736	0.715	0.420	0.734	0.713
Ni	0.049	0.081	0.055	0.048	0.080	0.054
Si	41.3	51.1	59.7	41.1	50.9	59.5
Sr	0.013	0.020	0.008	0.013	0.020	0.008
Zr	0.129	0.223	0.259	0.127	0.221	0.257
Ca	0.232	0.348	0.346	0.232	0.348	0.346
Mg	0.093	0.198	0.206	0.089	0.194	0.202
Na	18.6	23.4	29.0	18.4	23.2	28.8

TEST I

DEIONIZED WATER EXPERIMENT

DWPF GLASS (CRUSHED)

RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 28

Analytical Results

SAMPLE ID	12	17	5	6
Start Experiment	6/20/84	6/20/84	6/4/84	6/4/84
Stop Interval	7/19/84	7/19/84	7/2/84	7/2/84
Initial pH	6.00	6.00	6.00	6.00
Final pH	9.74	9.80	9.51	10.00
Diff (pH)	3.74	3.80	3.51	4.00
Spec SA (mm ²)	603.	1004.	2001.	2001.
Volume (g)	20.0	20.0	20.0	20.0
SA/V	0.3	0.5	1.0	1.0
Temp (°C)	90.0	90.0	90.0	90.0
Initial Weight(g)	97.38	97.01	99.83	98.46
Final Weight(g)	96.83	96.49	99.31	98.07
Weight Loss(g)	0.55	0.52	0.52	0.39
%Leach Loss	2.75%	2.60%	2.60%	1.95%
Initial Spec Wt(g)	0.0900	0.1500	0.2990	0.2990
Final Spec Wt(g)	-	-	-	-
Spec Wt Loss(g)	-	-	-	-

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result				Corrected for Blank			
	12	17	5	6	C12	C17	C5	C6
Al	5.39	5.73	7.08	6.97	5.37	5.71	7.06	6.95
B	6.10	6.74	8.99	8.73	6.08	6.72	8.97	8.71
Fe	3.76	3.58	5.33	4.83	3.74	3.56	5.31	4.81
Li	6.49	7.23	9.34	9.20	6.49	7.23	9.34	9.20
Mn	0.918	0.842	1.21	1.13	0.916	0.840	1.21	1.13
Ni	0.078	0.068	0.098	0.106	0.077	0.067	0.097	0.105
Si	52.6	57.1	73.8	71.0	52.4	56.9	73.6	70.8
Sr	0.033	0.033	0.042	0.029	0.033	0.033	0.042	0.029
Zr	NA	NA	0.326	0.325	NA	NA	0.324	0.323
Ca	0.490	0.466	0.504	0.463	0.490	0.466	0.504	0.463
Mg	0.265	0.234	0.313	0.273	0.261	0.230	0.309	0.269
Na	24.7	27.5	34.9	34.1	24.5	27.3	34.7	33.9

Note: NA - elemental analysis not available.

TEST I
 DEIONIZED WATER EXPERIMENT
 DWPF GLASS (CRUSHED)
 RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 61

Analytical Results

SAMPLE ID	13	18
Start Experiment	6/20/84	6/20/84
Stop Interval	8/20/84	8/20/84
Initial pH	6.00	6.00
Final pH	9.73	9.84
Diff (pH)	3.73	3.84
Spec SA (mm ²)	603.	1004.
Volume (g)	20.0	20.0
SA/V	0.3	0.5
Temp (°C)	90.0	90.0
Initial Weight(g)	98.33	99.33
Final Weight(g)	97.30	98.46
Weight Loss(g)	1.03	0.87
%Leach Loss	5.15%	4.35%
Initial Spec Wt(g)	0.0900	0.1500
Final Spec Wt(g)	-	-
Spec Wt Loss(g)	-	-

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result		Corrected for Blank	
	13	18	C13	C18
Al	5.38	6.06	5.36	6.04
B	7.02	8.09	7.00	8.07
Fe	3.82	3.79	3.82	3.79
Li	7.13	8.27	7.13	8.27
Mn	0.985	0.828	0.983	0.826
Ni	0.079	0.064	0.078	0.063
Si	59.4	66.4	59.2	66.2
Sr	0.050	0.044	0.050	0.044
Zr	0.250	0.280	0.248	0.278
Ca	0.523	0.488	0.523	0.488
Mg	0.254	0.209	0.250	0.205
Na	26.8	30.9	26.6	30.7

Appendix C.
Test II: DWPF Glass—J-13 Water Experiment,
Monolith Samples

TEST II
 J-13 WATER EXPERIMENT
 DWPF GLASS (MONOLITH)

NO.	GLASS	SA ₂ (mm ²)	INITIAL MASS(g)	FINAL MASS(g)	MASS LOSS(g)	SA/V TIME(d)	INTERVAL TIME(d)	TIME START	TIME STOP
1	3	411.	2.1378	2.1377	0.0001	.3	3	2/28/84	3/2/84
2	4	403.	1.3516	1.3512	0.0004	.3	7	"	3/6
3	6	402.	1.0858	1.0862	0.0004+	.3	14	"	3/13
4	8	404.	1.2905	1.2904	0.0001	.3	28	"	3/29
5	13	399.	1.3628	1.3629	0.0001+	.3	28	"	3/29
6	18/19	402.	0.9273	0.9275	0.0002+	.3	56	"	4/26
7	2	612.	2.4224	2.4224	0.0000	.5	3	"	3/2
8	11	605.	2.2957	2.2953	0.0004	.5	7	"	3/6
9	12	611.	2.5058	2.5058	0.0000	.5	14	"	3/19
10	9	605.	2.6077	2.6080	0.0003+	.5	28	"	3/29
11	7a/15	584.	2.1626	2.1628	0.0002+	.5	28	"	3/29
12	17/20	574.	1.5234	1.5236	0.0002+	.5	56	"	4/26
13	blank						3	"	3/2
14	blank						7	"	3/6
15	blank						14	"	3/13
16	blank						28	"	3/29
17	blank						28	"	3/29
18	blank						56	2/28/84	4/26

TEST II

J-13 WATER EXPERIMENT

DWPF GLASS (MONOLITH)

NO.	J-13(g)	INITIAL WT.(g)	FINAL WT.(g)	LEACHANT		FINAL pH
				LOSS(g)	LOSS(%)	
1	13.70	98.35	98.25	0.10	0.73%	9.17
2	13.43	96.30	95.93	0.37	2.76%	9.21
3	13.39	97.21	96.96	0.25	1.87%	9.18
4	13.46	97.41	96.91	0.50	3.71%	9.48
5	13.46	97.90	97.33	0.57	4.23%	9.41
6	13.41	97.36	96.37	0.99	7.38%	9.43
7	12.25	97.21	97.07	0.14	1.14%	9.21
8	12.09	96.97	96.62	0.35	2.89%	9.32
9	12.22	96.79	96.47	0.17	2.62%	9.44
10	12.11	97.60	96.83	0.77	6.36%	9.64
11	11.67	95.98	95.46	0.52	4.53%	9.35
12	11.48	95.51	94.40	1.11	9.67%	9.51
13	10.00	88.66	88.53	0.13	1.30%	9.17
14	10.00	88.83	88.61	0.22	2.20%	9.31
15	10.00	88.70	88.25	0.45	4.50%	9.60
16	10.00	88.62	87.89	0.73	7.30%	9.50
17	10.00	88.77	88.21	0.56	5.60%	9.41
18	10.00	88.82	87.51	1.31	13.10%	9.54

TEST II

J-13 WATER EXPERIMENT

DWPF GLASS (MONOLITH)

DAY 3 - ICP Analysis

ELEM	DET. LIM.	SAMPLE		
		<u>SA/V=0.3</u>	<u>0.5</u>	<u>BLANK</u>
		1	7	13
Al	.012	.888	.874	.804
B	.024	.196(.21)	.258(.10)	.193(.19)
Fe	.003	.255	.475	.028
Li	.002	.048(.056)	.581(.57)	.048(.40)
Mn	.0003	.019	.034	.003
Ni	.008	.043	.011	.007
Si	.020	40.3	40.5	40.2
Sr	.016	0.052	0.053	0.049
Zr	.002	NA	NA	NA
Ca	.004	12.5	12.3	12.5
K	.820	26.2	16.3	17.0
Mg	.001	.148	.207	.157
Na	.028	47.9	47.7	47.6

Note: - Values in parentheses were analyzed on a different system.
 NA - elemental analysis not available.

