SRNL-STI-2010-00242
Revision 0

Keywords: *SB6, Frit 418, variability, durability*

Retention: *Permanent*

Sludge Batch 6 Variability Study with Frit 418

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November 2010

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Prepared for the U.S. Department of Energy under contract number DE-AC09-08SR22470.

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Prepared for
U.S. Department of Energy

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EXECUTIVE SUMMARY

The Defense Waste Processing Facility (DWPF) initiated processing Sludge Batch 6 (SB6) in the summer of 2010. In support of processing, the Savannah River National Laboratory (SRNL) provided a recommendation to utilize Frit 418 to process SB6. This recommendation was based on assessments of the compositional projections for SB6 available at the time from the Liquid Waste Organization (LWO) and SRNL (using a model-based approach). To support qualification of SB6, SRNL executed a variability study to assess the applicability of the current durability models for SB6. The durability models were assessed over the expected Frit 418-SB6 composition range.

Seventeen glasses were selected for the variability study based on the sludge projections used in the frit recommendation. Five of the glasses are based on the centroid of the compositional region, spanning a waste loading (WL) range of 32 to 40%. The remaining twelve glasses are extreme vertices (EVs) of the sludge region of interest for SB6 combined with Frit 418 and are all at 36% WL. These glasses were fabricated and characterized using chemical composition analysis, X-ray diffraction (XRD) and the Product Consistency Test (PCT).

After initiating the SB6 variability study, the measured composition of the SB6 Tank 51 qualification glass produced at the SRNL Shielded Cells Facility indicated that thorium was present in the glass at an appreciable concentration (1.03 wt%), which made it a reportable element for SB6. This concentration of ThO_2 resulted in a second phase of experimental studies. Five glasses were formulated that were based on the centroid of the new sludge compositional region combined with Frit 418, spanning a WL range of 32 to 40%. These glasses were fabricated and characterized using chemical composition analysis and the PCT.

Based on the measured PCT response, all of the glasses (with and without thorium) were acceptable with respect to the Environmental Assessment (EA) reference glass regardless of thermal history. All of the normalized boron releases were less than 1 g/L. While all of the targeted glass compositions were predictable with respect to the Product Composition Control System (PCCS) models for durability, a small number of the measured glass compositions were located outside of the lower prediction limit indicating poorer durability than what was actually measured. These unpredictable glasses were in the same lithium metaborate (LM) preparation block during the chemical analyses, which resulted in measured compositions that were not representative of the target compositions. A review of the data did not indicate a clear cause for the problem. Re-digestion and re-measurement of three glasses from this preparation block yielded glass compositions closer to the target values and predicted PCT responses within the PCCS model uncertainty. Therefore, it is believed that the glasses were correctly fabricated and the targeted compositions are closer representations of the true compositions.

Per the requirements of the DWPF Glass Product Control Program, the PCCS durability models have been shown to be applicable for the SB6/Frit 418 glass system. PCT results from the glasses fabricated as part of the variability study were shown to be predictable and/or acceptable with respect to the DWPF PCCS models. In addition, the inclusion of ThO_2 was shown to have minimal impact on the acceptability and predictability of the variability study glasses.

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LIST OF ABBREVIATIONS

AD	Analytical Development
ARM	Approved Reference Material
ARP	Actinide Removal Process
DWPF	Defense Waste Processing Facility
EA	Environmental Assessment
EV	Extreme Vertices
ICP-AES	Inductively Coupled Plasma-Atomic Emission Spectroscopy
LM	Lithium Metaborate
LWO	Liquid Waste Organization
MA	Mixed Acid
PCT	Product Consistency Test
PF	Peroxide Fusion
PSAL	Process Science and Analytical Laboratory
SB6	Sludge Batch 6
SRNL	Savannah River National Laboratory
SRNL	Savannah River National Laboratory
TT&QAP	Task Technical and Quality Assurance Plan
TTR	Technical Task Request
XRD	X-ray Diffraction

1.0 Introduction

The Defense Waste Processing Facility (DWPF) initiated processing Sludge Batch 6 (SB6) in the summer of 2010. In support of the upcoming processing, the Savannah River National Laboratory (SRNL) assessed the applicability of using Frit 418 to process SB6.[1] This assessment was based on the compositional projections for SB6 available at the time from the Liquid Waste Organization (LWO) and SRNL (using a model-based approach).

To support qualification of SB6 and the Glass Product Control Program, SRNL executed a variability study to assess the applicability of the current durability models for SB6. The durability models were assessed over the expected Frit 418-SB6 composition range. The experimental portion of the original variability study was initiated by a DWPF Technical Task Request[2] (TTR) and was performed under a SRNL Task Technical and Quality Assurance Plan[3] (TT&QAP).

After initiating the SB6 variability study, the measured composition of the SB6 Tank 51 qualification glass produced at the SRNL Shielded Cells Facility indicated that thorium was present in the glass at an appreciable concentration (1.03 wt%), which made it a reportable element for SB6.[4] This concentration of ThO_2 resulted in a second phase of experimental studies that were initiated by an addendum to the original TTR.[a]

1.1 Glass Selection Strategy

For a complete discussion of the sludge projections and assessments leading up to the frit selection see SRNL-L3100-2010-00043 and SRNL-STI-2010-00137.[1,5] Only a brief summary will be provided in this section.

1.1.1 *Non-thorium Variability Study Glasses*

SRNL generated projections using updated compositional data from the Tank 51 SB6 qualification sample[6] and a washing spreadsheet[b] provided by LWO. These projections included several scenarios for the SB6 blend as well as the impact of additions of material from the Actinide Removal Process (ARP). The bounding intervals for each of the sludge components developed for the frit recommendation are repeated in Table 1-1. Note that "Others" includes BaO, CdO, Ce_2O_3, Cr_2O_3, CuO, Gd_2O_3, K_2O, La_2O_3, MoO_3 P_2O_5, PbO, SrO, ZnO and ZrO_2.

Seventeen glasses were selected for the variability study based on the sludge projections used in the frit selection.[1] Five of the glasses were based on the centroid (average) of the compositional space combined with Frit 418, spanning a waste loading (WL) range of 32 to 40% (2 wt% increments). The remaining twelve glasses were extreme vertices (EVs) of the sludge region of interest for SB6 combined with Frit 418 and were all at 36% WL.[7,c]

These glasses were fabricated and characterized using chemical composition analysis, X-ray diffraction (XRD) and the Product Consistency Test (PCT).

[a] Email communication from J. Bricker on 5/7/2010.
[b] Excel workbook "SB6_011310.xls." Sent by Jeff Gillam via email on 1/19/2010.
[c] The twelve sludge EVs were selected using the D-optimality routine available in the Custom Design platform in JMP™ to support investigation of linear affects of the sludge components.

Table 1-1. SB6 Sludge Composition Region
(wt% calcined basis)

Oxide	Maximum	Minimum
	(wt%)	
Al_2O_3	23.49	29.25
CaO	0.78	2.03
Fe_2O_3	21.69	26.82
MgO	0.17	1.38
MnO	6.25	7.58
Na_2O	23.92	29.55
NiO	2.39	3.51
SiO_2	1.59	2.74
SO_4	1.06	1.73
TiO_2	0	1.84
U_3O_8	3.95	5.65
Others	0.99	2.11

1.1.2 *Variability Study Glasses with Thorium*

Peeler and Edwards conducted a paper study, which determined the impact of ThO_2 PCCS predictions for durability, viscosity and liquidus temperature.[8] Based on the results, it was recommended that DWPF could process the SB6-Frit 418 system with ThO_2 concentrations up to 1.8 wt%. In order to confirm the affect of TiO_2 concentrations on durability, five additional glasses were generated using updated SB6 projections based on a thorium projection provided by Savannah River Remediation (SRR).[d] These projection included several scenarios for the SB6 blend as well as the impact of additions of material from ARP.[9] EVs were developed with these projections, which resulted in a centroid composition. Five glasses were formulated that were based on the centroid of the compositional region (Table 1-2) combined with Frit 418, spanning a WL range of 32 to 40% (2 wt% increments). The "Others" are shown individually in this table.

These glasses were fabricated and characterized using chemical composition analysis and the PCT.

[d] Thorium oxide concentration provided via email by H. H. Elder on May 6, 2010.

Table 1-2 Centroid of the SB6 Composition Region Used for Variation Stage Assessments

Sludge Oxide	Concentration (wt%)
Al_2O_3	25.36
BaO	0.13
CaO	1.37
Ce_2O_3	0.20
Cr_2O_3	0.12
CuO	0.10
Fe_2O_3	23.46
K_2O	0.08
La_2O_3	0.10
MgO	0.76
MnO	6.68
Na_2O	25.79
NiO	2.86
P_2O_5	0.43
PbO	0.03
SO_4^{2-}	1.35
SiO_2	2.10
ThO_2	3.16
TiO_2	0.92
U_3O_8	4.68
ZnO	0.07
ZrO_2	0.23

2.0 Experimental Procedure

2.1 Target Glass Compositions

Target glass compositions of the original seventeen variability study glasses are shown in Table 2-1. The first twelve glasses (SB6VS-01 through SB6VS-12) are based on the EVs, while the last five (SB6VS-13 through SB6VS-17) are based on the centroid of the compositional region.

Target glass compositions of the five ThO_2-based variability study glasses are shown in Table 2-2.

2.2 Glass Fabrication

Each variability study glass was prepared from the proper proportions of reagent-grade metal oxides, carbonates, H_3BO_3, and salts in 150 g batches.[10] The raw materials were thoroughly mixed and placed into a platinum alloy, 250 ml crucible. Batched materials were placed into a high-temperature furnace at the target melt temperature of 1150°C. The crucible was removed from the furnace after an isothermal hold at 1150°C for 1 hour. The molten glass was quenched by pouring the liquid onto a clean, stainless steel plate. The glass pour patty was used as a sampling stock for the various property measurements (i.e., chemical composition, durability testing and XRD).

Approximately 25 g of each glass was heat-treated to simulate cooling along the centerline of a DWPF-type canister to gauge the effects of thermal history on the product performance.[11] This cooling schedule is referred to as the centerline canister cooling (ccc) curve.

2.3 Compositional Analysis

2.3.1 *Non-thorium Glasses*

Two dissolution methods were utilized by the Process Science Analytical Laboratory (PSAL) to allow measurement of the compositions: lithium metaborate fusion (LM) and sodium peroxide fusion (PF). For each study glass, measurements were obtained from samples prepared in duplicate by each of these dissolution methods. A representative sample from each glass was submitted to Analytical Development (AD).[12] All of the prepared samples were analyzed (twice for each element of interest) by Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES) with the instrumentation being re-calibrated between the duplicate analyses. The analytical plan was developed in such a way as to provide the opportunity to evaluate potential sources of bias and error. Glass standards were also intermittently measured to assess the performance of the ICP-AES instrument over the course of these analyses.

2.3.2 *Variability Study Glasses with Thorium*

Representative samples of each glass were submitted to AD for ICP-AES.[13] Two dissolution methods were utilized by AD, which include: PF and mixed acid (MA).

2.4 XRD

Representative samples of quenched and ccc glasses were submitted to AD for XRD analysis.[e] Samples were analyzed under conditions providing a detection limit of approximately 0.5 vol%, i.e. no crystals can be detected if the amount in the sample is less than ~0.5 vol%.

2.5 Product Consistency Test

The PCT was performed in triplicate on each quenched and ccc glass to assess chemical durability using Method A of the procedure.[14] Also included in the experimental test matrix was the Environmental Assessment (EA) glass, the Approved Reference Material (ARM) glass, and blanks from the sample cleaning batch. Samples were ground, washed, and prepared according to the standard procedure. The resulting solutions were sampled (filtered and acidified) and analyzed by AD under the auspices of three analytical plans.[15-17] Samples of a multi-element, standard solution were also included in the analytical plan (as a check on the accuracy of the ICP-AES instrument). Normalized release rates were calculated based on target and measured compositional views using the average of the leachate concentrations.

[e] SB6VS-01 through SB6VS-17 only.

Table 2-1. Original SB6 Target Compositions

Glass ID	WL (%)	Al_2O_3	B_2O_3	BaO	CaO	Ce_2O_3	Cr_2O_3	CuO	Fe_2O_3	K_2O	La_2O_3	Li_2O	MgO	MnO	Na_2O	NiO	P_2O_5	PbO	SO_4	SiO_2	TiO_2	U_3O_8	ZnO	ZrO_2
SB6VS-01	36	10.03	5.12	0.05	0.28	0.08	0.05	0.04	9.66	0.03	0.04	5.12	0.50	2.25	13.73	0.86	0.17	0.01	0.62	49.21	0.00	2.03	0.03	0.09
SB6VS-02	36	9.79	5.12	0.05	0.73	0.08	0.05	0.04	9.66	0.03	0.04	5.12	0.06	2.25	13.73	0.86	0.17	0.01	0.38	49.63	0.66	1.42	0.03	0.09
SB6VS-03	36	10.35	5.12	0.05	0.28	0.08	0.05	0.04	7.81	0.03	0.04	5.12	0.06	2.73	13.73	1.26	0.17	0.01	0.62	49.63	0.66	2.03	0.03	0.09
SB6VS-04	36	9.76	5.12	0.02	0.73	0.03	0.02	0.01	9.66	0.01	0.01	5.12	0.06	2.73	13.73	1.26	0.06	0.00	0.38	49.21	0.00	2.03	0.01	0.03
SB6VS-05	36	10.53	5.12	0.05	0.28	0.08	0.05	0.04	7.93	0.03	0.04	5.12	0.06	2.73	15.76	0.86	0.17	0.01	0.38	49.21	0.00	1.42	0.03	0.09
SB6VS-06	36	9.81	5.12	0.02	0.73	0.03	0.02	0.01	7.81	0.01	0.01	5.12	0.06	2.25	15.76	0.86	0.06	0.00	0.62	49.63	0.00	2.03	0.01	0.03
SB6VS-07	36	10.53	5.12	0.02	0.28	0.03	0.02	0.01	7.81	0.01	0.01	5.12	0.50	2.25	15.50	1.26	0.06	0.00	0.38	49.63	0.00	1.42	0.01	0.03
SB6VS-08	36	8.46	5.12	0.02	0.28	0.03	0.02	0.01	9.66	0.01	0.01	5.12	0.06	2.25	15.68	1.26	0.06	0.00	0.62	49.21	0.66	1.42	0.01	0.03
SB6VS-09	36	8.46	5.12	0.05	0.73	0.08	0.05	0.04	9.66	0.03	0.04	5.12	0.50	2.73	14.16	1.26	0.17	0.01	0.62	49.63	0.00	1.42	0.03	0.09
SB6VS-10	36	8.46	5.12	0.02	0.28	0.03	0.02	0.01	9.66	0.01	0.01	5.12	0.50	2.73	14.38	0.86	0.06	0.00	0.38	49.63	0.66	2.03	0.01	0.03
SB6VS-11	36	10.53	5.12	0.02	0.73	0.03	0.02	0.01	7.81	0.01	0.01	5.12	0.50	2.73	14.49	0.86	0.06	0.00	0.62	49.21	0.66	1.42	0.01	0.03
SB6VS-12	36	8.57	5.12	0.05	0.73	0.08	0.05	0.04	7.81	0.03	0.04	5.12	0.50	2.25	15.76	1.26	0.17	0.01	0.38	49.21	0.66	2.03	0.03	0.09
SB6VS-13	32	8.47	5.44	0.03	0.45	0.05	0.03	0.02	7.79	0.02	0.02	5.44	0.25	2.21	14.02	0.94	0.10	0.01	0.45	52.37	0.29	1.53	0.02	0.05
SB6VS-14	34	9.00	5.28	0.03	0.48	0.05	0.03	0.03	8.28	0.02	0.03	5.28	0.26	2.35	14.39	1.00	0.11	0.01	0.48	50.90	0.31	1.63	0.02	0.06
SB6VS-15	36	9.53	5.12	0.03	0.50	0.05	0.03	0.03	8.76	0.02	0.03	5.12	0.28	2.49	14.77	1.06	0.11	0.01	0.50	49.42	0.33	1.72	0.02	0.06
SB6VS-16	38	10.06	4.96	0.04	0.53	0.06	0.03	0.03	9.25	0.02	0.03	4.96	0.29	2.63	15.14	1.12	0.12	0.01	0.53	47.94	0.35	1.82	0.02	0.06
SB6VS-17	40	10.59	4.80	0.04	0.56	0.06	0.03	0.03	9.74	0.02	0.03	4.80	0.31	2.77	15.52	1.18	0.13	0.01	0.56	46.46	0.36	1.91	0.02	0.07

Table 2-2. ThO_2-Based Target Compositions

Glass ID	WL (%)	Al_2O_3	B_2O_3	BaO	CaO	Ce_2O_3	Cr_2O_3	CuO	Fe_2O_3	K_2O	La_2O_3	Li_2O	MgO	MnO	Na_2O	NiO	P_2O_5	PbO	SO_4	SiO_2	ThO_2	TiO_2	U_3O_8	ZnO	ZrO_2
SB6VS-18	32	8.12	5.44	0.04	0.44	0.06	0.04	0.03	7.51	0.03	0.03	5.44	0.24	2.14	13.69	0.92	0.14	0.01	0.43	52.35	1.01	0.29	1.50	0.02	0.07
SB6VS-19	34	8.62	5.28	0.04	0.47	0.07	0.04	0.04	7.98	0.03	0.04	5.28	0.26	2.27	14.05	0.97	0.15	0.01	0.46	50.88	1.07	0.31	1.59	0.02	0.08
SB6VS-20	36	9.13	5.12	0.05	0.49	0.07	0.04	0.04	8.45	0.03	0.04	5.12	0.27	2.40	14.40	1.03	0.16	0.01	0.49	49.40	1.14	0.33	1.68	0.02	0.08
SB6VS-21	38	9.64	4.96	0.05	0.52	0.08	0.04	0.04	8.92	0.03	0.04	4.96	0.29	2.54	14.76	1.09	0.16	0.01	0.51	47.92	1.20	0.35	1.78	0.03	0.09
SB6VS-22	40	10.14	4.80	0.05	0.55	0.08	0.05	0.04	9.39	0.03	0.04	4.80	0.31	2.67	15.12	1.14	0.17	0.01	0.54	46.44	1.26	0.37	1.87	0.03	0.09

3.0 Results and Discussion

3.1 Chemical Composition Measurements

Tables A1 and A2 in Appendix A provide the elemental concentration measurements from the non-thorium study glasses that were prepared using LM and Table A3 in Appendix A provides the measurements from these glasses using PF. Tables C1 and C2 in Appendix C provide the elemental concentration measurements from the thorium study glasses that were prepared using MA with a 10X and 2X dilution, respectively. Tables C3 and C4 in Appendix C provide the measurements from these glasses prepared using PF. Measurements for the Batch 1 and uranium standard (U_{std}) glass are also provided in the tables of Appendix A while measurements of ARG-1 and U_{std} are provided in the tables of Appendix C.

Elemental concentrations were converted to oxide concentrations by multiplying the values for each element by the gravimetric factor for the corresponding oxide. During this process, an elemental concentration that was determined to be below the detection limit of the analytical procedures used was reduced to half of that detection limit as the oxide concentration was determined.[18]

3.1.1 *Measurements in Analytical Sequence*

Exhibit A1 in Appendix A provides plots in analytical sequence of the sample measurements generated by AD for each oxide by preparation method (i.e., LM and PF) for the non-thorium glass study. Exhibit C1 in Appendix C provides similar plots for the MA and PF measurements of the thorium glasses. These plots include all of the measurement data, and in addition to analytical sequence of the measurements, the laboratory identifiers of each sample are shown.

3.1.2 *Composition Measurements by Glass Identifier*

Exhibit A2 in Appendix A provides plots of the oxide concentration measurements by Glass ID/Lab ID (including Batch 1 and U_{std}) for the non-thorium glasses. Similar plots for the thorium glasses are provided in Exhibit C2 of Appendix C, which include measurements of ARG-1 and U_{std}. For both Exhibit A2 and Exhibit C2, the measurements are arranged by the target concentrations of the study glasses. The plots in both exhibits demonstrate the individual measurements across the duplicates of each preparation method and the two ICP-AES calibrations for each study glass. Exhibit C2 provides a comparison of the MA and PF measurements for the thorium glasses. While there appears to be good repeatability among the measurements for each of the oxides for most of the glasses, there are some issues that should be noted.

The following observations are made regarding Exhibit A2. The Al_2O_3 measurements for one of SB6VS-13 are significantly higher than intended for that glass. There also appears to be a preparation issue for this oxide for this glass. Preparation issues are also indicated for other results; these include: MnO, Na_2O, NiO, and U_3O_8 for SB6VS-14 and several glasses showing higher than targeted Na_2O measurements for both preparations. In general, the SiO_2 values of all of the glasses are low compared to the target values. Scatter in the data is also observed for B_2O_3, CaO, Li_2O, MnO and U_3O_8. A more thorough discussion of these analytical issues is provided in the following sections.

Based on a review of Exhibit C2, a decision was made by the authors to use the PF measurements

rather than the MA measurements for all of the oxides for which measurements from both preparations are available. For example, the MA values of ThO_2 for SB6VS-18 through 22 are consistently low when compared to both the PF and target values. Thus, the MA measurements for CaO, Na_2O and ZrO_2 will be used to represent the measured compositions of the thorium glasses, while the PF measurements will be used for the remaining oxides.[f]

3.1.3 *Statistical Evaluations of the Results from the Standard Glasses*

Exhibit A3 in Appendix A provides statistical analyses of the Batch 1 and U_{std} results from the non-thorium glass study by calibration block for each oxide of interest for both the LM and PF preparation methods. The results include analysis of variance (ANOVA) investigations, which determine statistically significant differences among the means of these groups for each of the oxides for each of the standards. The following components indicate a significant ICP-AES calibration effect on the block averages at the 5% significance level:

- Batch 1: BaO, CaO, Cr_2O_3, CuO, and TiO_2
- U_{std}: Al_2O_3, B_2O_3, CaO, Fe_2O_3, MgO, Na_2O, TiO_2, and U_3O_8

Exhibit C3 in Appendix C provides statistical analyses of the ARG-1 and U_{std} results from the thorium glass study by calibration block and ANOVA investigations for each oxide of interest from the PF and MA preparation methods. The following components indicate a significant ICP-AES calibration effect on the block averages at the 5% significance level:

- U_{std}: Cr_2O_3 (PF)

Reference values for the oxide concentrations of the standards are given in the header for each set of measurements in Exhibits A3 and C3.

3.1.4 *Measured versus Target Compositions*

Table A4 in Appendix A provides a summary of the average compositions of the non-thorium glasses as well as the target compositions and some associated differences and relative differences. Exhibit A4 in Appendix A provides plots showing results for each glass for each oxide to help highlight the comparisons among the measured and targeted values for the non-thorium glasses. Table C5 and Exhibit C4 in Appendix C provide similar information for the results of the thorium glass study. In general, the measured values are consistent with the target oxide content in each of the study glasses. Some exceptions include: (i) high measured values of CaO, Na_2O, MnO, NiO and SO_4 in some of the non-thorium glasses, (ii) low measured measured values of Fe_2O_3, Li_2O and SiO_2 in some of the non-thorium glasses, (iii) low measured values of ThO_2 in SB6VS-18 through 22, and (iv) high measured values of SiO_2 and SO_4 in the thorium glasses. Although these issues exist, the measured sums of oxides for all of the study glasses are still within the interval of 95 to 105 wt%. Despite the inconsistencies of some of the components, the compositions of the thorium glasses are thought to be accurate representations of the target compositions.

After thoroughly studying the data from the non-thorium glasses, it was hypothesized that the high Na_2O, MnO and NiO concentrations were likely due to preparation issues, specific to block

[f] Calcium (Ca) and sodium (Na) are contaminants in the fusion reagents and a significant amount of the Zr crucible is also dissolved during fusion digestion.

2 of the LM dissolutions. SB6VS-02, SB6VS-04 and SB6VS-15 were re-digested and re-measured by AD. In general, the re-measured compositions are consistent with the target compositions, as shown in Table 3-1, which confirms the presence of an analytical preparation issue. All of the sums of oxides are within 95 and 105 wt%. Based on these results, it should be recognized that the rest of the glass compositions from preparation block 2 are not representative of the target compositions and should not be included in the interpretation of the overall results of this study. The remainder of the glasses from preparation block 2 include: SB6VS-01, -03, -05 and -10.

Due to the low measured values of ThO_2, SB6VS-19 and SB6VS-22 were re-digested and re-measured. The re-measured results of these two glasses indicate that the measured values are consistent with the target values. At the present time the reason for the low ThO_2 recoveries in the first set of measurements remains unclear. A more thorough discussion of the ThO_2 analysis and results is provided in SRNL-L4000-2010-00052.[19]

Table 3-1. Re-measured Values of SB6VS-02, -04 and -15

Glass ID	SB6VS-02		SB6VS-04		SB6VS-15	
Comp View	target	measured	target	measured	target	measured
Al_2O_3	9.789	10.543	9.761	10.525	9.531	10.109
B_2O_3	5.12	5.023	5.12	5.055	5.12	5.023
BaO	0.052	0.055	0.017	0.02	0.034	0.033
CaO	0.729	0.775	0.729	0.708	0.504	0.498
Ce_2O_3	0.08	0.078	0.027	0.038	0.053	0.038
Cr_2O_3	0.046	0.052	0.016	0.037	0.031	0.044
CuO	0.041	0.036	0.014	0.009	0.028	0.039
Fe_2O_3	9.656	9.25	9.656	8.55	8.763	8.421
K_2O	0.033	0.119	0.011	0.119	0.022	0.119
La_2O_3	0.041	0.031	0.014	0.006	0.027	0.018
Li_2O	5.12	4.952	5.12	4.952	5.12	4.909
MgO	0.062	0.069	0.062	0.066	0.278	0.274
MnO	2.249	2.208	2.729	2.699	2.489	2.453
Na_2O	13.73	14.289	13.73	13.224	14.768	13.884
NiO	0.861	0.827	1.264	1.185	1.06	1.007
P_2O_5	0.171	0.38	0.058	0.38	0.114	0.38
PbO	0.011	0.039	0.004	0.039	0.007	0.039
SO_4	0.383	1.107	0.383	1.107	0.5034	1.1055
SiO_2	49.627	52.627	49.212	51.985	49.418	51.985
TiO_2	0.661	0.647	0	0.006	0.328	0.319
U_3O_8	1.422	1.226	2.034	1.722	1.723	1.474
ZnO	0.027	0.054	0.009	0.009	0.018	0.03
ZrO_2	0.09	0.088	0.03	0.031	0.06	0.054
Sum	100.00	104.53	100.00	102.53	100.00	102.31

3.2 MAR Assessment

MAR assessment results for both sets of glasses are provided in Table 3-2. The columns in the table list the glass identifier with compositional view, nepheline value, TiO_2 content (wt%) and the overall MAR assessment and the predicted values for: ΔG_p value for boron (B Del G_p value), normalized leachate for boron in grams/Liter (NL [B (g/L)]), liquidus temperature in degrees Celsius (T_L (ºC)) and viscosity in Poise (Visc (P)). No issues are present in any of the target compositions; however, a few issues appear for the measured compositions, which include: Del G_P and nepheline. Based on the data analyses in the previous section, these issues should not be a concern as the measured compositions used to calculate the MAR status were not representative of the target compositions or the actual glasses. The MAR assessment results of the three re-measured glasses are shown in
Table **3-3**. No issues are present in any of these glasses based on model predictions.

Table 3-2. MAR Assessment Results

Glass ID	Compositional View	B Del Gp Value	NL[B (g/L)]	TL Pred (oC)	Visc Pred (P)	TiO_2 wt%	Neph Val	MAR Status
SB6VS-01	target	-9.79	0.75	903	54	0.00	0.67	
SB6VS-02		-9.74	0.73	893	55	0.66	0.68	
SB6VS-03		-9.77	0.74	894	64	0.66	0.67	
SB6VS-04		-10.05	0.83	907	53	0.00	0.68	
SB6VS-05		-11.58	1.57	832	46	0.00	0.65	
SB6VS-06		-11.74	1.68	810	45	0.00	0.66	
SB6VS-07		-11.20	1.34	864	50	0.00	0.66	
SB6VS-08		-11.77	1.70	864	35	0.66	0.67	
SB6VS-09		-10.97	1.22	903	45	0.00	0.69	
SB6VS-10		-10.88	1.18	866	44	0.66	0.69	
SB6VS-11		-10.50	1.00	857	57	0.66	0.66	
SB6VS-12		-12.21	2.04	850	39	0.66	0.67	
SB6VS-13		-10.76	1.12	827	56	0.29	0.70	
SB6VS-14		-10.85	1.16	848	52	0.31	0.69	
SB6VS-15		-10.93	1.20	869	47	0.33	0.67	
SB6VS-16		-11.02	1.25	888	43	0.35	0.66	
SB6VS-17		-11.11	1.29	906	39	0.37	0.64	
SB6VS-01	measured	-12.10	1.96	866	41	0.01	0.64	
SB6VS-02		-12.28	2.11	852	38	0.75	0.64	
SB6VS-03		-12.48	2.29	849	46	0.78	0.64	
SB6VS-04		-12.56	2.37	844	36	0.01	0.64	
SB6VS-05		-14.68	5.74	794	28	0.01	0.61	Del Gp Neph
SB6VS-06		-11.60	1.59	812	48	0.01	0.65	
SB6VS-07		-11.55	1.55	852	49	0.01	0.64	
SB6VS-08		-12.76	2.58	838	27	0.71	0.65	
SB6VS-09		-11.62	1.60	887	42	0.01	0.67	
SB6VS-10		-13.34	3.28	832	29	0.82	0.65	
SB6VS-11		-11.55	1.55	820	52	0.71	0.64	
SB6VS-12		-12.53	2.34	838	36	0.69	0.66	
SB6VS-13		-10.98	1.22	848	55	0.33	0.65	
SB6VS-14		-10.32	0.93	841	58	0.32	0.68	
SB6VS-15		-13.52	3.53	831	31	0.41	0.63	Del Gp
SB6VS-16		-11.43	1.48	879	45	0.38	0.65	
SB6VS-17		-11.66	1.62	890	37	0.40	0.62	Neph
SB6VS18	target	-10.55	1.02	822	58	0.29	0.71	
SB6VS19		-10.63	1.06	844	54	0.31	0.69	
SB6VS20		-10.70	1.09	865	49	0.33	0.68	
SB6VS21		-10.78	1.12	885	45	0.35	0.66	
SB6VS22		-10.85	1.16	904	41	0.37	0.65	
SB6VS18	measured	-9.61	0.69	830	79	0.30	0.72	
SB6VS19		-10.37	0.95	839	66	0.32	0.70	
SB6VS20		-9.42	0.64	878	71	0.33	0.69	
SB6VS21		-10.70	1.09	874	54	0.35	0.67	
SB6VS22		-9.23	0.59	922	65	0.37	0.67	

Table 3-3. MAR Assessment Results of Re-Measured SB6VS-02, -04 and -15

Glass ID	Compositional View	B Del Gp Value	NL[B (g/L)]	TL Pred (oC)	Visc Pred (P)	TiO_2 wt%	Neph Val	MAR Status
SB6VS-02	target	-9.74	0.73	893	55	0.661	0.68	
	measured	-9.72	0.72	882	72	0.647	0.68	
SB6VS-04	target	-10.05	0.83	907	53	0	0.68	
	measured	-9.22	0.59	902	83	0.006	0.69	
SB6VS-15	target	-10.93	1.20	869	47	0.328	0.67	
	measured	-9.74	0.73	883	74	0.319	0.68	

3.3 XRD

Each of the quenched and ccc glasses were amorphous (within the detection limit of the instrument [0.5 vol%]). Representative XRD scans from a quenched and ccc glass are shown in Figure 3-1.[g]

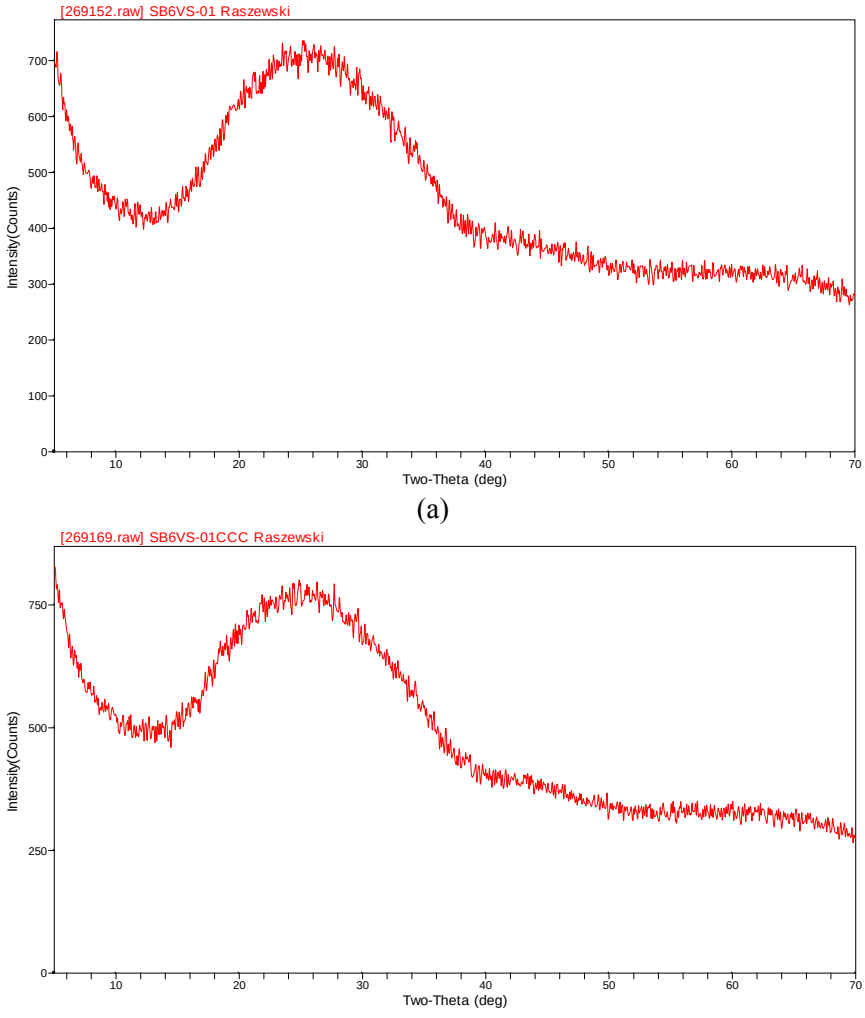


Figure 3-1. Representative XRD pattern from a quenched (a) and ccc (b) sample.

[g] The remainder of the XRD patterns (quenched and ccc) can be viewed in the laboratory notebook for the SB6 variability study on pages 25 through 29 (WSRC-NB-2003-00041). XRD spectra of the thorium glasses were not measured as no issues with durability were observed.

3.4 PCT

Table B1 in Appendix B and Table D1 in Appendix D provide the elemental leachate concentration measurements for the solution samples generated by the PCTs for the non-thorium study glasses and the thorium-based study glasses, respectively. Any measurement below the detection limit of the analytical procedure (indicated by a "<") was replaced by ½ of the detection limit in subsequent analyses.[18] In addition to adjustments for detection limits, the values were adjusted for the dilution factors: study glasses, blanks and the ARM glass were multiplied by 1.6667 to determine the values in parts per million (ppm) and the values for EA were multiplied by 16.6667. Table B2 in Appendix B provides the resulting values. Over the course of the 7-day test, there were no water loss issues.

3.4.1 *Measurements in Analytical Sequence*

Exhibit B1 in Appendix B provides plots of the common logarithms of the leachate (ppm) concentrations in analytical sequence for all of the data from all two sets of PCTs for the non-thorium study glasses. Exhibit D1 in Appendix D provides similar plots for the PCTs for the thorium glasses. No issues are observed in these plots.

3.4.2 *Results of the Multi-Element Solution Standard*

Exhibit B2 in Appendix B provides analyses of measurements of the multi-element solution standard by analytical set/ICP calibration block, and ANOVA investigations for each element of interest. A statistically significant difference (at a 5% level) among the averages of these measurements is indicated for B and Na. Exhibit D2 in Appendix D provides a similar analysis for the thorium glass study. No statistically significant differences are shown (at a 5% level) among the averages of these measurements for any of the elements of interest.

Table 3-4 summarizes the average measurements and the reference values for the 4 elements of interest for both sets of PCTs. The results indicate consistent and accurate measurements throughout the measurement process.

Table 3-4. Results from Samples of the Multi-Element Solution Standard

	Analytical Set/Block	Avg B	Avg Li	Avg Na	Avg Si
		(ppm)			
Non-Thorium Glasses	1/1	20	9.9	82.5	50.9
	1/2	20.1	10	82.3	50.9
	1/3	20	10	82.5	50.2
	2/1	20.1	10.1	82.5	50.8
	2/2	19.8	10	81.8	50.4
	2/3	19.9	10	80.9	50.5
Thorium Glasses	1	19.8	9.8	82.3	52
	2	19.8	9.8	82.4	51.8
	3	19.9	9.9	82.2	52
	Grand Average	19.9	9.9	82.2	51.1
	Reference Value	20	10	81	50
	% difference	-0.48%	-0.66%	1.43%	2.13%

3.4.3 *Measurements by Glass Identifier*

Exhibit B3 in Appendix B provides plots of the leachate concentrations for both the quenched and ccc version of each of the non-thorium study glasses, as well as the standards (EA, ARM[h], multi-element solution standard and blanks).[20] Two units of measure are used in these plots: ppm and the common logarithms of the ppm values. The common logarithm plots allow for the assessment of the repeatability of the measurements and any differences between the quenched and ccc version of a given glass. A similar set of plots is provided in Exhibit D3 of Appendix D for the thorium study glasses.

For some of the glasses, scatter in the triplicate values of some analytes is observed; however, these results do not affect the outcome of this study.

3.4.4 *Normalized PCT Results*

For all of the PCT results, the PCT leachate concentrations were normalized using the target and measured cation compositions (wt%) in the glass to obtain a grams-per-liter (g/L) leachate concentration.

As is the usual convention, the common logarithm of the normalized PCT (normalized leachate, NL) for each element of interest was determined and used for comparison. To accomplish this computation, one must:

1. Determine the common logarithm of the elemental leachate concentration (ppm) for each of the triplicates and each of the elements of interest (these values are provided in Table B1 of Appendix B for the non-throium set of glasses and in Table D1 of Appendix D for the thorium study glasses).

2. Average the common logarithms over the triplicates for each element of interest.

Normalizing Using Measured Composition

3. Subtract a quantity equal to 1 plus the common logarithm of the average cation measured concentration (expressed as a weight percent of the glass) from the average computed in step 2.

Or Normalizing Using Target Composition

3. Subtract a quantity equal to 1 plus the common logarithm of the target cation concentration (expressed as a weight percent of the glass) from the average computed in step 2.

Exhibit B4 in Appendix B provides scatter plots that contain normalized released rates for both the quenched and ccc version of the non-thorium study glasses based on the target and measured compositions. These plots offer an opportunity to investigate the consistency in the leaching across the elements for the glasses of this study. Consistency in the leaching across the elements is typically demonstrated by a high degree of linear correlation among the values for pairs of these elements. The smallest correlation in this plot is for Na and Si, with a value of ~95.4%, which demonstrates the consistency of the results among the 4 analytes. A similar set of results

[h] The concentrations of each element of interest for ARM are within the controls limits in THERMO™.

for the thorium glasses is provided in Exhibit D4 of Appendix D. The smallest correlation for these results is for B and Si, with a value of 98.5%.

Table 3-5 and Table 3-6 summarize the normalized PCTs for all of the glasses of this study, which are listed by heat treatment and compositional view for each glass. The PCTs for all of the glasses are acceptable based upon comparisons to the EA results.

3.4.5 *Effects of Heat Treatment*

Exhibit B5 in Appendix B provides plots of the normalized PCT responses between the two heat treatments for the non-thorium set of study glasses and Exhibit D5 of Appendix D providing similar plots for the thorium study glasses. These plots provide a basis for judging the practical impact of differences in the PCT response due to the heat treatment of the glass. In general, the ccc versions are relatively consistent with the quenched versions (within experimental error). The boron releases of each compositional view are well below EA and are acceptable.

3.4.6 *Predicted versus Measured PCT Values*

Exhibits B6 and B7 in Appendix B provide plots of the DWPF models for B, Li, Na, and Si that relate the logarithm of the normalized PCT (for each element of interest) to a linear function of a free energy of hydration term (ΔG_p, kcal/100g glass) derived for the target and measured compositional views, respectively, for the non-thorium study glasses. The results for both heat treatments are shown on each plot. Prediction limits at a 95% confidence level for an individual PCT result are also plotted along with the linear fit. The EA and ARM results are also indicated on these plots. A similar set of plots for the thorium study glasses is provided in Exhibits D6 and D7 of Appendix D. Figure 3-2 provides a closer look at the boron PCT responses from both sets of glasses.

Note that the PCT results for the measured compositions of the non-thorium glasses show some that are not predictable by the DWPF durability models. Table B2 in Appendix B highlights those glasses that are unpredictable. As stated in Section 3.1.4, it was determined that there were issues with analyses of block 2 of the LM dissolutions and that the target compositions are more representative of the actual glass compositions. In general, the unpredictable glasses highlighted in Table B2 correspond to those glasses of preparation block 2. PCT results of the re-digested and re-measured glasses from preparation block 2 (SB6VS-02, -04 and -15) are shown in Table 3-7. Figure 3-3 contains the boron PCT responses of the re-measured glasses. A plot of the original data is shown for comparison. Using the re-measured compositions, the glasses are both acceptable with respect to EA and predictable.

Table 3-5. Normalized PCT Results of the Non-Thorium Glasses

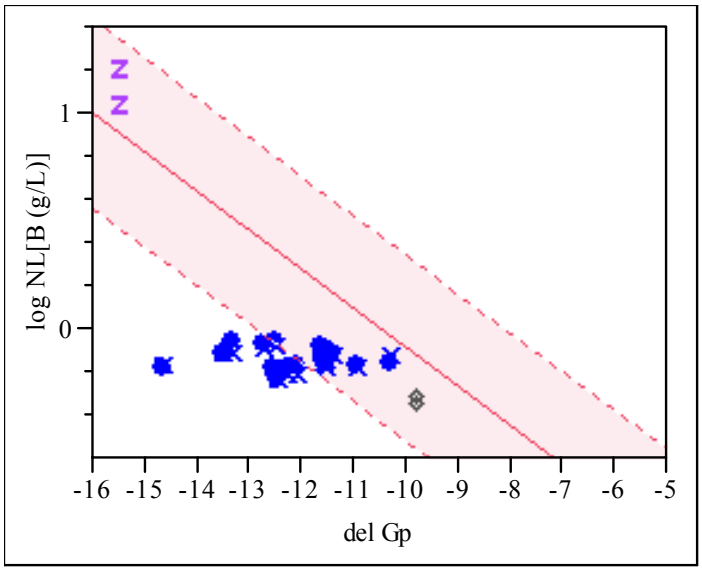
Set	Glass ID	Heat Treatment	Comp View	log NL [B (g/L)]	log NL [Li(g/L)]	log NL [Na (g/L)]	log NL [Si (g/L)]	NL B (g/L)	NL Li (g/L)	NL Na (g/L)	NL Si (g/L)
1	ARM	ref	reference	-0.34	-0.264	-0.325	-0.572	0.46	0.54	0.47	0.27
2				-0.309	-0.226	-0.288	-0.541	0.49	0.59	0.52	0.29
1	EA			1.212	0.959	1.107	0.587	16.3	9.1	12.8	3.86
2				1.048	0.839	0.958	0.488	11.16	6.91	9.09	3.08
1	SB6VS-01	ccc	measured	-0.206	-0.132	-0.222	-0.291	0.62	0.74	0.6	0.51
			target	-0.223	-0.153	-0.145	-0.297	0.6	0.7	0.72	0.5
		quenched	measured	-0.168	-0.111	-0.174	-0.268	0.68	0.77	0.67	0.54
			target	-0.185	-0.132	-0.097	-0.274	0.65	0.74	0.8	0.53
	SB6VS-02	ccc	measured	-0.216	-0.133	-0.234	-0.294	0.61	0.74	0.58	0.51
			target	-0.246	-0.156	-0.148	-0.305	0.57	0.7	0.71	0.5
		quenched	measured	-0.177	-0.109	-0.181	-0.267	0.66	0.78	0.66	0.54
			target	-0.208	-0.132	-0.096	-0.278	0.62	0.74	0.8	0.53
	SB6VS-03	ccc	measured	-0.232	-0.152	-0.246	-0.307	0.59	0.71	0.57	0.49
			target	-0.253	-0.173	-0.155	-0.314	0.56	0.67	0.7	0.49
		quenched	measured	-0.228	-0.155	-0.22	-0.301	0.59	0.7	0.6	0.5
			target	-0.25	-0.176	-0.129	-0.308	0.56	0.67	0.74	0.49
	SB6VS-04	ccc	measured	-0.176	-0.103	-0.21	-0.268	0.67	0.79	0.62	0.54
			target	-0.22	-0.139	-0.129	-0.293	0.6	0.73	0.74	0.51
		quenched	measured	-0.175	-0.123	-0.187	-0.265	0.67	0.75	0.65	0.54
			target	-0.22	-0.159	-0.106	-0.29	0.6	0.69	0.78	0.51
	SB6VS-05	ccc	measured	-0.164	-0.093	-0.143	-0.243	0.69	0.81	0.72	0.57
			target	-0.194	-0.117	-0.053	-0.255	0.64	0.76	0.88	0.56
		quenched	measured	-0.175	-0.131	-0.116	-0.255	0.67	0.74	0.77	0.56
			target	-0.205	-0.154	-0.026	-0.267	0.62	0.7	0.94	0.54
	SB6VS-06	ccc	measured	-0.166	-0.076	-0.025	-0.24	0.68	0.84	0.94	0.58
			target	-0.178	-0.095	-0.023	-0.246	0.66	0.8	0.95	0.57
		quenched	measured	-0.149	-0.076	0.022	-0.225	0.71	0.84	1.05	0.6
			target	-0.162	-0.095	0.025	-0.231	0.69	0.8	1.06	0.59
	SB6VS-07	ccc	measured	-0.149	-0.066	-0.061	-0.239	0.71	0.86	0.87	0.58
			target	-0.171	-0.099	-0.043	-0.252	0.67	0.8	0.91	0.56
		quenched	measured	-0.145	-0.094	-0.032	-0.233	0.72	0.81	0.93	0.58
			target	-0.167	-0.126	-0.013	-0.246	0.68	0.75	0.97	0.57
	SB6VS-08	ccc	measured	-0.088	-0.031	-0.038	-0.186	0.82	0.93	0.92	0.65
			target	-0.136	-0.072	-0.008	-0.218	0.73	0.85	0.98	0.61
		quenched	measured	-0.071	-0.036	0.008	-0.18	0.85	0.92	1.02	0.66
			target	-0.119	-0.078	0.038	-0.211	0.76	0.84	1.09	0.62
	SB6VS-09	ccc	measured	-0.152	-0.099	-0.127	-0.285	0.7	0.8	0.75	0.52
			target	-0.176	-0.131	-0.101	-0.299	0.67	0.74	0.79	0.5
		quenched	measured	-0.115	-0.067	-0.064	-0.248	0.77	0.86	0.86	0.56
			target	-0.138	-0.099	-0.038	-0.263	0.73	0.8	0.92	0.55
2	SB6VS-10	ccc	measured	-0.109	-0.048	-0.135	-0.197	0.78	0.9	0.73	0.64
			target	-0.141	-0.076	-0.056	-0.212	0.72	0.84	0.88	0.61
		quenched	measured	-0.057	-0.028	-0.086	-0.176	0.88	0.94	0.82	0.67
			target	-0.089	-0.056	-0.007	-0.191	0.81	0.88	0.98	0.64
	SB6VS-11	ccc	measured	-0.176	-0.099	-0.135	-0.268	0.67	0.8	0.73	0.54
			target	-0.208	-0.131	-0.1	-0.283	0.62	0.74	0.8	0.52
		quenched	measured	-0.147	-0.076	-0.079	-0.237	0.71	0.84	0.83	0.58
			target	-0.179	-0.108	-0.043	-0.251	0.66	0.78	0.91	0.56
	SB6VS-12	ccc	measured	-0.081	-0.018	-0.008	-0.199	0.83	0.96	0.98	0.63
			target	-0.12	-0.053	0.005	-0.22	0.76	0.89	1.01	0.6
		quenched	measured	-0.055	-0.005	0.048	-0.178	0.88	0.99	1.12	0.66
			target	-0.093	-0.04	0.061	-0.199	0.81	0.91	1.15	0.63
	SB6VS-13	ccc	measured	-0.176	-0.08	-0.165	-0.244	0.67	0.83	0.68	0.57
			target	-0.222	-0.134	-0.12	-0.274	0.6	0.73	0.76	0.53
		quenched	measured	-0.163	-0.066	-0.125	-0.246	0.69	0.86	0.75	0.57
			target	-0.21	-0.12	-0.08	-0.276	0.62	0.76	0.83	0.53
	SB6VS-14	ccc	measured	-0.123	-0.038	-0.03	-0.2	0.75	0.92	0.93	0.63
			target	-0.157	-0.067	-0.042	-0.217	0.7	0.86	0.91	0.61
		quenched	measured	-0.157	-0.087	-0.044	-0.23	0.7	0.82	0.9	0.59
			target	-0.19	-0.116	-0.055	-0.247	0.65	0.77	0.88	0.57
	SB6VS-15	ccc	measured	-0.106	-0.029	-0.106	-0.189	0.78	0.94	0.78	0.65
			target	-0.135	-0.066	-0.026	-0.207	0.73	0.86	0.94	0.62
		quenched	measured	-0.11	-0.041	-0.086	-0.194	0.78	0.91	0.82	0.64
			target	-0.14	-0.078	-0.006	-0.212	0.72	0.84	0.99	0.61
	SB6VS-16	ccc	measured	-0.117	-0.064	-0.048	-0.214	0.76	0.86	0.89	0.61
			target	-0.133	-0.08	-0.028	-0.213	0.74	0.83	0.94	0.61
		quenched	measured	-0.108	-0.056	-0.006	-0.211	0.78	0.88	0.99	0.62
			target	-0.124	-0.072	0.014	-0.21	0.75	0.85	1.03	0.62
	SB6VS-17	ccc	measured	-0.093	-0.066	-0.049	-0.215	0.81	0.86	0.89	0.61
			target	-0.128	-0.093	-0.027	-0.229	0.75	0.81	0.94	0.59
		quenched	measured	-0.073	-0.057	0.004	-0.194	0.85	0.88	1.01	0.64
			target	-0.108	-0.084	0.026	-0.208	0.78	0.82	1.06	0.62

Table 3-6. Normalized PCT Results of the Thorium Glasses

Set	Glass ID	Heat Treatment	Comp View	log NL [B (g/L)]	log NL [Li(g/L)]	log NL [Na (g/L)]	log NL [Si (g/L)]	NL B (g/L)	NL Li (g/L)	NL Na (g/L)	NL Si (g/L)
3	ARM	ref	reference	-0.304	-0.231	-0.287	-0.536	0.5	0.59	0.52	0.29
	EA			1.193	0.945	1.089	0.594	15.59	8.81	12.28	3.92
	SB6VS-18	ccc	measured	-0.146	-0.073	-0.059	-0.288	0.72	0.85	0.87	0.51
			target	-0.161	-0.084	-0.085	-0.274	0.69	0.82	0.82	0.53
		quenched	measured	-0.165	-0.093	-0.042	-0.298	0.68	0.81	0.91	0.5
			target	-0.18	-0.104	-0.068	-0.284	0.66	0.79	0.85	0.52
	SB6VS-19	ccc	measured	-0.165	-0.096	-0.09	-0.31	0.68	0.8	0.81	0.49
			target	-0.182	-0.106	-0.092	-0.294	0.66	0.78	0.81	0.51
		quenched	measured	-0.155	-0.094	-0.052	-0.302	0.7	0.8	0.89	0.5
			target	-0.171	-0.105	-0.054	-0.287	0.67	0.79	0.88	0.52
	SB6VS-20	ccc	measured	-0.157	-0.09	-0.038	-0.299	0.7	0.81	0.92	0.5
			target	-0.174	-0.099	-0.082	-0.287	0.67	0.8	0.83	0.52
		quenched	measured	-0.156	-0.1	-0.003	-0.298	0.7	0.79	0.99	0.5
			target	-0.173	-0.109	-0.047	-0.286	0.67	0.78	0.9	0.52
	SB6VS-21	ccc	measured	-0.146	-0.095	-0.073	-0.3	0.72	0.8	0.85	0.5
			target	-0.164	-0.105	-0.07	-0.285	0.68	0.79	0.85	0.52
		quenched	measured	-0.159	-0.128	-0.057	-0.314	0.69	0.74	0.88	0.48
			target	-0.178	-0.138	-0.054	-0.3	0.66	0.73	0.88	0.5
	SB6VS-22	ccc	measured	-0.143	-0.1	-0.019	-0.301	0.72	0.79	0.96	0.5
			target	-0.16	-0.108	-0.071	-0.287	0.69	0.78	0.85	0.52
		quenched	measured	-0.142	-0.129	0.021	-0.305	0.72	0.74	1.05	0.5
			target	-0.159	-0.137	-0.032	-0.291	0.69	0.73	0.93	0.51

Table 3-7. Normalized PCT Results of the Re-Measured Glasses

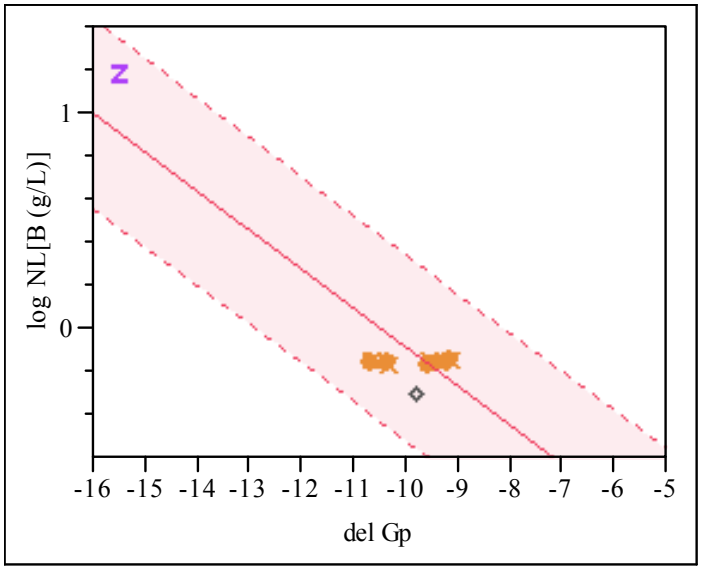
Glass ID	Heat Treatment	Comp View	log NL [B (g/L)]	log NL [Li(g/L)]	log NL [Na (g/L)]	log NL [Si (g/L)]	NL B (g/L)	NL Li (g/L)	NL Na (g/L)	NL Si (g/L)
SB6VS-02	ccc	measured	-0.238	-0.142	-0.166	-0.331	0.58	0.72	0.68	0.47
		target	-0.246	-0.156	-0.148	-0.305	0.57	0.70	0.71	0.50
	quenched	measured	-0.199	-0.117	-0.113	-0.304	0.63	0.76	0.77	0.50
		target	-0.208	-0.132	-0.096	-0.278	0.62	0.74	0.80	0.53
SB6VS-04	ccc	measured	-0.215	-0.124	-0.113	-0.317	0.61	0.75	0.77	0.48
		target	-0.22	-0.139	-0.129	-0.293	0.60	0.73	0.74	0.51
	quenched	measured	-0.214	-0.144	-0.09	-0.314	0.61	0.72	0.81	0.49
		target	-0.22	-0.159	-0.106	-0.29	0.60	0.69	0.78	0.51
SB6VS-15	ccc	measured	-0.127	-0.047	0	-0.229	0.75	0.90	1.00	0.59
		target	-0.135	-0.066	-0.026	-0.207	0.73	0.86	0.94	0.62
	quenched	measured	-0.131	-0.059	0.021	-0.234	0.74	0.87	1.05	0.58
		target	-0.14	-0.078	-0.006	-0.212	0.72	0.84	0.99	0.61



Legend

Symbol	Standard/ Comp View-Heat Treatment
Z	EA
◊	ARM
×	Measured-ccc
●	Measured-quenched

(a) Non-thorium Glasses

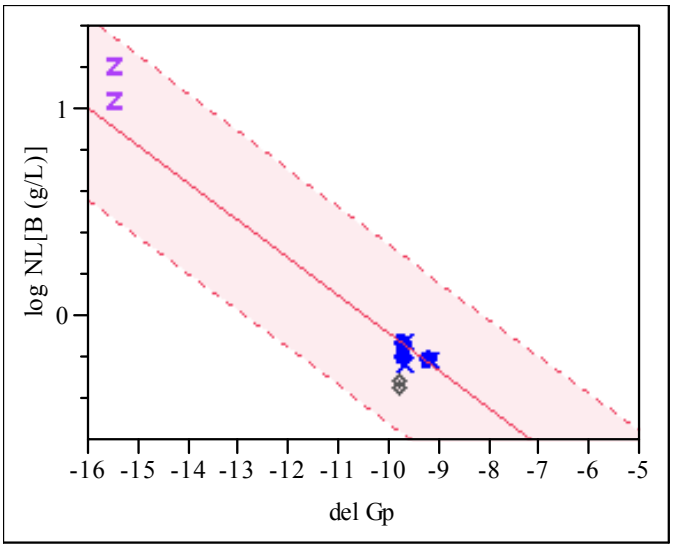


Legend

Symbol	Standard/ Comp View-Heat Treatment
Z	EA
◊	ARM
×	Measured-ccc
●	Measured-quenched

(b) Thorium Glasses

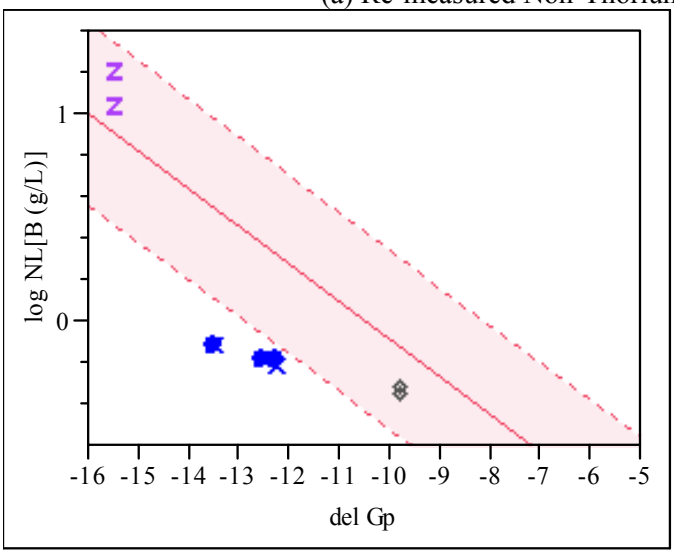
Figure 3-2. del Gp (ΔG_p) predictions versus the common logarithm of the normalized leachate (log NL[.]) for B. The PCT responses are normalized to the measured compositions of the (a) non-thorium glasses and (b) thorium glasses.



Legend

Symbol	Standard/ Comp View-Heat Treatment
z	EA
◊	ARM
×	Measured-ccc
●	Measured-quenched

(a) Re-measured Non-Thorium Glasses



Legend

Symbol	Standard/ Comp View-Heat Treatment
z	EA
◊	ARM
×	Measured-ccc
●	Measured-quenched

(b) Original Non-Thorium Glasses

Figure 3-3. del Gp (ΔG_p) predictions versus the common logarithm of the normalized leachate (log NL[.]) for B for SB6VS-02, -04 and -15. The PCT responses are normalized to the measured compositions of the (a) re-measured glasses and (b) original glasses.

4.0 Summary

To comply with the DWPF Glass Product Control Program, a total of twenty-two glasses were fabricated to assess the applicability of the current DWPF PCCS durability models for the SB6/Frit 418 system. Five of the twenty-two glasses contained thorium oxide, which were fabricated after it was discovered that thorium was a reportable element in the SRNL qualification glass. Based on the measured PCT response, all of the glasses (with and without thorium) are acceptable with respect to the EA reference glass regardless of thermal history. While all of the targeted glass compositions were predictable with respect to the PCCS models for durability, a small number of the measured glass compositions were located outside of the lower prediction limit indicating poorer durability than what was actually measured. These unpredictable glasses were in the same LM preparation block during the chemical analyses, which resulted in measured compositions that were not representative of the target compositions. A review of the data did not indicate a clear cause for the problem. Re-digestion and re-measurement of three glasses from this preparation block yielded glass compositions closer to the targets and predicted PCT responses within the PCCS model uncertainty. Therefore, it is believed that the glasses were correctly fabricated and the targeted compositions are closer representations of the true compositions.

Per the requirements of the DWPF Glass Product Control Program, the PCCS durability models have been shown to be applicable to the SB6/Frit 418 glass system. PCT results from the glasses fabricated as part of the variability study were shown to be predictable and/or acceptable with respect to the DWPF PCCS models. In addition, the inclusion of ThO_2 was shown to have minimal impact on the acceptability and predictability of the variability study glasses.

5.0 References

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Appendix A:

Tables and Exhibits Supporting the Analysis of the Chemical Composition Measurements of the Non-Thorium SB6 VS Glasses

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Table A1. Measured Elemental Concentrations (wt%) for the Study Glasses Prepared Using Lithium Metaborate (part 1)

Glass ID	Block	Sub-Block	Seq.	Lab ID	Ba (wt%)	Ca (wt%)	Cd (wt%)	Ce (wt%)	Cr (wt%)	Cu (wt%)	K (wt%)	La (wt%)	Mg (wt%)	Mn (wt%)
Batch 1	1	1	1	BCHLM111	0.126	0.850	<0.001	<0.012	0.070	0.287	2.83	<0.005	0.793	1.31
Ustd	1	1	2	UstdLM111	<0.003	0.966	<0.001	<0.012	0.171	<0.003	2.59	<0.005	0.713	2.14
SB6VS-11	1	1	3	K03LM21	0.019	0.592	<0.001	<0.012	0.017	0.011	0.05	0.011	0.316	2.23
SB6VS-07	1	1	4	K04LM11	0.017	0.246	<0.001	<0.012	0.016	0.010	0.05	0.008	0.301	1.77
SB6VS-17	1	1	5	K08LM11	0.035	0.426	<0.001	0.019	0.027	0.020	0.06	0.021	0.182	2.10
SB6VS-06	1	1	6	K09LM21	0.017	0.556	<0.001	<0.012	0.015	0.008	0.03	0.008	0.041	1.74
SB6VS-09	1	1	7	K01LM21	0.049	0.576	<0.001	0.042	0.034	0.030	0.06	0.030	0.325	2.17
SB6VS-12	1	1	8	K11LM11	0.048	0.564	<0.001	0.039	0.033	0.028	0.08	0.031	0.304	1.77
SB6VS-16	1	1	9	K17LM21	0.034	0.434	<0.001	0.021	0.029	0.022	0.08	0.021	0.181	2.08
SB6VS-12	1	1	10	K11LM21	0.047	0.551	<0.001	0.037	0.033	0.029	0.07	0.030	0.297	1.74
SB6VS-08	1	1	11	K06LM21	0.018	0.230	<0.001	<0.012	0.016	0.008	0.04	0.009	0.042	1.79
Batch 1	1	1	12	BCHLM121	0.126	0.850	<0.001	<0.012	0.071	0.285	2.81	<0.005	0.792	1.31
Ustd	1	1	13	UstdLM121	<0.003	0.965	<0.001	<0.012	0.172	<0.003	2.53	<0.005	0.713	2.16
SB6VS-09	1	1	14	K01LM11	0.050	0.587	<0.001	0.043	0.035	0.031	0.07	0.030	0.329	2.21
SB6VS-16	1	1	15	K17LM11	0.034	0.426	<0.001	0.016	0.029	0.021	0.05	0.021	0.181	2.11
SB6VS-17	1	1	16	K08LM21	0.038	0.476	<0.001	0.025	0.029	0.022	0.05	0.023	0.200	2.26
SB6VS-06	1	1	17	K09LM11	0.016	0.551	<0.001	<0.012	0.017	0.009	0.04	0.007	0.042	1.74
SB6VS-07	1	1	18	K04LM21	0.017	0.230	<0.001	<0.012	0.013	0.009	0.03	0.008	0.303	1.75
SB6VS-08	1	1	19	K06LM11	0.019	0.244	<0.001	<0.012	0.018	0.009	0.04	0.009	0.045	1.85
SB6VS-13	1	1	20	K05LM21	0.031	0.415	<0.001	0.017	0.024	0.019	0.05	0.018	0.164	1.83
SB6VS-13	1	1	21	K05LM11	0.029	0.362	<0.001	0.016	0.025	0.018	0.08	0.017	0.162	1.75
SB6VS-11	1	1	22	K03LM11	0.018	0.598	<0.001	<0.012	0.015	0.010	0.05	0.010	0.306	2.14
Batch 1	1	1	23	BCHLM131	0.127	0.864	<0.001	<0.012	0.071	0.286	2.51	<0.005	0.808	1.32
Ustd	1	1	24	UstdLM131	<0.003	0.975	<0.001	<0.012	0.171	<0.003	2.41	<0.005	0.725	2.15
Batch 1	1	2	1	BCHLM112	0.126	0.843	<0.001	<0.012	0.071	0.289	2.57	<0.005	0.798	1.31
Ustd	1	2	2	UstdLM112	<0.003	0.954	<0.001	<0.012	0.172	<0.003	2.58	<0.005	0.716	2.15
SB6VS-09	1	2	3	K01LM22	0.049	0.568	<0.001	0.042	0.035	0.031	0.065	0.030	0.325	2.18
SB6VS-11	1	2	4	K03LM22	0.019	0.583	<0.001	<0.012	0.017	0.011	0.048	0.011	0.316	2.23
SB6VS-08	1	2	5	K06LM12	0.019	0.236	<0.001	<0.012	0.018	0.009	0.044	0.009	0.044	1.85
SB6VS-13	1	2	6	K05LM12	0.029	0.351	<0.001	0.016	0.026	0.018	0.083	0.018	0.159	1.75
SB6VS-07	1	2	7	K04LM22	0.017	0.221	<0.001	<0.012	0.013	0.009	0.031	0.008	0.296	1.75
SB6VS-17	1	2	8	K08LM12	0.035	0.418	<0.001	0.021	0.027	0.020	0.060	0.021	0.180	2.10
SB6VS-12	1	2	9	K11LM22	0.047	0.541	<0.001	0.037	0.033	0.029	0.075	0.031	0.294	1.74
SB6VS-08	1	2	10	K06LM22	0.018	0.224	<0.001	<0.012	0.016	0.009	0.043	0.009	0.042	1.79
SB6VS-17	1	2	11	K08LM22	0.038	0.462	<0.001	0.025	0.030	0.022	0.055	0.023	0.194	2.27
Batch 1	1	2	12	BCHLM122	0.127	0.840	<0.001	<0.012	0.071	0.289	2.70	<0.005	0.787	1.32
Ustd	1	2	13	UstdLM122	<0.003	0.951	<0.001	<0.012	0.173	<0.003	2.51	<0.005	0.706	2.16
SB6VS-12	1	2	14	K11LM12	0.049	0.554	<0.001	0.040	0.034	0.028	0.079	0.031	0.300	1.78
SB6VS-06	1	2	15	K09LM12	0.016	0.529	<0.001	<0.012	0.018	0.009	0.038	0.008	0.038	1.74
SB6VS-09	1	2	16	K01LM12	0.050	0.571	<0.001	0.043	0.035	0.031	0.065	0.030	0.322	2.22
SB6VS-16	1	2	17	K17LM22	0.034	0.425	<0.001	0.021	0.029	0.022	0.077	0.021	0.178	2.09
SB6VS-07	1	2	18	K04LM12	0.017	0.239	<0.001	<0.012	0.016	0.010	0.050	0.008	0.294	1.78
SB6VS-13	1	2	19	K05LM22	0.031	0.400	<0.001	0.017	0.024	0.019	0.054	0.018	0.157	1.84
SB6VS-11	1	2	20	K03LM12	0.018	0.579	<0.001	<0.012	0.015	0.010	0.051	0.010	0.295	2.14
SB6VS-06	1	2	21	K09LM22	0.017	0.544	<0.001	<0.012	0.016	0.008	0.033	0.008	0.039	1.76
SB6VS-16	1	2	22	K17LM12	0.034	0.407	<0.001	0.018	0.030	0.021	0.053	0.020	0.173	2.12
Batch 1	1	2	23	BCHLM132	0.127	0.837	<0.001	<0.012	0.072	0.287	2.74	<0.005	0.778	1.32
Ustd	1	2	24	UstdLM132	<0.003	0.947	<0.001	<0.012	0.173	<0.003	2.56	<0.005	0.699	2.16
Batch 1	2	1	1	BCHLM211	0.128	0.845	<0.001	<0.012	0.072	0.284	2.69	<0.005	0.789	1.31
Ustd	2	1	2	UstdLM211	<0.003	0.963	<0.001	<0.012	0.174	<0.003	2.58	<0.005	0.715	2.16
SB6VS-15	2	1	3	K15LM11	0.037	0.455	<0.001	0.022	0.032	0.023	0.049	0.023	0.195	2.28
SB6VS-05	2	1	4	K12LM21	0.055	0.256	<0.001	0.045	0.039	0.035	0.077	0.035	0.047	2.48
SB6VS-01	2	1	5	K14LM21	0.057	0.264	<0.001	0.041	0.036	0.032	0.072	0.032	0.350	2.08
SB6VS-03	2	1	6	K13LM11	0.051	0.260	<0.001	0.042	0.038	0.033	0.072	0.034	0.047	2.48
SB6VS-10	2	1	7	K16LM21	0.021	0.258	<0.001	<0.012	0.019	0.007	0.035	0.010	0.346	2.51
SB6VS-01	2	1	8	K14LM11	0.056	0.254	<0.001	0.038	0.049	0.034	0.077	0.032	0.345	2.06
SB6VS-14	2	1	9	K02LM11	0.029	0.345	<0.001	0.016	0.025	0.017	0.034	0.017	0.147	1.74
SB6VS-14	2	1	10	K02LM21	0.036	0.424	<0.001	0.014	0.031	0.023	0.050	0.021	0.183	2.11
Batch 1	2	1	11	BCHLM221	0.130	0.847	<0.001	<0.012	0.073	0.282	2.63	<0.005	0.796	1.33
Ustd	2	1	12	UstdLM221	<0.003	0.959	<0.001	<0.012	0.176	<0.003	2.60	<0.005	0.716	2.19
SB6VS-02	2	1	13	K07LM11	0.058	0.649	<0.001	0.041	0.039	0.036	0.080	0.034	0.048	2.07
SB6VS-03	2	1	14	K13LM21	0.053	0.263	<0.001	0.042	0.039	0.034	0.068	0.034	0.048	2.56
SB6VS-05	2	1	15	K12LM11	0.057	0.261	<0.001	0.043	0.039	0.035	0.073	0.036	0.047	2.54
SB6VS-15	2	1	16	K15LM21	0.037	0.443	<0.001	0.019	0.031	0.021	0.046	0.022	0.192	2.24
SB6VS-10	2	1	17	K16LM11	0.020	0.247	<0.001	<0.012	0.017	0.006	0.030	0.010	0.339	2.44
SB6VS-04	2	1	18	K10LM11	0.020	0.632	<0.001	<0.012	0.017	0.011	0.033	0.010	0.047	2.36
SB6VS-02	2	1	19	K07LM21	0.058	0.641	<0.001	0.043	0.037	0.033	0.072	0.034	0.048	2.03
SB6VS-04	2	1	20	K10LM21	0.020	0.618	<0.001	<0.012	0.017	0.011	0.034	0.010	0.045	2.38
Batch 1	2	1	21	BCHLM231	0.132	0.846	<0.001	<0.012	0.074	0.279	2.67	<0.005	0.800	1.34

Table A1. Measured Elemental Concentrations (wt%) for the Study Glasses Prepared Using Lithium Metaborate (part 1)

Glass ID	Block	Sub-Block	Seq.	Lab ID	Ba (wt%)	Ca (wt%)	Cd (wt%)	Ce (wt%)	Cr (wt%)	Cu (wt%)	K (wt%)	La (wt%)	Mg (wt%)	Mn (wt%)
Ustd	2	1	22	UstdLM231	<0.003	0.957	<0.001	<0.012	0.180	<0.003	2.42	<0.005	0.721	2.21
Batch 1	2	2	1	BCHLM212	0.127	0.844	<0.001	<0.012	0.071	0.286	2.52	<0.005	0.798	1.30
Ustd	2	2	2	UstdLM212	<0.003	0.960	<0.001	<0.012	0.172	<0.003	2.47	<0.005	0.725	2.15
SB6VS-01	2	2	3	K14LM12	0.055	0.255	<0.001	0.036	0.048	0.034	0.076	0.032	0.351	2.03
SB6VS-14	2	2	4	K02LM12	0.028	0.345	<0.001	0.013	0.024	0.017	0.034	0.018	0.151	1.70
SB6VS-02	2	2	5	K07LM12	0.056	0.648	<0.001	0.039	0.039	0.037	0.078	0.035	0.050	2.05
SB6VS-05	2	2	6	K12LM12	0.056	0.261	<0.001	0.043	0.038	0.036	0.071	0.036	0.049	2.51
SB6VS-14	2	2	7	K02LM22	0.035	0.421	<0.001	<0.012	0.031	0.023	0.049	0.021	0.185	2.06
SB6VS-15	2	2	8	K15LM12	0.037	0.455	<0.001	0.016	0.032	0.023	0.048	0.023	0.199	2.28
SB6VS-03	2	2	9	K13LM12	0.051	0.260	<0.001	0.037	0.038	0.033	0.070	0.034	0.049	2.48
SB6VS-15	2	2	10	K15LM22	0.036	0.449	<0.001	0.016	0.031	0.021	0.045	0.022	0.197	2.21
Batch 1	2	2	11	BCHLM222	0.128	0.846	<0.001	<0.012	0.072	0.286	2.57	<0.005	0.812	1.31
Ustd	2	2	12	UstdLM222	<0.003	0.959	<0.001	<0.012	0.176	<0.003	2.41	<0.005	0.731	2.19
SB6VS-02	2	2	13	K07LM22	0.056	0.640	<0.001	0.042	0.036	0.034	0.072	0.034	0.049	1.98
SB6VS-10	2	2	14	K16LM12	0.020	0.248	<0.001	<0.012	0.017	0.006	0.029	0.010	0.345	2.40
SB6VS-10	2	2	15	K16LM22	0.020	0.256	<0.001	<0.012	0.019	0.007	0.034	0.010	0.353	2.51
SB6VS-03	2	2	16	K13LM22	0.053	0.263	<0.001	0.039	0.038	0.034	0.068	0.035	0.050	2.54
SB6VS-04	2	2	17	K10LM12	0.020	0.631	<0.001	<0.012	0.016	0.012	0.033	0.011	0.049	2.34
SB6VS-05	2	2	18	K12LM22	0.055	0.254	<0.001	0.036	0.039	0.035	0.074	0.035	0.049	2.48
SB6VS-01	2	2	19	K14LM22	0.057	0.247	<0.001	0.032	0.036	0.033	0.070	0.033	0.336	2.08
SB6VS-04	2	2	20	K10LM22	0.019	0.618	<0.001	<0.012	0.017	0.011	0.034	0.010	0.047	2.36
Batch 1	2	2	21	BCHLM232	0.129	0.844	<0.001	<0.012	0.073	0.285	2.57	<0.005	0.818	1.33
Ustd	2	2	22	UstdLM232	<0.003	0.958	<0.001	<0.012	0.177	<0.003	2.45	<0.005	0.738	2.20

Table A2. Measured Elemental Concentrations (wt%) for the Study Glasses Prepared Using Lithium Metaborate (part 2)

Glass ID	Block	Sub-Block	Seq	Lab ID	Na (wt%)	Ni (wt%)	P (wt%)	Pb (wt%)	S (wt%)	Ti (wt%)	U (wt%)	Zn (wt%)	Zr (wt%)
Batch 1	1	1	1	BCHLM111	6.78	0.586	<0.025	<0.005	<0.110	0.393	<0.500	<0.005	0.062
Ustd	1	1	2	UstdLM111	9.09	0.858	<0.025	<0.005	<0.110	0.599	2.09	<0.005	<0.002
SB6VS-11	1	1	3	K03LM21	12.00	0.724	0.030	<0.005	0.282	0.436	1.36	0.010	0.025
SB6VS-07	1	1	4	K04LM11	12.20	0.960	0.030	<0.005	0.192	0.007	1.21	0.012	0.022
SB6VS-17	1	1	5	K08LM11	11.70	0.899	0.060	<0.005	0.243	0.230	1.65	0.018	0.046
SB6VS-06	1	1	6	K09LM21	12.00	0.669	0.035	<0.005	0.241	0.006	1.77	0.008	0.023
SB6VS-09	1	1	7	K01LM21	11.20	1.010	0.076	0.011	0.270	0.006	1.27	0.022	0.066
SB6VS-12	1	1	8	K11LM11	12.30	0.990	0.079	<0.005	0.194	0.418	1.73	0.023	0.068
SB6VS-16	1	1	9	K17LM21	12.10	0.898	0.056	0.005	0.264	0.229	1.59	0.020	0.047
SB6VS-12	1	1	10	K11LM21	12.10	0.976	0.080	<0.005	0.185	0.409	1.73	0.023	0.066
SB6VS-08	1	1	11	K06LM21	12.30	0.993	0.032	<0.005	0.266	0.411	1.23	0.009	0.024
Batch 1	1	1	12	BCHLM121	7.04	0.596	<0.025	<0.005	<0.110	0.392	<0.500	<0.005	0.063
Ustd	1	1	13	UstdLM121	9.20	0.870	<0.025	<0.005	<0.110	0.597	2.05	<0.005	<0.002
SB6VS-09	1	1	14	K01LM11	11.40	1.030	0.073	0.010	0.281	0.006	1.28	0.023	0.067
SB6VS-16	1	1	15	K17LM11	11.90	0.904	0.065	0.008	0.267	0.226	1.66	0.018	0.045
SB6VS-17	1	1	16	K08LM21	12.80	0.971	0.064	<0.005	0.238	0.246	1.73	0.019	0.050
SB6VS-06	1	1	17	K09LM11	12.00	0.670	0.039	0.007	0.280	0.006	1.69	0.008	0.022
SB6VS-07	1	1	18	K04LM21	12.20	0.957	0.031	<0.005	0.176	0.006	1.24	0.010	0.022
SB6VS-08	1	1	19	K06LM11	13.00	1.030	0.033	<0.005	0.259	0.425	1.25	0.009	0.024
SB6VS-13	1	1	20	K05LM21	11.80	0.792	0.056	<0.005	0.222	0.199	1.37	0.020	0.041
SB6VS-13	1	1	21	K05LM11	11.90	0.758	0.051	<0.005	0.209	0.193	1.32	0.015	0.040
SB6VS-11	1	1	22	K03LM11	11.80	0.698	0.034	<0.005	0.273	0.413	1.19	0.009	0.024
Batch 1	1	1	23	BCHLM131	7.16	0.600	<0.025	<0.005	<0.110	0.393	<0.500	0.005	0.063
Ustd	1	1	24	UstdLM131	9.43	0.867	<0.025	<0.005	<0.110	0.593	2.06	<0.005	<0.002
Batch 1	1	2	1	BCHLM112	6.71	0.581	<0.025	<0.005	<0.110	0.398	<0.500	<0.005	0.063
Ustd	1	2	2	UstdLM112	8.95	0.851	<0.025	<0.005	<0.110	0.606	2.02	<0.005	<0.002
SB6VS-09	1	2	3	K01LM22	11.00	0.994	0.076	0.009	0.275	0.006	1.23	0.023	0.066
SB6VS-11	1	2	4	K03LM22	11.90	0.720	0.029	<0.005	0.293	0.441	1.26	0.011	0.024
SB6VS-08	1	2	5	K06LM12	12.50	1.010	0.034	<0.005	0.289	0.435	1.24	0.010	0.024
SB6VS-13	1	2	6	K05LM12	11.50	0.743	0.052	<0.005	0.206	0.198	1.27	0.016	0.040
SB6VS-07	1	2	7	K04LM22	11.80	0.942	0.029	<0.005	0.185	0.006	1.19	0.011	0.022
SB6VS-17	1	2	8	K08LM12	11.50	0.891	0.065	<0.005	0.254	0.233	1.54	0.019	0.046
SB6VS-12	1	2	9	K11LM22	11.90	0.960	0.083	<0.005	0.200	0.416	1.71	0.024	0.066
SB6VS-08	1	2	10	K06LM22	12.10	0.981	0.031	<0.005	0.275	0.419	1.20	0.010	0.024
SB6VS-17	1	2	11	K08LM22	12.40	0.962	0.065	<0.005	0.263	0.252	1.70	0.020	0.050
Batch 1	1	2	12	BCHLM122	6.81	0.589	<0.025	<0.005	<0.110	0.399	<0.500	<0.005	0.063
Ustd	1	2	13	UstdLM122	9.01	0.861	<0.025	<0.005	<0.110	0.606	2.03	<0.005	<0.002
SB6VS-12	1	2	14	K11LM12	11.90	0.989	0.086	<0.005	0.201	0.422	1.73	0.024	0.068
SB6VS-06	1	2	15	K09LM12	11.40	0.664	0.040	0.007	0.259	0.006	1.69	0.009	0.022
SB6VS-09	1	2	16	K01LM12	11.00	1.020	0.078	0.011	0.288	0.006	1.26	0.024	0.068
SB6VS-16	1	2	17	K17LM22	11.70	0.895	0.068	0.005	0.270	0.232	1.62	0.021	0.047
SB6VS-07	1	2	18	K04LM12	11.80	0.965	0.032	<0.005	0.191	0.007	1.17	0.012	0.022
SB6VS-13	1	2	19	K05LM22	11.00	0.787	0.056	<0.005	0.225	0.203	1.36	0.022	0.041
SB6VS-11	1	2	20	K03LM12	11.00	0.691	0.035	<0.005	0.276	0.420	1.23	0.009	0.024
SB6VS-06	1	2	21	K09LM22	11.60	0.678	0.039	0.005	0.268	0.006	1.68	0.008	0.023
SB6VS-16	1	2	22	K17LM12	11.40	0.902	0.066	0.008	0.265	0.229	1.69	0.020	0.045
Batch 1	1	2	23	BCHLM132	6.65	0.598	<0.025	<0.005	<0.110	0.397	<0.500	<0.005	0.063
Ustd	1	2	24	UstdLM132	8.81	0.869	<0.025	<0.005	<0.110	0.599	2.01	<0.005	<0.002
Batch 1	2	1	1	BCHLM211	6.80	0.580	<0.025	<0.005	<0.110	0.397	<0.500	<0.005	0.062
Ustd	2	1	2	UstdLM211	9.11	0.853	<0.025	<0.005	<0.110	0.603	2.06	<0.005	<0.002
SB6VS-15	2	1	3	K15LM11	13.30	0.958	0.054	<0.005	0.251	0.248	1.71	0.021	0.053
SB6VS-05	2	1	4	K12LM21	14.10	0.784	0.082	0.013	0.217	0.007	1.34	0.028	0.077
SB6VS-01	2	1	5	K14LM21	12.40	0.791	0.093	0.011	0.315	0.007	2.03	0.030	0.079
SB6VS-03	2	1	6	K13LM11	12.30	1.140	0.090	0.005	0.261	0.464	2.01	0.029	0.080
SB6VS-10	2	1	7	K16LM21	12.80	0.794	0.040	0.005	0.150	0.497	2.00	0.012	0.026
SB6VS-01	2	1	8	K14LM11	12.20	0.795	0.093	0.013	0.318	0.007	1.92	0.032	0.076
SB6VS-14	2	1	9	K02LM11	10.30	0.719	0.049	<0.005	0.204	0.191	1.32	0.015	0.040
SB6VS-14	2	1	10	K02LM21	12.90	0.889	0.057	<0.005	0.250	0.227	1.55	0.018	0.050
Batch 1	2	1	11	BCHLM221	6.87	0.598	<0.025	<0.005	<0.110	0.398	<0.500	<0.005	0.063
Ustd	2	1	12	UstdLM221	9.16	0.867	<0.025	<0.005	<0.110	0.602	2.06	<0.005	<0.002
SB6VS-02	2	1	13	K07LM11	12.30	0.786	0.087	0.010	0.198	0.455	1.49	0.029	0.077
SB6VS-03	2	1	14	K13LM21	12.60	1.180	0.099	0.005	0.273	0.472	2.05	0.030	0.082
SB6VS-05	2	1	15	K12LM11	14.4	0.809	0.087	0.014	0.214	0.007	1.43	0.029	0.078
SB6VS-15	2	1	16	K15LM21	12.9	0.940	0.049	0.006	0.236	0.239	1.63	0.021	0.051
SB6VS-10	2	1	17	K16LM11	12.50	0.772	0.041	<0.005	0.196	0.478	1.94	0.011	0.026
SB6VS-04	2	1	18	K10LM11	12.30	1.080	0.035	0.009	0.213	0.007	2.02	0.012	0.028
SB6VS-02	2	1	19	K07LM21	12.30	0.778	0.088	0.010	0.194	0.438	1.39	0.030	0.078
SB6VS-04	2	1	20	K10LM21	12.00	1.090	0.039	0.010	0.210	0.007	1.97	0.012	0.026
Batch 1	2	1	21	BCHLM231	6.89	0.611	<0.025	<0.005	<0.110	0.397	<0.500	<0.005	0.062

Table A2. Measured Elemental Concentrations (wt%) for the Study Glasses Prepared Using Lithium Metaborate (part 2)

Glass ID	Block	Sub-Block	Seq	Lab ID	Na (wt%)	Ni (wt%)	P (wt%)	Pb (wt%)	S (wt%)	Ti (wt%)	U (wt%)	Zn (wt%)	Zr (wt%)
Ustd	2	1	22	UstdLM231	9.18	0.888	<0.025	<0.005	<0.110	0.598	2.07	<0.005	<0.002
Batch 1	2	2	1	BCHLM212	6.87	0.582	<0.025	<0.005	<0.110	0.399	<0.500	<0.005	0.063
Ustd	2	2	2	UstdLM212	9.27	0.842	<0.025	<0.005	<0.110	0.606	1.98	<0.005	<0.002
SB6VS-01	2	2	3	K14LM12	12.30	0.779	0.093	0.010	0.304	0.007	1.88	0.031	0.076
SB6VS-14	2	2	4	K02LM12	10.50	0.703	0.050	<0.005	0.187	0.192	1.29	0.014	0.040
SB6VS-02	2	2	5	K07LM12	12.60	0.777	0.093	0.009	0.203	0.459	1.35	0.028	0.077
SB6VS-05	2	2	6	K12LM12	14.6	0.799	0.090	0.014	0.236	0.007	1.42	0.028	0.079
SB6VS-14	2	2	7	K02LM22	13.00	0.872	0.059	<0.005	0.236	0.227	1.55	0.018	0.049
SB6VS-15	2	2	8	K15LM12	13.4	0.964	0.062	<0.005	0.259	0.250	1.68	0.021	0.053
SB6VS-03	2	2	9	K13LM12	12.50	1.140	0.105	0.005	0.273	0.466	1.92	0.029	0.081
SB6VS-15	2	2	10	K15LM22	13.1	0.932	0.064	<0.005	0.237	0.243	1.63	0.020	0.051
Batch 1	2	2	11	BCHLM222	7.04	0.593	<0.025	<0.005	<0.110	0.401	<0.500	<0.005	0.063
Ustd	2	2	12	UstdLM222	9.33	0.871	<0.025	<0.005	<0.110	0.612	2.01	<0.005	<0.002
SB6VS-02	2	2	13	K07LM22	12.40	0.757	0.092	0.009	0.197	0.442	1.37	0.028	0.078
SB6VS-10	2	2	14	K16LM12	12.80	0.763	0.038	<0.005	0.165	0.482	1.90	0.011	0.026
SB6VS-10	2	2	15	K16LM22	13.10	0.804	0.046	0.005	0.202	0.501	1.93	0.012	0.026
SB6VS-03	2	2	16	K13LM22	12.80	1.170	0.100	0.006	0.277	0.476	2.01	0.030	0.082
SB6VS-04	2	2	17	K10LM12	12.60	1.080	0.044	0.009	0.230	0.007	1.97	0.012	0.028
SB6VS-05	2	2	18	K12LM22	14.40	0.799	0.095	0.011	0.225	0.007	1.40	0.029	0.077
SB6VS-01	2	2	19	K14LM22	11.80	0.805	0.106	0.012	0.324	0.007	1.88	0.030	0.078
SB6VS-04	2	2	20	K10LM22	12.20	1.070	0.040	0.009	0.235	0.007	1.92	0.012	0.026
Batch 1	2	2	21	BCHLM232	7.04	0.603	<0.025	<0.005	<0.110	0.403	<0.500	<0.005	0.063
Ustd	2	2	22	UstdLM232	9.40	0.879	<0.025	<0.005	<0.110	0.611	2.02	<0.005	<0.002

Table A3. Measured Elemental Concentrations (wt%) for the Study Glasses Prepared Using Peroxide Fusion

Glass ID	Block	Sub-Block	Sequence	Lab ID	Al (wt%)	B (wt%)	Fe (wt%)	Li (wt%)	Si (wt%)
Batch 1	1	1	1	BCHPF111	2.63	2.34	8.99	2.03	23.5
Ustd	1	1	2	UstdPF111	2.19	2.76	9.24	1.39	21.2
SB6VS-02	1	1	3	K07PF21	5.44	1.51	6.20	2.30	23.0
SB6VS-03	1	1	4	K13PF21	5.76	1.51	4.58	2.29	22.8
SB6VS-10	1	1	5	K16PF21	4.61	1.47	6.30	2.27	22.6
SB6VS-02	1	1	6	K07PF11	5.29	1.43	6.00	2.24	22.1
SB6VS-14	1	1	7	K02PF11	4.84	1.49	5.15	2.31	22.6
SB6VS-04	1	1	8	K10PF11	5.23	1.42	5.36	2.21	21.6
SB6VS-17	1	1	9	K08PF11	5.65	1.35	6.15	2.07	20.8
SB6VS-12	1	1	10	K11PF11	4.49	1.44	5.04	2.22	21.9
SB6VS-03	1	1	11	K13PF11	5.74	1.48	4.57	2.28	22.7
Batch 1	1	1	12	BCHPF121	2.63	2.29	8.96	2.04	23.5
Ustd	1	1	13	UstdPF121	2.20	2.72	9.22	1.39	21.2
SB6VS-08	1	1	14	K06PF11	4.35	1.41	5.95	2.20	21.2
SB6VS-08	1	1	15	K06PF21	4.40	1.41	6.00	2.19	21.4
SB6VS-14	1	1	16	K02PF21	4.82	1.50	5.18	2.34	22.9
SB6VS-05	1	1	17	K12PF11	5.62	1.43	5.05	2.23	21.9
SB6VS-12	1	1	18	K11PF21	4.49	1.42	4.97	2.21	21.8
SB6VS-10	1	1	19	K16PF11	4.47	1.43	6.22	2.24	22.1
SB6VS-04	1	1	20	K10PF21	5.22	1.42	5.37	2.22	21.7
SB6VS-17	1	1	21	K08PF21	5.78	1.37	6.26	2.15	21.2
SB6VS-05	1	1	22	K12PF21	5.85	1.50	5.27	2.34	22.8
Batch 1	1	1	23	BCHPF131	2.62	2.31	8.97	2.06	23.6
Ustd	1	1	24	UstdPF131	2.20	2.72	9.23	1.41	21.2
Batch 1	1	2	1	BCHPF112	2.62	2.37	8.97	2.03	23.5
Ustd	1	2	2	UstdPF112	2.18	2.77	9.26	1.37	21.2
SB6VS-04	1	2	3	K10PF22	5.23	1.45	5.40	2.16	21.8
SB6VS-03	1	2	4	K13PF12	5.73	1.53	4.58	2.25	22.8
SB6VS-17	1	2	5	K08PF12	5.68	1.38	6.20	2.07	20.9
SB6VS-04	1	2	6	K10PF12	5.24	1.45	5.40	2.17	21.7
SB6VS-02	1	2	7	K07PF12	5.27	1.47	6.06	2.20	22.3
SB6VS-08	1	2	8	K06PF22	4.40	1.44	6.05	2.13	21.6
SB6VS-08	1	2	9	K06PF12	4.34	1.44	5.99	2.13	21.4
SB6VS-02	1	2	10	K07PF22	5.44	1.52	6.24	2.28	23.1
SB6VS-17	1	2	11	K08PF22	5.76	1.40	6.28	2.09	21.2
Batch 1	1	2	12	BCHPF122	2.62	2.35	9.00	2.03	23.6
Ustd	1	2	13	UstdPF122	2.16	2.80	9.28	1.37	21.2
SB6VS-05	1	2	14	K12PF22	5.85	1.53	5.30	2.28	22.8
SB6VS-14	1	2	15	K02PF22	4.85	1.55	5.24	2.28	23.1
SB6VS-14	1	2	16	K02PF12	4.80	1.53	5.18	2.24	22.9
SB6VS-10	1	2	17	K16PF12	4.51	1.48	6.27	2.19	22.3
SB6VS-03	1	2	18	K13PF22	5.74	1.53	4.62	2.24	23.0
SB6VS-10	1	2	19	K16PF22	4.57	1.53	6.37	2.20	22.7
SB6VS-05	1	2	20	K12PF12	5.58	1.47	5.13	2.16	22.1
SB6VS-12	1	2	21	K11PF12	4.54	1.50	5.09	2.20	22.2
SB6VS-12	1	2	22	K11PF22	4.50	1.46	5.00	2.14	21.8
Batch 1	1	2	23	BCHPF132	2.59	2.36	9.02	2.01	23.7
Ustd	1	2	24	UstdPF132	2.18	2.80	9.32	1.39	21.3
Batch 1	2	1	1	BCHPF211	2.61	2.34	8.94	2.01	23.3
Ustd	2	1	2	UstdPF211	2.15	2.76	9.20	1.37	21.2
SB6VS-15	2	1	3	K15PF11	4.98	1.45	5.43	2.17	21.7
SB6VS-11	2	1	4	K03PF11	5.61	1.48	4.32	2.22	22.3
SB6VS-06	2	1	5	K09PF21	5.47	1.58	5.35	2.34	23.4
SB6VS-16	2	1	6	K17PF11	5.56	1.48	6.06	2.21	22.5
SB6VS-01	2	1	7	K14PF11	5.48	1.52	5.99	2.26	22.4
SB6VS-13	2	1	8	K05PF11	5.60	1.48	5.03	2.19	22.2
SB6VS-06	2	1	9	K09PF11	5.26	1.48	5.11	2.24	22.4
SB6VS-09	2	1	10	K01PF21	4.58	1.50	6.29	2.24	22.5
Batch 1	2	1	11	BCHPF221	2.63	2.37	9.06	2.03	23.6
Ustd	2	1	12	UstdPF221	2.16	2.77	9.23	1.37	21.2
SB6VS-13	2	1	13	K05PF21	5.95	1.59	5.35	2.33	23.4
SB6VS-01	2	1	14	K14PF21	5.56	1.54	6.09	2.31	23.0
SB6VS-11	2	1	15	K03PF21	5.64	1.49	4.34	2.22	22.3
SB6VS-15	2	1	16	K15PF21	5.14	1.52	5.63	2.24	22.6
SB6VS-16	2	1	17	K17PF21	5.60	1.51	6.11	2.24	22.5
SB6VS-09	2	1	18	K01PF11	4.50	1.49	6.21	2.21	22.5
SB6VS-07	2	1	19	K04PF21	5.67	1.50	5.10	2.22	22.5
SB6VS-07	2	1	20	K04PF11	5.72	1.52	5.16	2.23	22.7
Batch 1	2	1	21	BCHPF231	2.63	2.38	9.06	2.02	23.7

Table A3. Measured Elemental Concentrations (wt%) for the Study Glasses Prepared Using Peroxide Fusion

Glass ID	Block	Sub-Block	Sequence	Lab ID	Al (wt%)	B (wt%)	Fe (wt%)	Li (wt%)	Si (wt%)
Ustd	2	1	22	UstdPF231	2.15	2.78	9.24	1.37	21.3
Batch 1	2	2	1	BCHPF212	2.60	2.32	8.96	2.02	23.7
Ustd	2	2	2	UstdPF212	2.12	2.75	9.21	1.39	21.4
SB6VS-06	2	2	3	K09PF22	5.49	1.62	5.30	2.36	23.5
SB6VS-09	2	2	4	K01PF22	4.52	1.53	6.19	2.24	22.6
SB6VS-07	2	2	5	K04PF22	5.64	1.50	5.05	2.20	22.5
SB6VS-01	2	2	6	K14PF22	5.52	1.53	6.03	2.29	23.0
SB6VS-15	2	2	7	K15PF12	4.96	1.43	5.41	2.14	21.8
SB6VS-11	2	2	8	K03PF12	5.58	1.44	4.28	2.20	22.2
SB6VS-13	2	2	9	K05PF22	5.93	1.52	5.32	2.29	23.6
SB6VS-16	2	2	10	K17PF22	5.58	1.44	6.06	2.22	22.5
Batch 1	2	2	11	BCHPF222	2.60	2.29	8.99	2.05	23.7
Ustd	2	2	12	UstdPF222	2.11	2.68	9.15	1.34	21.1
SB6VS-11	2	2	13	K03PF22	5.61	1.50	4.32	2.21	22.2
SB6VS-16	2	2	14	K17PF12	5.53	1.51	6.01	2.20	22.3
SB6VS-01	2	2	15	K14PF12	5.44	1.53	5.95	2.21	22.3
SB6VS-15	2	2	16	K15PF22	5.15	1.54	5.61	2.19	22.5
SB6VS-09	2	2	17	K01PF12	4.51	1.51	6.18	2.16	22.2
SB6VS-13	2	2	18	K05PF12	5.58	1.48	5.02	2.12	22.1
SB6VS-06	2	2	19	K09PF12	5.24	1.50	5.10	2.16	22.3
SB6VS-07	2	2	20	K04PF12	5.72	1.52	5.13	2.18	22.5
Batch 1	2	2	21	BCHPF232	2.61	2.36	9.02	1.98	23.5
Ustd	2	2	22	UstdPF232	2.13	2.75	9.19	1.32	21.1

Table A4. Average Measured Chemical Compositions Versus Targeted Compositions

		Measured	Targeted	Difference of	% Difference of
Glass ID	**Oxide**	**(wt%)**	**(wt%)**	**Measured vs Targeted (wt%)**	**Measured vs Targeted**
Batch 1	Al_2O_3	4.9426	4.8770	0.0656	1.3%
Batch 1	B_2O_3	7.5346	7.7770	-0.2424	-3.1%
Batch 1	BaO	0.1426	0.1510	-0.0084	-5.5%
Batch 1	CaO	1.1842	1.2200	-0.0358	-2.9%
Batch 1	Ce_2O_3	0.0070	0.0000	0.0070	
Batch 1	Cr_2O_3	0.1049	0.1070	-0.0021	-2.0%
Batch 1	CuO	0.3573	0.3990	-0.0417	-10.5%
Batch 1	Fe_2O_3	12.8602	12.8390	0.0212	0.2%
Batch 1	K_2O	3.1932	3.3270	-0.1338	-4.0%
Batch 1	La_2O_3	0.0029	0.0000	0.0029	
Batch 1	Li_2O	4.3614	4.4290	-0.0676	-1.5%
Batch 1	MgO	1.3224	1.4190	-0.0966	-6.8%
Batch 1	MnO	1.7012	1.7260	-0.0248	-1.4%
Batch 1	Na_2O	9.2855	9.0030	0.2825	3.1%
Batch 1	NiO	0.7547	0.7510	0.0037	0.5%
Batch 1	P_2O_5	0.0286	0.0000	0.0286	
Batch 1	PbO	0.0027	0.0000	0.0027	
Batch 1	SiO_2	50.4340	50.2200	0.2140	0.4%
Batch 1	SO_4	0.1648	0.0000	0.1648	
Batch 1	TiO_2	0.6626	0.6770	-0.0144	-2.1%
Batch 1	U_3O_8	0.2948	0.0000	0.2948	
Batch 1	ZnO	0.0034	0.0000	0.0034	
Batch 1	ZrO_2	0.0848	0.0980	-0.0132	-13.5%
Batch 1	Sum	99.4308	99.0200	0.4108	0.4%
SB6VS-01	Al_2O_3	10.3923	10.0274	0.3648	3.6%
SB6VS-01	B_2O_3	4.9264	5.1200	-0.1936	-3.8%
SB6VS-01	BaO	0.0628	0.0515	0.0113	21.9%
SB6VS-01	CaO	0.3568	0.2794	0.0774	27.7%
SB6VS-01	Ce_2O_3	0.0430	0.0802	-0.0372	-46.3%
SB6VS-01	Cr_2O_3	0.0618	0.0463	0.0155	33.4%
SB6VS-01	CuO	0.0416	0.0414	0.0002	0.5%
SB6VS-01	Fe_2O_3	8.5996	9.6556	-1.0559	-10.9%
SB6VS-01	K_2O	0.0888	0.0332	0.0556	167.3%
SB6VS-01	La_2O_3	0.0378	0.0410	-0.0031	-7.7%
SB6VS-01	Li_2O	4.8817	5.1200	-0.2383	-4.7%
SB6VS-01	MgO	0.5729	0.4964	0.0765	15.4%
SB6VS-01	MnO	2.6631	2.2489	0.4142	18.4%
SB6VS-01	Na_2O	16.4119	13.7301	2.6818	19.5%
SB6VS-01	NiO	1.0085	0.8608	0.1477	17.2%
SB6VS-01	P_2O_5	0.2205	0.1712	0.0494	28.8%
SB6VS-01	PbO	0.0124	0.0110	0.0014	13.1%
SB6VS-01	SiO_2	48.5086	49.2120	-0.7034	-1.4%
SB6VS-01	SO_4	0.9445	0.6228	0.3217	51.6%
SB6VS-01	TiO_2	0.0117	0.0000	0.0117	
SB6VS-01	U_3O_8	2.2729	2.0340	0.2389	11.7%

Table A4. Average Measured Chemical Compositions Versus Targeted Compositions

		Measured	Targeted	Difference of	% Difference of
Glass ID	**Oxide**	**(wt%)**	**(wt%)**	**Measured vs Targeted (wt%)**	**Measured vs Targeted**
SB6VS-01	ZnO	0.0383	0.0270	0.0113	41.8%
SB6VS-01	ZrO_2	0.1043	0.0898	0.0146	16.2%
SB6VS-01	Sum	102.2629	100.0000	2.2629	2.3%
SB6VS-02	Al_2O_3	10.1277	9.7888	0.3390	3.5%
SB6VS-02	B_2O_3	4.7735	5.1200	-0.3465	-6.8%
SB6VS-02	BaO	0.0636	0.0515	0.0121	23.5%
SB6VS-02	CaO	0.9018	0.7294	0.1724	23.6%
SB6VS-02	Ce_2O_3	0.0483	0.0802	-0.0319	-39.8%
SB6VS-02	Cr_2O_3	0.0552	0.0463	0.0089	19.2%
SB6VS-02	CuO	0.0438	0.0414	0.0024	5.8%
SB6VS-02	Fe_2O_3	8.7569	9.6556	-0.8986	-9.3%
SB6VS-02	K_2O	0.0909	0.0332	0.0577	173.6%
SB6VS-02	La_2O_3	0.0402	0.0410	-0.0008	-1.9%
SB6VS-02	Li_2O	4.8548	5.1200	-0.2652	-5.2%
SB6VS-02	MgO	0.0808	0.0616	0.0193	31.3%
SB6VS-02	MnO	2.6244	2.2489	0.3754	16.7%
SB6VS-02	Na_2O	16.7152	13.7301	2.9851	21.7%
SB6VS-02	NiO	0.9856	0.8608	0.1248	14.5%
SB6VS-02	P_2O_5	0.2062	0.1712	0.0350	20.5%
SB6VS-02	PbO	0.0102	0.0110	-0.0007	-6.6%
SB6VS-02	SiO_2	48.4017	49.6271	-1.2255	-2.5%
SB6VS-02	SO_4	0.5932	0.3830	0.2101	54.9%
SB6VS-02	TiO_2	0.7481	0.6606	0.0875	13.2%
SB6VS-02	U_3O_8	1.6509	1.4216	0.2292	16.1%
SB6VS-02	ZnO	0.0358	0.0270	0.0088	32.6%
SB6VS-02	ZrO_2	0.1047	0.0898	0.0149	16.6%
SB6VS-02	Sum	101.9141	100.0000	1.9141	1.9%
SB6VS-03	Al_2O_3	10.8505	10.3511	0.4994	4.8%
SB6VS-03	B_2O_3	4.8701	5.1200	-0.2499	-4.9%
SB6VS-03	BaO	0.0581	0.0515	0.0065	12.7%
SB6VS-03	CaO	0.3659	0.2794	0.0865	31.0%
SB6VS-03	Ce_2O_3	0.0469	0.0802	-0.0334	-41.6%
SB6VS-03	Cr_2O_3	0.0559	0.0463	0.0096	20.8%
SB6VS-03	CuO	0.0419	0.0414	0.0005	1.2%
SB6VS-03	Fe_2O_3	6.5587	7.8077	-1.2489	-16.0%
SB6VS-03	K_2O	0.0837	0.0332	0.0505	151.9%
SB6VS-03	La_2O_3	0.0402	0.0410	-0.0008	-1.9%
SB6VS-03	Li_2O	4.8763	5.1200	-0.2437	-4.8%
SB6VS-03	MgO	0.0804	0.0616	0.0189	30.6%
SB6VS-03	MnO	3.2474	2.7288	0.5186	19.0%
SB6VS-03	Na_2O	16.9174	13.7301	3.1873	23.2%
SB6VS-03	NiO	1.4729	1.2643	0.2086	16.5%
SB6VS-03	P_2O_5	0.2257	0.1712	0.0545	31.8%
SB6VS-03	PbO	0.0057	0.0110	-0.0053	-48.4%
SB6VS-03	SiO_2	48.8295	49.6271	-0.7976	-1.6%

Table A4. Average Measured Chemical Compositions Versus Targeted Compositions

		Measured	Targeted	Difference of	% Difference of
Glass ID	**Oxide**	**(wt%)**	**(wt%)**	**Measured vs Targeted (wt%)**	**Measured vs Targeted**
SB6VS-03	SO_4	0.8119	0.6228	0.1891	30.4%
SB6VS-03	TiO_2	0.7831	0.6606	0.1225	18.5%
SB6VS-03	U_3O_8	2.3555	2.0340	0.3215	15.8%
SB6VS-03	ZnO	0.0367	0.0270	0.0097	36.0%
SB6VS-03	ZrO_2	0.1098	0.0898	0.0200	22.2%
SB6VS-03	Sum	102.7247	100.0000	2.7247	2.7%
SB6VS-04	Al_2O_3	9.8821	9.7614	0.1207	1.2%
SB6VS-04	B_2O_3	4.6206	5.1200	-0.4994	-9.8%
SB6VS-04	BaO	0.0221	0.0174	0.0047	26.9%
SB6VS-04	CaO	0.8742	0.7294	0.1448	19.9%
SB6VS-04	Ce_2O_3	0.0070	0.0270	-0.0200	-74.0%
SB6VS-04	Cr_2O_3	0.0245	0.0156	0.0089	56.8%
SB6VS-04	CuO	0.0141	0.0140	0.0001	0.8%
SB6VS-04	Fe_2O_3	7.6954	9.6556	-1.9602	-20.3%
SB6VS-04	K_2O	0.0404	0.0112	0.0291	260.0%
SB6VS-04	La_2O_3	0.0120	0.0138	-0.0018	-13.0%
SB6VS-04	Li_2O	4.7149	5.1200	-0.4051	-7.9%
SB6VS-04	MgO	0.0779	0.0616	0.0164	26.6%
SB6VS-04	MnO	3.0472	2.7288	0.3184	11.7%
SB6VS-04	Na_2O	16.5467	13.7301	2.8166	20.5%
SB6VS-04	NiO	1.3743	1.2643	0.1100	8.7%
SB6VS-04	P_2O_5	0.0905	0.0577	0.0328	56.8%
SB6VS-04	PbO	0.0100	0.0037	0.0063	169.8%
SB6VS-04	SiO_2	46.4228	49.2120	-2.7892	-5.7%
SB6VS-04	SO_4	0.6651	0.3830	0.2820	73.6%
SB6VS-04	TiO_2	0.0117	0.0000	0.0117	
SB6VS-04	U_3O_8	2.3230	2.0340	0.2890	14.2%
SB6VS-04	ZnO	0.0149	0.0091	0.0058	64.1%
SB6VS-04	ZrO_2	0.0365	0.0303	0.0062	20.5%
SB6VS-04	Sum	98.5282	100.0000	-1.4718	-1.5%
SB6VS-05	Al_2O_3	10.8174	10.5307	0.2867	2.7%
SB6VS-05	B_2O_3	4.7735	5.1200	-0.3465	-6.8%
SB6VS-05	BaO	0.0622	0.0515	0.0107	20.8%
SB6VS-05	CaO	0.3610	0.2794	0.0816	29.2%
SB6VS-05	Ce_2O_3	0.0489	0.0802	-0.0313	-39.0%
SB6VS-05	Cr_2O_3	0.0566	0.0463	0.0103	22.3%
SB6VS-05	CuO	0.0441	0.0414	0.0027	6.5%
SB6VS-05	Fe_2O_3	7.4166	7.9319	-0.5153	-6.5%
SB6VS-05	K_2O	0.0888	0.0332	0.0556	167.3%
SB6VS-05	La_2O_3	0.0416	0.0410	0.0007	1.6%
SB6VS-05	Li_2O	4.8494	5.1200	-0.2706	-5.3%
SB6VS-05	MgO	0.0796	0.0616	0.0180	29.3%
SB6VS-05	MnO	3.2312	2.7288	0.5024	18.4%
SB6VS-05	Na_2O	19.3775	15.7576	3.6199	23.0%
SB6VS-05	NiO	1.0151	0.8608	0.1544	17.9%

Table A4. Average Measured Chemical Compositions Versus Targeted Compositions

		Measured	Targeted	Difference of	% Difference of
Glass ID	**Oxide**	**(wt%)**	**(wt%)**	**Measured vs Targeted (wt%)**	**Measured vs Targeted**
SB6VS-05	P_2O_5	0.2028	0.1712	0.0316	18.5%
SB6VS-05	PbO	0.0140	0.0110	0.0031	27.9%
SB6VS-05	SiO_2	47.9203	49.2120	-1.2917	-2.6%
SB6VS-05	SO_4	0.6681	0.3830	0.2850	74.4%
SB6VS-05	TiO_2	0.0117	0.0000	0.0117	
SB6VS-05	U_3O_8	1.6479	1.4216	0.2263	15.9%
SB6VS-05	ZnO	0.0355	0.0270	0.0085	31.4%
SB6VS-05	ZrO_2	0.1050	0.0898	0.0152	17.0%
SB6VS-05	Sum	102.8696	100.0000	2.8696	2.9%
SB6VS-06	Al_2O_3	10.1372	9.8104	0.3268	3.3%
SB6VS-06	B_2O_3	4.9747	5.1200	-0.1453	-2.8%
SB6VS-06	BaO	0.0184	0.0174	0.0011	6.1%
SB6VS-06	CaO	0.7626	0.7294	0.0332	4.6%
SB6VS-06	Ce_2O_3	0.0070	0.0270	-0.0200	-74.0%
SB6VS-06	Cr_2O_3	0.0241	0.0156	0.0085	54.5%
SB6VS-06	CuO	0.0106	0.0140	-0.0033	-23.8%
SB6VS-06	Fe_2O_3	7.4559	7.8077	-0.3518	-4.5%
SB6VS-06	K_2O	0.0425	0.0112	0.0313	278.8%
SB6VS-06	La_2O_3	0.0091	0.0138	-0.0047	-34.2%
SB6VS-06	Li_2O	4.8978	5.1200	-0.2222	-4.3%
SB6VS-06	MgO	0.0663	0.0616	0.0048	7.8%
SB6VS-06	MnO	2.2531	2.2489	0.0042	0.2%
SB6VS-06	Na_2O	15.8390	15.7576	0.0814	0.5%
SB6VS-06	NiO	0.8529	0.8608	-0.0079	-0.9%
SB6VS-06	P_2O_5	0.0876	0.0577	0.0299	51.8%
SB6VS-06	PbO	0.0058	0.0037	0.0021	56.8%
SB6VS-06	SiO_2	48.9900	49.6271	-0.6371	-1.3%
SB6VS-06	SO_4	0.7849	0.6228	0.1621	26.0%
SB6VS-06	TiO_2	0.0100	0.0000	0.0100	
SB6VS-06	U_3O_8	2.0135	2.0340	-0.0205	-1.0%
SB6VS-06	ZnO	0.0103	0.0091	0.0012	12.8%
SB6VS-06	ZrO_2	0.0304	0.0303	0.0001	0.4%
SB6VS-06	Sum	99.2844	100.0000	-0.7156	-0.7%
SB6VS-07	Al_2O_3	10.7465	10.5307	0.2158	2.0%
SB6VS-07	B_2O_3	4.8620	5.1200	-0.2580	-5.0%
SB6VS-07	BaO	0.0190	0.0174	0.0016	9.3%
SB6VS-07	CaO	0.3274	0.2794	0.0481	17.2%
SB6VS-07	Ce_2O_3	0.0070	0.0270	-0.0200	-74.0%
SB6VS-07	Cr_2O_3	0.0212	0.0156	0.0056	35.8%
SB6VS-07	CuO	0.0119	0.0140	-0.0021	-14.9%
SB6VS-07	Fe_2O_3	7.3058	7.8077	-0.5019	-6.4%
SB6VS-07	K_2O	0.0485	0.0112	0.0373	332.6%
SB6VS-07	La_2O_3	0.0094	0.0138	-0.0044	-32.1%
SB6VS-07	Li_2O	4.7525	5.1200	-0.3675	-7.2%
SB6VS-07	MgO	0.4950	0.4964	-0.0014	-0.3%

Table A4. Average Measured Chemical Compositions Versus Targeted Compositions

		Measured	Targeted	Difference of	% Difference of
Glass ID	**Oxide**	**(wt%)**	**(wt%)**	**Measured vs Targeted (wt%)**	**Measured vs Targeted**
SB6VS-07	MnO	2.2757	2.2489	0.0268	1.2%
SB6VS-07	Na_2O	16.1760	15.5010	0.6750	4.4%
SB6VS-07	NiO	1.2165	1.2643	-0.0478	-3.8%
SB6VS-07	P_2O_5	0.0699	0.0577	0.0122	21.1%
SB6VS-07	PbO	0.0027	0.0037	-0.0010	-27.1%
SB6VS-07	SiO_2	48.2412	49.6271	-1.3859	-2.8%
SB6VS-07	SO_4	0.5572	0.3830	0.1742	45.5%
SB6VS-07	TiO_2	0.0108	0.0000	0.0108	
SB6VS-07	U_3O_8	1.4180	1.4216	-0.0037	-0.3%
SB6VS-07	ZnO	0.0140	0.0091	0.0049	53.8%
SB6VS-07	ZrO_2	0.0297	0.0303	-0.0006	-1.8%
SB6VS-07	Sum	98.6187	100.0000	-1.3813	-1.4%
SB6VS-08	Al_2O_3	8.2618	8.4575	-0.1956	-2.3%
SB6VS-08	B_2O_3	4.5884	5.1200	-0.5316	-10.4%
SB6VS-08	BaO	0.0207	0.0174	0.0033	18.9%
SB6VS-08	CaO	0.3267	0.2794	0.0474	17.0%
SB6VS-08	Ce_2O_3	0.0070	0.0270	-0.0200	-74.0%
SB6VS-08	Cr_2O_3	0.0248	0.0156	0.0092	59.2%
SB6VS-08	CuO	0.0110	0.0140	-0.0030	-21.6%
SB6VS-08	Fe_2O_3	8.5746	9.6556	-1.0809	-11.2%
SB6VS-08	K_2O	0.0503	0.0112	0.0391	348.7%
SB6VS-08	La_2O_3	0.0106	0.0138	-0.0033	-23.6%
SB6VS-08	Li_2O	4.6556	5.1200	-0.4644	-9.1%
SB6VS-08	MgO	0.0717	0.0616	0.0102	16.5%
SB6VS-08	MnO	2.3500	2.2489	0.1011	4.5%
SB6VS-08	Na_2O	16.8163	15.6759	1.1404	7.3%
SB6VS-08	NiO	1.2770	1.2643	0.0126	1.0%
SB6VS-08	P_2O_5	0.0745	0.0577	0.0167	29.0%
SB6VS-08	PbO	0.0027	0.0037	-0.0010	-27.1%
SB6VS-08	SiO_2	45.7810	49.2120	-3.4310	-7.0%
SB6VS-08	SO_4	0.8156	0.6228	0.1928	31.0%
SB6VS-08	TiO_2	0.7047	0.6606	0.0441	6.7%
SB6VS-08	U_3O_8	1.4504	1.4216	0.0288	2.0%
SB6VS-08	ZnO	0.0118	0.0091	0.0027	29.9%
SB6VS-08	ZrO_2	0.0324	0.0303	0.0021	7.1%
SB6VS-08	Sum	95.9203	100.0000	-4.0797	-4.1%
SB6VS-09	Al_2O_3	8.5547	8.4575	0.0972	1.1%
SB6VS-09	B_2O_3	4.8540	5.1200	-0.2660	-5.2%
SB6VS-09	BaO	0.0553	0.0515	0.0038	7.3%
SB6VS-09	CaO	0.8052	0.7294	0.0759	10.4%
SB6VS-09	Ce_2O_3	0.0498	0.0802	-0.0304	-37.9%
SB6VS-09	Cr_2O_3	0.0508	0.0463	0.0045	9.7%
SB6VS-09	CuO	0.0385	0.0414	-0.0029	-7.1%
SB6VS-09	Fe_2O_3	8.8892	9.6556	-0.7664	-7.9%
SB6VS-09	K_2O	0.0783	0.0332	0.0451	135.5%

Table A4. Average Measured Chemical Compositions Versus Targeted Compositions

Glass ID	Oxide	Measured (wt%)	Targeted (wt%)	Difference of Measured vs Targeted (wt%)	% Difference of Measured vs Targeted
SB6VS-09	La_2O_3	0.0352	0.0410	-0.0058	-14.1%
SB6VS-09	Li_2O	4.7633	5.1200	-0.3567	-7.0%
SB6VS-09	MgO	0.5394	0.4964	0.0429	8.6%
SB6VS-09	MnO	2.8342	2.7288	0.1054	3.9%
SB6VS-09	Na_2O	15.0302	14.1639	0.8663	6.1%
SB6VS-09	NiO	1.2897	1.2643	0.0254	2.0%
SB6VS-09	P_2O_5	0.1736	0.1712	0.0024	1.4%
SB6VS-09	PbO	0.0110	0.0110	0.0001	0.8%
SB6VS-09	SiO_2	48.0273	49.6271	-1.5998	-3.2%
SB6VS-09	SO_4	0.8344	0.6228	0.2116	34.0%
SB6VS-09	TiO_2	0.0100	0.0000	0.0100	
SB6VS-09	U_3O_8	1.4858	1.4216	0.0642	4.5%
SB6VS-09	ZnO	0.0286	0.0270	0.0016	6.1%
SB6VS-09	ZrO_2	0.0902	0.0898	0.0004	0.4%
SB6VS-09	Sum	98.5291	100.0000	-1.4709	-1.5%
SB6VS-10	Al_2O_3	8.5783	8.4575	0.1208	1.4%
SB6VS-10	B_2O_3	4.7574	5.1200	-0.3626	-7.1%
SB6VS-10	BaO	0.0226	0.0174	0.0052	30.2%
SB6VS-10	CaO	0.3529	0.2794	0.0736	26.3%
SB6VS-10	Ce_2O_3	0.0070	0.0270	-0.0200	-74.0%
SB6VS-10	Cr_2O_3	0.0263	0.0156	0.0107	68.5%
SB6VS-10	CuO	0.0081	0.0140	-0.0058	-41.7%
SB6VS-10	Fe_2O_3	8.9928	9.6556	-0.6627	-6.9%
SB6VS-10	K_2O	0.0385	0.0112	0.0273	243.9%
SB6VS-10	La_2O_3	0.0117	0.0138	-0.0021	-15.1%
SB6VS-10	Li_2O	4.7902	5.1200	-0.3298	-6.4%
SB6VS-10	MgO	0.5734	0.4964	0.0769	15.5%
SB6VS-10	MnO	3.1828	2.7288	0.4540	16.6%
SB6VS-10	Na_2O	17.2544	14.3770	2.8774	20.0%
SB6VS-10	NiO	0.9967	0.8608	0.1359	15.8%
SB6VS-10	P_2O_5	0.0945	0.0577	0.0368	63.8%
SB6VS-10	PbO	0.0040	0.0037	0.0003	9.4%
SB6VS-10	SiO_2	47.9738	49.6271	-1.6533	-3.3%
SB6VS-10	SO_4	0.5340	0.3830	0.1510	39.4%
SB6VS-10	TiO_2	0.8165	0.6606	0.1559	23.6%
SB6VS-10	U_3O_8	2.2906	2.0340	0.2566	12.6%
SB6VS-10	ZnO	0.0143	0.0091	0.0052	57.3%
SB6VS-10	ZrO_2	0.0351	0.0303	0.0048	16.0%
SB6VS-10	Sum	101.3568	100.0000	1.3568	1.4%
SB6VS-11	Al_2O_3	10.6001	10.5307	0.0694	0.7%
SB6VS-11	B_2O_3	4.7574	5.1200	-0.3626	-7.1%
SB6VS-11	BaO	0.0207	0.0174	0.0033	18.9%
SB6VS-11	CaO	0.8227	0.7294	0.0934	12.8%
SB6VS-11	Ce_2O_3	0.0070	0.0270	-0.0200	-74.0%
SB6VS-11	Cr_2O_3	0.0234	0.0156	0.0078	49.8%

Table A4. Average Measured Chemical Compositions Versus Targeted Compositions

		Measured	Targeted	Difference of	% Difference of
Glass ID	**Oxide**	**(wt%)**	**(wt%)**	**Measured vs Targeted (wt%)**	**Measured vs Targeted**
SB6VS-11	CuO	0.0131	0.0140	-0.0008	-5.9%
SB6VS-11	Fe_2O_3	6.1692	7.8077	-1.6385	-21.0%
SB6VS-11	K_2O	0.0599	0.0112	0.0487	434.7%
SB6VS-11	La_2O_3	0.0123	0.0138	-0.0015	-10.8%
SB6VS-11	Li_2O	4.7633	5.1200	-0.3567	-7.0%
SB6VS-11	MgO	0.5112	0.4964	0.0147	3.0%
SB6VS-11	MnO	2.8213	2.7288	0.0925	3.4%
SB6VS-11	Na_2O	15.7379	14.4894	1.2485	8.6%
SB6VS-11	NiO	0.9012	0.8608	0.0405	4.7%
SB6VS-11	P_2O_5	0.0733	0.0577	0.0156	27.0%
SB6VS-11	PbO	0.0027	0.0037	-0.0010	-27.1%
SB6VS-11	SiO_2	47.5994	49.2120	-1.6126	-3.3%
SB6VS-11	SO_4	0.8418	0.6228	0.2190	35.2%
SB6VS-11	TiO_2	0.7131	0.6606	0.0525	7.9%
SB6VS-11	U_3O_8	1.4858	1.4216	0.0642	4.5%
SB6VS-11	ZnO	0.0121	0.0091	0.0030	33.3%
SB6VS-11	ZrO_2	0.0328	0.0303	0.0025	8.2%
SB6VS-11	Sum	97.9823	100.0000	-2.0177	-2.0%
SB6VS-12	Al_2O_3	8.5122	8.5734	-0.0612	-0.7%
SB6VS-12	B_2O_3	4.6850	5.1200	-0.4350	-8.5%
SB6VS-12	BaO	0.0533	0.0515	0.0018	3.5%
SB6VS-12	CaO	0.7731	0.7294	0.0437	6.0%
SB6VS-12	Ce_2O_3	0.0448	0.0802	-0.0354	-44.1%
SB6VS-12	Cr_2O_3	0.0486	0.0463	0.0023	5.0%
SB6VS-12	CuO	0.0357	0.0414	-0.0057	-13.9%
SB6VS-12	Fe_2O_3	7.1842	7.8077	-0.6234	-8.0%
SB6VS-12	K_2O	0.0915	0.0332	0.0583	175.4%
SB6VS-12	La_2O_3	0.0361	0.0410	-0.0049	-12.0%
SB6VS-12	Li_2O	4.7202	5.1200	-0.3998	-7.8%
SB6VS-12	MgO	0.4954	0.4964	-0.0010	-0.2%
SB6VS-12	MnO	2.2693	2.2489	0.0204	0.9%
SB6VS-12	Na_2O	16.2434	15.7576	0.4858	3.1%
SB6VS-12	NiO	1.2455	1.2643	-0.0189	-1.5%
SB6VS-12	P_2O_5	0.1879	0.1712	0.0167	9.8%
SB6VS-12	PbO	0.0027	0.0110	-0.0083	-75.4%
SB6VS-12	SiO_2	46.9042	49.2120	-2.3079	-4.7%
SB6VS-12	SO_4	0.5842	0.3830	0.2012	52.5%
SB6VS-12	TiO_2	0.6943	0.6606	0.0337	5.1%
SB6VS-12	U_3O_8	2.0341	2.0340	0.0001	0.0%
SB6VS-12	ZnO	0.0293	0.0270	0.0023	8.4%
SB6VS-12	ZrO_2	0.0905	0.0898	0.0007	0.8%
SB6VS-12	Sum	96.9659	100.0000	-3.0341	-3.0%
SB6VS-13	Al_2O_3	10.8930	8.4717	2.4213	28.6%
SB6VS-13	B_2O_3	4.8862	5.4400	-0.5538	-10.2%
SB6VS-13	BaO	0.0335	0.0304	0.0031	10.0%

Table A4. Average Measured Chemical Compositions Versus Targeted Compositions

		Measured	Targeted	Difference of	% Difference of
Glass ID	**Oxide**	**(wt%)**	**(wt%)**	**Measured vs Targeted (wt%)**	**Measured vs Targeted**
SB6VS-13	CaO	0.5345	0.4481	0.0864	19.3%
SB6VS-13	Ce_2O_3	0.0193	0.0474	-0.0281	-59.2%
SB6VS-13	Cr_2O_3	0.0362	0.0274	0.0088	32.3%
SB6VS-13	CuO	0.0232	0.0245	-0.0013	-5.4%
SB6VS-13	Fe_2O_3	7.4058	7.7897	-0.3839	-4.9%
SB6VS-13	K_2O	0.0804	0.0196	0.0608	309.4%
SB6VS-13	La_2O_3	0.0208	0.0242	-0.0034	-14.0%
SB6VS-13	Li_2O	4.8063	5.4400	-0.6337	-11.6%
SB6VS-13	MgO	0.2662	0.2470	0.0192	7.8%
SB6VS-13	MnO	2.3145	2.2125	0.1020	4.6%
SB6VS-13	Na_2O	15.5694	14.0158	1.5536	11.1%
SB6VS-13	NiO	0.9798	0.9424	0.0375	4.0%
SB6VS-13	P_2O_5	0.1232	0.1011	0.0220	21.8%
SB6VS-13	PbO	0.0027	0.0065	-0.0038	-58.4%
SB6VS-13	SiO_2	48.8295	52.3718	-3.5423	-6.8%
SB6VS-13	SO_4	0.6456	0.4475	0.1981	44.3%
SB6VS-13	TiO_2	0.3307	0.2918	0.0389	13.3%
SB6VS-13	U_3O_8	1.5683	1.5316	0.0367	2.4%
SB6VS-13	ZnO	0.0227	0.0160	0.0068	42.4%
SB6VS-13	ZrO_2	0.0547	0.0530	0.0017	3.1%
SB6VS-13	Sum	99.4471	100.0000	-0.5529	-0.6%
SB6VS-14	Al_2O_3	9.1216	9.0012	0.1204	1.3%
SB6VS-14	B_2O_3	4.8862	5.2800	-0.3938	-7.5%
SB6VS-14	BaO	0.0318	0.0323	-0.0005	-1.6%
SB6VS-14	CaO	0.4827	0.4761	0.0067	1.4%
SB6VS-14	Ce_2O_3	0.0170	0.0504	-0.0334	-66.3%
SB6VS-14	Cr_2O_3	0.0358	0.0291	0.0067	23.2%
SB6VS-14	CuO	0.0213	0.0260	-0.0047	-18.2%
SB6VS-14	Fe_2O_3	7.4166	8.2766	-0.8600	-10.4%
SB6VS-14	K_2O	0.0410	0.0209	0.0201	96.3%
SB6VS-14	La_2O_3	0.0205	0.0257	-0.0052	-20.2%
SB6VS-14	Li_2O	4.9355	5.2800	-0.3445	-6.5%
SB6VS-14	MgO	0.2471	0.2624	-0.0154	-5.8%
SB6VS-14	MnO	2.2209	2.3508	-0.1299	-5.5%
SB6VS-14	Na_2O	14.0192	14.3918	-0.3726	-2.6%
SB6VS-14	NiO	0.9047	1.0013	-0.0965	-9.6%
SB6VS-14	P_2O_5	0.1134	0.1075	0.0060	5.5%
SB6VS-14	PbO	0.0027	0.0069	-0.0042	-60.8%
SB6VS-14	SiO_2	48.9365	50.8951	-1.9586	-3.8%
SB6VS-14	SO_4	0.5857	0.4754	0.1103	23.2%
SB6VS-14	TiO_2	0.3194	0.3101	0.0094	3.0%
SB6VS-14	U_3O_8	1.5389	1.6274	-0.0885	-5.4%
SB6VS-14	ZnO	0.0180	0.0169	0.0011	6.5%
SB6VS-14	ZrO_2	0.0540	0.0564	-0.0023	-4.1%
SB6VS-14	Sum	95.9711	100.0000	-4.0289	-4.0%

Table A4. Average Measured Chemical Compositions Versus Targeted Compositions

		Measured	Targeted	Difference of	% Difference of
Glass ID	**Oxide**	**(wt%)**	**(wt%)**	**Measured vs Targeted (wt%)**	**Measured vs Targeted**
SB6VS-15	Al_2O_3	9.5561	9.5307	0.0255	0.3%
SB6VS-15	B_2O_3	4.7816	5.1200	-0.3384	-6.6%
SB6VS-15	BaO	0.0410	0.0342	0.0068	19.8%
SB6VS-15	CaO	0.6303	0.5041	0.1263	25.1%
SB6VS-15	Ce_2O_3	0.0214	0.0533	-0.0319	-59.9%
SB6VS-15	Cr_2O_3	0.0460	0.0308	0.0153	49.6%
SB6VS-15	CuO	0.0275	0.0275	0.0000	0.0%
SB6VS-15	Fe_2O_3	7.8919	8.7634	-0.8715	-9.9%
SB6VS-15	K_2O	0.0566	0.0221	0.0345	156.2%
SB6VS-15	La_2O_3	0.0264	0.0272	-0.0008	-3.1%
SB6VS-15	Li_2O	4.7041	5.1200	-0.4159	-8.1%
SB6VS-15	MgO	0.3246	0.2779	0.0467	16.8%
SB6VS-15	MnO	2.9084	2.4890	0.4194	16.8%
SB6VS-15	Na_2O	17.7599	14.7678	2.9921	20.3%
SB6VS-15	NiO	1.2070	1.0602	0.1468	13.8%
SB6VS-15	P_2O_5	0.1312	0.1138	0.0174	15.3%
SB6VS-15	PbO	0.0036	0.0073	-0.0036	-50.1%
SB6VS-15	SiO_2	47.3855	49.4183	-2.0328	-4.1%
SB6VS-15	SO_4	0.7362	0.5034	0.2328	46.3%
SB6VS-15	TiO_2	0.4087	0.3283	0.0804	24.5%
SB6VS-15	U_3O_8	1.9604	1.7231	0.2373	13.8%
SB6VS-15	ZnO	0.0258	0.0179	0.0079	43.9%
SB6VS-15	ZrO_2	0.0702	0.0597	0.0106	17.7%
SB6VS-15	Sum	100.7052	100.0000	0.7052	0.7%
SB6VS-16	Al_2O_3	10.5198	10.0601	0.4596	4.6%
SB6VS-16	B_2O_3	4.7816	4.9600	-0.1784	-3.6%
SB6VS-16	BaO	0.0380	0.0361	0.0018	5.0%
SB6VS-16	CaO	0.5919	0.5321	0.0598	11.2%
SB6VS-16	Ce_2O_3	0.0223	0.0563	-0.0340	-60.5%
SB6VS-16	Cr_2O_3	0.0428	0.0325	0.0103	31.6%
SB6VS-16	CuO	0.0269	0.0291	-0.0021	-7.4%
SB6VS-16	Fe_2O_3	8.6640	9.2503	-0.5863	-6.3%
SB6VS-16	K_2O	0.0783	0.0233	0.0550	235.7%
SB6VS-16	La_2O_3	0.0243	0.0287	-0.0044	-15.3%
SB6VS-16	Li_2O	4.7741	4.9600	-0.1859	-3.7%
SB6VS-16	MgO	0.2956	0.2933	0.0023	0.8%
SB6VS-16	MnO	2.7115	2.6273	0.0842	3.2%
SB6VS-16	Na_2O	15.8727	15.1438	0.7289	4.8%
SB6VS-16	NiO	1.1449	1.1190	0.0259	2.3%
SB6VS-16	P_2O_5	0.1461	0.1201	0.0260	21.6%
SB6VS-16	PbO	0.0070	0.0077	-0.0007	-8.9%
SB6VS-16	SiO_2	48.0273	47.9416	0.0857	0.2%
SB6VS-16	SO_4	0.7984	0.5314	0.2670	50.3%
SB6VS-16	TiO_2	0.3820	0.3465	0.0354	10.2%
SB6VS-16	U_3O_8	1.9339	1.8188	0.1151	6.3%

Table A4. Average Measured Chemical Compositions Versus Targeted Compositions

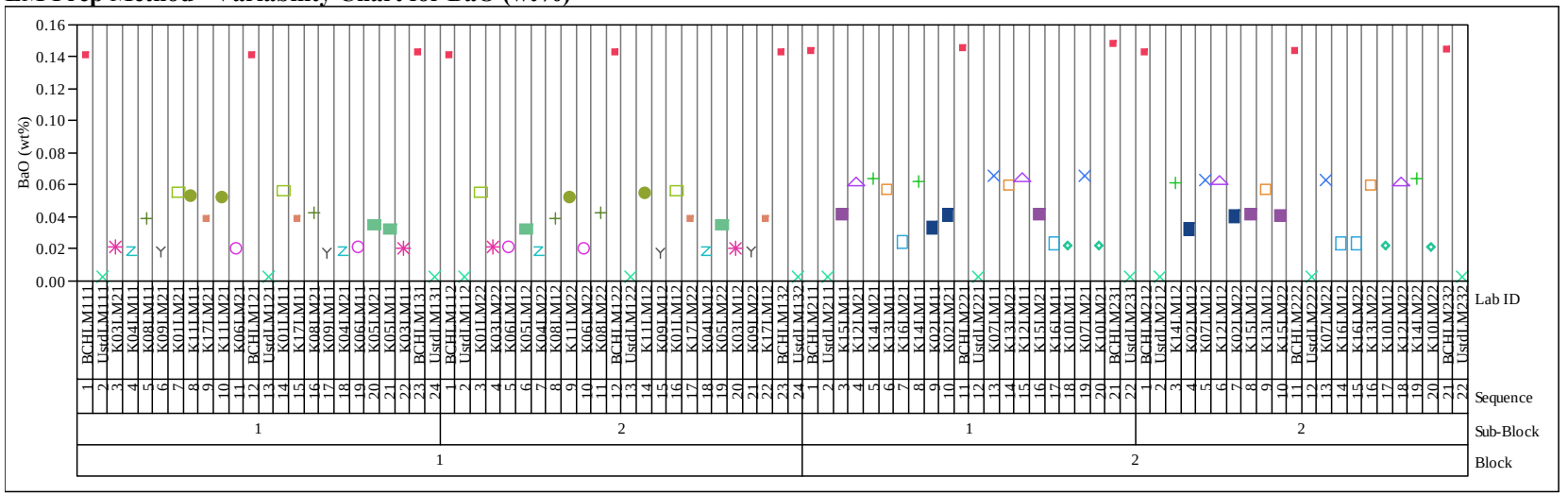
		Measured	Targeted	Difference of	% Difference of
Glass ID	**Oxide**	**(wt%)**	**(wt%)**	**Measured vs Targeted (wt%)**	**Measured vs Targeted**
SB6VS-16	ZnO	0.0246	0.0189	0.0056	29.8%
SB6VS-16	ZrO_2	0.0621	0.0630	-0.0009	-1.4%
SB6VS-16	Sum	100.9704	100.0000	0.9704	1.0%
SB6VS-17	Al_2O_3	10.8032	10.5896	0.2136	2.0%
SB6VS-17	B_2O_3	4.4274	4.8000	-0.3726	-7.8%
SB6VS-17	BaO	0.0408	0.0380	0.0027	7.1%
SB6VS-17	CaO	0.6233	0.5601	0.0633	11.3%
SB6VS-17	Ce_2O_3	0.0264	0.0592	-0.0329	-55.5%
SB6VS-17	Cr_2O_3	0.0413	0.0342	0.0071	20.8%
SB6VS-17	CuO	0.0263	0.0306	-0.0043	-14.1%
SB6VS-17	Fe_2O_3	8.8963	9.7371	-0.8408	-8.6%
SB6VS-17	K_2O	0.0678	0.0246	0.0432	176.0%
SB6VS-17	La_2O_3	0.0258	0.0303	-0.0045	-14.7%
SB6VS-17	Li_2O	4.5103	4.8000	-0.2897	-6.0%
SB6VS-17	MgO	0.3134	0.3087	0.0047	1.5%
SB6VS-17	MnO	2.8180	2.7656	0.0524	1.9%
SB6VS-17	Na_2O	16.3108	15.5198	0.7910	5.1%
SB6VS-17	NiO	1.1844	1.1779	0.0064	0.5%
SB6VS-17	P_2O_5	0.1455	0.1264	0.0191	15.1%
SB6VS-17	PbO	0.0027	0.0081	-0.0054	-66.7%
SB6VS-17	SiO_2	44.9788	46.4648	-1.4860	-3.2%
SB6VS-17	SO_4	0.7475	0.5593	0.1881	33.6%
SB6VS-17	TiO_2	0.4007	0.3648	0.0360	9.9%
SB6VS-17	U_3O_8	1.9516	1.9145	0.0370	1.9%
SB6VS-17	ZnO	0.0237	0.0199	0.0037	18.6%
SB6VS-17	ZrO_2	0.0648	0.0663	-0.0015	-2.2%
SB6VS-17	Sum	98.4313	100.0000	-1.5687	-1.6%
Ustd	Al_2O_3	4.0829	4.1000	-0.0171	-0.4%
Ustd	B_2O_3	8.8708	9.2090	-0.3382	-3.7%
Ustd	BaO	0.0017	0.0000	0.0017	
Ustd	CaO	1.3425	1.3010	0.0415	3.2%
Ustd	Ce_2O_3	0.0070	0.0000	0.0070	
Ustd	Cr_2O_3	0.2542	0.0000	0.2542	
Ustd	CuO	0.0019	0.0000	0.0019	
Ustd	Fe_2O_3	13.1973	13.1960	0.0013	0.0%
Ustd	K_2O	3.0225	2.9990	0.0235	0.8%
Ustd	La_2O_3	0.0029	0.0000	0.0029	
Ustd	Li_2O	2.9566	3.0570	-0.1004	-3.3%
Ustd	MgO	1.1909	1.2100	-0.0191	-1.6%
Ustd	MnO	2.7998	2.8920	-0.0922	-3.2%
Ustd	Na_2O	12.3499	11.7950	0.5549	4.7%
Ustd	NiO	1.1003	1.1200	-0.0197	-1.8%
Ustd	P_2O_5	0.0286	0.0000	0.0286	
Ustd	PbO	0.0027	0.0000	0.0027	
Ustd	SiO_2	45.3888	45.3530	0.0358	0.1%

Table A4. Average Measured Chemical Compositions Versus Targeted Compositions

		Measured	Targeted	Difference of	% Difference of
Glass ID	**Oxide**	**(wt%)**	**(wt%)**	**Measured vs Targeted (wt%)**	**Measured vs Targeted**
Ustd	SO_4	0.1648	0.0000	0.1648	
Ustd	TiO_2	1.0052	1.0490	-0.0438	-4.2%
Ustd	U_3O_8	2.4036	2.4060	-0.0024	-0.1%
Ustd	ZnO	0.0031	0.0000	0.0031	
Ustd	ZrO_2	0.0014	0.0000	0.0014	
Ustd	Sum	100.1802	99.6870	0.4932	0.5%

Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Prep Method by Oxide

LM Prep Method - Variability Chart for BaO (wt%)



LM Prep Method - Variability Chart for CaO (wt%)

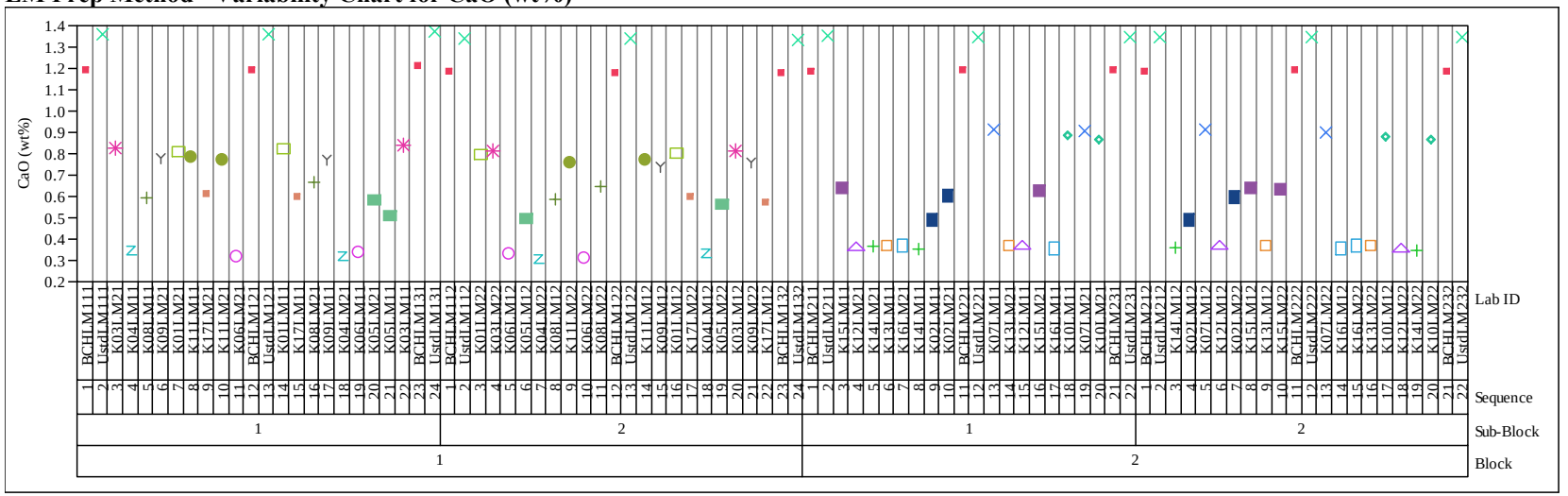
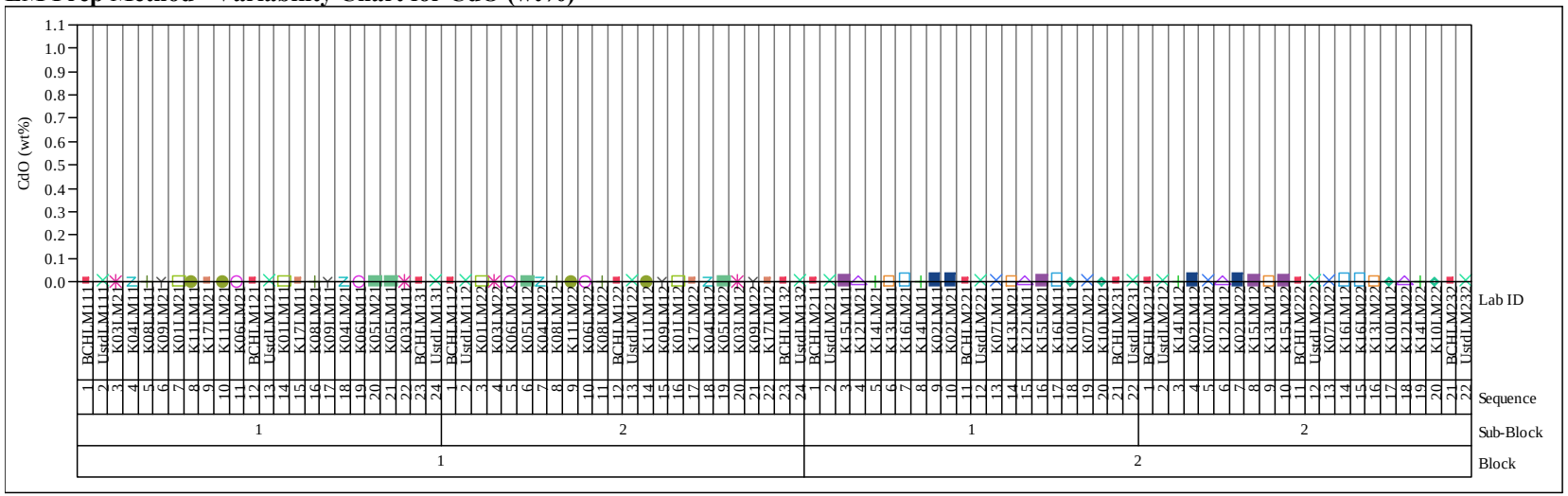


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Prep Method by Oxide

LM Prep Method - Variability Chart for CdO (wt%)



LM Prep Method - Variability Chart for Ce2O3 (wt%)

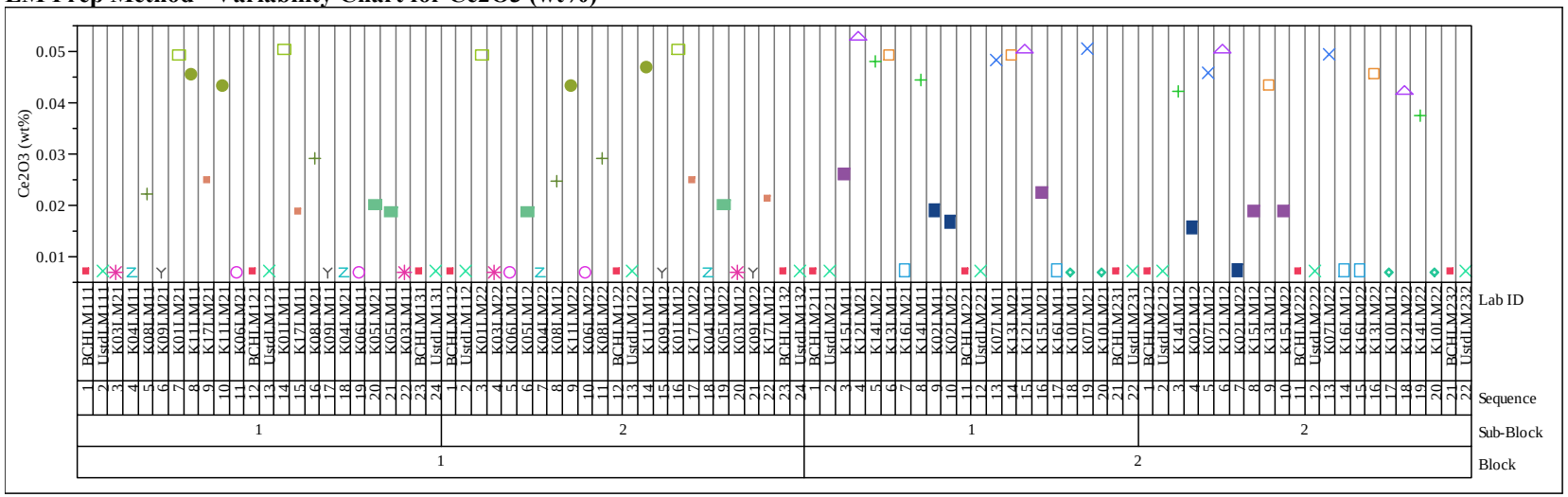
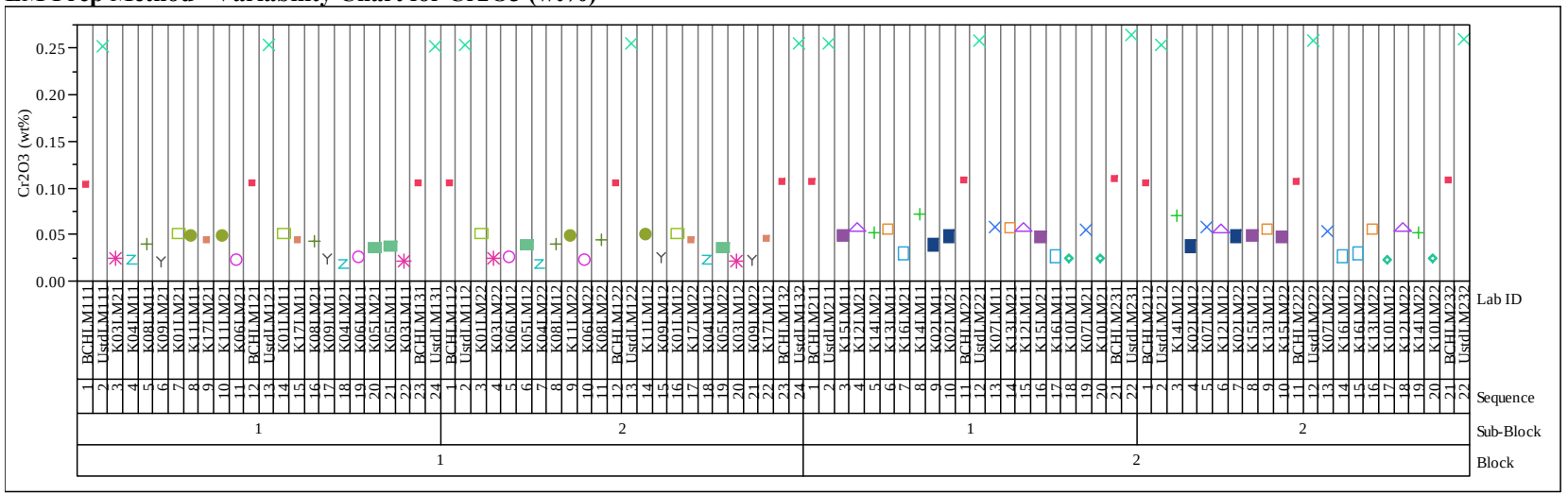


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Prep Method by Oxide

LM Prep Method - Variability Chart for Cr2O3 (wt%)



LM Prep Method - Variability Chart for CuO (wt%)

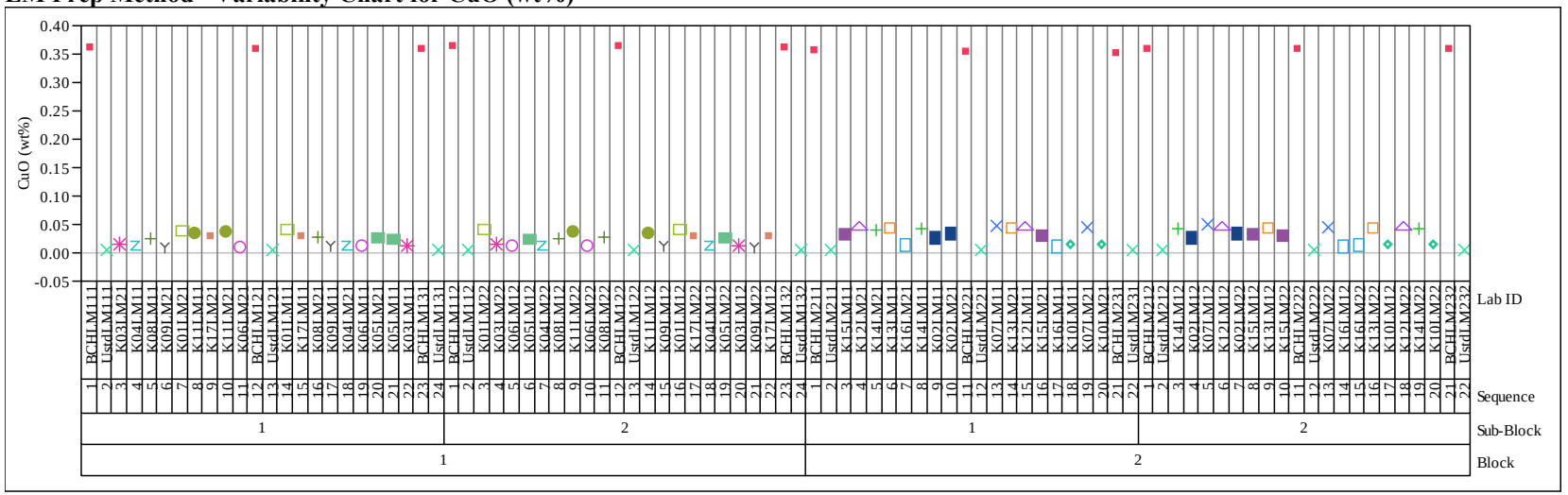
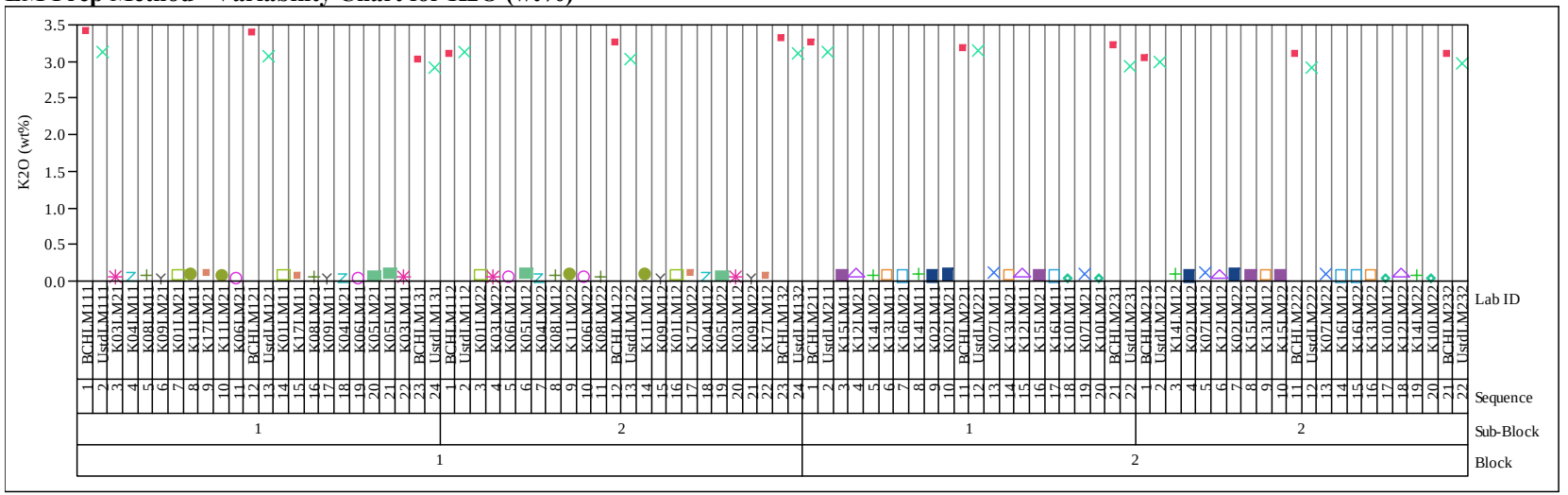


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Prep Method by Oxide

LM Prep Method - Variability Chart for K2O (wt%)



LM Prep Method - Variability Chart for La2O3 (wt%)

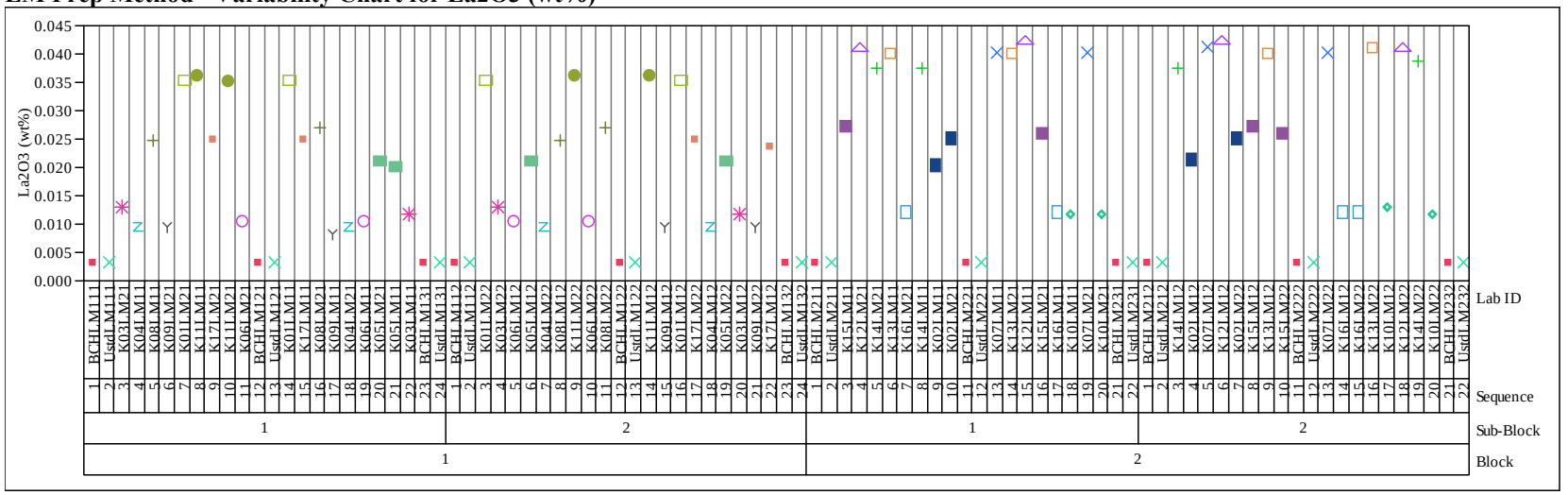
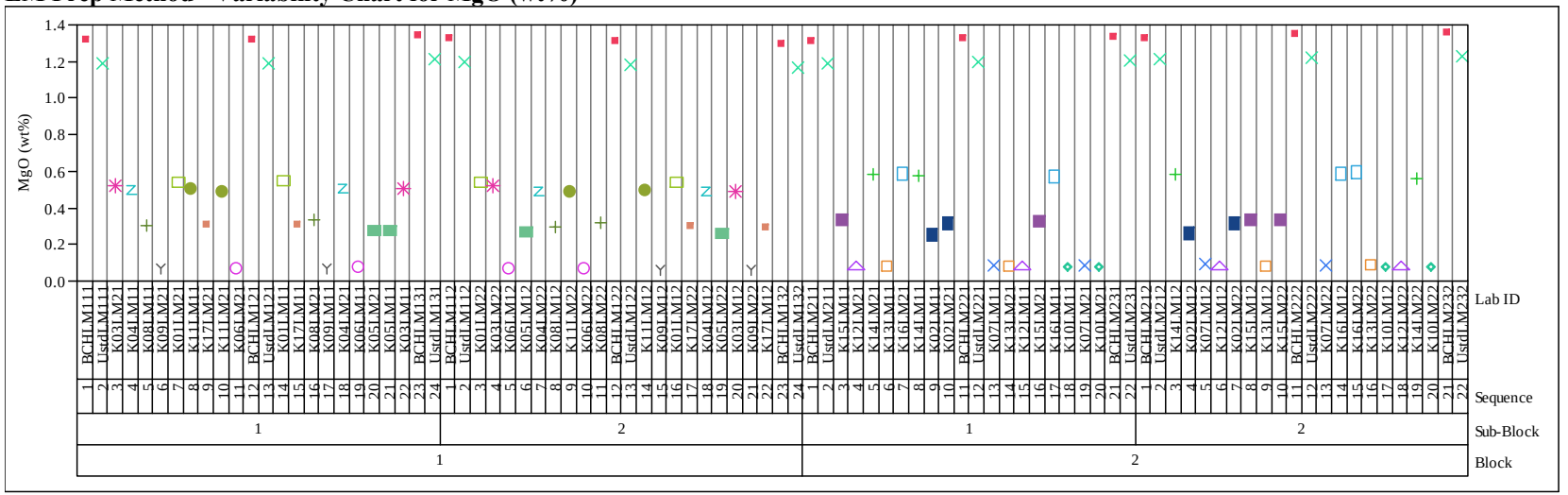


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Prep Method by Oxide

LM Prep Method - Variability Chart for MgO (wt%)



LM Prep Method - Variability Chart for MnO (wt%)

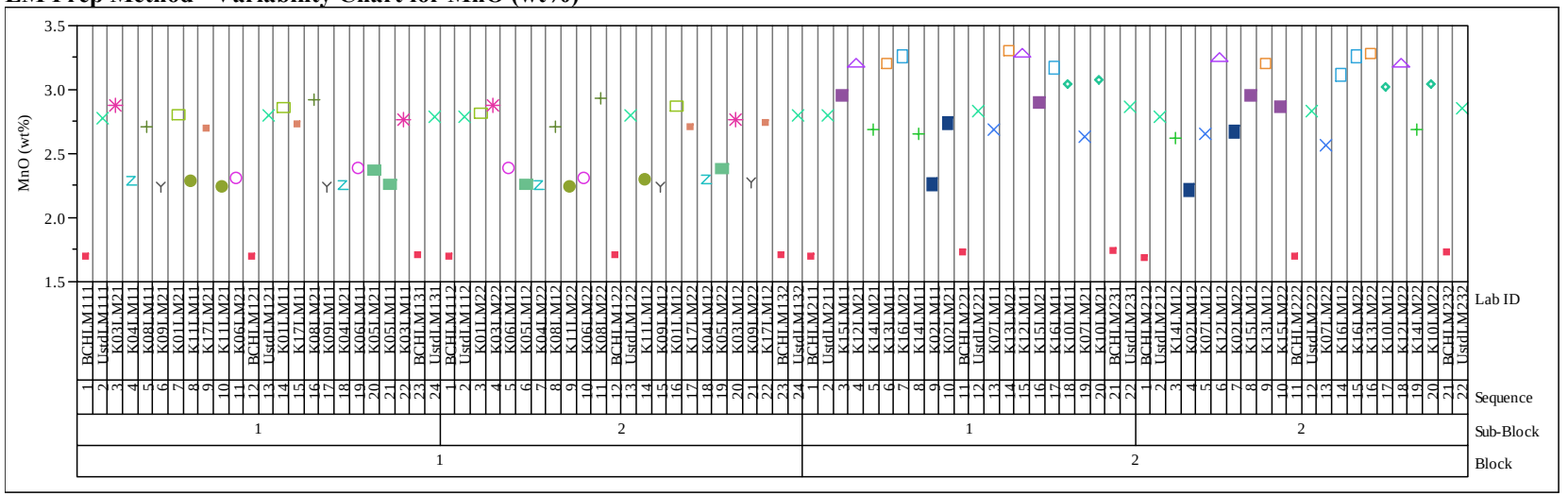
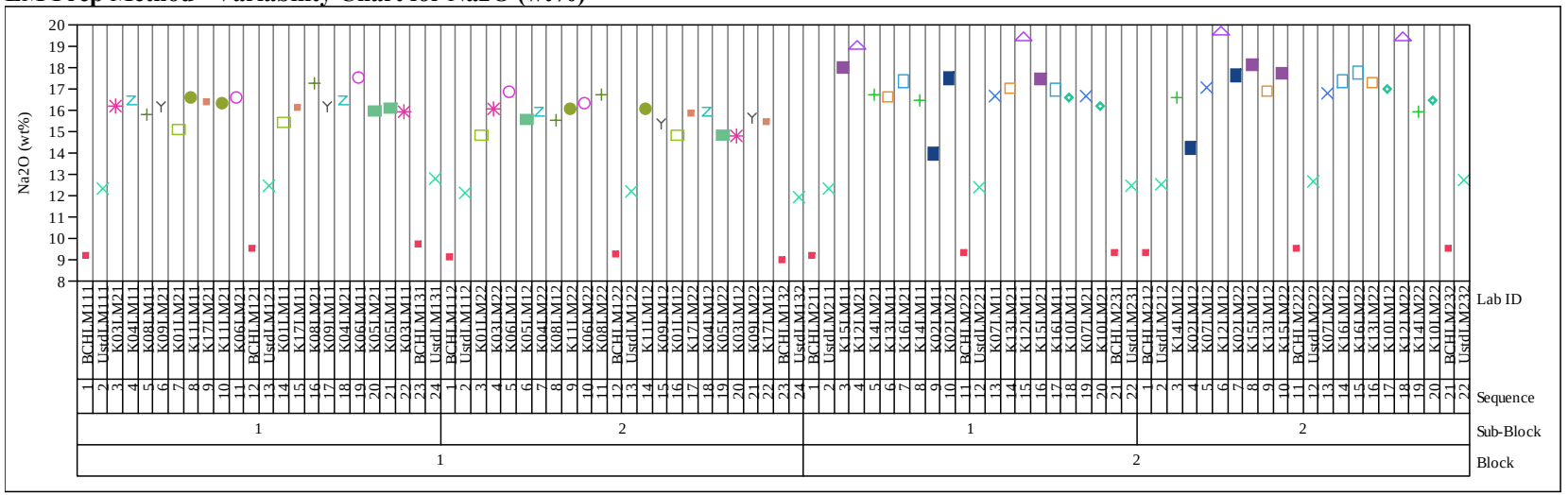


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Prep Method by Oxide

LM Prep Method - Variability Chart for Na2O (wt%)



LM Prep Method - Variability Chart for NiO (wt%)

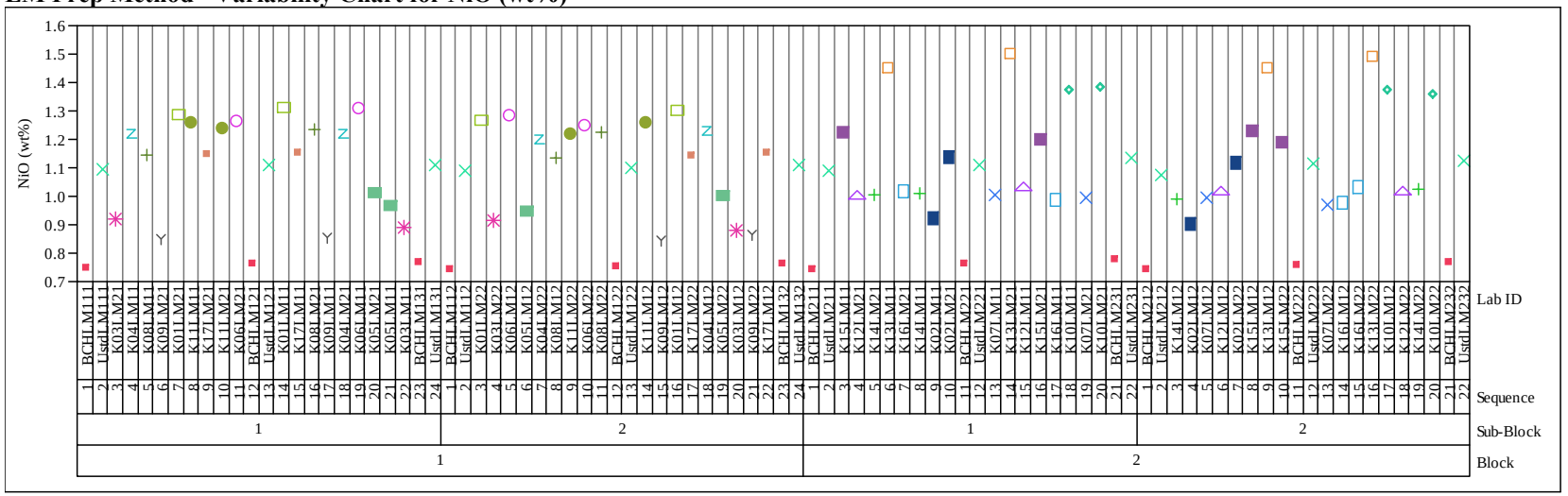
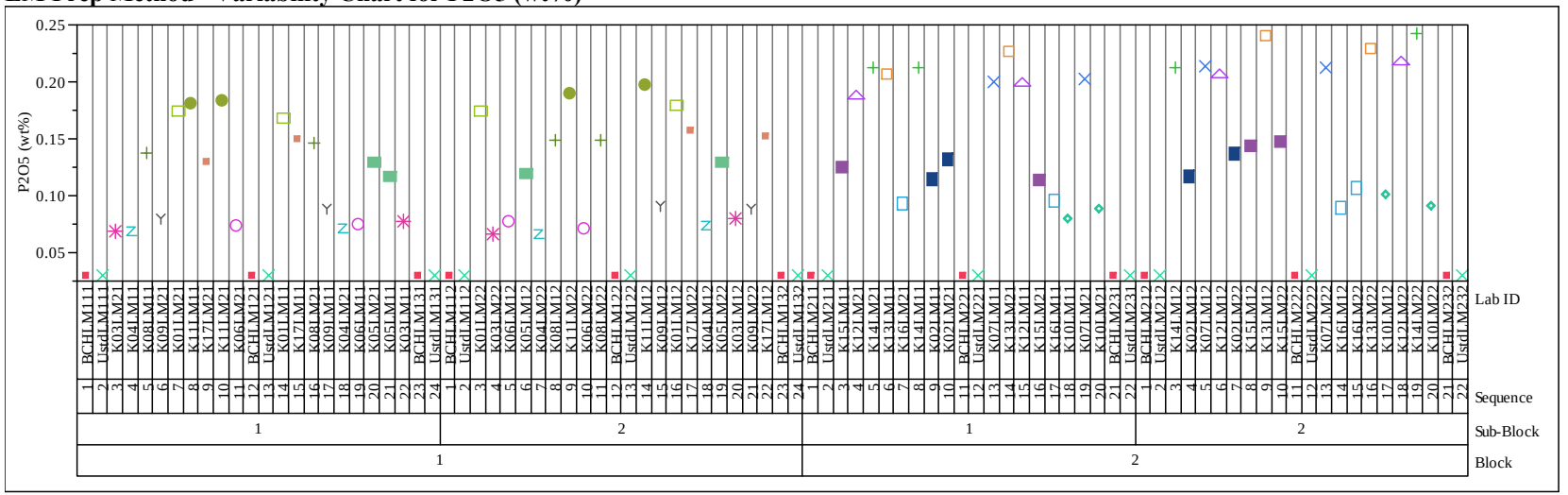


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Prep Method by Oxide

LM Prep Method - Variability Chart for P2O5 (wt%)



LM Prep Method - Variability Chart for PbO (wt%)

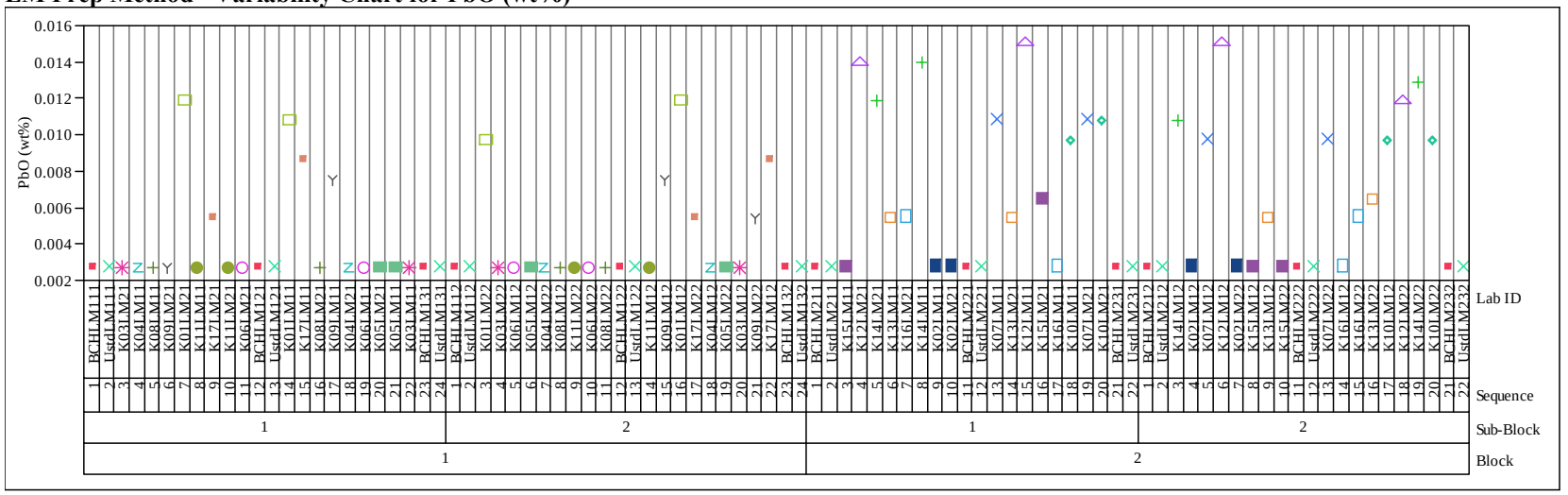
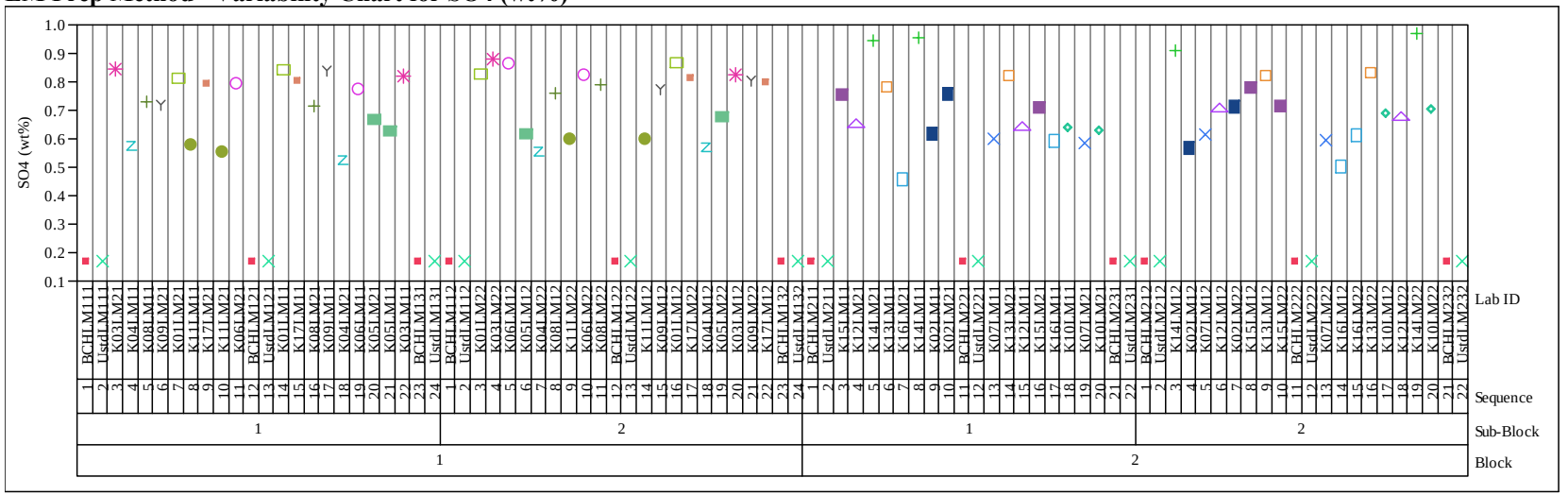


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Prep Method by Oxide

LM Prep Method - Variability Chart for SO4 (wt%)



LM Prep Method - Variability Chart for TiO2 (wt%)

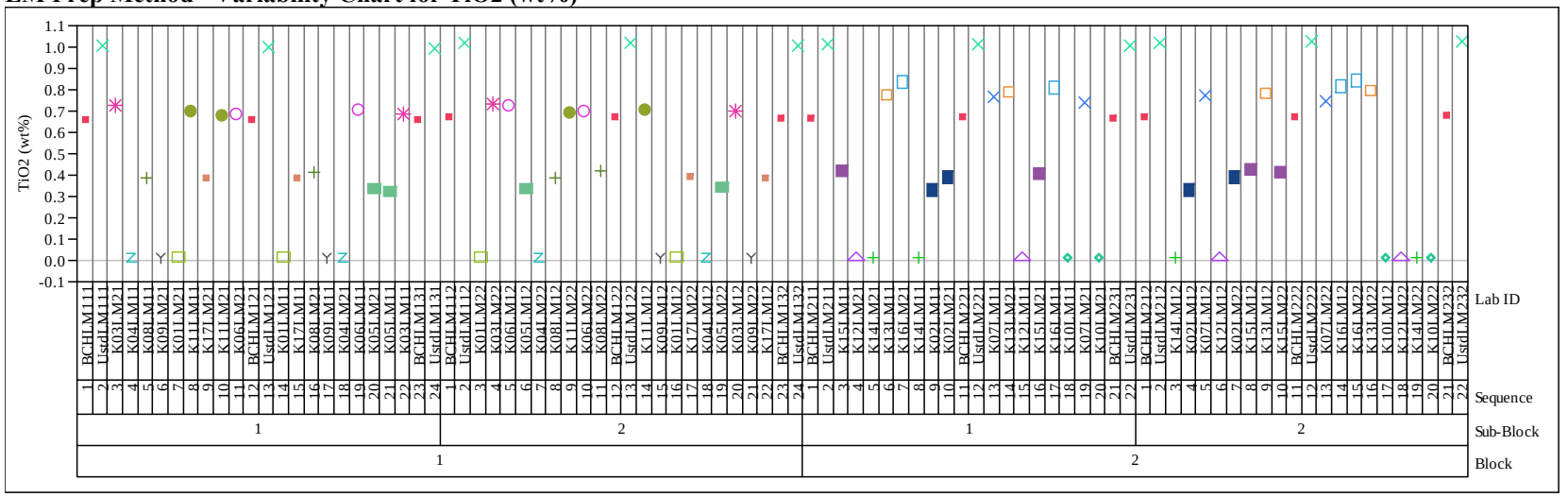
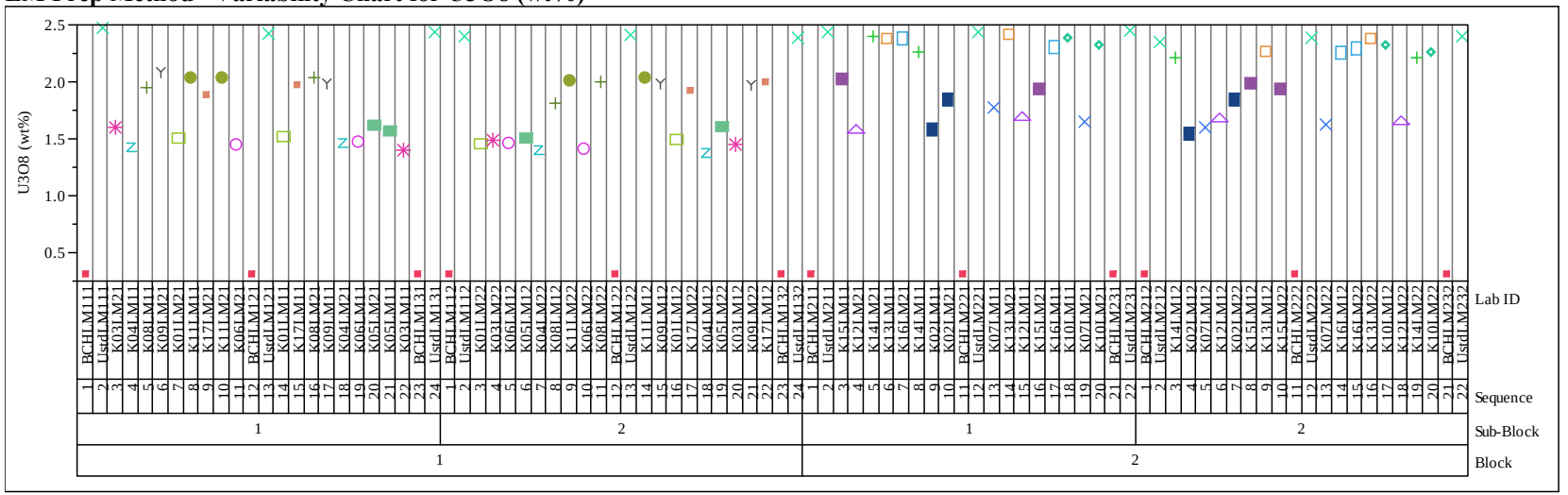


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Prep Method by Oxide

LM Prep Method - Variability Chart for U3O8 (wt%)



LM Prep Method - Variability Chart for ZnO (wt%)

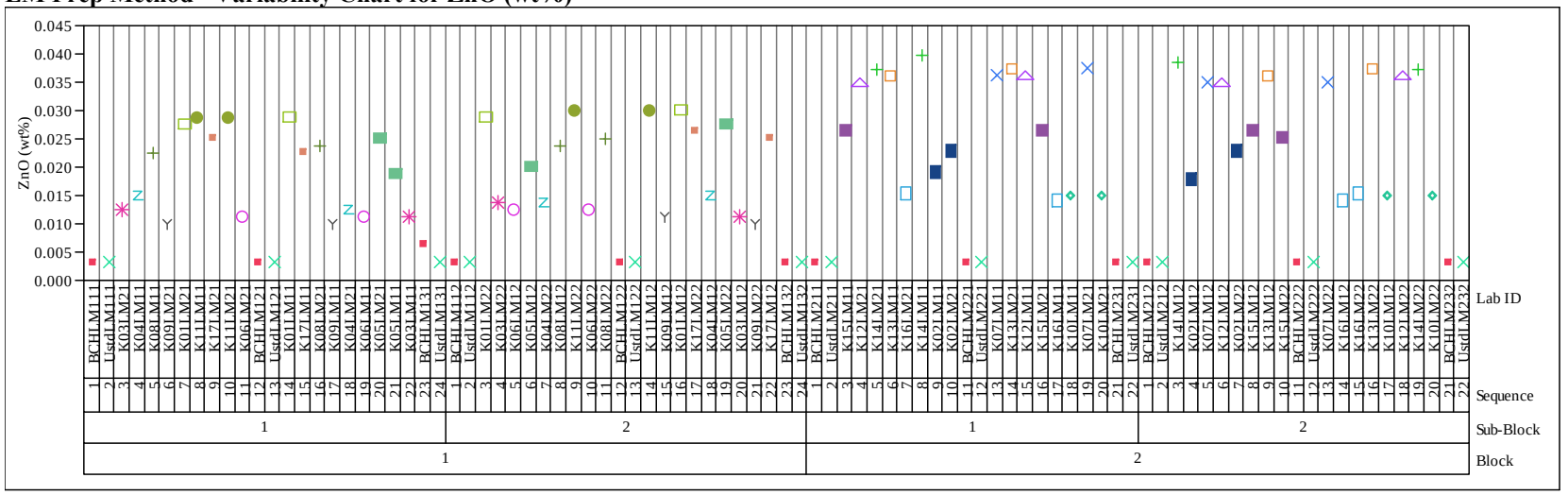
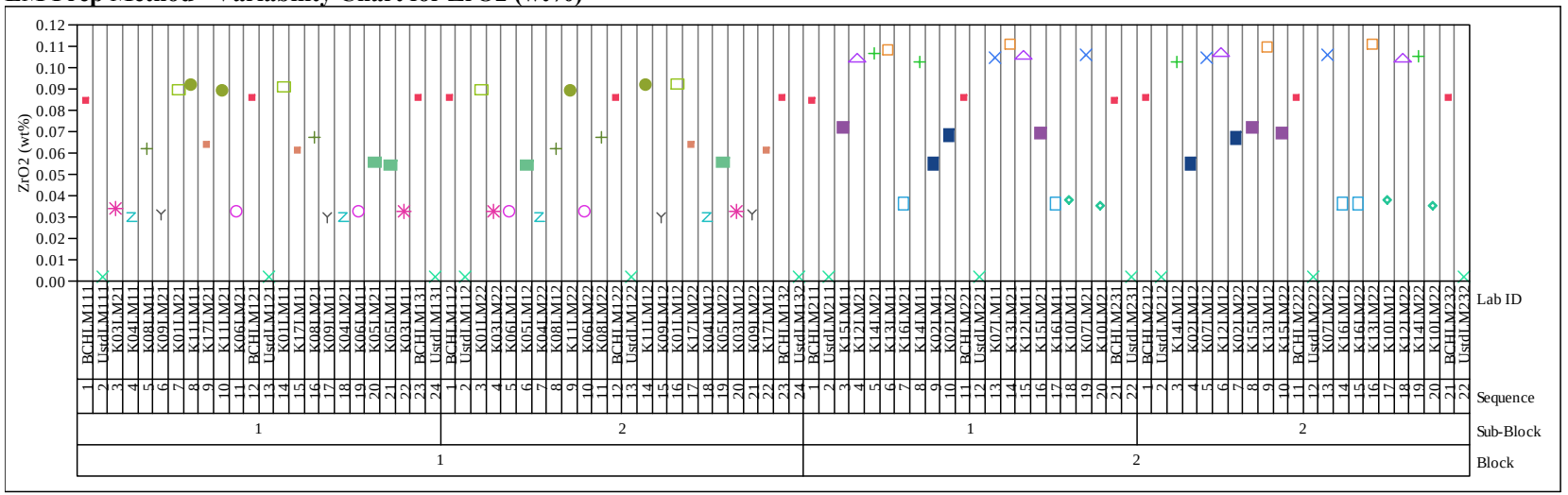


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Prep Method by Oxide

LM Prep Method - Variability Chart for ZrO2 (wt%)



PF Prep Method - Variability Chart for Al2O3 (wt%)

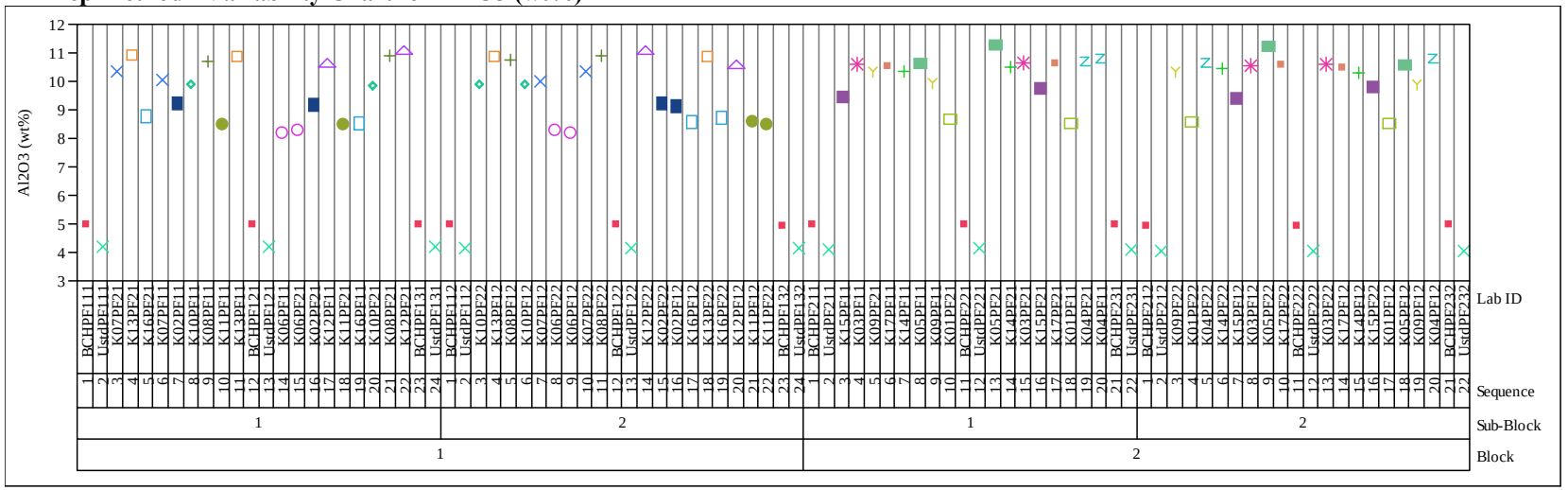
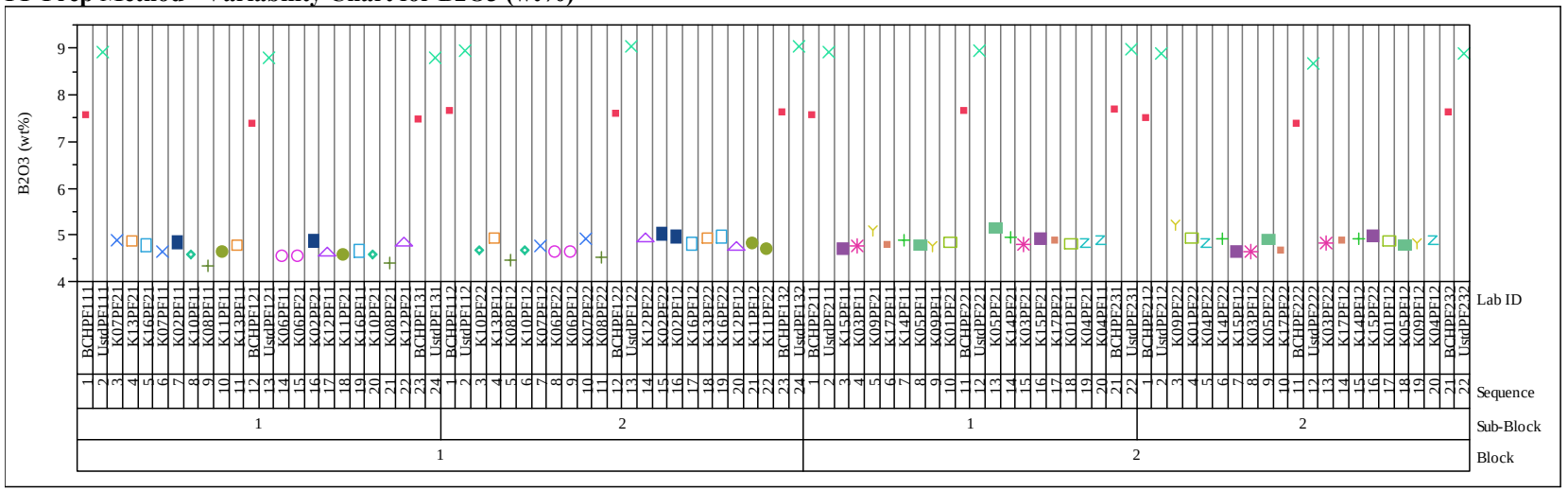


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Prep Method by Oxide

PF Prep Method - Variability Chart for B2O3 (wt%)



PF Prep Method - Variability Chart for Fe2O3 (wt%)

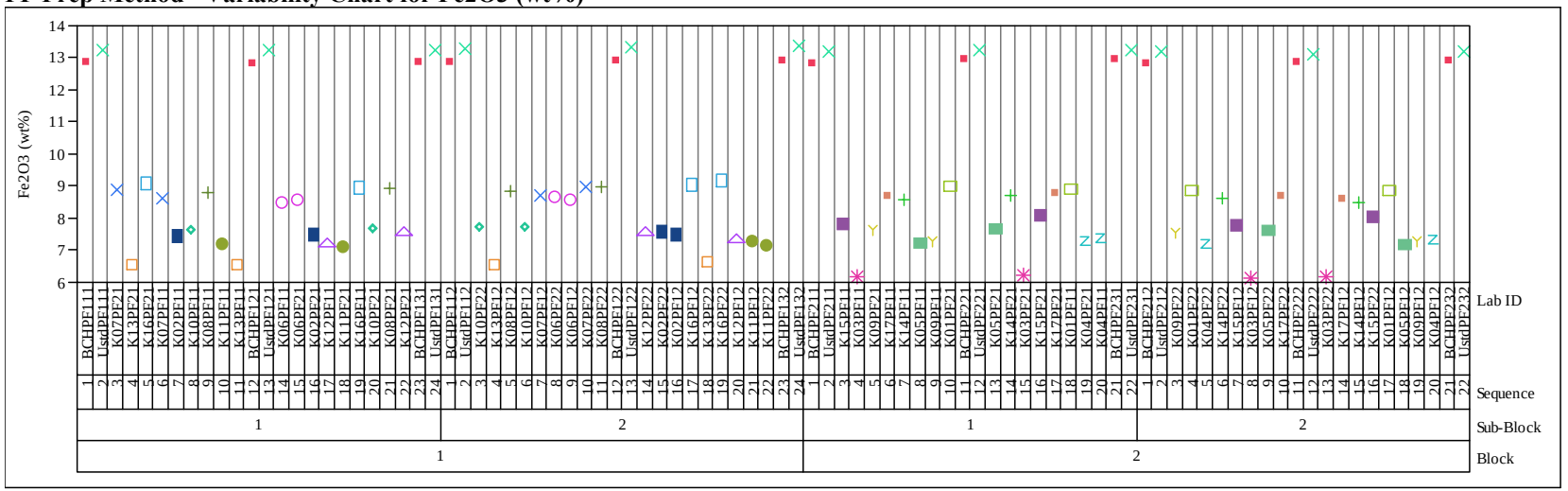
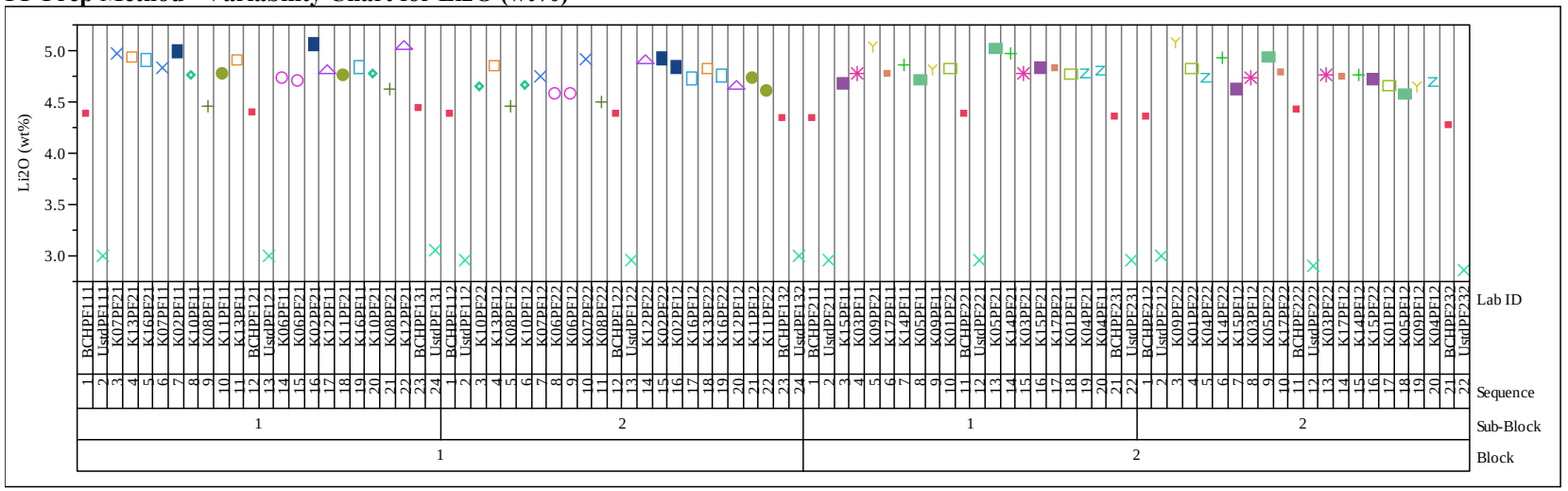


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Prep Method by Oxide

PF Prep Method - Variability Chart for Li2O (wt%)



PF Prep Method - Variability Chart for SiO2 (wt%)