TEST II

J-13 WATER EXPERIMENT

DWPF GLASS (MONOLITH)

DAY 7- Icp Analysis

		SAMPLES		
		<u>SA/V=0.3</u>	<u>0.5</u>	<u>BLANK</u>
ELEM	DET. LIM.	2	8	14
Al	.012	.832	.986	.795
B	.024	.232(.24)	.223(.22)	.195(.20)
Fe	.003	.283	.068	.028
Li	.002	.278(.28)	.438(.44)	.049(.07)
Mn	.0003	.042	.016	.002
Ni	.008	.058	.009	0.002
Si	.020	40.1	40.9	39.9
Sr	.016	.051	.049	0.045
Zr	.002	NA	NA	NA
Ca	.004	12.4	12.4	12.8
K	.820	13.7	13.6	13.4
Mg	.001	0.175	0.154	0.152
Na	.028	48.2	48.5	48.8

Note: Values in parentheses were analyzed on a different system.
 NA - elemental analysis not available.

TEST II

J-13 WATER EXPERIMENT

DMPF GLASS (MONOLITH)

DAY 14- Icp Analysis

ELEM	DET. LIM.	SAMPLES		BLANK
		SA/V=0.3	0.5	
		3	9	15
Al	.012	.989	.809	.832
B	.024	.240	.232	.195
Fe	.003	.201	.135	.066
Li	.002	.358	.406	.046
Mn	.0003	.030	.023	.004
Ni	.008	.023	.018	.011
Si	.020	35.0	36.2	36.5
Sr	.016	.109	.108	.114
Zr	.002	NA	NA	NA
Ca	.004	10.5	10.5	10.9
K	.820	13.2	12.8	13.1
Mg	.001	.137	.123	.131
Na	.028	43.2	42.9	42.6

Note: NA - elemental analysis not available.

TEST II
 J-13 WATER EXPERIMENT
 DWPF GLASS (MONOLITH)
 DAY 28- Icp Analysis

ELEM	SAMPLES				BLANKS	
	SA/V=0.3	SA/V=0.3	SA/V=0.5	SA/V=0.5	16	17
Al	.492	.518	.467	.709	.550	.699
B	.304(.30)	.261(.26)	.546(.49)	.235(.22)	.208(.20)	.212(.1
Fe	.027	.039	4.92	.022	.029	.505
Li	.521(.52)	.499(.50)	.989	.361	.052(.06)	.052(.0
Mn	.002	<.002	.004	<.002	<.002	.010
Ni	<.008	<.008	<.008	<.008	<.008	<.008
Si	36.7	38.6	37.2	37.2	38.6	38.5
Sr	.057	.060	.050	.061	.057	.054
Zr	NA	NA	NA	NA	NA	NA
Ca	10.7	8.01	7.41	5.95	5.65	7.06
K	24.2	18.3	14.0	16.7	13.0	12.6
Mg	.038	.049	.029	.030	.028	.161
Na	51.5	53.3	54.8	51.5	51.5	52.0

Note: The values in parentheses were analyzed on a different system
 NA - elemental analysis not available.

TEST II

J-13 WATER EXPERIMENT

DWPF GLASS (MONOLITH)

DAY 56- Icp Analysis

		SAMPLES		
		<u>SA/V=0.3</u>	<u>0.5</u>	<u>BLANK</u>
<u>ELEM</u>	<u>DET LIM</u>	<u>6</u>	<u>12</u>	<u>18</u>
Al	.012	1.14	1.09	1.15
B	.024	.489	.517	.230
Fe	.003	.573	.317	.857
Li	.002	.965	1.36	.053
Mn	.0003	.121	.098	.005
Ni	.008	.027	.019	.003
Si	.020	45.0	45.8	45.6
Sr	.016	.026	.028	.025
Zr	.002	.009	.008	<.002
Ca	.004	10.4	12.3	14.8
K	.820	25.9	16.1	18.7
Mg	.001	.130	.113	.179
Na	.028	58.1	60.4	59.1

TEST II

J-13 WATER EXPERIMENT

DWPF GLASS (MONOLITH)

RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 3

Analytical Result

SAMPLE ID	1	7	-
Start Experiment	2/28/84	2/28/84	
Stop Interval	3/2/84	3/2/84	
Initial pH	8.78	8.78	
Final pH	9.17	9.21	
Diff (pH)	0.39	0.43	
Spec SA (mm ²)	411.	612.	
Volume(g)	13.70	12.25	
SA/V	0.3	0.5	
Temp (°C)	90.0	90.0	
Initial Weight(g)	98.35	97.21	
Final Weight(g)	98.25	97.07	
Weight Loss(g)	0.10	0.14	
%Leach Loss	0.73%	1.14%	
Initial Spec Wt(g)	2.1378	2.4224	
Final Spec Wt(g)	2.1377	2.4224	
Spec Wt Loss(g)	0.0001	0.0000	

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result			Corrected for Blank	
	1	7	-	C1	C7
Al	0.888	0.874		0.084	0.070
B	0.196	0.258		0.003	0.065
Fe	0.255	0.475		0.227	0.447
Li	0.048	0.581		0.000	0.533
Mn	0.019	0.034		0.016	0.031
Ni	0.043	0.011		0.036	0.004
Si	40.3	40.5		0.1	0.3
Sr	0.052	0.053		0.003	0.004
Zr	NA	NA		NA	NA
Ca	12.5	12.3		0.0	-0.2
K	26.2	16.3		9.2	-0.7
Mg	0.148	0.207		-0.009	0.050
Na	47.9	47.7		0.3	0.1

Note: NA - elemental analysis not available.

TEST II
 J-13 WATER EXPERIMENT
 DWPF GLASS (MONOLITH)
 RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 7

Analytical Result

SAMPLE ID	2	8	-
Start Experiment	2/28/84	2/28/84	
Stop Interval	3/6/84	3/6/84	
Initial pH	8.78	8.78	
Final pH	9.21	9.32	
Diff (pH)	0.43	0.54	
Spec SA (mm ²)	403.	605.	
Volume (g)	13.43	12.09	
SA/V	0.3	0.5	
Temp (°C)	90.0	90.0	
Initial Weight(g)	96.30	96.97	
Final Weight(g)	95.93	96.62	
Weight Loss(g)	0.37	0.35	
%Leach Loss	2.76%	2.89%	
Initial Spec Wt(g)	1.3516	2.2957	
Final Spec Wt(g)	1.3512	2.2953	
Spec Wt Loss(g)	0.0004	0.0004	

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result			Corrected for Blank	
	2	8	-	C2	C8
Al	0.832	0.986		0.037	0.191
B	0.232	0.223		0.037	0.028
Fe	0.283	0.068		0.255	0.040
Li	0.278	0.438		0.229	0.389
Mn	0.042	0.016		0.040	0.014
Ni	0.058	0.009		0.056	0.007
Si	40.1	40.9		0.2	1.0
Sr	0.051	0.049		0.006	0.004
Zr	NA	NA		NA	NA
Ca	12.4	12.4		-0.4	-0.4
K	13.7	13.6		0.3	0.2
Mg	0.175	0.154		0.023	0.002
Na	48.2	48.5		-0.6	-0.3

Note: NA - elemental analysis not available.

TEST II
 J-13 WATER EXPERIMENT
 DWPF GLASS (MONOLITH)
 RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 14

Analytical Result

SAMPLE ID	3	9	-
Start Experiment	2/28/84	2/28/84	
Stop Interval	3/13/84	3/13/84	
Initial pH	8.78	8.78	
Final pH	9.18	9.44	
Diff (pH)	0.40	0.66	
Spec SA (mm ²)	402.	611.	
Volume (g)	13.39	12.22	
SA/V	0.3	0.5	
Temp (°C)	90.0	90.0	
Initial Weight(g)	97.21	96.79	
Final Weight(g)	96.96	96.47	
Weight Loss(g)	0.25	0.17	
%Leach Loss	1.87	2.62	
Initial Spec Wt(g)	1.0858	2.5058	
Final Spec Wt(g)	1.0862	2.5058	
Spec Wt Loss(g)	+0.0004	0.0000	

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result			Corrected for Blank	
	3	9	-	C3	C9
Al	0.989	0.809		0.157	-0.023
B	0.240	0.232		0.045	0.037
Fe	0.201	0.135		0.135	0.069
Li	0.358	0.406		0.312	0.360
Mn	0.030	0.023		0.026	0.019
Ni	0.023	0.018		0.012	0.007
Si	35.0	36.2		-1.5	-.3
Sr	0.109	0.108		-.005	-.006
Zr	NA	NA		NA	NA
Ca	10.5	10.5		-.4	-.4
K	13.2	12.8		0.1	-0.33
Mg	0.137	0.123		0.006	-.008
Na	43.2	42.9		0.6	0.3

Note: NA - elemental analysis not available.