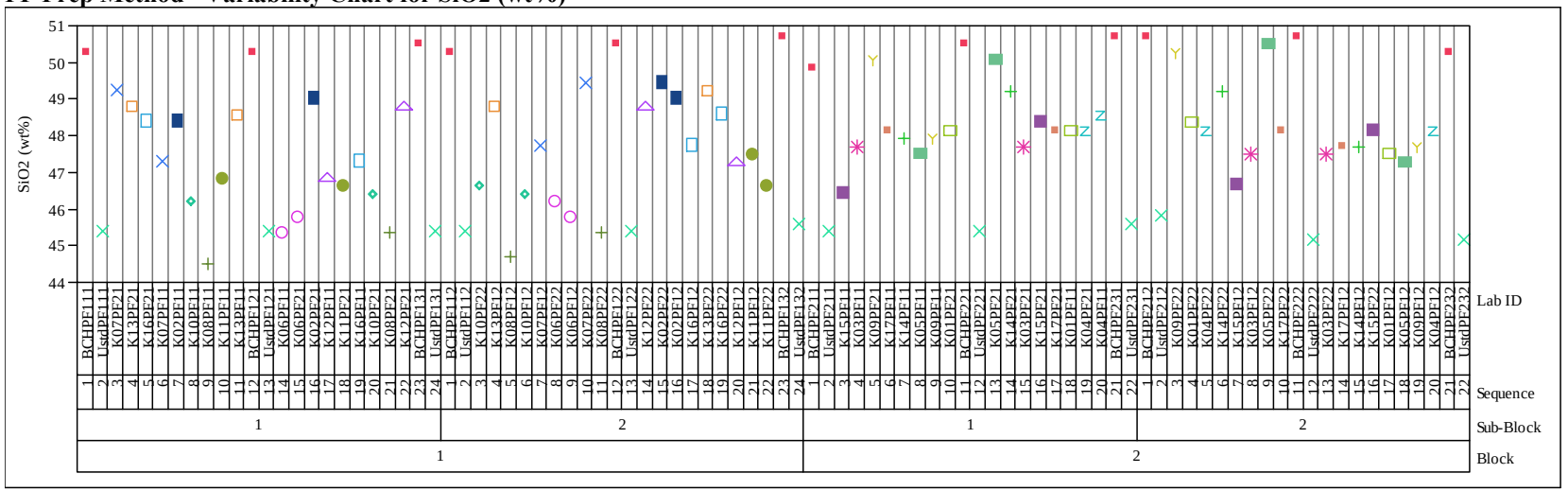


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=Al2O3 (wt%)
Variability Chart for Measured

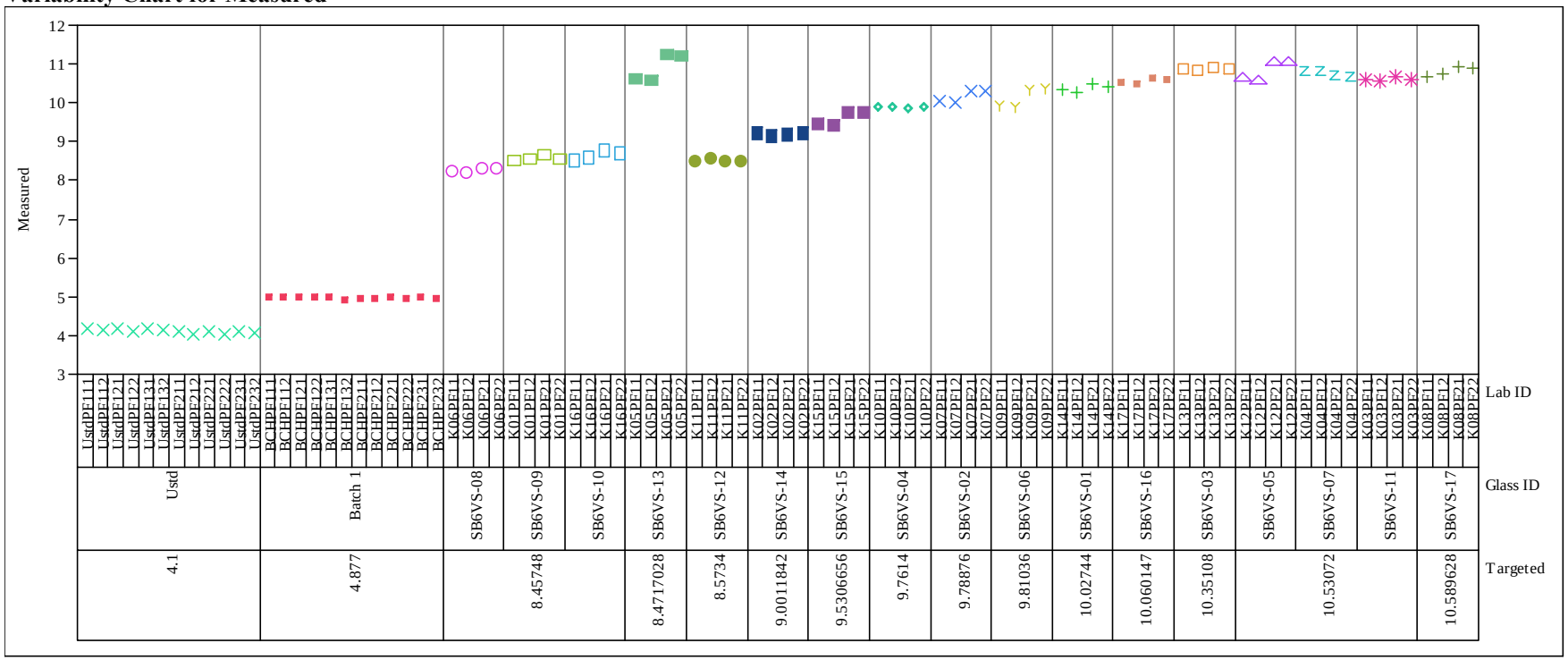


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=B2O3 (wt%)
Variability Chart for Measured

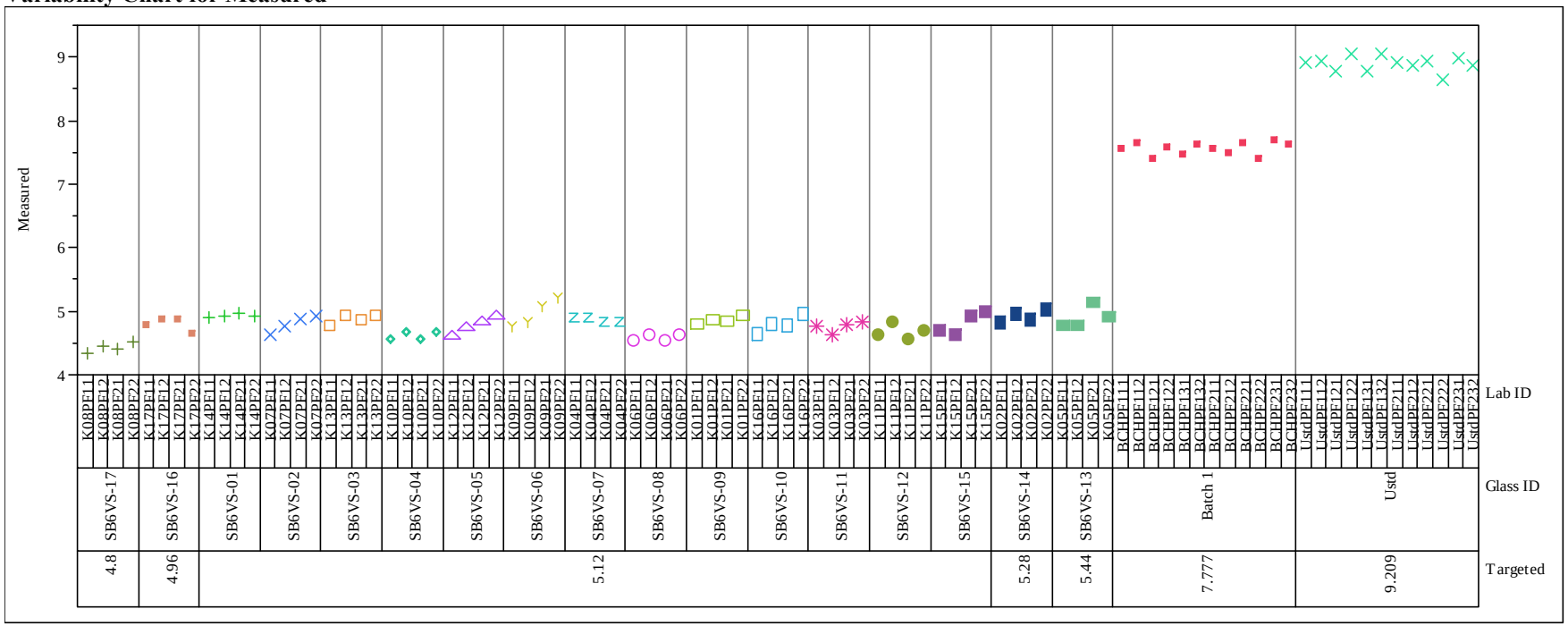


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=BaO (wt%)
Variability Chart for Measured

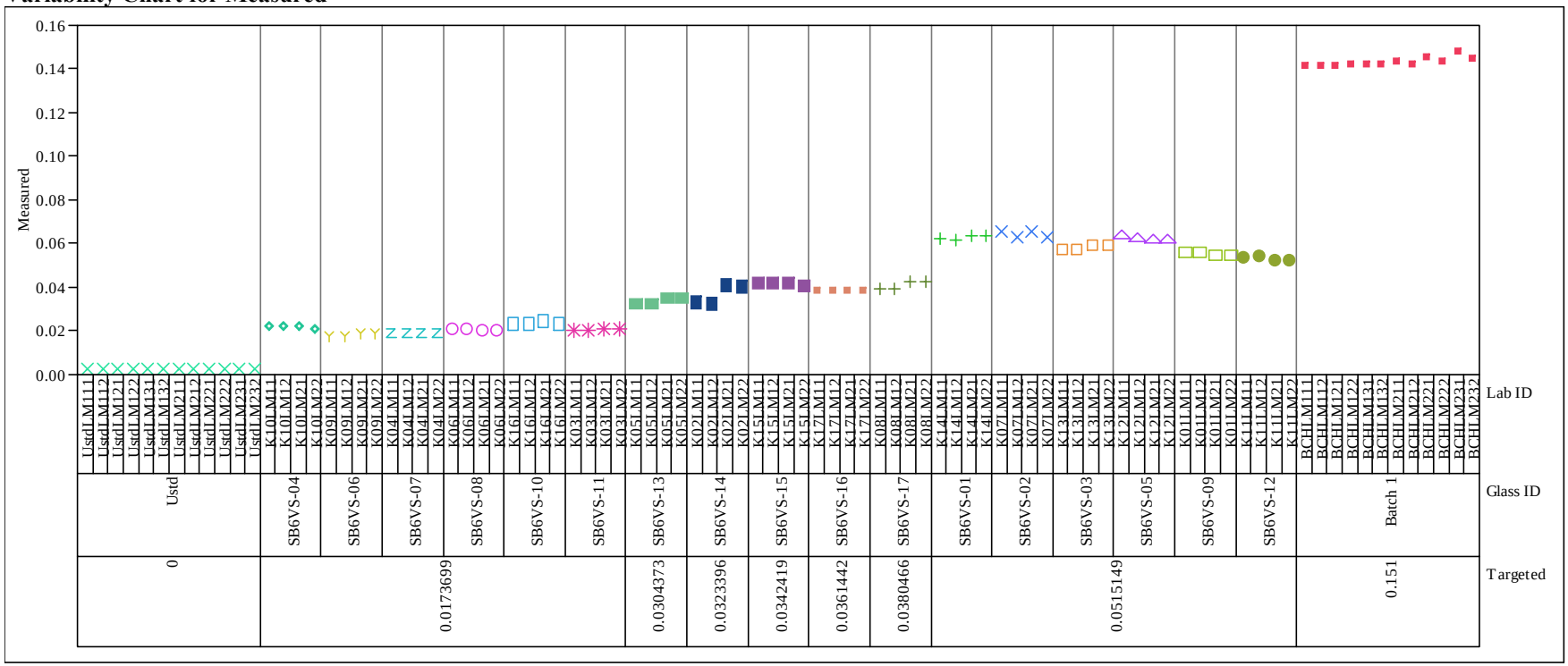


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=CaO (wt%)
Variability Chart for Measured

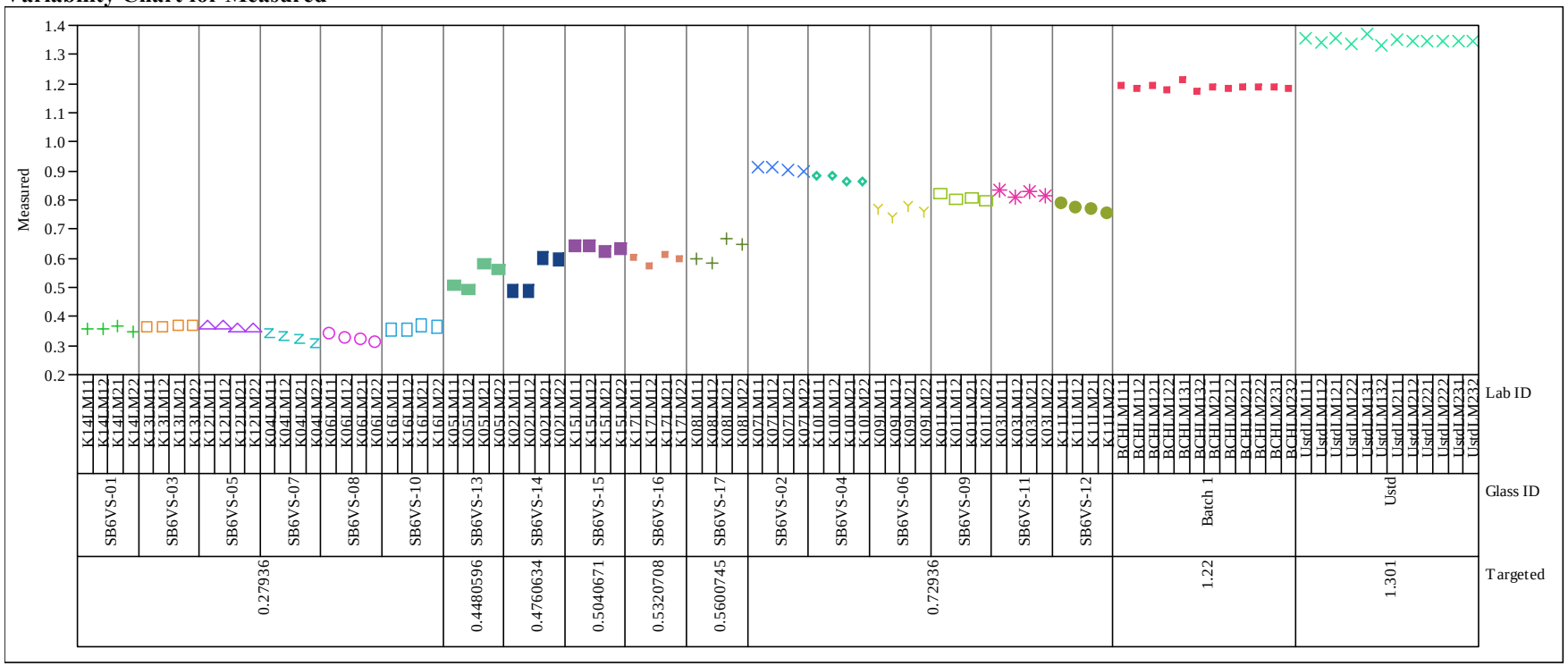


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=CdO (wt%)
Variability Chart for Measured

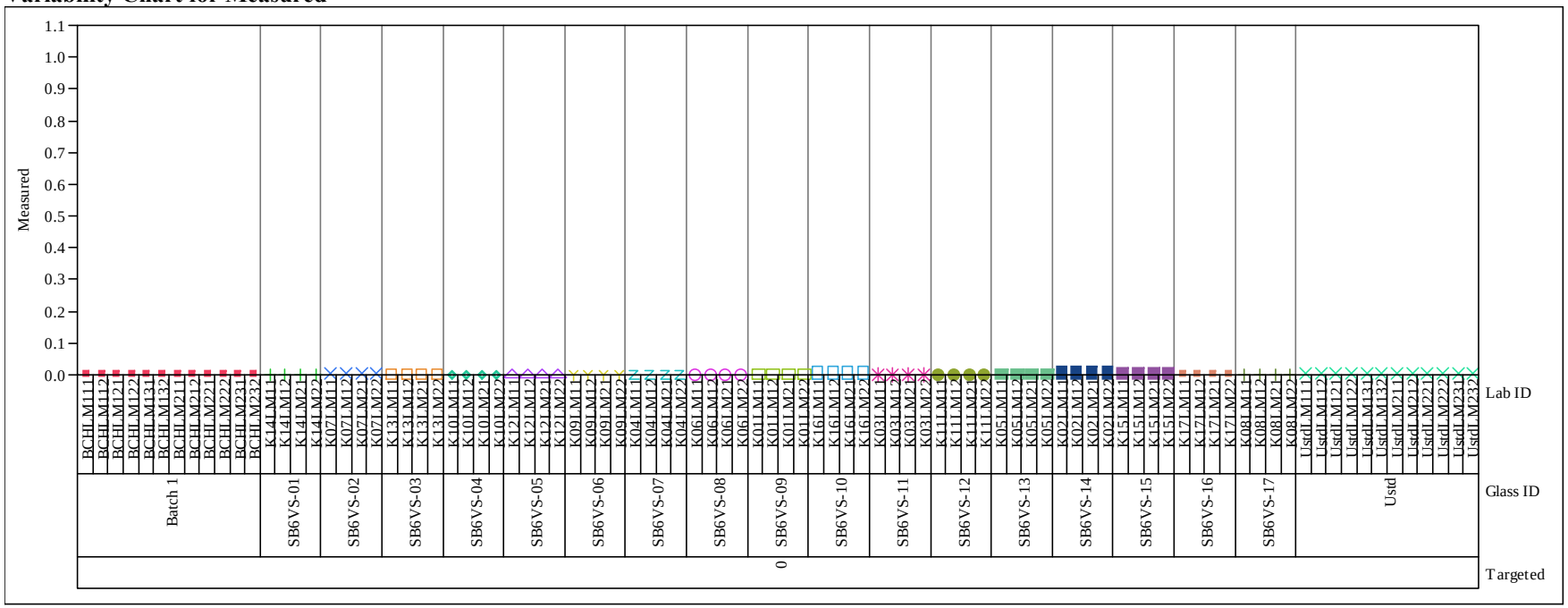


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=Ce2O3 (wt%)
Variability Chart for Measured

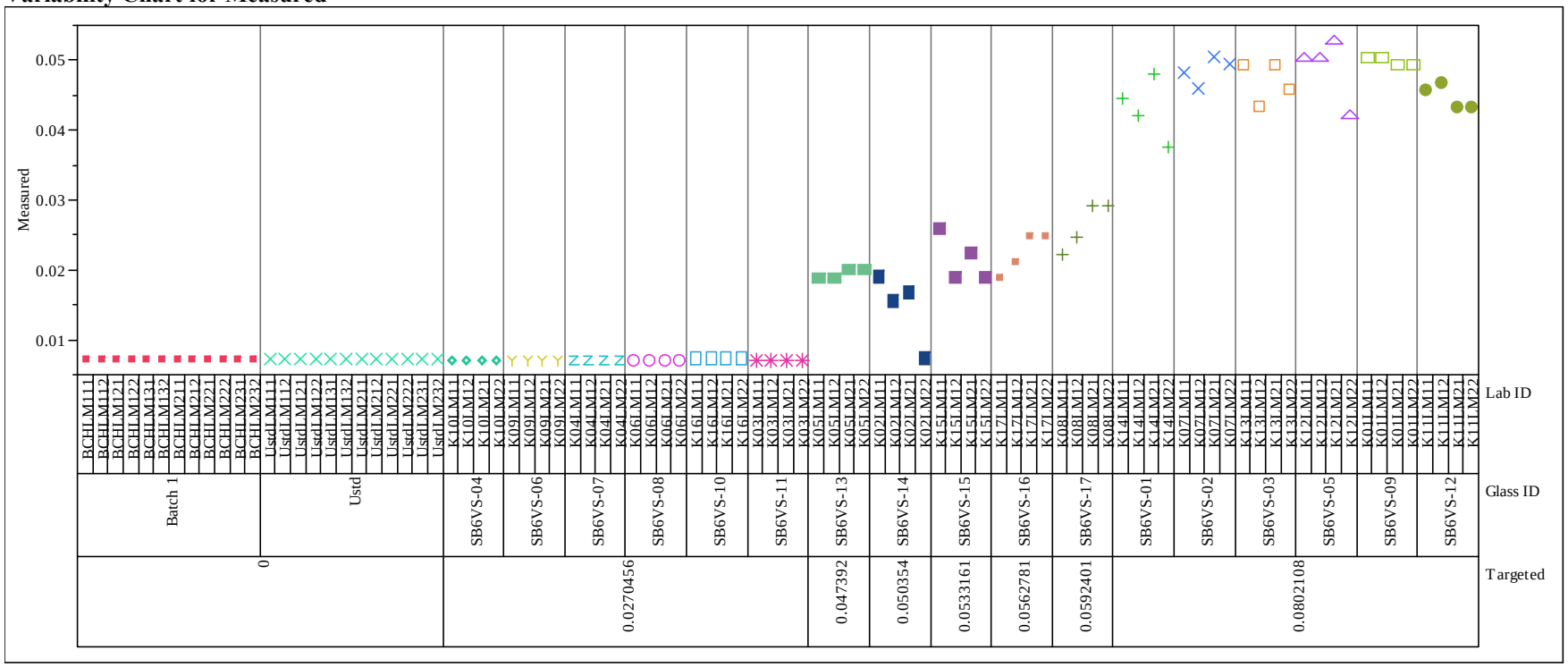


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=Cr2O3 (wt%)
Variability Chart for Measured

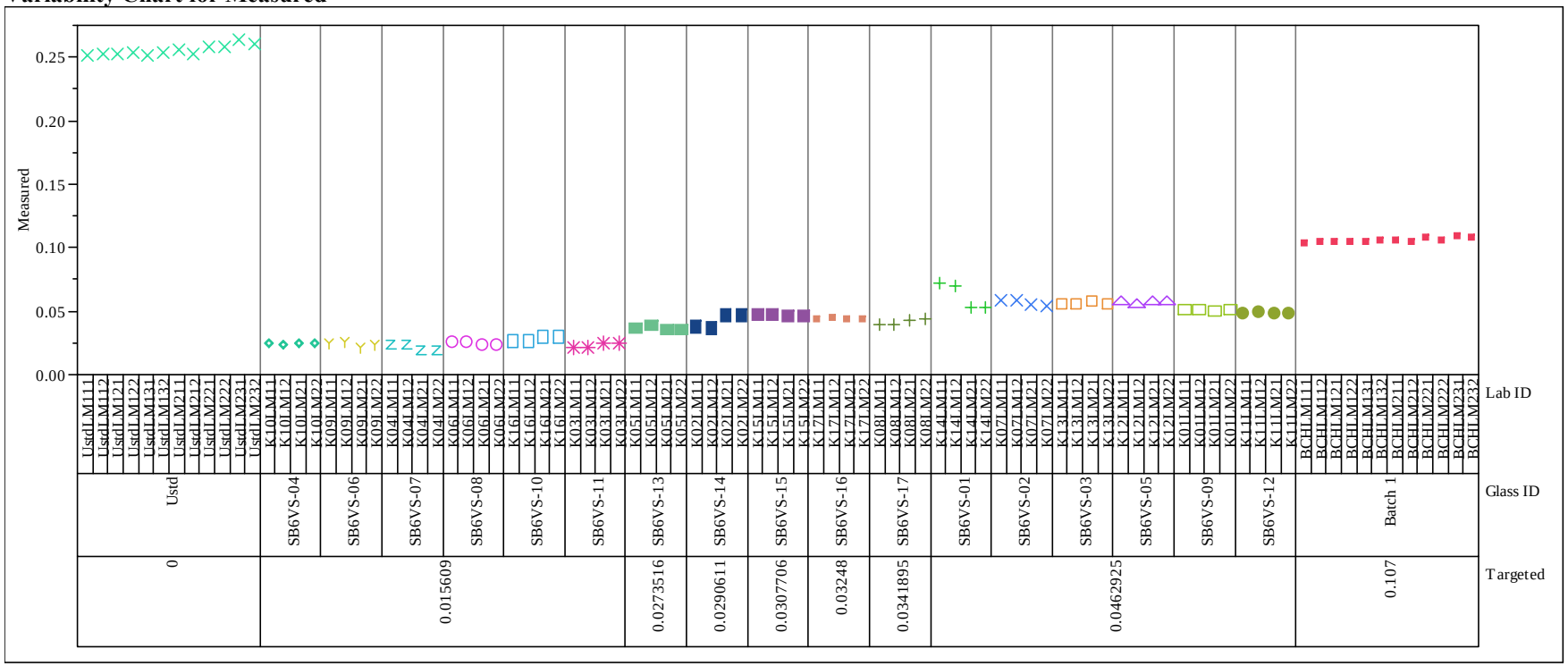


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=CuO (wt%)
Variability Chart for Measured

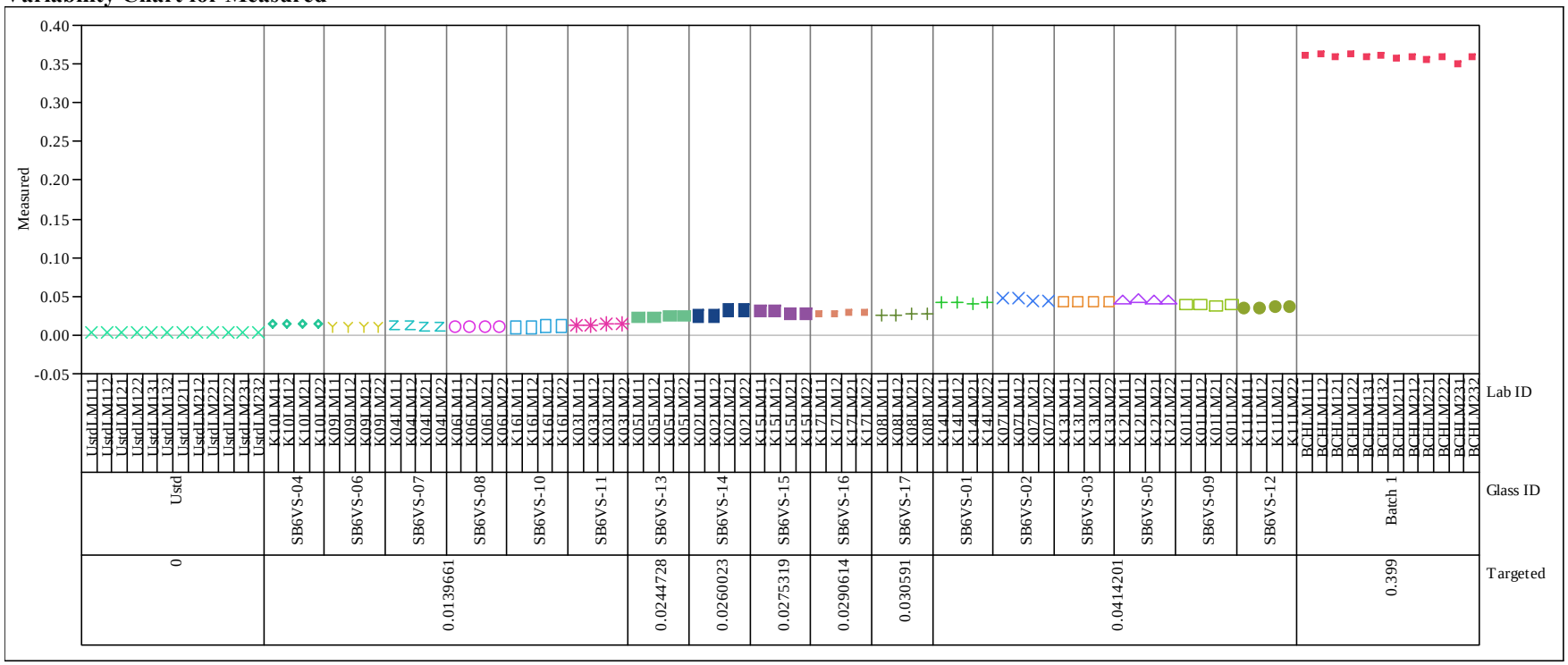


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=Fe2O3 (wt%)
Variability Chart for Measured

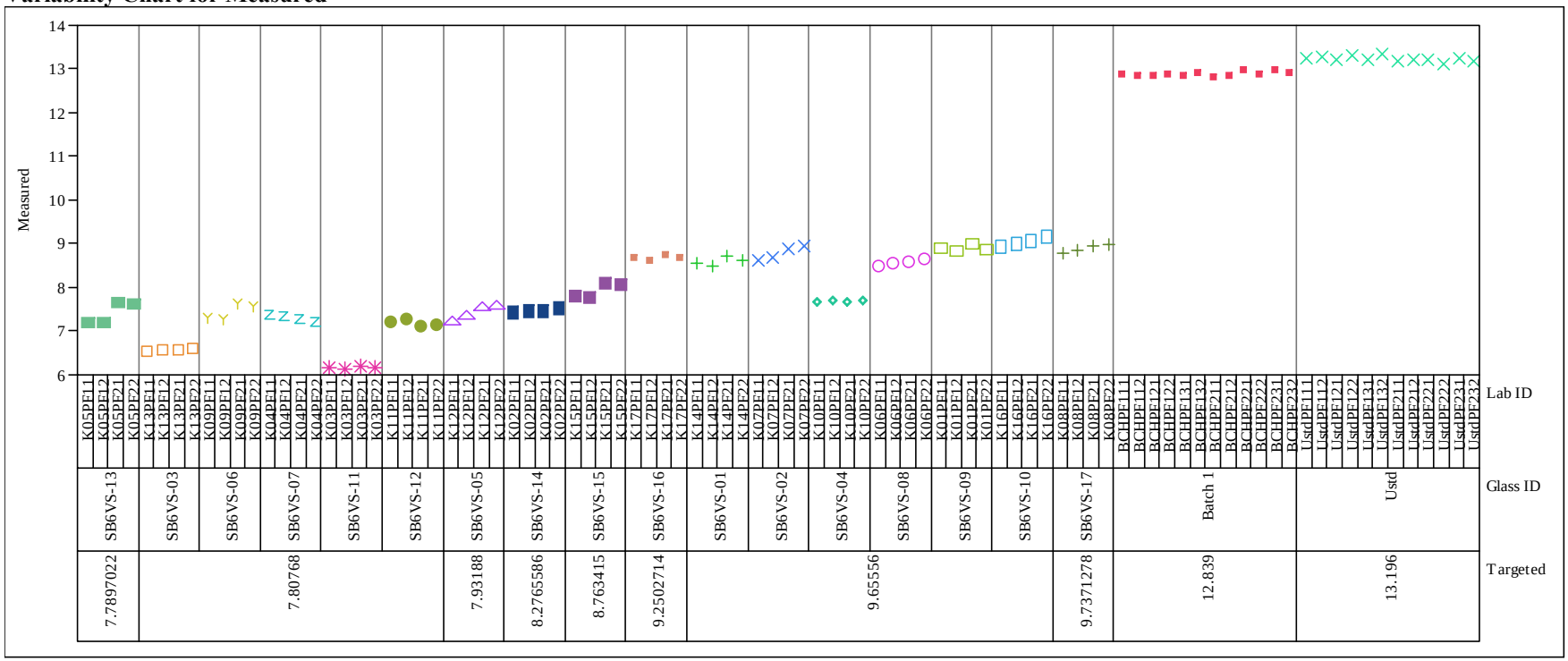


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=K2O (wt%)
Variability Chart for Measured

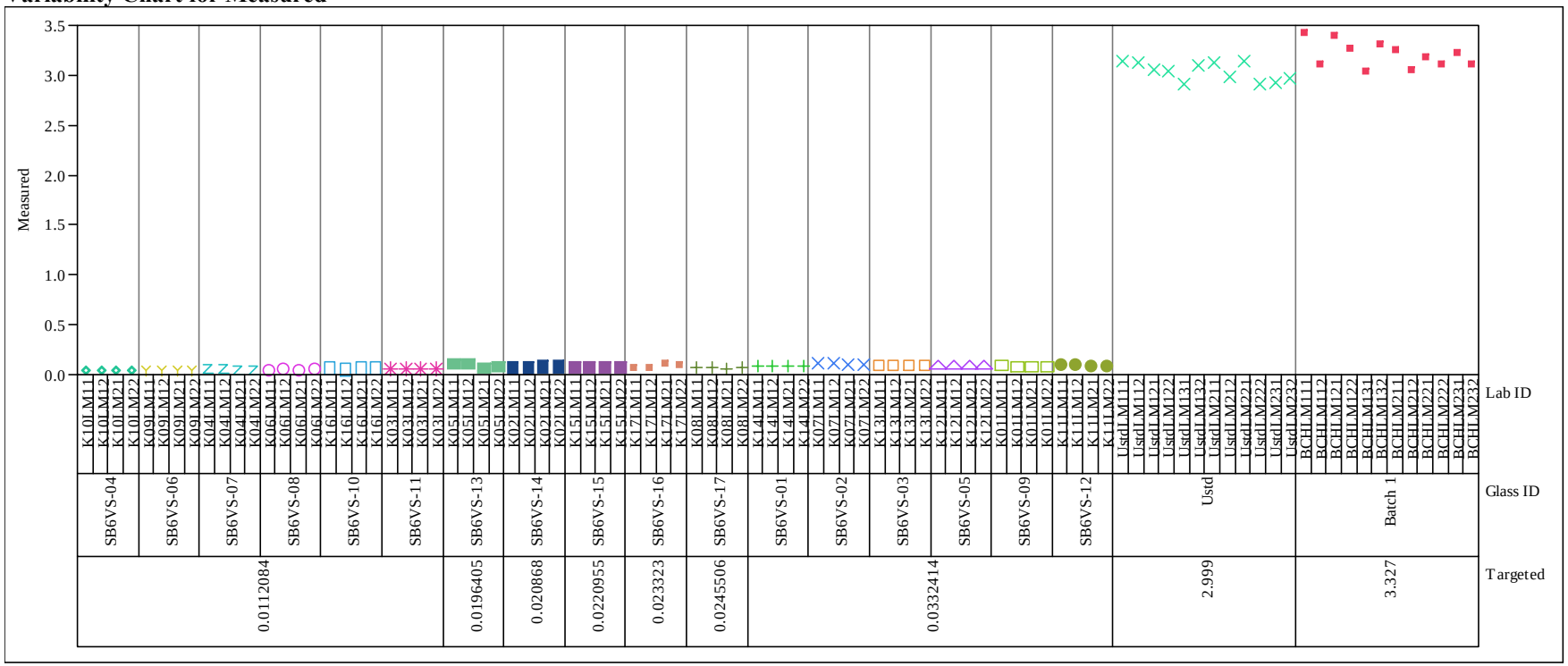


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=La2O3 (wt%)
Variability Chart for Measured

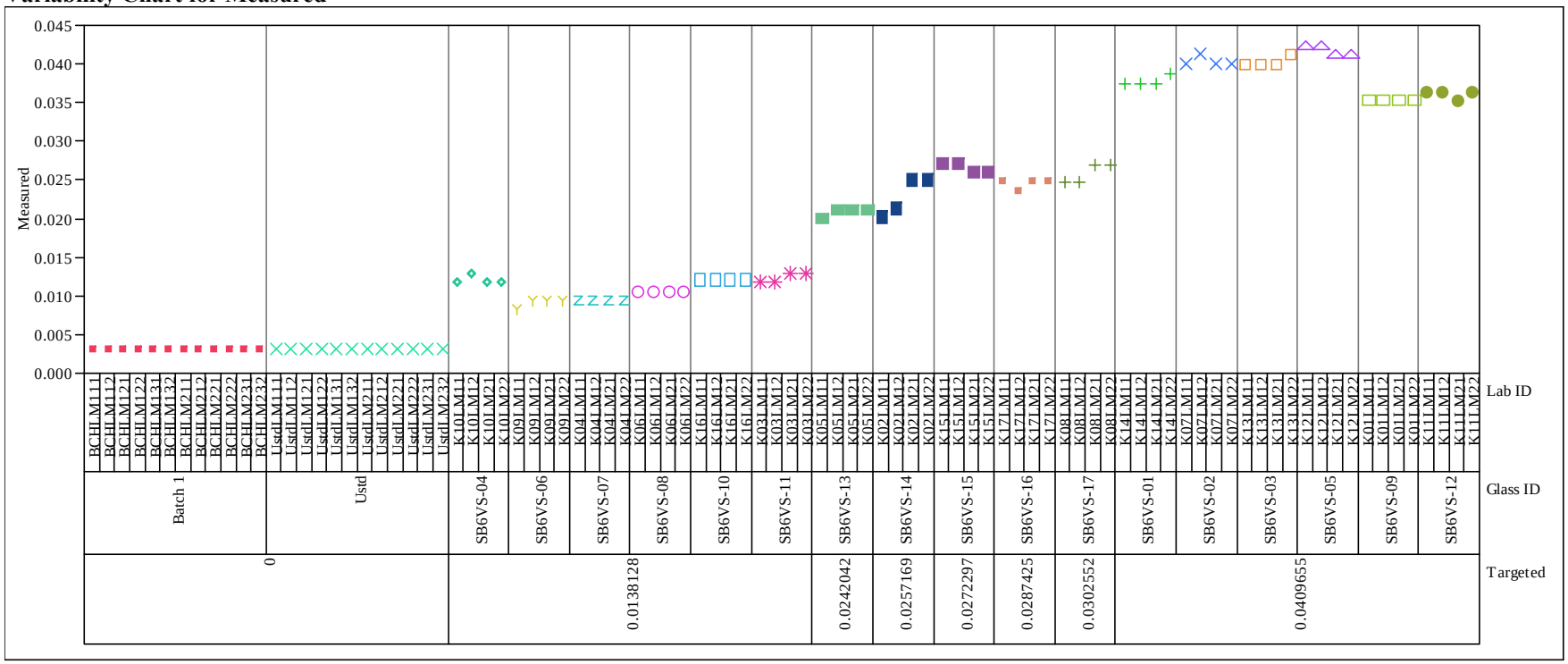


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=Li2O (wt%)
Variability Chart for Measured

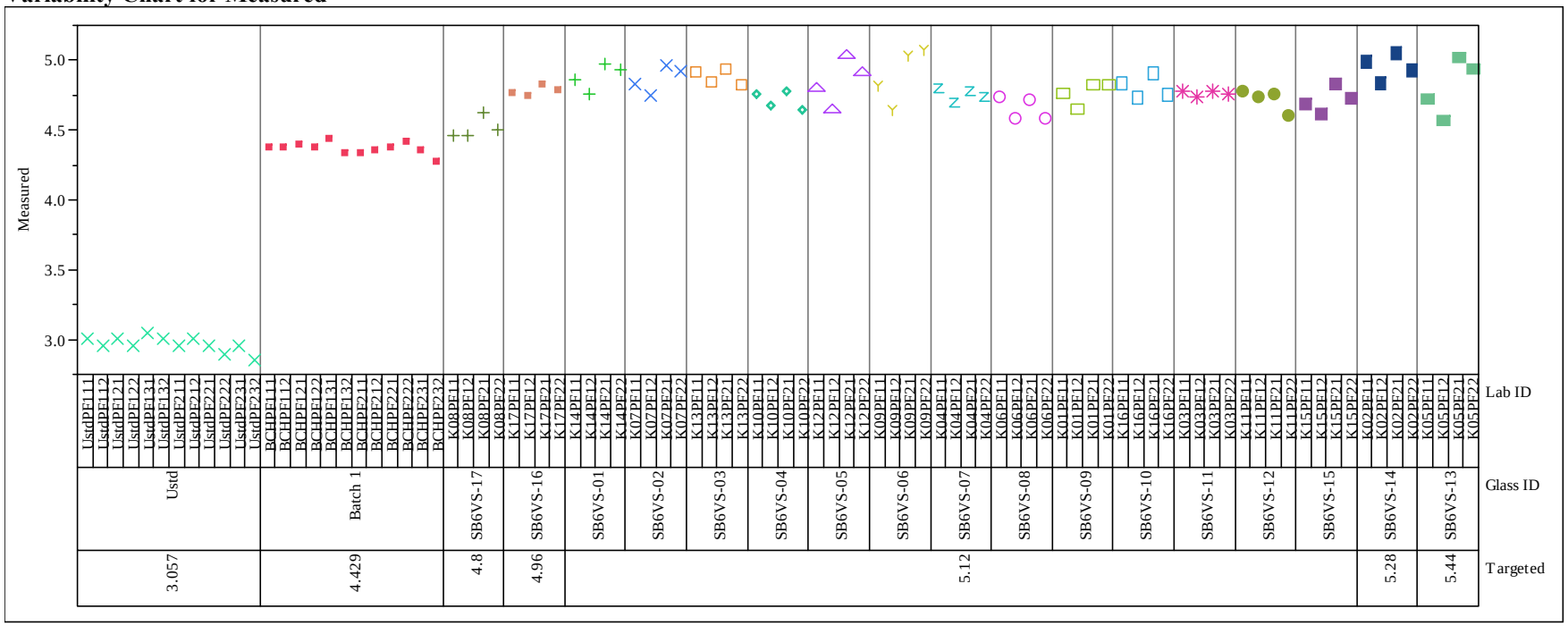


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=MgO (wt%)
Variability Chart for Measured

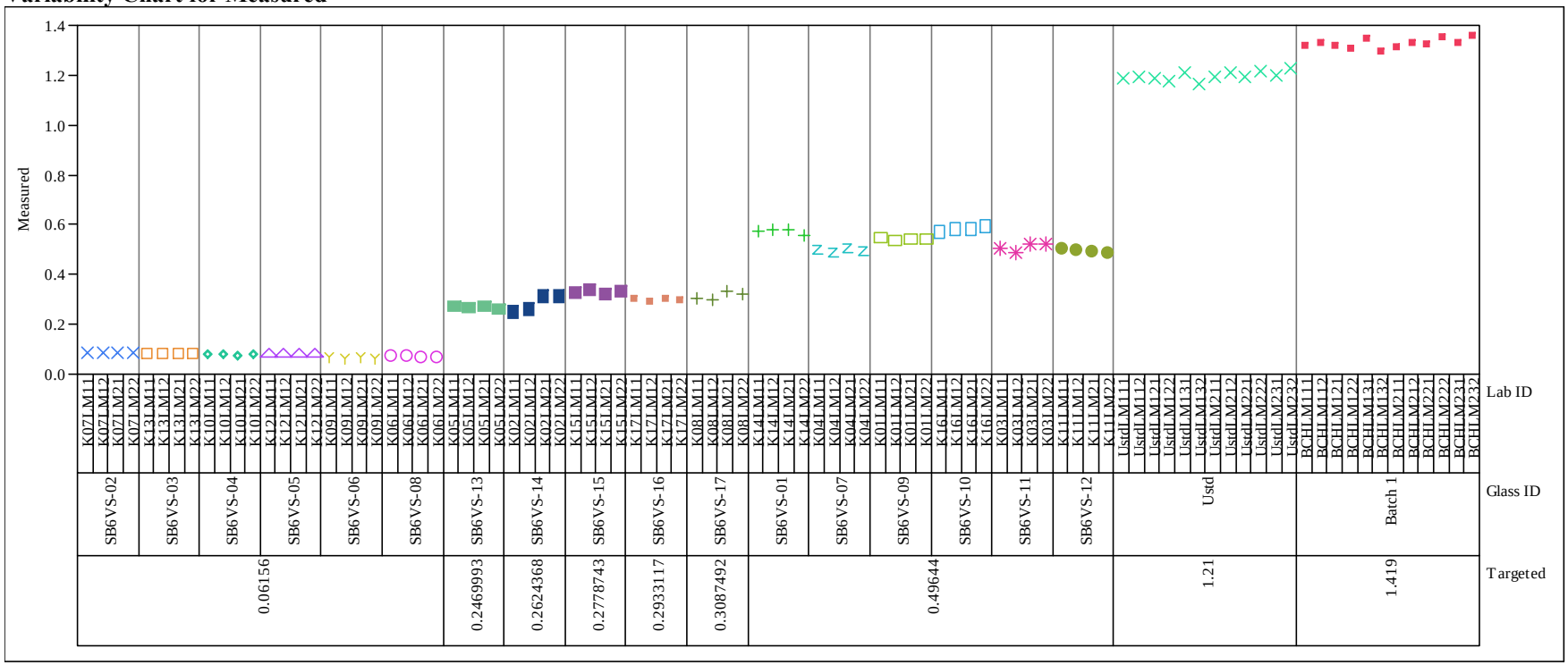


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=MnO (wt%)
Variability Chart for Measured

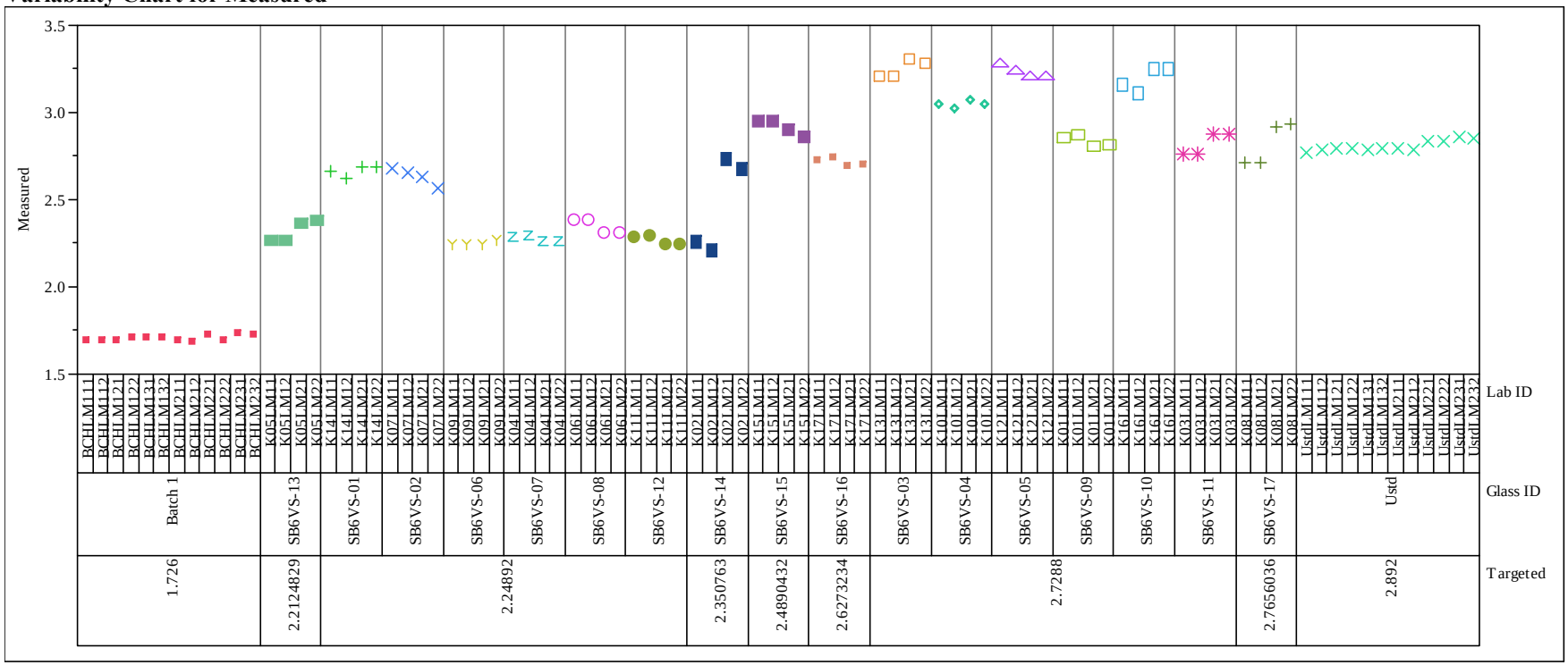


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=Na2O (wt%)
Variability Chart for Measured

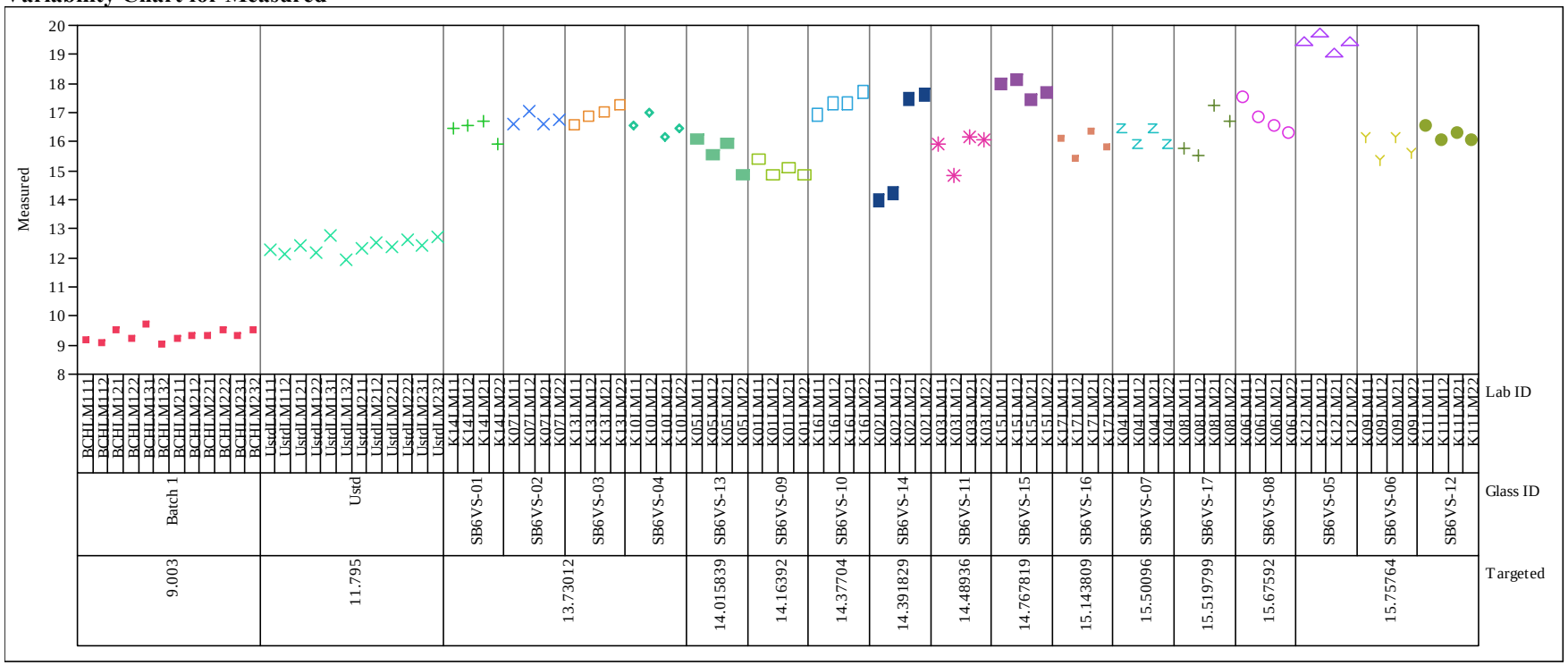


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=NiO (wt%)
Variability Chart for Measured

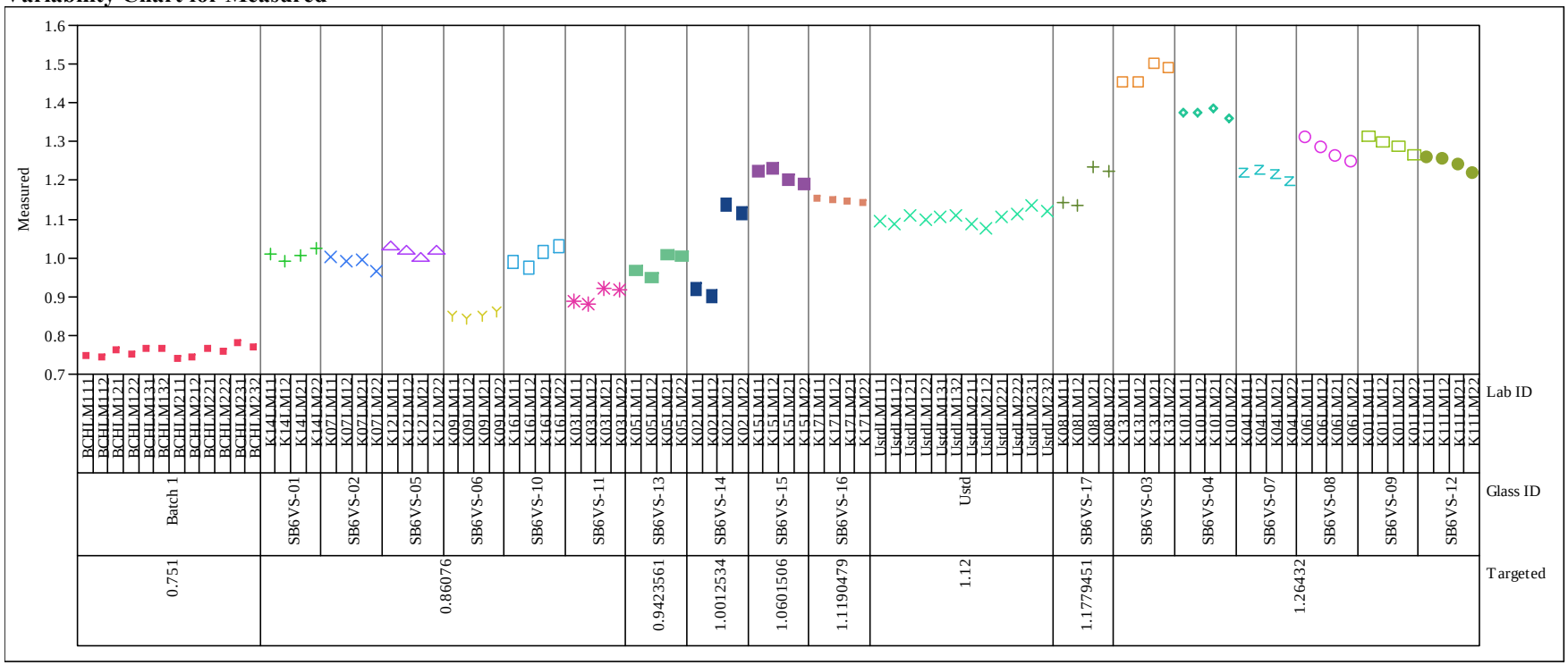


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=P2O5 (wt%)
Variability Chart for Measured

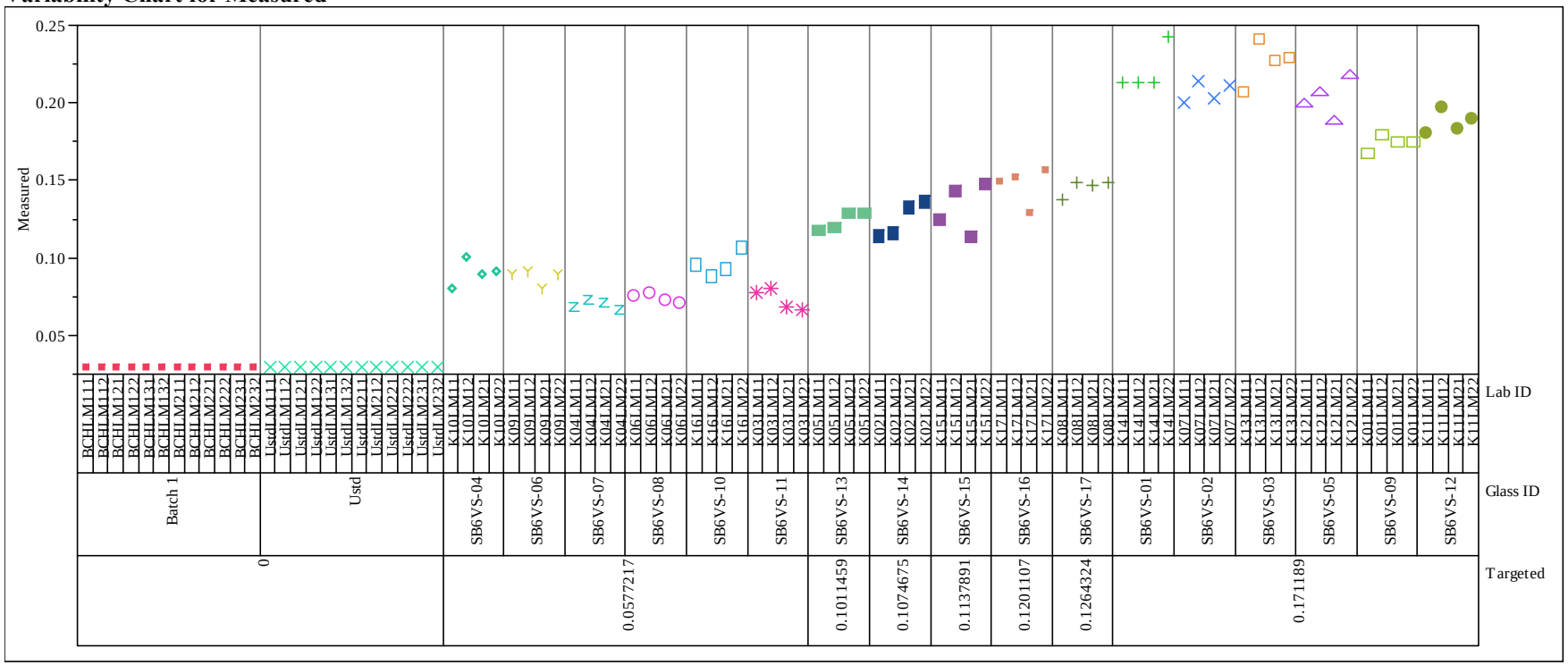


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=PbO (wt%)
Variability Chart for Measured

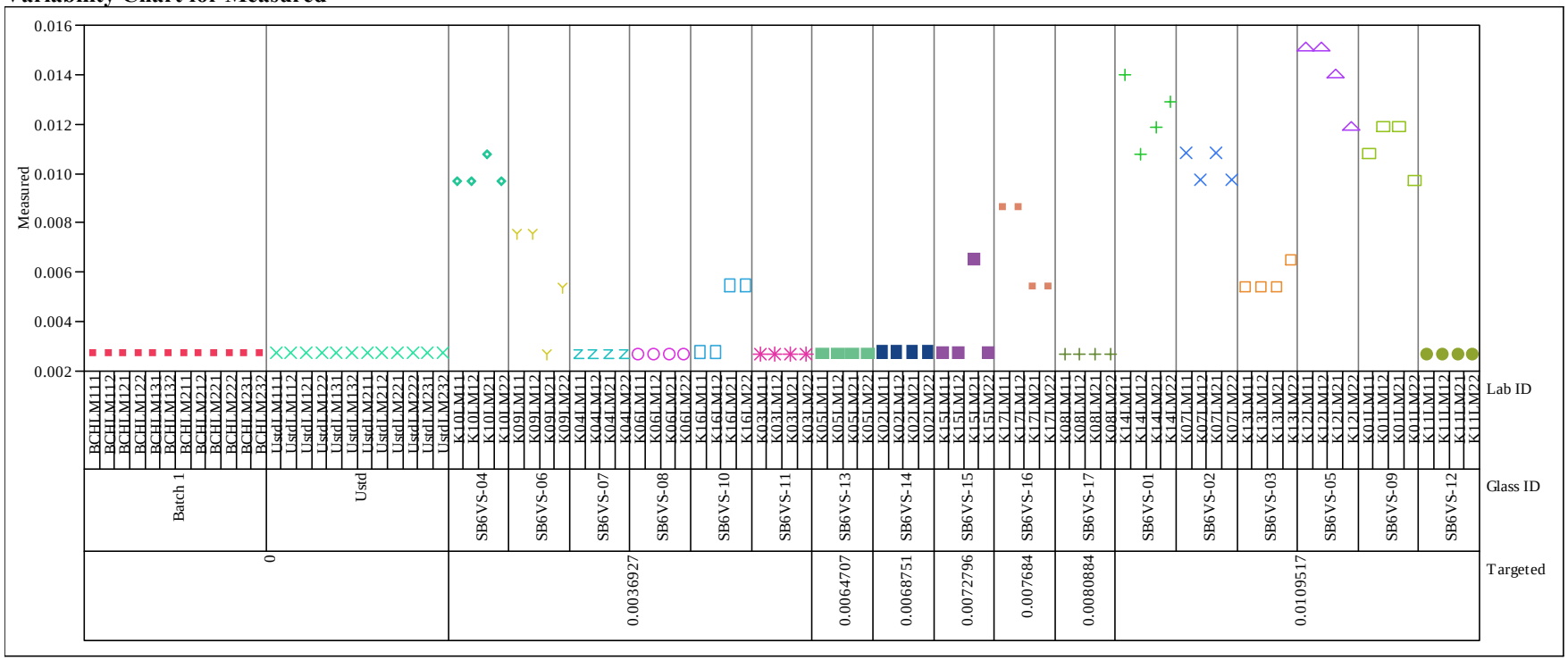


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=SiO2 (wt%)
Variability Chart for Measured

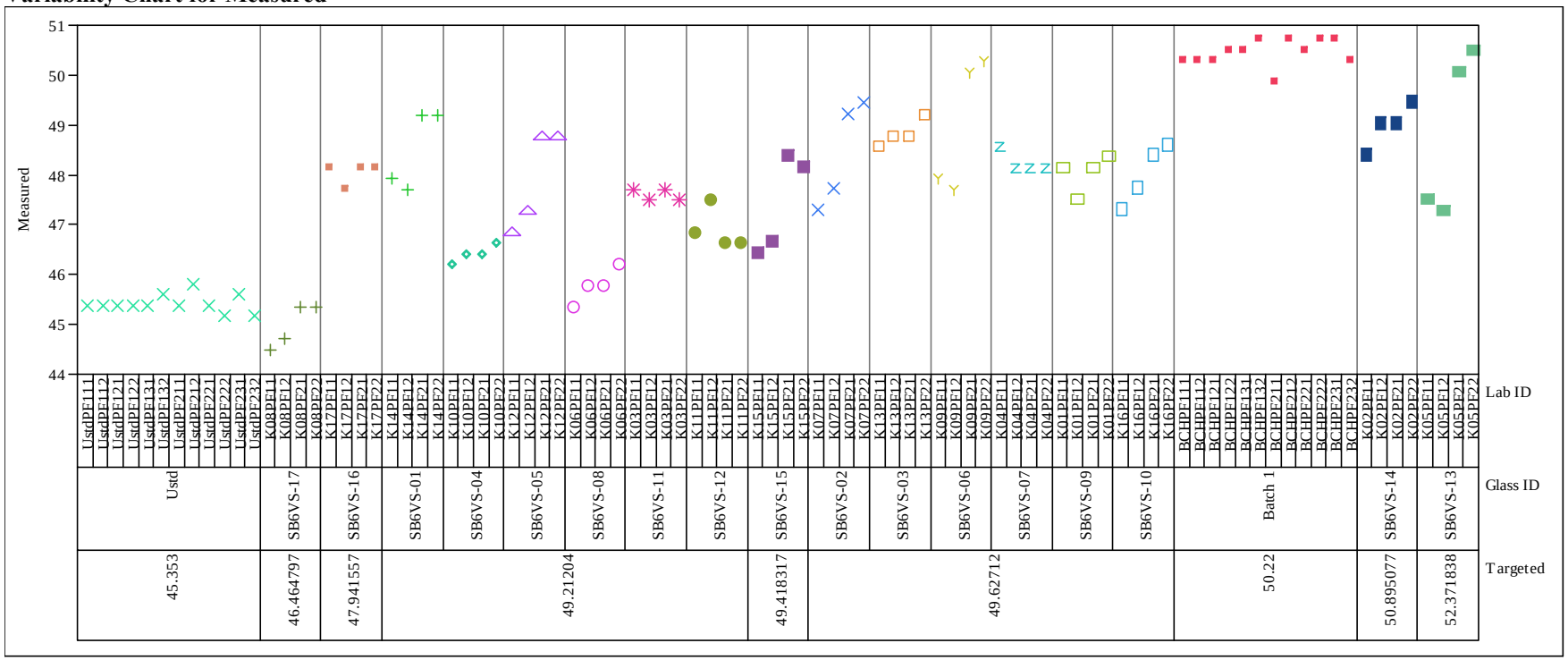


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=SO4 (wt%)
Variability Chart for Measured

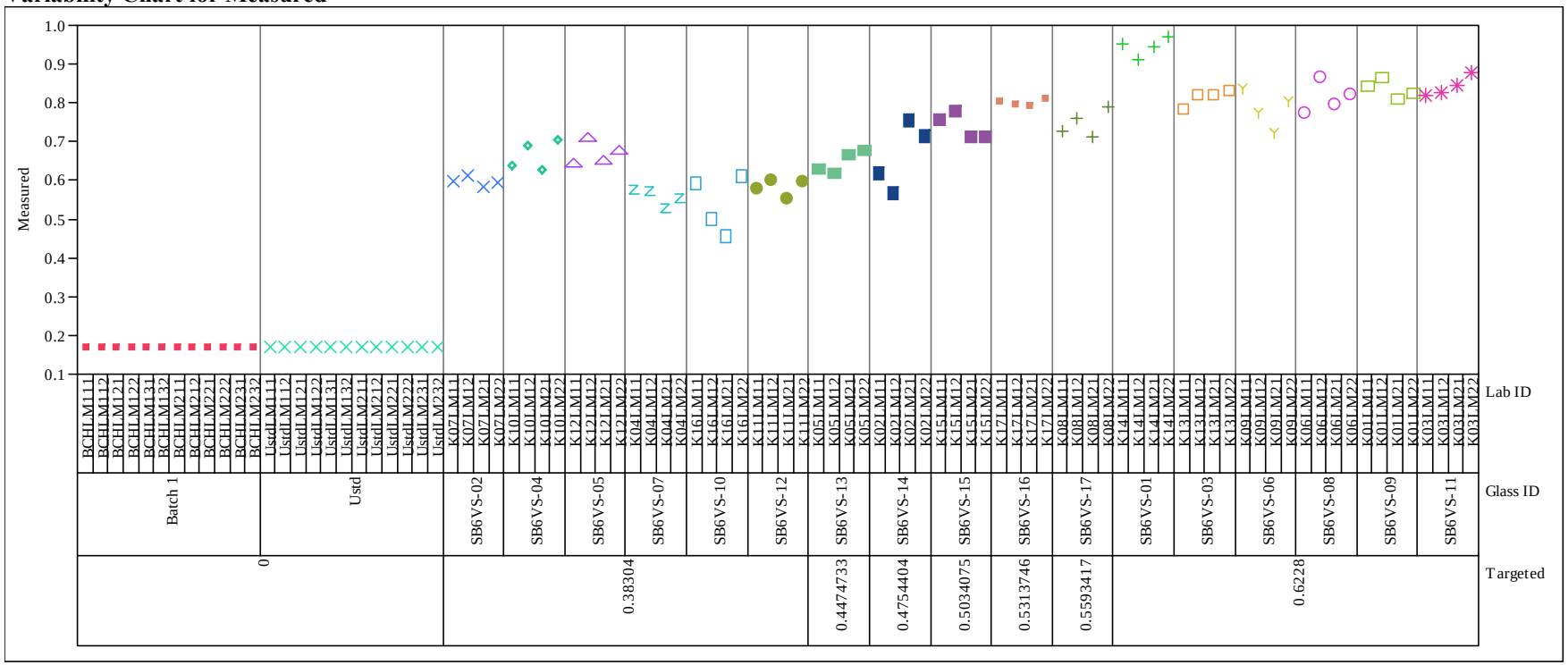


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=TiO2 (wt%)
Variability Chart for Measured

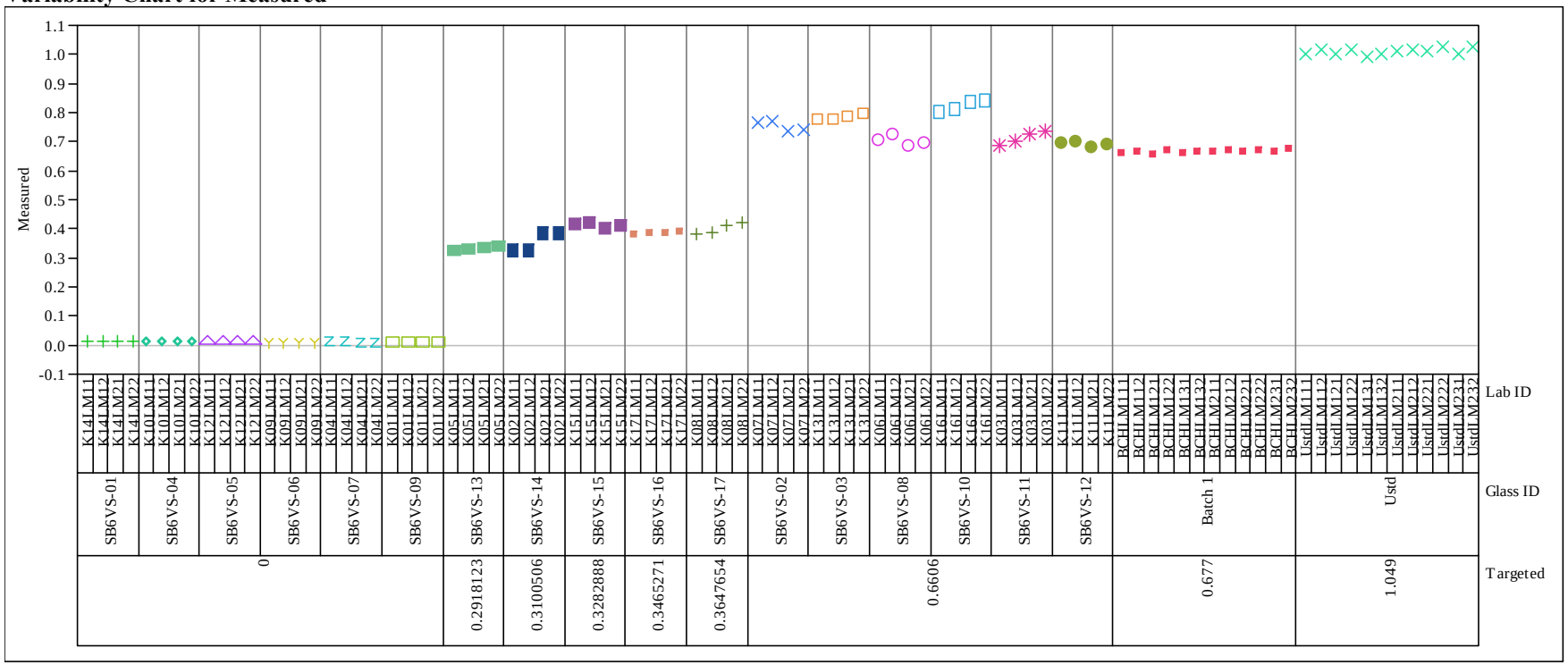


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=U3O8 (wt%)
Variability Chart for Measured

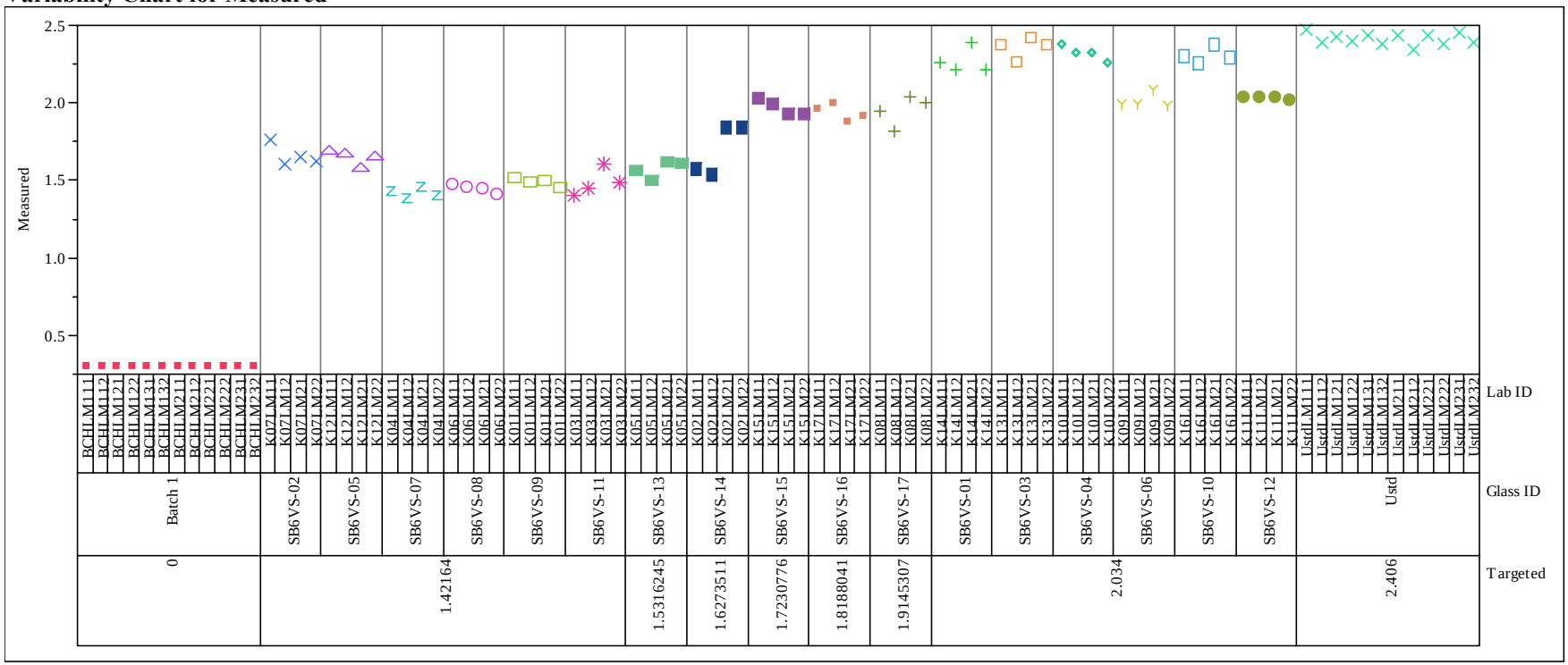


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=ZnO (wt%)
Variability Chart for Measured

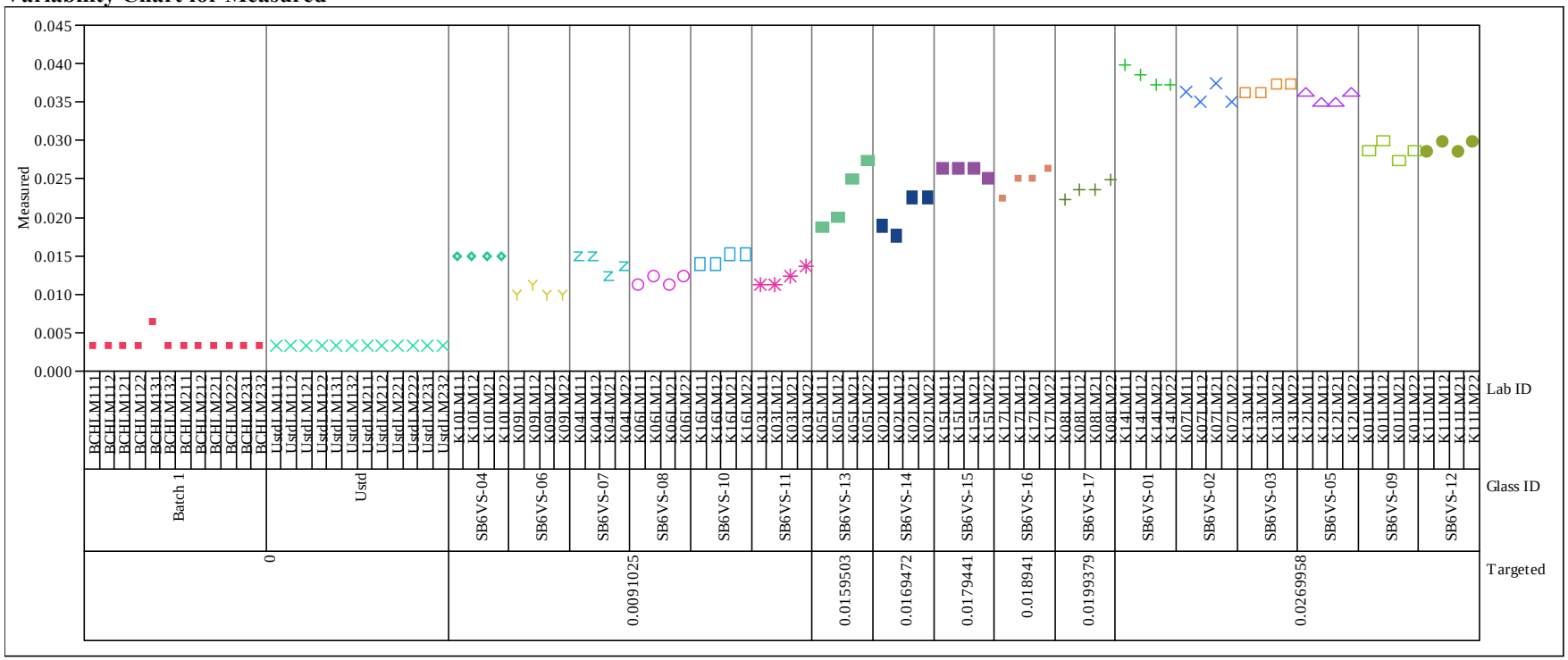


Exhibit A2. Measurements by Lab ID for Initial Glasses by Targeted Concentration for Each Oxide

Oxide=ZrO2 (wt%)
Variability Chart for Measured

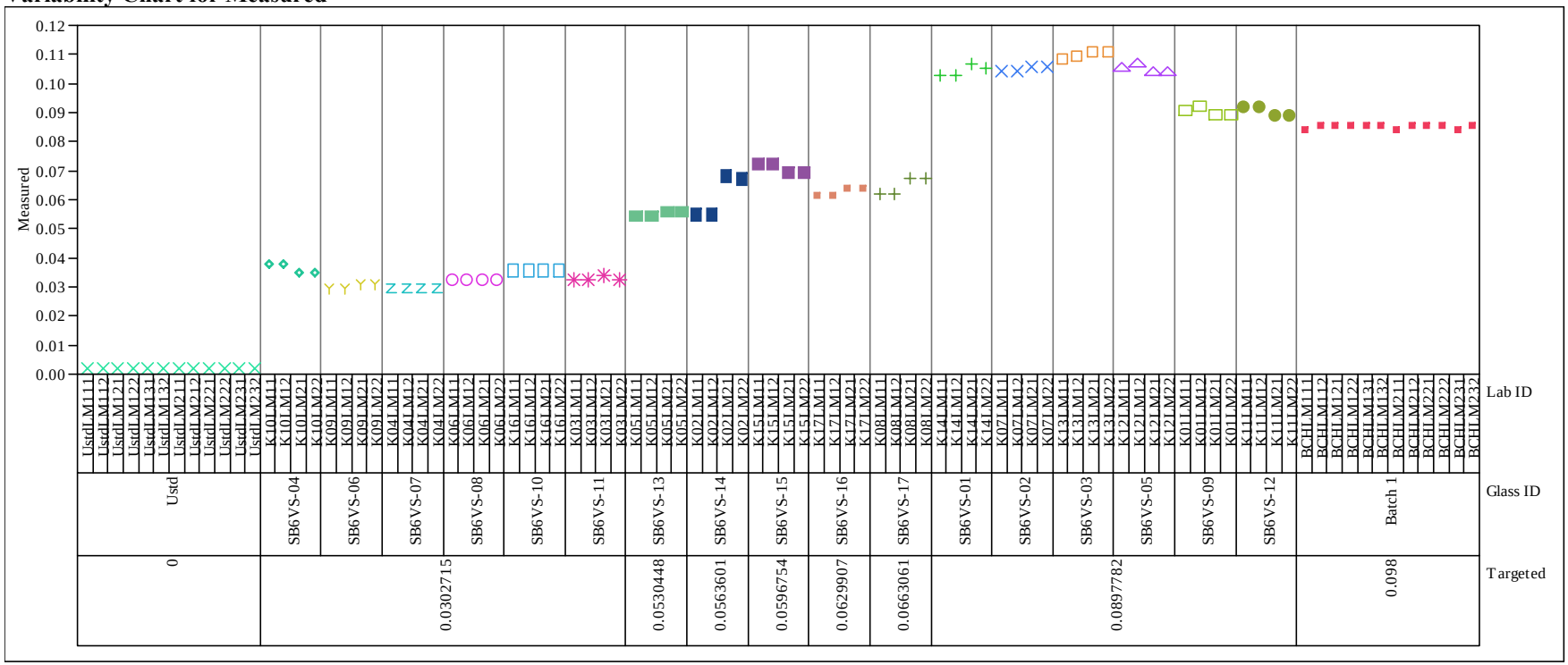
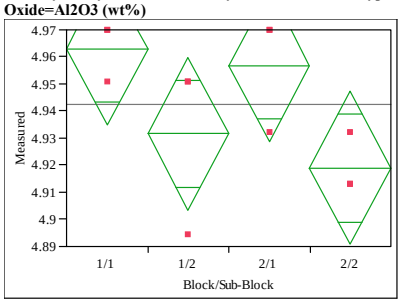


Exhibit A3. Measurements by Block and Sub-Block for Samples of the Batch 1 and Ustd Standards with the Initial Glasses by Oxide

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=Al2O3 (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.521912
Adj Rsquare	0.342629
Root Mean Square Error	0.021125
Mean of Response	4.942617
Observations (or Sum Wgts)	12

Analysis of Variance

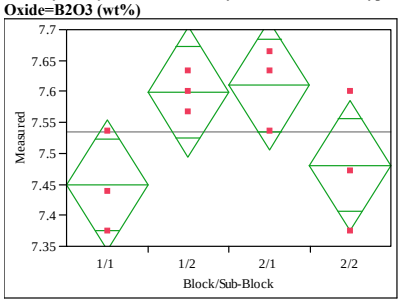
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.00389748	0.001299	2.9111	0.1008
Error	8	0.00357021	0.000446		
C. Total	11	0.00746769			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	4.96309	0.01220	4.9350	4.9912
1/2	3	4.93160	0.01220	4.9035	4.9597
2/1	3	4.95679	0.01220	4.9287	4.9849
2/2	3	4.91900	0.01220	4.8909	4.9471

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=B2O3 (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.54717
Adj Rsquare	0.377358
Root Mean Square Error	0.078871
Mean of Response	7.534566
Observations (or Sum Wgts)	12

Analysis of Variance

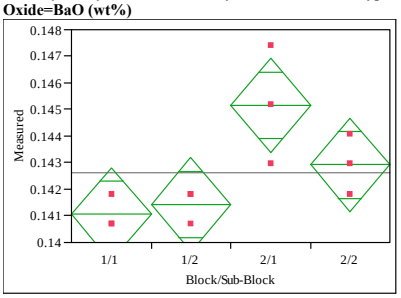
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.06013298	0.020044	3.2222	0.0825
Error	8	0.04976523	0.006221		
C. Total	11	0.10989821			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	7.44870	0.04554	7.3437	7.5537
1/2	3	7.59896	0.04554	7.4940	7.7040
2/1	3	7.60970	0.04554	7.5047	7.7147
2/2	3	7.48090	0.04554	7.3759	7.5859

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=BaO (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.687356
Adj Rsquare	0.570115
Root Mean Square Error	0.001329
Mean of Response	0.142633
Observations (or Sum Wgts)	12

Analysis of Variance

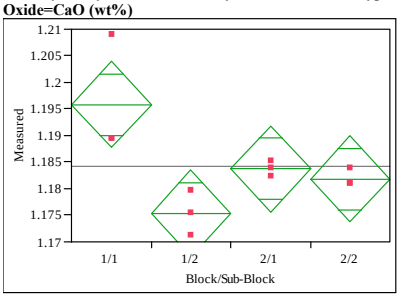
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.00003106	0.000010	5.8627	0.0203
Error	8	0.00001413	1.766e-6		
C. Total	11	0.00004519			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.141051	0.00077	0.13928	0.14282
1/2	3	0.141423	0.00077	0.13965	0.14319
2/1	3	0.145145	0.00077	0.14338	0.14691
2/2	3	0.142912	0.00077	0.14114	0.14468

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=CaO (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.6875
Adj Rsquare	0.570312
Root Mean Square Error	0.006126
Mean of Response	1.18419
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.00066042	0.000220	5.8667	0.0203
Error	8	0.00030019	0.000038		
C. Total	11	0.00096061			

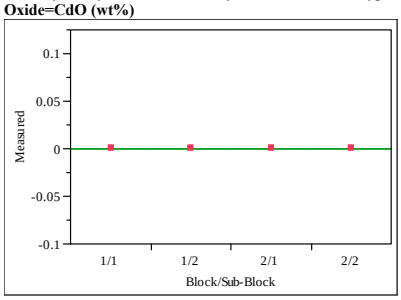
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	1.19585	0.00354	1.1877	1.2040
1/2	3	1.17533	0.00354	1.1672	1.1835
2/1	3	1.18372	0.00354	1.1756	1.1919
2/2	3	1.18186	0.00354	1.1737	1.1900

Std Error uses a pooled estimate of error variance

Exhibit A3. Measurements by Block and Sub-Block for Samples of the Batch 1 and Ustd Standards with the Initial Glasses by Oxide

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=CdO (wt%)



Oneway Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.000571
Observations (or Sum Wgts)	12

Analysis of Variance

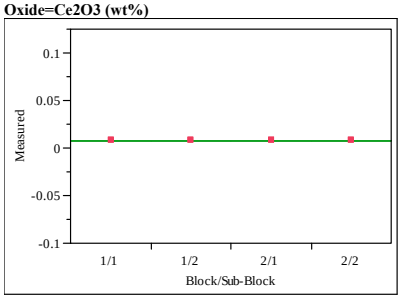
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0	0	.	.
Error	8	0	0		
C. Total	11	0			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.000571	0	0.00057	0.00057
1/2	3	0.000571	0	0.00057	0.00057
2/1	3	0.000571	0	0.00057	0.00057
2/2	3	0.000571	0	0.00057	0.00057

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=Ce2O3 (wt%)



Oneway Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.007028
Observations (or Sum Wgts)	12

Analysis of Variance

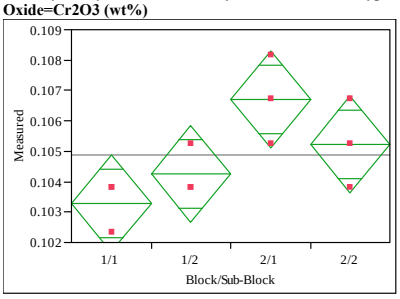
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0	0	.	.
Error	8	0	0		
C. Total	11	0			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.007028	0	0.00703	0.00703
1/2	3	0.007028	0	0.00703	0.00703
2/1	3	0.007028	0	0.00703	0.00703
2/2	3	0.007028	0	0.00703	0.00703

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=Cr2O3 (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.625731
Adj Rsquare	0.48538
Root Mean Square Error	0.001193
Mean of Response	0.10487
Observations (or Sum Wgts)	12

Analysis of Variance

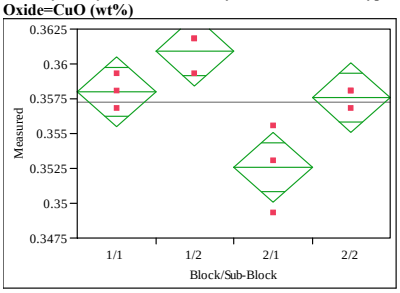
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.00001905	6.3495e-6	4.4583	0.0404
Error	8	0.00001139	1.4242e-6		
C. Total	11	0.00003044			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.103286	0.00069	0.10170	0.10488
1/2	3	0.104261	0.00069	0.10267	0.10585
2/1	3	0.106697	0.00069	0.10511	0.10829
2/2	3	0.105235	0.00069	0.10365	0.10682

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=CuO (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.792905
Adj Rsquare	0.715244
Root Mean Square Error	0.001878
Mean of Response	0.357285
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.00010799	0.000036	10.2099	0.0041
Error	8	0.00002821	3.526e-6		
C. Total	11	0.00013620			

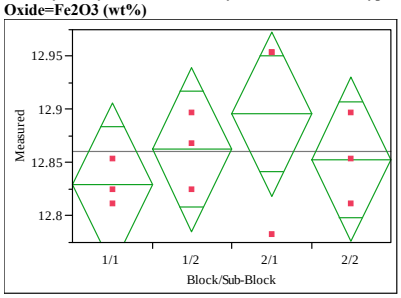
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.358015	0.00108	0.35551	0.36051
1/2	3	0.360936	0.00108	0.35844	0.36344
2/1	3	0.352590	0.00108	0.35009	0.35509
2/2	3	0.357598	0.00108	0.35510	0.36010

Std Error uses a pooled estimate of error variance

Exhibit A3. Measurements by Block and Sub-Block for Samples of the Batch 1 and Ustd Standards with the Initial Glasses by Oxide

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=Fe2O3 (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.20404
Adj Rsquare	-0.09444
Root Mean Square Error	0.057928
Mean of Response	12.86015
Observations (or Sum Wgts)	12

Analysis of Variance

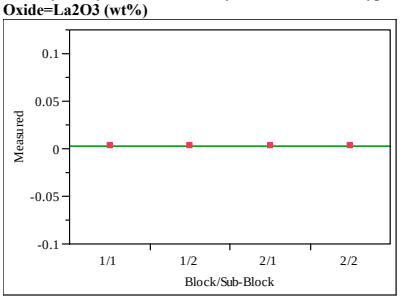
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.00688161	0.002294	0.6836	0.5866
Error	8	0.02684509	0.003356		
C. Total	11	0.03372669			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	12.8292	0.03344	12.752	12.906
1/2	3	12.8625	0.03344	12.785	12.940
2/1	3	12.8959	0.03344	12.819	12.973
2/2	3	12.8530	0.03344	12.776	12.930

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=La2O3 (wt%)



Oneway Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.002932
Observations (or Sum Wgts)	12

Analysis of Variance

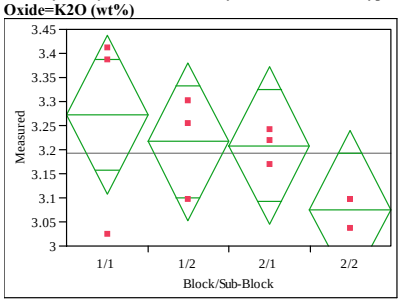
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0	0	.	.
Error	8	0	0		
C. Total	11	0			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.002932	0	0.00293	0.00293
1/2	3	0.002932	0	0.00293	0.00293
2/1	3	0.002932	0	0.00293	0.00293
2/2	3	0.002932	0	0.00293	0.00293

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=K2O (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.34013
Adj Rsquare	0.092679
Root Mean Square Error	0.123141
Mean of Response	3.193194
Observations (or Sum Wgts)	12

Analysis of Variance

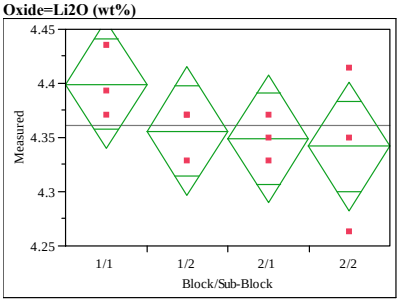
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.06252864	0.020843	1.3745	0.3187
Error	8	0.12130871	0.015164		
C. Total	11	0.18383736			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	3.27250	0.07110	3.1086	3.4364
1/2	3	3.21628	0.07110	3.0523	3.3802
2/1	3	3.20825	0.07110	3.0443	3.3722
2/2	3	3.07575	0.07110	2.9118	3.2397

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=Li2O (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.275311
Adj Rsquare	0.003552
Root Mean Square Error	0.044383
Mean of Response	4.361417
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.00598685	0.001996	1.0131	0.4360
Error	8	0.01575893	0.001970		
C. Total	11	0.02174577			

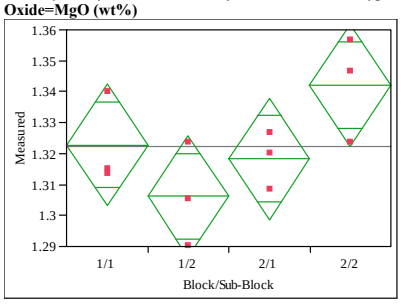
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	4.39909	0.02562	4.3400	4.4582
1/2	3	4.35603	0.02562	4.2969	4.4151
2/1	3	4.34886	0.02562	4.2898	4.4079
2/2	3	4.34168	0.02562	4.2826	4.4008

Std Error uses a pooled estimate of error variance

Exhibit A3. Measurements by Block and Sub-Block for Samples of the Batch 1 and Ustd Standards with the Initial Glasses by Oxide

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=MgO (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.534821
Adj Rsquare	0.360379
Root Mean Square Error	0.014763
Mean of Response	1.322356
Observations (or Sum Wgts)	12

Analysis of Variance

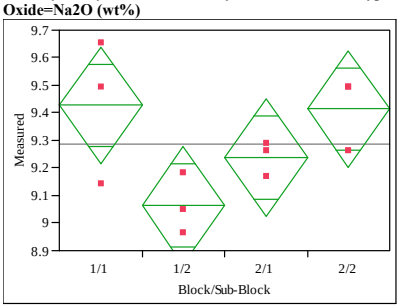
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.00200449	0.000668	3.0659	0.0911
Error	8	0.00174347	0.000218		
C. Total	11	0.00374796			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	1.32277	0.00852	1.3031	1.3424
1/2	3	1.30619	0.00852	1.2865	1.3258
2/1	3	1.31835	0.00852	1.2987	1.3380
2/2	3	1.34212	0.00852	1.3225	1.3618

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=Na2O (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.564464
Adj Rsquare	0.401138
Root Mean Square Error	0.159687
Mean of Response	9.285473
Observations (or Sum Wgts)	12

Analysis of Variance

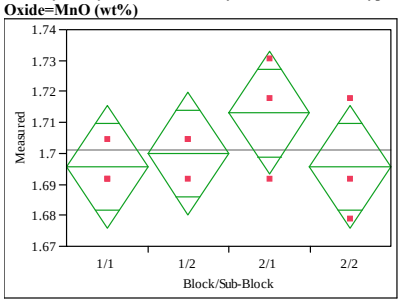
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.26438863	0.088130	3.4561	0.0714
Error	8	0.20400021	0.025500		
C. Total	11	0.46838884			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	9.42701	0.09220	9.2144	9.6396
1/2	3	9.06305	0.09220	8.8505	9.2757
2/1	3	9.23829	0.09220	9.0257	9.4509
2/2	3	9.41353	0.09220	9.2009	9.6261

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=MnO (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.251462
Adj Rsquare	-0.02924
Root Mean Square Error	0.014909
Mean of Response	1.701156
Observations (or Sum Wgts)	12

Analysis of Variance

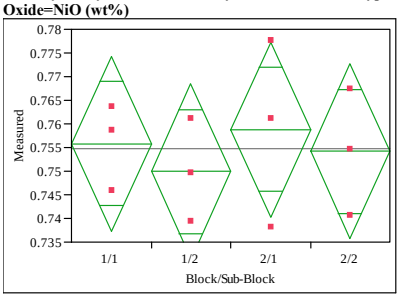
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.00059741	0.000199	0.8958	0.4842
Error	8	0.00177834	0.000222		
C. Total	11	0.00237576			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	1.69578	0.00861	1.6759	1.7156
1/2	3	1.70008	0.00861	1.6802	1.7199
2/1	3	1.71299	0.00861	1.6931	1.7328
2/2	3	1.69578	0.00861	1.6759	1.7156

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=NiO (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.07461
Adj Rsquare	-0.27241
Root Mean Square Error	0.013896
Mean of Response	0.754699
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.00012455	0.000042	0.2150	0.8833
Error	8	0.00154477	0.000193		
C. Total	11	0.00166932			

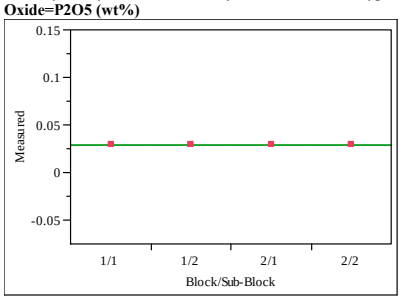
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.755865	0.00802	0.73736	0.77437
1/2	3	0.749927	0.00802	0.73143	0.76843
2/1	3	0.758834	0.00802	0.74033	0.77733
2/2	3	0.754168	0.00802	0.73567	0.77267

Std Error uses a pooled estimate of error variance

Exhibit A3. Measurements by Block and Sub-Block for Samples of the Batch 1 and Ustd Standards with the Initial Glasses by Oxide

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=P2O5 (wt%)



Oneway Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.028643
Observations (or Sum Wgts)	12

Analysis of Variance

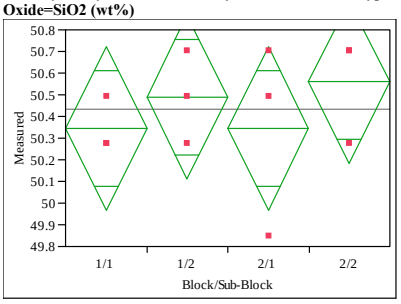
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0	0	.	.
Error	8	0	0		
C. Total	11	0			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.028643	0	0.02864	0.02864
1/2	3	0.028643	0	0.02864	0.02864
2/1	3	0.028643	0	0.02864	0.02864
2/2	3	0.028643	0	0.02864	0.02864

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=SiO2 (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.138462
Adj Rsquare	-0.18462
Root Mean Square Error	0.283003
Mean of Response	50.434
Observations (or Sum Wgts)	12

Analysis of Variance

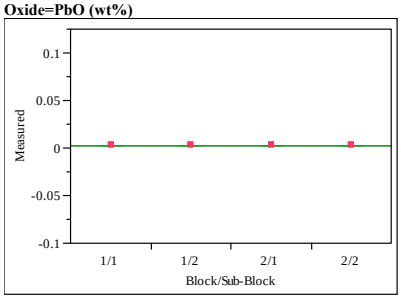
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.10297360	0.034325	0.4286	0.7381
Error	8	0.64072463	0.080091		
C. Total	11	0.74369823			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	50.3449	0.16339	49.968	50.722
1/2	3	50.4875	0.16339	50.111	50.864
2/1	3	50.3449	0.16339	49.968	50.722
2/2	3	50.5588	0.16339	50.182	50.936

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=PbO (wt%)



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.375
Root Mean Square Error	5.31e-19
Mean of Response	0.002693
Observations (or Sum Wgts)	12

Analysis of Variance

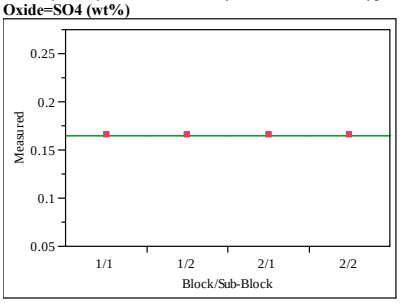
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0	0	0.0000	1.0000
Error	8	2.2569e-36	2.821e-37		
C. Total	11	2.2569e-36			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.002693	3.067e-19	0.00269	0.00269
1/2	3	0.002693	3.067e-19	0.00269	0.00269
2/1	3	0.002693	3.067e-19	0.00269	0.00269
2/2	3	0.002693	3.067e-19	0.00269	0.00269

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=SO4 (wt%)



Oneway Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.164775
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0	0	.	.
Error	8	0	0		
C. Total	11	0			