TEST II

J-13 WATER EXPERIMENT

DWPF GLASS (MONOLITH)

RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 28 (PAGE 1)

Analytical Result

SAMPLE ID	4	5
Start Experiment	2/28/84	2/28/84
Stop Interval	3/29/84	3/29/84
Initial pH	8.78	8.78
Final pH	9.48	9.41
Diff (pH)	0.70	0.63
Spec SA (mm ²)	404.	399.
Volume (g)	13.46	13.46
SA/V	0.3	0.3
Temp (°C)	90.0	90.0
Initial Weight(g)	97.41	97.90
Final Weight(g)	96.91	97.33
Weight Loss(g)	0.50	0.57
%Leach Loss	3.71	4.23
Initial Spec Wt(g)	1.2905	1.3628
Final Spec Wt(g)	1.2904	1.3629
Spec Wt Loss(g)	0.0001	+0.0001

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result		Corrected for Blank	
	4	5	C04	C05
Al	0.492	0.518	-0.133	-0.107
B	0.304	0.261	0.094	0.051
Fe	0.027	0.039	-0.240	-0.228
Li	0.521	0.499	0.469	0.447
Mn	0.002	<0.002	0.002	<.002
Ni	<.008	<.008	<.008	<.008
Si	36.7	38.6	-1.85	0.05
Sr	0.057	0.060	0.001	0.004
Zr	NA	NA	NA	NA
Ca	10.7	8.01	4.35	1.66
K	24.2	18.3	11.4	5.5
Mg	0.038	0.049	-0.056	0.046
Na	51.5	53.3	-0.25	1.55

Note: NA - elemental analysis not available.

TEST II
 J-13 WATER EXPERIMENT
 DWPF GLASS (MONOLITH)
 RAW DATA TABULATION - LEACHATE ANALYSIS
 DAY 28 (PAGE 2)

Analytical Result

SAMPLE ID	10	11
Start Experiment	2/28/84	2/28/84
Stop Interval	3/29/84	3/29/84
Initial pH	8.78	8.78
Final pH	9.64	9.35
Diff (pH)	0.86	0.57
Spec SA (mm ²)	605.	584.
Volume (g)	12.11	11.67
SA/V	0.5	0.5
Temp (°C)	90.C	90.0
Initial Weight(g)	97.60	95.98
Final Weight(g)	96.83	95.46
Weight Loss(g)	0.77	0.52
%Leach Loss	6.36	4.53
Initial Spec Wt(g)	2.6077	2.1626
Final Spec Wt(g)	2.6080	2.1628
Spec Wt Loss	+0.0003	+0.0002

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result		Corrected for Blank	
	10	11	C10	C11
A)	0.467	0.709	-0.158	0.085
B	0.546	0.235	0.336	0.025
Fe	4.92	0.022	4.65	-0.25
Li	0.989	0.361	0.937	0.309
Mn	0.004	<0.002	0.004	<.002
Ni	<0.008	<0.008	<.008	<.008
Si	37.2	37.2	-1.35	-1.35
Sr	0.050	0.061	0.001	0.004
Zr	NA	NA	NA	NA
Ca	7.41	5.95	1.06	-0.41
K	14.0	16.7	1.2	3.9
Hg	0.029	0.030	-0.066	-0.065
Na	54.8	51.5	3.05	-0.25

Note: NA - elemental analysis not available.

TEST II

J-13 WATER EXPERIMENT

DWPF GLASS (MONOLITH)

RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 56

Analytical Result

SAMPLE ID	6	12
Start Experiment	2/28/84	2/28/84
Initial pH	8.78	8.78
Final pH	9.43	9.51
Diff (pH)	0.65	0.73
Stop Interval	4/26/84	4/26/84
Spec SA (mm ²)	402.	574.
Volume (g)	13.41	11.48
SA/V	0.3	0.5
Temp (°C)	90.0	90.0
Initial Weight(g)	97.36	95.51
Final Weight(g)	96.37	94.40
Weight Loss(g)	0.99	1.11
%Leach Loss	7.38	9.67
Initial Spec Wt(g)	0.9273	1.5234
Final Spec Wt(g)	0.9275	1.5236
Spec Wt Loss(g)	+0.0002	+0.0002

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result		Corrected for Blank	
	6	12	--	C6 C12
Al	1.14	1.09	-.01	-.06
B	0.489	0.517	0.259	0.287
Fe	0.573	0.317	-.284	-.540
Li	0.965	1.36	0.912	1.31
Mn	0.121	0.098	0.116	0.093
Ni	0.027	0.019	0.024	0.016
Si	45.0	45.8	-.6	-.2
Sr	0.026	0.028	0.001	0.003
Zr	0.009	0.008	0.009	0.008
Ca	10.4	12.3	-4.4	-2.5
K	25.9	16.1	7.2	-2.6
Mg	0.130	0.113	-.049	-.066
Na	58.1	60.4	-1.0	1.3

Appendix D.
Test III: DWPF Glass—J-13 Water + Tuff Experiment,
Monolith Samples

TEST III

J-13 WATER EXPERIMENT WITH TUFF

DWPF GLASS (MONDLITH)

NO.	GLASS (#)	S.A. (mm ²)	INITIAL WT(g)	FINAL WT(g)	MASS LOSS(g)	SA/V	INTERVAL TIME(d)	TIME START	TIME STOP
5	8	298	0.4094	0.4095	+0.0001	0.1	7.	11/14/83	11/21/83
6	5	252	0.6230	0.6230	0.0000	0.1	14.	"	11/28/83
1	134	212	0.3920	0.3919	0.0001	0.1	28.	"	12/12/83
7	4	305	0.8025	0.8024	0.0001	0.1	28.	"	12/12/83
8	2	355	0.9009	0.9001	0.0008	0.1	56.	"	1/17/84
9	3/6	501	1.1174	1.1174	0.0000	0.3	7.	"	11/21/83
10	1	614	1.9387	1.9387	0.0000	0.3	14.	"	11/28/83
2	135/137	421	0.7913	0.7911	0.0002	0.3	28.	"	"
3	138/142	423	0.7003	0.7003	0.0000	0.3	28.	"	"
11	11/12	416	0.9776	0.9774	0.0002	0.3	28.	"	12/12/83
12	9/10	422	0.9784	0.9785	+0.0001	0.3	56.	"	1/17/84
24	5a	296	0.7766	0.7767	+0.0001	0.3	91.	2/08/84	5/09/84
25	7b	299	0.7381	0.7381	0.0000	0.3	91.	"	"
26	5b	279	0.6269	0.6266	0.0003	0.3	182.	"	8/08/84
22	BLANK						7.	1/19/84	1/21/84
18	BLANK						14.	"	1/18/84
19	BLANK						28.	"	2/ 1/84
20	BLANK						28.	"	2/ 1/84
21	BLANK						56.	"	2/29/84
27	BLANK						91.	2/08/84	5/09/84
28	BLANK						182.	2/08/84	8/ 8/84

TEST III
 J-13 WATER EXPERIMENT WITH TUFF
 DMPF GLASS (MONOLITH)

NO.	J-13. WT(g)	INITIAL WEIGHT	FINAL WEIGHT	LEACHANT LOSS(G) LOSS(%)		FINAL PH	ROCK WT(g)
5	29.80	115.11	114.05	1.06	3.93	9.21	1.490
6	25.20	110.25	109.51	0.74	3.30	9.04	1.260
1	21.00	105.85	104.99	0.86	4.35	9.26	1.050
7	30.50	116.15	114.85	1.30	4.70	9.25	1.525
8	35.50	121.56	119.63	1.93	6.20	9.25	1.775
9	16.70	100.50	99.82	0.68	7.14	9.08	0.835
10	20.50	106.99	105.60	1.39	8.01	9.37	1.025
2	14.01	97.40	95.90	1.50	13.03	9.40	0.700
3	14.10	98.23	95.29	2.94	29.35	9.50	0.705
11	13.90	97.79	97.06	0.73	6.19	9.22	0.700
12	14.10	97.83	88.74	9.09	9.52	9.55	0.705
24	9.87	110.11	109.78	0.33	3.46	9.26	0.495
25	9.63	109.80	109.45	0.35	3.63	9.30	0.500
26	9.28	109.71	109.14	0.57	6.18	9.30	0.465
22	19.88	99.56	99.35	0.21	1.11	9.02	1.000
18	20.01	99.71	97.94	1.77	10.69	9.35	1.000
19	19.99	99.56	97.10	2.46	14.95	9.77	1.000
20	20.00	99.84	97.96	0.88	4.98	9.75	1.000
21	20.00	99.66	98.26	1.04	5.94	9.55	1.000
27	20.00	117.68	117.34	0.34	1.73	8.75	1.000
28	20.00	118.21	118.11	0.10	1.00	8.44	1.000