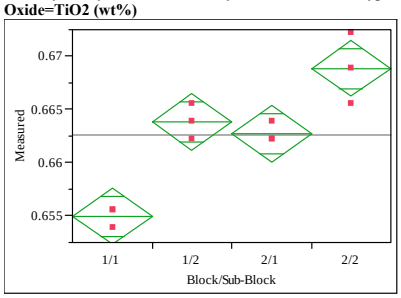
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.164775	0	0.16477	0.16477
1/2	3	0.164775	0	0.16477	0.16477
2/1	3	0.164775	0	0.16477	0.16477
2/2	3	0.164775	0	0.16477	0.16477

Std Error uses a pooled estimate of error variance

Exhibit A3. Measurements by Block and Sub-Block for Samples of the Batch 1 and Ustd Standards with the Initial Glasses by Oxide

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=TiO2 (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.904158
Adj Rsquare	0.868217
Root Mean Square Error	0.001985
Mean of Response	0.662613
Observations (or Sum Wgts)	12

Analysis of Variance

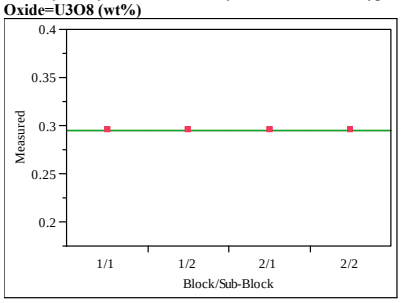
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.00029747	0.000099	25.1569	0.0002
Error	8	0.00003153	3.941e-6		
C. Total	11	0.00032900			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.654968	0.00115	0.65232	0.65761
1/2	3	0.663864	0.00115	0.66122	0.66651
2/1	3	0.662752	0.00115	0.66011	0.66540
2/2	3	0.668868	0.00115	0.66622	0.67151

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=U3O8 (wt%)



Oneway Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.2948
Observations (or Sum Wgts)	12

Analysis of Variance

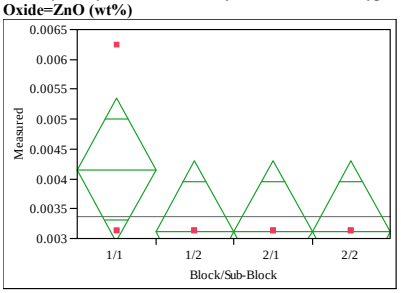
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0	0	.	.
Error	8	0	0		
C. Total	11	0			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.294800	0	0.29480	0.29480
1/2	3	0.294800	0	0.29480	0.29480
2/1	3	0.294800	0	0.29480	0.29480
2/2	3	0.294800	0	0.29480	0.29480

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=ZnO (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.272727
Adj Rsquare	2.22e-16
Root Mean Square Error	0.000898
Mean of Response	0.003371
Observations (or Sum Wgts)	12

Analysis of Variance

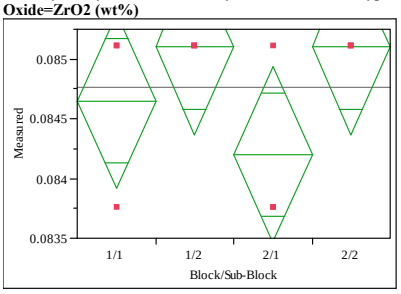
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	2.42114e-6	8.0705e-7	1.0000	0.4411
Error	8	6.45636e-6	8.0705e-7		
C. Total	11	8.8775e-6			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.004149	0.00052	0.00295	0.00535
1/2	3	0.003112	0.00052	0.00192	0.00431
2/1	3	0.003112	0.00052	0.00192	0.00431
2/2	3	0.003112	0.00052	0.00192	0.00431

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Batch 1, Oxide=ZrO2 (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.407407
Adj Rsquare	0.185185
Root Mean Square Error	0.000551
Mean of Response	0.084763
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	1.67261e-6	5.5754e-7	1.8333	0.2192
Error	8	2.43288e-6	3.0411e-7		
C. Total	11	4.10549e-6			

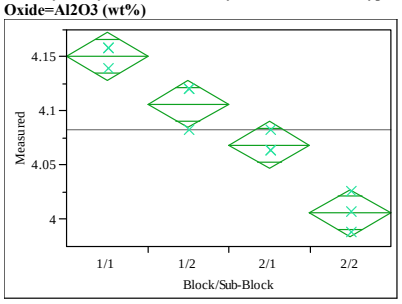
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.084650	0.00032	0.08392	0.08538
1/2	3	0.085100	0.00032	0.08437	0.08583
2/1	3	0.084200	0.00032	0.08347	0.08493
2/2	3	0.085100	0.00032	0.08437	0.08583

Std Error uses a pooled estimate of error variance

Exhibit A3. Measurements by Block and Sub-Block for Samples of the Batch 1 and Ustd Standards with the Initial Glasses by Oxide

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=Al2O3 (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.940545
Adj Rsquare	0.918249
Root Mean Square Error	0.016364
Mean of Response	4.082895
Observations (or Sum Wgts)	12

Analysis of Variance

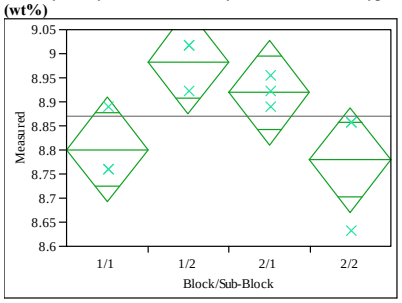
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.03388725	0.011296	42.1852	<.0001
Error	8	0.00214213	0.000268		
C. Total	11	0.03602937			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	4.15060	0.00945	4.1288	4.1724
1/2	3	4.10651	0.00945	4.0847	4.1283
2/1	3	4.06872	0.00945	4.0469	4.0905
2/2	3	4.00574	0.00945	3.9840	4.0275

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=B2O3 (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.614035
Adj Rsquare	0.469298
Root Mean Square Error	0.081564
Mean of Response	8.870825
Observations (or Sum Wgts)	12

Analysis of Variance

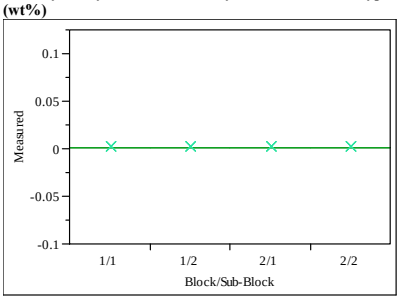
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.08467001	0.028223	4.2424	0.0454
Error	8	0.05322115	0.006653		
C. Total	11	0.13789115			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	8.80106	0.04709	8.6925	8.9097
1/2	3	8.98352	0.04709	8.8749	9.0921
2/1	3	8.91912	0.04709	8.8105	9.0277
2/2	3	8.77959	0.04709	8.6710	8.8882

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=BaO (wt%)



Oneway Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.001675
Observations (or Sum Wgts)	12

Analysis of Variance

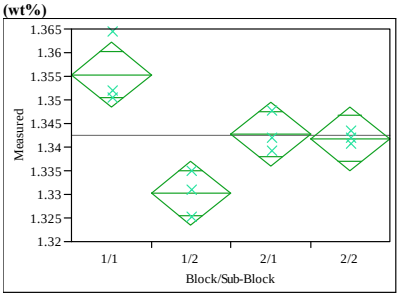
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0	0	.	.
Error	8	0	0		
C. Total	11	0			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.001675	0	0.00167	0.00167
1/2	3	0.001675	0	0.00167	0.00167
2/1	3	0.001675	0	0.00167	0.00167
2/2	3	0.001675	0	0.00167	0.00167

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=CaO (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.821248
Adj Rsquare	0.754216
Root Mean Square Error	0.005093
Mean of Response	1.342532
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.00095343	0.000318	12.2516	0.0023
Error	8	0.00020752	0.000026		
C. Total	11	0.00116095			

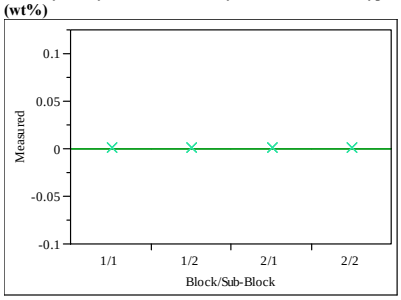
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	1.35536	0.00294	1.3486	1.3621
1/2	3	1.33017	0.00294	1.3234	1.3370
2/1	3	1.34277	0.00294	1.3360	1.3495
2/2	3	1.34183	0.00294	1.3351	1.3486

Std Error uses a pooled estimate of error variance

Exhibit A3. Measurements by Block and Sub-Block for Samples of the Batch 1 and Ustd Standards with the Initial Glasses by Oxide

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=CdO (wt%)



Oneway Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.000571
Observations (or Sum Wgts)	12

Analysis of Variance

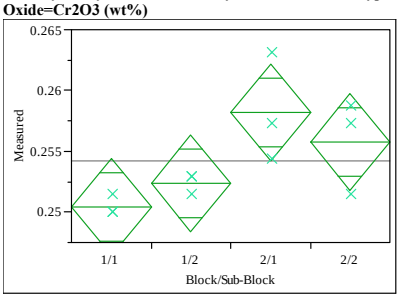
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0	0	.	.
Error	8	0	0		
C. Total	11	0			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.000571	0	0.00057	0.00057
1/2	3	0.000571	0	0.00057	0.00057
2/1	3	0.000571	0	0.00057	0.00057
2/2	3	0.000571	0	0.00057	0.00057

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=Cr2O3 (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.599607
Adj Rsquare	0.44946
Root Mean Square Error	0.003013
Mean of Response	0.254197
Observations (or Sum Wgts)	12

Analysis of Variance

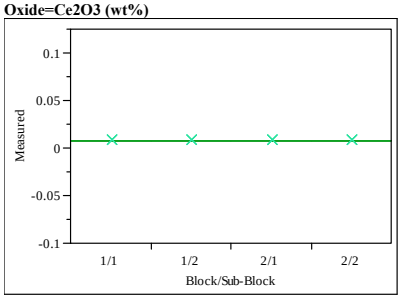
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.00010877	0.000036	3.9935	0.0521
Error	8	0.00007263	9.079e-6		
C. Total	11	0.00018141			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.250421	0.00174	0.24641	0.25443
1/2	3	0.252370	0.00174	0.24836	0.25638
2/1	3	0.258216	0.00174	0.25420	0.26223
2/2	3	0.255780	0.00174	0.25177	0.25979

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=Ce2O3 (wt%)



Oneway Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.007028
Observations (or Sum Wgts)	12

Analysis of Variance

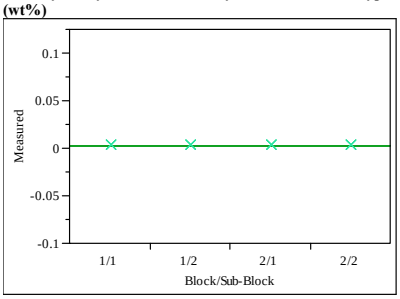
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0	0	.	.
Error	8	0	0		
C. Total	11	0			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.007028	0	0.00703	0.00703
1/2	3	0.007028	0	0.00703	0.00703
2/1	3	0.007028	0	0.00703	0.00703
2/2	3	0.007028	0	0.00703	0.00703

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=CuO (wt%)



Oneway Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.001878
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0	0	.	.
Error	8	0	0		
C. Total	11	0			

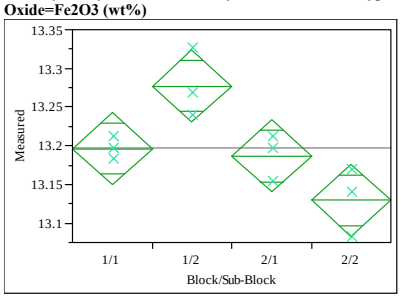
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.001878	0	0.00188	0.00188
1/2	3	0.001878	0	0.00188	0.00188
2/1	3	0.001878	0	0.00188	0.00188
2/2	3	0.001878	0	0.00188	0.00188

Std Error uses a pooled estimate of error variance

Exhibit A3. Measurements by Block and Sub-Block for Samples of the Batch 1 and Ustd Standards with the Initial Glasses by Oxide

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=Fe2O3 (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.772422
Adj Rsquare	0.68708
Root Mean Square Error	0.03502
Mean of Response	13.19732
Observations (or Sum Wgts)	12

Analysis of Variance

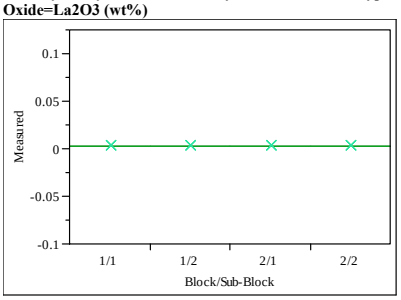
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.03330085	0.011100	9.0509	0.0060
Error	8	0.00981140	0.001226		
C. Total	11	0.04311225			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	13.1961	0.02022	13.150	13.243
1/2	3	13.2771	0.02022	13.231	13.324
2/1	3	13.1866	0.02022	13.140	13.233
2/2	3	13.1294	0.02022	13.083	13.176

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=La2O3 (wt%)



Oneway Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.002932
Observations (or Sum Wgts)	12

Analysis of Variance

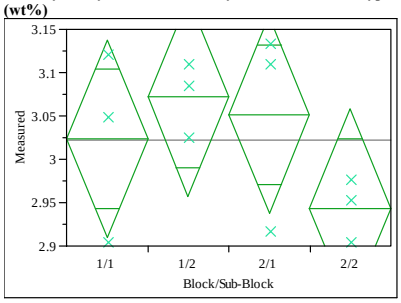
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0	0	.	.
Error	8	0	0		
C. Total	11	0			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.002932	0	0.00293	0.00293
1/2	3	0.002932	0	0.00293	0.00293
2/1	3	0.002932	0	0.00293	0.00293
2/2	3	0.002932	0	0.00293	0.00293

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=K2O (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.326629
Adj Rsquare	0.074115
Root Mean Square Error	0.085955
Mean of Response	3.022542
Observations (or Sum Wgts)	12

Analysis of Variance

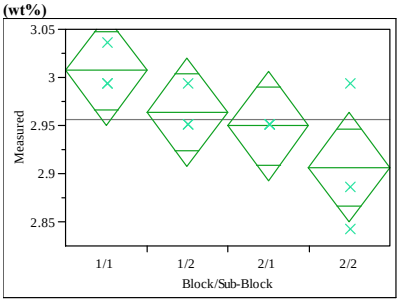
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.02867055	0.009557	1.2935	0.3414
Error	8	0.05910656	0.007388		
C. Total	11	0.08777711			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	3.02355	0.04963	2.9091	3.1380
1/2	3	3.07173	0.04963	2.9573	3.1862
2/1	3	3.05165	0.04963	2.9372	3.1661
2/2	3	2.94324	0.04963	2.8288	3.0577

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=Li2O (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.515464
Adj Rsquare	0.333763
Root Mean Square Error	0.042607
Mean of Response	2.956649
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.01544993	0.005150	2.8369	0.1059
Error	8	0.01452293	0.001815		
C. Total	11	0.02997286			

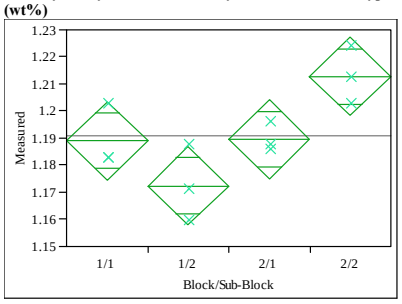
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	3.00688	0.02460	2.9502	3.0636
1/2	3	2.96383	0.02460	2.9071	3.0206
2/1	3	2.94947	0.02460	2.8927	3.0062
2/2	3	2.90642	0.02460	2.8497	2.9631

Std Error uses a pooled estimate of error variance

Exhibit A3. Measurements by Block and Sub-Block for Samples of the Batch 1 and Ustd Standards with the Initial Glasses by Oxide

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=MgO (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.721614
Adj Rsquare	0.617219
Root Mean Square Error	0.010927
Mean of Response	1.190936
Observations (or Sum Wgts)	12

Analysis of Variance

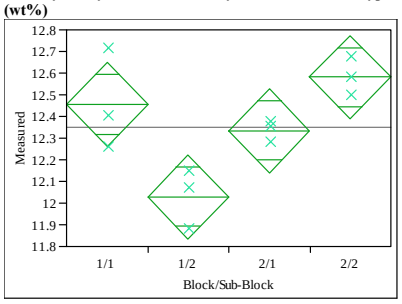
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.00247588	0.000825	6.9123	0.0130
Error	8	0.00095515	0.000119		
C. Total	11	0.00343103			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	1.18900	0.00631	1.1745	1.2035
1/2	3	1.17242	0.00631	1.1579	1.1870
2/1	3	1.18955	0.00631	1.1750	1.2041
2/2	3	1.21277	0.00631	1.1982	1.2273

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=Na2O (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.750428
Adj Rsquare	0.656838
Root Mean Square Error	0.144819
Mean of Response	12.34993
Observations (or Sum Wgts)	12

Analysis of Variance

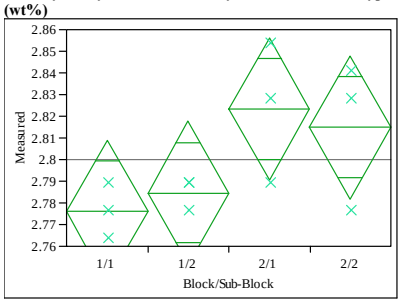
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.50448864	0.168163	8.0183	0.0085
Error	8	0.16777927	0.020972		
C. Total	11	0.67226791			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	12.4555	0.08361	12.263	12.648
1/2	3	12.0287	0.08361	11.836	12.221
2/1	3	12.3342	0.08361	12.141	12.527
2/2	3	12.5813	0.08361	12.389	12.774

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=MnO (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.491329
Adj Rsquare	0.300578
Root Mean Square Error	0.024725
Mean of Response	2.799752
Observations (or Sum Wgts)	12

Analysis of Variance

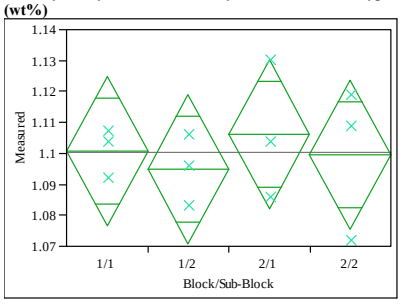
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.00472373	0.001575	2.5758	0.1266
Error	8	0.00489045	0.000611		
C. Total	11	0.00961417			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	2.77608	0.01427	2.7432	2.8090
1/2	3	2.78469	0.01427	2.7518	2.8176
2/1	3	2.82342	0.01427	2.7905	2.8563
2/2	3	2.81482	0.01427	2.7819	2.8477

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=NiO (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.070773
Adj Rsquare	-0.27769
Root Mean Square Error	0.018104
Mean of Response	1.100288
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.00019971	0.000067	0.2031	0.8914
Error	8	0.00262212	0.000328		
C. Total	11	0.00282182			

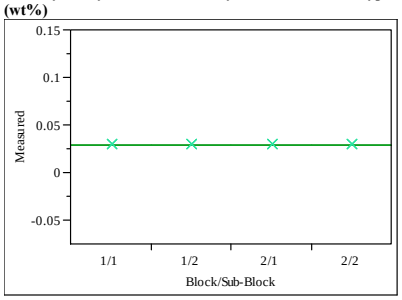
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	1.10071	0.01045	1.0766	1.1248
1/2	3	1.09477	0.01045	1.0707	1.1189
2/1	3	1.10623	0.01045	1.0821	1.1303
2/2	3	1.09944	0.01045	1.0753	1.1235

Std Error uses a pooled estimate of error variance

Exhibit A3. Measurements by Block and Sub-Block for Samples of the Batch 1 and Ustd Standards with the Initial Glasses by Oxide

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=P2O5 (wt%)



Oneway Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.028643
Observations (or Sum Wgts)	12

Analysis of Variance

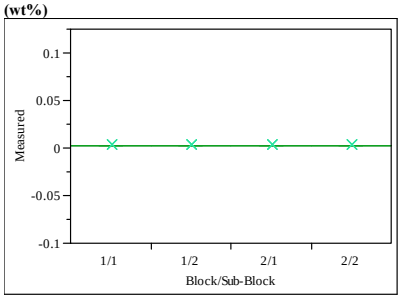
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0	0	.	.
Error	8	0	0		
C. Total	11	0			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.028643	0	0.02864	0.02864
1/2	3	0.028643	0	0.02864	0.02864
2/1	3	0.028643	0	0.02864	0.02864
2/2	3	0.028643	0	0.02864	0.02864

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=PbO (wt%)



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.375
Root Mean Square Error	5.31e-19
Mean of Response	0.002693
Observations (or Sum Wgts)	12

Analysis of Variance

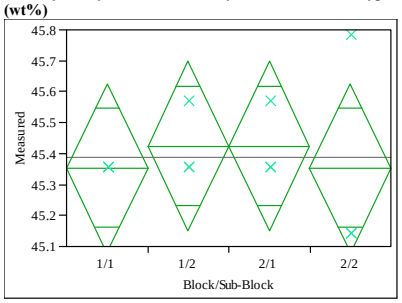
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0	0	0.0000	1.0000
Error	8	2.2569e-36	2.821e-37		
C. Total	11	2.2569e-36			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.002693	3.067e-19	0.00269	0.00269
1/2	3	0.002693	3.067e-19	0.00269	0.00269
2/1	3	0.002693	3.067e-19	0.00269	0.00269
2/2	3	0.002693	3.067e-19	0.00269	0.00269

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=SiO2 (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.043478
Adj Rsquare	-0.31522
Root Mean Square Error	0.204822
Mean of Response	45.38882
Observations (or Sum Wgts)	12

Analysis of Variance

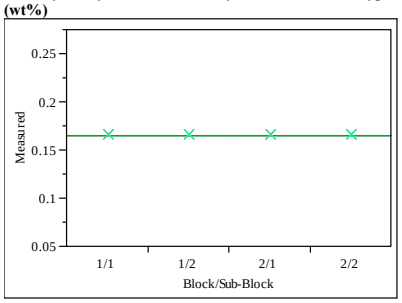
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.01525535	0.005085	0.1212	0.9450
Error	8	0.33561766	0.041952		
C. Total	11	0.35087301			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	45.3532	0.11825	45.080	45.626
1/2	3	45.4245	0.11825	45.152	45.697
2/1	3	45.4245	0.11825	45.152	45.697
2/2	3	45.3532	0.11825	45.080	45.626

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=SO4 (wt%)



Oneway Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.164775
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0	0	.	.
Error	8	0	0		
C. Total	11	0			

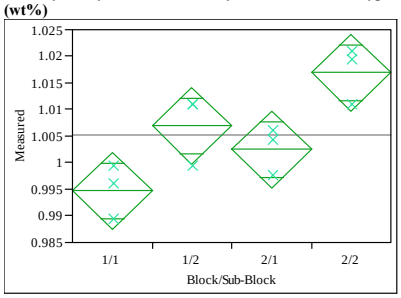
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.164775	0	0.16477	0.16477
1/2	3	0.164775	0	0.16477	0.16477
2/1	3	0.164775	0	0.16477	0.16477
2/2	3	0.164775	0	0.16477	0.16477

Std Error uses a pooled estimate of error variance

Exhibit A3. Measurements by Block and Sub-Block for Samples of the Batch 1 and Ustd Standards with the Initial Glasses by Oxide

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=TiO2 (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.764168
Adj Rsquare	0.675731
Root Mean Square Error	0.005469
Mean of Response	1.005248
Observations (or Sum Wgts)	12

Analysis of Variance

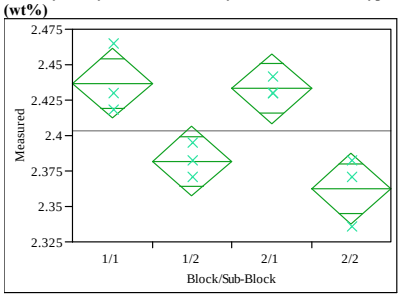
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.00077531	0.000258	8.6408	0.0069
Error	8	0.00023927	0.000030		
C. Total	11	0.00101458			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.99468	0.00316	0.9874	1.0020
1/2	3	1.00692	0.00316	0.9996	1.0142
2/1	3	1.00247	0.00316	0.9952	1.0097
2/2	3	1.01692	0.00316	1.0096	1.0242

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=U3O8 (wt%)



Oneway Anova
Summary of Fit

Rsquare	0.817629
Adj Rsquare	0.74924
Root Mean Square Error	0.018645
Mean of Response	2.403603
Observations (or Sum Wgts)	12

Analysis of Variance

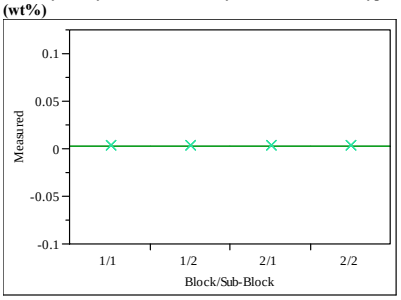
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0.01246826	0.004156	11.9556	0.0025
Error	8	0.00278103	0.000348		
C. Total	11	0.01524929			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	2.43701	0.01076	2.4122	2.4618
1/2	3	2.38198	0.01076	2.3572	2.4068
2/1	3	2.43308	0.01076	2.4083	2.4579
2/2	3	2.36233	0.01076	2.3375	2.3872

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=ZnO (wt%)



Oneway Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.003112
Observations (or Sum Wgts)	12

Analysis of Variance

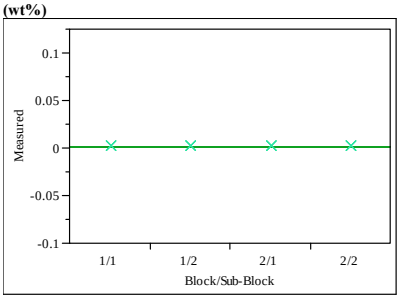
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0	0	.	.
Error	8	0	0		
C. Total	11	0			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.003112	0	0.00311	0.00311
1/2	3	0.003112	0	0.00311	0.00311
2/1	3	0.003112	0	0.00311	0.00311
2/2	3	0.003112	0	0.00311	0.00311

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block/Sub-Block Type=Ustd, Oxide=ZrO2 (wt%)



Oneway Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.001351
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Block	3	0	0	.	.
Error	8	0	0		
C. Total	11	0			

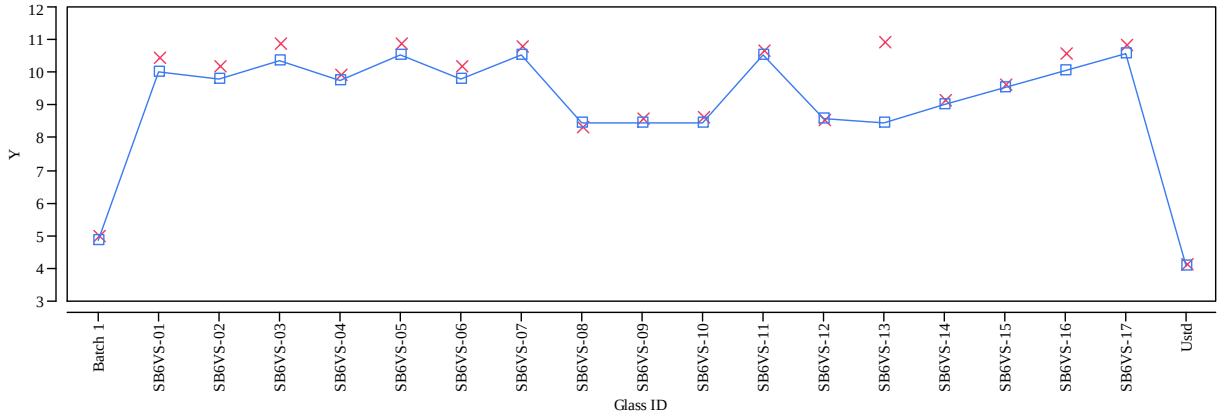
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.001351	0	0.00135	0.00135
1/2	3	0.001351	0	0.00135	0.00135
2/1	3	0.001351	0	0.00135	0.00135
2/2	3	0.001351	0	0.00135	0.00135

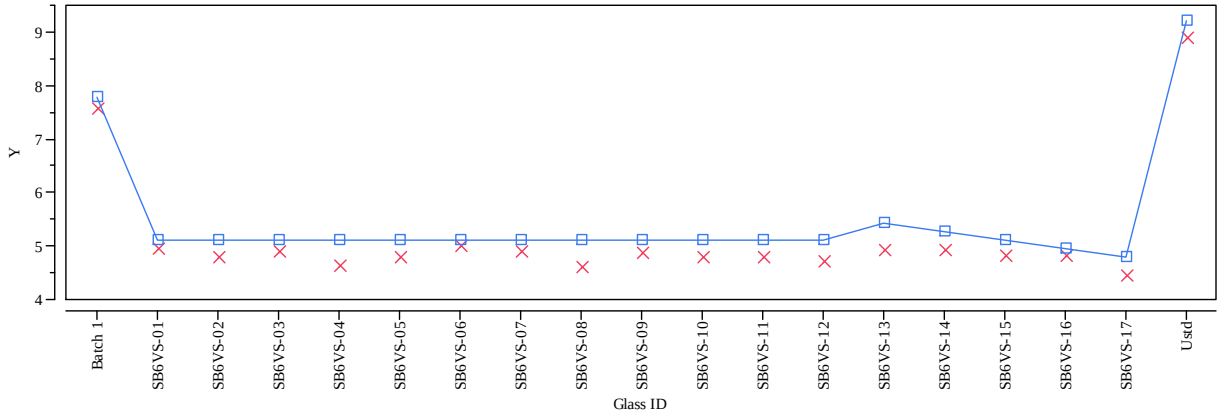
Std Error uses a pooled estimate of error variance

Exhibit A4. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the Initial SB6 VS Glasses

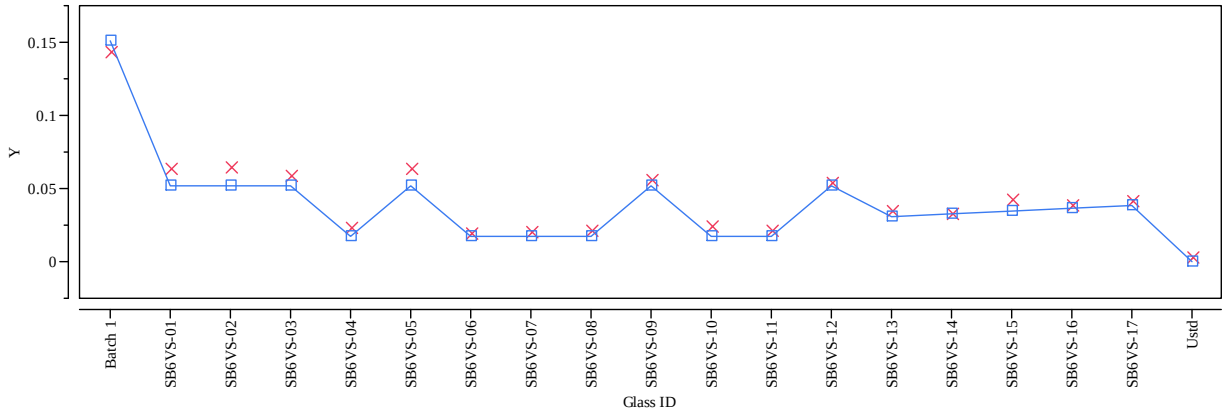
Overlay Plot Oxide=Al2O3 (wt%)



Overlay Plot Oxide=B2O3 (wt%)



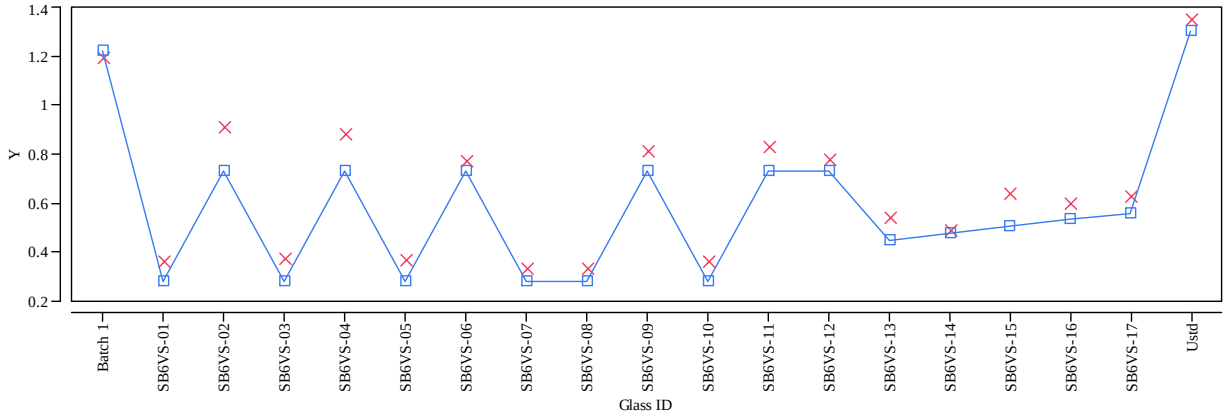
Overlay Plot Oxide=BaO (wt%)



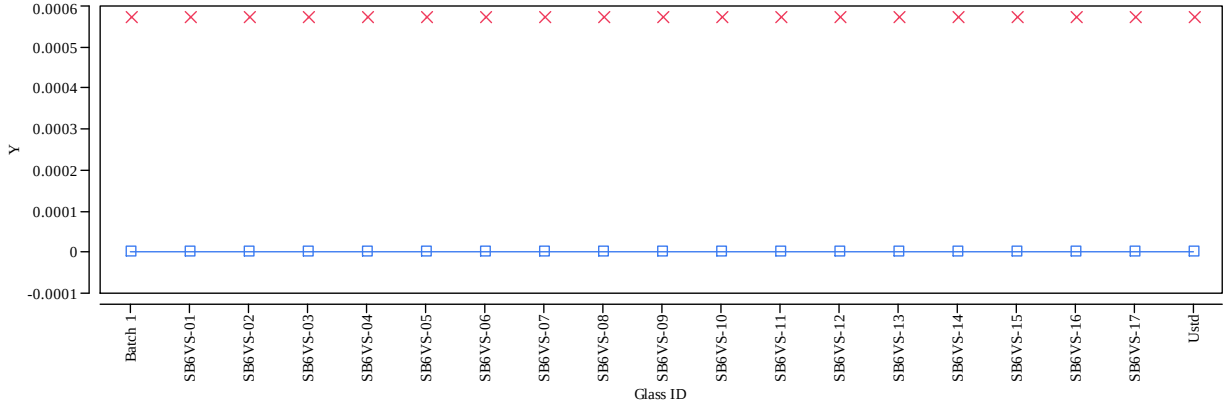
Y Measured Targeted

Exhibit A4. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the Initial SB6 VS Glasses

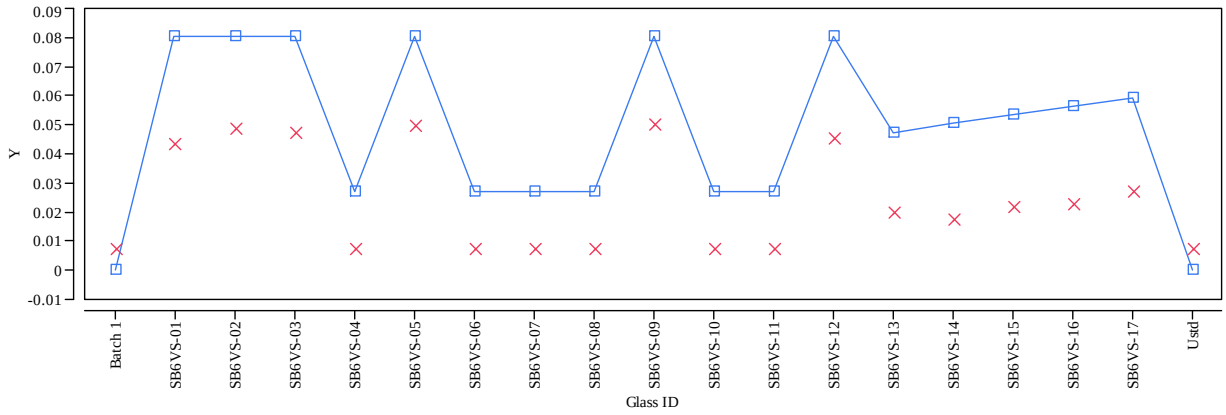
Overlay Plot Oxide=CaO (wt%)



Overlay Plot Oxide=CdO (wt%)



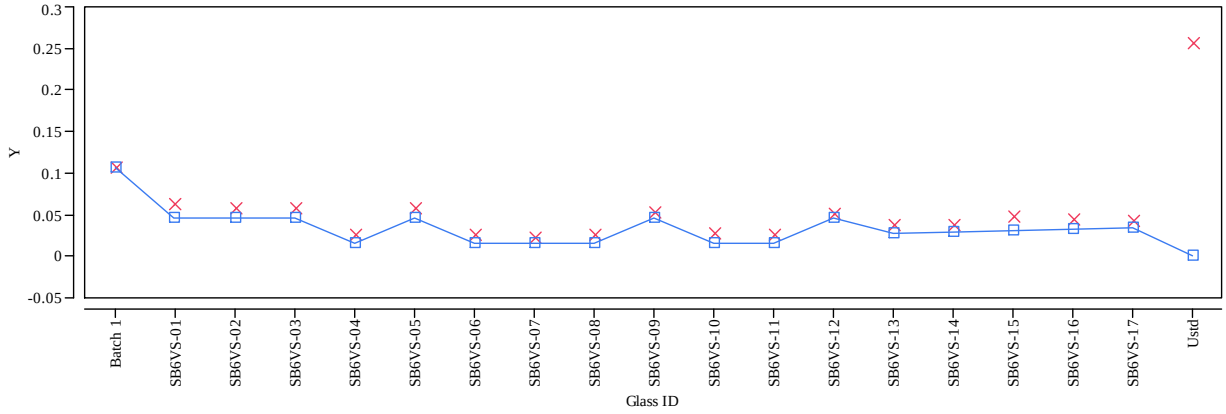
Overlay Plot Oxide=Ce2O3 (wt%)



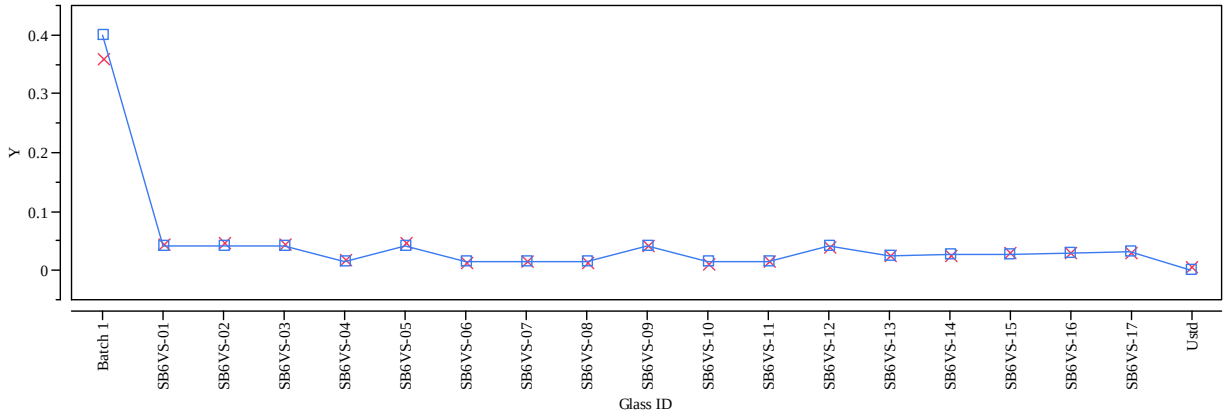
Y Measured Targeted

Exhibit A4. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the Initial SB6 VS Glasses

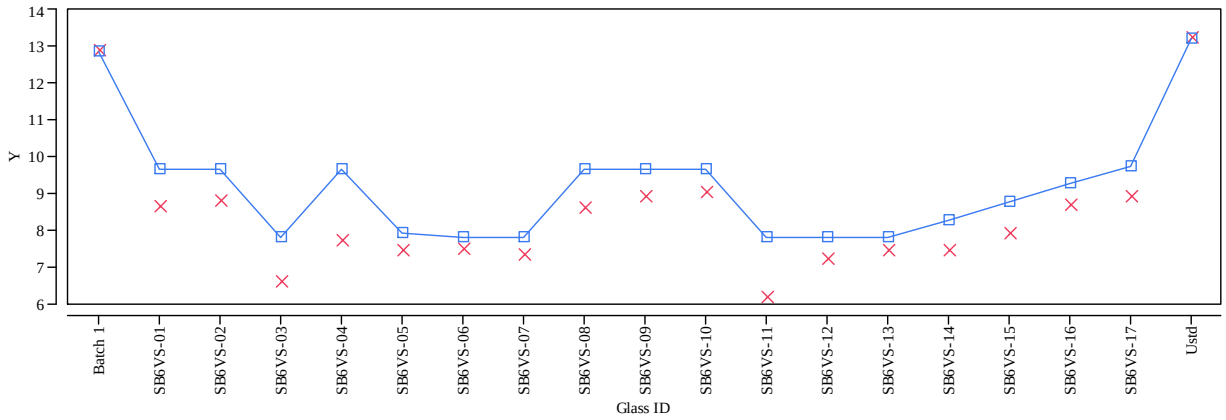
Overlay Plot Oxide=Cr2O3 (wt%)



Overlay Plot Oxide=CuO (wt%)



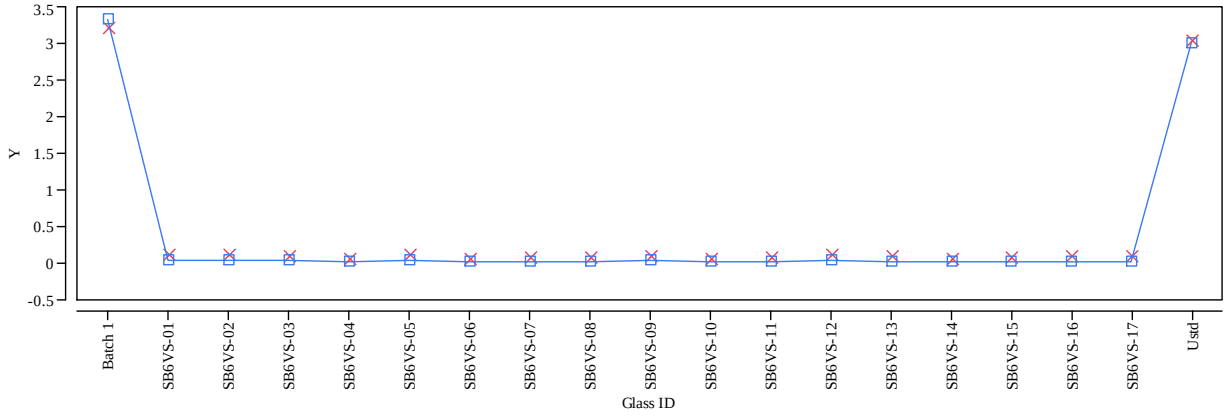
Overlay Plot Oxide=Fe2O3 (wt%)



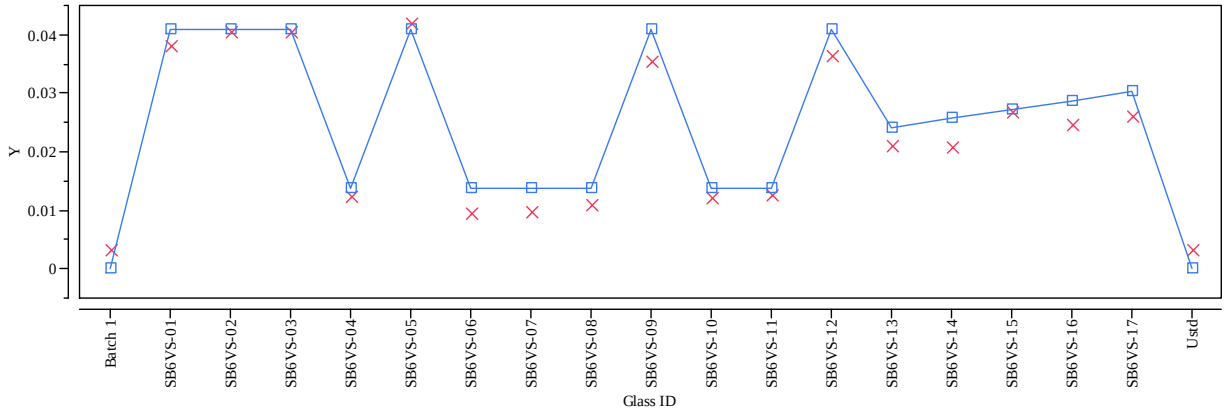
Y Measured Targeted

Exhibit A4. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the Initial SB6 VS Glasses

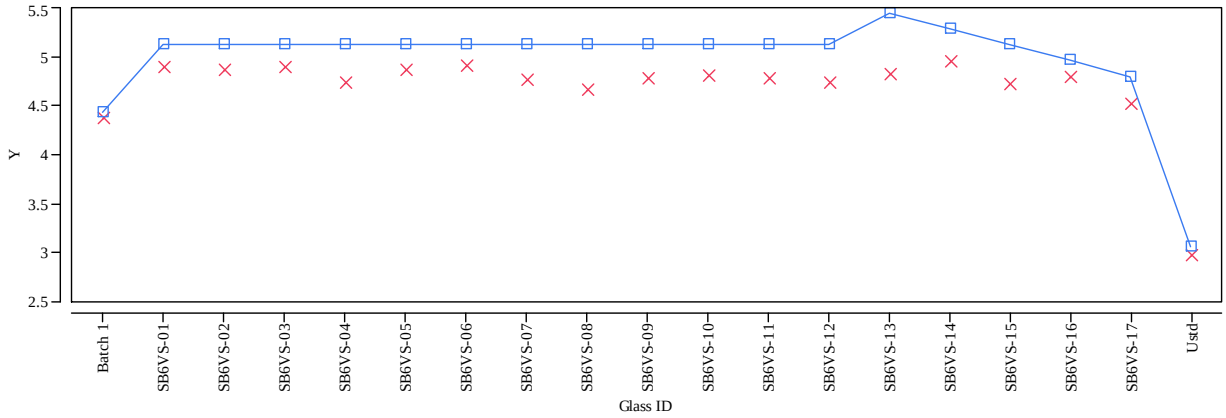
Overlay Plot Oxide=K2O (wt%)



Overlay Plot Oxide=La2O3 (wt%)



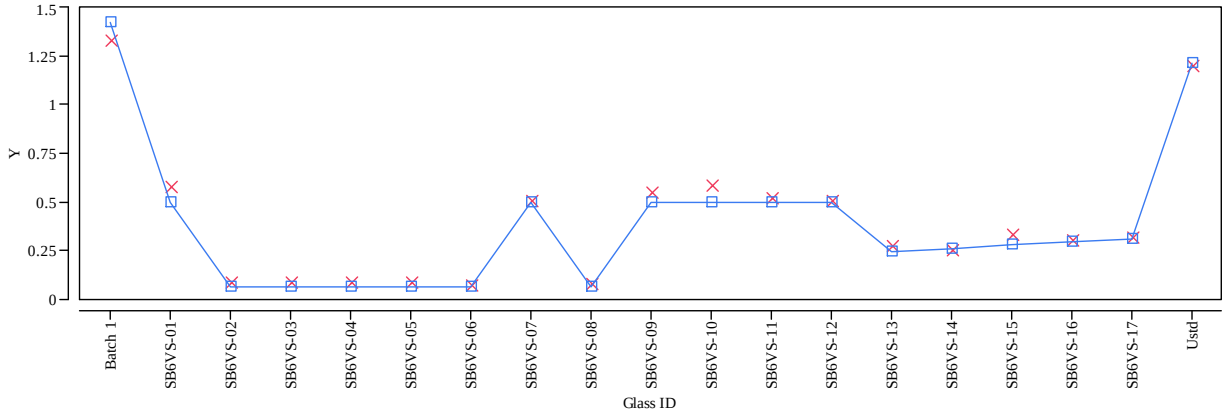
Overlay Plot Oxide=Li2O (wt%)



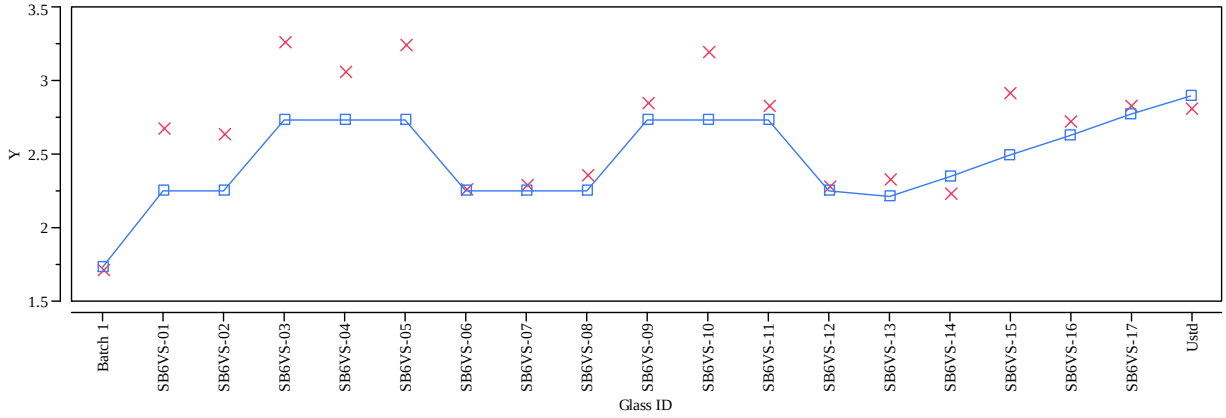
Y Measured Targeted

Exhibit A4. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the Initial SB6 VS Glasses

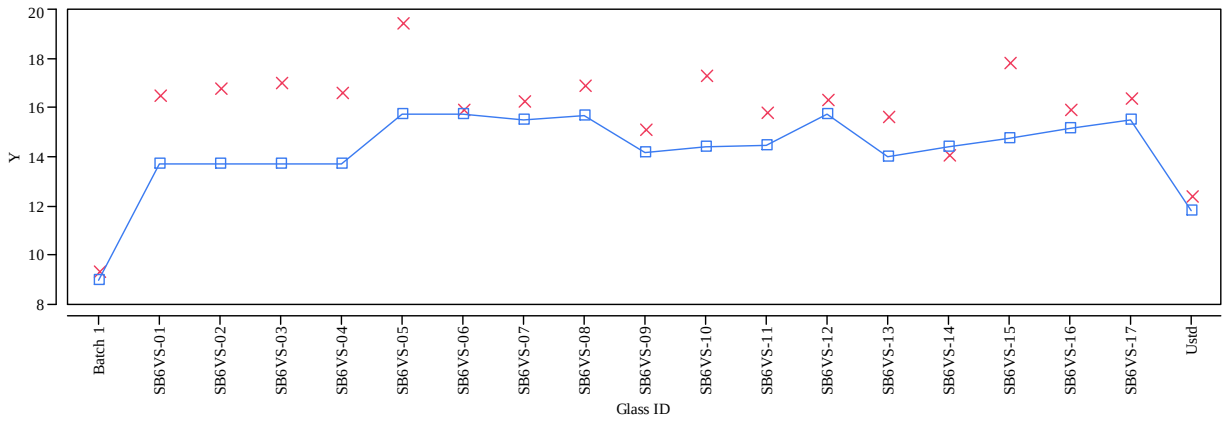
Overlay Plot Oxide=MgO (wt%)



Overlay Plot Oxide=MnO (wt%)



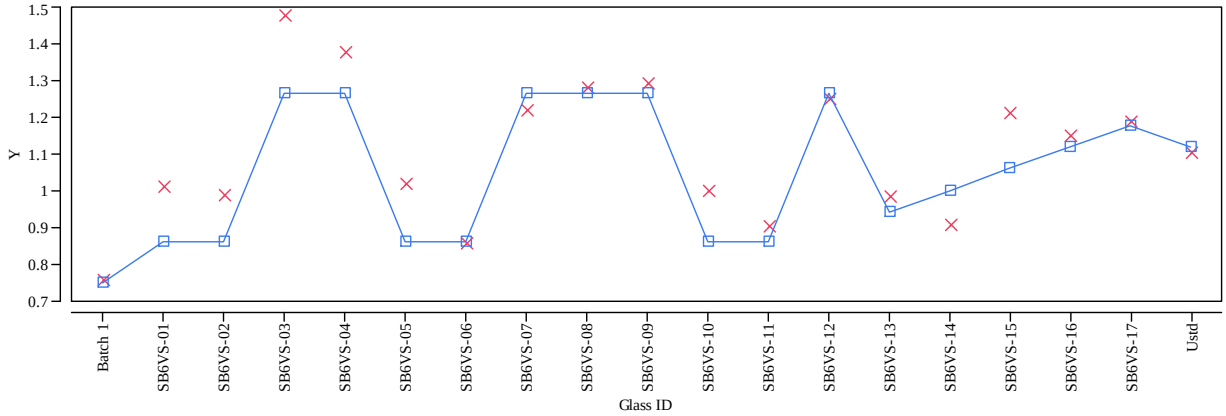
Overlay Plot Oxide=Na2O (wt%)



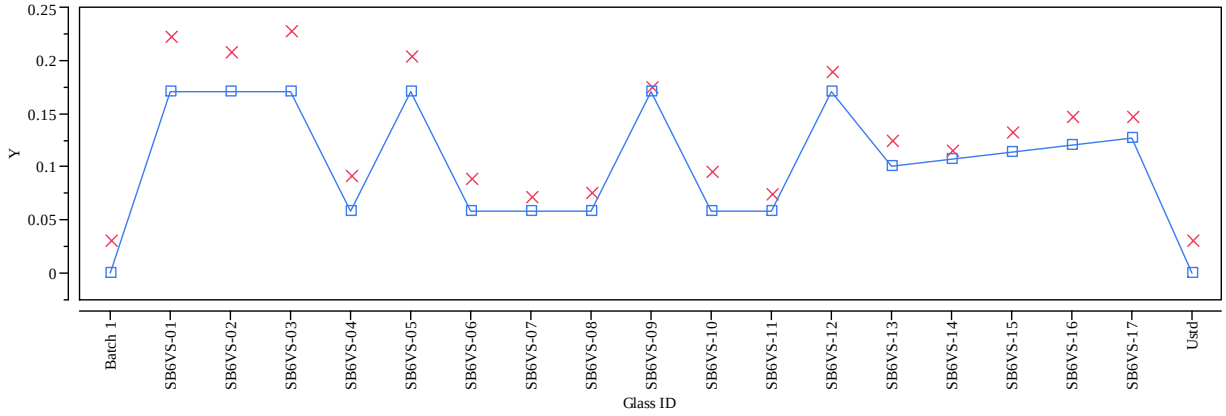
Y Measured Targeted

Exhibit A4. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the Initial SB6 VS Glasses

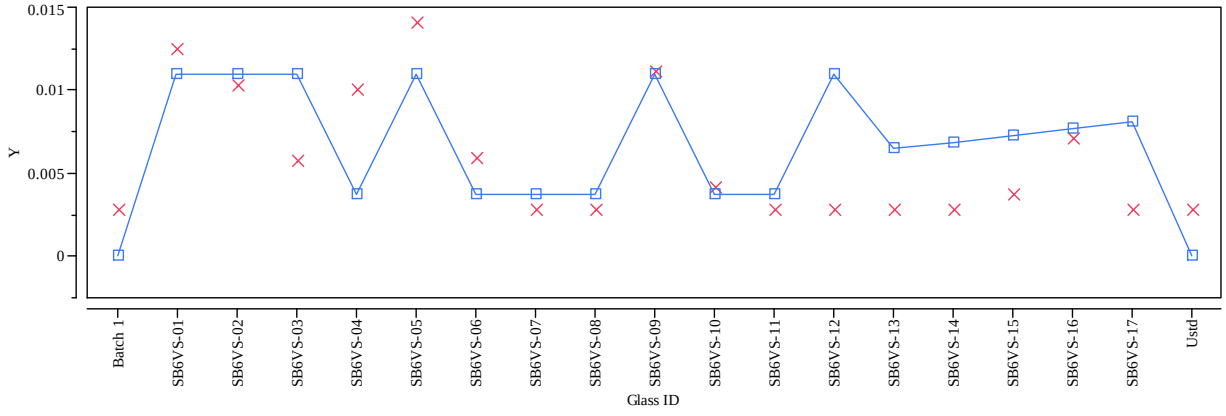
Overlay Plot Oxide=NiO (wt%)



Overlay Plot Oxide=P2O5 (wt%)



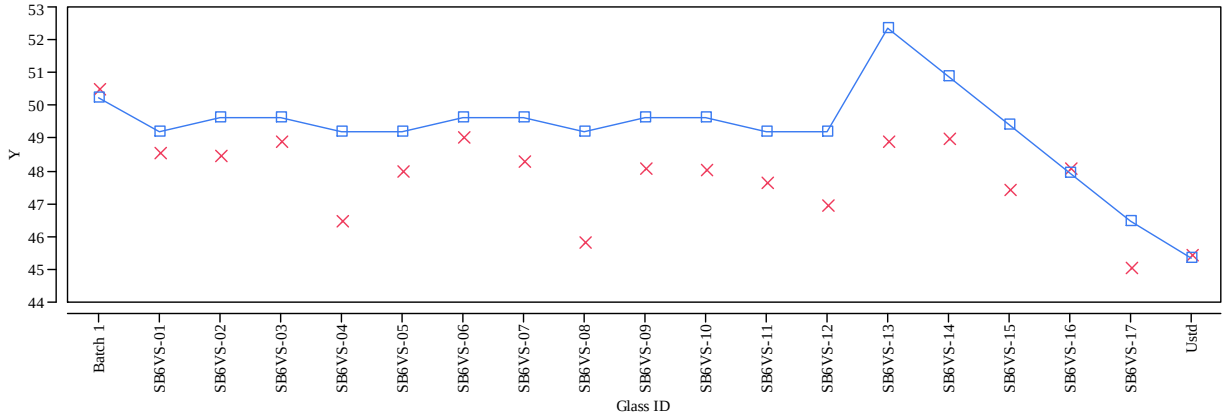
Overlay Plot Oxide=PbO (wt%)



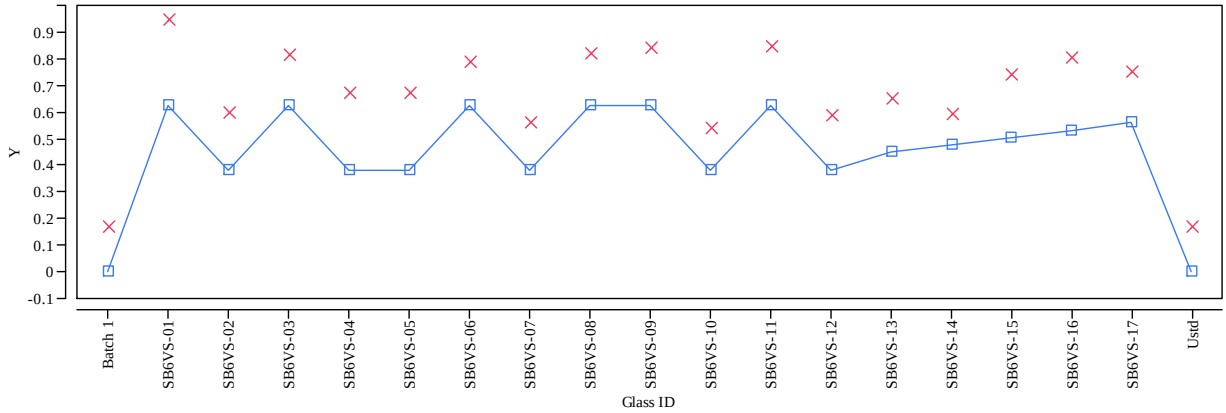
Y × Measured ▫ — Targeted

Exhibit A4. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the Initial SB6 VS Glasses

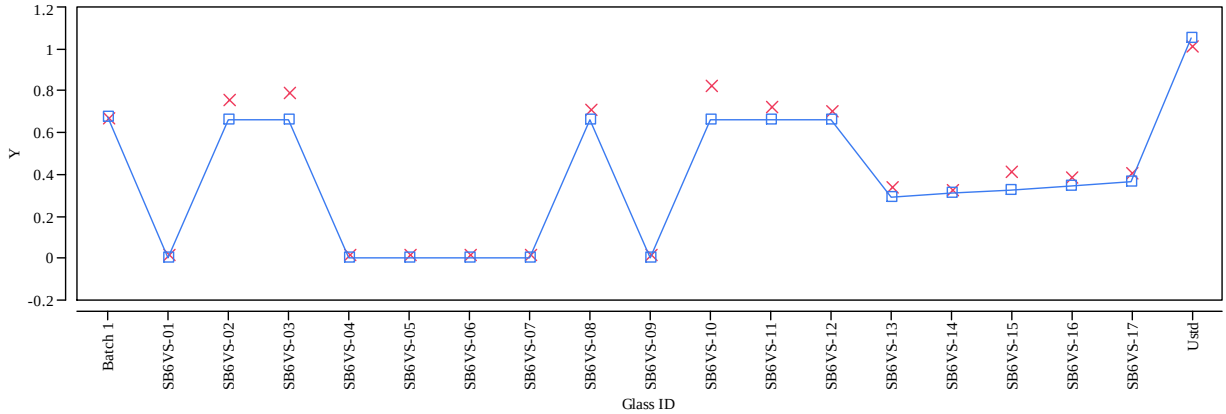
Overlay Plot Oxide=SiO2 (wt%)



Overlay Plot Oxide=SO4 (wt%)



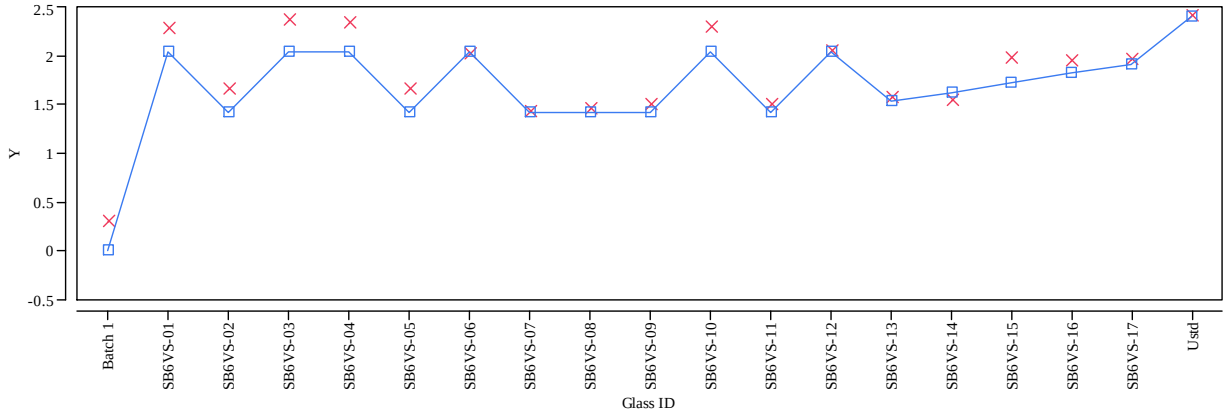
Overlay Plot Oxide=TiO2 (wt%)



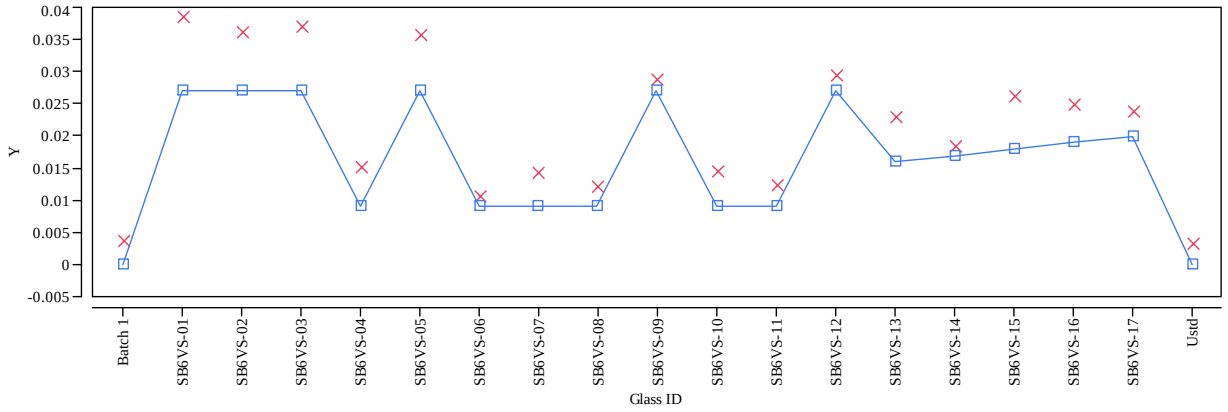
Y Measured Targeted

Exhibit A4. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the Initial SB6 VS Glasses

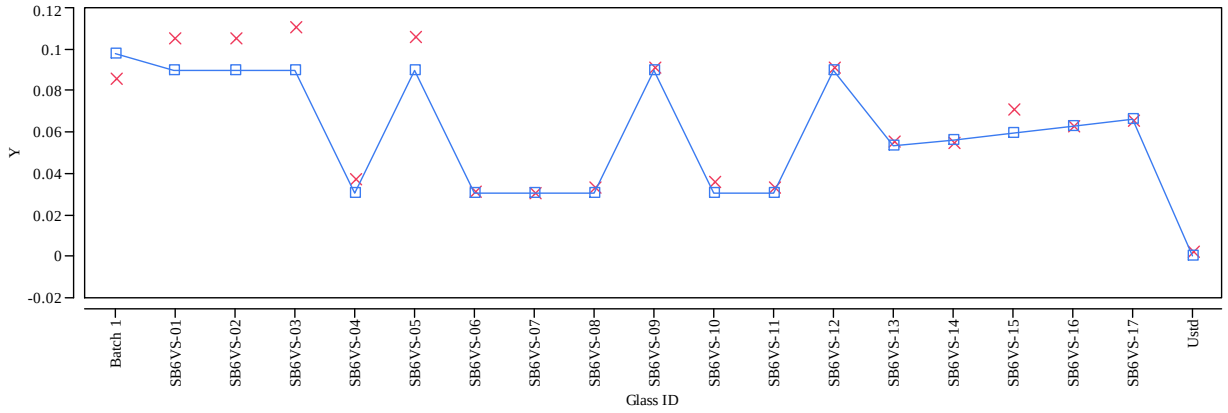
Overlay Plot Oxide=U3O8 (wt%)



Overlay Plot Oxide=ZnO (wt%)

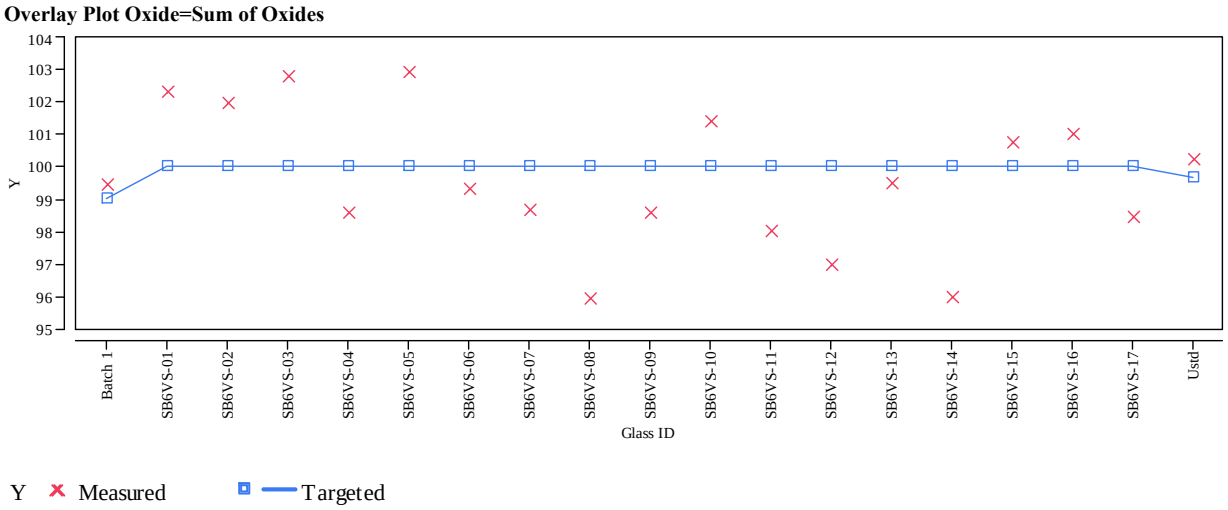


Overlay Plot Oxide=ZrO2 (wt%)



Y Measured Targeted

Exhibit A4. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the Initial SB6 VS Glasses



Appendix B:

Tables and Exhibits Supporting the Analysis of the PCT Results for the Initial (Non-Thorium) Study Glasses

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Table B1. Analytical Development's Measurements of the PCT Solutions As-Received (ar) and After Appropriate Adjustments (in ppm)

Set	Glass ID	Heat Treatment	Block	Seq	Lab ID	B ar	Li ar	Na ar	Si ar	B (ppm)	Li (ppm)	Na (ppm)	Si (ppm)
1	Soln Std	ref	1	1	std-11	20.0	9.89	82.5	51.0	20.000	9.890	82.500	51.000
1	SB6VS-02	quenched	1	2	M58	5.82	10.3	48.1	72.5	9.700	17.167	80.168	120.836
1	SB6VS-06	ccc	1	3	M18	6.36	11.5	66.8	81.6	10.600	19.167	111.336	136.003
1	EA	ref	1	4	M05	34.8	10.9	97.3	54.0	580.001	181.667	1621.670	900.002
1	SB6VS-09	quenched	1	5	M55	7.05	11.5	58.8	77.1	11.750	19.167	98.002	128.503
1	SB6VS-07	quenched	1	6	M44	6.28	10.3	64.9	77.8	10.467	17.167	108.169	129.669
1	SB6VS-01	ccc	1	7	M50	5.90	10.3	45.4	72.4	9.834	17.167	75.668	120.669
1	SB6VS-04	quenched	1	8	M40	5.71	9.79	47.6	70.3	9.517	16.317	79.335	117.169
1	SB6VS-08	ccc	1	9	M20	6.90	11.9	68.1	84.9	11.500	19.834	113.502	141.503
1	SB6VS-07	ccc	1	10	M57	6.49	11.4	63.2	80.1	10.817	19.000	105.335	133.503
1	SB6VS-01	quenched	1	11	M52	6.07	10.1	48.1	72.9	10.117	16.834	80.168	121.502
1	SB6VS-03	quenched	1	12	M28	5.31	9.35	46.3	67.9	8.850	15.584	77.168	113.169
1	Soln Std	ref	1	13	std-12	19.9	9.85	82.2	50.9	19.900	9.850	82.200	50.900
1	SB6VS-04	ccc	1	14	M02	5.73	10.3	45.5	70.6	9.550	17.167	75.835	117.669
1	SB6VS-02	ccc	1	15	M06	5.43	10.0	43.9	69.6	9.050	16.667	73.168	116.002
1	SB6VS-03	ccc	1	16	M53	5.36	9.53	43.3	68.1	8.934	15.884	72.168	113.502
1	SB6VS-09	ccc	1	17	M35	6.32	10.4	49.6	69.6	10.534	17.334	82.668	116.002
1	SB6VS-06	quenched	1	18	M10	6.62	11.5	75.2	84.9	11.034	19.167	125.336	141.503
1	SB6VS-05	ccc	1	19	M19	6.15	11.0	62.8	76.1	10.250	18.334	104.669	126.836
1	SB6VS-05	quenched	1	20	M12	6.05	10.2	67.3	77.7	10.084	17.000	112.169	129.503
1	ARM-1	ref	1	21	M56	9.91	7.83	20.9	35.7	16.517	13.050	34.834	59.501
1	blank	ref	1	22	M62	<0.176	<0.173	<0.863	<0.231	0.147	0.144	0.719	0.193
1	SB6VS-08	quenched	1	23	M04	7.20	12.0	76.5	86.6	12.000	20.000	127.503	144.336
1	Soln Std	ref	1	24	std-13	20.0	9.93	82.7	50.9	20.000	9.930	82.700	50.900
1	Soln Std	ref	2	1	std-21	20.3	10.1	82.7	51.6	20.300	10.100	82.700	51.600
1	SB6VS-05	ccc	2	2	M36	6.10	10.8	61.6	76.5	10.167	18.000	102.669	127.503
1	SB6VS-06	quenched	2	3	M34	6.55	11.3	72.7	80.0	10.917	18.834	121.169	133.336
1	SB6VS-04	quenched	2	4	M47	5.83	9.98	47.8	72.8	9.717	16.634	79.668	121.336
1	SB6VS-04	ccc	2	5	M30	5.76	10.4	45.0	70.9	9.600	17.334	75.002	118.169
1	SB6VS-05	quenched	2	6	M51	5.91	9.89	65.2	73.9	9.850	16.484	108.669	123.169
1	SB6VS-01	quenched	2	7	M27	6.44	11.0	50.3	75.0	10.734	18.334	83.835	125.003
1	SB6VS-03	quenched	2	8	M09	5.31	9.39	44.2	67.2	8.850	15.650	73.668	112.002
1	SB6VS-06	ccc	2	9	M29	6.41	11.5	66.7	78.7	10.684	19.167	111.169	131.169
1	SB6VS-09	quenched	2	10	M17	6.93	11.3	57.3	75.6	11.550	18.834	95.502	126.003
1	SB6VS-03	ccc	2	11	M23	5.29	9.56	42.4	67.7	8.817	15.934	70.668	112.836
1	SB6VS-07	quenched	2	12	M26	6.65	10.8	68.2	80.4	11.084	18.000	113.669	134.003
1	Soln Std	ref	2	13	std-22	20.0	10.0	82.3	50.8	20.000	10.000	82.300	50.800
1	ARM-1	ref	2	14	M22	9.58	7.69	20.6	35.2	15.967	12.817	34.334	58.668
1	EA	ref	2	15	M13	35.5	10.9	97.5	52.1	591.668	181.667	1625.003	868.335
1	SB6VS-08	quenched	2	16	M46	7.45	12.2	77.0	85.3	12.417	20.334	128.336	142.170
1	SB6VS-01	ccc	2	17	M11	5.70	10.0	43.6	69.0	9.500	16.667	72.668	115.002
1	SB6VS-07	ccc	2	18	M41	6.28	11.1	60.6	75.6	10.467	18.500	101.002	126.003
1	SB6VS-02	quenched	2	19	M24	6.01	10.7	49.8	73.9	10.017	17.834	83.002	123.169
1	SB6VS-08	ccc	2	20	M45	7.21	12.6	70.1	84.5	12.017	21.000	116.836	140.836
1	SB6VS-09	ccc	2	21	M25	6.26	10.4	48.9	68.7	10.434	17.334	81.502	114.502
1	SB6VS-02	ccc	2	22	M15	5.44	10.0	43.5	68.8	9.067	16.667	72.501	114.669
1	Soln Std	ref	2	23	std-23	19.9	9.93	81.8	50.4	19.900	9.930	81.800	50.400
1	Soln Std	ref	3	1	std-31	20.0	9.93	82.5	50.6	20.000	9.930	82.500	50.600
1	SB6VS-02	quenched	3	2	M16	5.91	10.6	49.1	73.6	9.850	17.667	81.835	122.669
1	SB6VS-09	ccc	3	3	M08	6.53	10.9	51.4	71.3	10.884	18.167	85.668	118.836
1	SB6VS-01	quenched	3	4	M03	6.19	10.5	48.4	72.4	10.317	17.500	80.668	120.669
1	SB6VS-05	ccc	3	5	M48	6.05	10.9	61.7	77.6	10.084	18.167	102.835	129.336
1	SB6VS-08	quenched	3	6	M54	7.12	11.6	75.0	82.8	11.867	19.334	125.003	138.003
1	SB6VS-03	ccc	3	7	M42	5.32	9.67	42.5	67.0	8.867	16.117	70.835	111.669
1	SB6VS-02	ccc	3	8	M01	5.36	9.86	42.9	68.4	8.934	16.434	71.501	114.002
1	SB6VS-09	quenched	3	9	M49	6.84	11.3	57.1	75.4	11.400	18.834	95.169	125.669
1	SB6VS-04	quenched	3	10	M43	5.72	9.94	48.1	69.2	9.534	16.567	80.168	115.336
1	SB6VS-06	quenched	3	11	M39	6.56	11.6	74.8	80.7	10.934	19.334	124.669	134.503
1	SB6VS-07	ccc	3	12	M60	6.54	11.6	63.9	78.3	10.900	19.334	106.502	130.503
1	Soln Std	ref	3	13	std-32	20.0	9.95	82.3	50.3	20.000	9.950	82.300	50.300
1	SB6VS-08	ccc	3	14	M21	6.84	11.8	67.4	81.4	11.400	19.667	112.336	135.669
1	SB6VS-01	ccc	3	15	M32	5.55	9.80	42.4	67.5	9.250	16.334	70.668	112.502
1	EA	ref	3	16	M14	32.7	10.6	92.5	52.2	545.001	176.667	1541.670	870.002
1	SB6VS-07	quenched	3	17	M38	6.56	10.9	67.7	79.0	10.934	18.167	112.836	131.669
1	ARM-1	ref	3	18	M59	9.39	7.61	19.6	33.9	15.650	12.684	32.667	56.501
1	blank	ref	3	19	M37	<0.176	<0.173	<0.863	<0.231	0.147	0.144	0.719	0.193
1	SB6VS-03	quenched	3	20	M31	5.49	9.78	45.8	70.4	9.150	16.300	76.335	117.336
1	SB6VS-05	quenched	3	21	M07	5.89	9.92	65.5	72.5	9.817	16.534	109.169	120.836
1	SB6VS-06	ccc	3	22	M61	6.22	11.4	66.1	77.0	10.367	19.000	110.169	128.336

Table B1. Analytical Development's Measurements of the PCT Solutions As-Received (ar) and After Appropriate Adjustments (in ppm)

Set	Glass ID	Heat Treatment	Block	Seq	Lab ID	B ar	Li ar	Na ar	Si ar	B (ppm)	Li (ppm)	Na (ppm)	Si (ppm)
1	SB6VS-04	ccc	3	23	M33	5.74	10.4	45.6	69.4	9.567	17.334	76.002	115.669
1	Soln Std	ref	3	24	std-33	19.9	10.1	82.8	49.8	19.900	10.100	82.800	49.800
2	Soln Std	ref	1	1	std-11	20.1	10.0	82.9	51.1	20.100	10.000	82.900	51.100
2	SB6VS-14	quenched	1	2	N30	6.46	11.6	57.6	81.9	10.767	19.334	96.002	136.503
2	SB6VS-13	ccc	1	3	N33	5.96	10.9	46.3	75.0	9.934	18.167	77.168	125.003
2	SB6VS-13	quenched	1	4	N46	6.16	11.3	51.3	77.6	10.267	18.834	85.502	129.336
2	SB6VS-15	ccc	1	5	N13	6.82	12.2	61.7	85.3	11.367	20.334	102.835	142.170
2	SB6VS-15	quenched	1	6	N25	6.94	12.2	66.1	86.5	11.567	20.334	110.169	144.170
2	SB6VS-17	ccc	1	7	N45	6.70	11.0	66.2	79.0	11.167	18.334	110.336	131.669
2	SB6VS-17	quenched	1	8	N53	7.09	11.4	75.9	82.4	11.817	19.000	126.503	137.336
2	ARM-1	ref	1	9	N29	10.9	8.70	22.7	38.7	18.167	14.500	37.834	64.501
2	SB6VS-11	quenched	1	10	N41	6.23	11.1	58.4	77.3	10.384	18.500	97.335	128.836
2	SB6VS-14	ccc	1	11	N54	7.04	12.9	59.6	89.9	11.734	21.500	99.335	149.836
2	Soln Std	ref	1	12	std-12	20.1	10.1	82.2	50.9	20.100	10.100	82.200	50.900
2	blank	ref	1	13	N05	<0.176	<0.173	<0.863	<0.231	0.147	0.144	0.719	0.193
2	SB6VS-10	quenched	1	14	N38	7.94	13.0	65.4	94.0	13.234	21.667	109.002	156.670
2	EA	ref	1	15	N17	24.2	8.40	70.1	42.3	403.334	140.000	1168.336	705.001
2	SB6VS-12	ccc	1	16	N34	7.24	12.7	71.7	83.7	12.067	21.167	119.502	139.503
2	SB6VS-11	ccc	1	17	N06	6.02	11.0	53.2	74.0	10.034	18.334	88.668	123.336
2	SB6VS-10	ccc	1	18	N19	6.87	12.1	56.8	87.1	11.450	20.167	94.669	145.170
2	SB6VS-16	quenched	1	19	N50	6.87	11.7	69.8	82.4	11.450	19.500	116.336	137.336
2	SB6VS-12	quenched	1	20	N02	7.66	13.0	81.2	86.4	12.767	21.667	135.336	144.003
2	SB6VS-16	ccc	1	21	N40	6.93	12.1	65.8	86.0	11.550	20.167	109.669	143.336
2	Soln Std	ref	1	22	std-13	20.0	10.1	82.5	50.4	20.000	10.100	82.500	50.400
2	Soln Std	ref	2	1	std-21	19.8	9.92	82.2	50.5	19.800	9.920	82.200	50.500
2	SB6VS-15	quenched	2	2	N26	6.87	11.8	64.1	85.1	11.450	19.667	106.835	141.836
2	SB6VS-13	ccc	2	3	N31	6.09	11.2	48.1	78.2	10.150	18.667	80.168	130.336
2	SB6VS-15	ccc	2	4	N37	6.88	12.1	61.1	83.9	11.467	20.167	101.835	139.836
2	SB6VS-17	ccc	2	5	N42	6.50	10.7	64.3	75.7	10.834	17.834	107.169	126.169
2	SB6VS-11	ccc	2	6	N44	5.70	10.0	49.7	69.4	9.500	16.667	82.835	115.669
2	SB6VS-14	quenched	2	7	N49	6.29	11.1	56.2	78.9	10.484	18.500	93.669	131.503
2	SB6VS-10	ccc	2	8	N22	6.83	11.9	55.8	84.3	11.384	19.834	93.002	140.503
2	SB6VS-16	ccc	2	9	N03	6.72	11.3	62.2	81.9	11.200	18.834	103.669	136.503
2	SB6VS-12	ccc	2	10	N15	7.21	12.7	71.0	83.4	12.017	21.167	118.336	139.003
2	SB6VS-13	quenched	2	11	N48	6.44	12.0	53.5	79.9	10.734	20.000	89.168	133.169
2	Soln Std	ref	2	12	std-22	19.7	9.94	81.7	50.2	19.700	9.940	81.700	50.200
2	EA	ref	2	13	N08	23.7	8.37	68.6	42.7	395.001	139.500	1143.336	711.668
2	ARM-1	ref	2	14	N04	9.92	8.26	21.6	36.8	16.534	13.767	36.001	61.335
2	SB6VS-17	quenched	2	15	N24	6.99	11.1	73.7	82.6	11.650	18.500	122.836	137.669
2	SB6VS-12	quenched	2	16	N07	7.67	12.9	80.4	88.7	12.784	21.500	134.003	147.836
2	SB6VS-11	quenched	2	17	N35	6.32	11.2	58.5	78.7	10.534	18.667	97.502	131.169
2	SB6VS-16	quenched	2	18	N32	6.96	11.7	70.3	84.4	11.600	19.500	117.169	140.669
2	SB6VS-10	quenched	2	19	N09	7.60	12.2	61.6	88.6	12.667	20.334	102.669	147.670
2	SB6VS-14	ccc	2	20	N27	6.73	12.5	57.6	86.5	11.217	20.834	96.002	144.170
2	Soln Std	ref	2	21	std-23	19.8	10.1	81.5	50.5	19.800	10.100	81.500	50.500
2	Soln Std	ref	3	1	std-31	20.0	9.95	80.8	50.6	20.000	9.950	80.800	50.600
2	SB6VS-15	ccc	3	2	N56	7.26	12.5	62.8	88.9	12.100	20.834	104.669	148.170
2	SB6VS-14	ccc	3	3	N01	6.81	12.4	57.4	83.4	11.350	20.667	95.669	139.003
2	SB6VS-17	ccc	3	4	N12	6.80	10.7	64.1	76.2	11.334	17.834	106.835	127.003
2	EA	ref	3	5	N23	22.6	7.85	65.2	41.2	376.667	130.834	1086.669	686.668
2	SB6VS-11	quenched	3	6	N20	6.41	11.1	58.4	76.3	10.684	18.500	97.335	127.169
2	blank	ref	3	7	N11	<0.176	<0.173	<0.863	<0.231	0.147	0.144	0.719	0.193
2	ARM-1	ref	3	8	N10	10.2	8.28	22.3	37.1	17.000	13.800	37.167	61.835
2	SB6VS-13	ccc	3	9	N18	6.18	11.3	47.7	81.4	10.300	18.834	79.502	135.669
2	SB6VS-12	ccc	3	10	N47	7.28	12.5	70.2	82.3	12.134	20.834	117.002	137.169
2	SB6VS-15	quenched	3	11	N28	6.94	11.8	64.4	83.7	11.567	19.667	107.335	139.503
2	Soln Std	ref	3	12	std-32	19.8	9.99	80.7	50.4	19.800	9.990	80.700	50.400
2	SB6VS-11	ccc	3	13	N16	6.01	10.7	51.0	72.6	10.017	17.834	85.002	121.002
2	SB6VS-10	ccc	3	14	N51	6.98	11.9	56.3	85.0	11.634	19.834	93.835	141.670
2	SB6VS-14	quenched	3	15	N43	6.29	11.1	55.4	81.9	10.484	18.500	92.335	136.503
2	SB6VS-13	quenched	3	16	N36	6.15	11.2	51	75.9	10.250	18.667	85.002	126.503
2	SB6VS-10	quenched	3	17	N39	7.77	12.4	62.1	86.8	12.950	20.667	103.502	144.670
2	SB6VS-16	ccc	3	18	N55	6.77	11.1	61.7	79.0	11.284	18.500	102.835	131.669
2	SB6VS-12	quenched	3	19	N52	7.77	13.1	80.5	86.7	12.950	21.834	134.169	144.503
2	SB6VS-16	quenched	3	20	N21	7.00	11.7	68.9	81.9	11.667	19.500	114.836	136.503
2	SB6VS-17	quenched	3	21	N14	6.85	10.6	70.5	77.2	11.417	17.667	117.502	128.669
2	Soln Std	ref	3	22	std-33	19.8	10.1	81.1	50.5	19.800	10.100	81.100	50.500

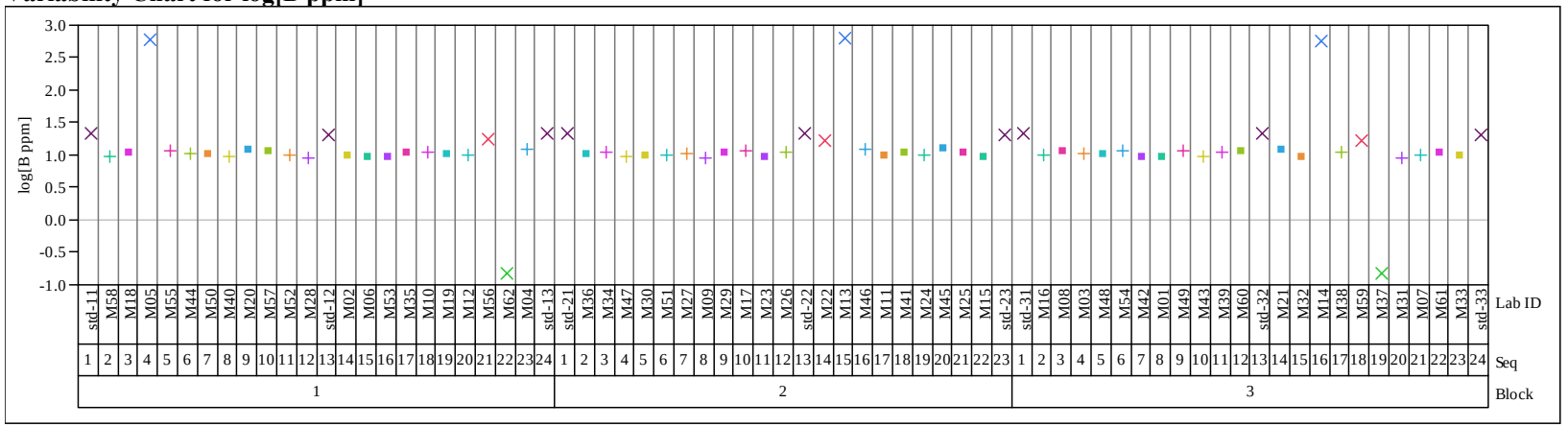
Table B2. Initial Study Glasses with Unpredictable Durability Responses for Boron Release

(Glasses whose rows are shaded in yellow have unpredictable boron releases.)

Glass ID	Heat Treatment	Composition View	NL [B (g/L)]	Del Gp	log NL[B (g/L)]	Lower 95% Indiv log NL[B (g/L)]	Pred Formula log NL[B (g/L)]	Upper 95% Indiv log NL[B (g/L)]	LM Prep Block
EA		reference	16.30	-15.5186	1.212065	0.47178733	0.91057981	1.34937228	.
EA		reference	11.16	-15.5186	1.047504	0.47178733	0.91057981	1.34937228	.
SB6VS-05	ccc	measured	0.69	-14.6796	-0.16382	0.32251251	0.75856007	1.19460763	2
SB6VS-05	quenched	measured	0.67	-14.6796	-0.17465	0.32251251	0.75856007	1.19460763	2
SB6VS-15	ccc	measured	0.78	-13.5161	-0.10577	0.11470753	0.54773009	0.98075266	2
SB6VS-15	quenched	measured	0.78	-13.5161	-0.10998	0.11470753	0.54773009	0.98075266	2
SB6VS-10	ccc	measured	0.78	-13.3413	-0.10926	0.08339879	0.51604635	0.94869391	2
SB6VS-10	quenched	measured	0.88	-13.3413	-0.05732	0.08339879	0.51604635	0.94869391	2
SB6VS-08	ccc	measured	0.82	-12.764	-0.08801	-0.0201245	0.41143402	0.84299259	1
SB6VS-08	quenched	measured	0.85	-12.764	-0.0713	-0.0201245	0.41143402	0.84299259	1
SB6VS-04	ccc	measured	0.67	-12.5591	-0.17583	-0.0569247	0.3743026	0.80552993	2
SB6VS-04	quenched	measured	0.67	-12.5591	-0.17509	-0.0569247	0.3743026	0.80552993	2
SB6VS-12	ccc	measured	0.83	-12.5278	-0.08107	-0.0625384	0.36864098	0.79982036	1
SB6VS-12	quenched	measured	0.88	-12.5278	-0.05452	-0.0625384	0.36864098	0.79982036	1
SB6VS-03	ccc	measured	0.59	-12.4797	-0.23166	-0.0711779	0.35992904	0.79103595	2
SB6VS-03	quenched	measured	0.59	-12.4797	-0.22792	-0.0711779	0.35992904	0.79103595	2
SB6VS-02	ccc	measured	0.61	-12.2808	-0.21595	-0.1069341	0.32389012	0.7547143	2
SB6VS-02	quenched	measured	0.66	-12.2808	-0.17734	-0.1069341	0.32389012	0.7547143	2
SB6VS-01	ccc	measured	0.62	-12.1009	-0.20583	-0.1393175	0.29127452	0.72186649	2
SB6VS-01	quenched	measured	0.68	-12.1009	-0.16825	-0.1393175	0.29127452	0.72186649	2
SB6VS-17	ccc	measured	0.81	-11.6559	-0.09261	-0.2194625	0.21065224	0.64076702	1
SB6VS-17	quenched	measured	0.85	-11.6559	-0.07284	-0.2194625	0.21065224	0.64076702	1
SB6VS-09	ccc	measured	0.70	-11.6218	-0.15233	-0.225624	0.20445981	0.63454365	1
SB6VS-09	quenched	measured	0.77	-11.6218	-0.11507	-0.225624	0.20445981	0.63454365	1
SB6VS-06	ccc	measured	0.68	-11.6003	-0.1657	-0.2294987	0.2005661	0.6306309	1
SB6VS-06	quenched	measured	0.71	-11.6003	-0.14907	-0.2294987	0.2005661	0.6306309	1
SB6VS-11	ccc	measured	0.67	-11.55	-0.17622	-0.2385644	0.19145712	0.62147864	1
SB6VS-11	quenched	measured	0.71	-11.55	-0.14698	-0.2385644	0.19145712	0.62147864	1
SB6VS-07	ccc	measured	0.71	-11.5483	-0.14853	-0.2388711	0.19114896	0.62116904	1
SB6VS-07	quenched	measured	0.72	-11.5483	-0.14456	-0.2388711	0.19114896	0.62116904	1
SB6VS-16	ccc	measured	0.76	-11.4299	-0.11697	-0.2602338	0.16969146	0.5996167	1
SB6VS-16	quenched	measured	0.78	-11.4299	-0.10831	-0.2602338	0.16969146	0.5996167	1
SB6VS-13	ccc	measured	0.67	-10.9773	-0.17565	-0.3419707	0.08768248	0.51733562	1
SB6VS-13	quenched	measured	0.69	-10.9773	-0.16349	-0.3419707	0.08768248	0.51733562	1
SB6VS-14	ccc	measured	0.75	-10.3192	-0.12303	-0.4610855	-0.0315721	0.39794125	2
SB6VS-14	quenched	measured	0.70	-10.3192	-0.15676	-0.4610855	-0.0315721	0.39794125	2
ARM		reference	0.46	-9.79971	-0.34001	-0.5553188	-0.1257013	0.30391612	.
ARM		reference	0.49	-9.79971	-0.3092	-0.5553188	-0.1257013	0.30391612	.