TEST - III

J-13 WATER EXPERIMENT WITH TUFF

DWPF GLASS (MONOLITH)

DAY 7 - ICP Analysis

		SAMPLES		
		<u>SA/V=0.3</u>	<u>0.5</u>	<u>BLANK</u>
<u>ELEM</u>	<u>DET. LIM.</u>	<u>5</u>	<u>9</u>	<u>22</u>
Al	.020	1.27	2.17	1.27
B	.020	0.202	0.223	0.178
Fe	.004	0.698	0.167	0.079
Li	.001	0.130	0.285	0.045
Mn	.0005	0.005	0.013	0.005
Ni	.008	0.052	0.010	0.011
Si	.008	45.8	48.7	39.7
Sr	.012	0.061	0.059	0.056
Zr	.002	NA	NA	NA
Ca	.020	10.3	11.1	11.7
K	.536	12.5	13.8	13.3
Mg	.004	0.062	0.083	0.104
Na	.024	52.1	54.6	50.1

NOTE: Detection limit is 4 times the standard deviation of the blank.

Results are in micrograms per milliliter (or ppm).

NA - elemental analysis not available.

TEST - III

J-13 WATER EXPERIMENT WITH TUFF

DWPf GLASS (MONOLITH)

DAY 14 - ICP Analysis

ELEM	DET. LIM.	SAMPLES		BLANK
		SA/V=0.3	0.5	
		6	10	18
Al	.020	1.13	1.14	.936
B	.020	.218	.280	.201
Fe	.004	.146	.317	.060
Li	.001	.149	.448	.048
Mn	.0005	.004	.004	.002
Ni	.008	.017	.024	.004
Si	.008	46.3	52.5	51.0
Sr	.012	.058	.052	.033
Zr	.002	NA	NA	NA
Ca	.020	8.88	8.53	9.22
K	.536	14.1	13.0	12.1
Mg	.0004	.033	.022	.034
Na	.024	51.7	54.5	56.1

Note: NA - elemental analysis not available.

TEST - III

J-13 WATER EXPERIMENT WITH TUFF

DWPF GLASS (MONOLITH)

DAY 28 - ICP Analysis

ELEM	DET LIM	SAMPLES					BLANKS	
		SA/V= 0.1	0.3	0.3	0.1	0.3	19	20
		1	2	3	7	11		
Al	.020	1.51	4.25	.960	.933	.932	1.25	3.10
B	.020	.206	.244	.333	.219	.251	0.209	0.205
Fe	.004	.112	.311	.088	.479	.387	0.080	0.185
Li	.001	.155	.394	.406	.208	.499	0.051	0.049
Mn	.0005	.007	.024	.006	.002	.005	0.006	0.017
Ni	.008	.012	.033	.014	.020	.021	0.009	0.038
Si	.008	46.5	61.5	63.4	48.1	48.4	58.9	59.2
Sr	.012	0.055	0.057	0.058	0.037	0.035	0.034	0.042
Zr	.002	NA	NA	NA	NA	NA	NA	NA
Ca	.020	8.03	8.99	9.67	7.68	7.39	8.46	8.37
K	.536	12.2	14.7	13.3	11.5	11.5	16.8	14.7
Mg	.004	.053	.080	.030	.023	.027	0.047	0.083
Na	.024	52.0	59.0	65.0	54.0	55.1	59.6	56.2

Note: NA - elemental analysis not available.

TEST - III

J-13 WATER EXPERIMENT WITH TUFF

DWPF GLASS (MONOLITH)

DAY 56 - ICP Analysis

ELEM	DET LIM	SAMPLES		BLANK
		SA/V=0.1	0.3	
		8	12 ⁽¹⁾	21
Al	.020	0.783	0.190	2.55
B	.020	0.222	0.705	0.211
Fe	.004	0.039	0.210	0.177
Li	.001	0.260	1.68	0.050
Mn	.0005	0.002	0.003	0.014
Ni	.008	<.008	<.008	0.009
Si	.008	50.0	101.	57.6
Sr	.012	0.024	0.072	0.031
Zr	.002	<.002	<.002	<.002
Ca	.020	6.54	16.6	6.91
K	.536	10.9	25.0	14.6
Mg	.004	0.035	0.087	0.077
Na	.024	55.5	150.	56.3

Note: (1) Leachant lost >10%.

TEST - III

J-13 WATER EXPERIMENT WITH TUFF

DWPF GLASS (MONOLITH)

DAY 91 - ICP Analysis

		SAMPLES		
		<u>SA/V=0.3</u>	<u>0.3</u>	<u>BLANK</u>
<u>ELEM</u>	<u>DET LIM</u>	<u>24</u>	<u>25</u>	<u>27</u>
Al	.012	.486	.509	.129
B	.024	.285	.291	.211
Fe	.003	<.003	<.003	<.003
Li	.002	.802	.886	.053
Mn	.0003	<.0003	<.0003	<.0003
Ni	.008	<.008	<.008	<.008
Si	.020	56.2	57.2	52.5
Sr	.016	.022	<.016	.020
Zr	.002	<.002	<.002	<.002
Ca	.004	7.09	4.92	5.68
K	.820	15.9	22.9	20.2
Mg	.001	.028	.012	.017
Na	.028	63.8	64.0	58.0

TEST - III

J-13 WATER EXPERIMENT WITH TUFF

DWPF GLASS (MONOLITH)

DAY 182 - ICP Analysis

ELEM	DET LIM	SAMPLE	
		<u>SA/V=0.3</u>	<u>BLANK</u>
		26	28
Al	.012	.839	.412
B	.024	.396	.215
Fe	.003	.122	.062
Li	.002	1.13	.054
Mn	.0003	.002	.004
Ni	.008	.015	.018
Si	.020	57.4	47.7
Sr	.016	.037	.073
Zr	.002	<.002	<.002
Ca	.004	6.62	13.4
K	.820	17.5	22.5
Mg	.001	.069	.456
Na	.028	57.6	53.4

TEST III

J-13 WATER EXPERIMENT WITH TUFF

DWPF GLASS (MONOLITH)

RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 7

Analytical Result

SAMPLE ID	5	9	-
Start Experiment	11/14/83	11/14/83	
Stop Interval	11/21/83	11/21/83	
Initial pH	7.23	7.23	
Final pH	9.21	9.08	
Diff (pH)	1.98	1.85	
Spec SA (mm ²)	298.	501.	
Volume (g)	29.80	16.70	
SA/V	0.1	0.3	
Temp (°C)	90.0	90.0	
Initial Weight(g)	115.11	100.50	
Final Weight(g)	114.05	99.82	
Weight Loss(g)	1.06	0.68	
%Leach Loss	3.56	4.07	
Initial Spec Wt(g)	0.4094	1.1174	
Final Spec Wt(g)	0.4095	1.1174	
Spec Wt Loss(g)	+0.0001	0.0000	
Rock Weight(g)	1.490	0.835	

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result			Corrected for Blank	
	5	9	-	C5	C9
Al	1.27	2.17		0.00	0.90
B	0.202	0.223		0.024	0.045
Fe	0.698	0.167		0.619	0.088
Li	0.130	0.285		0.085	0.240
Mn	0.005	0.013		0.000	.008
Ni	0.052	0.010		0.041	-.001
Si	45.8	48.7		6.1	9.0
Sr	0.061	0.059		0.005	0.003
Zr	NA	NA		NA	NA
Ca	10.3	11.1		-1.4	-0.6
K	12.5	13.8		-0.008	0.005
Mg	0.062	0.083		-.042	-.021
Na	52.1	54.6		2.0	4.5

Note: NA - elemental analysis not available.

TEST III
 J-13 WATER EXPERIMENT WITH TUFF
 DWPF GLASS (MONOLITH)
 RAW DATA TABULATION - LEACHATE ANALYSIS
 DAY 14

Analytical Result

SPEC ID	6	10	-
Start Experiment	11/14/83	11/14/83	
Stop Interval	11/28/83	11/28/83	
Initial pH	7.23	7.23	
Final pH	9.04	9.37	
Diff (pH)	1.81	2.14	
Spec SA (mm ²)	252.	614.	
Volume (g)	25.20	20.50	
SA/V	0.1	0.3	
Temp (°C)	90.0	90.0	
Initial Weight(g)	110.25	106.99	
Final Weight(g)	109.51	105.60	
Weight Loss(g)	0.74	1.39	
%Leach Loss	2.94	6.78	
Initial Spec Wt(g)	0.6230	1.9387	
Final Spec Wt(g)	0.6230	1.9385	
Spec Wt Loss(g)	0.0000	0.0002	
Rock Weight(g)	1.260	1.025	

CONSTITUENT ANALYSIS(mg/liter)

SPEC ID	Analytical Result			Corrected for Blank	
	6	10	-	C6	C10
Al	1.13	1.14		0.194	0.204
B	0.218	0.280		0.017	0.079
Fe	0.146	0.317		0.086	0.257
Li	0.149	0.448		0.101	0.400
Mn	0.004	0.004		0.002	0.002
Ni	0.017	0.024		0.013	0.020
Si	46.3	52.5		-4.7	1.5
Sr	0.058	0.052		0.019	0.013
Zr	NA	NA		NA	NA
Ca	8.88	8.53		-.34	-.69
K	14.1	13.0		2.0	0.9
Mg	0.033	0.022		-.001	-.012
Na	51.7	54.5		-4.4	-1.6

Note: NA - elemental analysis not available.

TEST III

J-13 WATER EXPERIMENT WITH TUFF

DWPF GLASS (MONOLITH)

RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 28 (PAGE 1)

Analytical Result

SAMPLE ID	1	7
Start Experiment	11/14/83	11/14/83
Stop Interval	12/12/83	12/12/83
Initial pH	7.23	7.23
Final pH	9.26	9.25
Diff (pH)	2.03	2.02
Spec SA (mm ²)	212.	305.
Volume (g)	21.00	30.50
SA/V	0.1	0.1
Temp (°C)	90.0	90.0
Initial Weight(g)	105.85	116.15
Final Weight(g)	104.99	114.85
Weight Loss(g)	0.86	1.30
%Leach Loss	4.10	4.26
Initial Spec Wt(g)	0.3920	0.8025
Final Spec Wt(g)	0.3919	0.8024
Spec Wt Loss(g)	0.0001	0.0001
Rock Weight(g)	1.050	1.525

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result		Corrected for Blank	
	1	7	C01	C07
Al	1.51	0.933	-.665	-1.242
B	0.206	0.219	-.001	.012
Fe	0.112	0.479	-.021	0.346
Li	0.155	0.208	0.105	0.158
Mn	0.007	0.002	-.005	-.010
Ni	0.012	0.020	-.012	-.004
Si	46.5	48.1	-12.6	-11.1
Sr	0.055	0.037	0.017	-.001
Zr	NA	NA	NA	NA
Ca	8.03	7.68	-0.39	-0.74
K	12.2	11.5	-3.55	-4.25
Mg	0.053	0.023	-.012	-.042
Na	52.0	54.0	-5.9	-3.9

Note: NA - elemental analysis not available.

TEST III

J-13 WATER EXPERIMENT WITH TUFF

DWPF GLASS (MONOLITH)

RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 28 (PAGE 2)

Analytical Result

SAMPLE ID	2	3	11
Start Experiment	11/14/83	11/14/83	11/14/83
Stop Interval	12/12/83	12/12/83	12/12/83
Initial pH	7.23	7.23	7.23
Final pH	9.40	9.50	9.22
Diff (pH)	2.17	2.27	1.99
Spec SA (mm ²)	421.	423.	416.
Volume (g)	14.01	14.10	13.90
SA/V	0.3	0.3	0.3
Temp (°C)	90.0	90.0	90.0
Initial Weight(g)	97.40	98.23	97.79
Final Weight(g)	95.90	95.29	97.06
Weight Loss(g)	1.50	2.94	0.73
%Leach Loss	10.71	20.85	5.25
Initial Spec Wt(g)	0.7913	0.7003	0.9776
Final Spec Wt(g)	0.7911	0.7003	0.9774
Spec Wt Loss(g)	0.0002	0.0000	0.0002
Rock Weight(g)	0.700	0.705	0.700

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result			Corrected for Blank		
	02	03	11	C02	C03	C11
Al	4.25	0.960	0.932	2.42	-0.87	-0.90
B	0.244	0.333	0.251	0.037	0.126	0.044
Fe	0.311	0.088	0.387	0.178	-0.025	0.254
Li	0.394	0.406	0.499	0.344	0.356	0.449
Mn	0.024	0.006	0.005	-0.012	-0.006	-0.007
Ni	0.033	0.014	0.021	0.009	-0.010	-0.003
S1	61.5	63.4	48.1	2.3	4.3	-10.8
Sr	0.057	0.058	0.035	0.019	0.020	-0.003
Zr	NA	NA	NA	NA	NA	NA
Ca	8.99	9.67	7.39	0.39	0.75	-0.97
K	14.7	13.3	11.5	-1.05	-2.45	-4.25
Mg	0.080	0.030	0.027	0.015	-0.035	-0.038
Na	59.0	65.0	55.1	1.1	7.1	-2.8

Note: NA - elemental analysis not available.

TEST III

J-13 WATER EXPERIMENT WITH TUFF

DWPF GLASS (MONOLITH)

RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 56

Analytical Result

SAMPLE ID	8	12
Start Experiment	11/14/83	11/14/83
Stop Interval	1/17/84	1/17/84
Initial pH	7.23	7.23
Final pH	9.25	9.55
Diff (pH)	2.02	2.32
Spec SA (mm ²)	355.	422.
Volume (g)	35.50	14.10
SA/V	0.1	0.3
Temp (°C)	90.0	90.0
Initial Weight(g)	121.56	97.83
Final Weight(g)	119.63	88.74
Weight Loss(g)	1.93	9.09
%Leach Loss	5.44	64.46
Initial Spec Wt(g)	0.9009	0.9784
Final Spec Wt(g)	0.9001	0.9785
Spec Wt Loss(g)	0.0008	+0.0001
Rock Weight(g)	1.775	0.705

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result			Corrected for Blank	
	8	12	--	C8	C12
Al	0.783	0.190		-1.767	-2.36
B	0.222	0.705		0.011	0.494
Fe	0.039	0.210		-0.138	0.023
Li	0.260	1.68		0.210	1.18
Mn	0.002	0.003		-0.012	-0.011
Ni	<.008	<.008		<.008	<.008
Si	50.0	101.		-7.6	43.4
Sr	0.024	0.072		-0.007	0.041
Zr	<0.002	<0.002		<0.002	<0.002
Ca	54	16.6		-0.37	6.97
K	10.9	25.0		-3.7	10.4
Mg	0.035	0.087		-0.042	0.010
Na	55.5	150.		-0.80	93.7

TEST III

J-13 WATER EXPERIMENT WITH TUFF

DWPF GLASS (MONOLITH)

RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 91

Analytical Result

SAMPLE ID	24	25
Start Experiment	11/14/83	11/14/83
Stop Interval	5/9/84	5/9/84
Initial pH	7.23	7.23
Final pH	9.26	9.30
Diff (pH)	2.03	2.07
Spec SA (mm ²)	296.1	299.4
Volume (g)	9.87	9.98
SA/V	0.3	0.3
Temp (°C)	90.0	90.0
Initial Weight(g)	110.11	109.80
Final Weight(g)	109.78	109.45
Weight Loss(g)	0.33	0.35
%Leach Loss	3.0	2.8
Initial Spec Wt(g)	0.7766	0.7381
Final Spec Wt(g)	0.7767	0.7381
Spec Wt Loss(g)	+0.0001	0.0000
Rock Weight(g)	0.495	0.500

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result		Corrected for Blank	
	24 (d)	25 (d)	C24 (d)	C25 (d)
Al	.486(<.028)	.509(<.028)	.357(<-)	.380(<-)
B	.285(0.60)	.291(0.50)	.074(.39)	.080(.29)
Fe	<.003	<.003	<.003	<.003
Li	.802(.50)	.886(.70)	.749(.50)	.833(.70)
Mn	<.0003	<.0003	<.0003	<.0003
Ni	<.008	<.008	<.008	<.008
Si	56.2(48.)	57.2(49.)	3.7(-1.)	4.7(0.0)
Sr	0.022	<0.016	0.002	<0.016
Zr	<0.002	<0.002	<0.002	<0.002
Ca	7.09	4.92	1.41	-.76
K	15.9	22.9	-4.3	2.7
Mg	.028(<.001)	.012(<.001)	.011(<-)	-.005(<-)
Na	63.8(50.)	64.0(53.)	5.8(-1.0)	6.0(+2.)