Exhibit B1. PCT Measurements (as Common Logarithms) in Analytical Sequence by Analytical Set for Initial Glasses

Set=1
Variability Chart for log[B ppm]



Set=1
Variability Chart for log[Li ppm]

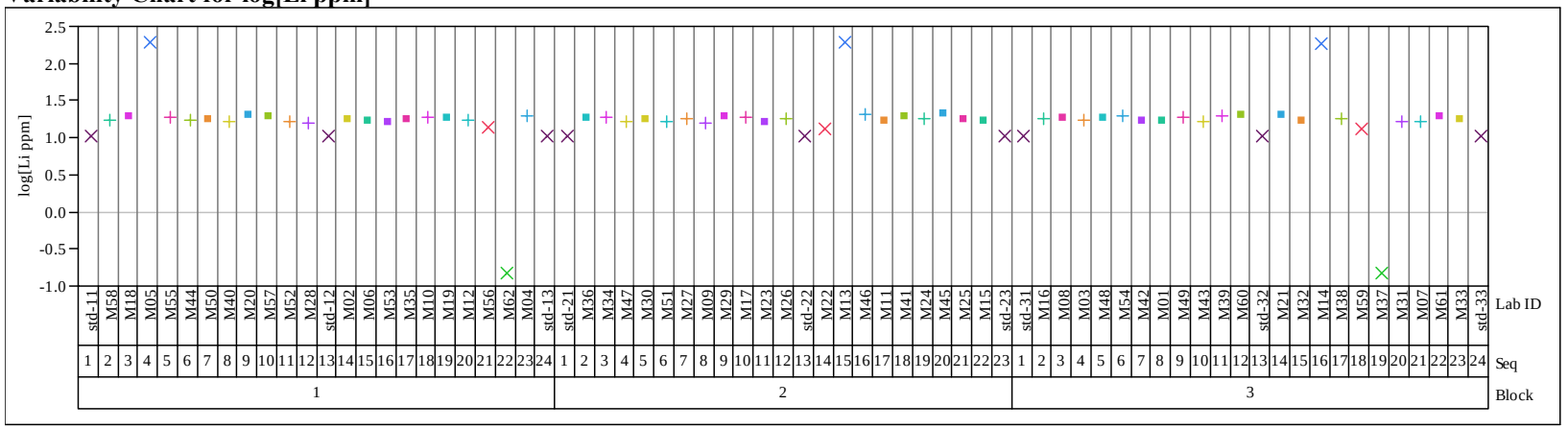
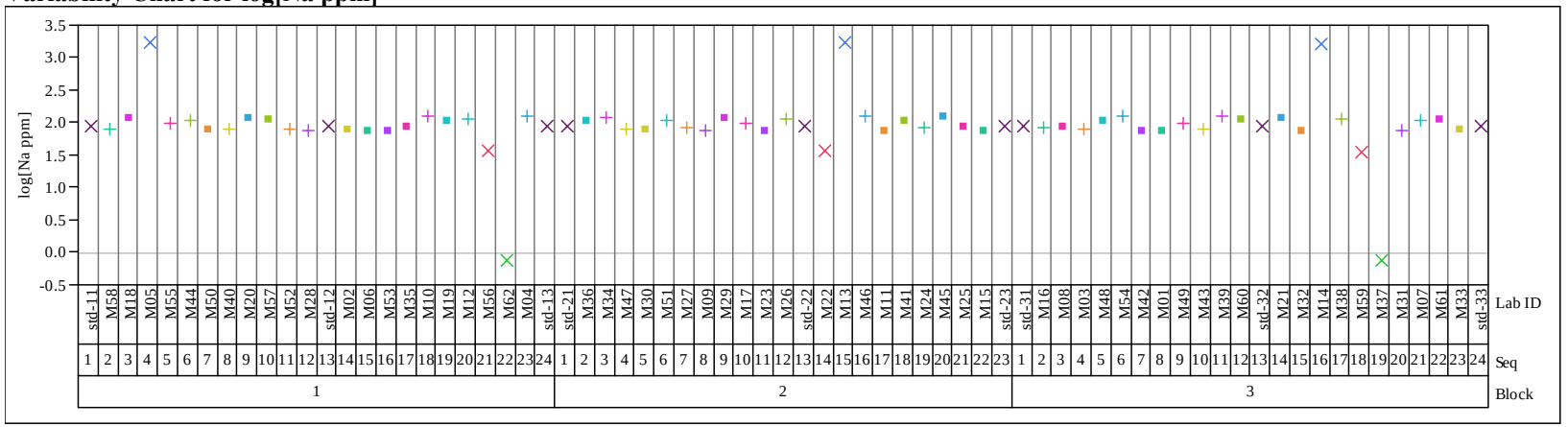


Exhibit B1. PCT Measurements (as Common Logarithms) in Analytical Sequence by Analytical Set for Initial Glasses

Set=1
Variability Chart for log[Na ppm]



Set=1
Variability Chart for log[Si ppm]

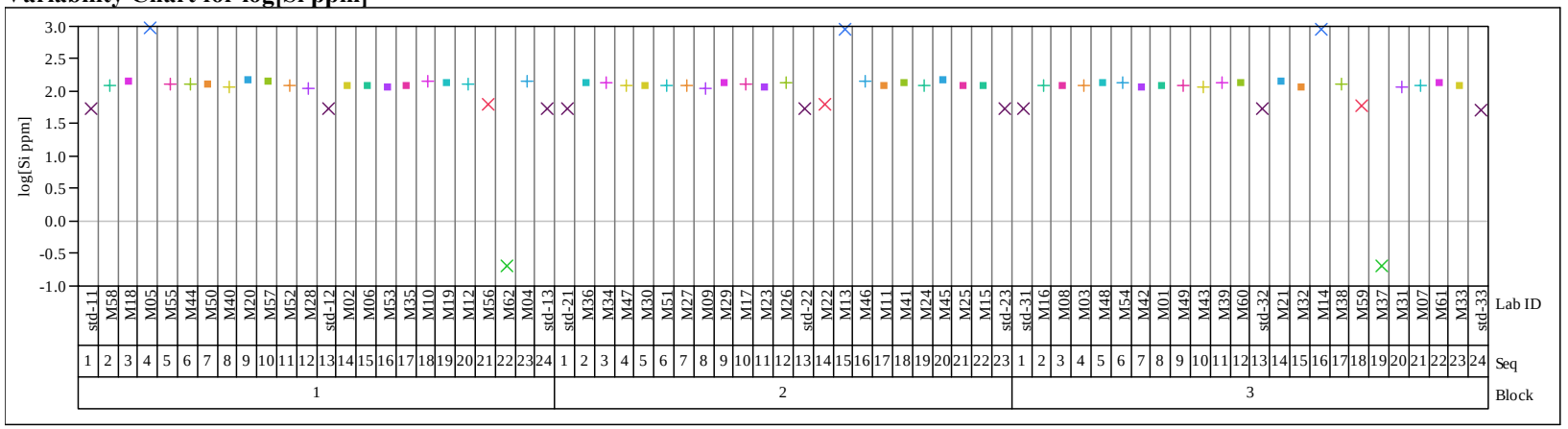
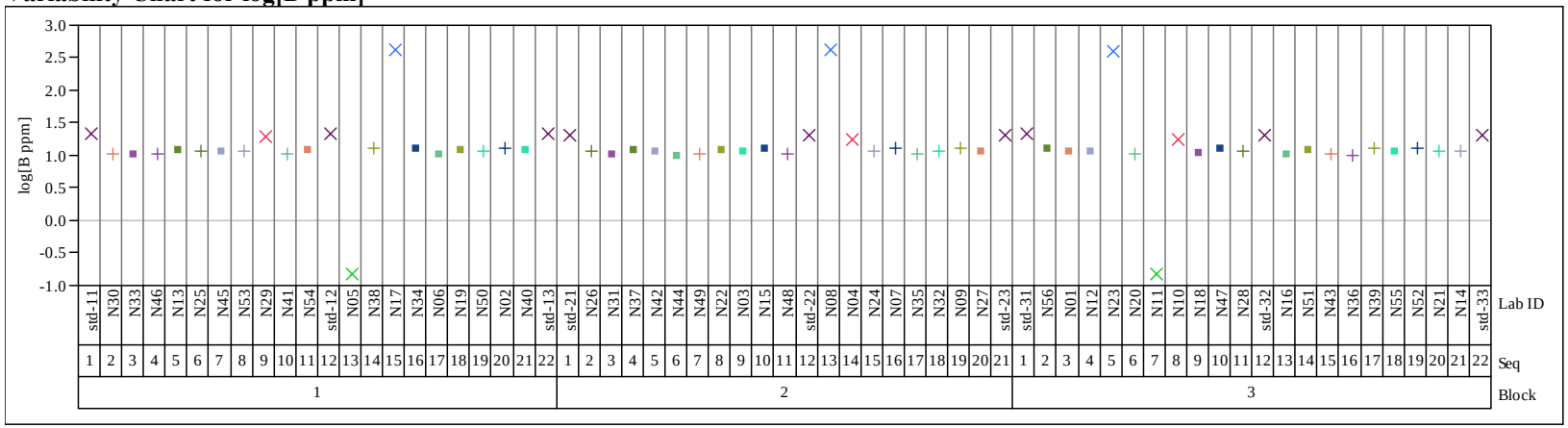


Exhibit B1. PCT Measurements (as Common Logarithms) in Analytical Sequence by Analytical Set for Initial Glasses

Set=2
Variability Chart for log[B ppm]



Set=2
Variability Chart for log[Li ppm]

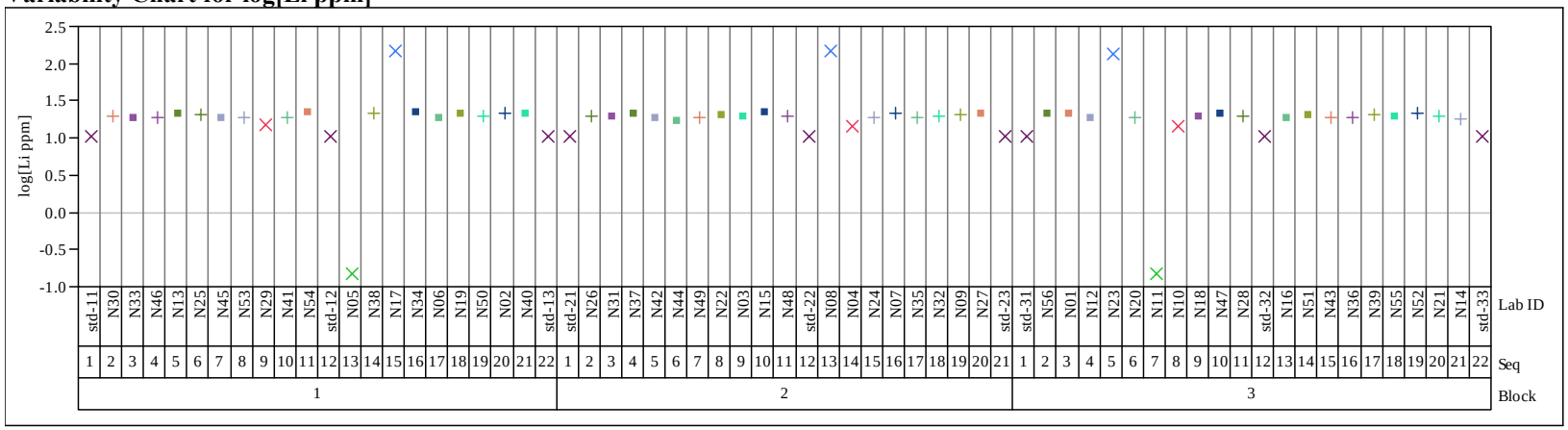
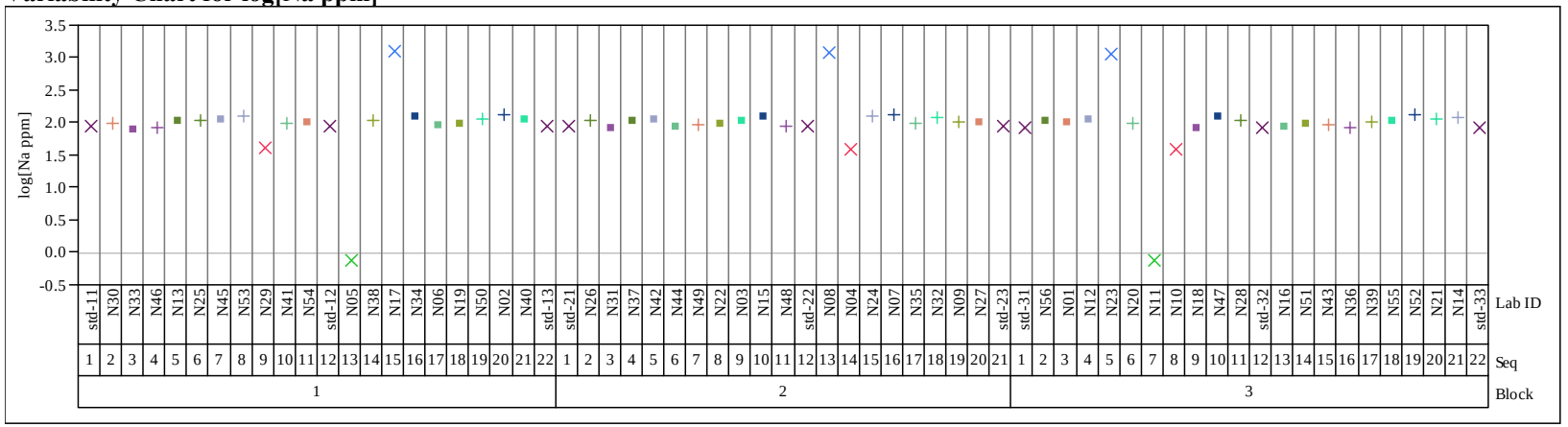


Exhibit B1. PCT Measurements (as Common Logarithms) in Analytical Sequence by Analytical Set for Initial Glasses

Set=2
Variability Chart for log[Na ppm]



Set=2
Variability Chart for log[Si ppm]

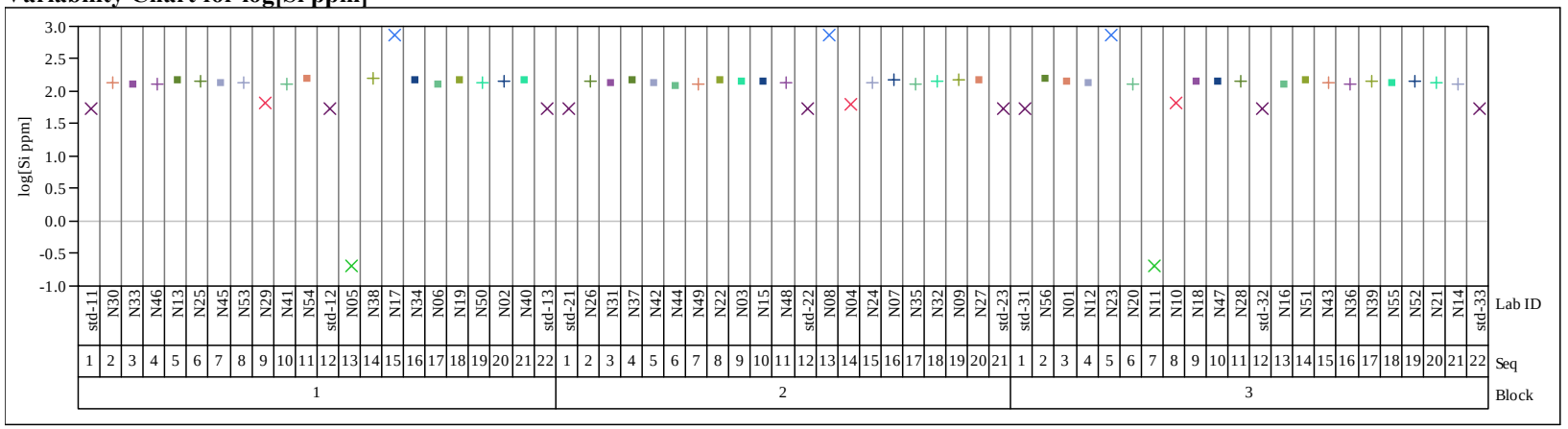
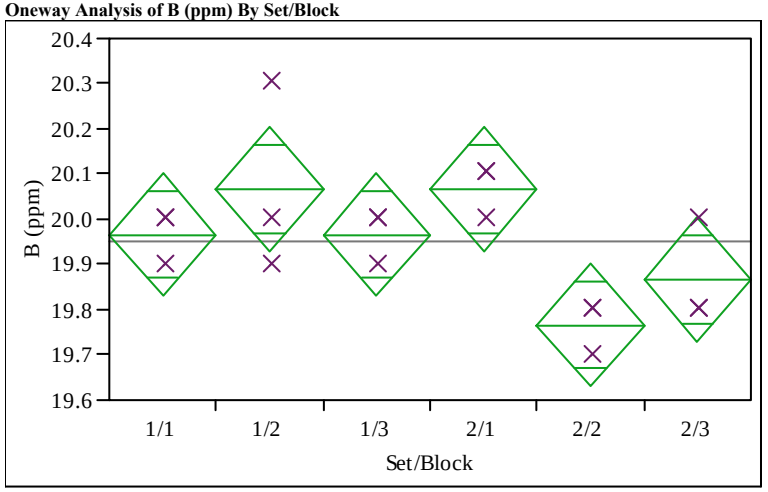


Exhibit B2. Measurements of the Multi-Element Solution Standard by ICP Block for Initial Glasses

Oneway Analysis of B (ppm) By Set/Block



Oneway Anova
Summary of Fit

Rsquare	0.594203
Adj Rsquare	0.425121
Root Mean Square Error	0.108012
Mean of Response	19.95
Observations (or Sum Wgts)	18

Analysis of Variance

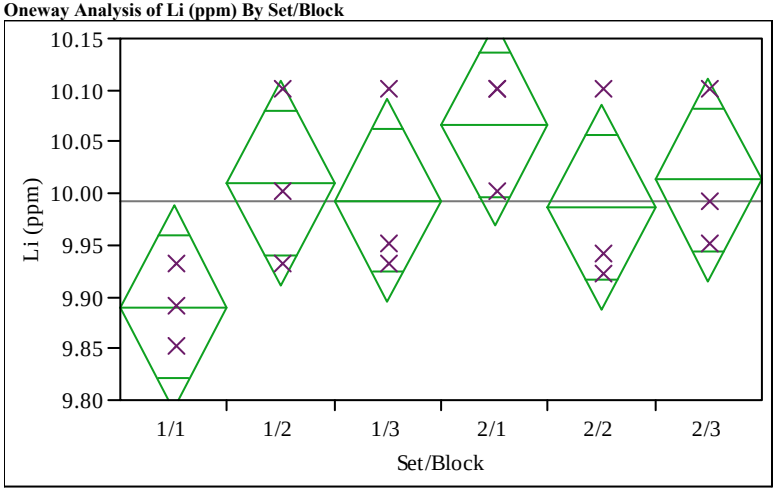
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Set/Block	5	0.20500000	0.041000	3.5143	0.0346
Error	12	0.14000000	0.011667		
C. Total	17	0.34500000			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	19.9667	0.06236	19.831	20.103
1/2	3	20.0667	0.06236	19.931	20.203
1/3	3	19.9667	0.06236	19.831	20.103
2/1	3	20.0667	0.06236	19.931	20.203
2/2	3	19.7667	0.06236	19.631	19.903
2/3	3	19.8667	0.06236	19.731	20.003

Std Error uses a pooled estimate of error variance

Oneway Analysis of Li (ppm) By Set/Block



Oneway Anova
Summary of Fit

Rsquare	0.407228
Adj Rsquare	0.160239
Root Mean Square Error	0.078138
Mean of Response	9.993333
Observations (or Sum Wgts)	18

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Set/Block	5	0.05033333	0.010067	1.6488	0.2213
Error	12	0.07326667	0.006106		
C. Total	17	0.12360000			

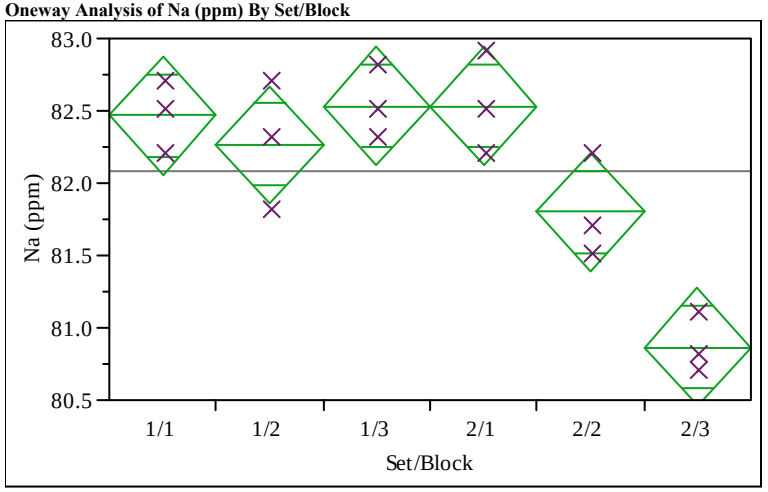
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	9.8900	0.04511	9.7917	9.988
1/2	3	10.0100	0.04511	9.9117	10.108
1/3	3	9.9933	0.04511	9.8950	10.092
2/1	3	10.0667	0.04511	9.9684	10.165
2/2	3	9.9867	0.04511	9.8884	10.085
2/3	3	10.0133	0.04511	9.9150	10.112

Std Error uses a pooled estimate of error variance

Exhibit B2. Measurements of the Multi-Element Solution Standard by ICP Block for Initial Glasses

Oneway Analysis of Na (ppm) By Set/Block



Oneway Anova
Summary of Fit

Rsquare	0.837041
Adj Rsquare	0.769142
Root Mean Square Error	0.323179
Mean of Response	82.07778
Observations (or Sum Wgts)	18

Analysis of Variance

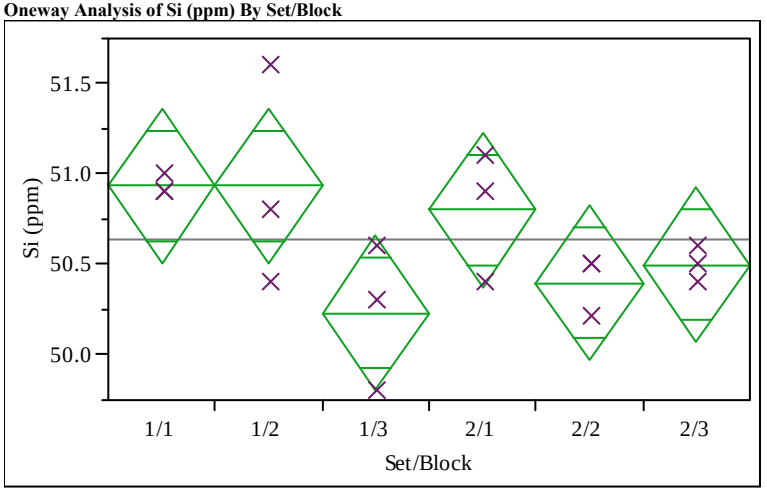
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Set/Block	5	6.4377778	1.28756	12.3277	0.0002
Error	12	1.2533333	0.10444		
C. Total	17	7.6911111			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	82.4667	0.18659	82.060	82.873
1/2	3	82.2667	0.18659	81.860	82.673
1/3	3	82.5333	0.18659	82.127	82.940
2/1	3	82.5333	0.18659	82.127	82.940
2/2	3	81.8000	0.18659	81.393	82.207
2/3	3	80.8667	0.18659	80.460	81.273

Std Error uses a pooled estimate of error variance

Oneway Analysis of Si (ppm) By Set/Block



Oneway Anova
Summary of Fit

Rsquare	0.481752
Adj Rsquare	0.265815
Root Mean Square Error	0.343996
Mean of Response	50.63333
Observations (or Sum Wgts)	18

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Set/Block	5	1.3200000	0.264000	2.2310	0.1183
Error	12	1.4200000	0.118333		
C. Total	17	2.7400000			

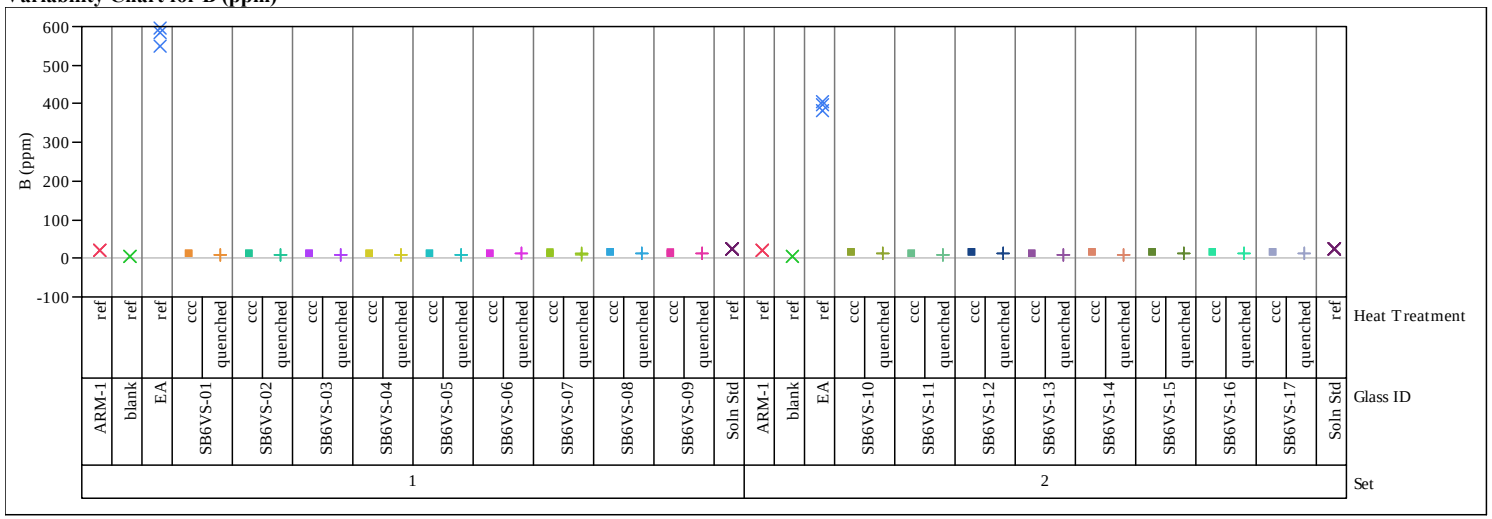
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	50.9333	0.19861	50.501	51.366
1/2	3	50.9333	0.19861	50.501	51.366
1/3	3	50.2333	0.19861	49.801	50.666
2/1	3	50.8000	0.19861	50.367	51.233
2/2	3	50.4000	0.19861	49.967	50.833
2/3	3	50.5000	0.19861	50.067	50.933

Std Error uses a pooled estimate of error variance

Exhibit B3. Laboratory PCT Measurements by Glass Identifier for Initial Study Glasses and Standards

Variability Chart for B (ppm)



Variability Chart for Li (ppm)

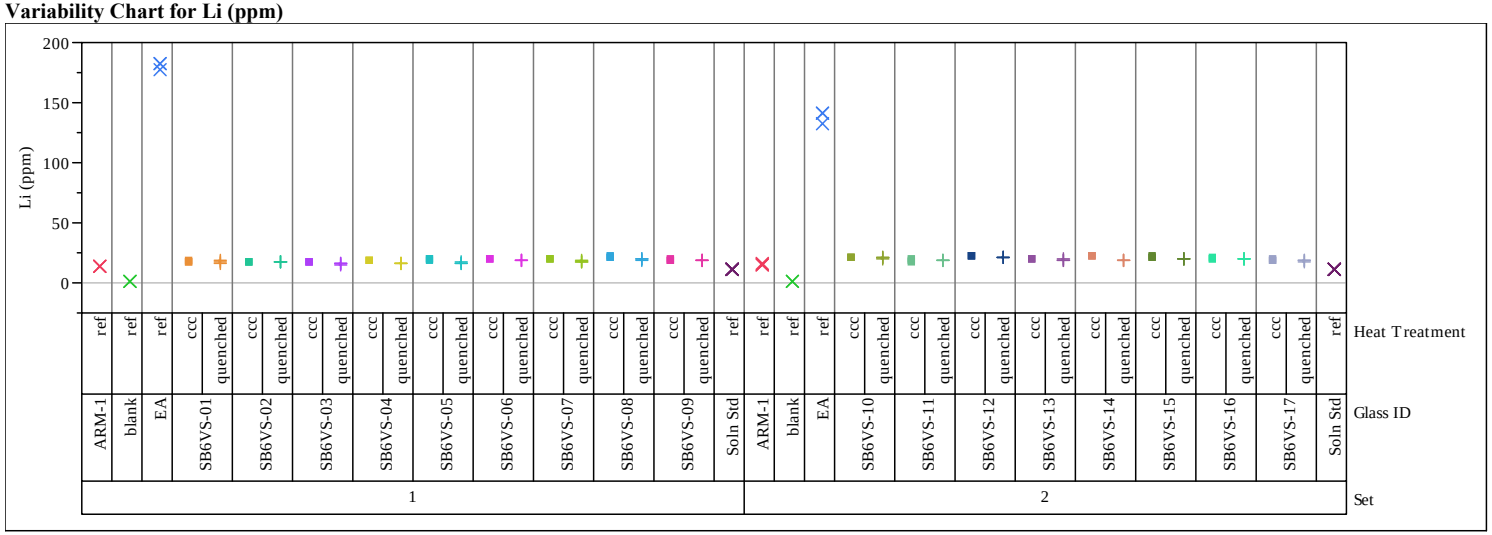
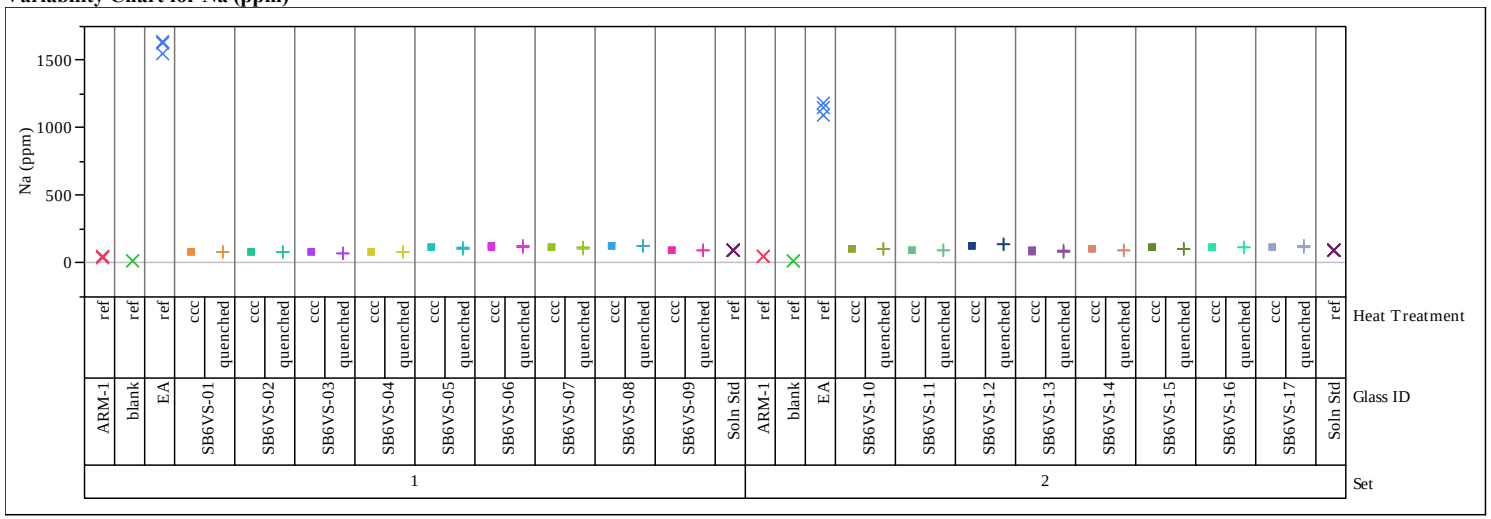


Exhibit B3. Laboratory PCT Measurements by Glass Identifier for Initial Study Glasses and Standards

Variability Chart for Na (ppm)



Variability Chart for Si (ppm)

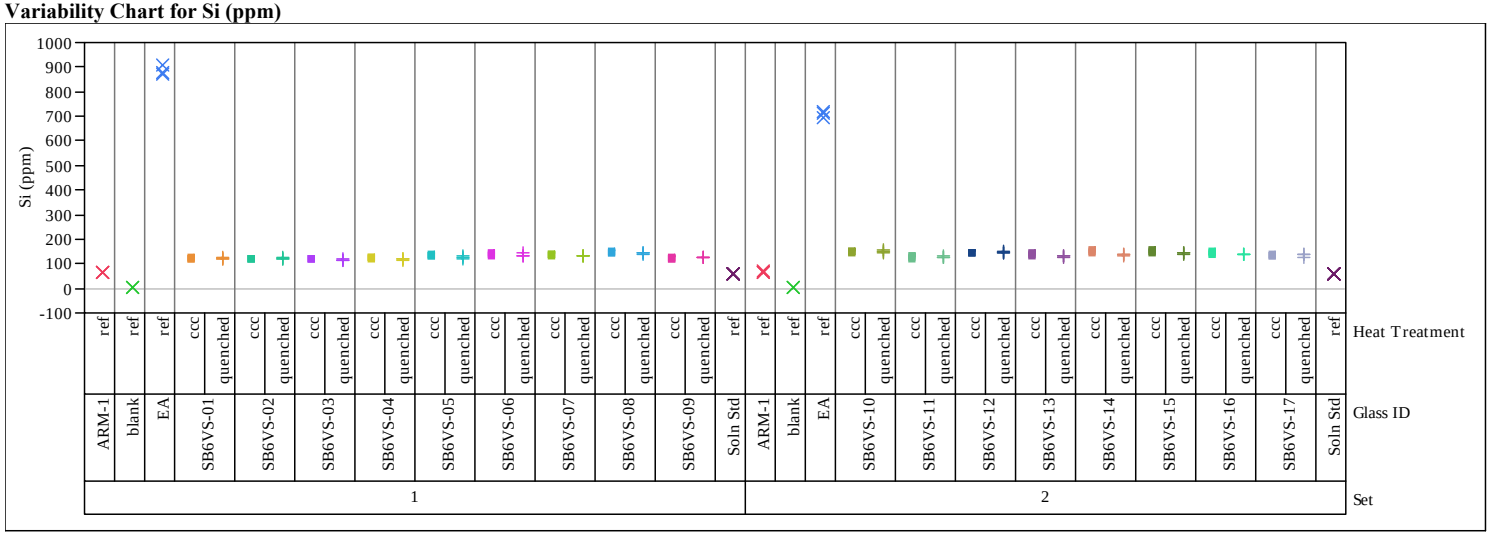
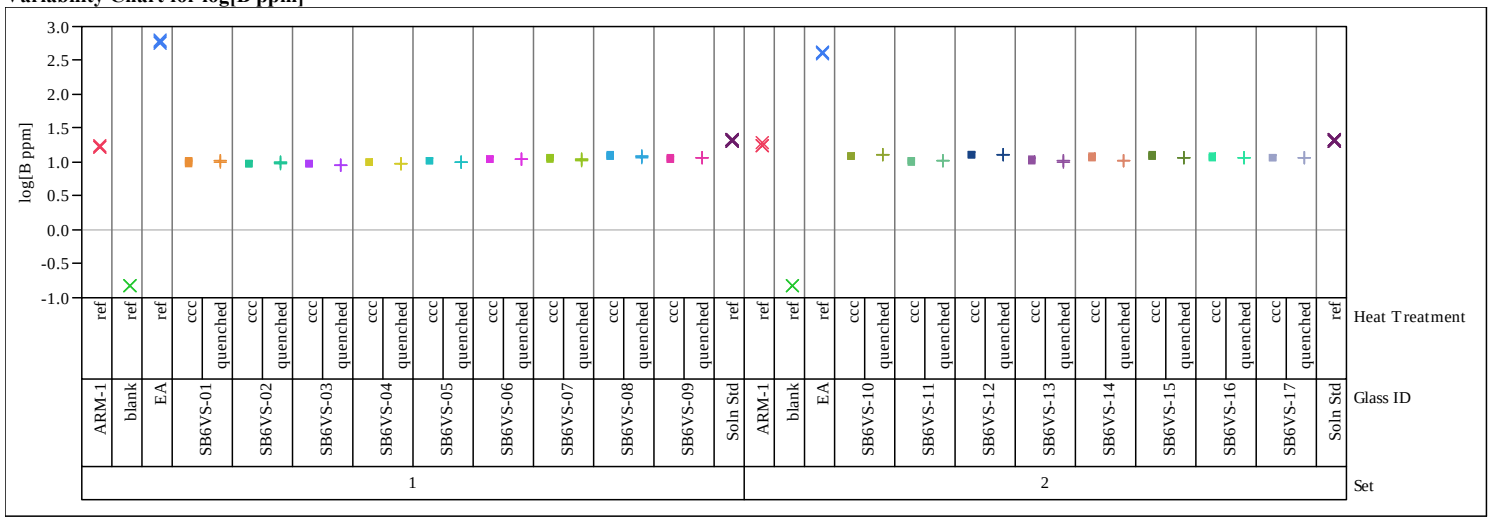


Exhibit B3. Laboratory PCT Measurements by Glass Identifier for Initial Study Glasses and Standards

Variability Chart for log[B ppm]



Variability Chart for log[Li ppm]

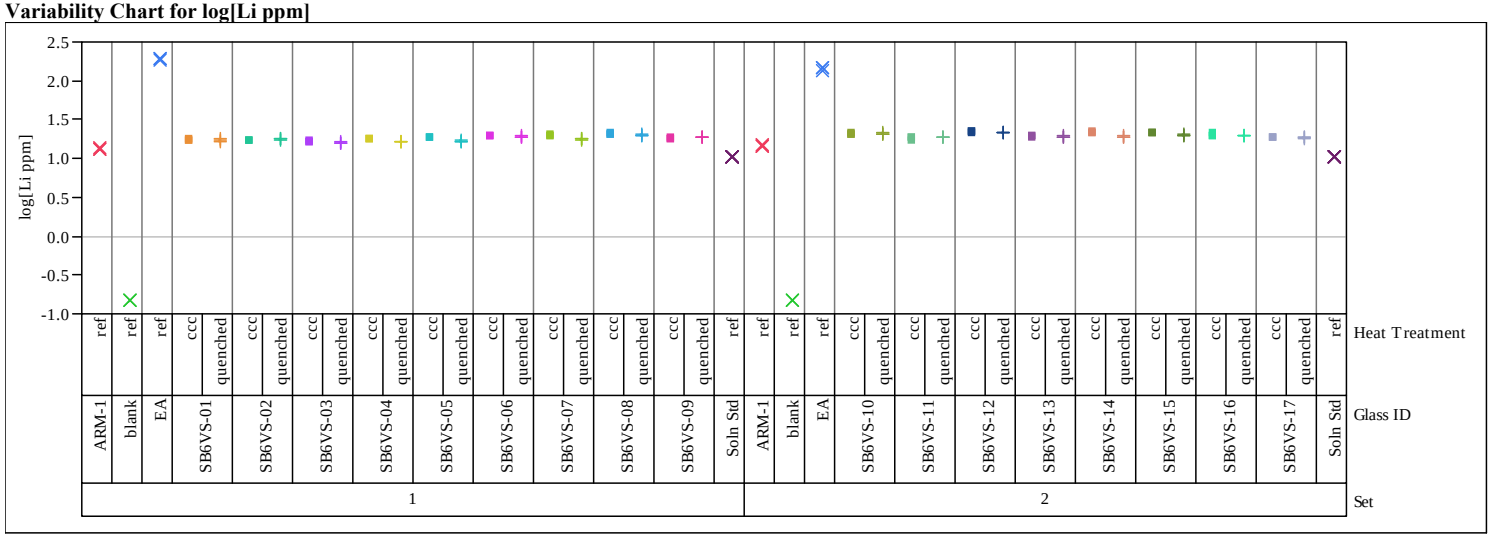
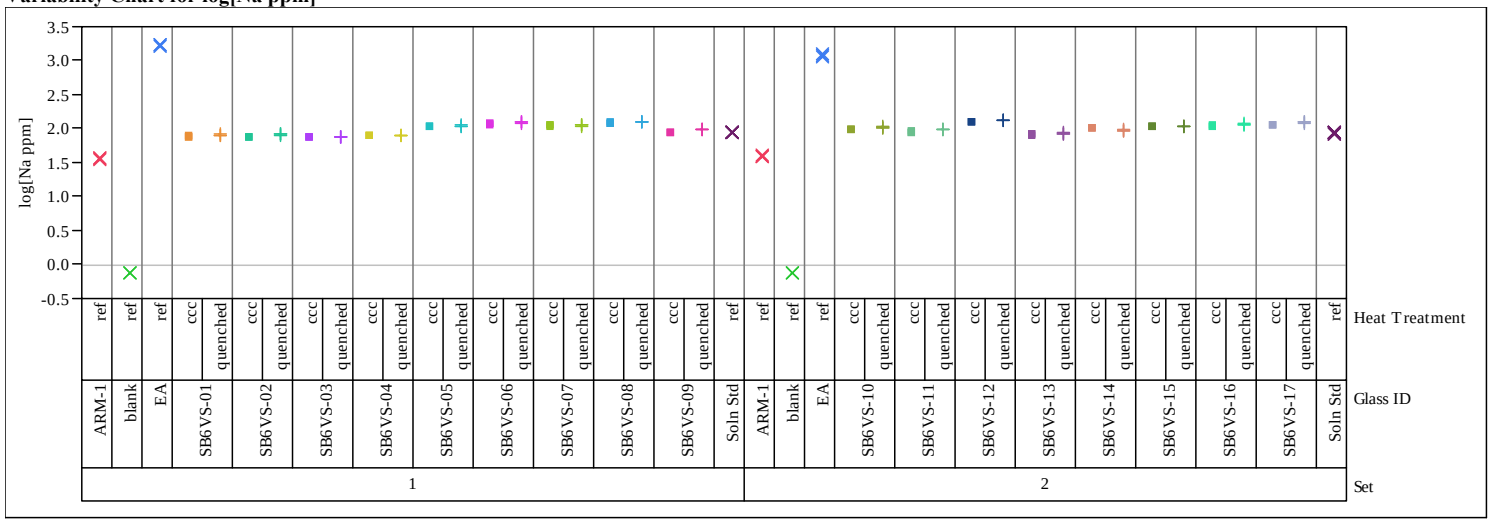


Exhibit B3. Laboratory PCT Measurements by Glass Identifier for Initial Study Glasses and Standards

Variability Chart for log[Na ppm]



Variability Chart for log[Si ppm]

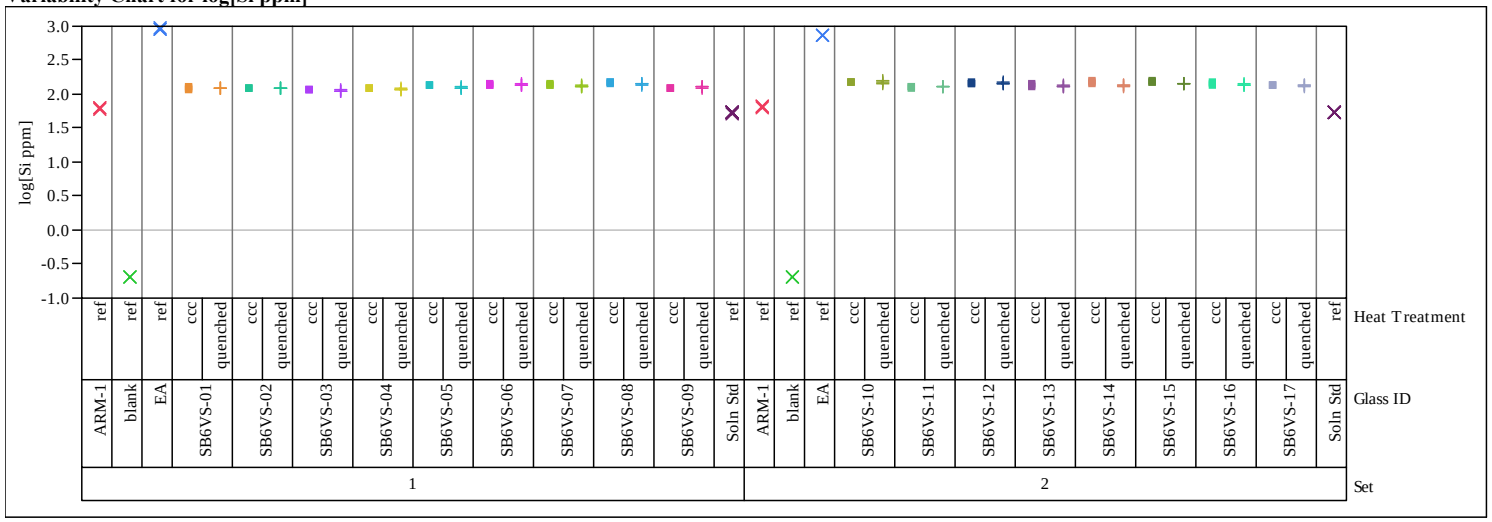


Exhibit B4. Correlations and Scatter Plots of Normalized PCTs Over All Compositional Views and Heat Treatments for All Initial Study Glasses

Multivariate Correlations

	log NL[B (g/L)]	log NL[Li(g/L)]	log NL[Na (g/L)]	log NL[Si (g/L)]
log NL[B (g/L)]	1.0000	0.9963	0.9590	0.9661
log NL[Li(g/L)]	0.9963	1.0000	0.9555	0.9713
log NL[Na (g/L)]	0.9590	0.9555	1.0000	0.9538
log NL[Si (g/L)]	0.9661	0.9713	0.9538	1.0000

Scatterplot Matrix

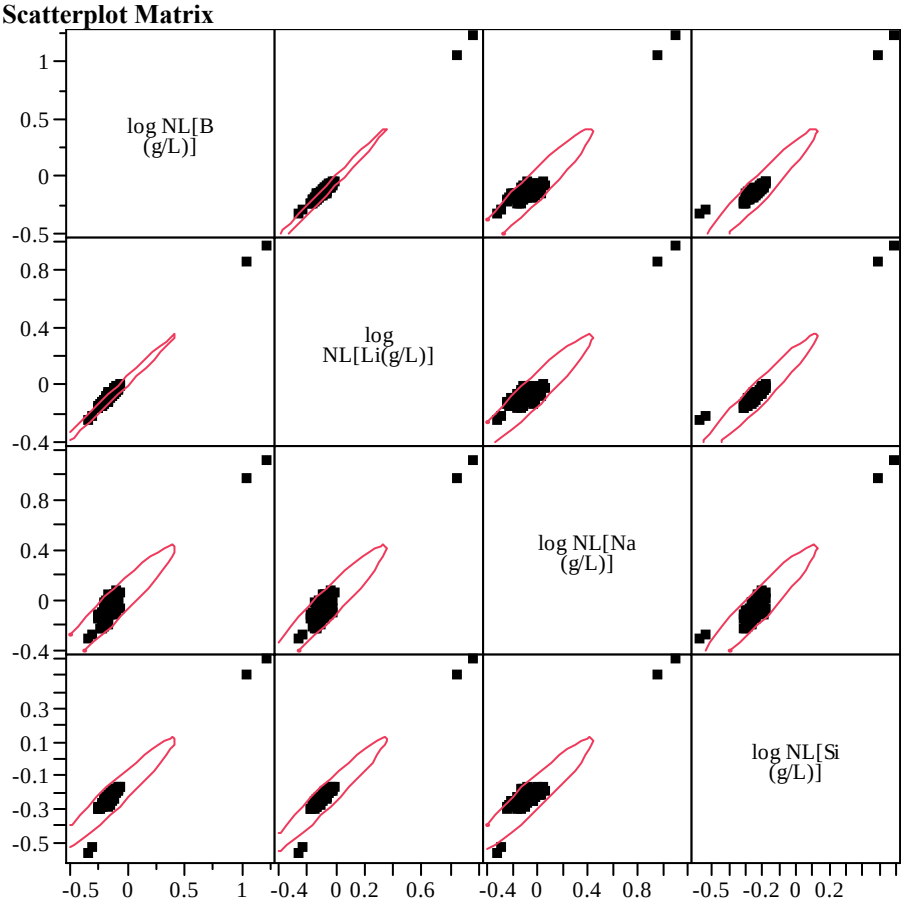
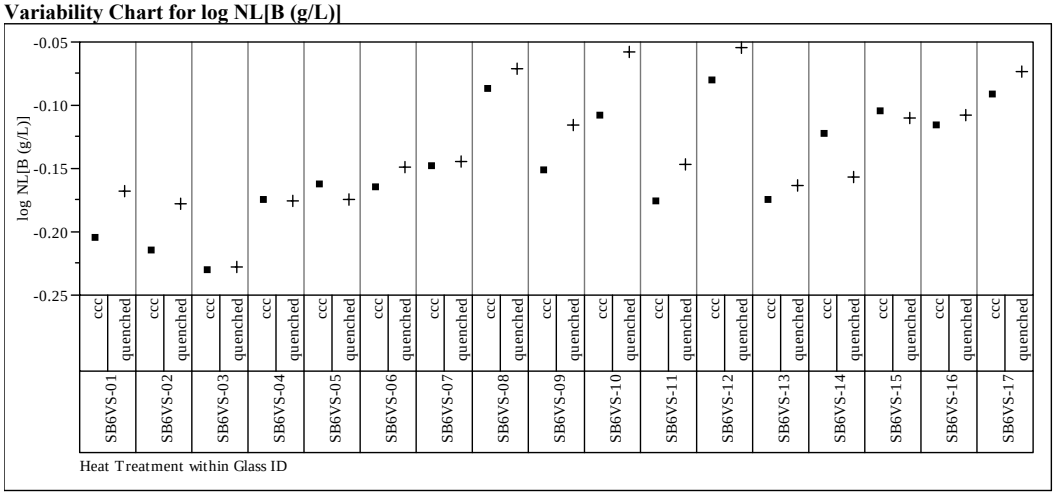
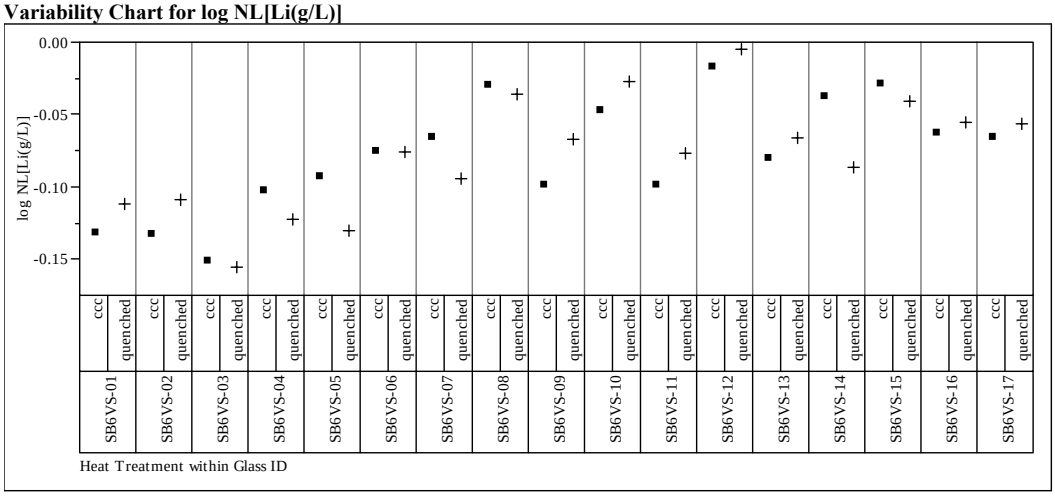


Exhibit B5. Effects of Heat Treatment for Initial Study Glasses by Compositional View

Comp View=measured
Variability Chart for log NL[B (g/L)]



Comp View=measured
Variability Chart for log NL[Li(g/L)]



Comp View=measured
Variability Chart for log NL[Na (g/L)]

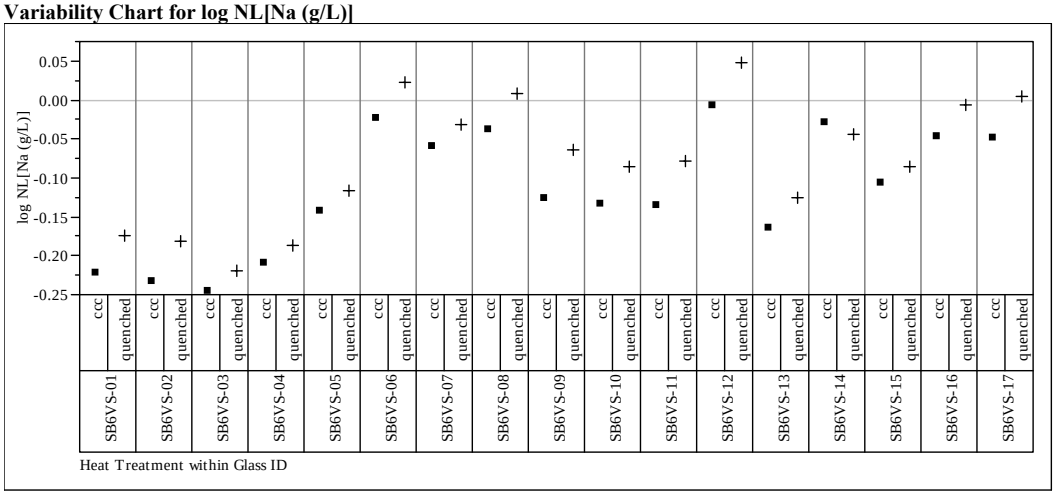
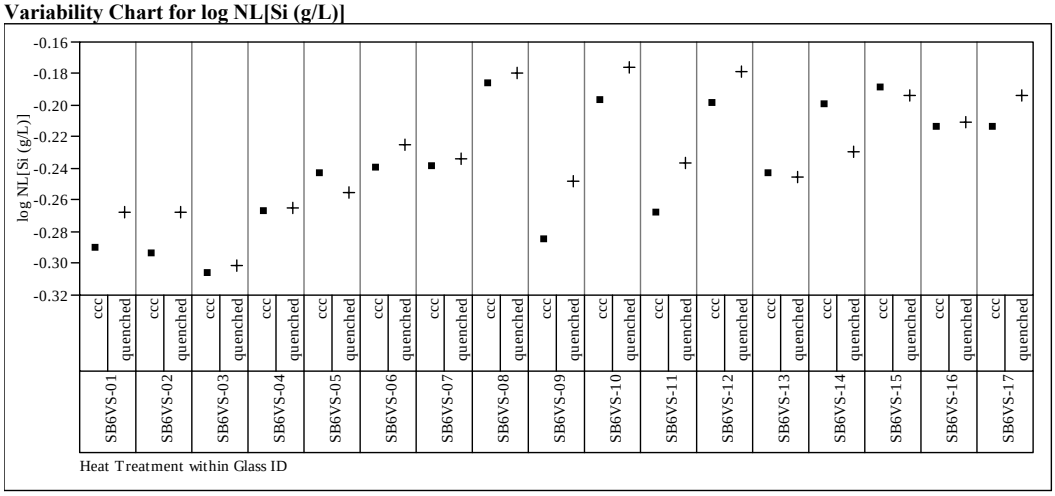
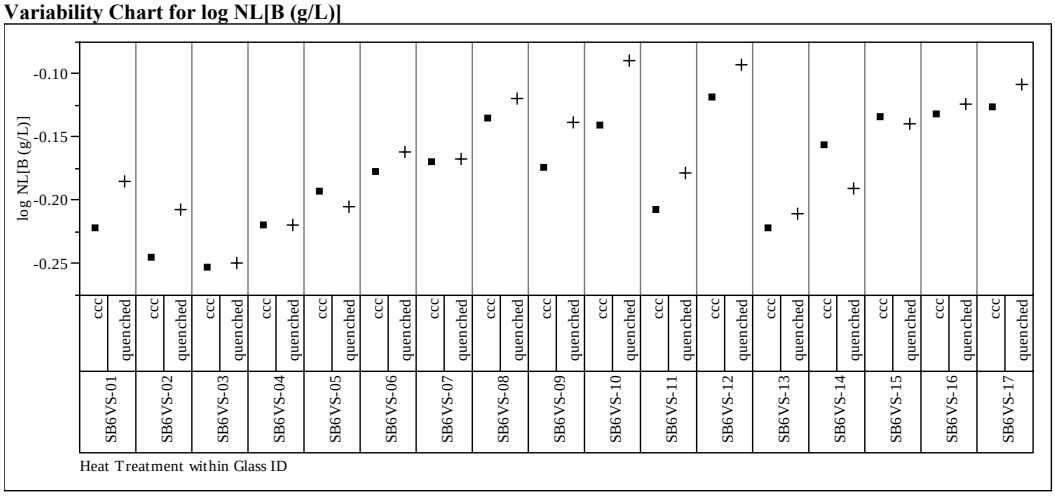


Exhibit B5. Effects of Heat Treatment for Initial Study Glasses by Compositional View

Comp View=measured
Variability Chart for log NL[Si (g/L)]



Comp View=targeted
Variability Chart for log NL[B (g/L)]



Comp View=targeted
Variability Chart for log NL[Li(g/L)]

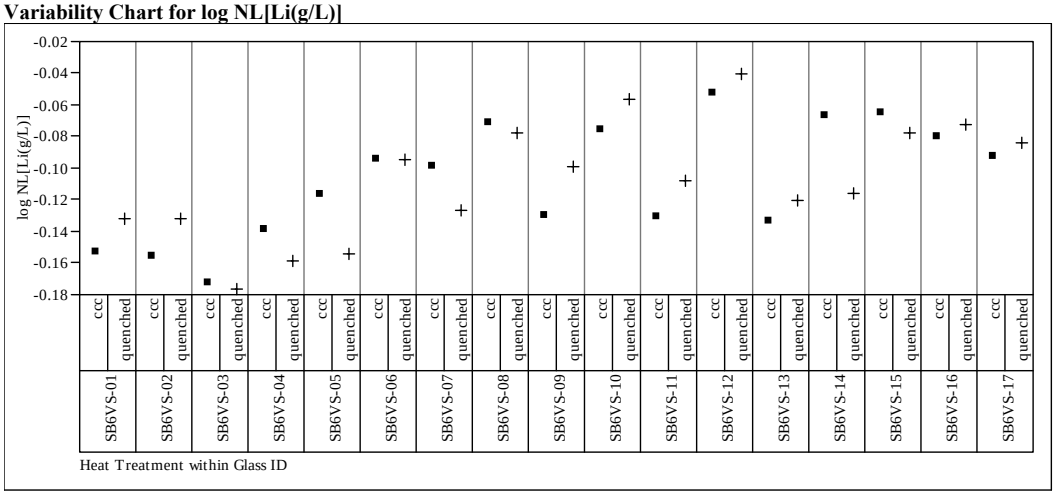
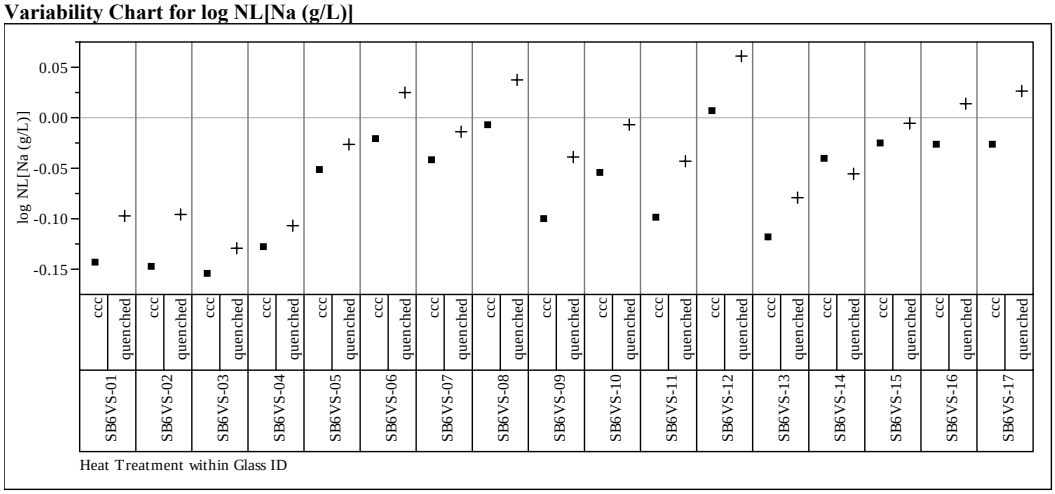


Exhibit B5. Effects of Heat Treatment for Initial Study Glasses by Compositional View

Comp View=targeted
Variability Chart for log NL[Na (g/L)]



Comp View=targeted
Variability Chart for log NL[Si (g/L)]

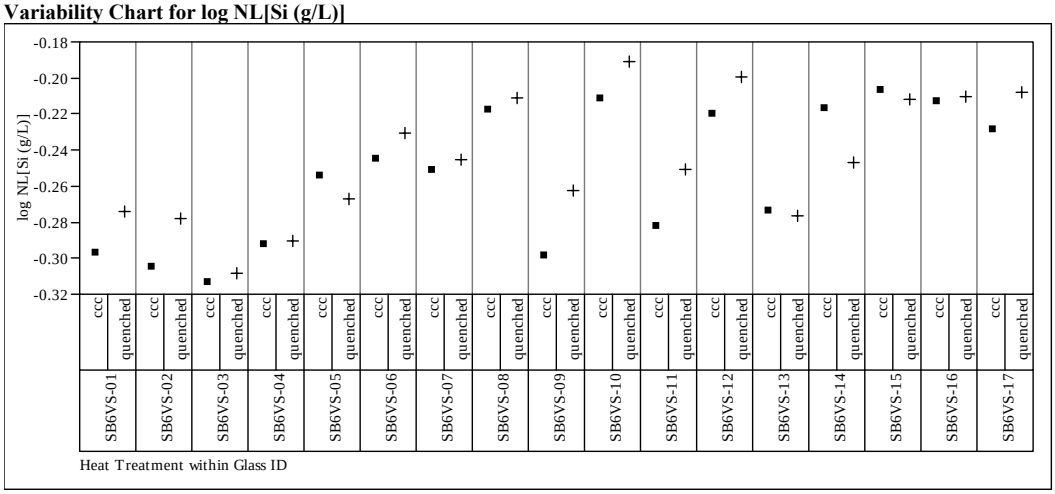


Exhibit B6. del Gp (ΔG_p) Predictions versus the Common Logarithm of the Normalized Leachate (log NL[.]) for B, Li, Na and Si for Targeted Compositions for the Initial Study Glasses for Both Heat Treatments

Legend

Symbol	Standard/ Comp View-Heat Treatment
Z	EA
◊	ARM
×	Targeted-ccc
●	Targeted-quenched

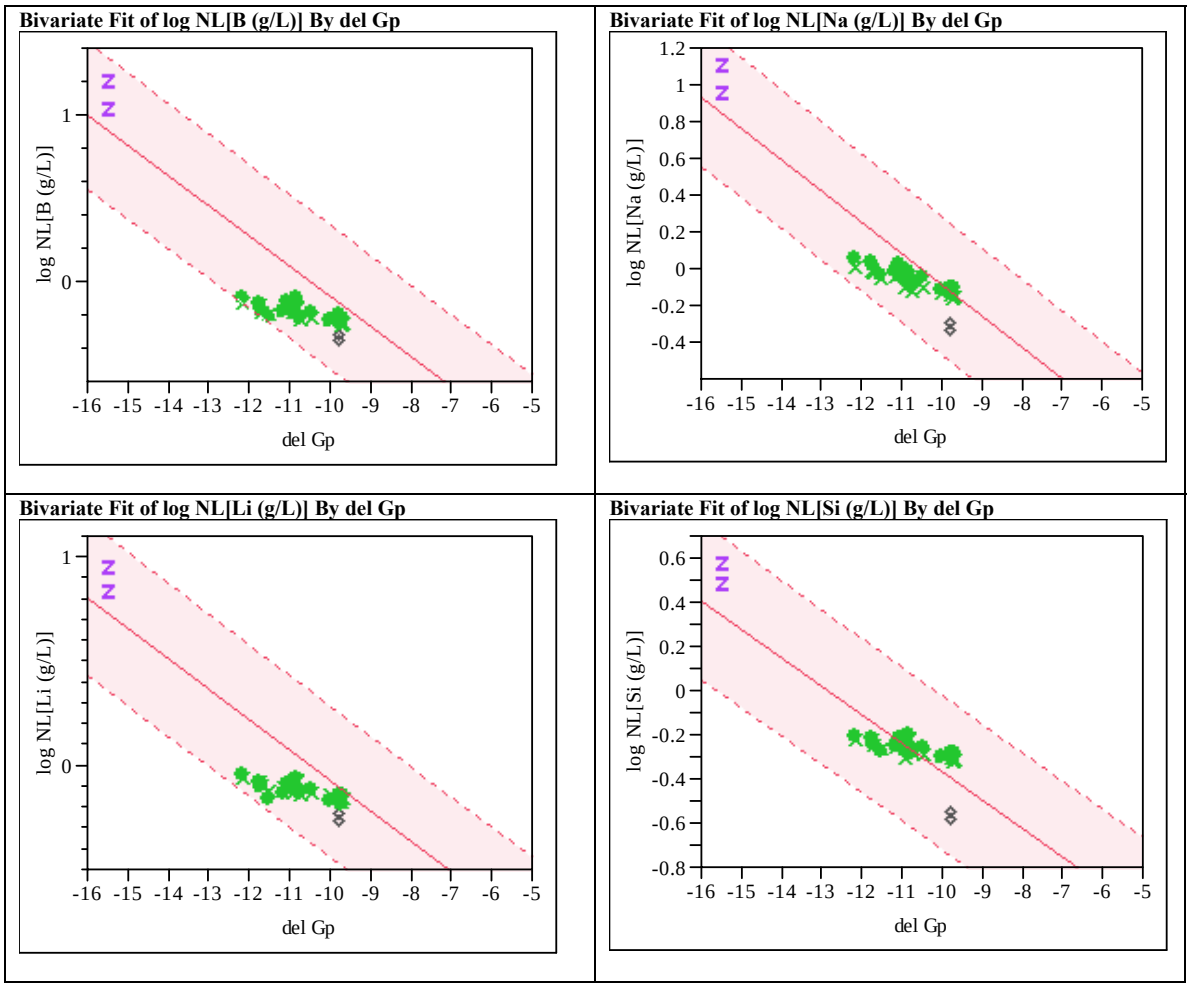
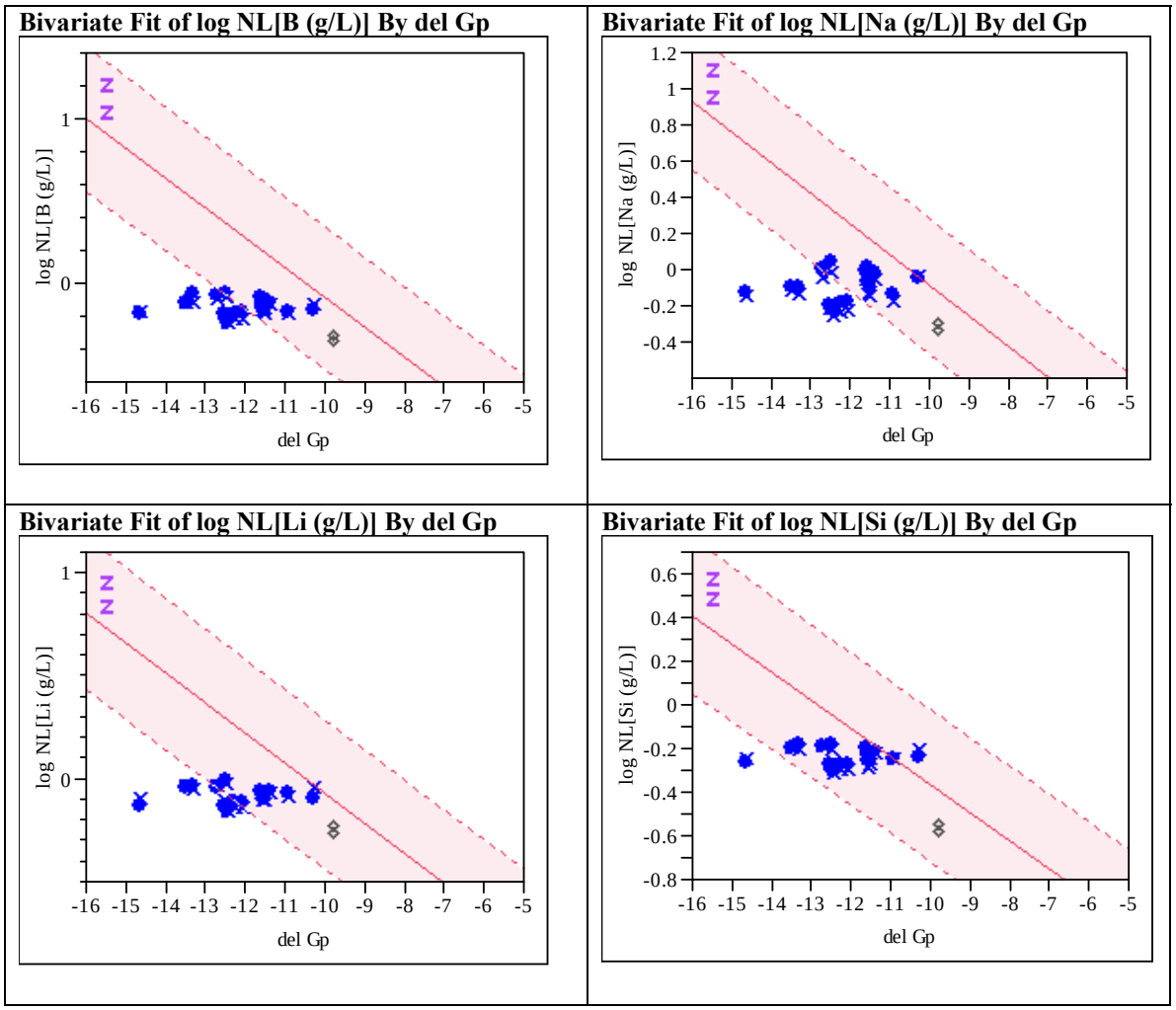


Exhibit B6. del Gp (ΔG_p) Predictions versus the Common Logarithm of the Normalized Leachate (log NL[.]) for B, Li, Na and Si for Measured Compositions for the Initial Study Glasses for Both Heat Treatments

Legend

Symbol	Standard/ Comp View-Heat Treatment
Z	EA
◊	ARM
×	Measured-ccc
●	Measured-quenched



Appendix C:

Tables and Exhibits Supporting the Analysis of the Chemical Composition Measurements of the SB6 VS Glasses with Thorium

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Table C1. Measured Elemental Concentrations (micrograms of element per gram of glass) for the Thorium Study Glasses Prepared Using a 10X Dilution Factor with Mixed Acid Preparation Method

Prep Method	Dilution Factor	Glass ID	Block	Seq.	Lab ID	Al (ug/g)	Ba (ug/g)	Cu (ug/g)	Fe (ug/g)	La (ug/g)	Li (ug/g)	Mn (ug/g)	Na (ug/g)	Si (ug/g)	Th (ug/g)
MA	10X	ARG-1	1	1	300272391	26100	845	< 138	106000	< 96.9	14900	15200	89000	242000	< 2290
MA	10X	U-std	1	2	300272392	21300	< 115	< 139	93100	< 97.7	13000	21000	84900	216000	< 2310
MA	10X	SB6VS20	1	3	300272393	46800	372	247	54300	264	20700	16800	96900	221000	5630
MA	10X	SB6VS18	1	4	300272394	45000	294	251	51400	154	23700	16100	98400	249000	3000
MA	10X	SB6VS22	1	5	300272395	52900	366	275	61800	171	20200	19300	103000	216000	3370
MA	10X	SB6VS19	1	6	300272396	48200	354	261	55500	142	23400	17400	102000	247000	2810
MA	10X	SB6VS22	1	7	300272397	48300	348	255	56500	230	18500	17600	94400	201000	5370
MA	10X	ARG-1	1	8	300272398	26400	853	< 138	107000	< 97.3	15400	15400	89800	247000	< 2300
MA	10X	U-std	1	9	300272399	23300	< 117	< 141	102000	< 99.1	14800	23100	92000	240000	< 2340
MA	10X	SB6VS19	1	10	300272400	49700	360	262	57300	143	24600	17900	104000	254000	2640
MA	10X	SB6VS18	1	11	300272401	42100	296	219	48600	190	22700	15200	92000	235000	4250
MA	10X	SB6VS21	1	12	300272402	53200	477	292	61700	364	22300	19200	105000	232000	8300
MA	10X	SB6VS21	1	13	300272403	57700	508	333	66500	357	24100	20700	114000	248000	8260
MA	10X	SB6VS20	1	14	300272404	46300	359	262	53800	254	20800	16800	95000	219000	5310
MA	10X	ARG-1	1	15	300272405	24700	798	< 139	99900	< 97.9	14400	14400	83800	232000	< 2310
MA	10X	BLANK	1	16	300272407	< 533	< 118	< 142	121	< 100	< 1640	< 13	< 863	24700	< 2360
MA	10X	U-std	1	17	300272406	21400	< 116	< 139	93000	< 98.2	13200	21000	83900	218000	< 2320
MA	10X	ARG-1	2	1	300272391	26200	843	< 138	105000	< 96.9	15300	15100	89800	237000	< 2290
MA	10X	U-std	2	2	300272392	21500	< 115	< 139	92400	< 97.7	13400	21000	85600	211000	< 2310
MA	10X	SB6VS20	2	3	300272393	47100	382	257	54100	352	21200	16900	97800	216000	7110
MA	10X	SB6VS18	2	4	300272394	45000	300	223	51300	172	24200	16000	99200	241000	3550
MA	10X	SB6VS22	2	5	300272395	52900	369	276	61400	189	20300	19200	105000	208000	3710
MA	10X	SB6VS19	2	6	300272396	48200	358	255	54900	171	23700	17300	103000	238000	3450
MA	10X	SB6VS22	2	7	300272397	48200	357	252	55900	293	18500	17500	95300	191000	6180
MA	10X	ARG-1	2	8	300272398	26600	855	< 138	106000	< 97.3	15700	15400	90800	240000	< 2300
MA	10X	U-std	2	9	300272399	23300	< 117	< 141	102000	< 99.1	14800	23000	93000	232000	< 2340
MA	10X	SB6VS19	2	10	300272400	49700	364	261	56900	146	24600	17900	106000	247000	3070
MA	10X	SB6VS18	2	11	300272401	42400	293	238	48400	206	22700	15100	92900	228000	4220
MA	10X	SB6VS21	2	12	300272402	53300	478	312	61400	408	22300	19100	107000	226000	8930
MA	10X	SB6VS21	2	13	300272403	57600	521	323	66400	408	23900	20700	115000	242000	9220
MA	10X	SB6VS20	2	14	300272404	46400	373	244	53600	289	21000	16700	96200	214000	5980
MA	10X	ARG-1	2	15	300272405	24500	800	< 139	99000	< 97.9	14600	14300	84400	225000	< 2310
MA	10X	BLANK	2	16	300272407	< 533	< 118	< 142	111	< 100	< 756	< 13	< 863	14600	< 2360
MA	10X	U-std	2	17	300272406	21500	< 116	< 139	92000	< 98.2	13500	21000	84900	212000	< 2320

Table C2. Measured Elemental Concentrations (micrograms of element per gram of glass) for the Thorium Study Glasses Prepared Using a 2X Dilution Factor with Mixed Acid Preparation Method

Prep Method	Dilution Factor	Glass ID	Block	Seq.	Lab ID	Ca (ug/g)	Cd (ug/g)	Ce (ug/g)	Cr (ug/g)	K (ug/g)	Mg (ug/g)	Ni (ug/g)	P (ug/g)	Pb (ug/g)	S (ug/g)	Ti (ug/g)	U (ug/g)	Zn (ug/g)	Zr (ug/g)
MA	2X	ARG-1	1	1	300272391	10700	< 24.8	< 342	682	23000	5490	8130	1220	< 142	< 2180	7150	< 1680	171	1010
MA	2X	U-std	1	2	300272392	9110	< 25	< 345	1620	23400	7120	7830	< 166	< 143	< 2210	5610	18800	< 29.5	16.4
MA	2X	SB6VS20	1	3	300272393	3340	< 25.3	< 349	225	< 396	1570	6680	494	< 145	< 2220	1800	12600	186	568
MA	2X	SB6VS18	1	4	300272394	3200	< 25.3	< 350	219	< 396	1500	6500	456	< 145	< 2220	1720	11800	193	529
MA	2X	SB6VS22	1	5	300272395	3800	< 25.1	< 346	261	< 392	1770	7680	543	< 143	< 2210	2040	14100	216	639
MA	2X	SB6VS19	1	6	300272396	3430	< 25.2	< 348	229	< 394	1620	7010	492	< 144	< 2220	1840	12600	195	569
MA	2X	SB6VS22	1	7	300272397	3450	< 25.4	< 351	242	< 398	1620	7050	524	< 145	< 2240	1850	12700	195	564
MA	2X	ARG-1	1	8	300272398	10900	< 24.9	< 344	705	23300	5600	8330	1230	< 142	< 2190	7260	< 1690	181	1030
MA	2X	U-std	1	9	300272399	9890	< 25.4	< 350	1790	25600	7720	8590	< 168	< 145	< 2240	6150	20100	< 29.9	22.8
MA	2X	SB6VS19	1	10	300272400	3530	< 25.2	< 347	235	< 394	1660	7180	524	< 144	< 2220	1900	13100	208	571
MA	2X	SB6VS18	1	11	300272401	3010	< 25.2	< 347	199	< 394	1410	6100	479	< 144	< 2220	1610	11200	182	498
MA	2X	SB6VS21	1	12	300272402	3800	< 25.2	< 348	225	< 394	1780	7630	562	< 144	< 2220	2010	14100	207	633
MA	2X	SB6VS21	1	13	300272403	4110	< 25.3	< 349	238	< 396	1910	8200	621	< 144	2230	2180	15300	230	663
MA	2X	SB6VS20	1	14	300272404	3330	< 25	< 346	219	< 392	1570	6600	485	< 143	< 2210	1770	12300	188	529
MA	2X	ARG-1	1	15	300272405	10200	< 25	< 346	651	21400	5160	7640	1110	< 143	< 2210	6750	< 1700	162	947
MA	2X	BLANK	1	16	300272407	18.4	< 25.6	< 353	< 27.8	< 400	5.4	< 186	< 170	< 146	< 2250	< 3.4	< 1740	< 30.2	< 9.4
MA	2X	U-std	1	17	300272406	9110	< 25.1	< 347	1610	23000	7000	7770	< 167	< 144	< 2210	5560	18400	< 29.7	25.5
MA	2X	ARG-1	2	1	300272391	10800	< 24.8	< 342	684	23200	5510	8160	1270	< 142	< 2180	7150	< 1680	167	1020
MA	2X	U-std	2	2	300272392	9100	< 25	< 345	1620	23800	7120	7850	< 166	< 143	< 2210	5600	18400	< 29.5	17
MA	2X	SB6VS20	2	3	300272393	3320	< 25.3	< 349	224	< 396	1570	6710	523	< 145	< 2220	1800	12500	184	548
MA	2X	SB6VS18	2	4	300272394	3180	< 25.3	< 350	215	< 396	1510	6470	529	< 145	< 2240	1720	11900	188	525
MA	2X	SB6VS22	2	5	300272395	3770	< 25.1	< 346	258	< 392	1780	7680	598	< 143	< 2210	2030	14100	209	610
MA	2X	SB6VS19	2	6	300272396	3420	< 25.2	< 348	229	< 394	1610	6960	545	< 144	< 2220	1830	12800	192	559
MA	2X	SB6VS22	2	7	300272397	3440	< 25.4	< 351	243	< 398	1620	7030	551	< 145	< 2240	1840	12800	190	560
MA	2X	ARG-1	2	8	300272398	10900	< 24.9	< 344	689	23300	5560	8260	1260	< 142	< 2190	7230	< 1690	176	1030
MA	2X	U-std	2	9	300272399	9880	< 25.4	< 350	1760	25800	7660	8600	< 168	< 145	< 2240	6120	20300	< 29.9	22.2
MA	2X	SB6VS19	2	10	300272400	3530	< 25.2	< 347	233	< 394	1650	7160	540	< 144	< 2210	1890	13200	202	569
MA	2X	SB6VS18	2	11	300272401	3000	< 25.2	< 347	199	< 394	1410	6130	519	< 144	< 2220	1610	11300	178	499
MA	2X	SB6VS21	2	12	300272402	3790	< 25.2	< 348	222	< 394	1780	7690	632	< 144	< 2220	2000	14300	203	624
MA	2X	SB6VS21	2	13	300272403	4090	< 25.3	< 349	239	< 396	1920	8290	645	< 144	< 2220	2180	15500	226	657
MA	2X	SB6VS20	2	14	300272404	3320	< 25	< 346	219	< 392	1580	6700	532	< 143	< 2210	1760	12300	192	530
MA	2X	ARG-1	2	15	300272405	10200	< 25	< 346	642	21900	5200	7750	1180	< 143	< 2210	6740	< 1700	160	945
MA	2X	BLANK	2	16	300272407	20.2	< 25.6	< 353	< 27.8	< 400	6.6	< 186	< 170	< 146	< 2250	< 3.4	< 1740	< 30.2	< 9.4
MA	2X	U-std	2	17	300272406	9060	< 25.1	< 347	1590	23500	7040	7830	< 167	< 144	< 2210	5550	18500	< 29.7	25.5

Table C3. Measured Elemental Concentrations (micrograms of element per gram of glass) for the Thorium Study Glasses Prepared Using a 10X Dilution Factor with Peroxide Fusion Preparation Method (part 1)

Prep Method	Dilution Factor	Glass ID	Block	Seq	Lab ID	Al (ug/g)	B (ug/g)	Ba (ug/g)	Ca (ug/g)	Cd (ug/g)	Ce (ug/g)	Cr (ug/g)	Cu (ug/g)	Fe (ug/g)	K (ug/g)	La (ug/g)	Li (ug/g)
PF	10X	ARG-1	1	1	300272374	25600	25400	784	11300	< 155	< 1590	653	< 172	97200	22900	< 131	14600
PF	10X	U-std	1	2	300272375	21300	27300	< 117	10100	< 127	< 1300	1650	< 141	92200	25000	< 107	13900
PF	10X	SB6VS20	1	3	300272376	50000	15200	424	4340	< 127	< 1300	259	291	57700	3050	246	23200
PF	10X	SB6VS18	1	4	300272377	44900	16200	348	3950	< 127	< 1300	220	285	51300	< 1980	219	24700
PF	10X	SB6VS22	1	5	300272378	55300	14300	442	5000	< 127	< 1300	282	324	63900	< 1990	257	21700
PF	10X	SB6VS22	1	6	300272379	55400	14300	452	4910	< 127	< 1300	293	334	64100	2070	284	21800
PF	10X	SB6VS19	1	7	300272380	47700	15800	400	4090	< 126	< 1290	257	292	54500	2980	230	23800
PF	10X	ARG-1	1	8	300272381	25700	25700	795	11100	< 129	< 1320	667	< 143	97600	23400	< 109	14600
PF	10X	U-std	1	9	300272382	21600	27500	< 116	10200	< 126	< 1290	1630	< 140	92400	26300	< 107	13700
PF	10X	SB6VS21	1	10	300272383	53600	14800	491	4710	< 127	< 1300	239	315	60900	2660	238	22400
PF	10X	SB6VS18	1	11	300272384	44800	16200	342	4080	< 127	< 1300	241	276	50700	2410	230	24400
PF	10X	SB6VS19	1	12	300272385	47500	15600	400	4100	< 126	< 1290	244	283	54100	3070	222	23600
PF	10X	SB6VS21	1	13	300272386	53400	14700	480	4720	< 127	< 1300	247	320	60800	3040	230	22100
PF	10X	SB6VS20	1	14	300272387	50700	15400	415	4350	< 127	< 1300	244	299	57900	3530	226	22800
PF	10X	ARG-1	1	15	300272388	25600	25600	776	11100	< 137	< 1410	620	< 152	96900	23200	< 116	14500
PF	10X	BLANK	1	16	300272390	1140	< 176	< 118	1400	< 128	< 1310	< 139	< 142	221	< 2000	< 108	< 756
PF	10X	U-std	1	17	300272389	21700	27400	< 116	9840	< 126	< 1290	1620	< 140	92200	25800	< 106	13600
PF	10X	ARG-1	2	1	300272374	25400	25800	783	11400	< 155	< 1590	650	< 172	97700	26200	< 131	14900
PF	10X	U-std	2	2	300272375	21200	27400	< 117	10100	< 127	< 1300	1660	< 141	92100	28700	< 107	14000
PF	10X	SB6VS20	2	3	300272387	50900	15400	418	4400	< 127	< 1300	255	288	57900	3800	234	23700
PF	10X	SB6VS21	2	4	300272383	53600	14700	485	4730	< 127	< 1300	265	320	60900	3600	232	23000
PF	10X	SB6VS22	2	5	300272379	55900	14300	442	4940	< 127	< 1300	301	322	64000	3440	258	22300
PF	10X	SB6VS19	2	6	300272380	47800	15700	387	4100	< 126	< 1290	253	277	54000	< 1970	213	24300
PF	10X	SB6VS20	2	7	300272376	50000	15200	416	4350	< 127	< 1300	251	295	57200	< 1990	242	23500
PF	10X	ARG-1	2	8	300272381	25900	25600	779	11200	< 129	< 1320	662	< 143	97200	23400	< 109	14800
PF	10X	U-std	2	9	300272382	21800	27600	< 116	10400	< 126	< 1290	1700	< 140	93600	25700	< 107	14000
PF	10X	SB6VS18	2	10	300272384	44800	16400	346	4240	< 127	< 1300	223	256	51900	< 1990	220	24800
PF	10X	SB6VS21	2	11	300272386	53800	14800	493	4900	< 127	< 1300	247	316	62100	< 1980	226	22700
PF	10X	SB6VS22	2	12	300272378	56200	14500	446	4900	< 127	< 1300	299	318	65300	< 1990	263	21800
PF	10X	SB6VS19	2	13	300272385	48000	16000	405	4340	< 126	< 1290	277	271	55700	< 1980	238	24100
PF	10X	SB6VS18	2	14	300272377	45300	16500	350	4130	< 127	< 1300	227	263	52500	< 1980	199	24700
PF	10X	ARG-1	2	15	300272388	25700	26000	808	11700	< 137	< 1410	686	< 152	100000	22500	< 116	14500
PF	10X	BLANK	2	16	300272390	962	< 375	< 118	1460	< 128	< 1310	< 139	< 142	240	< 2000	< 108	< 173
PF	10X	U-std	2	17	300272389	22000	28200	< 116	10500	< 126	< 1290	1710	< 140	96900	24300	< 106	13700

Table C4. Measured Elemental Concentrations (micrograms of element per gram of glass) for the Thorium Study Glasses Prepared Using a 10X Dilution Factor with Peroxide Fusion Preparation Method (part 2)

Prep Method	Dilution Factor	Glass ID	Block	Seq	Lab ID	Mg (ug/g)	Mn (ug/g)	Ni (ug/g)	P (ug/g)	Pb (ug/g)	S (ug/g)	Si (ug/g)	Th (ug/g)	Ti (ug/g)	U (ug/g)	Zn (ug/g)
PF	10X	ARG-1	1	1	300272374	5140	14200	8030	< 1030	< 885	< 9080	228000	< 2860	6980	< 9080	< 183
PF	10X	U-std	1	2	300272375	7350	21200	8220	< 841	< 724	< 7430	218000	< 2340	5890	19900	< 150
PF	10X	SB6VS20	1	3	300272376	1640	18000	7220	< 842	< 725	< 7440	237000	8710	2000	12800	212
PF	10X	SB6VS18	1	4	300272377	1470	16200	6650	< 842	< 725	< 7430	251000	7610	1820	11600	366
PF	10X	SB6VS22	1	5	300272378	1830	20400	8230	< 843	< 726	< 7440	223000	9830	2230	15600	198
PF	10X	SB6VS22	1	6	300272379	1840	20400	8250	< 843	< 726	< 7450	224000	10000	2240	15100	214
PF	10X	SB6VS19	1	7	300272380	1550	17400	7080	< 837	< 721	< 7400	246000	7920	1940	11900	205
PF	10X	ARG-1	1	8	300272381	5170	14100	7940	1290	< 738	< 7570	232000	< 2380	7060	< 7570	173
PF	10X	U-std	1	9	300272382	7330	21400	8050	< 838	< 721	< 7400	220000	< 2330	5930	20500	< 149
PF	10X	SB6VS21	1	10	300272383	1730	19100	7710	< 840	< 723	< 7420	232000	9410	2120	14300	204
PF	10X	SB6VS18	1	11	300272384	1470	16100	6560	< 843	< 726	< 7450	251000	7870	1810	11900	172
PF	10X	SB6VS19	1	12	300272385	1540	17200	7040	< 838	< 722	< 7410	246000	8230	1910	12700	167
PF	10X	SB6VS21	1	13	300272386	1730	19300	7690	< 841	< 724	< 7430	231000	9490	2120	15400	185
PF	10X	SB6VS20	1	14	300272387	1640	18400	7530	< 840	< 723	< 7420	239000	8520	2020	14400	185
PF	10X	ARG-1	1	15	300272388	5120	14200	7660	< 911	< 785	< 8050	231000	< 2540	7070	< 8050	< 162
PF	10X	BLANK	1	16	300272390	< 25	< 110	< 930	< 849	< 731	< 7500	< 231	< 2360	< 110	< 7500	< 151
PF	10X	U-std	1	17	300272389	7280	21300	8140	< 836	< 720	< 7390	219000	< 2330	5940	20700	< 149
PF	10X	ARG-1	2	1	300272374	5110	14100	7680	< 1030	< 885	< 9080	230000	< 2860	6940	< 9080	< 183
PF	10X	U-std	2	2	300272375	7240	20900	7870	< 841	< 724	< 7430	217000	< 2340	5830	20400	< 150
PF	10X	SB6VS20	2	3	300272387	1620	17900	7140	< 840	< 723	< 7420	237000	8500	1980	14000	216
PF	10X	SB6VS21	2	4	300272383	1710	18600	7760	< 840	< 723	< 7420	231000	9290	2080	14700	198
PF	10X	SB6VS22	2	5	300272379	1810	20100	8090	< 843	< 726	< 7450	223000	10000	2210	15400	220
PF	10X	SB6VS19	2	6	300272380	1510	16900	6810	< 837	< 721	< 7400	243000	7880	1880	12200	201
PF	10X	SB6VS20	2	7	300272376	1610	17800	7190	< 842	< 725	< 7440	236000	8770	1960	13200	217
PF	10X	ARG-1	2	8	300272381	5070	13900	7640	910	< 738	< 7570	230000	< 2380	6970	< 7570	170
PF	10X	U-std	2	9	300272382	7270	21200	8020	< 838	< 721	< 7400	220000	< 2330	5880	19100	< 149
PF	10X	SB6VS18	2	10	300272384	1470	16100	6620	< 843	< 726	< 7450	254000	7780	1760	13000	217
PF	10X	SB6VS21	2	11	300272386	1730	19100	7800	< 841	< 724	< 7430	233000	9290	2060	15000	220
PF	10X	SB6VS22	2	12	300272378	1830	20500	8090	< 843	< 726	< 7440	226000	9710	2230	15400	233
PF	10X	SB6VS19	2	13	300272385	1560	17300	7100	< 838	< 722	< 7410	250000	8040	1910	12400	190
PF	10X	SB6VS18	2	14	300272377	1480	16300	6700	< 842	< 725	< 7430	255000	7460	1810	12000	199
PF	10X	ARG-1	2	15	300272388	5170	14300	7960	1060	< 785	< 8050	235000	< 2540	7050	< 8050	< 162
PF	10X	BLANK	2	16	300272390	< 25	< 110	< 930	< 849	< 731	< 7500	< 231	< 2360	< 110	< 7500	< 151
PF	10X	U-std	2	17	300272389	7420	21700	8380	< 837	< 721	< 7390	226000	< 2330	5920	19200	< 149

Table C5. Average Measured Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID for Thorium Glasses

Glass ID	Oxide	Measured (wt%)	Targeted (wt%)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
ARG-1	Al_2O_3	4.8466	4.7300	0.1166	2.5%
ARG-1	B_2O_3	8.2698	8.6700	-0.4002	-4.6%
ARG-1	BaO	0.0879	0.0900	-0.0021	-2.3%
ARG-1	CaO	1.4855	1.4300	0.0555	3.9%
ARG-1	Ce_2O_3	0.0843	0.0000	0.0843	
ARG-1	Cr_2O_3	0.0959	0.0900	0.0059	6.6%
ARG-1	CuO	0.0097	0.0000	0.0097	
ARG-1	Fe_2O_3	13.9777	14.0000	-0.0223	-0.2%
ARG-1	K_2O	2.8429	2.7100	0.1329	4.9%
ARG-1	La_2O_3	0.0070	0.0000	0.0070	
ARG-1	Li_2O	3.1540	3.2100	-0.0560	-1.7%
ARG-1	MgO	0.8507	0.8600	-0.0093	-1.1%
ARG-1	MnO	1.8249	2.3100	-0.4851	-21.0%
ARG-1	Na_2O	11.8534	11.5000	0.3534	3.1%
ARG-1	NiO	0.9949	1.0500	-0.0551	-5.2%
ARG-1	P_2O_5	0.1812	0.2200	-0.0388	-17.6%
ARG-1	PbO	0.0432	0.0000	0.0432	
ARG-1	SiO_2	49.4178	47.9000	1.5178	3.2%
ARG-1	SO_4	1.2333	0.0000	1.2333	
ARG-1	ThO_2	0.1475	0.0000	0.1475	
ARG-1	TiO_2	1.1695	1.1500	0.0195	1.7%
ARG-1	U_3O_8	0.4854	0.0000	0.4854	
ARG-1	ZnO	0.0143	0.0200	-0.0057	-28.6%
ARG-1	ZrO_2	0.1347	0.1300	0.0047	3.6%
ARG-1	Sum	103.3159	100.0700	3.2459	3.2%
SB6VS18	Al_2O_3	8.4933	8.1160	0.3773	4.6%
SB6VS18	B_2O_3	5.2565	5.4400	-0.1835	-3.4%
SB6VS18	BaO	0.0387	0.0420	-0.0033	-7.9%
SB6VS18	CaO	0.4334	0.4390	-0.0056	-1.3%
SB6VS18	Ce_2O_3	0.0761	0.0650	0.0111	17.1%
SB6VS18	Cr_2O_3	0.0333	0.0380	-0.0047	-12.4%
SB6VS18	CuO	0.0338	0.0330	0.0008	2.4%
SB6VS18	Fe_2O_3	7.3773	7.5090	-0.1317	-1.8%
SB6VS18	K_2O	0.1622	0.0270	0.1352	500.6%
SB6VS18	La_2O_3	0.0254	0.0330	-0.0076	-22.9%
SB6VS18	Li_2O	5.3069	5.4400	-0.1331	-2.4%
SB6VS18	MgO	0.2442	0.2440	0.0002	0.1%
SB6VS18	MnO	2.0885	2.1370	-0.0485	-2.3%
SB6VS18	Na_2O	12.8903	13.6920	-0.8018	-5.9%
SB6VS18	NiO	0.8440	0.9160	-0.0720	-7.9%
SB6VS18	P_2O_5	0.0965	0.1390	-0.0425	-30.6%
SB6VS18	PbO	0.0391	0.0090	0.0301	334.2%
SB6VS18	SiO_2	54.0708	52.3530	1.7178	3.3%
SB6VS18	SO_4	1.1145	0.4320	0.6825	158.0%
SB6VS18	ThO_2	0.8739	1.0110	-0.1371	-13.6%

Table C5. Average Measured Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID for Thorium Glasses

Glass ID	Oxide	Measured (wt%)	Targeted (wt%)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
SB6VS18	TiO_2	0.3002	0.2940	0.0062	2.1%
SB6VS18	U_3O_8	1.4298	1.4980	-0.0682	-4.6%
SB6VS18	ZnO	0.0297	0.0220	0.0077	34.9%
SB6VS18	ZrO_2	0.0693	0.0720	-0.0027	-3.8%
SB6VS18	Sum	101.4751	100.0010	1.4741	1.5%
SB6VS19	Al_2O_3	9.0224	8.6230	0.3994	4.6%
SB6VS19	B_2O_3	5.0794	5.2800	-0.2006	-3.8%
SB6VS19	BaO	0.0444	0.0440	0.0004	1.0%
SB6VS19	CaO	0.4866	0.4670	0.0196	4.2%
SB6VS19	Ce_2O_3	0.0755	0.0690	0.0065	9.5%
SB6VS19	Cr_2O_3	0.0377	0.0400	-0.0023	-5.8%
SB6VS19	CuO	0.0351	0.0360	-0.0009	-2.4%
SB6VS19	Fe_2O_3	7.8026	7.9780	-0.1754	-2.2%
SB6VS19	K_2O	0.2417	0.0290	0.2127	733.4%
SB6VS19	La_2O_3	0.0265	0.0350	-0.0085	-24.4%
SB6VS19	Li_2O	5.1562	5.2800	-0.1238	-2.3%
SB6VS19	MgO	0.2554	0.2590	-0.0036	-1.4%
SB6VS19	MnO	2.2209	2.2700	-0.0491	-2.2%
SB6VS19	Na_2O	13.9855	14.0480	-0.0625	-0.4%
SB6VS19	NiO	0.8917	0.9730	-0.0813	-8.4%
SB6VS19	P_2O_5	0.0960	0.1480	-0.0520	-35.2%
SB6VS19	PbO	0.0389	0.0100	0.0289	288.6%
SB6VS19	SiO_2	52.6803	50.8750	1.8053	3.5%
SB6VS19	SO_4	1.1092	0.4590	0.6502	141.7%
SB6VS19	ThO_2	0.9123	1.0740	-0.1617	-15.1%
SB6VS19	TiO_2	0.3186	0.3130	0.0056	1.8%
SB6VS19	U_3O_8	1.4504	1.5910	-0.1406	-8.8%
SB6VS19	ZnO	0.0237	0.0230	0.0007	3.2%
SB6VS19	ZrO_2	0.0766	0.0770	-0.0004	-0.5%
SB6VS19	Sum	102.1698	100.0010	2.1688	2.2%
SB6VS20	Al_2O_3	9.5231	9.1300	0.3931	4.3%
SB6VS20	B_2O_3	4.9264	5.1200	-0.1936	-3.8%
SB6VS20	BaO	0.0467	0.0470	-0.0003	-0.6%
SB6VS20	CaO	0.4656	0.4940	-0.0284	-5.8%
SB6VS20	Ce_2O_3	0.0761	0.0730	0.0031	4.3%
SB6VS20	Cr_2O_3	0.0369	0.0430	-0.0061	-14.3%
SB6VS20	CuO	0.0367	0.0380	-0.0013	-3.4%
SB6VS20	Fe_2O_3	8.2458	8.4470	-0.2012	-2.4%
SB6VS20	K_2O	0.3426	0.0300	0.3126	1041.9%
SB6VS20	La_2O_3	0.0278	0.0370	-0.0092	-24.9%
SB6VS20	Li_2O	5.0163	5.1200	-0.1037	-2.0%
SB6VS20	MgO	0.2699	0.2750	-0.0051	-1.9%
SB6VS20	MnO	2.3274	2.4040	-0.0766	-3.2%
SB6VS20	Na_2O	13.0048	14.4040	-1.3992	-9.7%
SB6VS20	NiO	0.9251	1.0300	-0.1049	-10.2%

Table C5. Average Measured Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID for Thorium Glasses

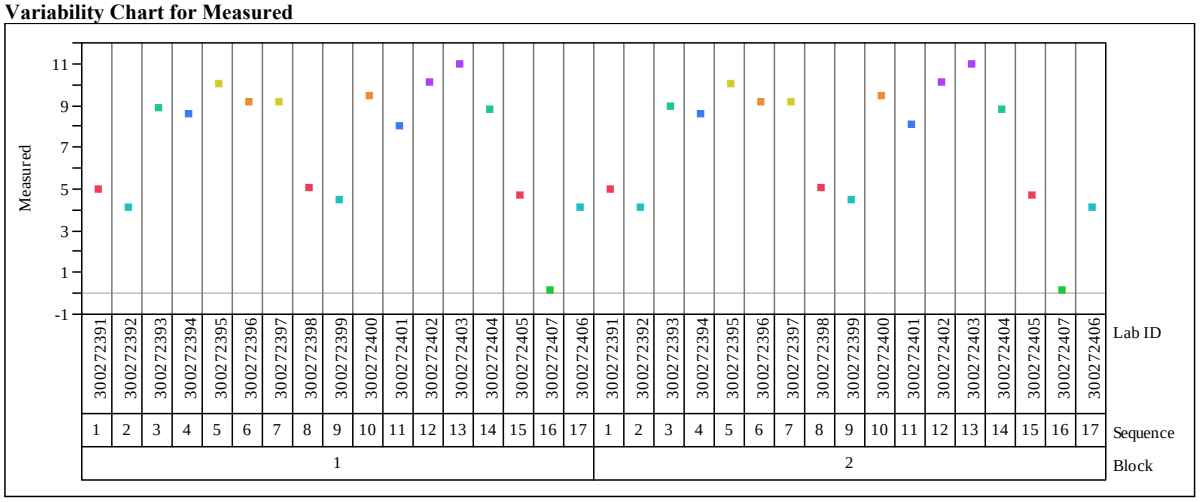
Glass ID	Oxide	Measured (wt%)	Targeted (wt%)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
SB6VS20	P_2O_5	0.0964	0.1560	-0.0596	-38.2%
SB6VS20	PbO	0.0390	0.0100	0.0290	289.9%
SB6VS20	SiO_2	50.7549	49.3970	1.3579	2.7%
SB6VS20	SO_4	1.1130	0.4860	0.6270	129.0%
SB6VS20	ThO_2	0.9814	1.1370	-0.1556	-13.7%
SB6VS20	TiO_2	0.3319	0.3310	0.0009	0.3%
SB6VS20	U_3O_8	1.6037	1.6850	-0.0813	-4.8%
SB6VS20	ZnO	0.0258	0.0250	0.0008	3.3%
SB6VS20	ZrO_2	0.0734	0.0810	-0.0076	-9.3%
SB6VS20	Sum	100.4424	100.0000	0.4424	0.4%
SB6VS21	Al_2O_3	10.1277	9.6370	0.4907	5.1%
SB6VS21	B_2O_3	4.7494	4.9600	-0.2106	-4.2%
SB6VS21	BaO	0.0544	0.0500	0.0044	8.8%
SB6VS21	CaO	0.5523	0.5220	0.0303	5.8%
SB6VS21	Ce_2O_3	0.0761	0.0770	-0.0009	-1.1%
SB6VS21	Cr_2O_3	0.0365	0.0450	-0.0085	-19.0%
SB6VS21	CuO	0.0398	0.0400	-0.0002	-0.6%
SB6VS21	Fe_2O_3	8.7462	8.9170	-0.1708	-1.9%
SB6VS21	K_2O	0.3099	0.0320	0.2779	868.4%
SB6VS21	La_2O_3	0.0272	0.0390	-0.0118	-30.4%
SB6VS21	Li_2O	4.8548	4.9600	-0.1052	-2.1%
SB6VS21	MgO	0.2861	0.2900	-0.0039	-1.4%
SB6VS21	MnO	2.4565	2.5370	-0.0805	-3.2%
SB6VS21	Na_2O	14.8617	14.7600	0.1017	0.7%
SB6VS21	NiO	0.9849	1.0880	-0.1031	-9.5%
SB6VS21	P_2O_5	0.0963	0.1650	-0.0687	-41.6%
SB6VS21	PbO	0.0390	0.0110	0.0280	254.3%
SB6VS21	SiO_2	49.5783	47.9190	1.6593	3.5%
SB6VS21	SO_4	1.1122	0.5130	0.5992	116.8%
SB6VS21	ThO_2	1.0662	1.2000	-0.1338	-11.1%
SB6VS21	TiO_2	0.3494	0.3500	-0.0006	-0.2%
SB6VS21	U_3O_8	1.7511	1.7780	-0.0269	-1.5%
SB6VS21	ZnO	0.0251	0.0260	-0.0009	-3.4%
SB6VS21	ZrO_2	0.0870	0.0860	0.0010	1.2%
SB6VS21	Sum	102.3897	100.0020	2.3877	2.4%
SB6VS22	Al_2O_3	10.5245	10.1450	0.3795	3.7%
SB6VS22	B_2O_3	4.6206	4.8000	-0.1794	-3.7%
SB6VS22	BaO	0.0497	0.0520	-0.0023	-4.3%
SB6VS22	CaO	0.5058	0.5490	-0.0432	-7.9%
SB6VS22	Ce_2O_3	0.0761	0.0810	-0.0049	-6.0%
SB6VS22	Cr_2O_3	0.0429	0.0470	-0.0041	-8.7%
SB6VS22	CuO	0.0406	0.0420	-0.0014	-3.3%
SB6VS22	Fe_2O_3	9.1965	9.3860	-0.1895	-2.0%
SB6VS22	K_2O	0.2259	0.0340	0.1919	564.3%
SB6VS22	La_2O_3	0.0311	0.0410	-0.0099	-24.1%

Table C5. Average Measured Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID for Thorium Glasses

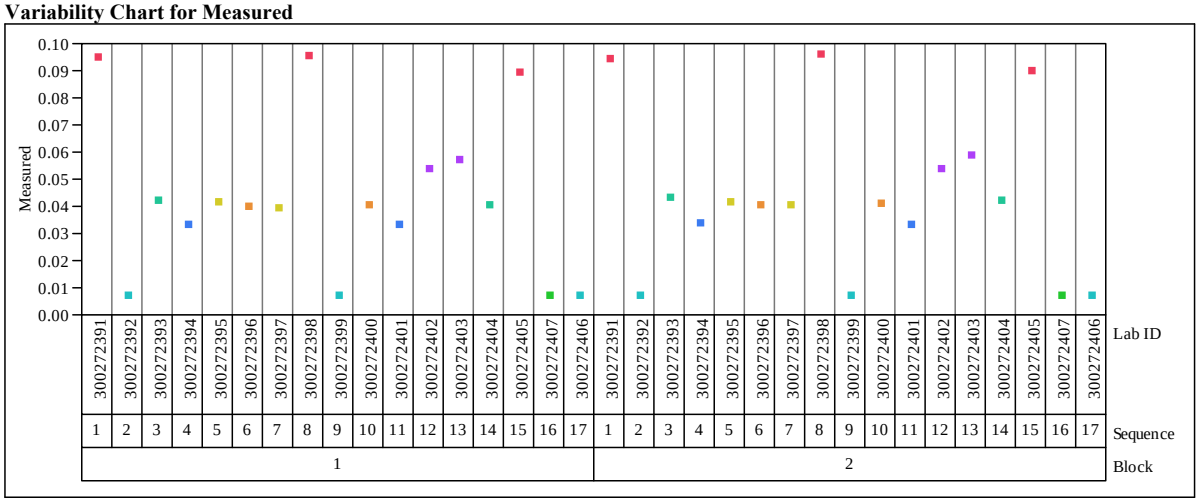
Glass ID	Oxide	Measured (wt%)	Targeted (wt%)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
SB6VS22	Li_2O	4.7149	4.8000	-0.0851	-1.8%
SB6VS22	MgO	0.3031	0.3050	-0.0019	-0.6%
SB6VS22	MnO	2.6276	2.6710	-0.0434	-1.6%
SB6VS22	Na_2O	13.4025	15.1160	-1.7135	-11.3%
SB6VS22	NiO	1.0390	1.1450	-0.1060	-9.3%
SB6VS22	P_2O_5	0.0966	0.1740	-0.0774	-44.5%
SB6VS22	PbO	0.0391	0.0110	0.0281	255.5%
SB6VS22	SiO_2	47.9203	46.4410	1.4793	3.2%
SB6VS22	SO_4	1.1152	0.5400	0.5752	106.5%
SB6VS22	ThO_2	1.1248	1.2630	-0.1382	-10.9%
SB6VS22	TiO_2	0.3715	0.3680	0.0035	1.0%
SB6VS22	U_3O_8	1.8130	1.8720	-0.0590	-3.2%
SB6VS22	ZnO	0.0269	0.0270	-0.0001	-0.3%
SB6VS22	ZrO_2	0.0801	0.0900	-0.0099	-11.0%
SB6VS22	Sum	100.1808	100.0000	0.1808	0.2%
U-std	Al_2O_3	4.0813	4.1000	-0.0187	-0.5%
U-std	B_2O_3	8.8762	9.2090	-0.3328	-3.6%
U-std	BaO	0.0065	0.0000	0.0065	
U-std	CaO	1.3094	1.3010	0.0084	0.6%
U-std	Ce_2O_3	0.0757	0.0000	0.0757	
U-std	Cr_2O_3	0.2429	0.0000	0.2429	
U-std	CuO	0.0088	0.0000	0.0088	
U-std	Fe_2O_3	13.3296	13.1960	0.1336	1.0%
U-std	K_2O	3.1279	2.9990	0.1289	4.3%
U-std	La_2O_3	0.0063	0.0000	0.0063	
U-std	Li_2O	2.9746	3.0570	-0.0824	-2.7%
U-std	MgO	1.2130	1.2100	0.0030	0.3%
U-std	MnO	2.7481	2.8920	-0.1439	-5.0%
U-std	Na_2O	11.7793	11.7950	-0.0157	-0.1%
U-std	NiO	1.0324	1.1200	-0.0876	-7.8%
U-std	P_2O_5	0.0961	0.0000	0.0961	
U-std	PbO	0.0389	0.0000	0.0389	
U-std	SiO_2	47.0646	45.3530	1.7116	3.8%
U-std	SO_4	1.1095	0.0000	1.1095	
U-std	ThO_2	0.1328	0.0000	0.1328	
U-std	TiO_2	0.9838	1.0490	-0.0652	-6.2%
U-std	U_3O_8	2.3545	2.4060	-0.0515	-2.1%
U-std	ZnO	0.0093	0.0000	0.0093	
U-std	ZrO_2	0.0029	0.0000	0.0029	
U-std	Sum	102.7279	99.6870	3.0409	3.1%

Exhibit C1. Measurements of Thorium Glasses in Analytical Sequence for Samples by Prep Method by Oxide

Prep Method=MA, Oxide=Al2O3 (wt%)
Variability Chart for Measured



Prep Method=MA, Oxide=BaO (wt%)
Variability Chart for Measured



Prep Method=MA, Oxide=CaO (wt%)
Variability Chart for Measured

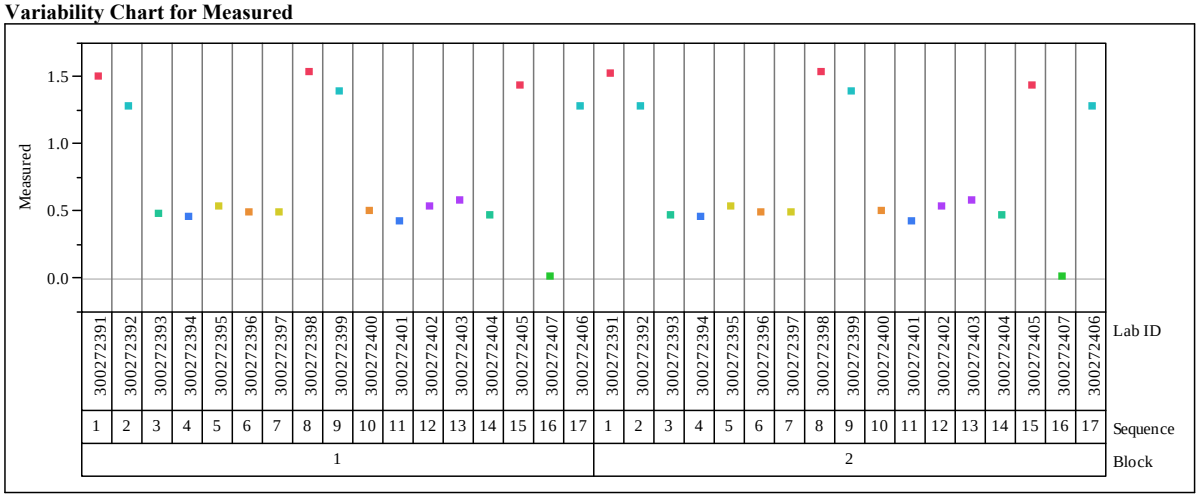
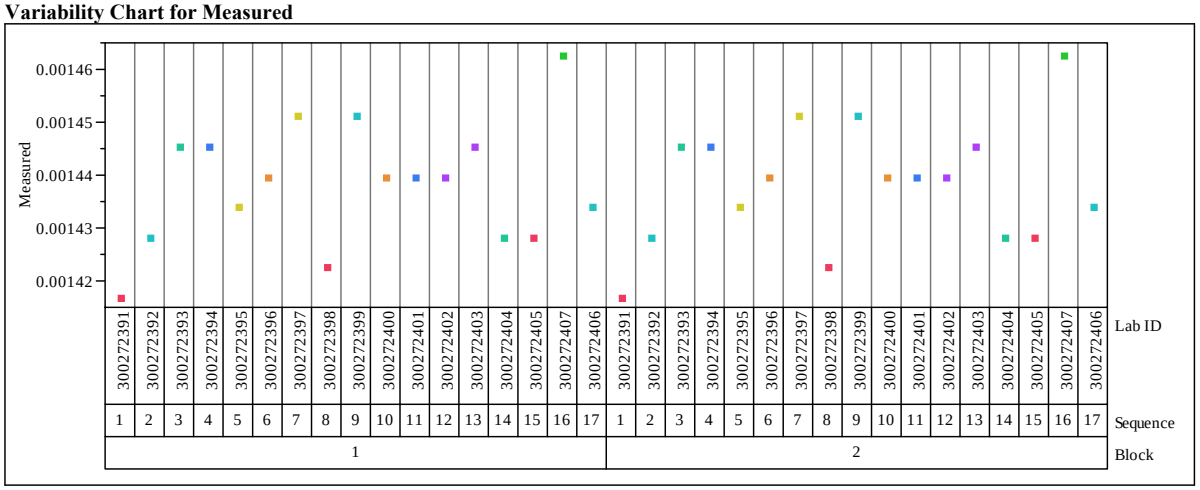


Exhibit C1. Measurements of Thorium Glasses in Analytical Sequence for Samples by Prep Method by Oxide

Prep Method=MA, Oxide=CdO (wt%)
Variability Chart for Measured



Prep Method=MA, Oxide=Ce2O3 (wt%)
Variability Chart for Measured

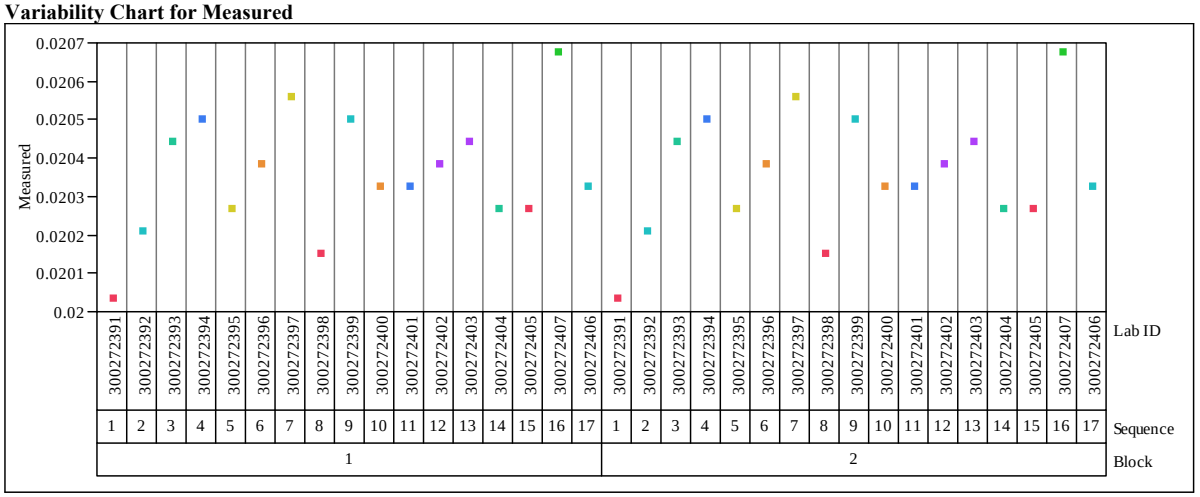
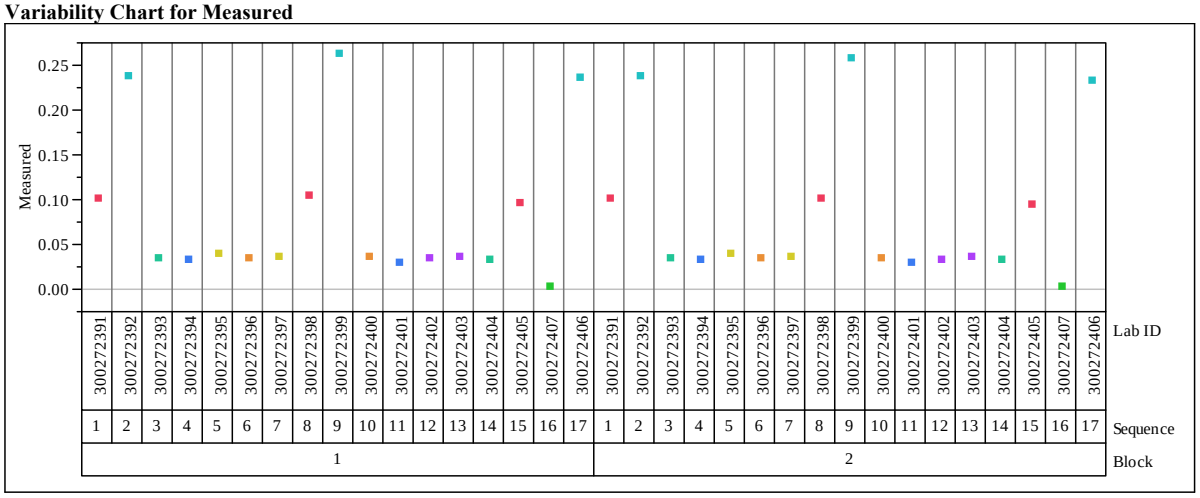
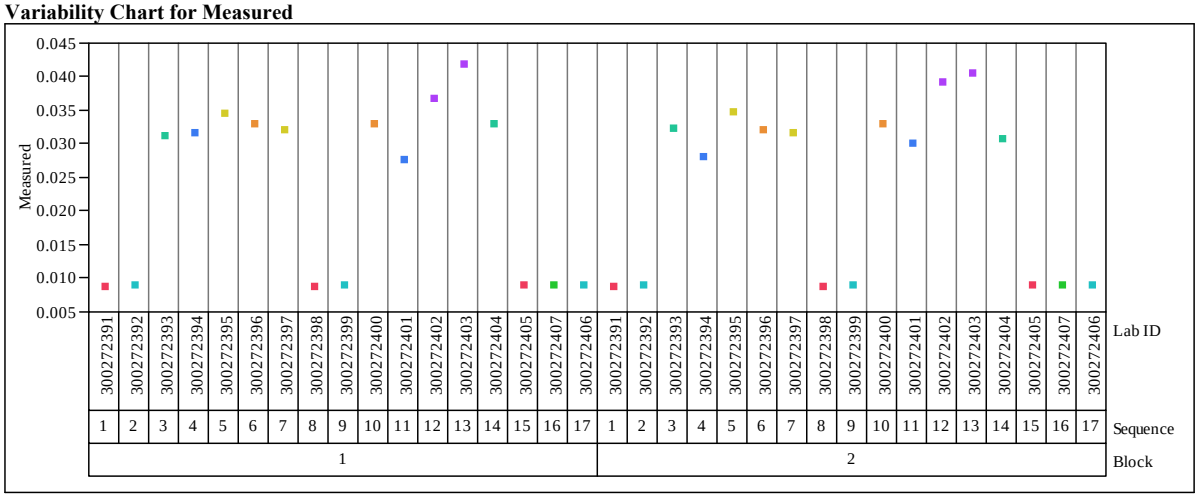


Exhibit C1. Measurements of Thorium Glasses in Analytical Sequence for Samples by Prep Method by Oxide

Prep Method=MA, Oxide=Cr2O3 (wt%)
Variability Chart for Measured



Prep Method=MA, Oxide=CuO (wt%)
Variability Chart for Measured



Prep Method=MA, Oxide=Fe2O3 (wt%)
Variability Chart for Measured

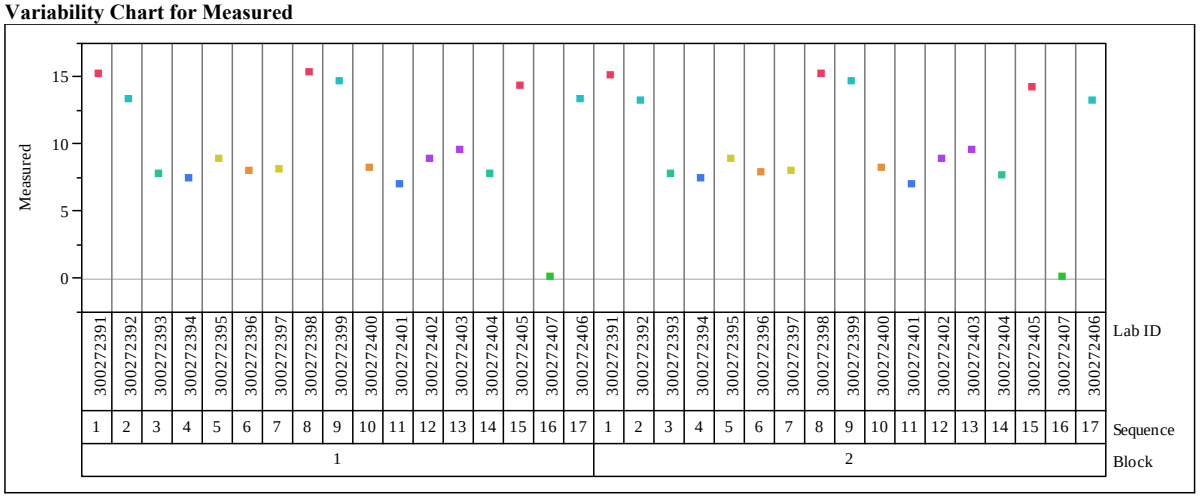
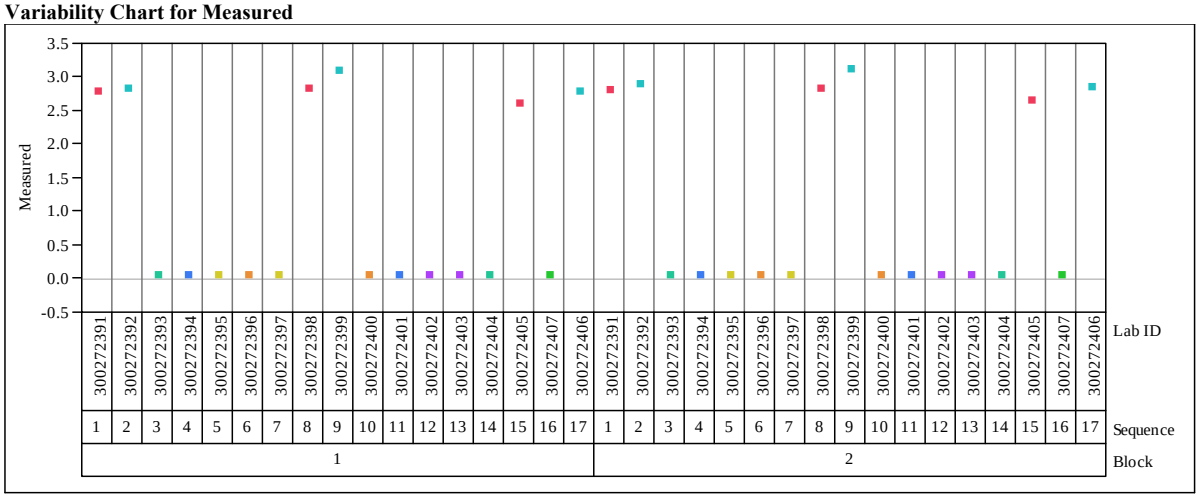


Exhibit C1. Measurements of Thorium Glasses in Analytical Sequence for Samples by Prep Method by Oxide

Prep Method=MA, Oxide=K2O (wt%)
Variability Chart for Measured



Prep Method=MA, Oxide=La2O3 (wt%)
Variability Chart for Measured

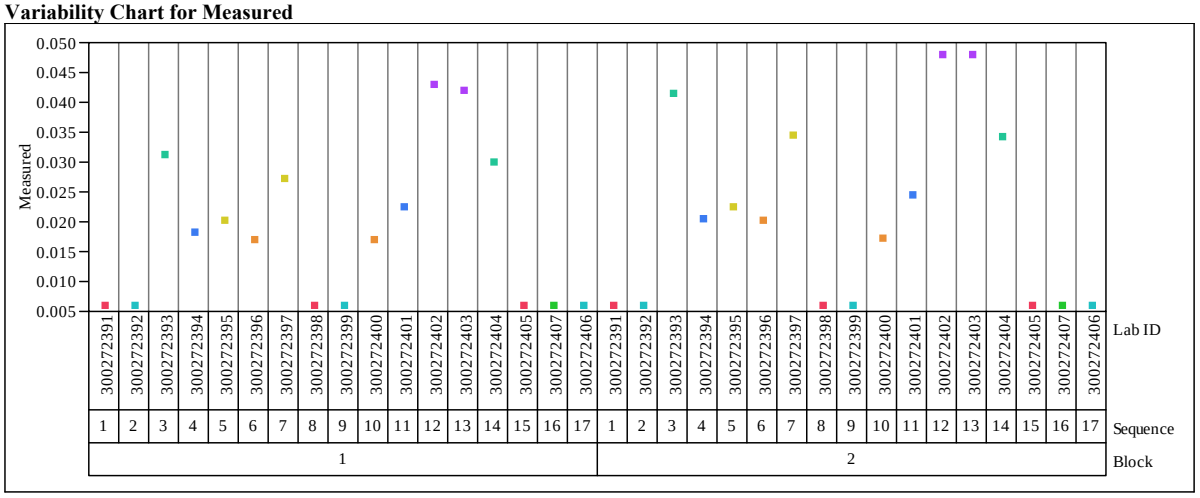
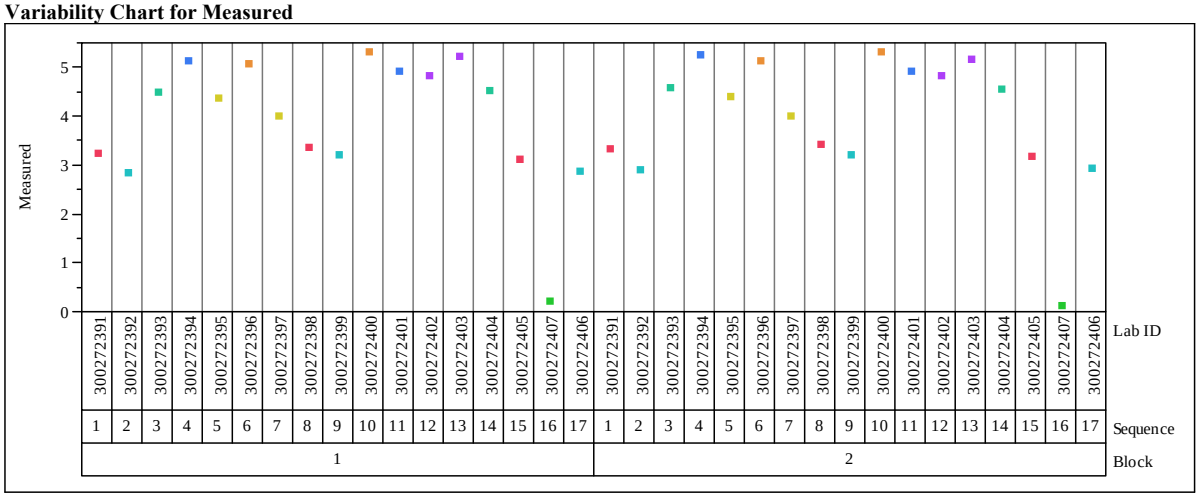
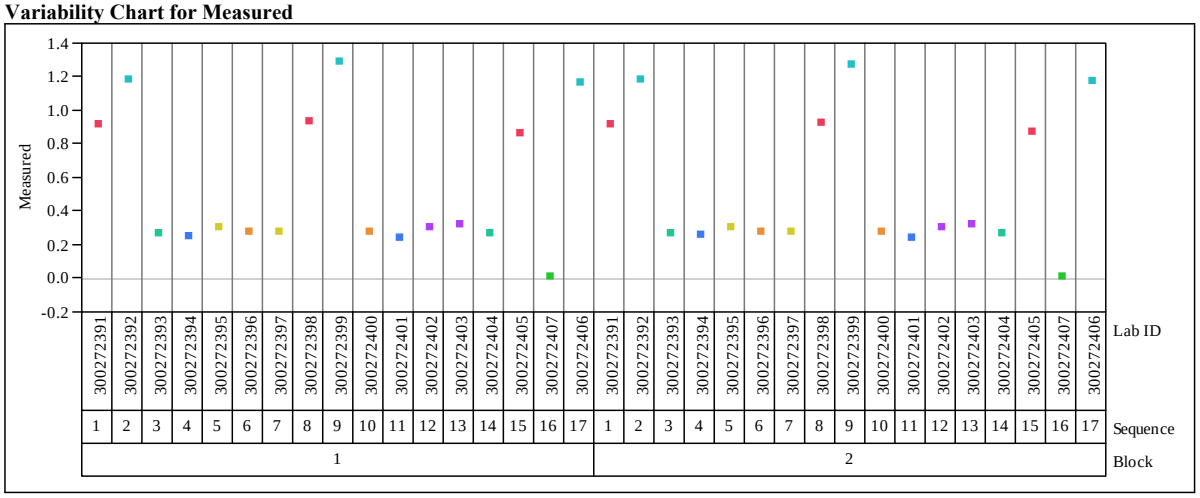


Exhibit C1. Measurements of Thorium Glasses in Analytical Sequence for Samples by Prep Method by Oxide

Prep Method=MA, Oxide=Li2O (wt%)
Variability Chart for Measured



Prep Method=MA, Oxide=MgO (wt%)
Variability Chart for Measured



Prep Method=MA, Oxide=MnO (wt%)
Variability Chart for Measured

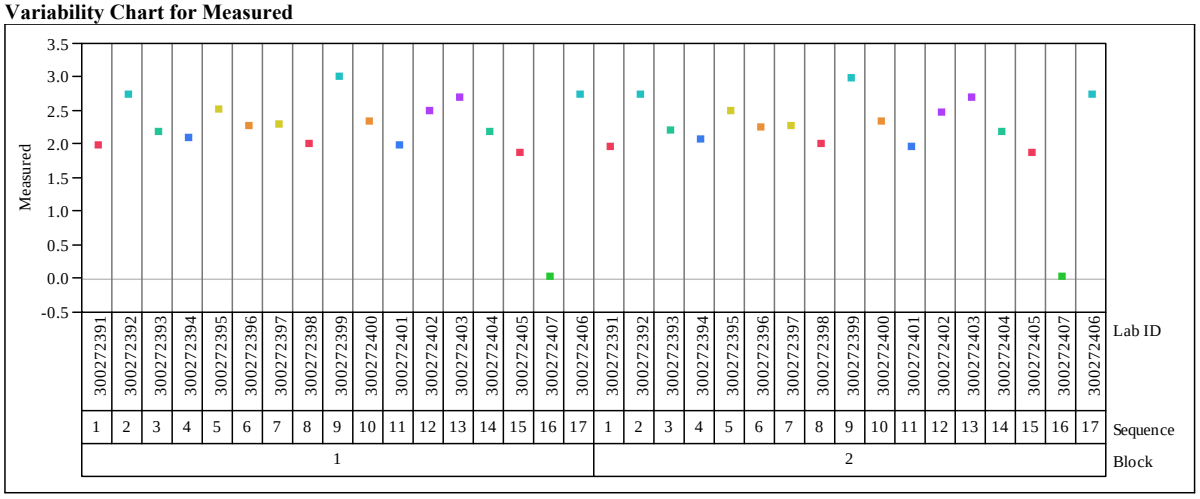
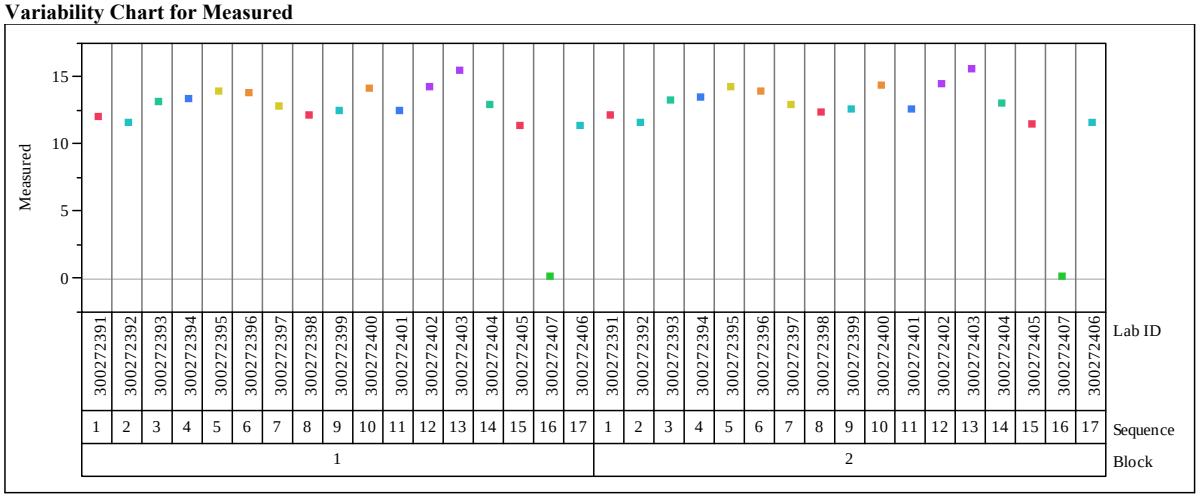


Exhibit C1. Measurements of Thorium Glasses in Analytical Sequence for Samples by Prep Method by Oxide

Prep Method=MA, Oxide=Na2O (wt%)
Variability Chart for Measured



Prep Method=MA, Oxide=NiO (wt%)
Variability Chart for Measured

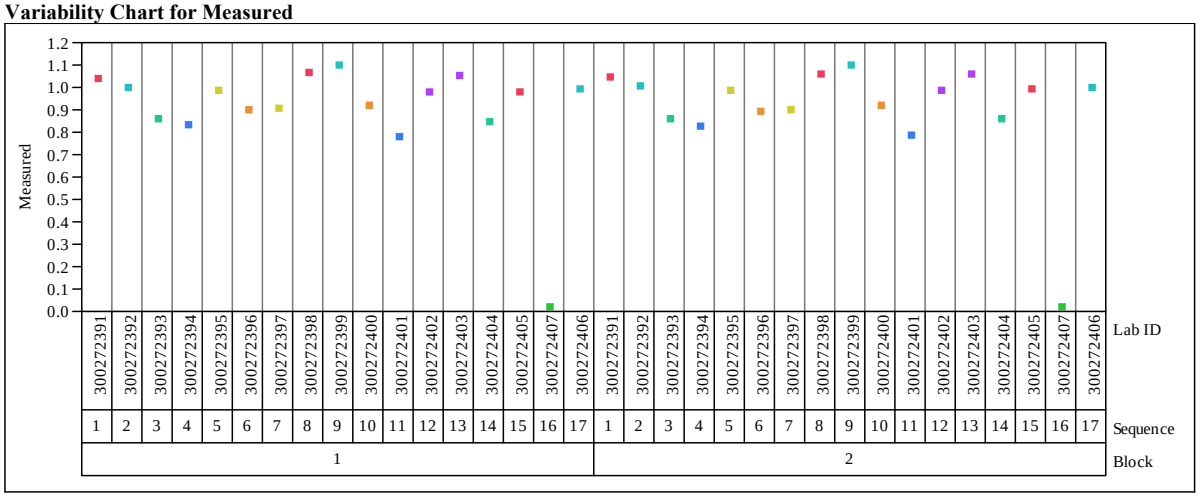
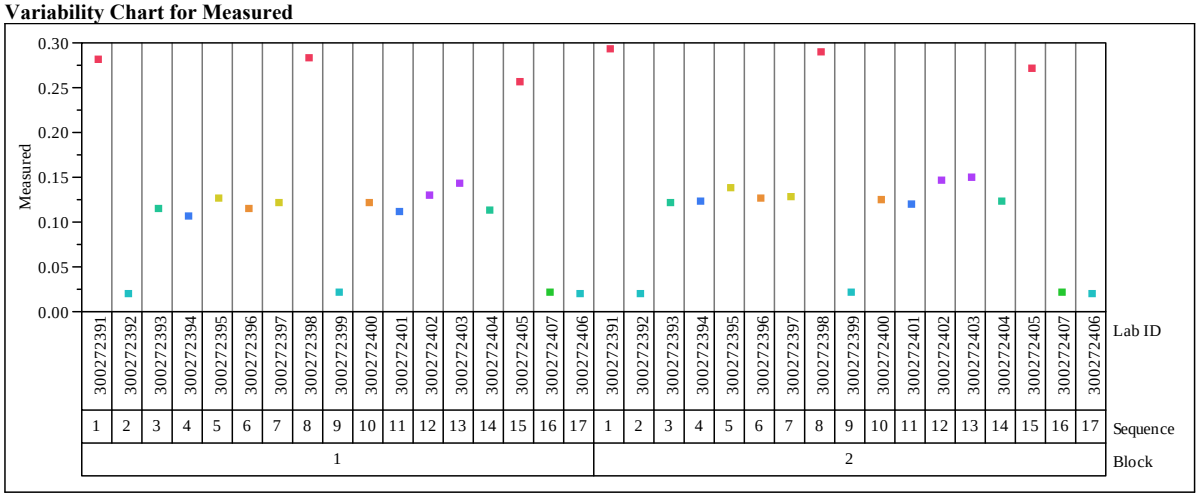
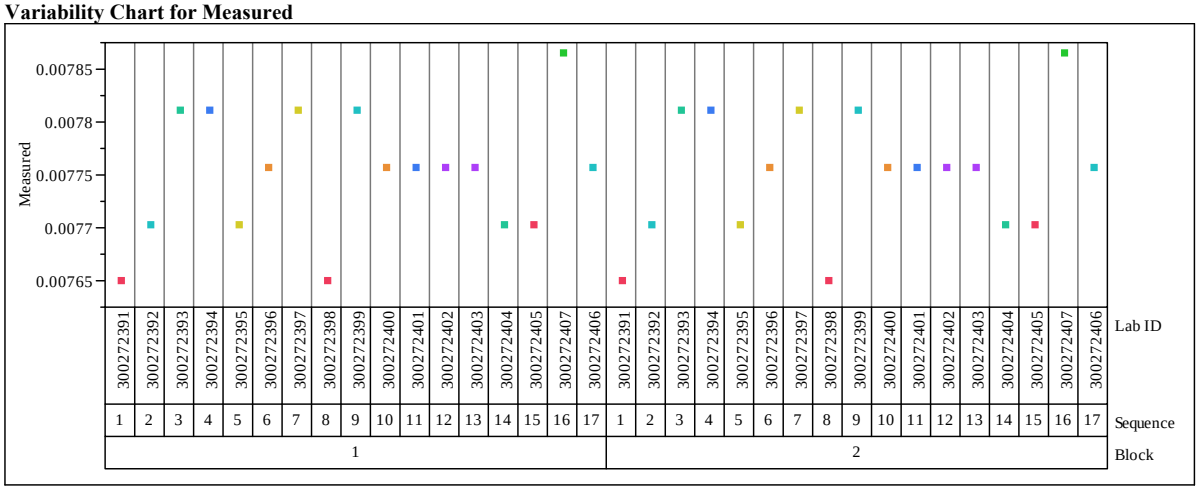


Exhibit C1. Measurements of Thorium Glasses in Analytical Sequence for Samples by Prep Method by Oxide

Prep Method=MA, Oxide=P2O5 (wt%)
Variability Chart for Measured



Prep Method=MA, Oxide=PbO (wt%)
Variability Chart for Measured



Prep Method=MA, Oxide=SiO2 (wt%)
Variability Chart for Measured

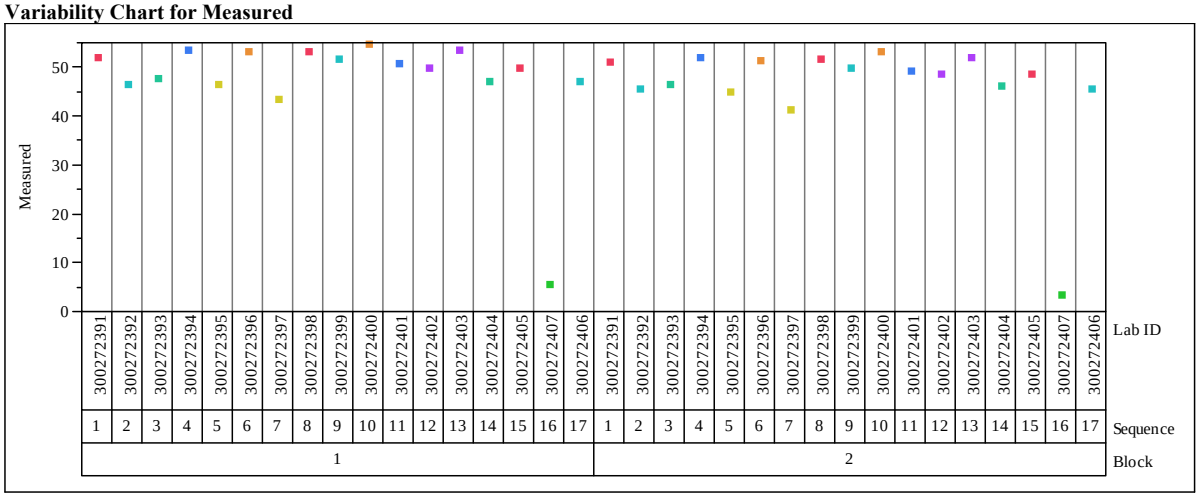
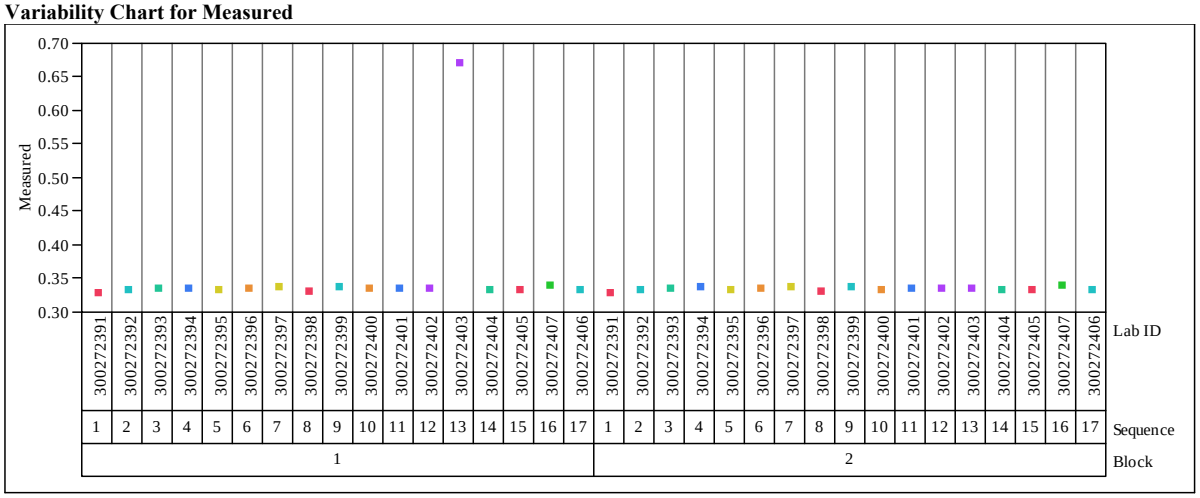


Exhibit C1. Measurements of Thorium Glasses in Analytical Sequence for Samples by Prep Method by Oxide

Prep Method=MA, Oxide=SO4 (wt%)
Variability Chart for Measured



Prep Method=MA, Oxide=ThO2 (wt%)
Variability Chart for Measured

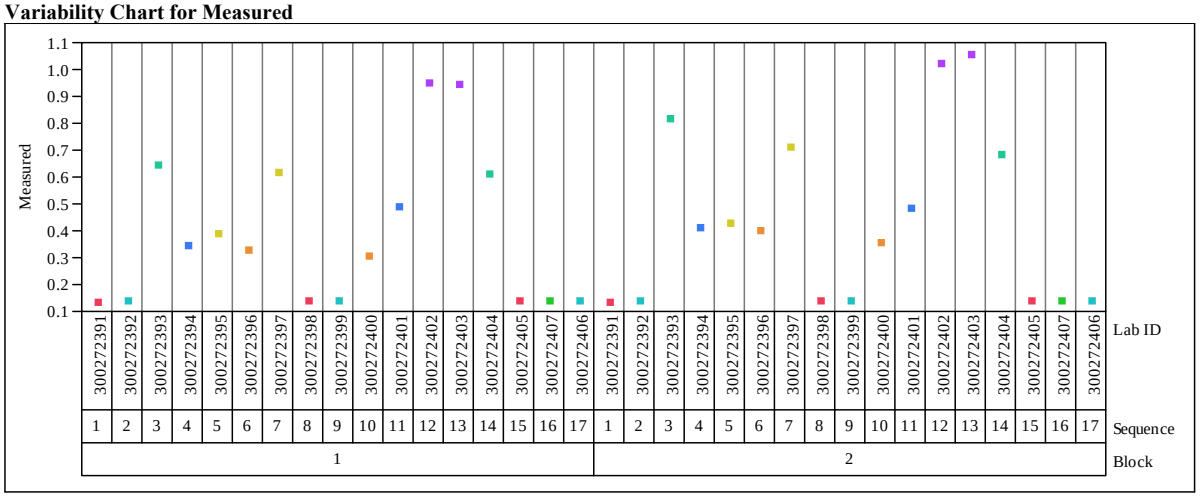
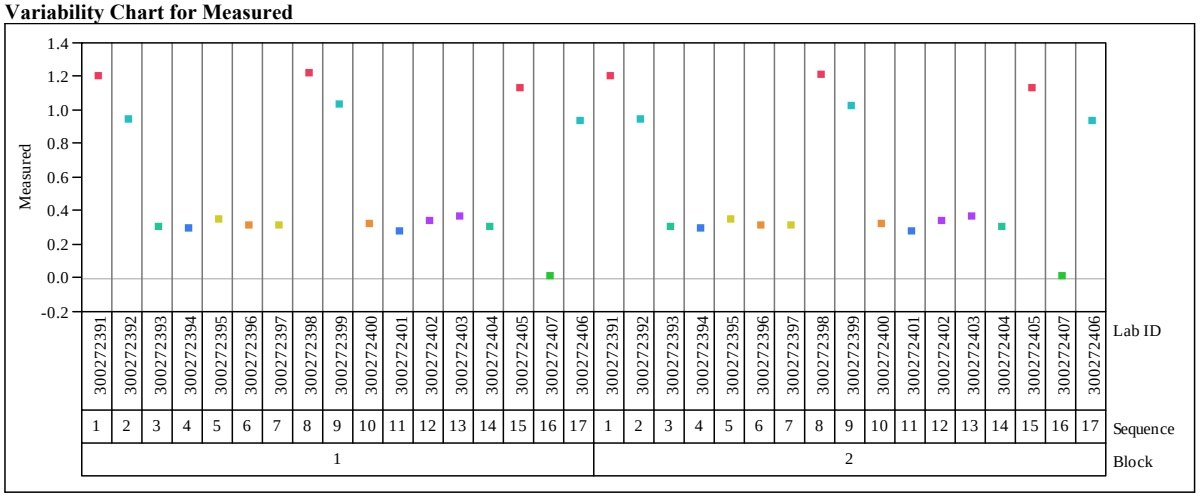
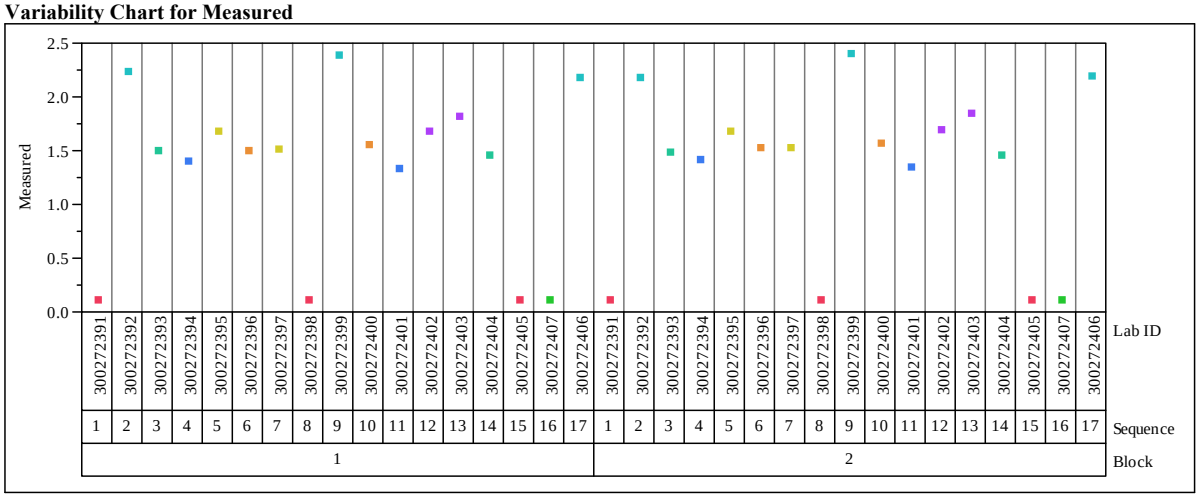


Exhibit C1. Measurements of Thorium Glasses in Analytical Sequence for Samples by Prep Method by Oxide

Prep Method=MA, Oxide=TiO2 (wt%)
Variability Chart for Measured



Prep Method=MA, Oxide=U3O8 (wt%)
Variability Chart for Measured



Prep Method=MA, Oxide=ZnO (wt%)
Variability Chart for Measured

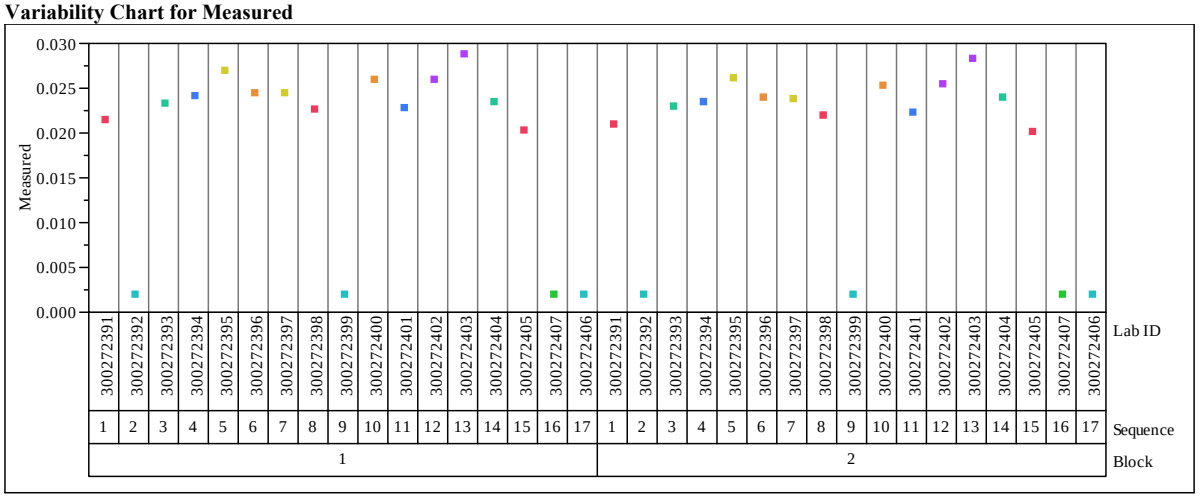
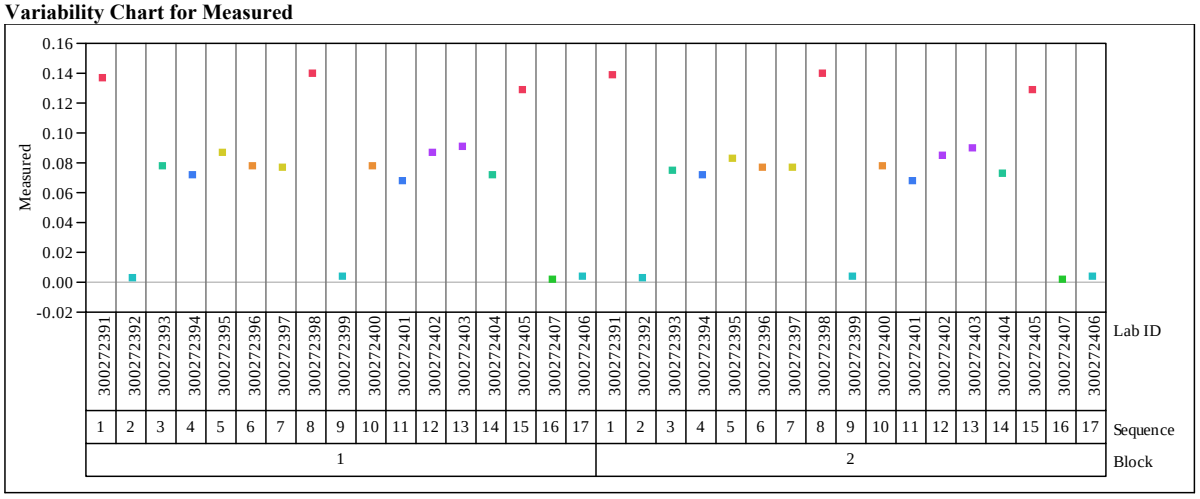


Exhibit C1. Measurements of Thorium Glasses in Analytical Sequence for Samples by Prep Method by Oxide

Prep Method=MA, Oxide=ZrO2 (wt%)
Variability Chart for Measured



Prep Method=PF, Oxide=Al2O3 (wt%)
Variability Chart for Measured

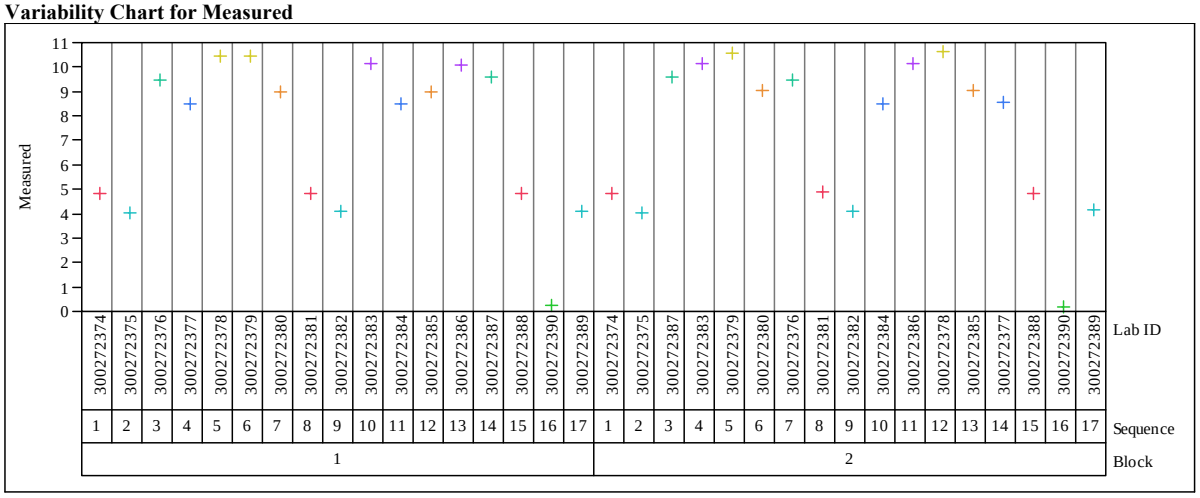
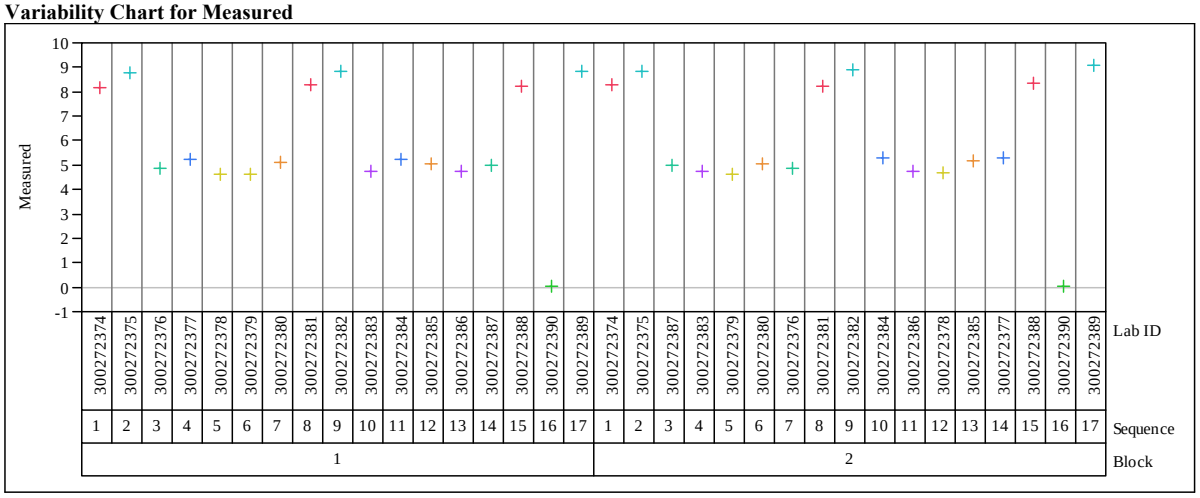
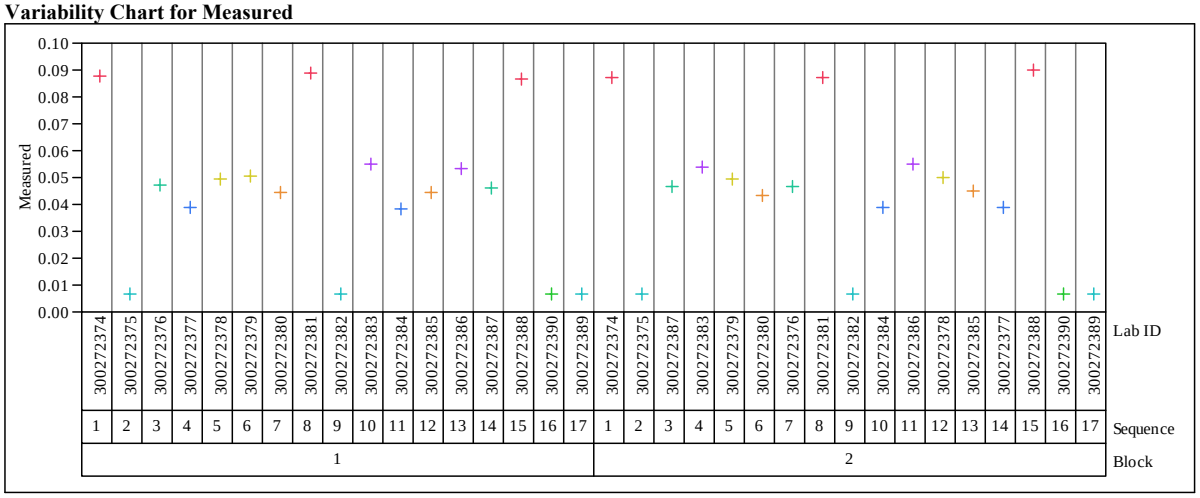


Exhibit C1. Measurements of Thorium Glasses in Analytical Sequence for Samples by Prep Method by Oxide

Prep Method=PF, Oxide=B2O3 (wt%)
Variability Chart for Measured



Prep Method=PF, Oxide=BaO (wt%)
Variability Chart for Measured



Prep Method=PF, Oxide=CaO (wt%)
Variability Chart for Measured

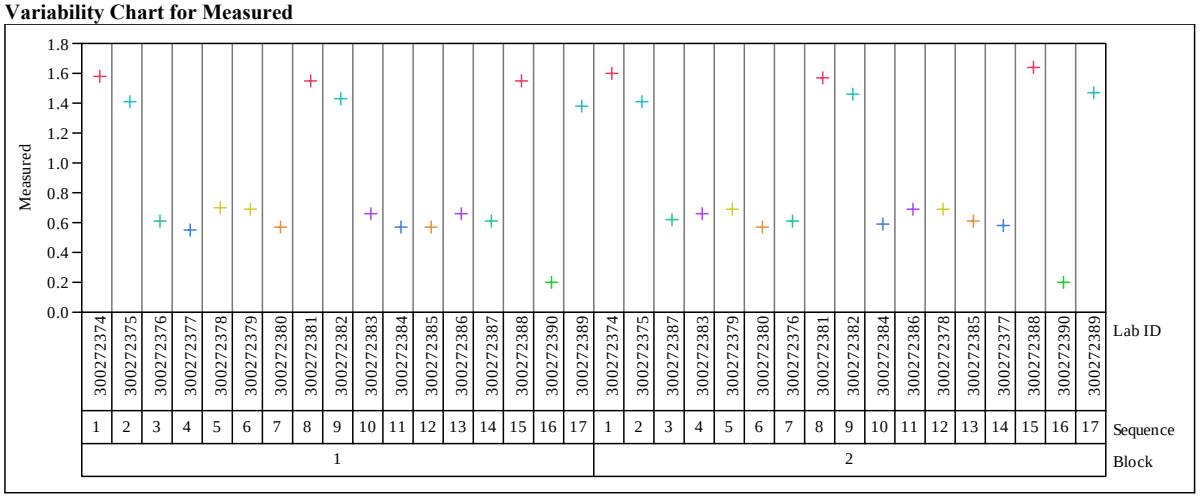
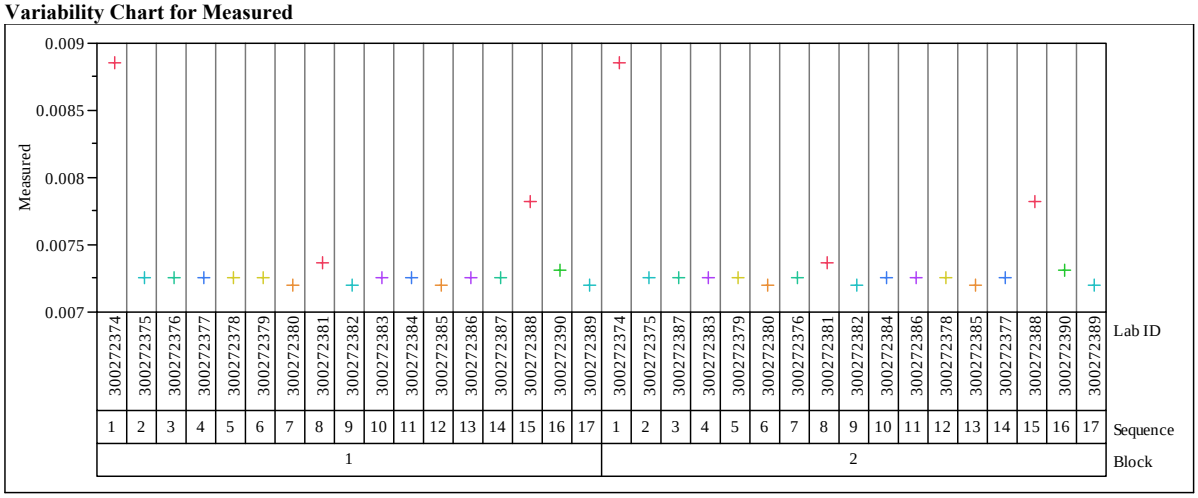


Exhibit C1. Measurements of Thorium Glasses in Analytical Sequence for Samples by Prep Method by Oxide

Prep Method=PF, Oxide=CdO (wt%)
Variability Chart for Measured



Prep Method=PF, Oxide=Ce2O3 (wt%)
Variability Chart for Measured

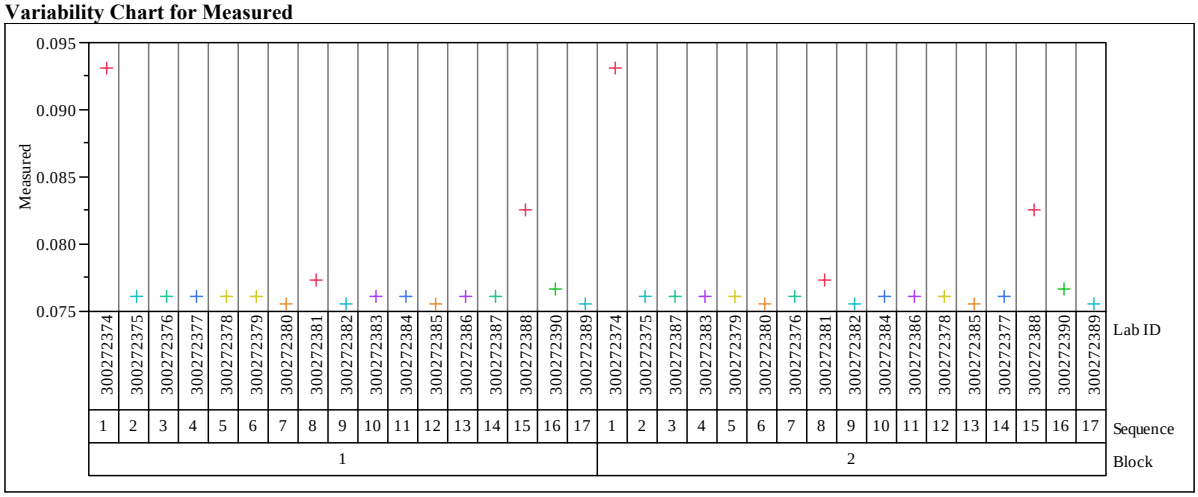
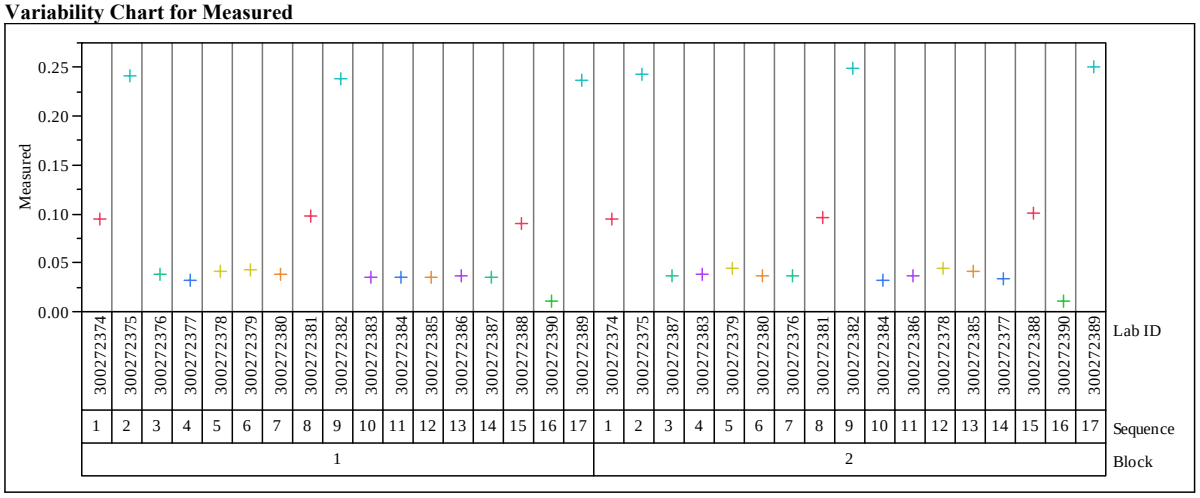
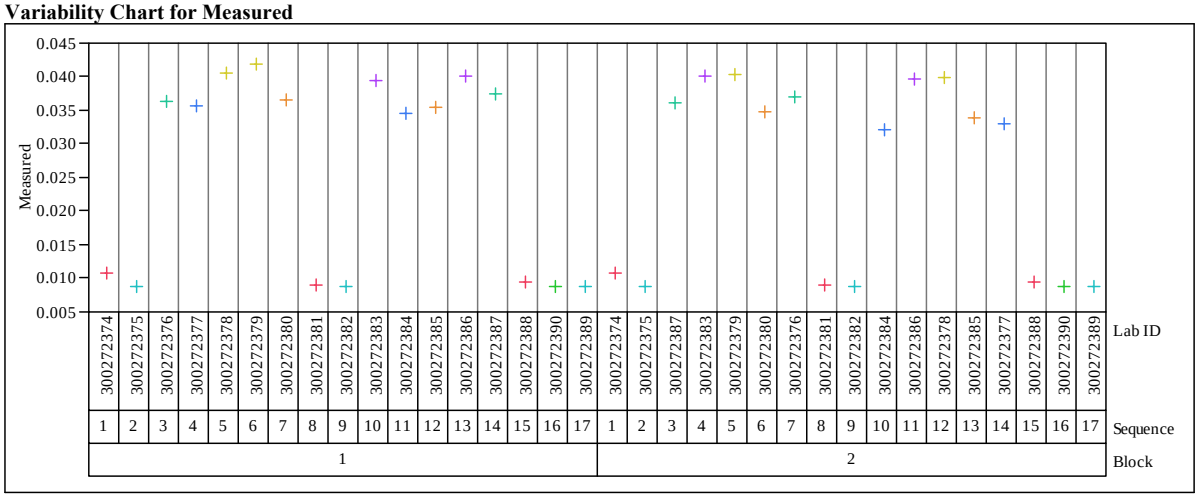


Exhibit C1. Measurements of Thorium Glasses in Analytical Sequence for Samples by Prep Method by Oxide

Prep Method=PF, Oxide=Cr2O3 (wt%)
Variability Chart for Measured



Prep Method=PF, Oxide=CuO (wt%)
Variability Chart for Measured



Prep Method=PF, Oxide=Fe2O3 (wt%)
Variability Chart for Measured

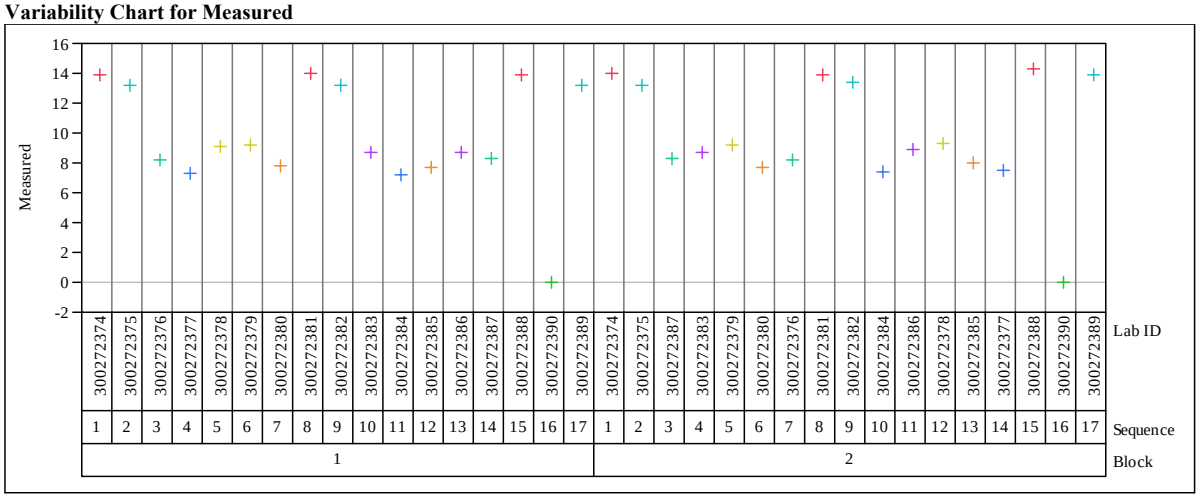
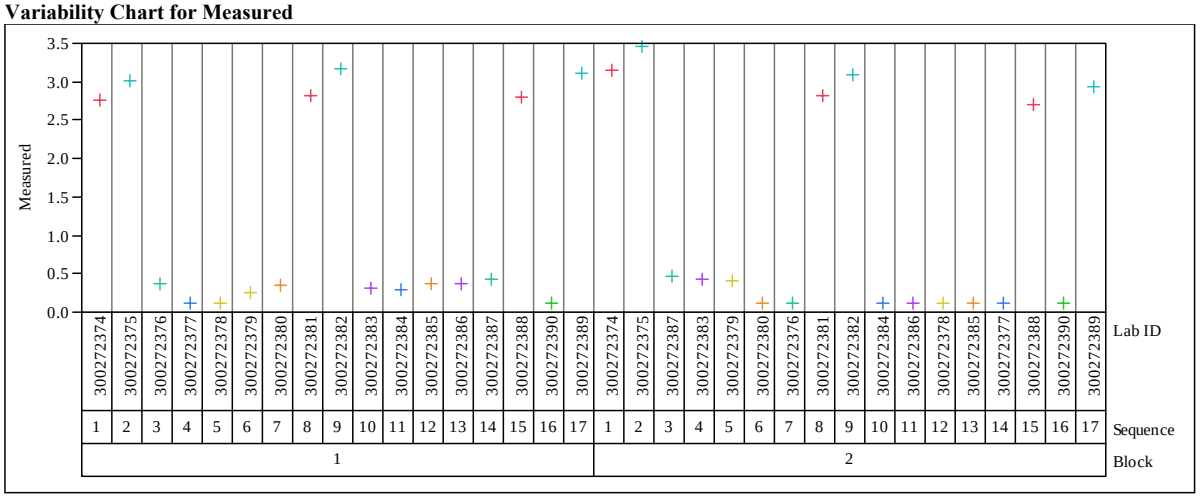


Exhibit C1. Measurements of Thorium Glasses in Analytical Sequence for Samples by Prep Method by Oxide

Prep Method=PF, Oxide=K2O (wt%)
Variability Chart for Measured



Prep Method=PF, Oxide=La2O3 (wt%)
Variability Chart for Measured

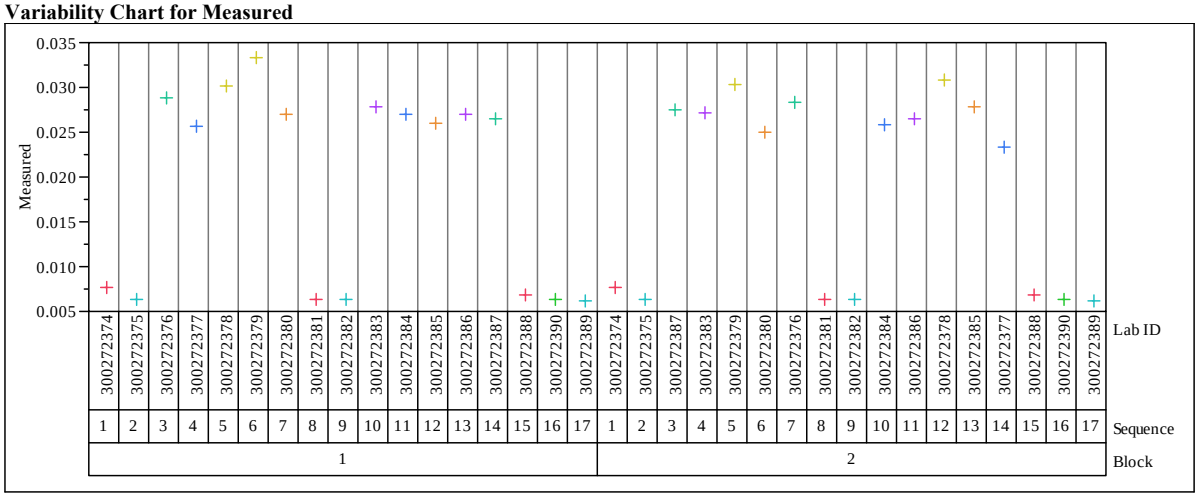
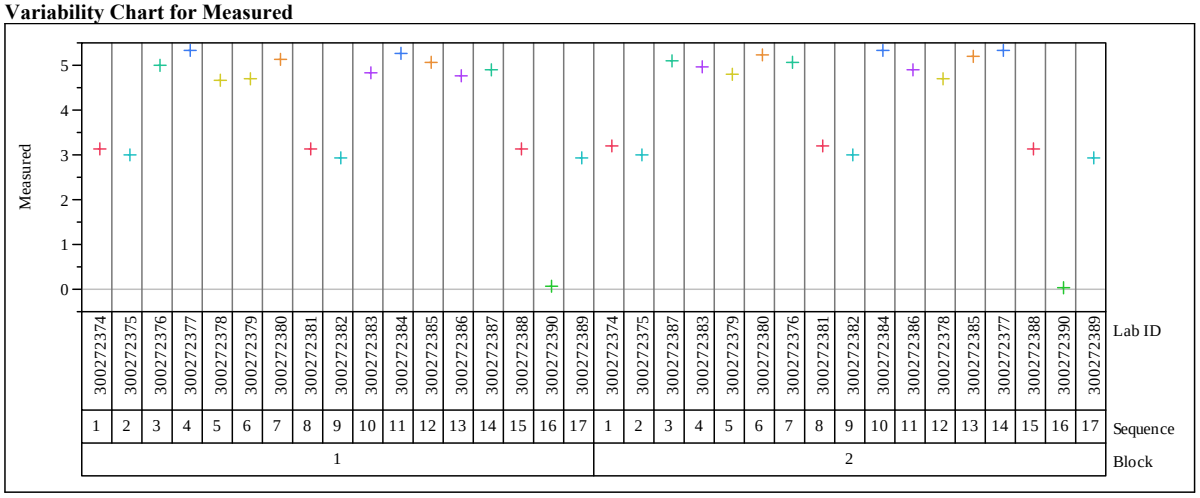
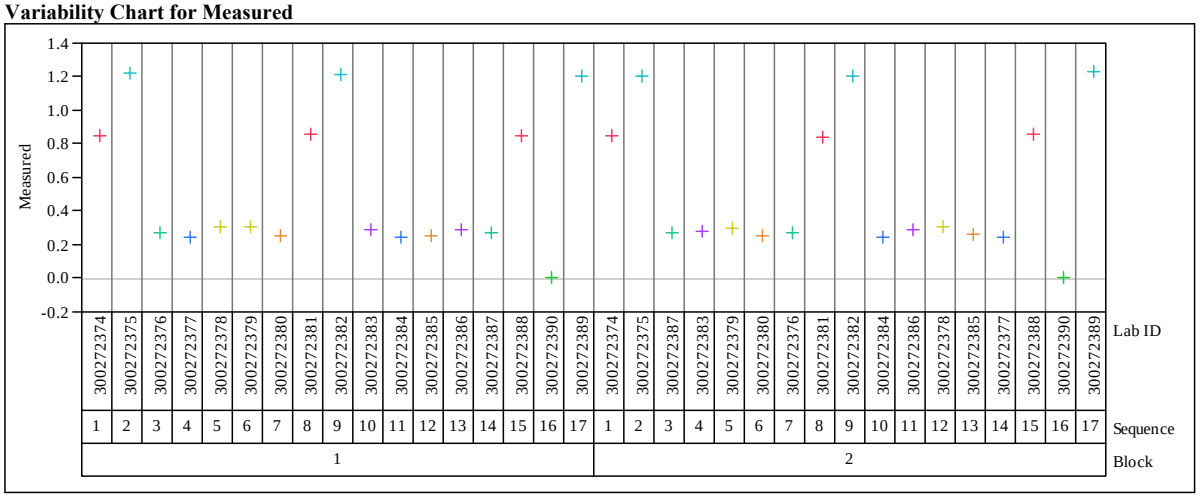


Exhibit C1. Measurements of Thorium Glasses in Analytical Sequence for Samples by Prep Method by Oxide

Prep Method=PF, Oxide=Li2O (wt%)
Variability Chart for Measured



Prep Method=PF, Oxide=MgO (wt%)
Variability Chart for Measured



Prep Method=PF, Oxide=MnO (wt%)
Variability Chart for Measured

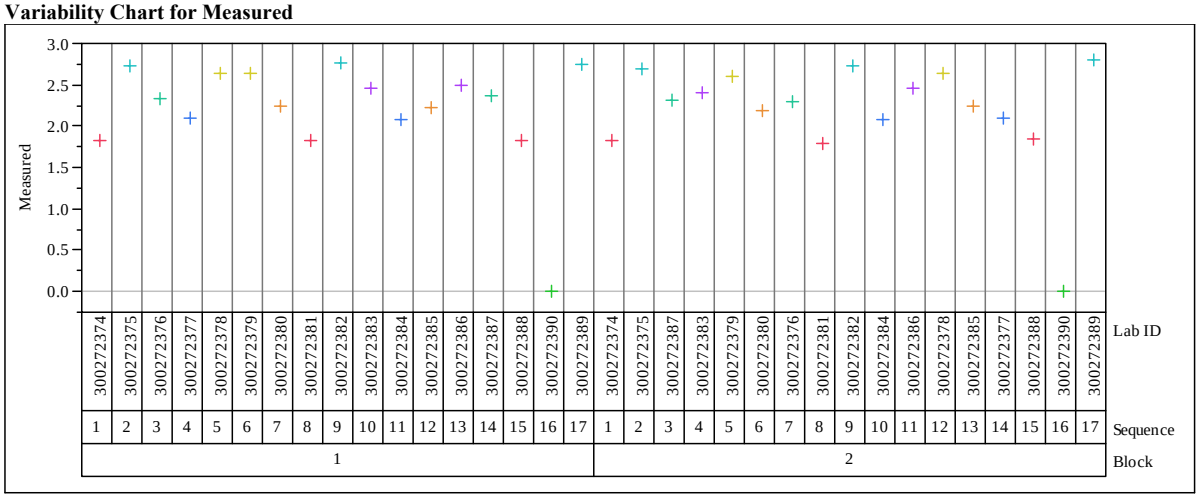
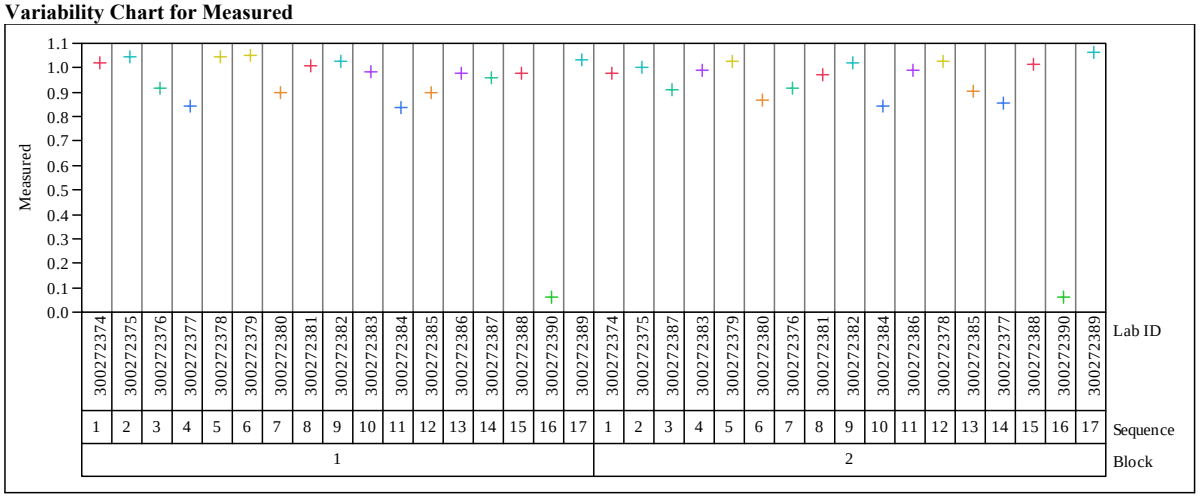


Exhibit C1. Measurements of Thorium Glasses in Analytical Sequence for Samples by Prep Method by Oxide

Prep Method=PF, Oxide=NiO (wt%)
Variability Chart for Measured



Prep Method=PF, Oxide=P2O5 (wt%)
Variability Chart for Measured

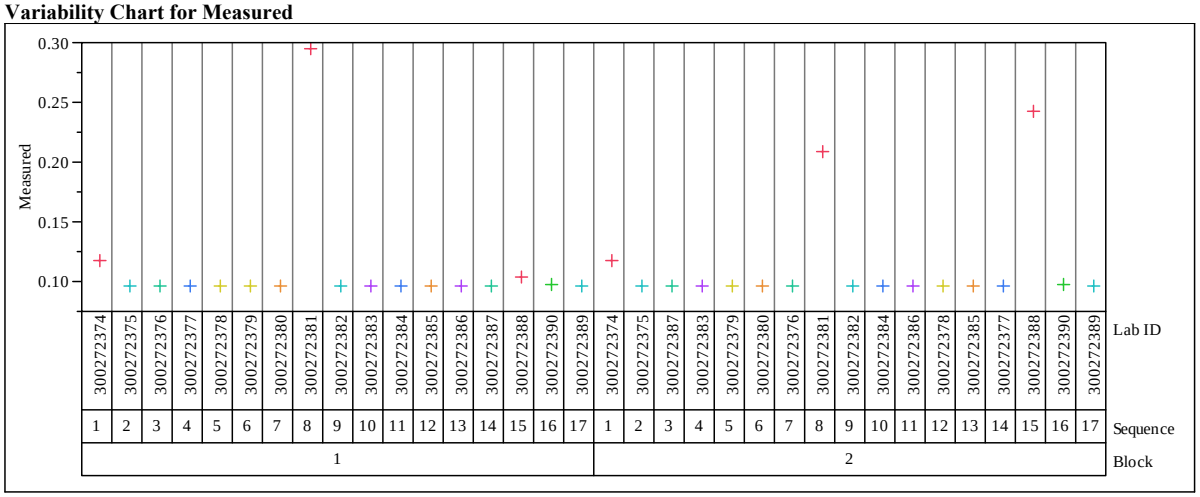
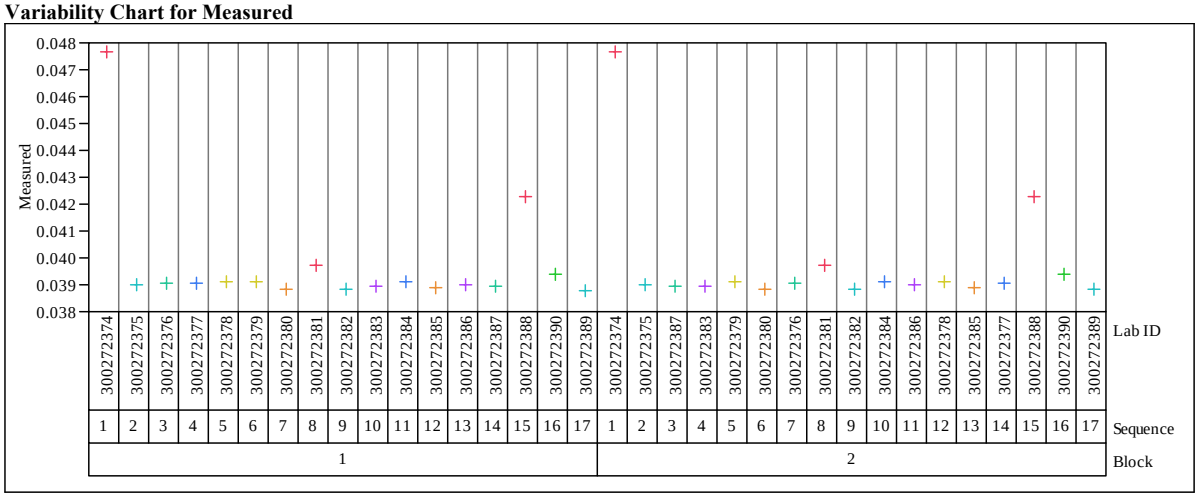
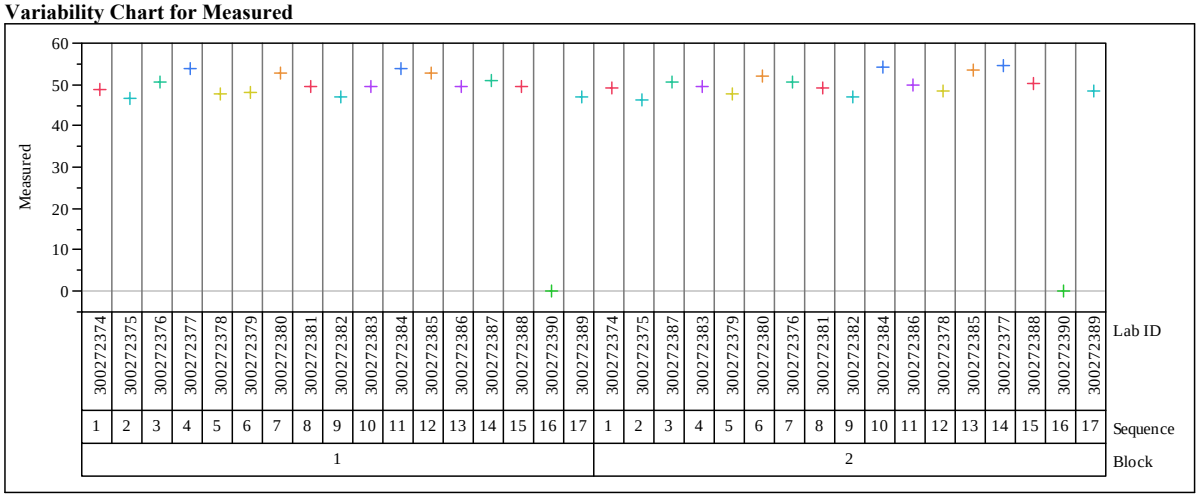


Exhibit C1. Measurements of Thorium Glasses in Analytical Sequence for Samples by Prep Method by Oxide

Prep Method=PF, Oxide=PbO (wt%)
Variability Chart for Measured



Prep Method=PF, Oxide=SiO2 (wt%)
Variability Chart for Measured



Prep Method=PF, Oxide=SO4 (wt%)
Variability Chart for Measured

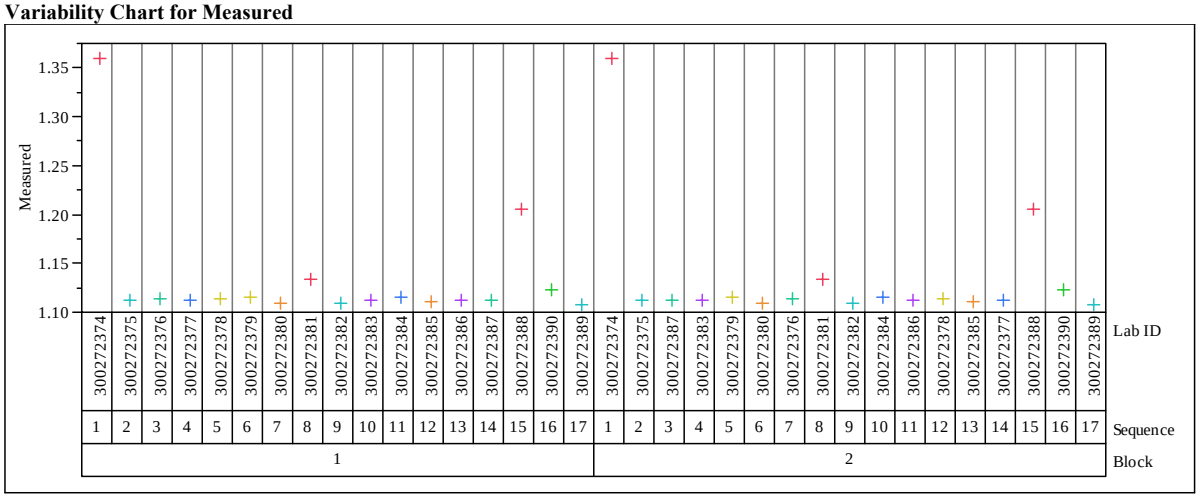
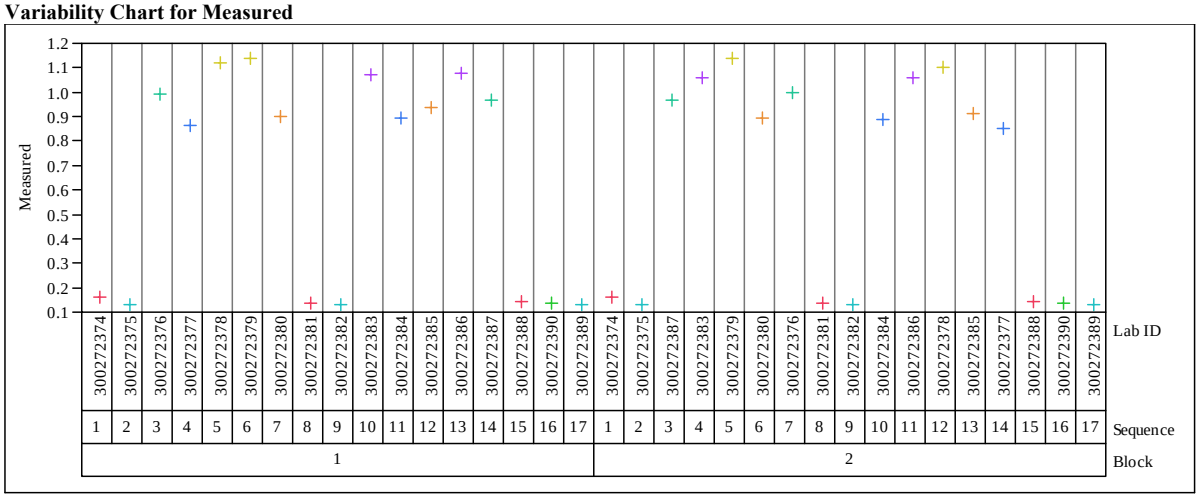


Exhibit C1. Measurements of Thorium Glasses in Analytical Sequence for Samples by Prep Method by Oxide

Prep Method=PF, Oxide=ThO2 (wt%)
Variability Chart for Measured



Prep Method=PF, Oxide=TiO2 (wt%)
Variability Chart for Measured

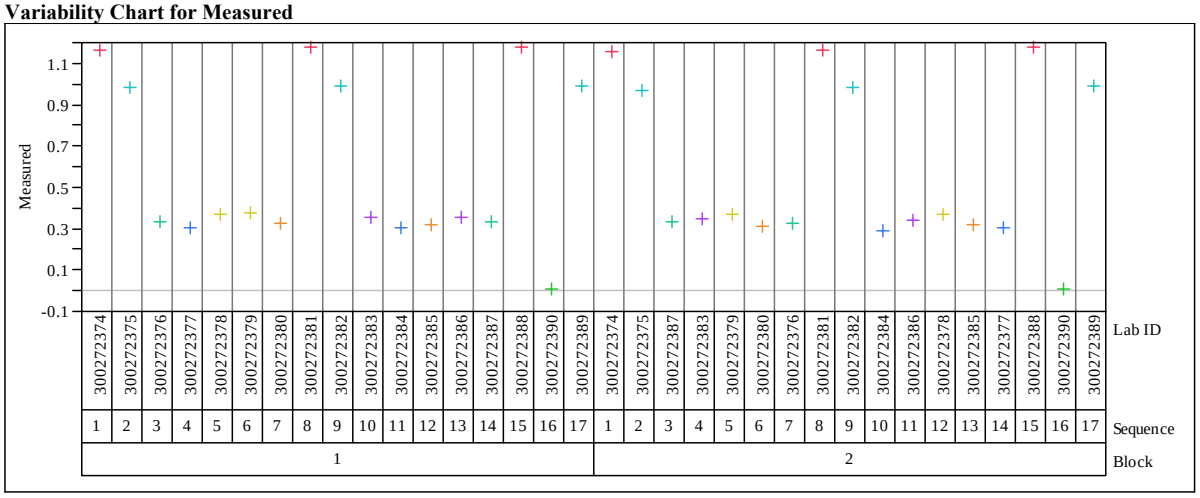
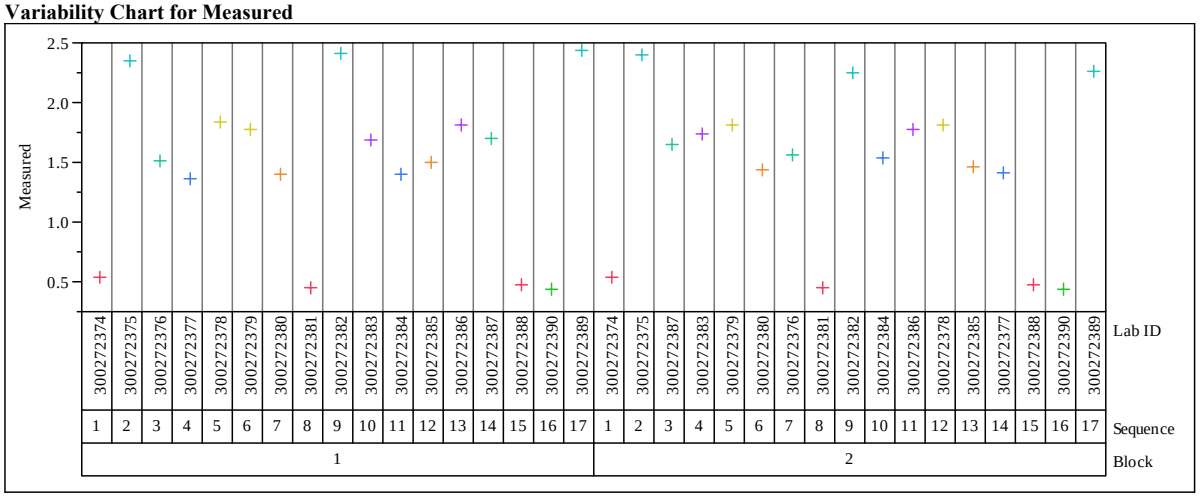


Exhibit C1. Measurements of Thorium Glasses in Analytical Sequence for Samples by Prep Method by Oxide

Prep Method=PF, Oxide=U3O8 (wt%)
Variability Chart for Measured



Prep Method=PF, Oxide=ZnO (wt%)
Variability Chart for Measured

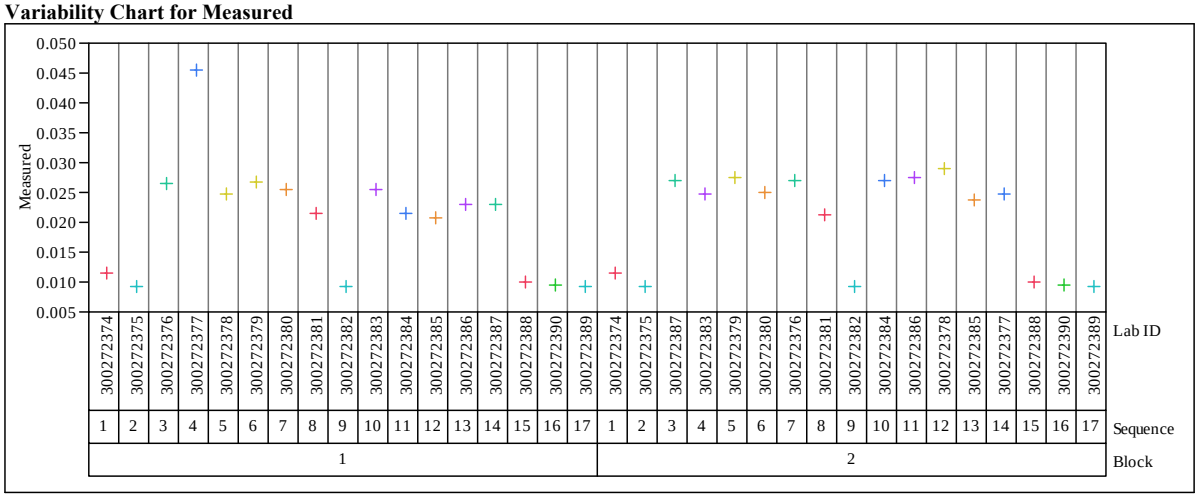
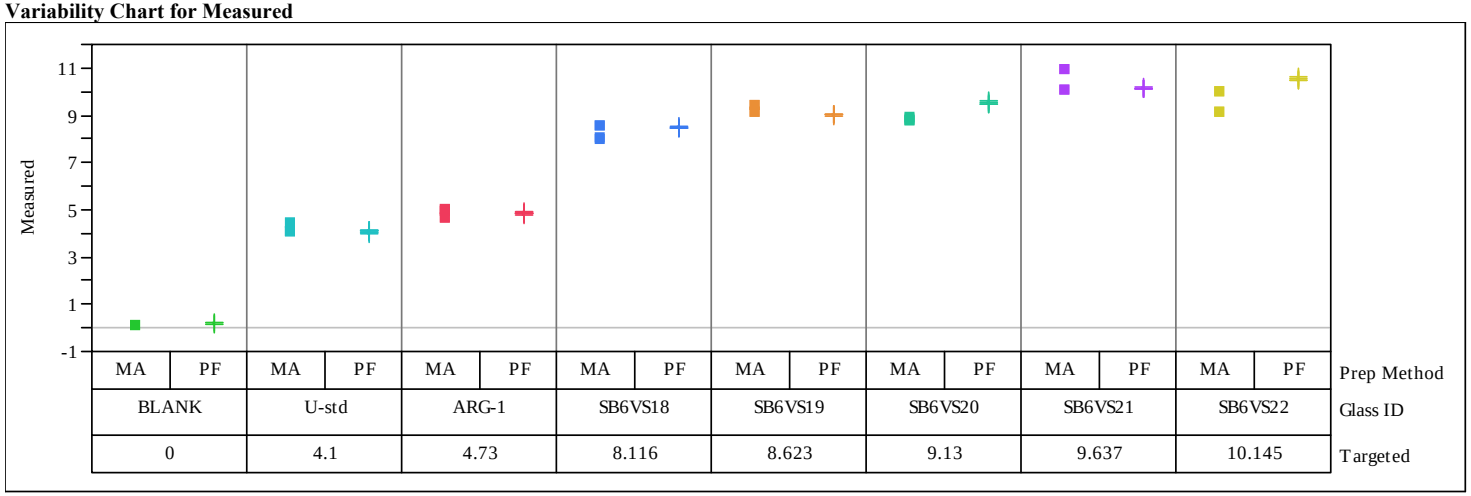