NOTE: Values in parentheses were analyzed on another instrument.

TEST III

J-13 WATER EXPERIMENT WITH TUFF

DWPF GLASS (MONOLITH)

RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 182

Analytical Result

SAMPLE ID	26
Start Experiment	2/8/84
Stop Interval	8/08/84
Initial pH	7.23
Final pH	9.30
Diff (pH)	2.07
Spec SA (mm ²)	278.6
Volume (g)	9.285
SA/V	0.3
Temp °C	90.0
Initial Weight(g)	109.71
Final Weight(g)	109.14
Weight Loss(g)	0.57
%Leach Loss	6.18
Initial Spec Wt(g)	0.6269
Final Spec Wt(g)	0.6266
Spec Wt Loss(g)	0.0003
Rock Weight(g)	0.465

CONSTITUENT ANALYSIS(mg/liter)

	Analytical Result	Corrected for Blank
SAMPLE ID	26	C26
Al	0.839	0.427
B	0.396	0.181
Fe	0.122	0.060
Li	1.13	1.08
Mn	0.002	-.002
Ni	0.015	-.003
Si	57.4	9.7
Sr	0.037	-0.036
Zr	<0.002	<0.002
Ca	6.62	-6.8
K	17.5	-5.0
Mg	0.069	-.387
Na	57.6	4.2

Note: Used Parr Bombs

Appendix E.

**Test IV: DWPF Glass—J-13 Water + Tuff + Stainless Steel
Experiment, Monolith Samples**

TEST IV

J-13 WATER EXPERIMENT WITH TUFF AND STAINLESS STEEL

DWPf GLASS (MONOLITH)

NO	GLASS NO.	SA ₂ (mm ²)	INITIAL MASS(g)	FINAL MASS(g)	MASS LOSS(g)	SA/V	INTERVAL TIME(d)	TIME START	TIME STOP
1	35+36	404.	1.0470	1.0467	0.0003	.3	3	5/07/84	5/10/84
2	14+37	439.	1.0521	1.0520	0.0001	.3	7	"	5/14/84
3	16+38	458.	1.0816	1.0817	0.0001+	.3	14	"	5/21/84
4	39	364.	1.7904	1.7903	0.0001	.3	28	"	6/04/84
5	22+23	440.	1.1358	1.1355	0.0003	.3	28	"	"
6	24+25	408.	0.9309	0.9315	0.0006+	.3	57	"	7/03/84
7	27+29	464.	1.0007	1.0008	0.0001+	.3	91	"	8/06/84
8	26+33	452.	0.8545	0.8549	0.0004+	.3	91	"	"
9	32	323.	0.9263	0.9264	0.0001+	.3	182	"	11/5/84
10	30	564.	1.5204	1.5205	0.0001+	.5	3	"	5/10/84
11	31	591.	2.0428	2.0429	0.0001+	.5	7	"	5/14/84
12	40	584.	1.3456	1.3434	0.0022	.5	14	"	5/21/84
13	41	583.	1.4772	1.4771	0.0001	.5	28	"	6/04/84
14	42	599.	1.2733	1.2734	0.0001+	.5	28	"	"
15	43	597.	1.4150	1.4153	0.0003+	.5	57	"	7/03/84
16	44	618.	1.6354	1.6363	0.0009+	.5	91	"	8/06/84
17	45	615.	2.7131	2.7133	0.0002	.5	91	"	"
18	21+28+34	435.	0.8719	0.8722	0.0003+	.5	182	"	11/5/84
19	BLANK	-					3	"	5/10/84
20	BLANK	-					7	"	5/14/84
21	BLANK	-					14	"	5/21/84
22	BLANK	-					28	"	6/04/84
23	BLANK	-					28	"	"
24	BLANK	-					57	"	7/03/84
25	BLANK	-					91	"	8/06/84
26	BLANK	-					91	"	"
27	BLANK	-					182	"	11/5/84

TEST IV

J-13 WATER EXPERIMENT WITH TUFF AND STAINLESS STEEL

DMPF GLASS (MONOLITH)

NO.	J-13 MASS(g)	START MASS(g)	FINAL MASS(g)	LEACHANT LOSS(g) LOSS(%)		TUFF MASS(g)	FINAL pH
1	13.48	53.13	52.94	0.19	1.41	0.67	9.37
2	14.62	54.57	54.28	0.29	1.98	0.73	9.45
3	15.26	55.33	54.88	0.45	2.95	0.76	9.54
4	12.14	53.01	51.83	1.18	9.72	0.61	9.63
5	14.66	55.11	54.32	0.79	5.39	0.73	9.60
6	13.62	53.75	52.47	1.28	9.40	0.68	9.45
7	15.47	55.65	54.28	1.37	8.86	0.77	9.38
8	15.08	54.95	53.28	1.67	11.07	0.75	9.51
9	10.76	50.64	47.45	3.19	29.65	0.54	9.40
10	11.27	51.74	51.63	0.11	0.97	0.56	8.92
11	11.83	52.60	52.47	0.13	1.10	0.59	9.29
12	11.68	51.98	51.84	0.14	1.20	0.58	9.18
13	11.67	52.10	51.15	0.95	1.82	0.58	9.65
14	11.98	52.34	51.65	0.69	5.76	0.60	9.58
15	11.94	52.35	51.73	0.62	5.19	0.60	9.36
16	12.36	53.00	52.00	1.00	8.09	0.62	9.43
17	12.31	54.00	53.00	1.00	8.12	0.62	9.47
18	8.71	48.03	45.21	2.82	32.38	0.44	9.40
19	10.00	87.50	87.36	0.14	1.40	0.50	9.13
20	10.00	88.91	88.69	0.22	2.20	0.50	9.24
21	10.00	88.03	87.74	0.29	2.90	0.50	9.36
22	10.00	88.75	88.15	0.60	6.00	0.50	9.46
23	10.00	88.17	87.51	0.66	6.60	0.50	9.56
24	10.00	89.29	88.08	1.21	12.10	0.50	9.58
25	10.00	88.87	87.11	1.76	17.60	0.50	9.46
26	10.00	89.19	85.85	3.34	33.40	0.50	9.67
27	10.00	88.06	85.03	3.03	30.30	0.50	9.57

TEST IV

J-13 WATER EXPERIMENT WITH TUFF AND STAINLESS STEEL

DWPF GLASS (MONOLITH)

DAY 3 - ICP Analysis

ELEM	DET. LIM.	SAMPLES			J-13
		<u>SA/V=0.3</u>	<u>0.5</u>	<u>BLANK</u>	
		1	10	19	
Al	.012	1.60	.628	.580	.677
B	.024	.280	.289	.273	.240
Fe	.003	.697	.048	.240	.021
Li	.002	.120	.281	.046	.043
Mn	.0003	.010	.002	.004	.003
Ni	.008	.011	<.008	.011	<.008
Si	.020	44.4	42.1	43.3	39.3
Sr	.016	.036	.030	.033	.036
Zr	.002	.002	.003	<.002	.004
Ca	.004	9.97	9.80	11.1	10.6
K	.920	18.2	63.5	21.0	11.7
Mg	.001	.341	.084	.612	.149
Na	.028	51.1	52.1	53.6	49.1

TEST IV

J-13 WATER EXPERIMENT WITH TUFF AND STAINLESS STEEL

DWPF GLASS (MONOLITH)

DAY 7 - ICP Analysis

		SAMPLES		
		<u>SA/V=0.3</u>	<u>0.5</u>	<u>BLANK</u>
<u>ELEM</u>	<u>DET. LIM.</u>	<u>2</u>	<u>11</u>	<u>20</u>
Al	.012	2.12	.827	.404
B	.024	.309	.328	.288
Fe	.003	.118	.171	.043
Li	.002	.256	.417	.047
Mn	.0003	.015	.005	<.0003
Ni	.008	.009	<.008	<.008
Si	.020	49.3	44.5	45.3
Sr	.016	.045	.040	.040
Zr	.002	<.002	<.002	<.002
Ca	.004	10.1	9.88	11.3
K	.820	19.8	23.0	16.4
Mg	.001	.075	.058	.065
Na	.028	55.1	55.0	55.2