Exhibit C2. Measurements by Lab ID for Thorium Glasses by Targeted Concentration for Each Oxide

Oxide=Al2O3 (wt%)
Variability Chart for Measured



Oxide=B2O3 (wt%)
Variability Chart for Measured

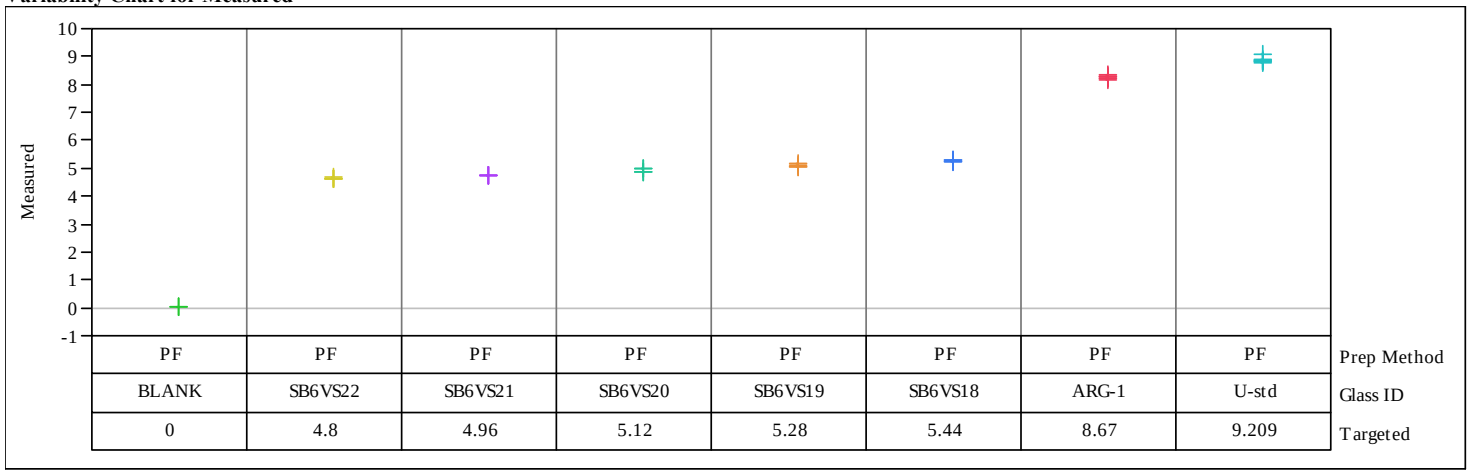
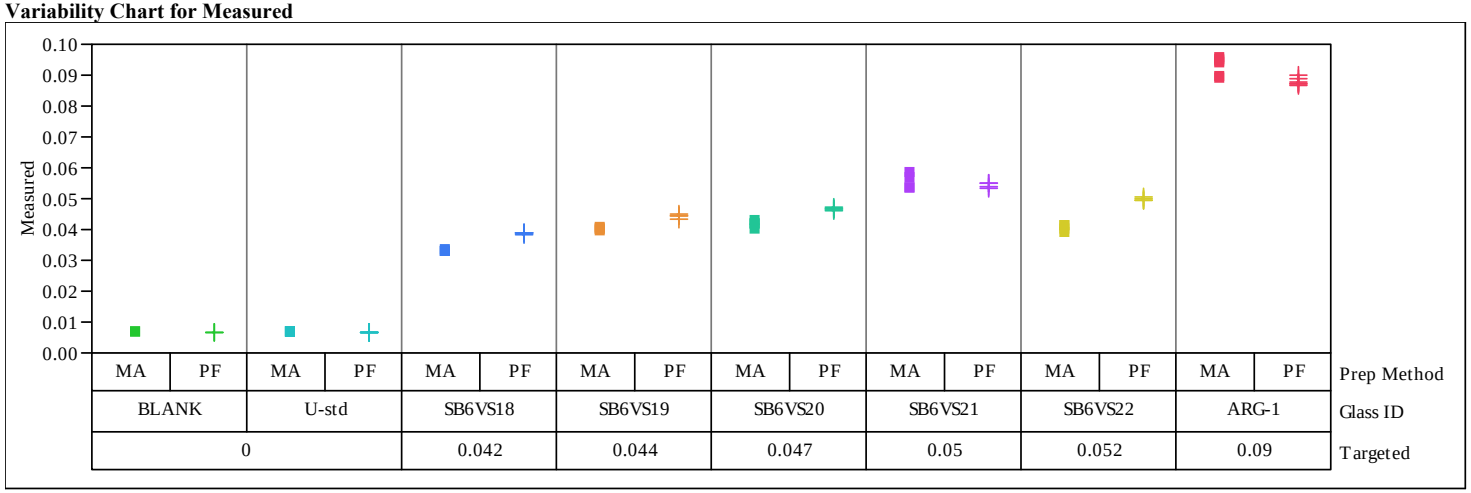


Exhibit C2. Measurements by Lab ID for Thorium Glasses by Targeted Concentration for Each Oxide

Oxide=BaO (wt%)
Variability Chart for Measured



Oxide=CaO (wt%)
Variability Chart for Measured

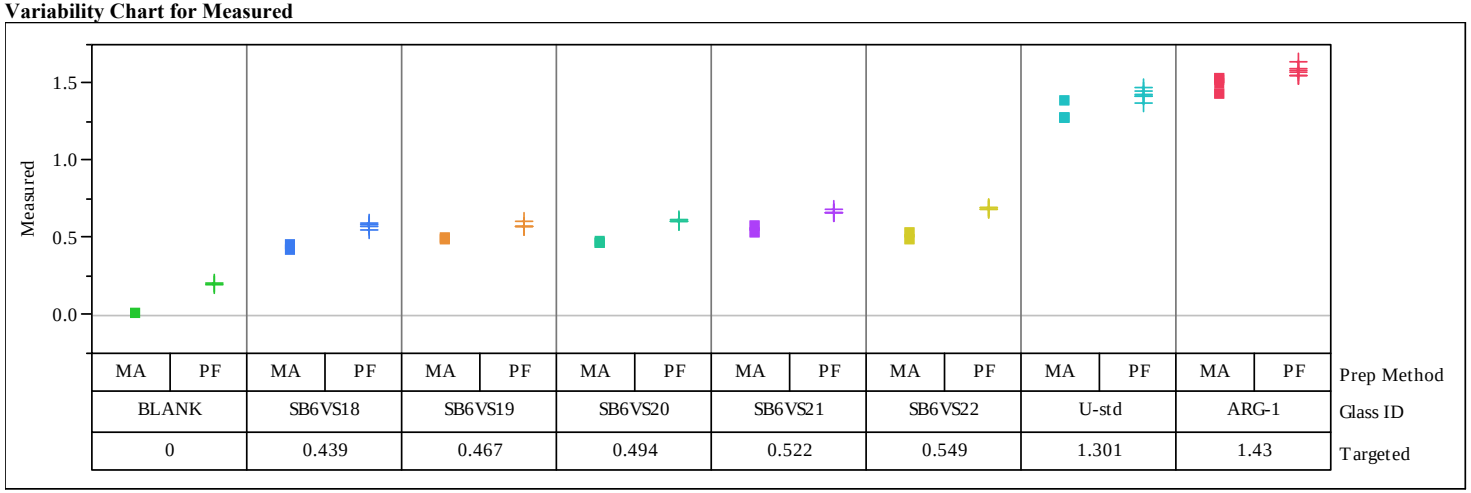
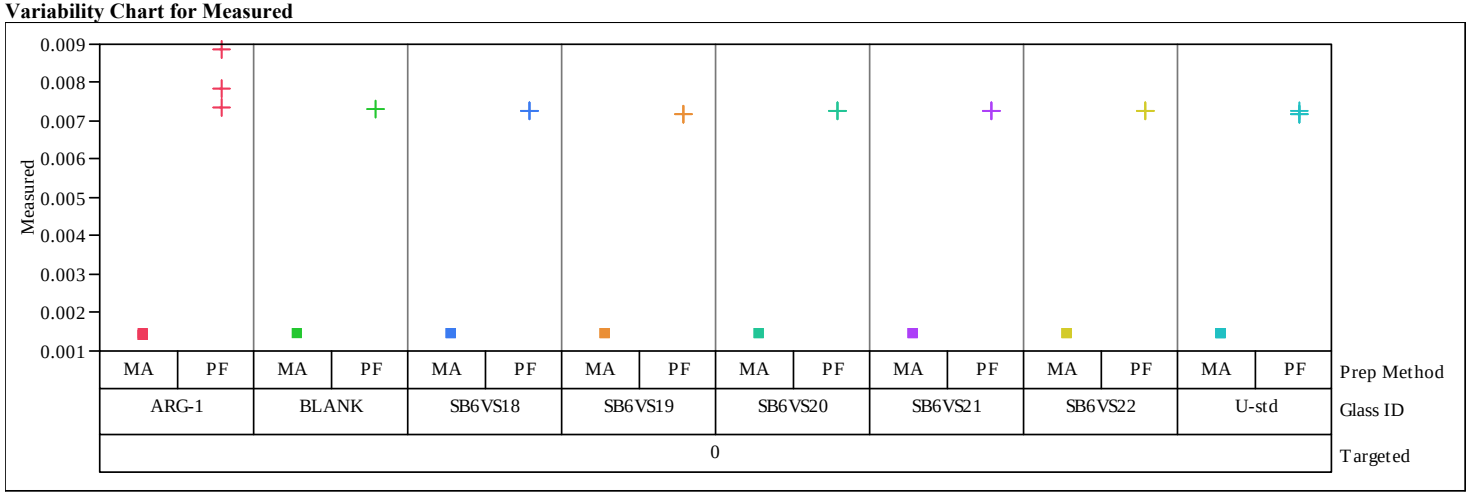


Exhibit C2. Measurements by Lab ID for Thorium Glasses by Targeted Concentration for Each Oxide

Oxide=CdO (wt%)
Variability Chart for Measured



Oxide=Ce2O3 (wt%)
Variability Chart for Measured

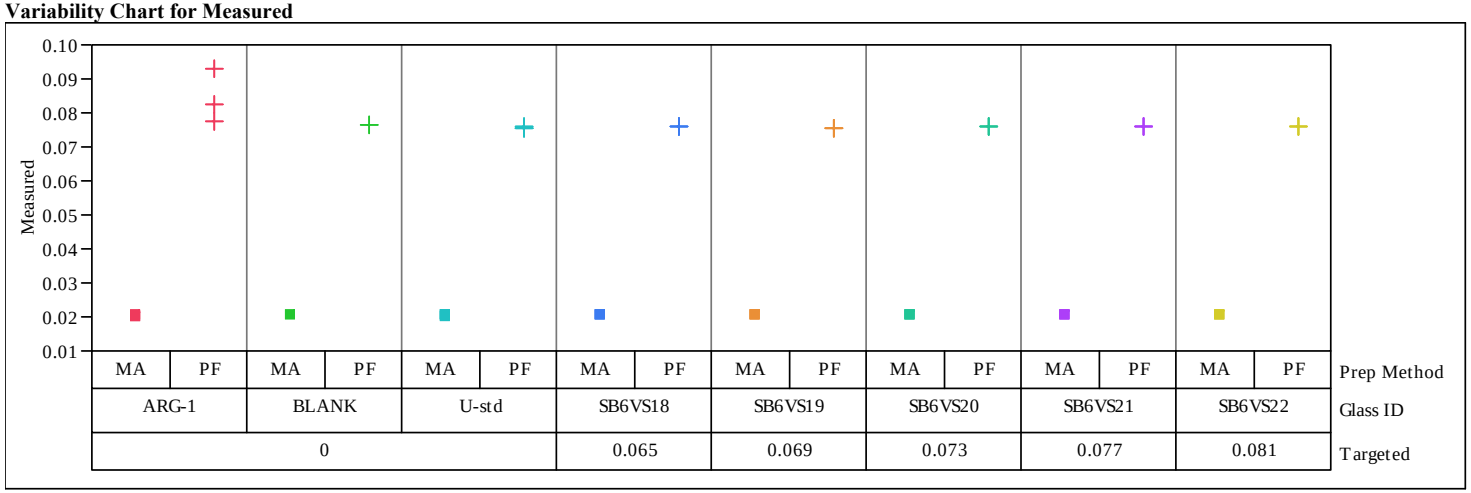
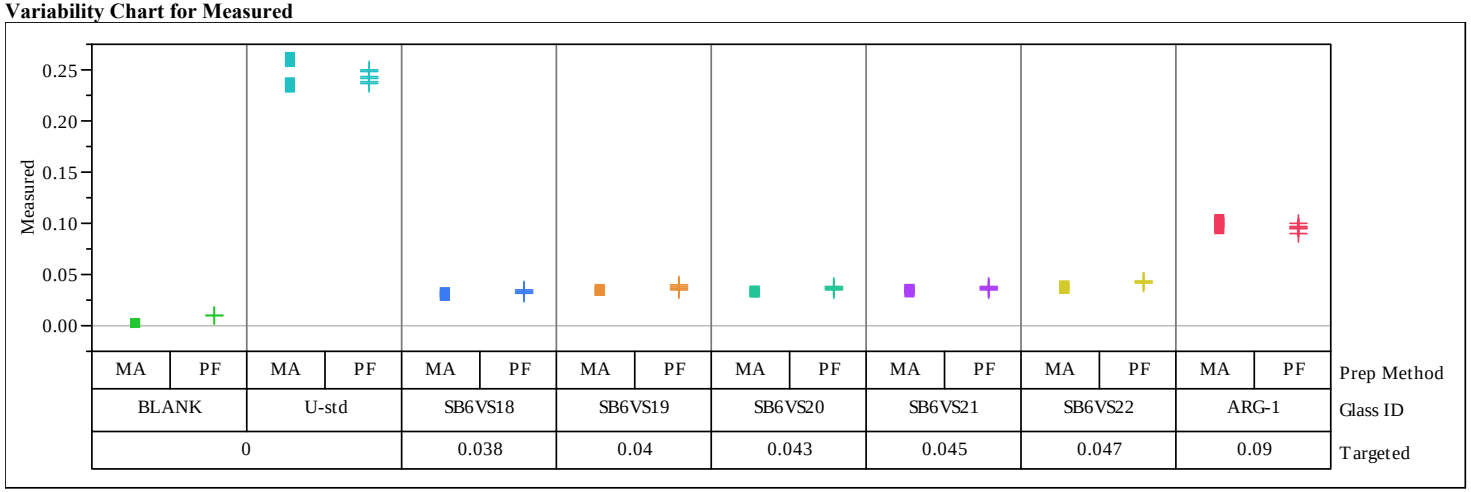


Exhibit C2. Measurements by Lab ID for Thorium Glasses by Targeted Concentration for Each Oxide

Oxide=Cr2O3 (wt%)
Variability Chart for Measured



Oxide=CuO (wt%)
Variability Chart for Measured

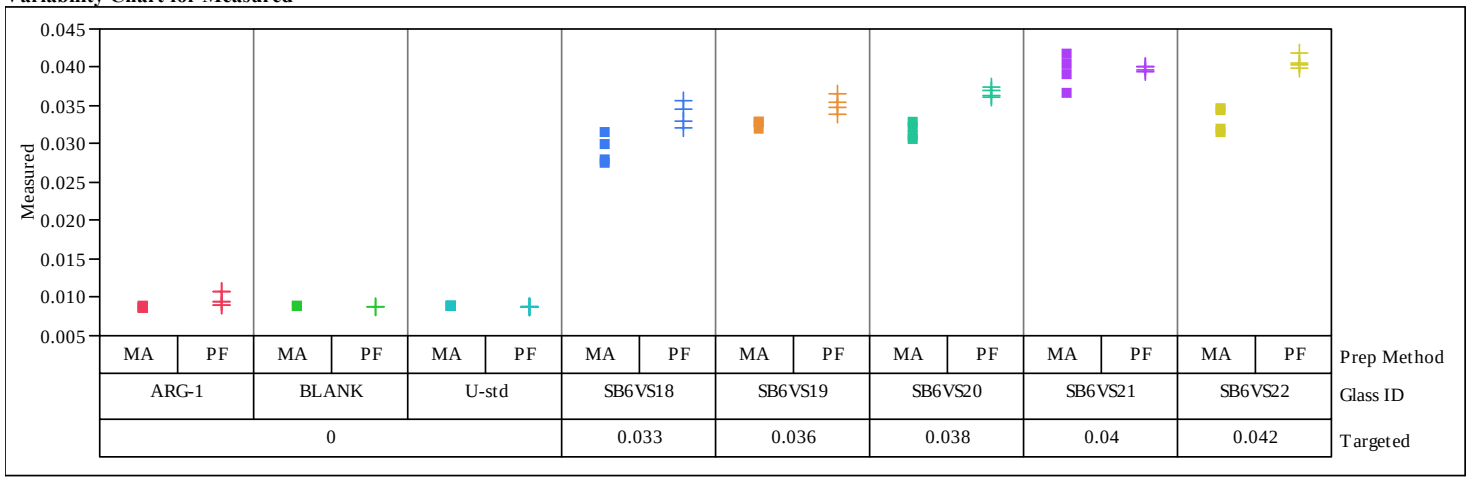
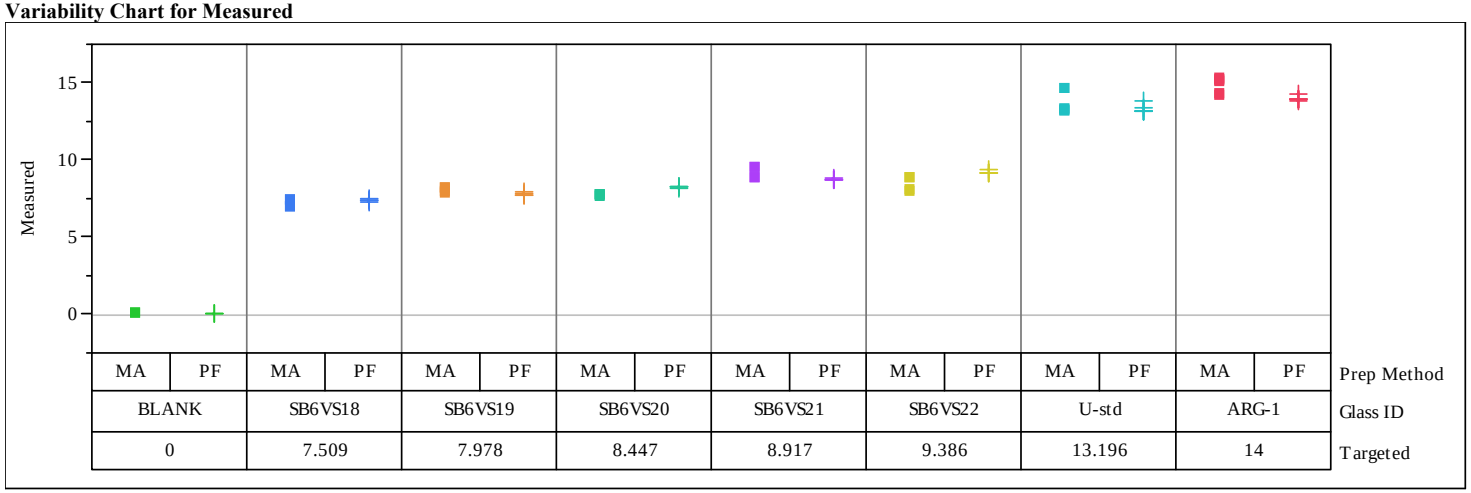


Exhibit C2. Measurements by Lab ID for Thorium Glasses by Targeted Concentration for Each Oxide

Oxide=Fe2O3 (wt%)
Variability Chart for Measured



Oxide=K2O (wt%)
Variability Chart for Measured

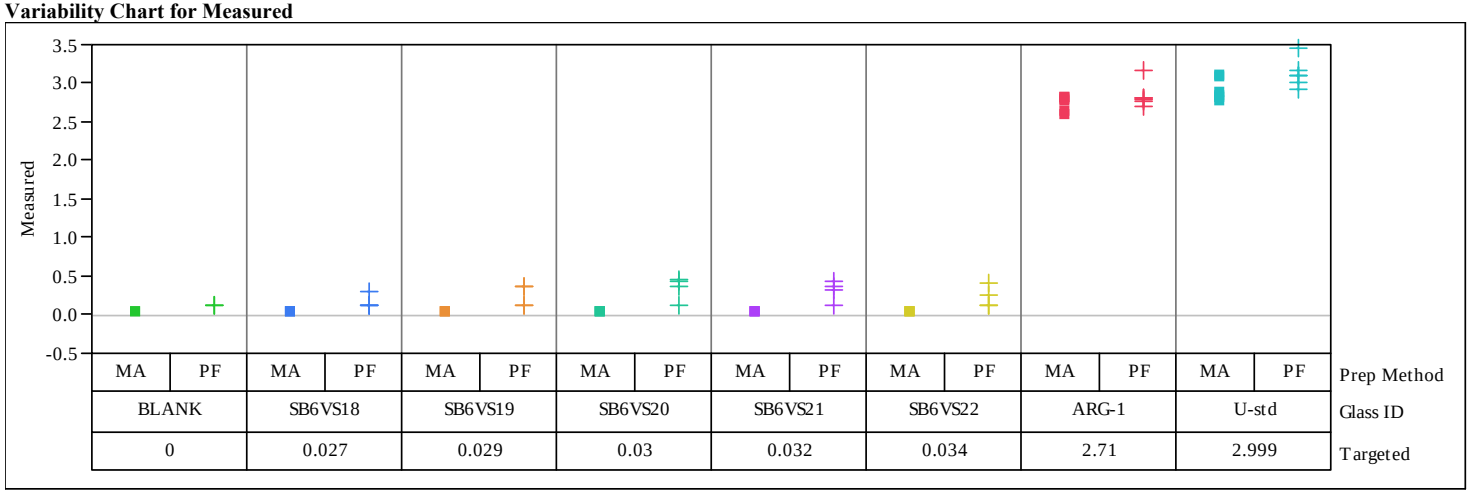
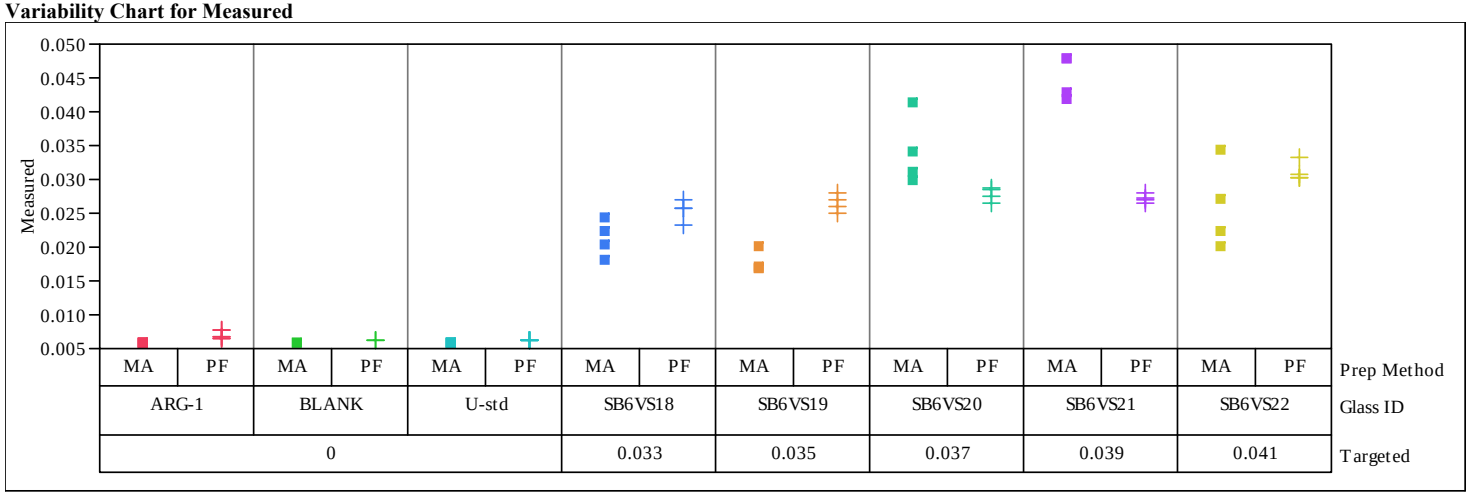


Exhibit C2. Measurements by Lab ID for Thorium Glasses by Targeted Concentration for Each Oxide

Oxide=La2O3 (wt%)
Variability Chart for Measured



Oxide=Li2O (wt%)
Variability Chart for Measured

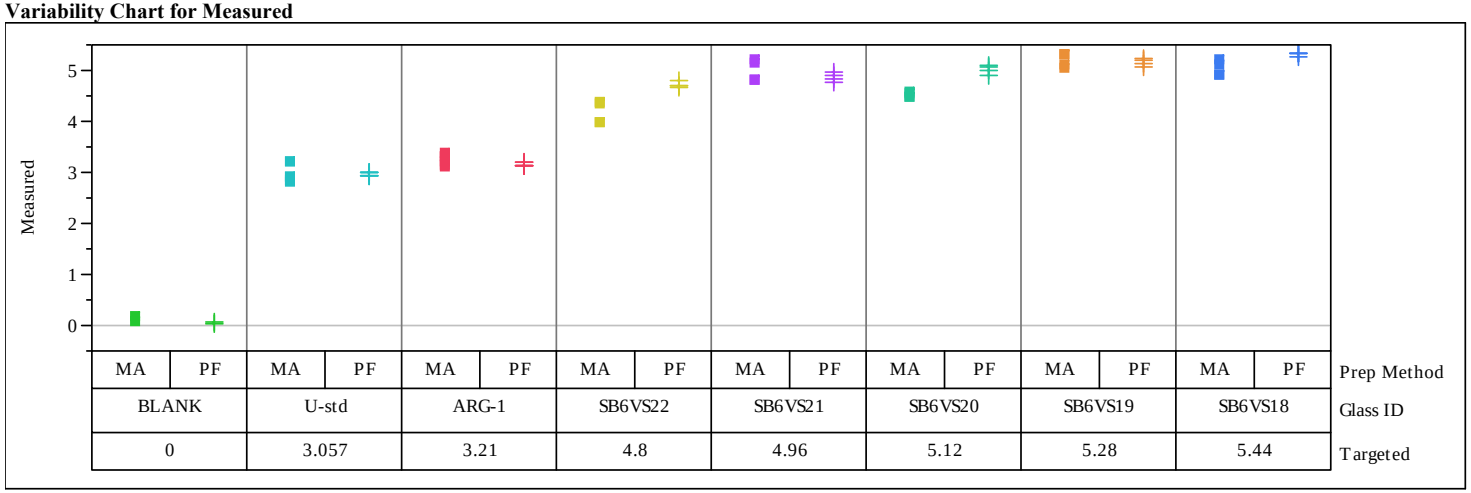
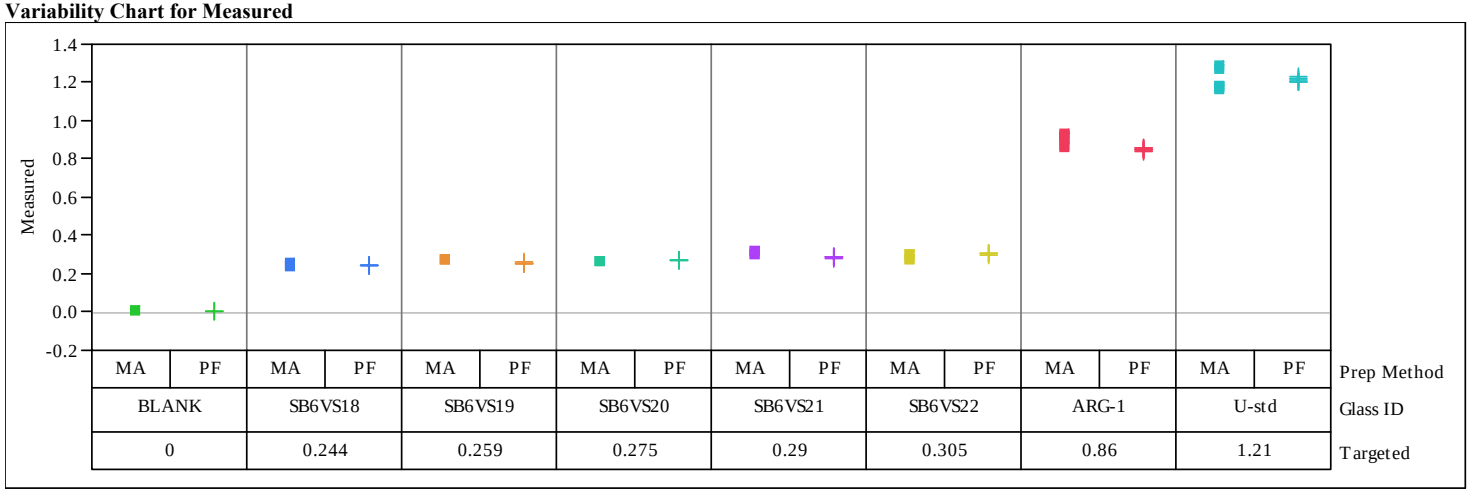


Exhibit C2. Measurements by Lab ID for Thorium Glasses by Targeted Concentration for Each Oxide

Oxide=MgO (wt%)
Variability Chart for Measured



Oxide=MnO (wt%)
Variability Chart for Measured

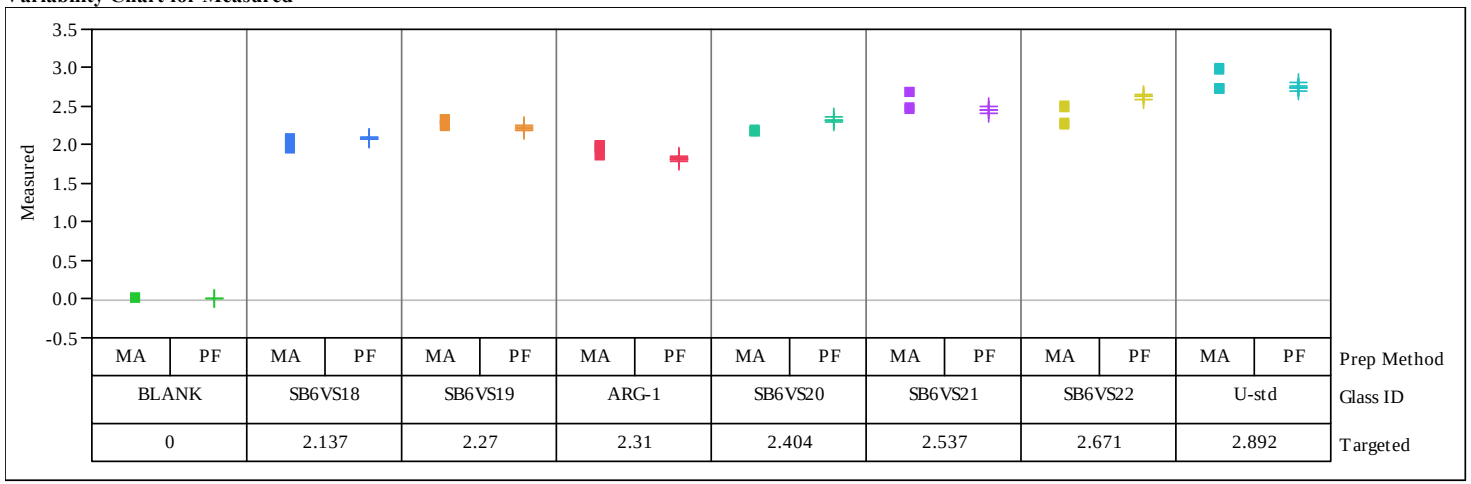
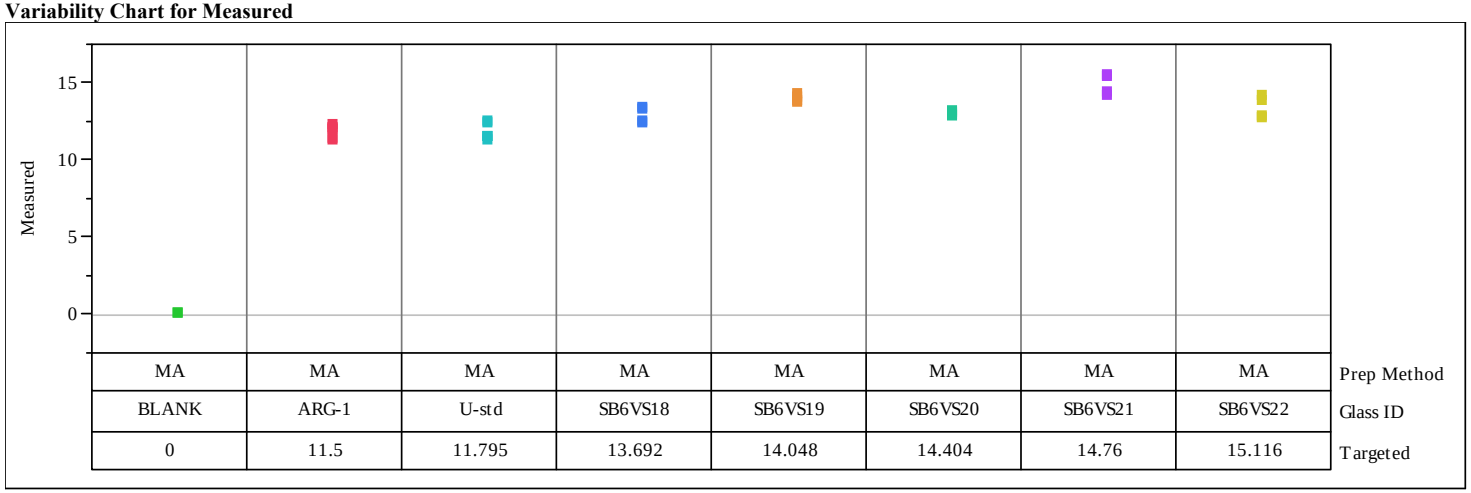


Exhibit C2. Measurements by Lab ID for Thorium Glasses by Targeted Concentration for Each Oxide

Oxide=Na2O (wt%)
Variability Chart for Measured



Oxide=NiO (wt%)
Variability Chart for Measured

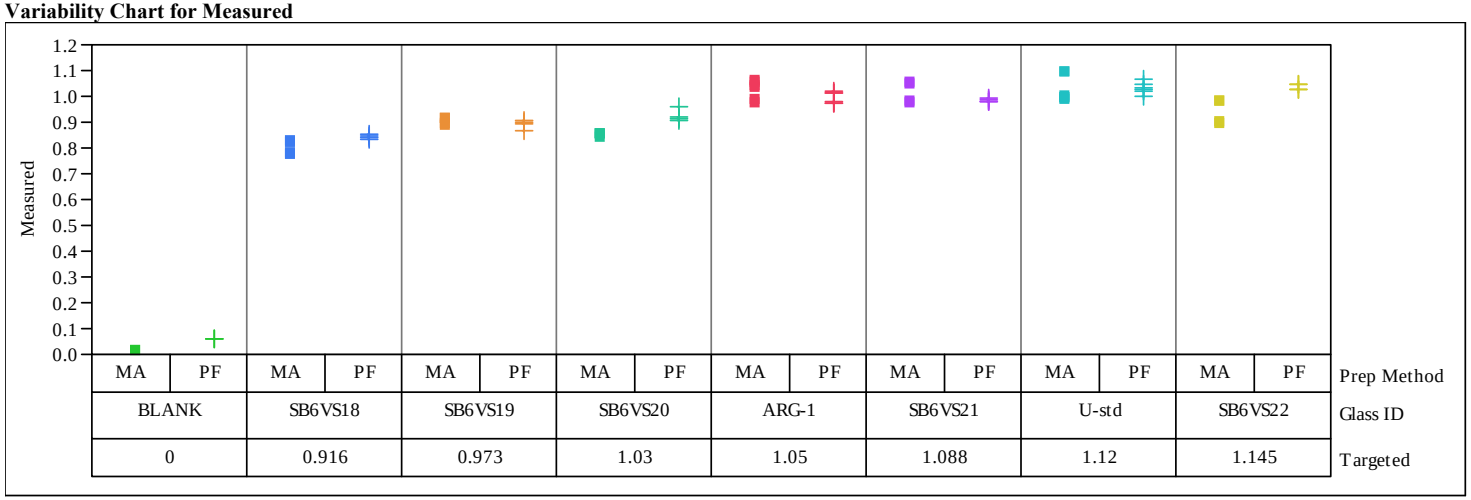
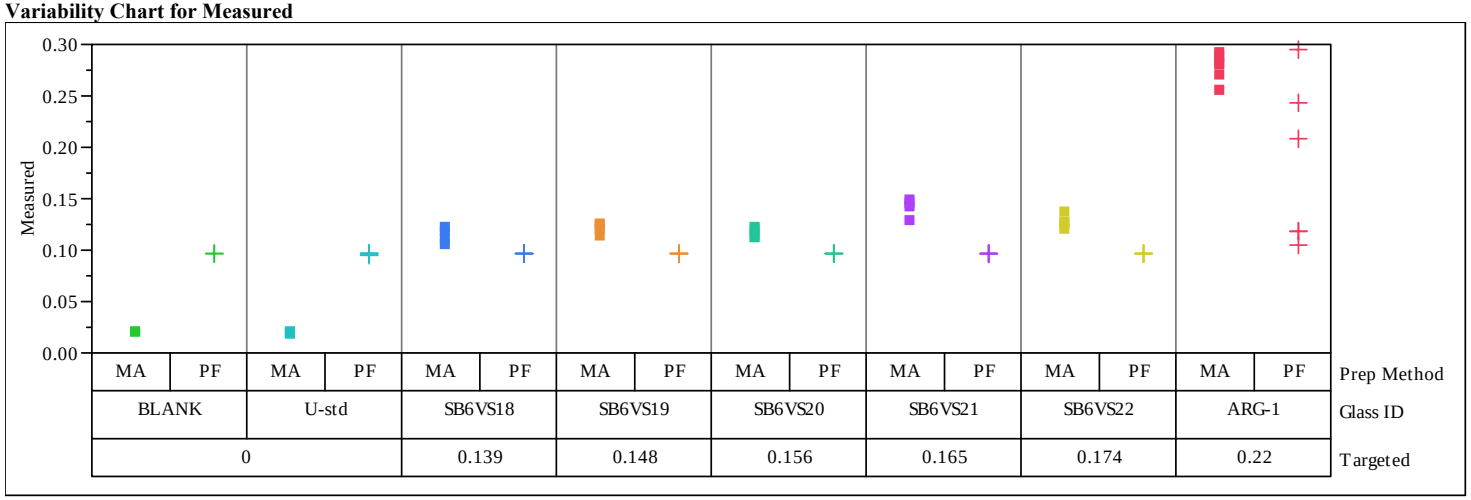


Exhibit C2. Measurements by Lab ID for Thorium Glasses by Targeted Concentration for Each Oxide

Oxide=P2O5 (wt%)
Variability Chart for Measured



Oxide=PbO (wt%)
Variability Chart for Measured

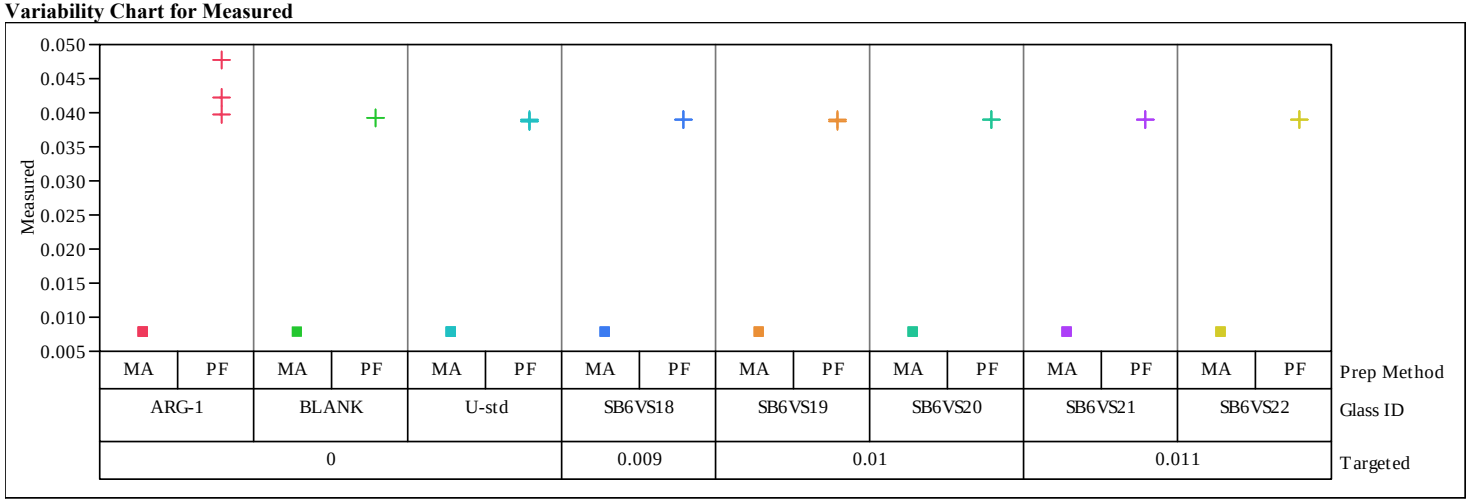
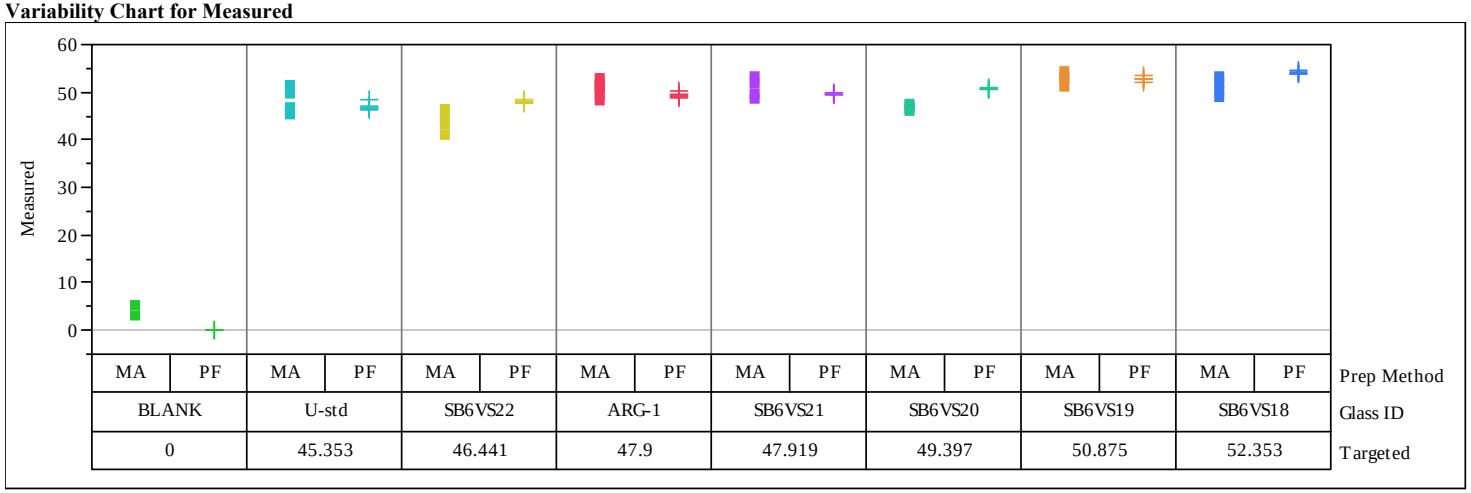


Exhibit C2. Measurements by Lab ID for Thorium Glasses by Targeted Concentration for Each Oxide

Oxide=SiO2 (wt%)
Variability Chart for Measured



Oxide=SO4 (wt%)
Variability Chart for Measured

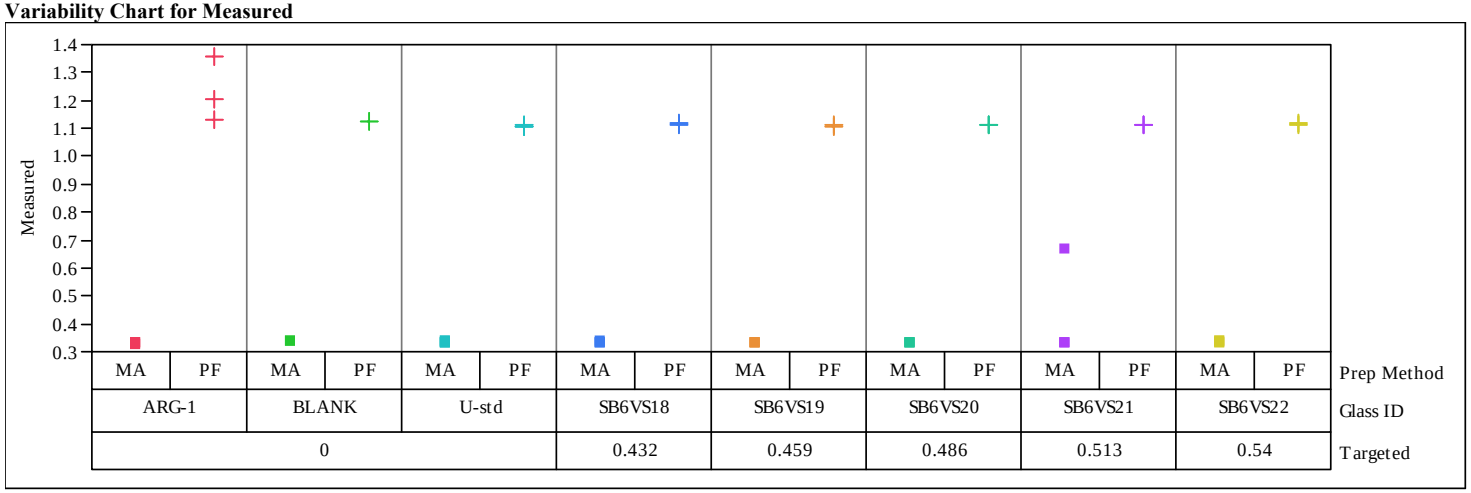
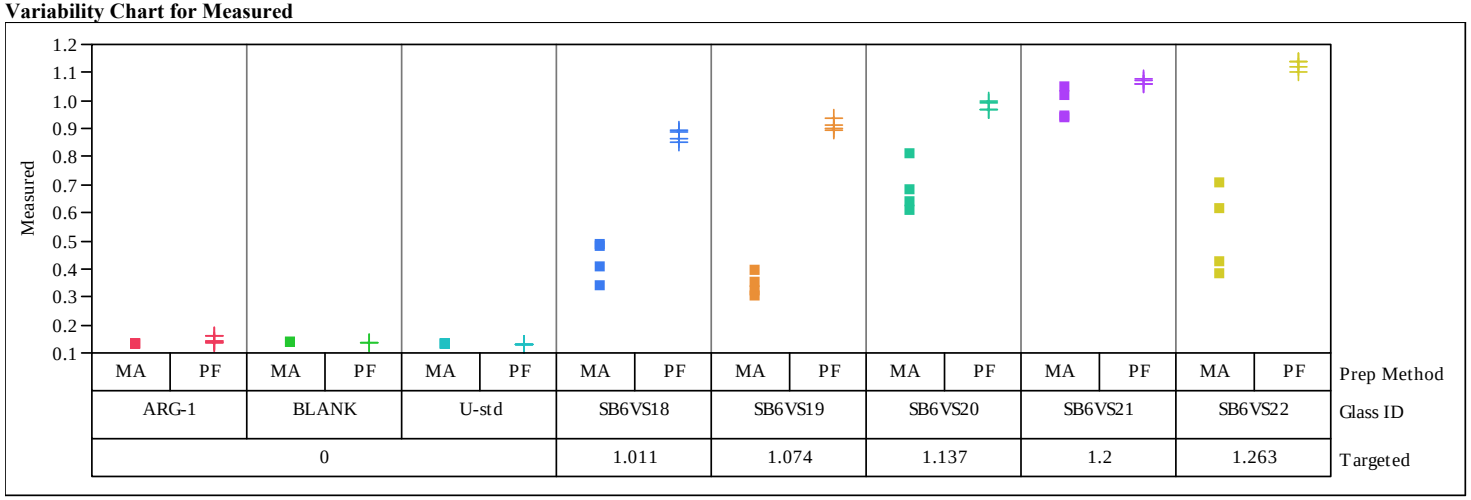


Exhibit C2. Measurements by Lab ID for Thorium Glasses by Targeted Concentration for Each Oxide

Oxide=ThO2 (wt%)
Variability Chart for Measured



Oxide=TiO2 (wt%)
Variability Chart for Measured

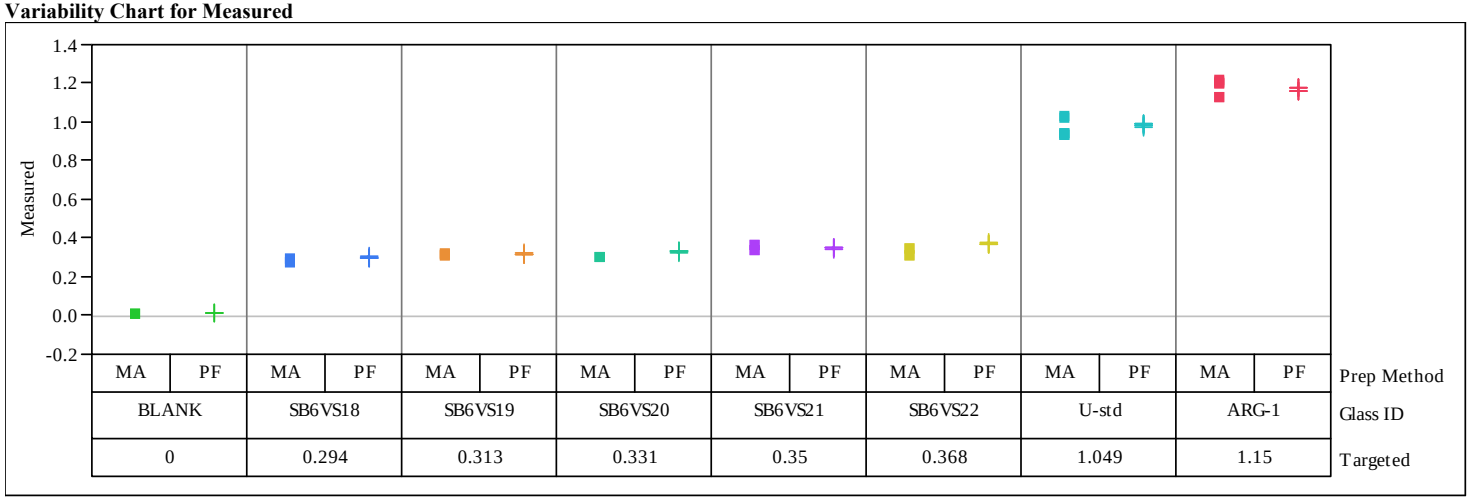
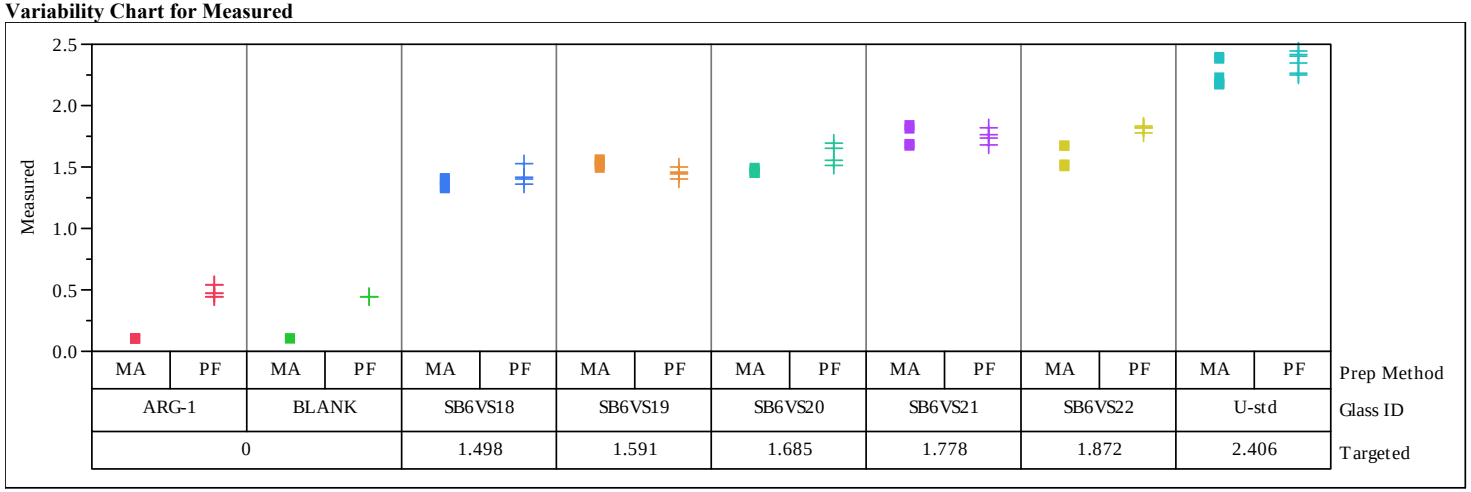


Exhibit C2. Measurements by Lab ID for Thorium Glasses by Targeted Concentration for Each Oxide

Oxide=U3O8 (wt%)
Variability Chart for Measured



Oxide=ZnO (wt%)
Variability Chart for Measured

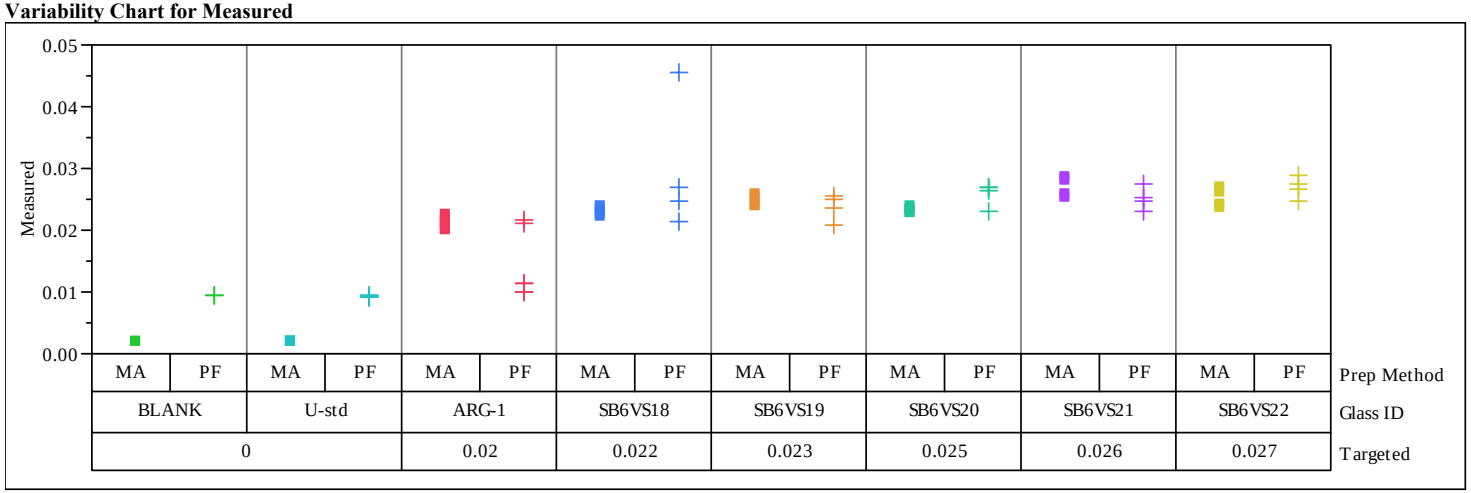


Exhibit C2. Measurements by Lab ID for Thorium Glasses by Targeted Concentration for Each Oxide

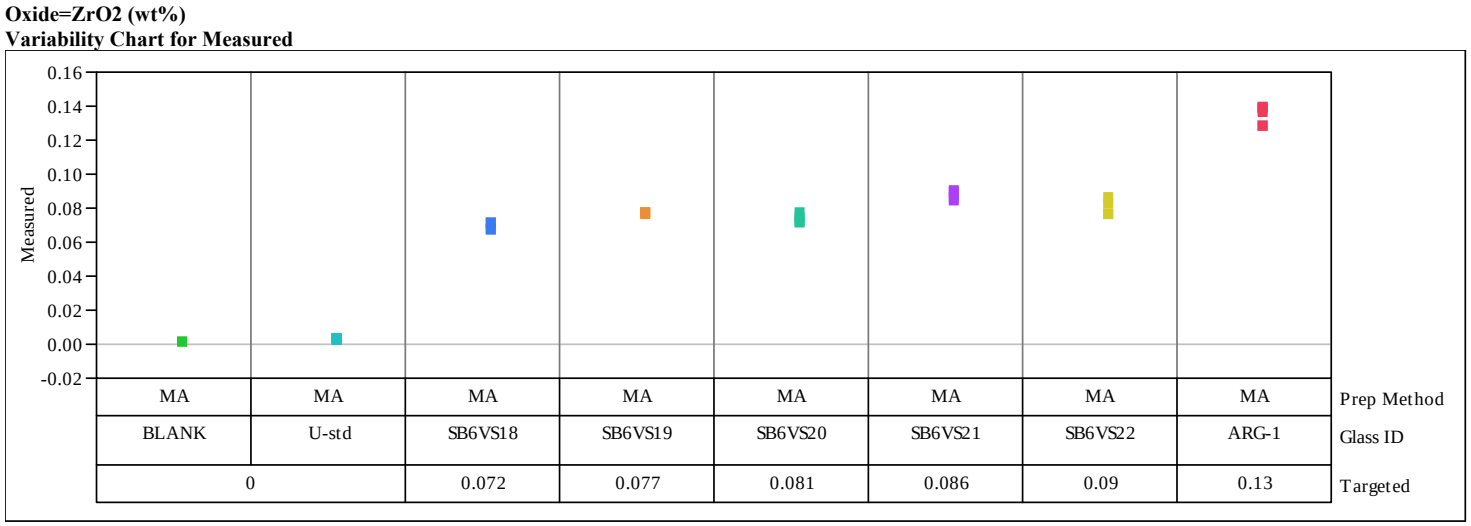
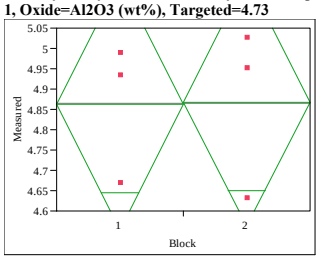


Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=Al2O3 (wt%), Targeted=4.73



Oneway Anova
Summary of Fit

Rsquare	0.000403
Adj Rsquare	-0.2495
Root Mean Square Error	0.192073
Mean of Response	4.865463
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

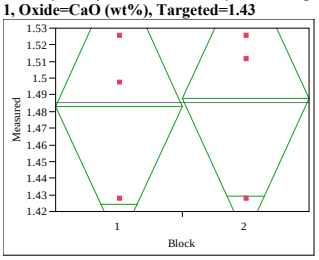
Difference	0.00630	t Ratio	0.040161
Std Err Dif	0.15683	DF	4
Upper CL Dif	0.44172	Prob > |t|	0.9699
Lower CL Dif	-0.42912	Prob > t	0.4849
Confidence	0.95	Prob < t	0.5151

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	4.86231	0.11089	4.5544	5.1702
2	3	4.86861	0.11089	4.5607	5.1765

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=CaO (wt%), Targeted=1.43



Oneway Anova
Summary of Fit

Rsquare	0.00304
Adj Rsquare	-0.2462
Root Mean Square Error	0.051726
Mean of Response	1.485484
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

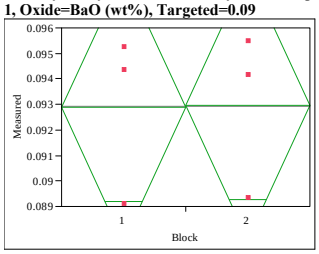
Difference	0.00466	t Ratio	0.110432
Std Err Dif	0.04223	DF	4
Upper CL Dif	0.12193	Prob > |t|	0.9174
Lower CL Dif	-0.11260	Prob > t	0.4587
Confidence	0.95	Prob < t	0.5413

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	1.48315	0.02986	1.4002	1.5661
2	3	1.48782	0.02986	1.4049	1.5707

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=BaO (wt%), Targeted=0.09



Oneway Anova
Summary of Fit

Rsquare	0.000194
Adj Rsquare	-0.24976
Root Mean Square Error	0.003274
Mean of Response	0.09293
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

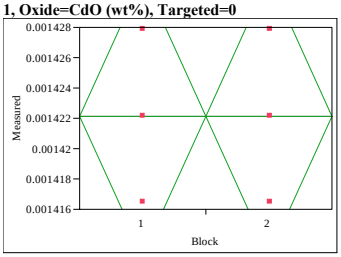
Difference	7.443e-5	t Ratio	0.027848
Std Err Dif	0.00267	DF	4
Upper CL Dif	0.00750	Prob > |t|	0.9791
Lower CL Dif	-0.00735	Prob > t	0.4896
Confidence	0.95	Prob < t	0.5104

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.092893	0.00189	0.08765	0.09814
2	3	0.092967	0.00189	0.08772	0.09821

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=CdO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	5.711e-6
Mean of Response	0.001422
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

Difference	0.00000	t Ratio	0
Std Err Dif	4.663e-6	DF	4
Upper CL Dif	0.000013	Prob > |t|	1.0000
Lower CL Dif	-1.29e-5	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

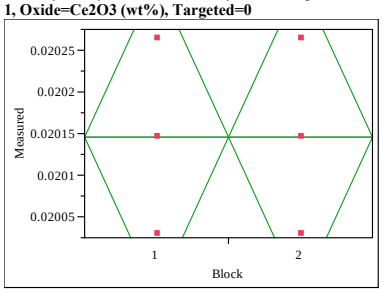
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.001422	3.2975e-6	0.00141	0.00143
2	3	0.001422	3.2975e-6	0.00141	0.00143

Std Error uses a pooled estimate of error variance

Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=Ce2O3 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.000117
Mean of Response	0.020146
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

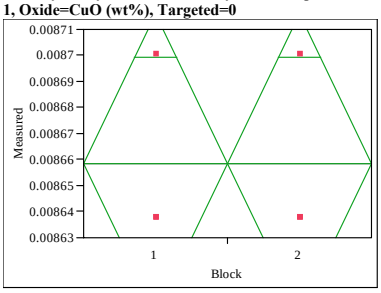
Difference	0.00000	t Ratio	0
Std Err Dif	9.564e-5	DF	4
Upper CL Dif	0.00027	Prob > |t|	1.0000
Lower CL Dif	-0.00027	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.020146	6.76e-5	0.01996	0.02033
2	3	0.020146	6.76e-5	0.01996	0.02033

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=CuO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	3.614e-5
Mean of Response	0.008658
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

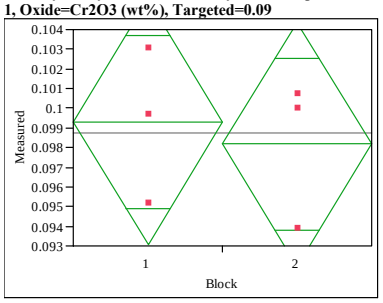
Difference	0.00000	t Ratio	0
Std Err Dif	2.951e-5	DF	4
Upper CL Dif	0.000082	Prob > |t|	1.0000
Lower CL Dif	-8.19e-5	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.008658	0.00002	0.00860	0.00872
2	3	0.008658	0.00002	0.00860	0.00872

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=Cr2O3 (wt%), Targeted=0.09



Oneway Anova
Summary of Fit

Rsquare	0.030513
Adj Rsquare	-0.21186
Root Mean Square Error	0.003868
Mean of Response	0.098731
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

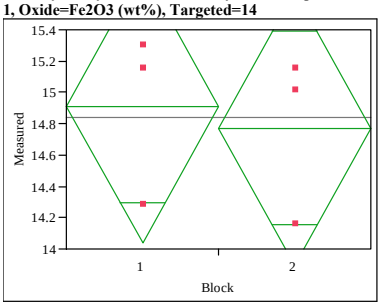
Difference	-0.00112	t Ratio	-0.35481
Std Err Dif	0.00316	DF	4
Upper CL Dif	0.00765	Prob > |t|	0.7406
Lower CL Dif	-0.00989	Prob > t	0.6297
Confidence	0.95	Prob < t	0.3703

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.099291	0.00223	0.09309	0.10549
2	3	0.098171	0.00223	0.09197	0.10437

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=Fe2O3 (wt%), Targeted=14



Oneway Anova
Summary of Fit

Rsquare	0.023515
Adj Rsquare	-0.22061
Root Mean Square Error	0.545383
Mean of Response	14.84267
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

Difference	-0.1382	t Ratio	-0.31036
Std Err Dif	0.4453	DF	4
Upper CL Dif	1.0982	Prob > |t|	0.7718
Lower CL Dif	-1.3746	Prob > t	0.6141
Confidence	0.95	Prob < t	0.3859

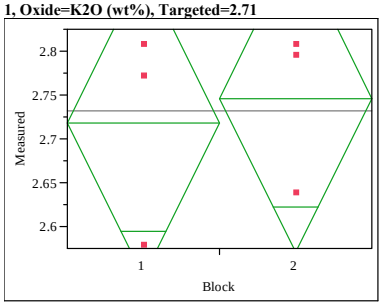
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	14.9118	0.31488	14.038	15.786
2	3	14.7736	0.31488	13.899	15.648

Std Error uses a pooled estimate of error variance

Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=K2O (wt%), Targeted=2.71



Oneway Anova
Summary of Fit

Rsquare	0.024102
Adj Rsquare	-0.21987
Root Mean Square Error	0.109524
Mean of Response	2.732434
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

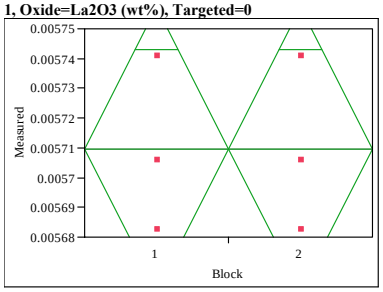
Difference	0.02811	t Ratio	0.314309
Std Err Dif	0.08943	DF	4
Upper CL Dif	0.27639	Prob > |t|	0.7690
Lower CL Dif	-0.22018	Prob > t	0.3845
Confidence	0.95	Prob < t	0.6155

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	2.71838	0.06323	2.5428	2.8939
2	3	2.74649	0.06323	2.5709	2.9221

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=La2O3 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	2.951e-5
Mean of Response	0.00571
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

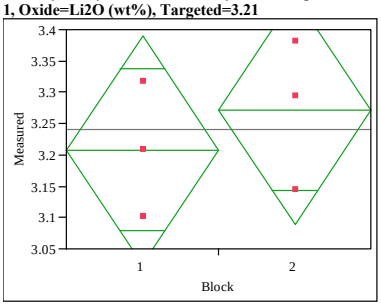
Difference	0.00000	t Ratio	0
Std Err Dif	0.000024	DF	4
Upper CL Dif	0.000067	Prob > |t|	1.0000
Lower CL Dif	-6.69e-5	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.005710	1.7e-5	0.00566	0.00576
2	3	0.005710	1.7e-5	0.00566	0.00576

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=Li2O (wt%), Targeted=3.21



Oneway Anova
Summary of Fit

Rsquare	0.10757
Adj Rsquare	-0.11554
Root Mean Square Error	0.113921
Mean of Response	3.240115
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

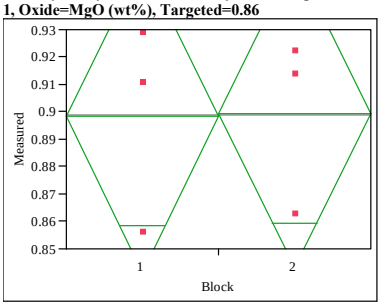
Difference	0.06459	t Ratio	0.694365
Std Err Dif	0.09302	DF	4
Upper CL Dif	0.32284	Prob > |t|	0.5257
Lower CL Dif	-0.19367	Prob > t	0.2628
Confidence	0.95	Prob < t	0.7372

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	3.20782	0.06577	3.0252	3.3904
2	3	3.27241	0.06577	3.0898	3.4550

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=MgO (wt%), Targeted=0.86



Oneway Anova
Summary of Fit

Rsquare	0.000368
Adj Rsquare	-0.24954
Root Mean Square Error	0.035269
Mean of Response	0.898799
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

Difference	0.00111	t Ratio	0.038391
Std Err Dif	0.02880	DF	4
Upper CL Dif	0.08106	Prob > |t|	0.9712
Lower CL Dif	-0.07885	Prob > t	0.4856
Confidence	0.95	Prob < t	0.5144

Means for Oneway Anova

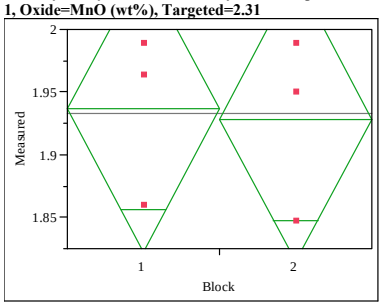
Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.898246	0.02036	0.84171	0.95478

Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
2	3	0.899351	0.02036	0.84282	0.95589

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=MnO (wt%), Targeted=2.31



Oneway Anova
Summary of Fit

Rsquare	0.005495
Adj Rsquare	-0.24313
Root Mean Square Error	0.070918
Mean of Response	1.932496
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

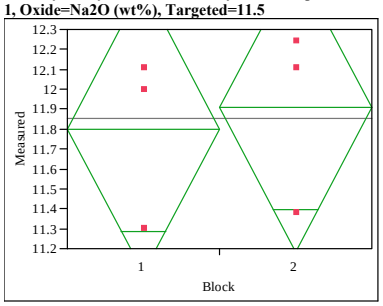
Difference	-0.00861	t Ratio	-0.14866
Std Err Dif	0.05790	DF	4
Upper CL Dif	0.15216	Prob > |t|	0.8890
Lower CL Dif	-0.16938	Prob > t	0.5555
Confidence	0.95	Prob < t	0.4445

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	1.93680	0.04094	1.8231	2.0505
2	3	1.92819	0.04094	1.8145	2.0419

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=Na2O (wt%), Targeted=11.5



Oneway Anova
Summary of Fit

Rsquare	0.020918
Adj Rsquare	-0.22385
Root Mean Square Error	0.451798
Mean of Response	11.85341
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

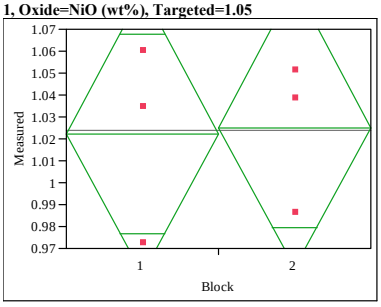
Difference	0.1078	t Ratio	0.292335
Std Err Dif	0.3689	DF	4
Upper CL Dif	1.1320	Prob > |t|	0.7846
Lower CL Dif	-0.9164	Prob > t	0.3923
Confidence	0.95	Prob < t	0.6077

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	11.7995	0.26085	11.075	12.524
2	3	11.9073	0.26085	11.183	12.632

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=NiO (wt%), Targeted=1.05



Oneway Anova
Summary of Fit

Rsquare	0.002047
Adj Rsquare	-0.24744
Root Mean Square Error	0.040146
Mean of Response	1.023726
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

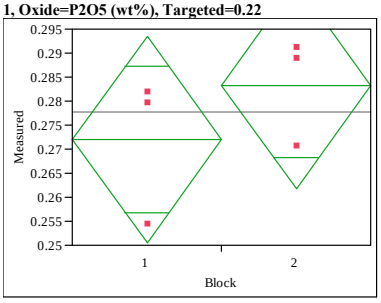
Difference	0.00297	t Ratio	0.090581
Std Err Dif	0.03278	DF	4
Upper CL Dif	0.09398	Prob > |t|	0.9322
Lower CL Dif	-0.08804	Prob > t	0.4661
Confidence	0.95	Prob < t	0.5339

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	1.02224	0.02318	0.95789	1.0866
2	3	1.02521	0.02318	0.96086	1.0896

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=P2O5 (wt%), Targeted=0.22



Oneway Anova
Summary of Fit

Rsquare	0.21449
Adj Rsquare	0.018112
Root Mean Square Error	0.013426
Mean of Response	0.277641
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

Difference	0.01146	t Ratio	1.0451
Std Err Dif	0.01096	DF	4
Upper CL Dif	0.04189	Prob > |t|	0.3550
Lower CL Dif	-0.01898	Prob > t	0.1775
Confidence	0.95	Prob < t	0.8225

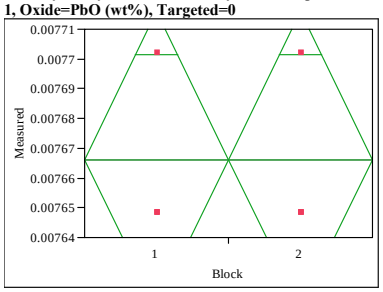
Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.271913	0.00775	0.25039	0.29344
2	3	0.283370	0.00775	0.26185	0.30489

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=PbO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.000031
Mean of Response	0.007666
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

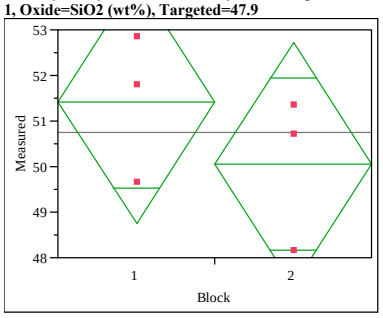
Difference	0.00000	t Ratio	0
Std Err Dif	2.539e-5	DF	4
Upper CL Dif	7.049e-5	Prob > |t|	1.0000
Lower CL Dif	-0.00007	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.007666	1.8e-5	0.00762	0.00772
2	3	0.007666	1.8e-5	0.00762	0.00772

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=SiO2 (wt%), Targeted=47.9



Oneway Anova
Summary of Fit

Rsquare	0.198679
Adj Rsquare	-0.00165
Root Mean Square Error	1.666275
Mean of Response	50.73707
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

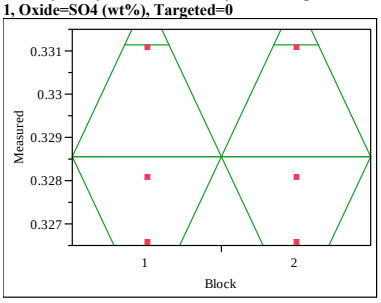
Difference	-1.3549	t Ratio	-0.99587
Std Err Dif	1.3605	DF	4
Upper CL Dif	2.4225	Prob > |t|	0.3757
Lower CL Dif	-5.1323	Prob > t	0.8122
Confidence	0.95	Prob < t	0.1878

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	51.4145	0.96202	48.744	54.086
2	3	50.0596	0.96202	47.389	52.731

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=SO4 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.002288
Mean of Response	0.32855
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

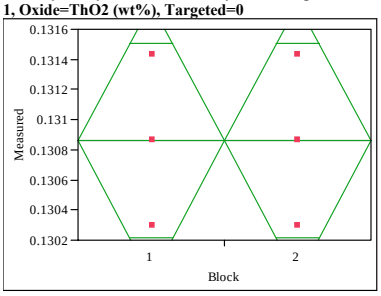
Difference	0.00000	t Ratio	0
Std Err Dif	0.00187	DF	4
Upper CL Dif	0.00519	Prob > |t|	1.0000
Lower CL Dif	-0.00519	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.328550	0.00132	0.32488	0.33222
2	3	0.328550	0.00132	0.32488	0.33222

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=ThO2 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.000569
Mean of Response	0.130859
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

Difference	0.00000	t Ratio	0
Std Err Dif	0.00046	DF	4
Upper CL Dif	0.00129	Prob > |t|	1.0000

Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

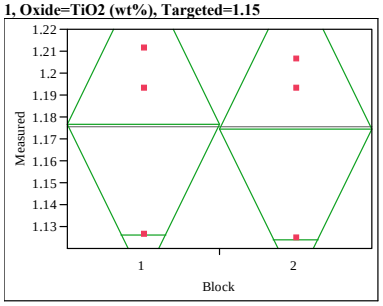
Lower CL Dif	-0.00129	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.130859	0.00033	0.12995	0.13177
2	3	0.130859	0.00033	0.12995	0.13177

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=TiO2 (wt%), Targeted=1.15



Oneway Anova
Summary of Fit

Rsquare	0.000944
Adj Rsquare	-0.24882
Root Mean Square Error	0.044309
Mean of Response	1.175384
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

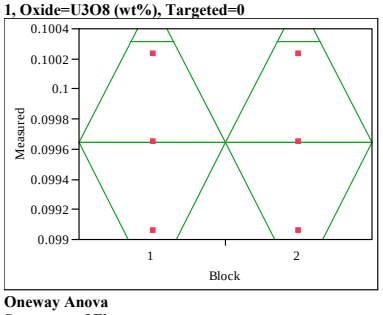
Difference	-0.00222	t Ratio	-0.06147
Std Err Dif	0.03618	DF	4
Upper CL Dif	0.09822	Prob > |t|	0.9539
Lower CL Dif	-0.10267	Prob > t	0.5230
Confidence	0.95	Prob < t	0.4770

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	1.17650	0.02558	1.1055	1.2475
2	3	1.17427	0.02558	1.1032	1.2453

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=U3O8 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.00059
Mean of Response	0.099642
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

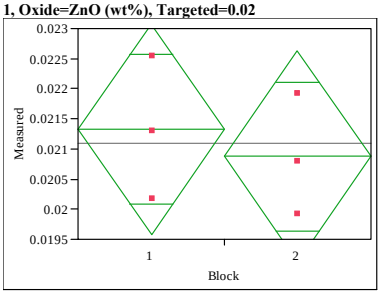
Difference	0.00000	t Ratio	0
Std Err Dif	0.00048	DF	4
Upper CL Dif	0.00134	Prob > |t|	1.0000
Lower CL Dif	-0.00134	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.099642	0.00034	0.09870	0.10059
2	3	0.099642	0.00034	0.09870	0.10059

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=ZnO (wt%), Targeted=0.02



Oneway Anova
Summary of Fit

Rsquare	0.061204
Adj Rsquare	-0.1735
Root Mean Square Error	0.001095
Mean of Response	0.021099
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

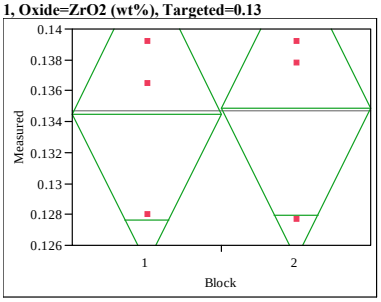
Difference	-0.00046	t Ratio	-0.51066
Std Err Dif	0.00089	DF	4
Upper CL Dif	0.00203	Prob > |t|	0.6365
Lower CL Dif	-0.00294	Prob > t	0.6818
Confidence	0.95	Prob < t	0.3182

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.021328	0.00063	0.01957	0.02308
2	3	0.020871	0.00063	0.01912	0.02263

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=ARG-1, Oxide=ZrO2 (wt%), Targeted=0.13



Oneway Anova
Summary of Fit

Rsquare	0.00132
Adj Rsquare	-0.24835
Root Mean Square Error	0.006067
Mean of Response	0.134675
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

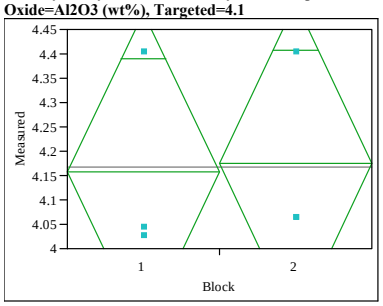
Difference	0.00036	t Ratio	0.072715
Std Err Dif	0.00495	DF	4
Upper CL Dif	0.01411	Prob > |t|	0.9455
Lower CL Dif	-0.01339	Prob > t	0.4728
Confidence	0.95	Prob < t	0.5272

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.134495	0.00350	0.12477	0.14422
2	3	0.134855	0.00350	0.12513	0.14458

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=Al2O3 (wt%), Targeted=4.1



Oneway Anova
Summary of Fit

Rsquare	0.003181
Adj Rsquare	-0.24602
Root Mean Square Error	0.204817
Mean of Response	4.166348
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

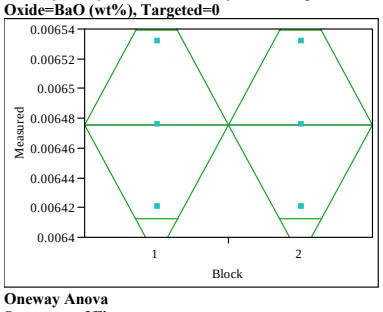
Difference	0.01889	t Ratio	0.112987
Std Err Dif	0.16723	DF	4
Upper CL Dif	0.48321	Prob > |t|	0.9155
Lower CL Dif	-0.44542	Prob > t	0.4577
Confidence	0.95	Prob < t	0.5423

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	4.15690	0.11825	3.8286	4.4852
2	3	4.17579	0.11825	3.8475	4.5041

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=BaO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	5.582e-5
Mean of Response	0.006476
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

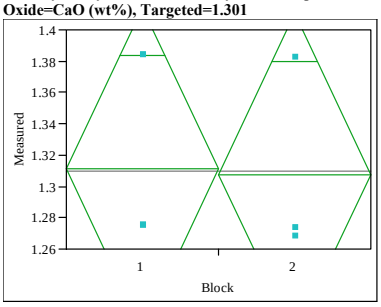
Difference	0.00000	t Ratio	0
Std Err Dif	4.558e-5	DF	4
Upper CL Dif	0.00013	Prob > |t|	1.0000
Lower CL Dif	-0.00013	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.006476	3.22e-5	0.00639	0.00657
2	3	0.006476	3.22e-5	0.00639	0.00657

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=CaO (wt%), Targeted=1.301



Oneway Anova
Summary of Fit

Rsquare	0.000979
Adj Rsquare	-0.24878
Root Mean Square Error	0.063854
Mean of Response	1.309418
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

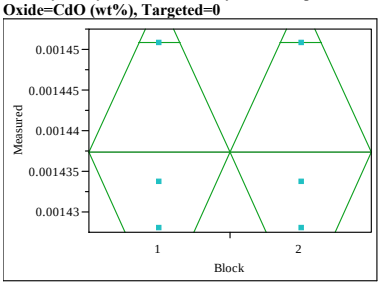
Difference	-0.00326	t Ratio	-0.06262
Std Err Dif	0.05214	DF	4
Upper CL Dif	0.14149	Prob > |t|	0.9531
Lower CL Dif	-0.14802	Prob > t	0.5235
Confidence	0.95	Prob < t	0.4765

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	1.31105	0.03687	1.2087	1.4134
2	3	1.30779	0.03687	1.2054	1.4101

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=CdO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	1.189e-5
Mean of Response	0.001437
Observations (or Sum Wgts)	6

t Test
2-1

Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

Assuming equal variances

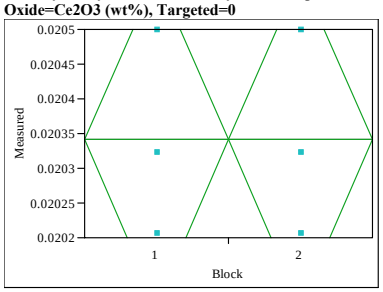
Difference	0.00000	t Ratio	0
Std Err Dif	9.708e-6	DF	4
Upper CL Dif	0.000027	Prob > |t|	1.0000
Lower CL Dif	-2.7e-5	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.001437	6.8644e-6	0.00142	0.00146
2	3	0.001437	6.8644e-6	0.00142	0.00146

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=Ce2O3 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.000147
Mean of Response	0.020342
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

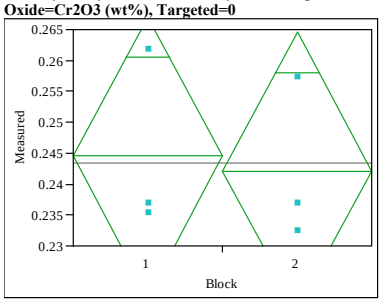
Difference	0.00000	t Ratio	0
Std Err Dif	0.00012	DF	4
Upper CL Dif	0.00033	Prob > |t|	1.0000
Lower CL Dif	-0.00033	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.020342	8.51e-5	0.02011	0.02058
2	3	0.020342	8.51e-5	0.02011	0.02058

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=Cr2O3 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0.011156
Adj Rsquare	-0.23606
Root Mean Square Error	0.014045
Mean of Response	0.243356
Observations (or Sum Wgts)	6

t Test
2-1

Assuming equal variances

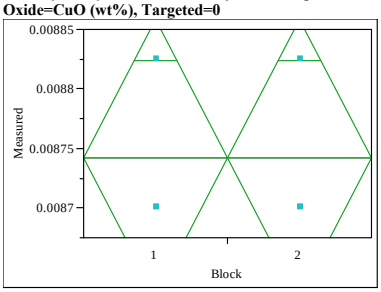
Difference	-0.00244	t Ratio	-0.21243
Std Err Dif	0.01147	DF	4
Upper CL Dif	0.02940	Prob > |t|	0.8422
Lower CL Dif	-0.03427	Prob > t	0.5789
Confidence	0.95	Prob < t	0.4211

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.244574	0.00811	0.22206	0.26709
2	3	0.242138	0.00811	0.21963	0.26465

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=CuO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	7.227e-5
Mean of Response	0.008742
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

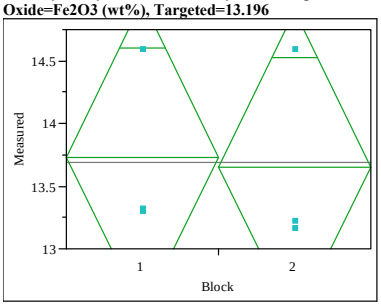
Difference	0.00000	t Ratio	0
Std Err Dif	0.000059	DF	4
Upper CL Dif	0.00016	Prob > |t|	1.0000
Lower CL Dif	-0.00016	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.008742	4.17e-5	0.00863	0.00886
2	3	0.008742	4.17e-5	0.00863	0.00886

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=Fe2O3 (wt%), Targeted=13.196



Oneway Anova
Summary of Fit

Rsquare	0.004082
Adj Rsquare	-0.2449
Root Mean Square Error	0.774923
Mean of Response	13.68938
Observations (or Sum Wgts)	6

Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

t Test
2-1
Assuming equal variances

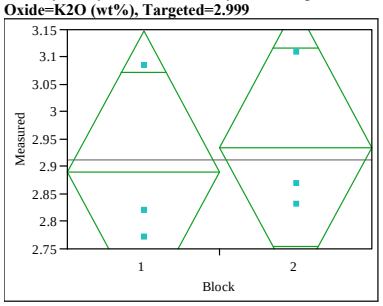
Difference	-0.0810	t Ratio	-0.12804
Std Err Dif	0.6327	DF	4
Upper CL Dif	1.6757	Prob > |t|	0.9043
Lower CL Dif	-1.8377	Prob > t	0.5479
Confidence	0.95	Prob < t	0.4521

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	13.7299	0.44740	12.488	14.972
2	3	13.6489	0.44740	12.407	14.891

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=K2O (wt%), Targeted=2.999



Oneway Anova
Summary of Fit

Rsquare	0.027822
Adj Rsquare	-0.21522
Root Mean Square Error	0.159884
Mean of Response	2.913124
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

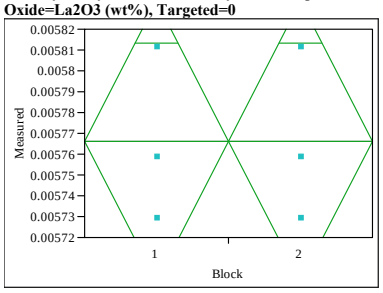
Difference	0.04417	t Ratio	0.338341
Std Err Dif	0.13054	DF	4
Upper CL Dif	0.40662	Prob > |t|	0.7521
Lower CL Dif	-0.31828	Prob > t	0.3761
Confidence	0.95	Prob < t	0.6239

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	2.89104	0.09231	2.6347	3.1473
2	3	2.93521	0.09231	2.6789	3.1915

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=La2O3 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	4.16e-5
Mean of Response	0.005766
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

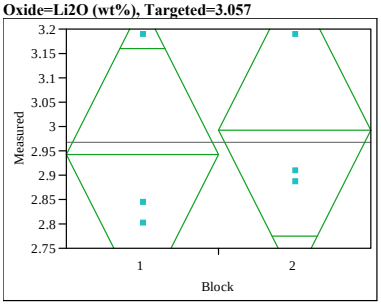
Difference	0.00000	t Ratio	0
Std Err Dif	0.000034	DF	4
Upper CL Dif	9.431e-5	Prob > |t|	1.0000
Lower CL Dif	-9.43e-5	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.005766	2.4e-5	0.00570	0.00583
2	3	0.005766	2.4e-5	0.00570	0.00583

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=Li2O (wt%), Targeted=3.057



Oneway Anova
Summary of Fit

Rsquare	0.025141
Adj Rsquare	-0.21857
Root Mean Square Error	0.191556
Mean of Response	2.967414
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

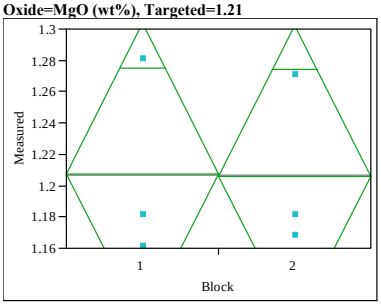
Difference	0.05023	t Ratio	0.321182
Std Err Dif	0.15640	DF	4
Upper CL Dif	0.48448	Prob > |t|	0.7642
Lower CL Dif	-0.38401	Prob > t	0.3821
Confidence	0.95	Prob < t	0.6179

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	2.94230	0.11059	2.6352	3.2494
2	3	2.99253	0.11059	2.6855	3.2996

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=MgO (wt%), Targeted=1.21



Oneway Anova
Summary of Fit

Rsquare	0.000127
Adj Rsquare	-0.24984
Root Mean Square Error	0.060081
Mean of Response	1.20669

Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

Observations (or Sum Wgts) 6

t Test
2-1
Assuming equal variances

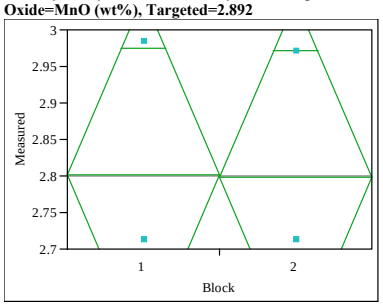
Difference	-0.00111	t Ratio	-0.02254
Std Err Dif	0.04906	DF	4
Upper CL Dif	0.13510	Prob > |t|	0.9831
Lower CL Dif	-0.13731	Prob > t	0.5085
Confidence	0.95	Prob < t	0.4915

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	1.20724	0.03469	1.1109	1.3036
2	3	1.20614	0.03469	1.1098	1.3024

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=MnO (wt%), Targeted=2.892



Oneway Anova
Summary of Fit

Rsquare	0.000297
Adj Rsquare	-0.24963
Root Mean Square Error	0.152868
Mean of Response	2.799752
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

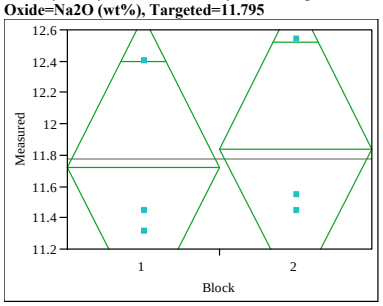
Difference	-0.00430	t Ratio	-0.03448
Std Err Dif	0.12482	DF	4
Upper CL Dif	0.34224	Prob > |t|	0.9741
Lower CL Dif	-0.35085	Prob > t	0.5129
Confidence	0.95	Prob < t	0.4871

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	2.80190	0.08826	2.5569	3.0469
2	3	2.79760	0.08826	2.5526	3.0426

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=Na2O (wt%), Targeted=11.795



Oneway Anova
Summary of Fit

Rsquare	0.015092
Adj Rsquare	-0.23114
Root Mean Square Error	0.600175
Mean of Response	11.77927
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

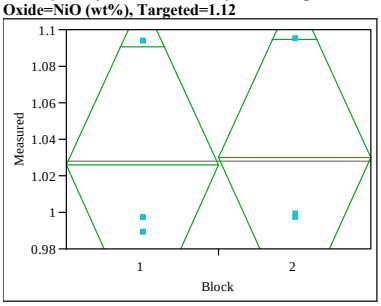
Difference	0.1213	t Ratio	0.247571
Std Err Dif	0.4900	DF	4
Upper CL Dif	1.4819	Prob > |t|	0.8167
Lower CL Dif	-1.2393	Prob > t	0.4083
Confidence	0.95	Prob < t	0.5917

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	11.7186	0.34651	10.757	12.681
2	3	11.8399	0.34651	10.878	12.802

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=NiO (wt%), Targeted=1.12



Oneway Anova
Summary of Fit

Rsquare	0.001678
Adj Rsquare	-0.2479
Root Mean Square Error	0.057019
Mean of Response	1.027968
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

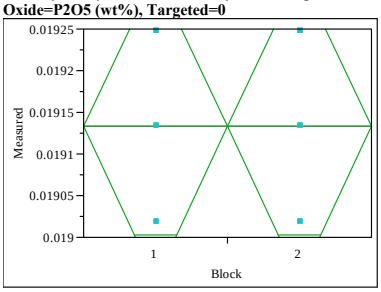
Difference	0.00382	t Ratio	0.081998
Std Err Dif	0.04656	DF	4
Upper CL Dif	0.13308	Prob > |t|	0.9386
Lower CL Dif	-0.12544	Prob > t	0.4693
Confidence	0.95	Prob < t	0.5307

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	1.02606	0.03292	0.93466	1.1175
2	3	1.02988	0.03292	0.93848	1.1213

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=P2O5 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.000115
Mean of Response	0.019133
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

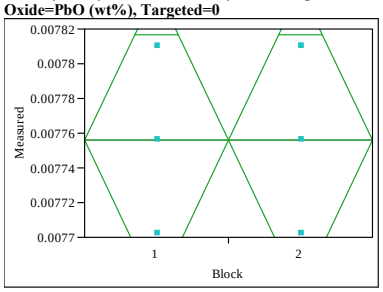
Difference	0.00000	t Ratio	0
Std Err Dif	9.355e-5	DF	4
Upper CL Dif	0.00026	Prob > |t|	1.0000
Lower CL Dif	-0.00026	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.019133	6.61e-5	0.01895	0.01932
2	3	0.019133	6.61e-5	0.01895	0.01932

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=PbO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	5.386e-5
Mean of Response	0.007756
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

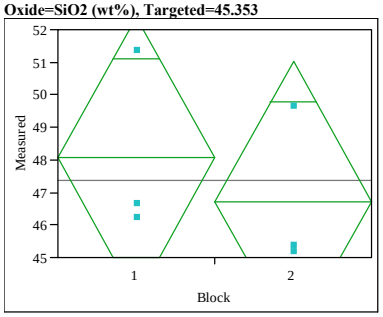
Difference	0.00000	t Ratio	0
Std Err Dif	0.000044	DF	4
Upper CL Dif	0.00012	Prob > |t|	1.0000
Lower CL Dif	-0.00012	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.007756	3.11e-5	0.00767	0.00784
2	3	0.007756	3.11e-5	0.00767	0.00784

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=SiO2 (wt%), Targeted=45.353



Oneway Anova
Summary of Fit

Rsquare	0.086509
Adj Rsquare	-0.14186
Root Mean Square Error	2.69614
Mean of Response	47.3855
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

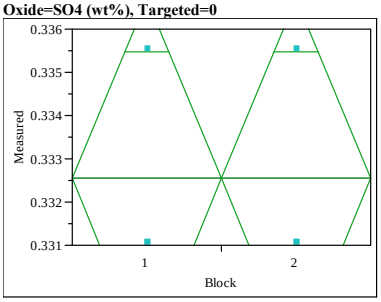
Difference	-1.3549	t Ratio	-0.61547
Std Err Dif	2.2014	DF	4
Upper CL Dif	4.7571	Prob > |t|	0.5715
Lower CL Dif	-7.4669	Prob > t	0.7142
Confidence	0.95	Prob < t	0.2858

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	48.0629	1.5566	43.741	52.385
2	3	46.7081	1.5566	42.386	51.030

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=SO4 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.002595
Mean of Response	0.332545
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

Difference	0.00000	t Ratio	0
Std Err Dif	0.00212	DF	4
Upper CL Dif	0.00588	Prob > |t|	1.0000
Lower CL Dif	-0.00588	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

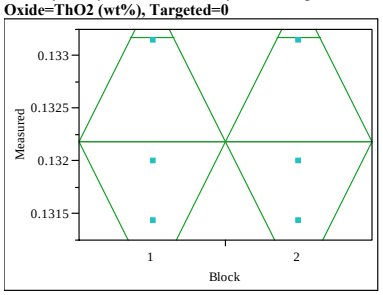
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.332545	0.00150	0.32839	0.33670
2	3	0.332545	0.00150	0.32839	0.33670

Std Error uses a pooled estimate of error variance

Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=ThO2 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.000869
Mean of Response	0.132186
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

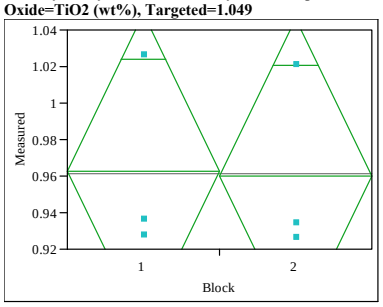
Difference	0.00000	t Ratio	0
Std Err Dif	0.00071	DF	4
Upper CL Dif	0.00197	Prob > |t|	1.0000
Lower CL Dif	-0.00197	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.132186	0.00050	0.13079	0.13358
2	3	0.132186	0.00050	0.13079	0.13358

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=TiO2 (wt%), Targeted=1.049



Oneway Anova
Summary of Fit

Rsquare	0.001007
Adj Rsquare	-0.24874
Root Mean Square Error	0.053619
Mean of Response	0.961602
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