TEST IV

J-13 WATER EXPERIMENT WITH TUFF AND STAINLESS STEEL

DWPF GLASS (MONOLITH)

DAY 14 - ICP Analysis

ELEM	DET. LIM.	SAMPLES		
		<u>SA/V=0.3</u>	<u>0.5</u>	<u>BLANK</u>
		3	12	21
Al	.012	.755	.460	.464
B	.024	.348	.388	.289
Fe	.003	.045	.170	.117
Li	.002	.422	.739	.048
Mn	.0003	.002	.003	.003
Ni	.008	<.008	<.008	<.008
Si	.020	49.7	46.1	46.8
Sr	.016	.043	.033	.028
Zr	.002	<.002	<.002	<.002
Ca	.004	9.69	10.1	9.96
K	.820	19.7	26.1	17.1
Mg	.001	.044	.049	.214
Na	.028	55.3	58.2	55.1

TEST IV

J-13 WATER EXPERIMENT WITH TUFF AND STAINLESS STEEL

DMPF GLASS (MONOLITH)

DAY 28 - ICP Analysis

ELEM-D.L.	SAMPLES				BLANKS	
	SA/V=0.3	0.3	0.5	0.5		
	4	5	13	14	22	23
Al	.012	.679	.613	.588	.673	.495
B	.024	.353	.375	.423	.435	.316
Fe	.003	.039	.031	.051	.051	.017
Li	.002	.053	.524	.852	.946	.049
Mn	.0003	.002	.001	.003	.006	.001
Ni	.008	<.008	<.008	<.008	<.008	<.008
Si	.020	57.5	54.4	56.5	54.9	52.0
Sr	.016	.032	.033	.015	.025	.022
Zr	.002	<.002	<.002	<.002	<.002	<.002
Ca	.004	9.29	9.25	8.12	8.54	10.3
K	.820	41.0	21.6	26.1	29.5	20.6
Mg	.001	.021	.019	.025	.056	.128
Na	.028	61.3	58.5	63.2	62.2	57.8

TEST IV

J-13 WATER EXPERIMENT WITH TUFF AND STAINLESS STEEL

DWPF GLASS (MONOLITH)

DAY 57- Icp Analysis

		SAMPLES		
		<u>SA/V=0.3</u>	<u>0.5</u>	<u>BLANK</u>
<u>ELEM</u>	<u>DET. LIM.</u>	<u>6</u>	<u>15</u>	<u>24</u>
A1	.012	.059	.553	.521
B	.024	.394	.437	.322
Fe	.003	.028	.039	.018
Li	.002	.547	1.08	.056
Mn	.0003	.003	.002	.003
Ni	.008	.032	<.008	<.008
Si	.020	61.4	57.0	60.5
Sr	.016	.070	.068	.061
Zr	.002	.005	<.002	<.002
Ca	.004	9.39	7.88	7.55
K	.820	30.2	37.1	18.2
Mg	.001	.009	.009	.006
Na	.028	60.0	59.6	59.8

TEST IV

J-13 WATER EXPERIMENT WITH TUFF AND STAINLESS STEEL

DWPF GLASS (MONOLITH)

DAY 91- Icp Analysis

ELEM-D.L.	SAMPLES				BLANKS		
	SA/V=0.3	0.3	0.5	0.5	25	26	
A1	.012	.477	.713	.501	.475	.998	.487
B	.024	.395	.409	.430	.445	.421	.441
Fe	.003	.053	.077	.015	.032	.035	.018
Li	.002	.778	.760	1.18	1.31	.063	.075
Mn	.0003	.001	.003	.002	.002	.015	.003
Ni	.008	<.008	<.008	<.008	<.008	.561	.014
Si	.020	64.7	66.4	62.9	62.5	67.5	82.9
Sr	.016	.055	.054	.047	.052	.062	.063
Zr	.002	.003	.002	.002	.002	.002	.002
Ca	.004	8.72	9.04	8.19	8.91	10.6	10.6
K	.820	26.8	22.0	20.7	20.7	20.5	22.7
Mg	.001	.042	.019	.013	.013	.013	.018
Na	.028	60.8	63.1	62.7	62.6	68.7	76.5

TEST IV
 J-13 WATER EXPERIMENT WITH TUFF AND STAINLESS STEEL
 DWPF GLASS (MONOLITH)
 RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 3

Analytical Result

SAMPLE ID	1	10	-
Start Experiment	5/7/84	5/7/84	
Stop Interval	5/10/84	5/10/84	
Initial pH	7.98	7.98	
Final pH	9.37	8.92	
Diff (pH)	1.39	0.96	
Spec SA (mm ²)	404.	564.	
Volume (g)	13.48	11.27	
SA/V	0.3	0.5	
Temp (°C)	90.0	90.0	
Initial Weight(g)	53.13	51.74	
Final Weight(g)	52.94	51.63	
Weight Loss(g)	0.19	0.11	
%Leach Loss	1.41	0.97	
Initial Spec Wt(g)	1.0470	1.5204	
Final Sec Wt(g)	1.0467	1.5205	
Spec Wt Loss(g)	0.0003	+0.0001	
Rock Weight(g)	0.670	0.560	

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result			Corrected for Blank	
	1	10	-	C1	C10
Al	1.60	0.628		1.02	0.048
B	0.280	0.289		0.007	0.016
Fe	0.697	0.048		0.457	-0.192
Li	0.120	0.281		0.074	0.235
Mn	0.010	0.002		0.006	-.002
Ni	0.011	<.008		0.000	<.008
Si	44.4	42.1		1.1	-1.2
Sr	0.036	0.030		0.003	-.003
Zr	0.002	0.003		0.002	0.003
Ca	9.97	9.80		-1.13	-1.3
K	18.2	63.5		-2.8	42.5
Mg	0.341	0.084		-.271	-.528
Na	51.1	52.1		-2.5	-1.5

TEST IV

J-13 WATER EXPERIMENT WITH TUFF AND STAINLESS STEEL

DWPF GLASS (MONOLITH)

RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 7

Analytical Result

SAMPLE ID	2	11	-
Start Experiment	5/7/84	5/7/84	
Stop Interval	5/14/84	5/14/84	
Initial pH	7.98	7.98	
Final pH	9.45	9.29	
Diff (pH)	1.47	1.31	
Spec SA (mm ²)	439.	591.	
Volume (g)	14.62	11.83	
SA/V	0.3	0.5	
Temp (°C)	90.0	90.0	
Initial Weight(g)	54.57	52.60	
Final Weight(g)	54.28	52.47	
Weight Loss(g)	0.29	0.13	
%Leach Loss(g)	1.98	1.10	
Initial Spec Wt(g)	1.0521	2.0428	
Final Spec Wt(g)	1.0520	2.0429	
Spec Wt Loss(g)	0.0001	0.0001+	
Rock Weight(g)	0.73	0.59	

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result			Corrected for Blank	
	2	11	-	C2	C11
Al	2.12	0.827		1.716	0.423
B	0.309	0.328		0.021	0.040
Fe	0.118	0.171		0.075	0.128
Li	0.256	0.417		0.209	0.370
Mn	0.015	0.005		0.015	0.005
Ni	0.009	<.008		0.009	<.008
Si	49.3	44.5		4.0	-0.8
Sr	0.045	0.040		0.005	0.000
Zr	<.002	<.002		<.002	<.002
Ca	10.1	9.88		-1.2	-1.4
K	19.8	23.0		3.4	6.6
Mg	0.075	0.058		0.010	-0.007
Na	55.1	55.0		-0.1	-0.2

TEST IV

J-13 WATER EXPERIMENT WITH TUFF AND STAINLESS STEEL

DWPF GLASS (MONOLITH)

RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 14

Analytical Result

SAMPLE ID	3	12	-
Start Experiment	5/7/84	5/7/84	
Stop Interval	5/21/84	5/21/84	
Initial pH	7.98	7.98	
Final pH	9.54	9.18	
Diff (pH)	1.56	1.20	
Spec SA (mm ²)	458.	584.	
Volume (g)	15.26	11.68	
SA/V	0.3	0.5	
Temp (°C)	90.0	90.0	
Initial Weight(g)	55.33	51.98	
Final Weight(g)	54.88	51.84	
Weight Loss(g)	0.45	0.14	
%Leach Loss	2.95	1.20	
Initial Spec Wt(g)	1.0816	1.3456	
Final Spec Wt(g)	1.0817	1.3434	
Spec Wt Loss(g)	0.0001+	0.0022	
Rock Weight(g)	0.76	0.58	

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result			Corrected for Blank	
	3	12	-	C3	C12
Al	0.755	0.460		0.291	-0.004
B	0.348	0.388		0.059	0.099
Fe	0.045	0.170		-0.004	0.053
Li	0.422	0.739		0.374	0.691
Mn	0.002	0.003		-0.001	0.000
Ni	<.008	<.008		<.008	<.008
Si	49.7	46.1		2.9	-0.1
Sr	0.743	0.033		0.010	0.005
Zr	<.002	<.002		<.002	<.002
Ca	9.69	10.1		-0.27	0.14
K	19.7	26.1		2.6	9.0
Mg	0.044	0.049		-0.170	-0.165
Na	55.3	58.2		0.2	3.1

TEST IV

J-13 WATER EXPERIMENT WITH TUFF AND STAINLESS STEEL

DWPF GLASS (MONOLITH)

RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 28 (PAGE 1)

Analytical Result

SAMPLE ID	4	5
Start Experiment	5/7/84	5/7/84
Stop Interval	6/4/84	6/4/84
Initial pH	7.98	7.98
Final pH	9.63	9.60
Diff (pH)	1.74	1.62
Spec SA (mm ²)	364.	440.
Volume (g)	12.14	14.66
SA/V	0.3	0.3
Temp (°C)	90.0	90.0
Initial Weight(g)	53.01	55.11
Final Weight(g)	51.83	54.32
Weight Loss(g)	1.18	0.79
%Leach Loss	9.72	5.39
Initial Spec Wt(g)	1.7904	1.1358
Final Spec Wt(g)	1.7903	1.1355
Spec Wt Loss(g)	0.0001	0.0003
Rock Weight(g)	0-61	0-73

CONSTITUENT ANALYSIS(mg/liter)

Analytical Result

Corrected for Blank

SAMPLE ID	4	5	C4	C5
Al	.679	.613	.160	.094
B	.353	.375	.030	.052
Fe	.039	.031	.011	.004
Li	.053	.524	.004	.475
Mn	.002	.001	.000	.000
Ni	<.008	<.008	<.008	<.008
Si	57.5	54.4	5.0	1.9
Sr	0.032	0.033	0.008	0.009
Zr	<.002	<.002	<.002	<.002
Ca	9.29	9.25	-.3	-.40
Mg	.021	.019	.009	.007
Na	61.3	58.5	3.2	.4

TEST IV

J-13 WATER EXPERIMENT WITH TUFF AND STAINLESS STEEL

DWPF GLASS (MONOLITH)

RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 28 (PAGE 2)

Analytical Result

SAMPLE ID	13	14
Start Experiment	5/7/84	5/7/84
Stop Interval	6/4/84	6/4/84
Initial pH	7.98	7.98
Final pH	9.65	9.58
Diff (pH)	1.67	1.60
Spec SA (mm ²)	583.	599.
Volume (g)	11.67	11.98
SA/V	0.5	0.5
Temp (°C)	90.0	90.0
Initial Weight(g)	52.10	52.34
Final Weight(g)	51.15	51.65
Weight Loss(g)	0.95	0.69
%Leach Loss	1.82	5.76
Initial Spec Wt(g)	1.4772	1.2733
Final Spec Wt(g)	1.4771	1.2734
Spec Wt Loss(g)	0.0001	0.0001+
Rock Weight(g)	0.58	0.60

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result		Corrected for Blank	
	13	14	C13	C14
A1	.588	.673	.069	.154
B	.423	.435	.100	.112
Fe	.051	.051	.024	.024
Li	.852	.946	.803	.897
Mn	.003	.003	.001	.001
Ni	<.008	<.008	<.008	<.008
Si	56.5	54.9	4.0	2.4
Sr	0.015	0.025	-.009	.001
Zr	<.002	<.002	<.002	<.002
Ca	8.12	8.54	1.5	1.1
Mg	.025	.056	.013	.044
Na	63.2	62.2	5.1	4.1

TEST IV

J-13 WATER EXPERIMENT WITH TUFF AND STAINLESS STEEL

DWPF GLASS (MONOLITH)

RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 57

Analytical Result

SAMPLE ID	6	15	-
Start Experiment	5/7/84	5/7/84	
Stop Interval	7/3/84	7/3/84	
Initial pH	7.98	7.98	
Final pH	9.45	9.36	
Diff (pH)	1.47	1.38	
Spec SA (mm ²)	408.	597.	
Volume (g)	13.62	11.94	
SA/V	0.3	0.5	
Temp (°C)	90.0	90.0	
Initial Weight(g)	53.75	52.35	
Final Weight(g)	52.47	51.73	
Weight Loss(g)	1.28	0.62	
%Leach Loss	9.40	5.19	
Initial Spec Wt(g)	0.9309	1.4150	
Final Spec Wt(g)	0.9315	1.4153	
Spec Wt Loss(g)	0.0006+	0.0003+	
Rock Weight(g)	0.68	0.60	

CONSTITUENT ANALYSIS(mg/liter)

SAMPLE ID	Analytical Result			Corrected for Blank	
	6	15	-	C6	C15
Al	0.059	0.553		-.462	0.032
B	0.394	0.437		0.072	0.115
Fe	0.028	0.039		0.010	0.021
Li	0.547	1.08		0.491	1.024
Mn	0.003	0.002		0.000	-.001
Ni	0.023	<.008		0.023	<.008
Si	61.4	57.0		0.9	-3.5
Sr	0.070	0.068		0.009	0.007
Zr	0.005	<.002		0.005	<.002
Ca	9.39	7.88		1.84	0.33
K	30.2	37.1		12.0	18.9
Mg	0.009	0.009		0.003	0.003
Na	60.0	59.6		0.2	-.2

TEST IV

J-13 WATER EXPERIMENT WITH TUFF AND STAINLESS STEEL

DWPF GLASS (MONOLITH)

RAW DATA TABULATION - LEACHATE ANALYSIS

DAY 91

Analytical Result

SAMPLE ID	7	8	-	16	17
Start Experiment	5/7/84	5/7/84		5/7/84	5/7/84
Stop Interval	8/6/84	8/6/84		8/6/84	8/6/84
Initial pH	7.98	7.98		7.98	7.98
Final pH	9.38	9.51		9.43	9.47
Diff (pH)	1.40	1.53		1.45	1.49
Spec SA (mm ²)	464.	452.		618.	615.
Volume (g)	15.47	15.08		12.36	12.31
SA/V	0.3	0.3		0.5	0.5
Temp (°C)	90.0	90.0		90.0	90.0
Initial Weight(g)	55.65	54.95		53.00	54.00
Final Weight(g)	54.28	53.28		52.00	53.00
Weight Loss(g)	1.37	1.67		1.00	1.00
%Leach Loss	8.86	11.07		8.09	8.12
Initial Spec Wt(g)	1.0007	0.8549		1.6354	2.7133
Final Spec Wt(g)	1.0008	0.8549		1.6363	2.7133
Spec Wt Loss(g)	+0.0001	+0.0004		+0.0009	0.0002
Rock Weight(g)	0.77	0.75		0.62	0.62

CONSTITUENT ANALYSIS(mg/liter)

Analytical Result

Corrected for Blank

SAMPLE ID	7	8	16	17	C7	C8	C16	C17
Al	.477	.713	.501	.475	-.267	-.030	-.242	-.332
B	.395	.409	.430	.445	-.036	-.022	-.001	.014
Fe	.053	.077	.015	.032	.027	.051	-.012	.006
Li	.778	.760	1.18	1.31	.709	.691	1.11	1.24
Ni	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008
Si	64.7	66.4	62.9	62.5	-10.5	-8.8	-12.3	-12.7
Sr	0.055	0.054	0.047	0.052	-.008	-.009	-.016	-.021
Zr	0.003	0.002	0.002	0.002	.001	.000	.000	.000
Ca	8.72	9.04	8.19	8.91	-1.88	-1.56	-2.41	-1.69
K	26.8	22.0	20.7	20.7	5.2	0.4	-.9	-.9
Mg	.042	.019	.013	.013	.026	.003	-.003	-.003
Na	60.8	63.1	62.7	62.6	-11.8	-9.6	-9.9	-10.