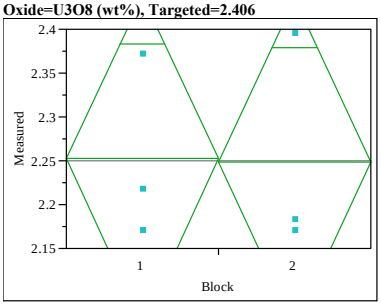
Difference	-0.00278	t Ratio	-0.0635
Std Err Dif	0.04378	DF	4
Upper CL Dif	0.11877	Prob > |t|	0.9524
Lower CL Dif	-0.12433	Prob > t	0.5238
Confidence	0.95	Prob < t	0.4762

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.962992	0.03096	0.87704	1.0489
2	3	0.960212	0.03096	0.87426	1.0462

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=U3O8 (wt%), Targeted=2.406



Oneway Anova
Summary of Fit

Rsquare	0.000431
Adj Rsquare	-0.24946
Root Mean Square Error	0.115938
Mean of Response	2.250307
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

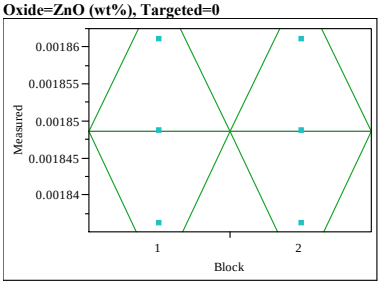
Difference	-0.00393	t Ratio	-0.04152
Std Err Dif	0.09466	DF	4
Upper CL Dif	0.25890	Prob > |t|	0.9689
Lower CL Dif	-0.26676	Prob > t	0.5156
Confidence	0.95	Prob < t	0.4844

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	2.25227	0.06694	2.0664	2.4381
2	3	2.24834	0.06694	2.0625	2.4342

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=ZnO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	1.245e-5
Mean of Response	0.001849
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

Difference	0.00000	t Ratio	0
Std Err Dif	1.016e-5	DF	4
Upper CL Dif	2.822e-5	Prob > |t|	1.0000
Lower CL Dif	-2.82e-5	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

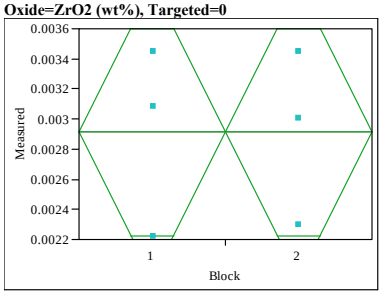
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.001849	7.1869e-6	0.00183	0.00187
2	3	0.001849	7.1869e-6	0.00183	0.00187

Std Error uses a pooled estimate of error variance

Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

Oneway Analysis of Measured By Block Prep Method=MA, Glass ID=U-std, Oxide=ZrO2 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.000606
Mean of Response	0.002913
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

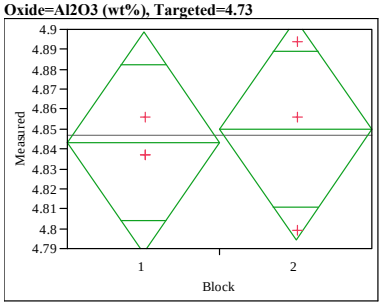
Difference	0.00000	t Ratio	0
Std Err Dif	0.00049	DF	4
Upper CL Dif	0.00137	Prob > |t|	1.0000
Lower CL Dif	-0.00137	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.002913	0.00035	0.00194	0.00388
2	3	0.002913	0.00035	0.00194	0.00388

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=Al2O3 (wt%), Targeted=4.73



Oneway Anova
Summary of Fit

Rsquare	0.012346
Adj Rsquare	-0.23457
Root Mean Square Error	0.034497
Mean of Response	4.846568
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

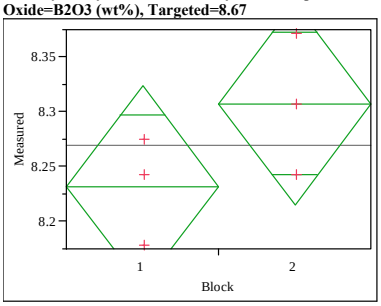
Difference	0.00630	t Ratio	0.223607
Std Err Dif	0.02817	DF	4
Upper CL Dif	0.08450	Prob > |t|	0.8340
Lower CL Dif	-0.07191	Prob > t	0.4170
Confidence	0.95	Prob < t	0.5830

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	4.84342	0.01992	4.7881	4.8987
2	3	4.84972	0.01992	4.7944	4.9050

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=B2O3 (wt%), Targeted=8.67



Oneway Anova
Summary of Fit

Rsquare	0.392
Adj Rsquare	0.24
Root Mean Square Error	0.057299
Mean of Response	8.269777
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

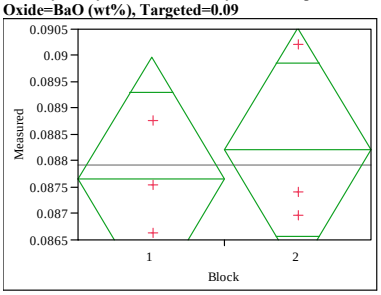
Difference	0.07513	t Ratio	1.60591
Std Err Dif	0.04678	DF	4
Upper CL Dif	0.20502	Prob > |t|	0.1836
Lower CL Dif	-0.05476	Prob > t	0.0918
Confidence	0.95	Prob < t	0.9082

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	8.23221	0.03308	8.1404	8.3241
2	3	8.30734	0.03308	8.2155	8.3992

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=BaO (wt%), Targeted=0.09



Oneway Anova
Summary of Fit

Rsquare	0.052558
Adj Rsquare	-0.1843
Root Mean Square Error	0.001451
Mean of Response	0.087924
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

Difference	0.00056	t Ratio	0.471056
Std Err Dif	0.00119	DF	4
Upper CL Dif	0.00385	Prob > |t|	0.6621
Lower CL Dif	-0.00273	Prob > t	0.3311
Confidence	0.95	Prob < t	0.6689

Means for Oneway Anova

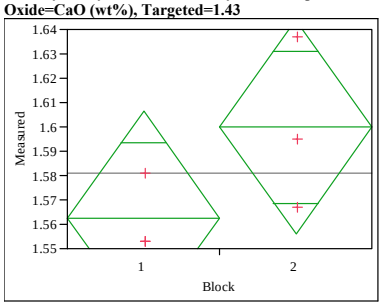
Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.087645	0.00084	0.08532	0.08997

Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
2	3	0.088204	0.00084	0.08588	0.09053

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=CaO (wt%), Targeted=1.43



Oneway Anova
Summary of Fit

Rsquare	0.410256
Adj Rsquare	0.262821
Root Mean Square Error	0.027395
Mean of Response	1.581096
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

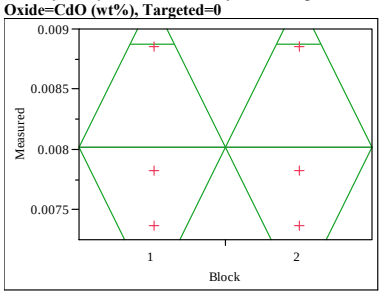
Difference	0.03731	t Ratio	1.668115
Std Err Dif	0.02237	DF	4
Upper CL Dif	0.09941	Prob > |t|	0.1706
Lower CL Dif	-0.02479	Prob > t	0.0853
Confidence	0.95	Prob < t	0.9147

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	1.56244	0.01582	1.5185	1.6064
2	3	1.59975	0.01582	1.5558	1.6437

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=CdO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.000761
Mean of Response	0.008015
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

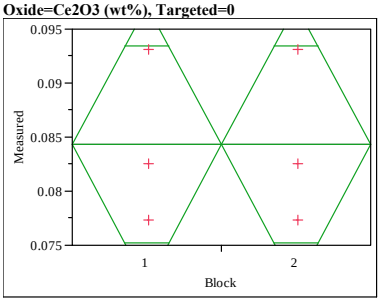
Difference	0.00000	t Ratio	0
Std Err Dif	0.00062	DF	4
Upper CL Dif	0.00172	Prob > |t|	1.0000
Lower CL Dif	-0.00172	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.008015	0.00044	0.00680	0.00923
2	3	0.008015	0.00044	0.00680	0.00923

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=Ce2O3 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.008051
Mean of Response	0.084334
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

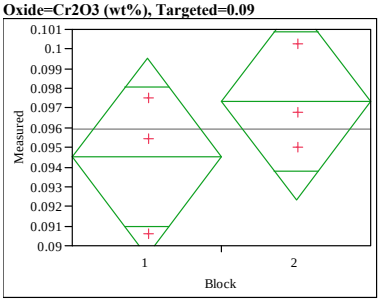
Difference	0.00000	t Ratio	0
Std Err Dif	0.00657	DF	4
Upper CL Dif	0.01825	Prob > |t|	1.0000
Lower CL Dif	-0.01825	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.084334	0.00465	0.07143	0.09724
2	3	0.084334	0.00465	0.07143	0.09724

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=Cr2O3 (wt%), Targeted=0.09



Oneway Anova
Summary of Fit

Rsquare	0.233871
Adj Rsquare	0.042339
Root Mean Square Error	0.003132
Mean of Response	0.09593
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

Difference	0.00283	t Ratio	1.105013
Std Err Dif	0.00256	DF	4
Upper CL Dif	0.00993	Prob > |t|	0.3311
Lower CL Dif	-0.00427	Prob > t	0.1656
Confidence	0.95	Prob < t	0.8344

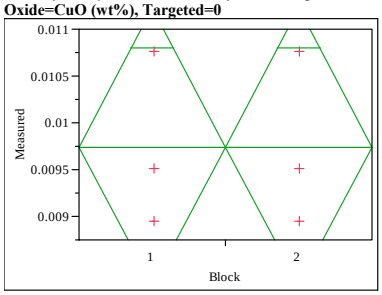
Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.094517	0.00181	0.08950	0.09954
2	3	0.097343	0.00181	0.09232	0.10236

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=CuO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.000929
Mean of Response	0.009743
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

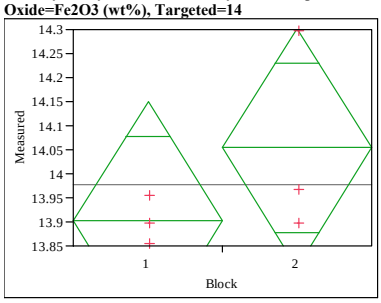
Difference	0.00000	t Ratio	0
Std Err Dif	0.00076	DF	4
Upper CL Dif	0.00211	Prob > |t|	1.0000
Lower CL Dif	-0.00211	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.009743	0.00054	0.00825	0.01123
2	3	0.009743	0.00054	0.00825	0.01123

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=Fe2O3 (wt%), Targeted=14



Oneway Anova
Summary of Fit

Rsquare	0.266112
Adj Rsquare	0.08264
Root Mean Square Error	0.155086
Mean of Response	13.9777
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

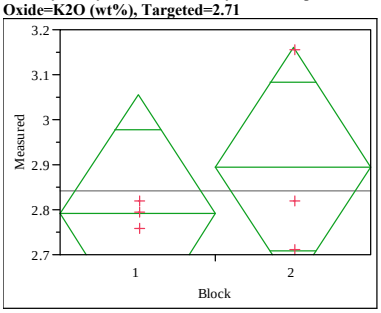
Difference	0.15250	t Ratio	1.204336
Std Err Dif	0.12663	DF	4
Upper CL Dif	0.50407	Prob > |t|	0.2948
Lower CL Dif	-0.19907	Prob > t	0.1474
Confidence	0.95	Prob < t	0.8526

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	13.9014	0.08954	13.653	14.150
2	3	14.0540	0.08954	13.805	14.303

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=K2O (wt%), Targeted=2.71



Oneway Anova
Summary of Fit

Rsquare	0.129502
Adj Rsquare	-0.08812
Root Mean Square Error	0.165751
Mean of Response	2.842856
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

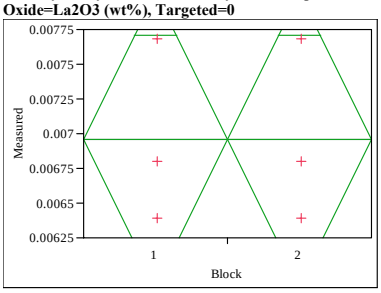
Difference	0.10440	t Ratio	0.771408
Std Err Dif	0.13534	DF	4
Upper CL Dif	0.48015	Prob > |t|	0.4835
Lower CL Dif	-0.27135	Prob > t	0.2418
Confidence	0.95	Prob < t	0.7582

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	2.79066	0.09570	2.5250	3.0564
2	3	2.89506	0.09570	2.6294	3.1608

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=La2O3 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.000659
Mean of Response	0.006959
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

Difference	0.00000	t Ratio	0
Std Err Dif	0.00054	DF	4
Upper CL Dif	0.00149	Prob > |t|	1.0000

Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

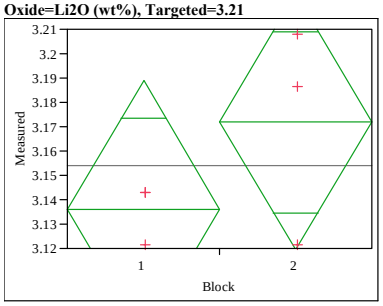
Lower CL Dif	-0.00149	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.006959	0.00038	0.00590	0.00802
2	3	0.006959	0.00038	0.00590	0.00802

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=Li2O (wt%), Targeted=3.21



Oneway Anova
Summary of Fit

Rsquare	0.308642
Adj Rsquare	0.135802
Root Mean Square Error	0.032886
Mean of Response	3.153999
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

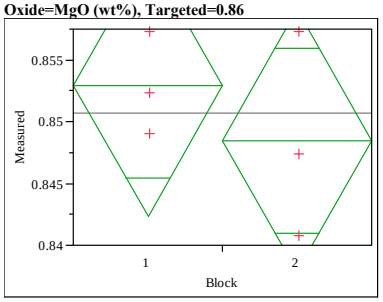
Difference	0.03588	t Ratio	1.336306
Std Err Dif	0.02685	DF	4
Upper CL Dif	0.11043	Prob > |t|	0.2524
Lower CL Dif	-0.03867	Prob > t	0.1262
Confidence	0.95	Prob < t	0.8738

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	3.13606	0.01899	3.0833	3.1888
2	3	3.17194	0.01899	3.1192	3.2247

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=MgO (wt%), Targeted=0.86



Oneway Anova
Summary of Fit

Rsquare	0.144144
Adj Rsquare	-0.06982
Root Mean Square Error	0.006599
Mean of Response	0.850708
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

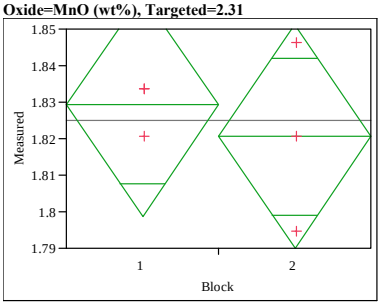
Difference	-0.00442	t Ratio	-0.82078
Std Err Dif	0.00539	DF	4
Upper CL Dif	0.01054	Prob > |t|	0.4579
Lower CL Dif	-0.01938	Prob > t	0.7711
Confidence	0.95	Prob < t	0.2289

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.852919	0.00381	0.84234	0.86350
2	3	0.848497	0.00381	0.83792	0.85907

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=MnO (wt%), Targeted=2.31



Oneway Anova
Summary of Fit

Rsquare	0.071429
Adj Rsquare	-0.16071
Root Mean Square Error	0.019006
Mean of Response	1.824896
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

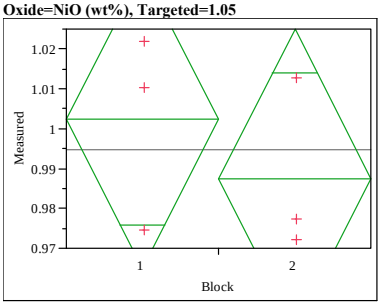
Difference	-0.00861	t Ratio	-0.5547
Std Err Dif	0.01552	DF	4
Upper CL Dif	0.03448	Prob > |t|	0.6087
Lower CL Dif	-0.05169	Prob > t	0.6957
Confidence	0.95	Prob < t	0.3043

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	1.82920	0.01097	1.7987	1.8597
2	3	1.82059	0.01097	1.7901	1.8511

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=NiO (wt%), Targeted=1.05



Oneway Anova
Summary of Fit

Rsquare	0.131142
Adj Rsquare	-0.08607
Root Mean Square Error	0.0234
Mean of Response	0.994883
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

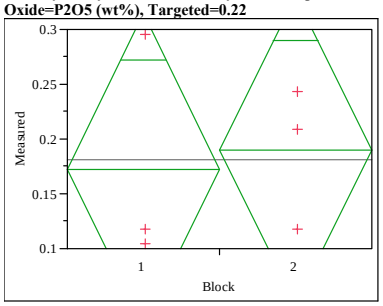
Difference	-0.01485	t Ratio	-0.77701
Std Err Dif	0.01911	DF	4
Upper CL Dif	0.03820	Prob > |t|	0.4805
Lower CL Dif	-0.06789	Prob > t	0.7597
Confidence	0.95	Prob < t	0.2403

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	1.00231	0.01351	0.96480	1.0398
2	3	0.98746	0.01351	0.94995	1.0250

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=P2O5 (wt%), Targeted=0.22



Oneway Anova
Summary of Fit

Rsquare	0.01399
Adj Rsquare	-0.23251
Root Mean Square Error	0.088155
Mean of Response	0.181231
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

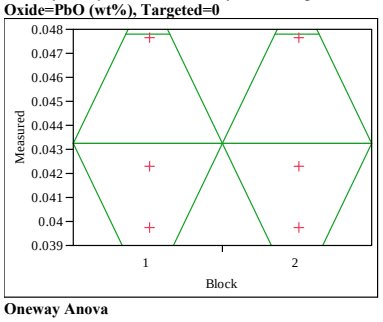
Difference	0.01715	t Ratio	0.23823
Std Err Dif	0.07198	DF	4
Upper CL Dif	0.21699	Prob > |t|	0.8234
Lower CL Dif	-0.18270	Prob > t	0.4117
Confidence	0.95	Prob < t	0.5883

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.172657	0.05090	0.03135	0.31397
2	3	0.189804	0.05090	0.04849	0.33111

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=PbO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.004044
Mean of Response	0.043232
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

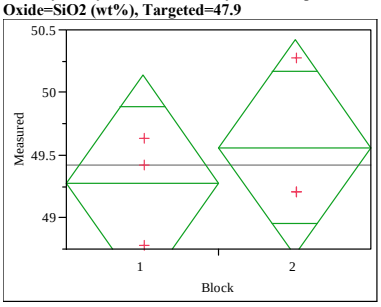
Difference	0.00000	t Ratio	0
Std Err Dif	0.00330	DF	4
Upper CL Dif	0.00917	Prob > |t|	1.0000
Lower CL Dif	-0.00917	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.043232	0.00233	0.03675	0.04971
2	3	0.043232	0.00233	0.03675	0.04971

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=SiO2 (wt%), Targeted=47.9



Oneway Anova
Summary of Fit

Rsquare	0.095238
Adj Rsquare	-0.13095
Root Mean Square Error	0.538379
Mean of Response	49.41783
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

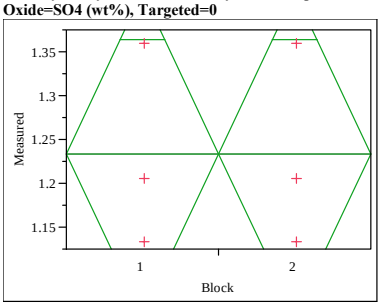
Difference	0.2852	t Ratio	0.648886
Std Err Dif	0.4396	DF	4
Upper CL Dif	1.5057	Prob > |t|	0.5518
Lower CL Dif	-0.9352	Prob > t	0.2759
Confidence	0.95	Prob < t	0.7241

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	49.2752	0.31083	48.412	50.138
2	3	49.5605	0.31083	48.697	50.423

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=SO4 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.115569
Mean of Response	1.233312
Observations (or Sum Wgts)	6

Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

t Test
2-1
Assuming equal variances

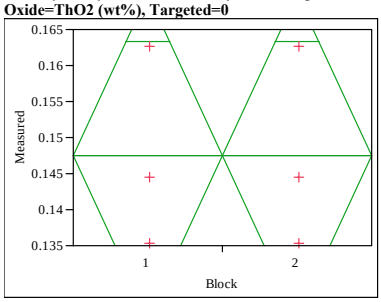
Difference	0.00000	t Ratio	0
Std Err Dif	0.09436	DF	4
Upper CL Dif	0.26199	Prob > |t|	1.0000
Lower CL Dif	-0.26199	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	1.23331	0.06672	1.0481	1.4186
2	3	1.23331	0.06672	1.0481	1.4186

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=ThO2 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.013905
Mean of Response	0.147548
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

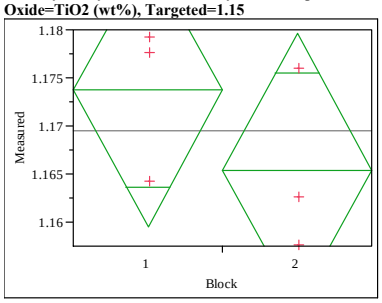
Difference	0.00000	t Ratio	0
Std Err Dif	0.01135	DF	4
Upper CL Dif	0.03152	Prob > |t|	1.0000
Lower CL Dif	-0.03152	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.147548	0.00803	0.12526	0.16984
2	3	0.147548	0.00803	0.12526	0.16984

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=TiO2 (wt%), Targeted=1.15



Oneway Anova
Summary of Fit

Rsquare	0.248619
Adj Rsquare	0.060773
Root Mean Square Error	0.008879
Mean of Response	1.169546
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

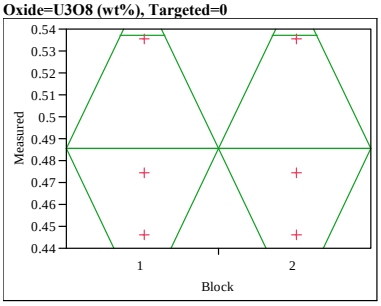
Difference	-0.00834	t Ratio	-1.15045
Std Err Dif	0.00725	DF	4
Upper CL Dif	0.01179	Prob > |t|	0.3141
Lower CL Dif	-0.02847	Prob > t	0.8430
Confidence	0.95	Prob < t	0.1570

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	1.17372	0.00513	1.1595	1.1879
2	3	1.16538	0.00513	1.1511	1.1796

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=U3O8 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.045488
Mean of Response	0.485437
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

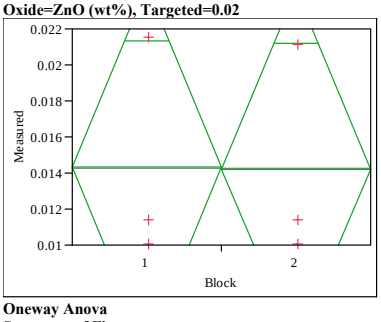
Difference	0.00000	t Ratio	0
Std Err Dif	0.03714	DF	4
Upper CL Dif	0.10312	Prob > |t|	1.0000
Lower CL Dif	-0.10312	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.485437	0.02626	0.41252	0.55835
2	3	0.485437	0.02626	0.41252	0.55835

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=ARG-1, Oxide=ZnO (wt%), Targeted=0.02



Oneway Anova
Summary of Fit

Rsquare	0.000153
Adj Rsquare	-0.24981
Root Mean Square Error	0.006162
Mean of Response	0.014274

Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

Observations (or Sum Wgts) 6

t Test
2-1
Assuming equal variances

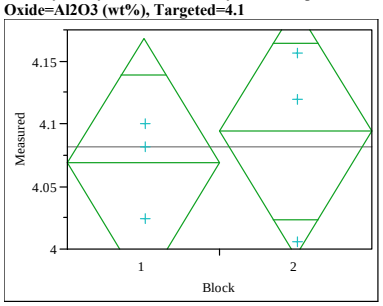
Difference	-0.00012	t Ratio	-0.02474
Std Err Dif	0.00503	DF	4
Upper CL Dif	0.01385	Prob > |t|	0.9814
Lower CL Dif	-0.01409	Prob > t	0.5093
Confidence	0.95	Prob < t	0.4907

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.014336	0.00356	0.00446	0.02421
2	3	0.014211	0.00356	0.00433	0.02409

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=Al2O3 (wt%), Targeted=4.1



Oneway Anova
Summary of Fit

Rsquare	0.057971
Adj Rsquare	-0.17754
Root Mean Square Error	0.062191
Mean of Response	4.08132
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

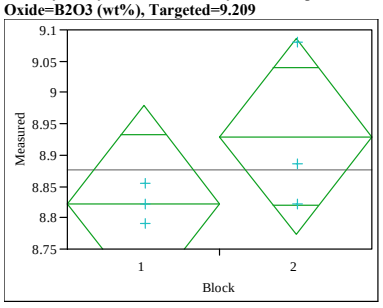
Difference	0.02519	t Ratio	0.496139
Std Err Dif	0.05078	DF	4
Upper CL Dif	0.16618	Prob > |t|	0.6458
Lower CL Dif	-0.11579	Prob > t	0.3229
Confidence	0.95	Prob < t	0.6771

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	4.06872	0.03591	3.9690	4.1684
2	3	4.09392	0.03591	3.9942	4.1936

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=B2O3 (wt%), Targeted=9.209



Oneway Anova
Summary of Fit

Rsquare	0.3125
Adj Rsquare	0.140625
Root Mean Square Error	0.097487
Mean of Response	8.876191
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

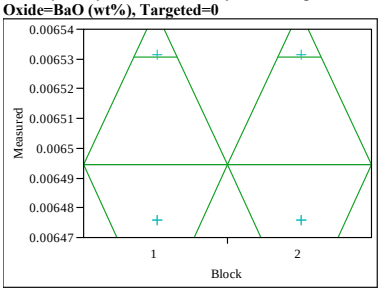
Difference	0.10733	t Ratio	1.3484
Std Err Dif	0.07960	DF	4
Upper CL Dif	0.32833	Prob > |t|	0.2488
Lower CL Dif	-0.11367	Prob > t	0.1244
Confidence	0.95	Prob < t	0.8756

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	8.82253	0.05628	8.6663	8.9788
2	3	8.92986	0.05628	8.7736	9.0861

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=BaO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	3.223e-5
Mean of Response	0.006494
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

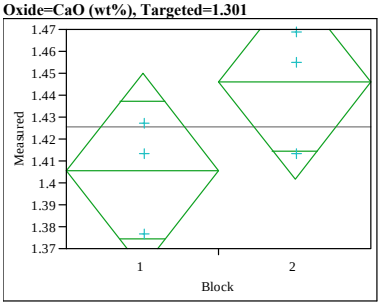
Difference	0.00000	t Ratio	0
Std Err Dif	2.632e-5	DF	4
Upper CL Dif	0.000073	Prob > |t|	1.0000
Lower CL Dif	-7.31e-5	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.006494	1.86e-5	0.00644	0.00655
2	3	0.006494	1.86e-5	0.00644	0.00655

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=CaO (wt%), Targeted=1.301



Oneway Anova
Summary of Fit

Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

Rsquare	0.441816
Adj Rsquare	0.30227
Root Mean Square Error	0.027608
Mean of Response	1.425785
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

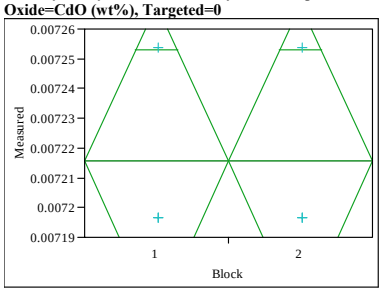
Difference	0.04011	t Ratio	1.779353
Std Err Dif	0.02254	DF	4
Upper CL Dif	0.10270	Prob > |t|	0.1498
Lower CL Dif	-0.02248	Prob > t	0.0749
Confidence	0.95	Prob < t	0.9251

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	1.40573	0.01594	1.3615	1.4500
2	3	1.44584	0.01594	1.4016	1.4901

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=CdO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.000033
Mean of Response	0.007216
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

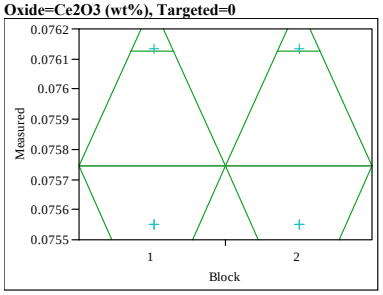
Difference	0.00000	t Ratio	0
Std Err Dif	0.000027	DF	4
Upper CL Dif	7.475e-5	Prob > |t|	1.0000
Lower CL Dif	-7.48e-5	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.007216	0.00002	0.00716	0.00727
2	3	0.007216	0.00002	0.00716	0.00727

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=Ce2O3 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.000338
Mean of Response	0.075744
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

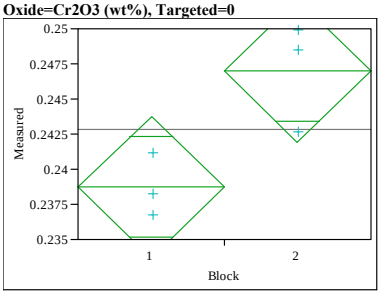
Difference	0.00000	t Ratio	0
Std Err Dif	0.00028	DF	4
Upper CL Dif	0.00077	Prob > |t|	1.0000
Lower CL Dif	-0.00077	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.075744	0.00020	0.07520	0.07629
2	3	0.075744	0.00020	0.07520	0.07629

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=Cr2O3 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0.720698
Adj Rsquare	0.650873
Root Mean Square Error	0.003157
Mean of Response	0.242869
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

Difference	0.008282	t Ratio	3.212698
Std Err Dif	0.002578	DF	4
Upper CL Dif	0.015440	Prob > |t|	0.0325
Lower CL Dif	0.001125	Prob > t	0.0163
Confidence	0.95	Prob < t	0.9837

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.238728	0.00182	0.23367	0.24379
2	3	0.247010	0.00182	0.24195	0.25207

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=CuO (wt%), Targeted=0

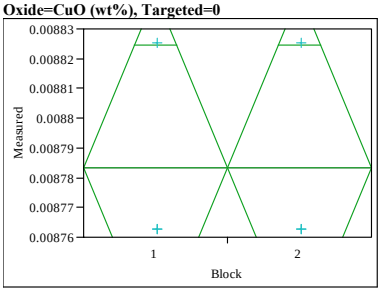


Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	3.614e-5
Mean of Response	0.008783
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

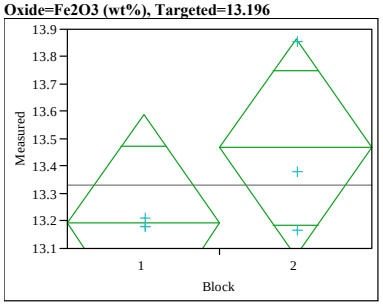
Difference	0.00000	t Ratio	0
Std Err Dif	2.951e-5	DF	4
Upper CL Dif	0.000082	Prob > |t|	1.0000
Lower CL Dif	-8.19e-5	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.008783	0.00002	0.00873	0.00884
2	3	0.008783	0.00002	0.00873	0.00884

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=Fe2O3 (wt%), Targeted=13.196



Oneway Anova
Summary of Fit

Rsquare	0.31688
Adj Rsquare	0.1461
Root Mean Square Error	0.248524
Mean of Response	13.32957
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

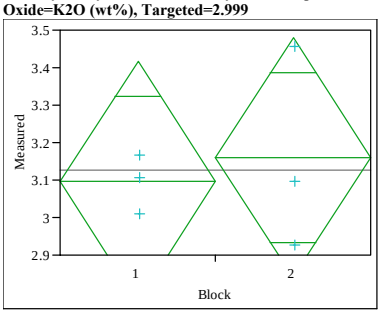
Difference	0.27641	t Ratio	1.362163
Std Err Dif	0.20292	DF	4
Upper CL Dif	0.83980	Prob > |t|	0.2448
Lower CL Dif	-0.28698	Prob > t	0.1224
Confidence	0.95	Prob < t	0.8776

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	13.1914	0.14349	12.793	13.590
2	3	13.4678	0.14349	13.069	13.866

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=K2O (wt%), Targeted=2.999



Oneway Anova
Summary of Fit

Rsquare	0.037449
Adj Rsquare	-0.20319
Root Mean Square Error	0.199457
Mean of Response	3.127945
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

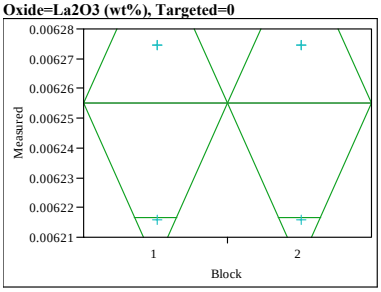
Difference	0.06425	t Ratio	0.394491
Std Err Dif	0.16286	DF	4
Upper CL Dif	0.51641	Prob > |t|	0.7133
Lower CL Dif	-0.38792	Prob > t	0.3567
Confidence	0.95	Prob < t	0.6433

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	3.09582	0.11516	2.7761	3.4155
2	3	3.16007	0.11516	2.8403	3.4798

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=La2O3 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	3.386e-5
Mean of Response	0.006255
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

Difference	0.00000	t Ratio	0
Std Err Dif	2.764e-5	DF	4
Upper CL Dif	7.675e-5	Prob > |t|	1.0000
Lower CL Dif	-7.67e-5	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

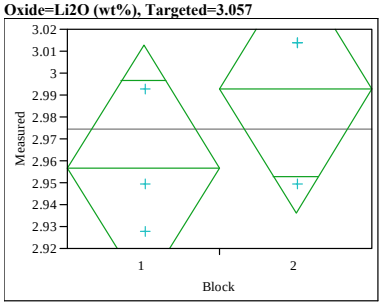
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.006255	0.00002	0.00620	0.00631
2	3	0.006255	0.00002	0.00620	0.00631

Std Error uses a pooled estimate of error variance

Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=Li2O (wt%), Targeted=3.057



Oneway Anova
Summary of Fit

Rsquare	0.280899
Adj Rsquare	0.101124
Root Mean Square Error	0.035157
Mean of Response	2.97459
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

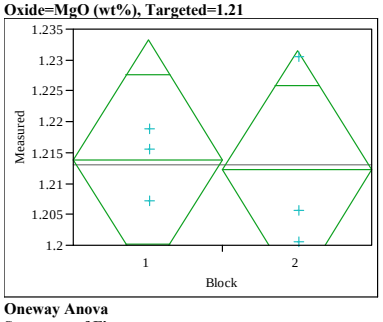
Difference	0.03588	t Ratio	1.25
Std Err Dif	0.02871	DF	4
Upper CL Dif	0.11558	Prob > |t|	0.2794
Lower CL Dif	-0.04382	Prob > t	0.1397
Confidence	0.95	Prob < t	0.8603

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	2.95665	0.02030	2.9003	3.0130
2	3	2.99253	0.02030	2.9362	3.0489

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=MgO (wt%), Targeted=1.21



Oneway Anova
Summary of Fit

Rsquare	0.007026
Adj Rsquare	-0.24122
Root Mean Square Error	0.012073
Mean of Response	1.213046
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

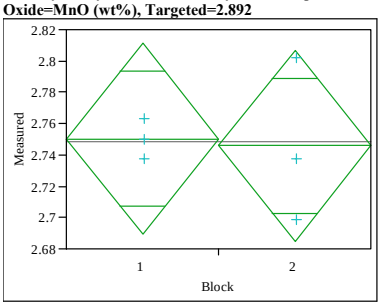
Difference	-0.00166	t Ratio	-0.16823
Std Err Dif	0.00986	DF	4
Upper CL Dif	0.02571	Prob > |t|	0.8746
Lower CL Dif	-0.02903	Prob > t	0.5627
Confidence	0.95	Prob < t	0.4373

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	1.21388	0.00697	1.1945	1.2332
2	3	1.21222	0.00697	1.1929	1.2316

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=MnO (wt%), Targeted=2.892



Oneway Anova
Summary of Fit

Rsquare	0.004785
Adj Rsquare	-0.24402
Root Mean Square Error	0.038012
Mean of Response	2.748104
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

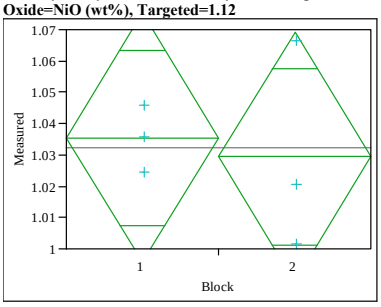
Difference	-0.00430	t Ratio	-0.13868
Std Err Dif	0.03104	DF	4
Upper CL Dif	0.08187	Prob > |t|	0.8964
Lower CL Dif	-0.09048	Prob > t	0.5518
Confidence	0.95	Prob < t	0.4482

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	2.75026	0.02195	2.6893	2.8112
2	3	2.74595	0.02195	2.6850	2.8069

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=NiO (wt%), Targeted=1.12



Oneway Anova
Summary of Fit

Rsquare	0.021057
Adj Rsquare	-0.22368
Root Mean Square Error	0.024795
Mean of Response	1.032422
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

Difference	-0.00594	t Ratio	-0.29333
Std Err Dif	0.02024	DF	4
Upper CL Dif	0.05027	Prob > |t|	0.7839
Lower CL Dif	-0.06215	Prob > t	0.6081
Confidence	0.95	Prob < t	0.3919

Means for Oneway Anova

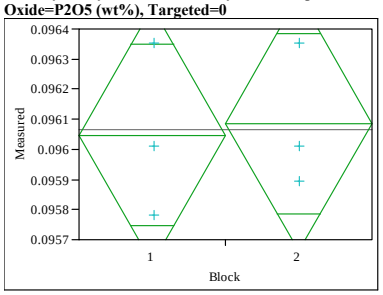
Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	1.03539	0.01432	0.99565	1.0751

Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
2	3	1.02945	0.01432	0.98971	1.0692

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=P2O5 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0.007752
Adj Rsquare	-0.24031
Root Mean Square Error	0.000265
Mean of Response	0.096067
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

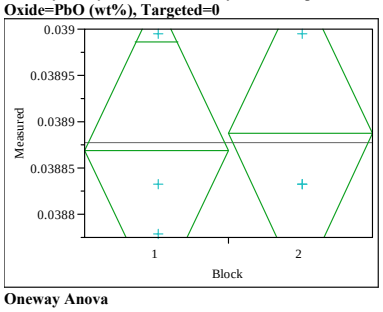
Difference	3.819e-5	t Ratio	0.176777
Std Err Dif	0.00022	DF	4
Upper CL Dif	0.00064	Prob > |t|	0.8683
Lower CL Dif	-0.00056	Prob > t	0.4341
Confidence	0.95	Prob < t	0.5659

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.096048	0.00015	0.09562	0.09647
2	3	0.096086	0.00015	0.09566	0.09651

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=PbO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0.011236
Adj Rsquare	-0.23596
Root Mean Square Error	0.000103
Mean of Response	0.038878
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

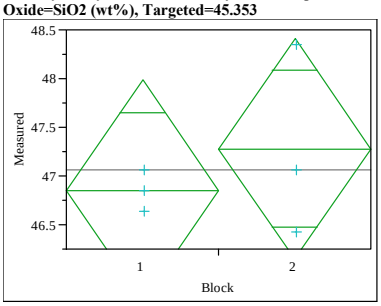
Difference	0.000018	t Ratio	0.213201
Std Err Dif	8.421e-5	DF	4
Upper CL Dif	0.00025	Prob > |t|	0.8416
Lower CL Dif	-0.00022	Prob > t	0.4208
Confidence	0.95	Prob < t	0.5792

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.038869	0.00006	0.03870	0.03903
2	3	0.038887	0.00006	0.03872	0.03905

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=SiO2 (wt%), Targeted=45.353



Oneway Anova
Summary of Fit

Rsquare	0.12
Adj Rsquare	-0.1
Root Mean Square Error	0.709526
Mean of Response	47.0646
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

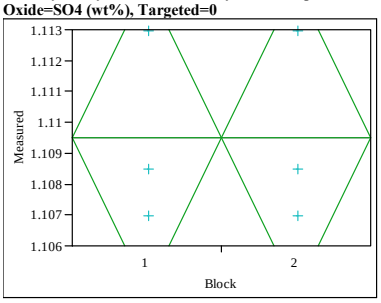
Difference	0.4279	t Ratio	0.738549
Std Err Dif	0.5793	DF	4
Upper CL Dif	2.0363	Prob > |t|	0.5012
Lower CL Dif	-1.1806	Prob > t	0.2506
Confidence	0.95	Prob < t	0.7494

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	46.8507	0.40964	45.713	47.988
2	3	47.2785	0.40964	46.141	48.416

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=SO4 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.003118
Mean of Response	1.109482
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

Difference	0.00000	t Ratio	0
Std Err Dif	0.00255	DF	4
Upper CL Dif	0.00707	Prob > |t|	1.0000
Lower CL Dif	-0.00707	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

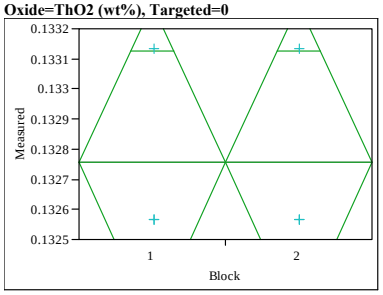
Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	1.10948	0.00180	1.1045	1.1145
2	3	1.10948	0.00180	1.1045	1.1145

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=ThO2 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.000328
Mean of Response	0.132755
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

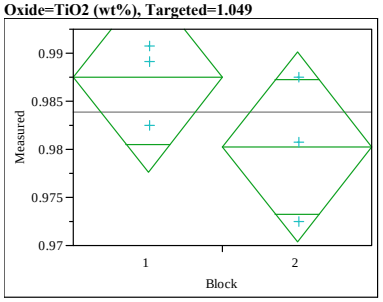
Difference	0.00000	t Ratio	0
Std Err Dif	0.00027	DF	4
Upper CL Dif	0.00074	Prob > |t|	1.0000
Lower CL Dif	-0.00074	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.132755	0.00019	0.13223	0.13328
2	3	0.132755	0.00019	0.13223	0.13328

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=TiO2 (wt%), Targeted=1.049



Oneway Anova
Summary of Fit

Rsquare	0.34004
Adj Rsquare	0.17505
Root Mean Square Error	0.006166
Mean of Response	0.983842
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

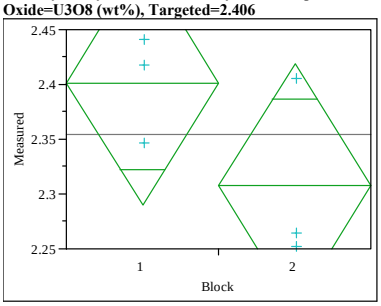
Difference	-0.00723	t Ratio	-1.43561
Std Err Dif	0.00503	DF	4
Upper CL Dif	0.00675	Prob > |t|	0.2244
Lower CL Dif	-0.02121	Prob > t	0.8878
Confidence	0.95	Prob < t	0.1122

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.987456	0.00356	0.97757	0.99734
2	3	0.980228	0.00356	0.97034	0.99011

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=U3O8 (wt%), Targeted=2.406



Oneway Anova
Summary of Fit

Rsquare	0.407932
Adj Rsquare	0.259915
Root Mean Square Error	0.069596
Mean of Response	2.354469
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

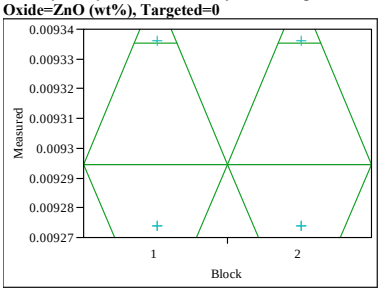
Difference	-0.09434	t Ratio	-1.66011
Std Err Dif	0.05682	DF	4
Upper CL Dif	0.06344	Prob > |t|	0.1722
Lower CL Dif	-0.25211	Prob > t	0.9139
Confidence	0.95	Prob < t	0.0861

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	2.40164	0.04018	2.2901	2.5132
2	3	2.30730	0.04018	2.1957	2.4189

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Block Prep Method=PF, Glass ID=U-std, Oxide=ZnO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.25
Root Mean Square Error	0.000036
Mean of Response	0.009295
Observations (or Sum Wgts)	6

t Test
2-1
Assuming equal variances

Difference	0.00000	t Ratio	0
Std Err Dif	2.934e-5	DF	4
Upper CL Dif	8.146e-5	Prob > |t|	1.0000
Lower CL Dif	-8.15e-5	Prob > t	0.5000
Confidence	0.95	Prob < t	0.5000

Exhibit C3. Measurements by Block and Sub-Block for Samples of the ARG-1 and Ustd Standards with the Thorium Glasses by Oxide

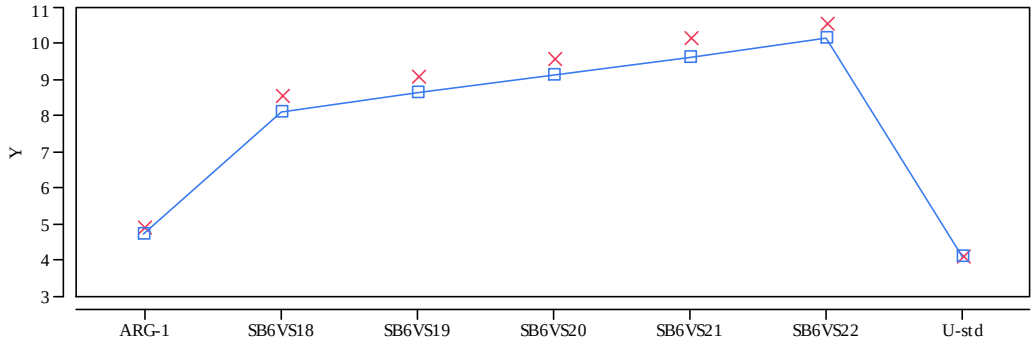
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	0.009295	0.00002	0.00924	0.00935
2	3	0.009295	0.00002	0.00924	0.00935

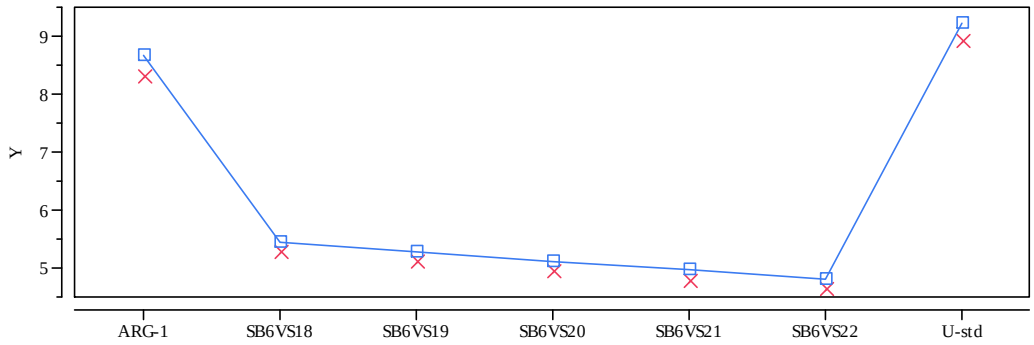
Std Error uses a pooled estimate of error variance

Exhibit C4. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the Thorium SB6 VS Glasses

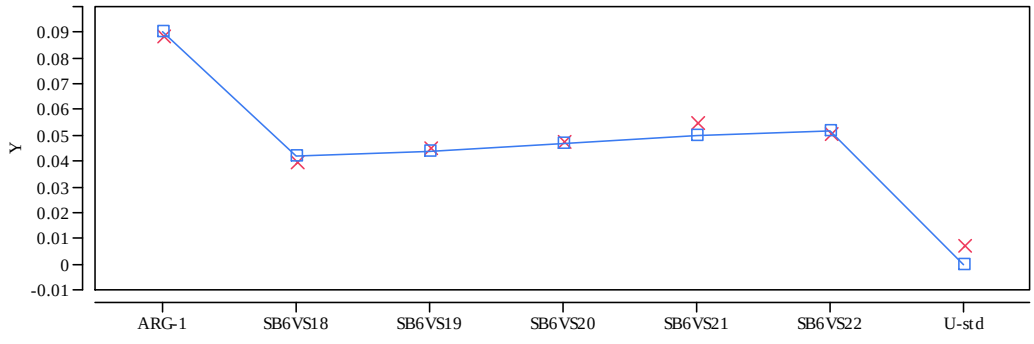
Overlay Plot Oxide=Al2O3 (wt%)



Overlay Plot Oxide=B2O3 (wt%)



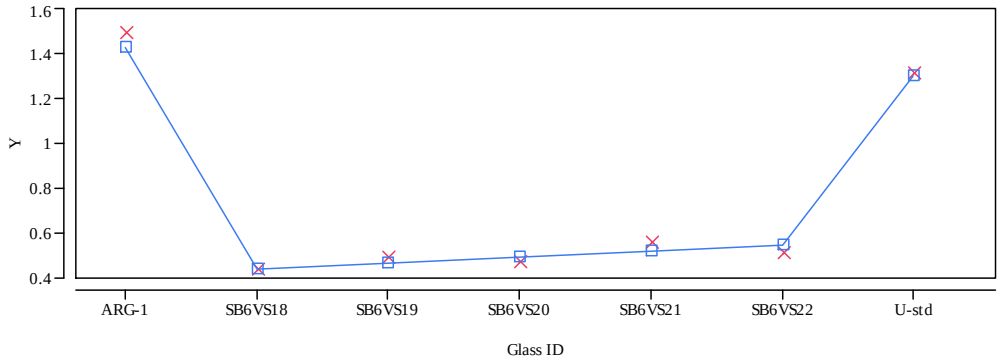
Overlay Plot Oxide=BaO (wt%)



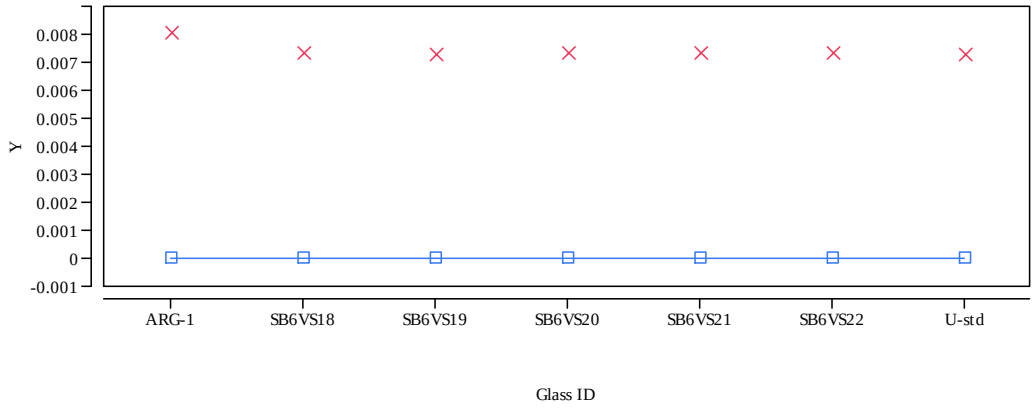
Y Measured Targeted

Exhibit C4. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the Thorium SB6 VS Glasses

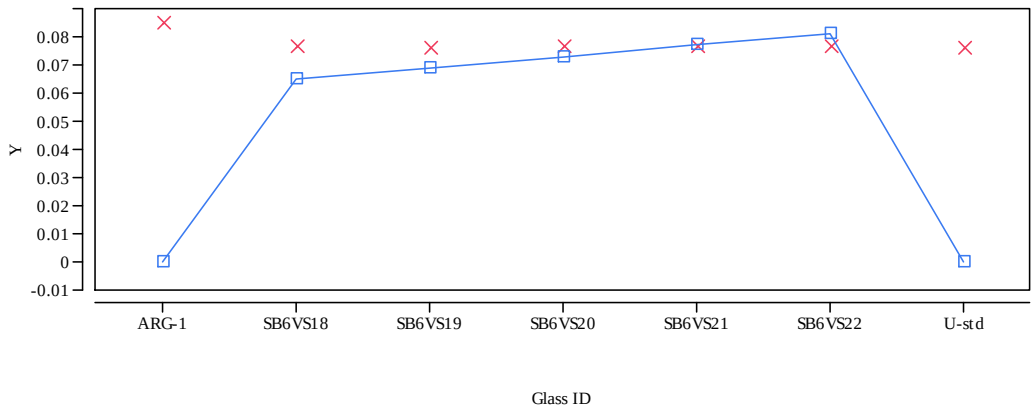
Overlay Plot Oxide=CaO (wt%)



Overlay Plot Oxide=CdO (wt%)



Overlay Plot Oxide=Ce2O3 (wt%)



Y Measured Targeted

Exhibit C4. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the Thorium SB6 VS Glasses

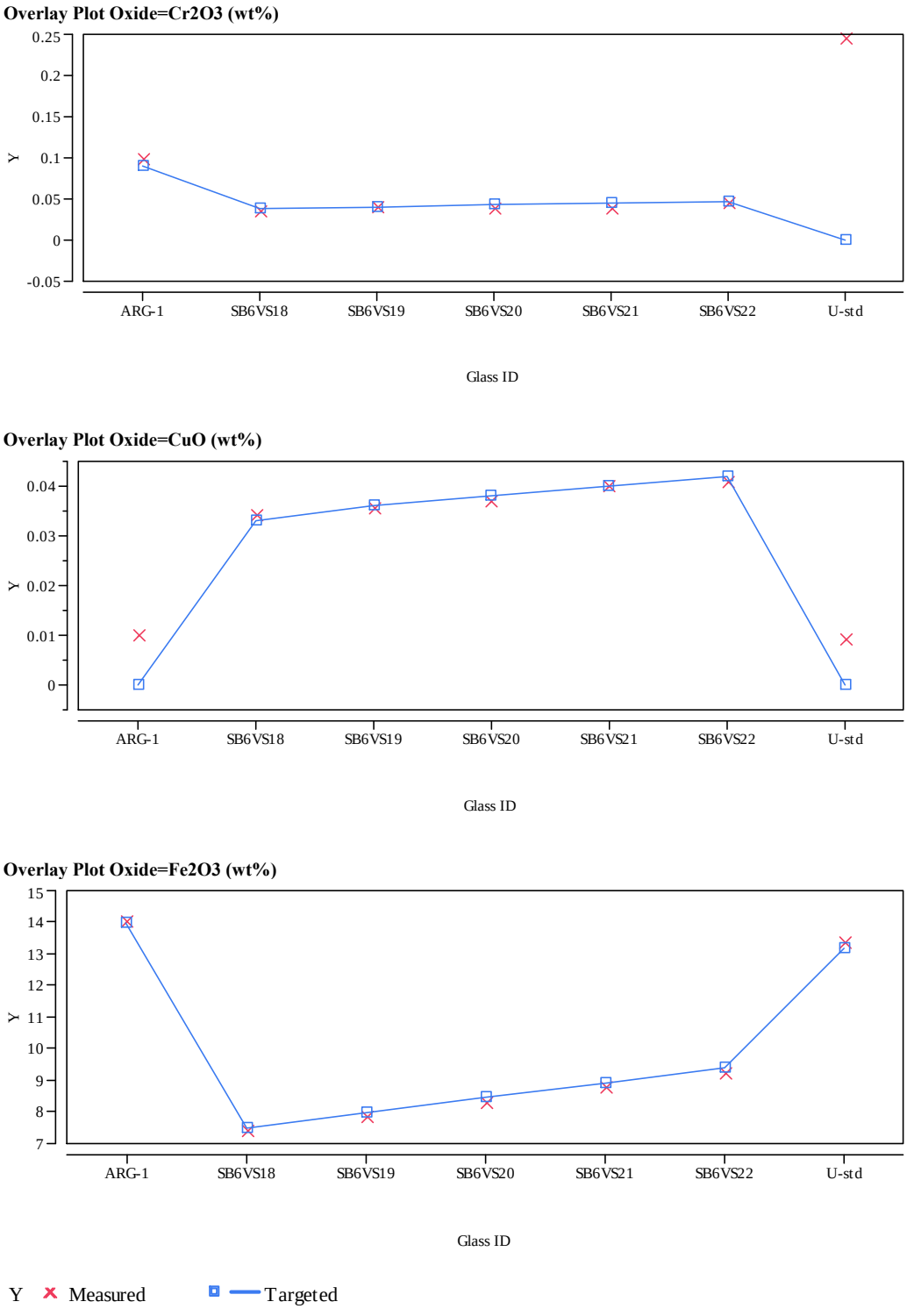
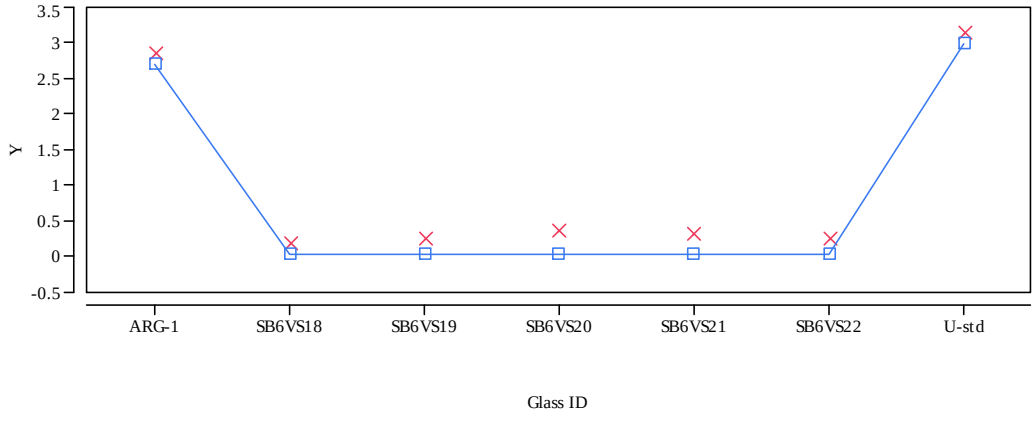
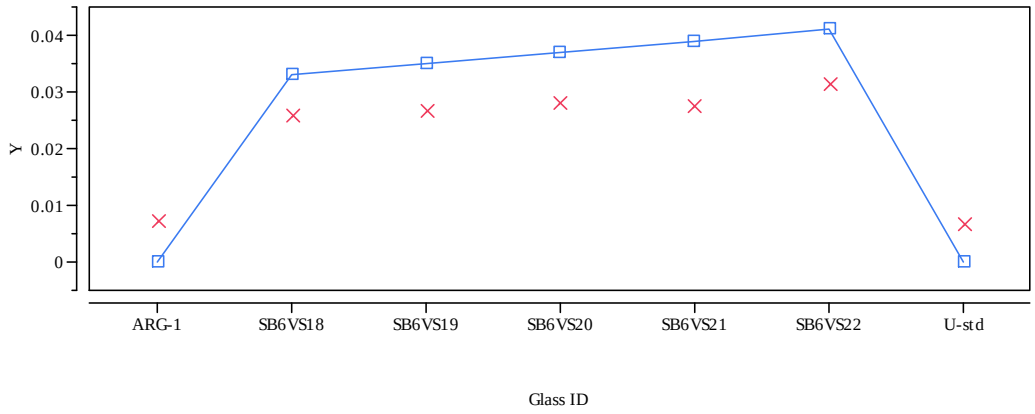


Exhibit C4. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the Thorium SB6 VS Glasses

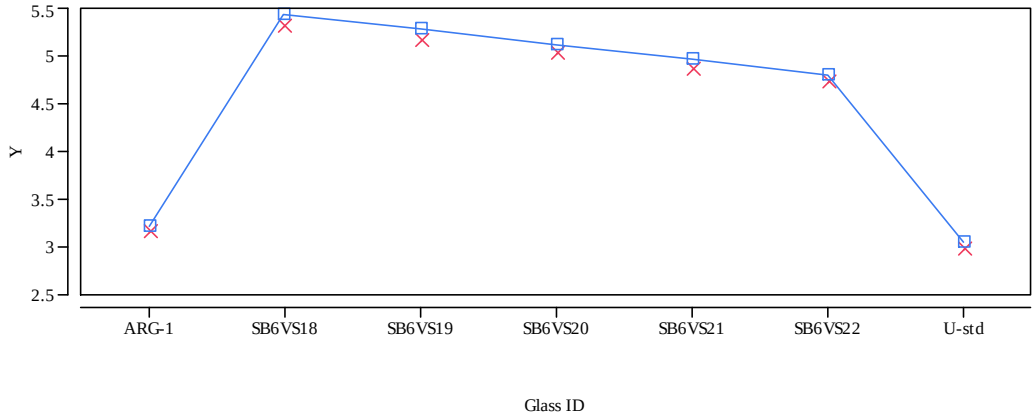
Overlay Plot Oxide=K2O (wt%)



Overlay Plot Oxide=La2O3 (wt%)



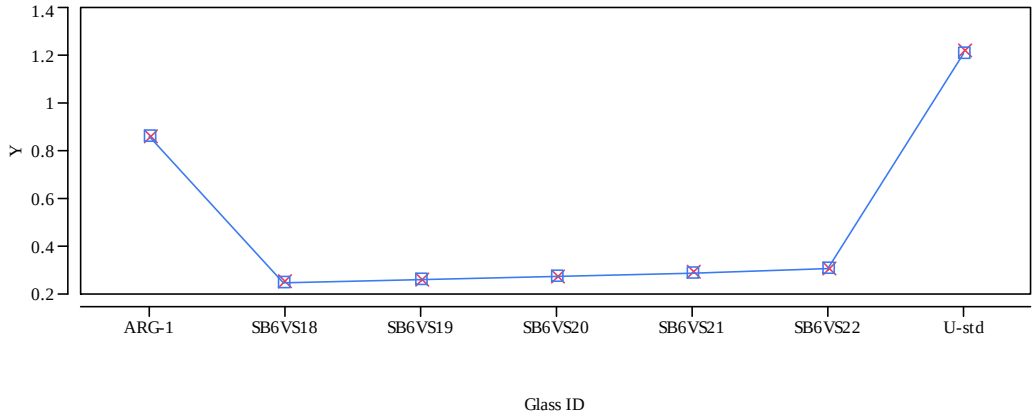
Overlay Plot Oxide=Li2O (wt%)



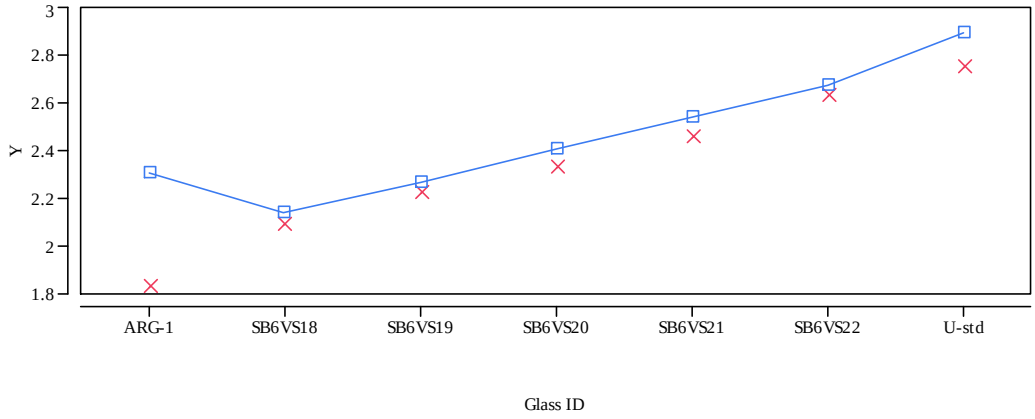
Y Measured Targeted

Exhibit C4. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the Thorium SB6 VS Glasses

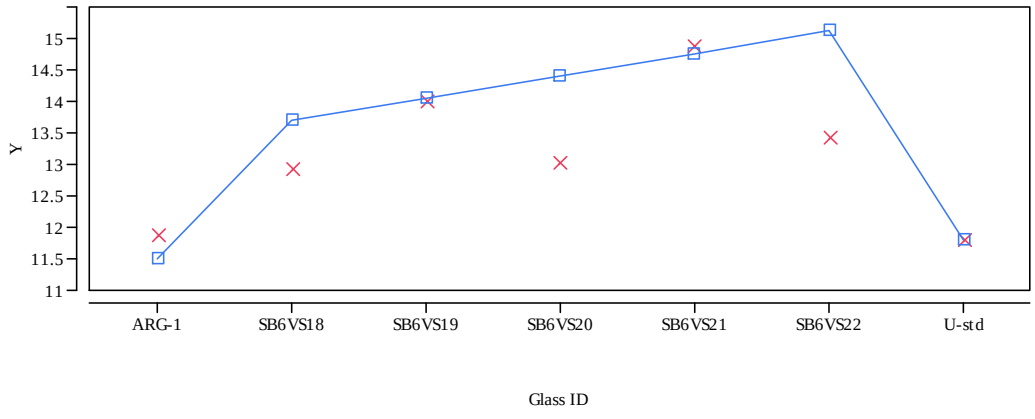
Overlay Plot Oxide=MgO (wt%)



Overlay Plot Oxide=MnO (wt%)



Overlay Plot Oxide=Na2O (wt%)



Y Measured Targeted

Exhibit C4. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the Thorium SB6 VS Glasses

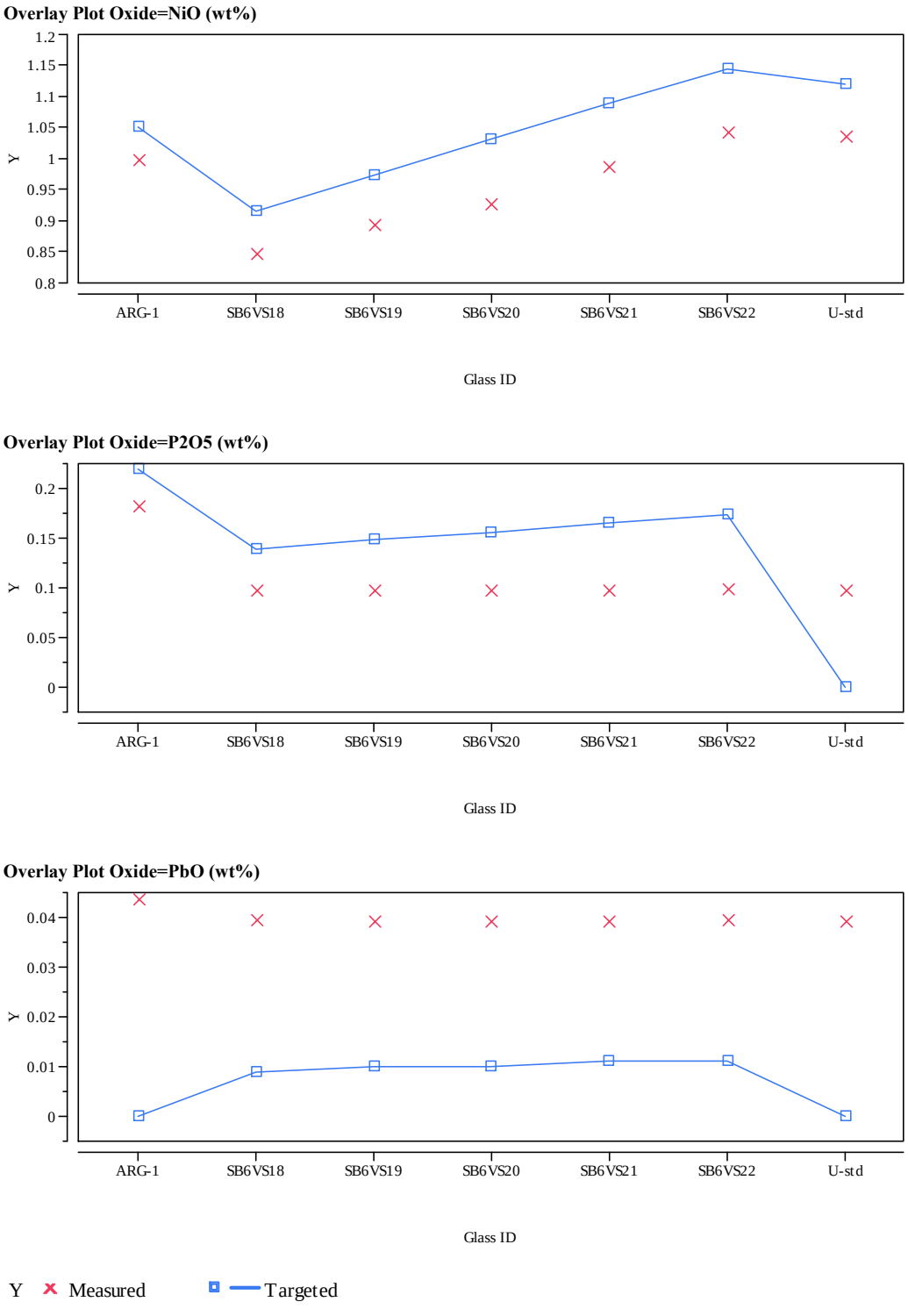
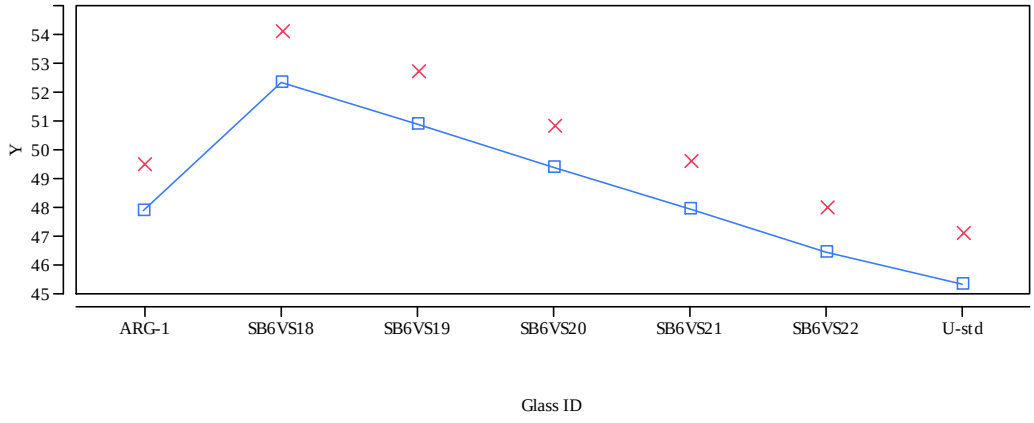
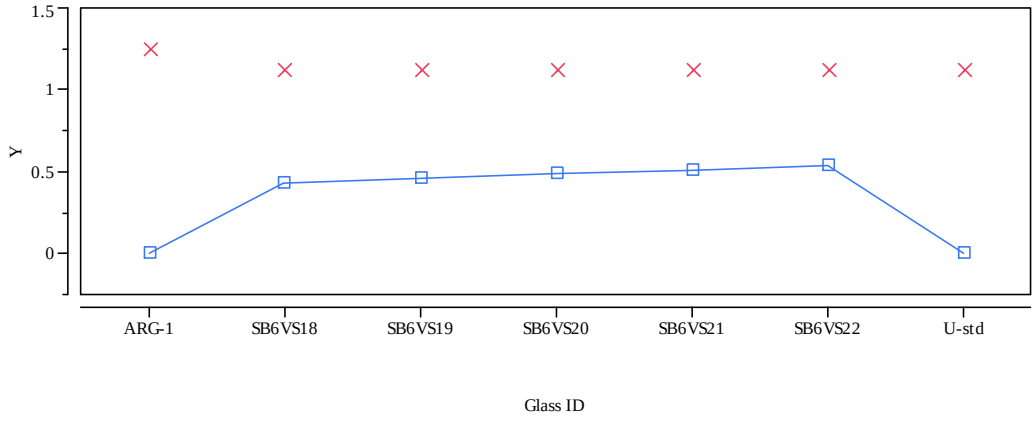


Exhibit C4. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the Thorium SB6 VS Glasses

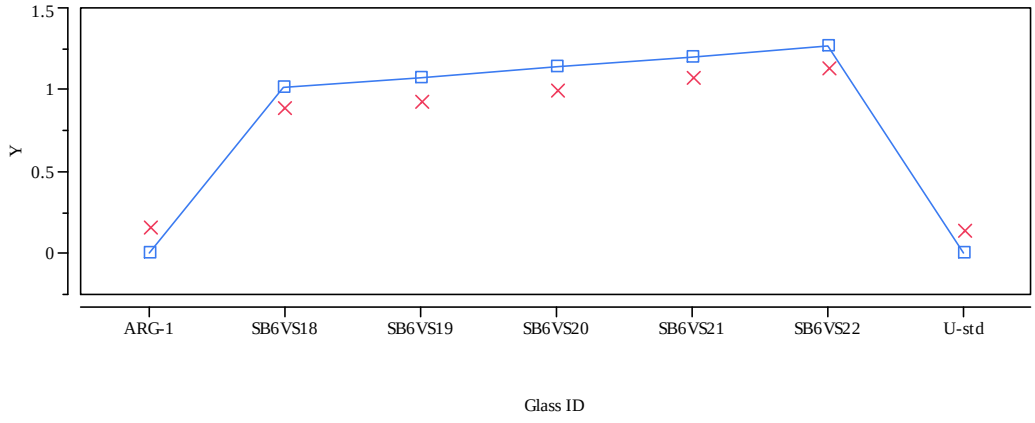
Overlay Plot Oxide=SiO2 (wt%)



Overlay Plot Oxide=SO4 (wt%)

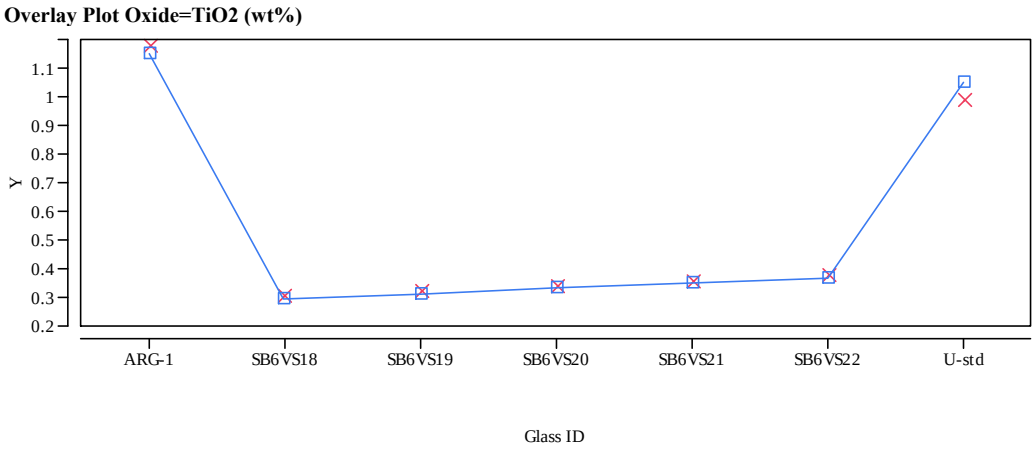


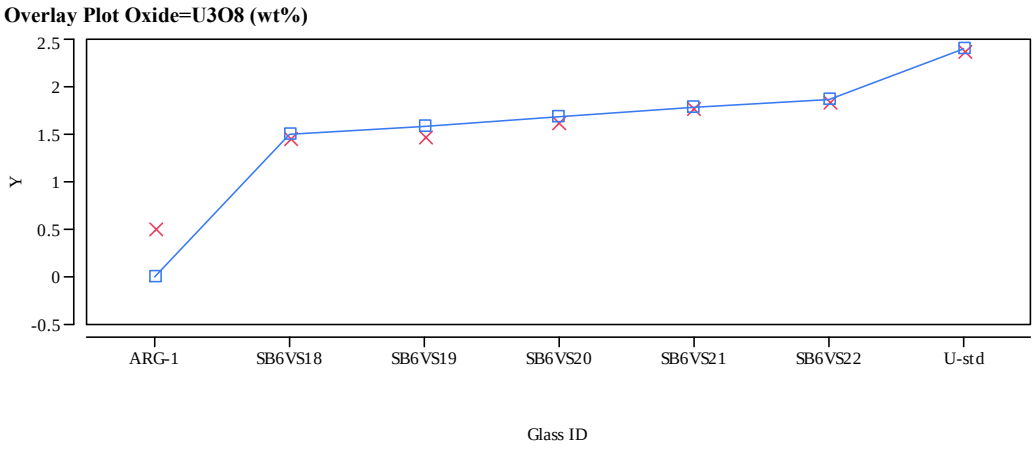
Overlay Plot Oxide=ThO2 (wt%)



Y × Measured — *Targeted*

Exhibit C4. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the Thorium SB6 VS Glasses





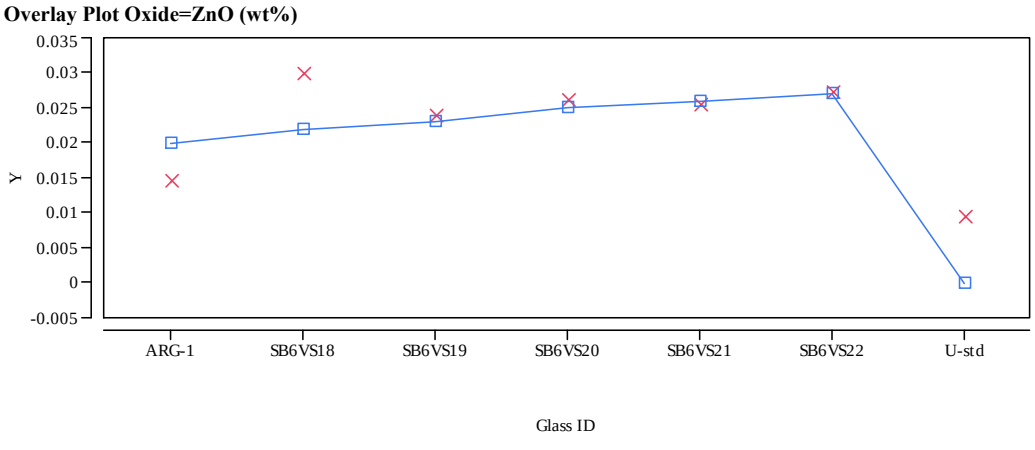
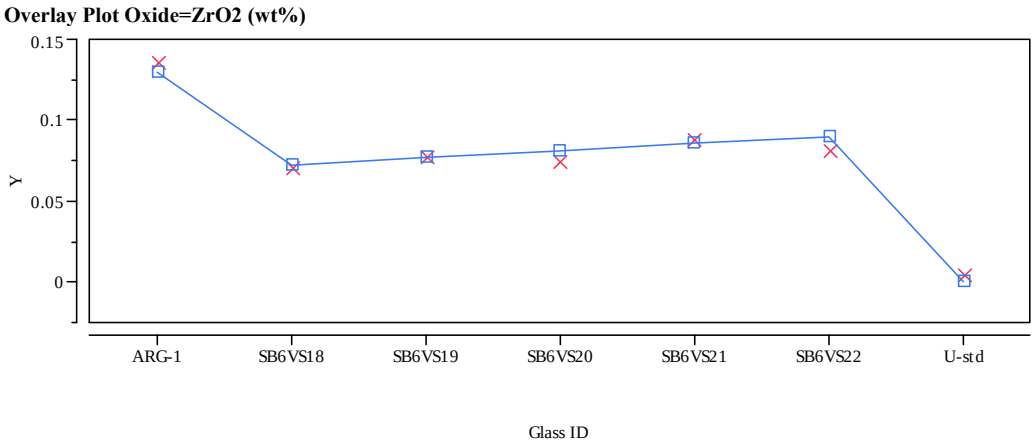
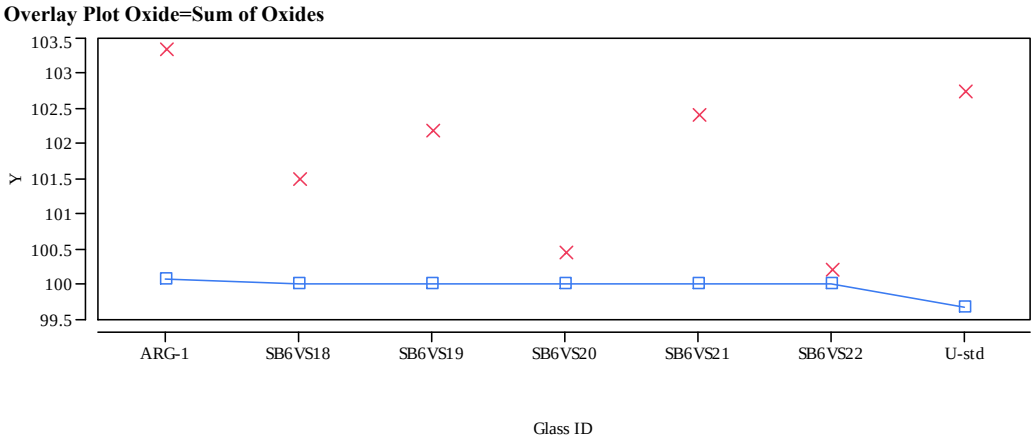


Exhibit C4. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the Thorium SB6 VS Glasses





Y Measured Targeted

Appendix D:

Tables and Exhibits Supporting the Analysis of the PCT Results for the Thorium Study Glasses

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Table D1. Analytical Development's Measurements of the PCT Solutions As-Received (ar) and After Appropriate Adjustments (in ppm) for the Thorium Glasses

Glass ID	Heat Treatment	Block	Seq	Lab ID	B ar	Li ar	Na ar	Si ar	B (ppm)	Li (ppm)	Na (ppm)	Si (ppm)
Soln Std	ref	1	1	std-11	19.7	9.77	81.7	51.8	19.700	9.770	81.700	51.800
SB6VS-21	quenched	1	2	Y15	6.4	10.7	60.4	70	10.667	17.834	100.669	116.669
SB6VS-21	ccc	1	3	Y18	6.31	11	55.7	69.4	10.517	18.334	92.835	115.669
SB6VS-20	quenched	1	4	Y32	6.48	11.3	58.5	72.4	10.800	18.834	97.502	120.669
SB6VS-18	ccc	1	5	Y06	7.03	12.7	50.7	79.3	11.717	21.167	84.502	132.169
blank	ref	1	6	Y24	< 0.375	< 0.756	< 0.863	< 0.954	0.313	0.630	0.719	0.795
SB6VS-19	ccc	1	7	Y20	6.58	11.8	51.2	73.6	10.967	19.667	85.335	122.669
SB6VS-20	ccc	1	8	Y09	6.36	11.4	53.2	70.9	10.600	19.000	88.668	118.169
Soln Std	ref	1	9	std-12	19.8	9.89	82.7	52.2	19.800	9.890	82.700	52.200
SB6VS-22	ccc	1	10	Y01	6.14	10.3	57.1	66.2	10.234	17.167	95.169	110.336
EA	ref	1	11	Y34	30.7	10.2	86.1	51.6	511.668	170.000	1435.003	860.002
SB6VS-22	quenched	1	12	Y35	6.36	10.2	63.5	67.6	10.600	17.000	105.835	112.669
SB6VS-18	quenched	1	13	Y30	6.74	12	52.6	75.9	11.234	20.000	87.668	126.503
ARM-1	ref	1	14	Y31	10.3	8.37	22.1	37.5	17.167	13.950	36.834	62.501
SB6VS-19	quenched	1	15	Y28	6.6	11.5	54.9	73.5	11.000	19.167	91.502	122.502
Soln Std	ref	1	16	std-13	19.8	9.87	82.6	51.9	19.800	9.870	82.600	51.900
Soln Std	ref	2	1	std-21	19.9	9.75	82.7	52.2	19.900	9.750	82.700	52.200
SB6VS-22	quenched	2	2	Y10	6.04	9.36	61.3	65.2	10.067	15.600	102.169	108.669
SB6VS-21	quenched	2	3	Y12	6.02	9.77	57.5	66	10.034	16.284	95.835	110.002
ARM-1	ref	2	4	Y08	10.4	8.25	22.4	38.3	17.334	13.750	37.334	63.835
SB6VS-22	quenched	2	5	Y37	6.22	9.73	62.9	67.1	10.367	16.217	104.835	111.836
SB6VS-20	quenched	2	6	Y26	6.35	11	57.3	71.2	10.584	18.334	95.502	118.669
SB6VS-20	ccc	2	7	Y16	6.42	11.3	53.3	72.4	10.700	18.834	88.835	120.669
SB6VS-19	ccc	2	8	Y04	6.19	11	49.5	69.4	10.317	18.334	82.502	115.669
Soln Std	ref	2	9	std-22	19.7	9.84	82.2	51.7	19.700	9.840	82.200	51.700
SB6VS-19	quenched	2	10	Y02	6.55	11.5	54.9	72.8	10.917	19.167	91.502	121.336
EA	ref	2	11	Y22	34.4	10.6	96.5	54.9	573.334	176.667	1608.337	915.002
SB6VS-18	ccc	2	12	Y27	6.98	12.3	49.5	76.5	11.634	20.500	82.502	127.503
SB6VS-21	ccc	2	13	Y23	6.21	10.5	55.6	69	10.350	17.500	92.669	115.002
SB6VS-18	quenched	2	14	Y33	6.62	11.7	51.6	75.8	11.034	19.500	86.002	126.336
Soln Std	ref	2	15	std-23	19.8	9.67	82.3	51.6	19.800	9.670	82.300	51.600
Soln Std	ref	3	1	std-31	19.9	9.79	82.1	52	19.900	9.790	82.100	52.000
SB6VS-21	ccc	3	2	Y05	6.47	11.1	56.6	70.9	10.784	18.500	94.335	118.169
SB6VS-19	quenched	3	3	Y38	6.74	11.7	55.7	74.8	11.234	19.500	92.835	124.669
ARM-1	ref	3	4	Y14	10.7	8.35	22.2	38	17.834	13.917	37.001	63.335
EA	ref	3	5	Y29	33.5	10.6	93.1	54.4	558.334	176.667	1551.670	906.668
SB6VS-22	ccc	3	6	Y36	6.24	10.5	57.2	67.9	10.400	17.500	95.335	113.169
SB6VS-18	ccc	3	7	Y21	7	12.5	50	78.5	11.667	20.834	83.335	130.836
SB6VS-22	ccc	3	8	Y17	6.2	10.5	56.9	67.6	10.334	17.500	94.835	112.669
Soln Std	ref	3	9	std-32	19.9	9.86	81.8	52	19.900	9.860	81.800	52.000
SB6VS-19	ccc	3	10	Y07	6.67	11.8	51	74.4	11.117	19.667	85.002	124.002
SB6VS-21	quenched	3	11	Y03	6	9.77	56.4	66.3	10.000	16.284	94.002	110.502
blank	ref	3	12	Y19	< 0.375	< 0.756	< 0.863	< 0.954	0.313	0.630	0.719	0.795
SB6VS-20	quenched	3	13	Y25	6.38	11	56.8	71.6	10.634	18.334	94.669	119.336
SB6VS-20	ccc	3	14	Y11	6.39	11.4	52.6	71.4	10.650	19.000	87.668	119.002
SB6VS-18	quenched	3	15	Y13	6.74	12.1	52	77.4	11.234	20.167	86.668	129.003
Soln Std	ref	3	16	std-33	19.8	9.9	82.7	51.9	19.800	9.900	82.700	51.900

Exhibit D1. PCT Measurements (as Common Logarithms) in Analytical Sequence by Analytical Set for Thorium Glasses

Variability Chart for log[B ppm]

Variability Chart for log[Li ppm]

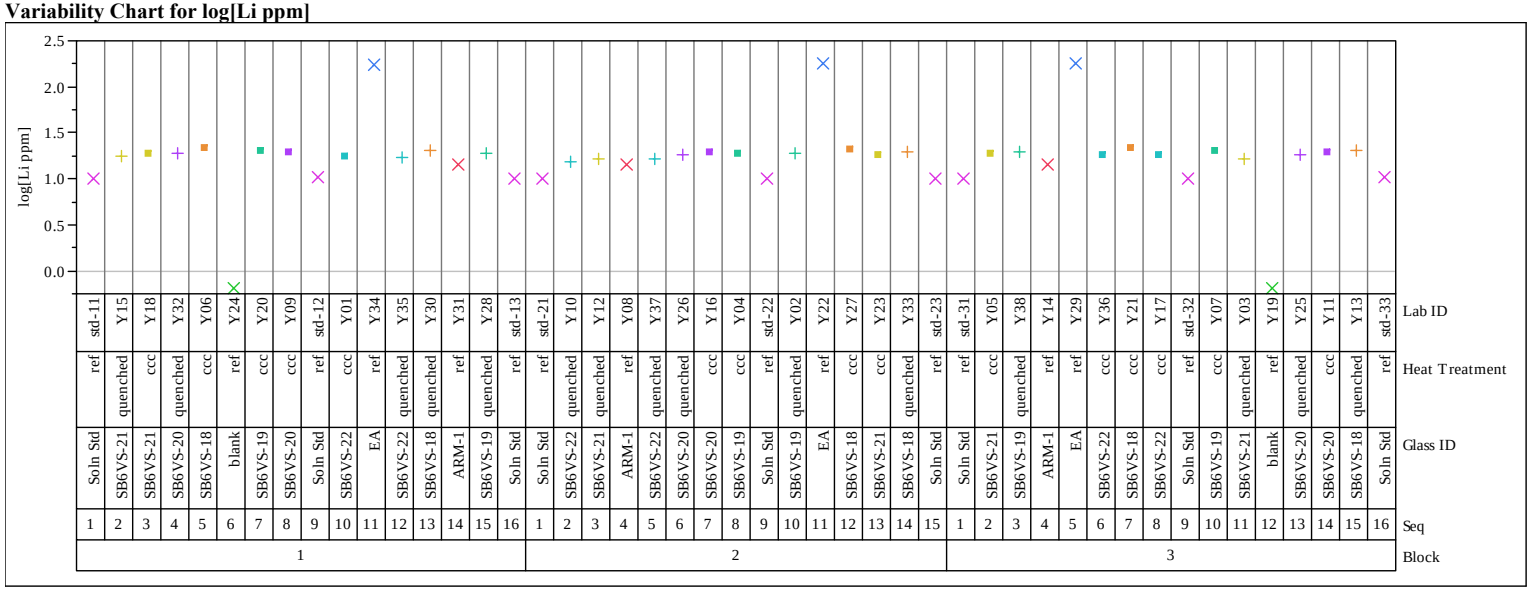


Exhibit D1. PCT Measurements (as Common Logarithms) in Analytical Sequence by Analytical Set for Thorium Glasses

Variability Chart for log[Na ppm]

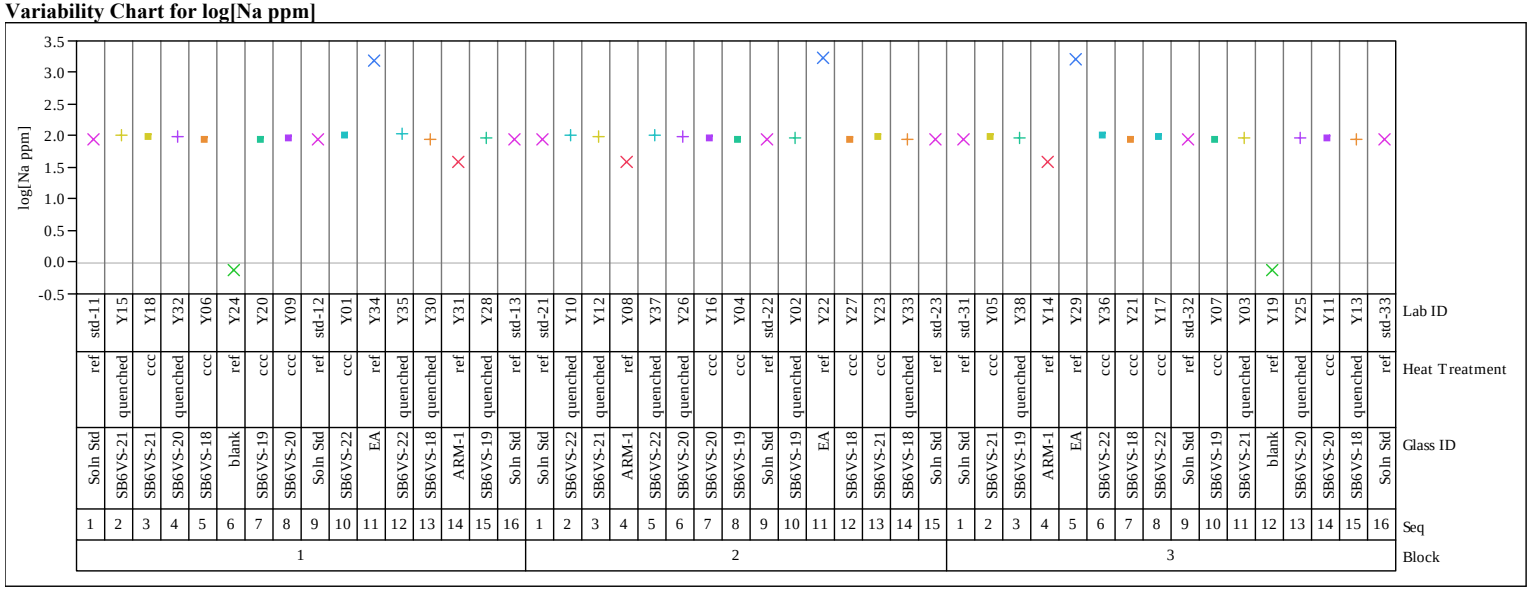


Exhibit D1. PCT Measurements (as Common Logarithms) in Analytical Sequence by Analytical Set for Thorium Glasses

Variability Chart for log[Si ppm]

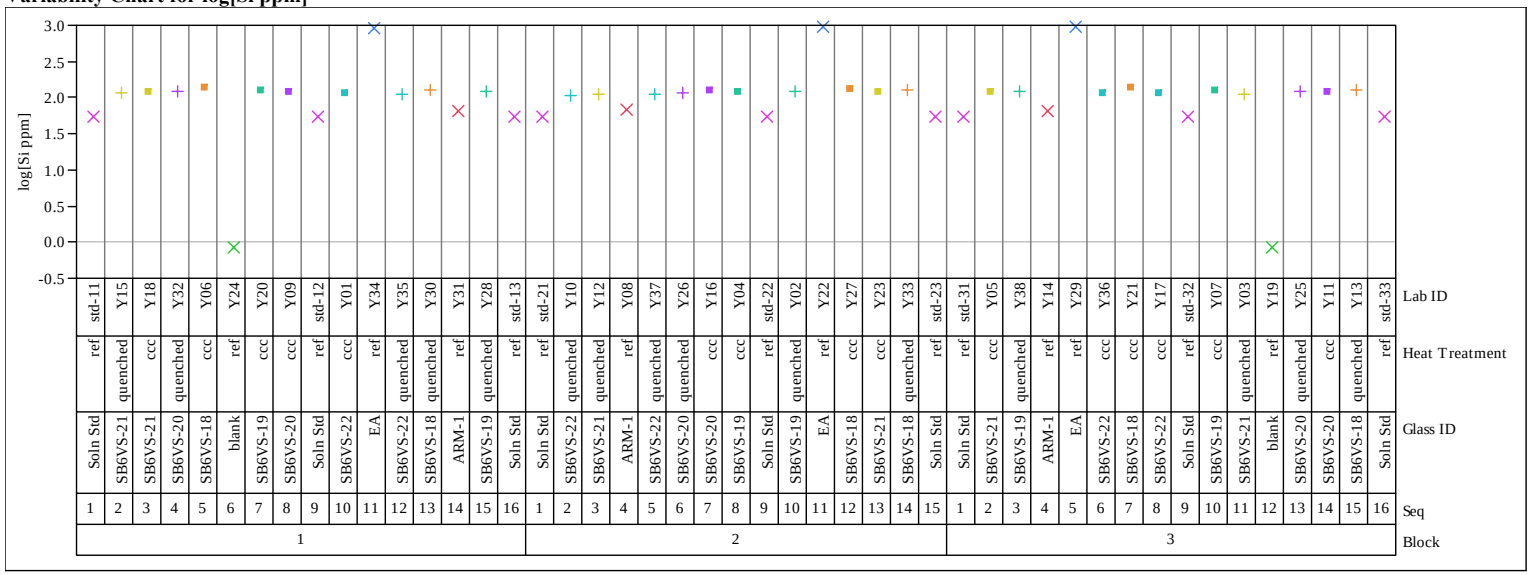
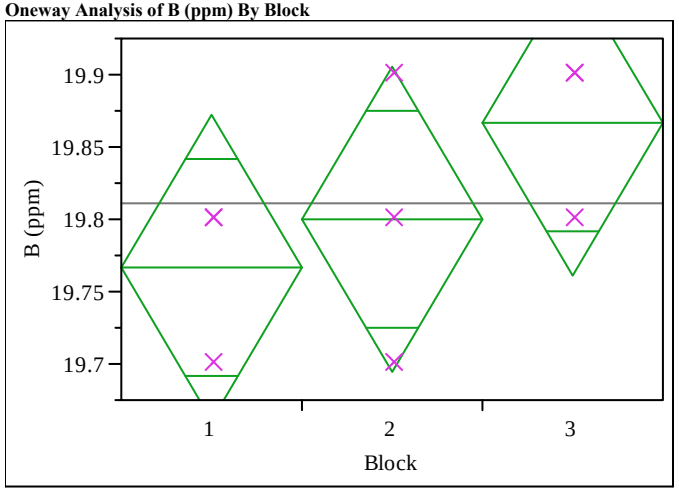


Exhibit D2. Measurements of the Multi-Element Solution Standard by ICP Block for Thorium Glasses

Oneway Analysis of B (ppm) By Block



Oneway Anova
Summary of Fit

Rsquare	0.318182
Adj Rsquare	0.090909
Root Mean Square Error	0.074536
Mean of Response	19.81111
Observations (or Sum Wgts)	9

Analysis of Variance

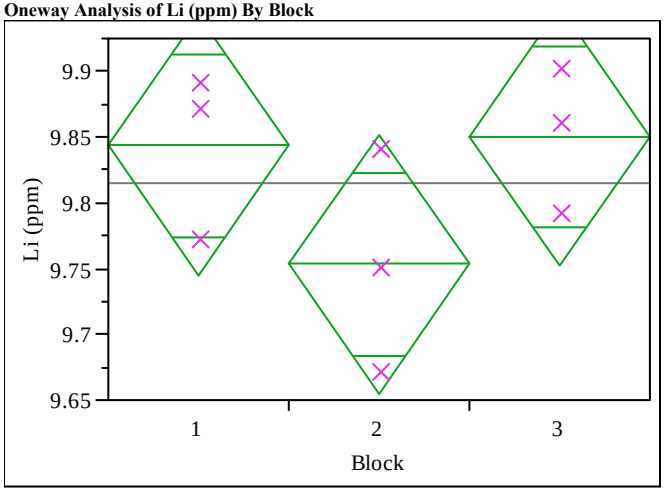
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block	2	0.01555556	0.007778	1.4000	0.3170
Error	6	0.03333333	0.005556		
C. Total	8	0.04888889			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	19.7667	0.04303	19.661	19.872
2	3	19.8000	0.04303	19.695	19.905
3	3	19.8667	0.04303	19.761	19.972

Std Error uses a pooled estimate of error variance

Oneway Analysis of Li (ppm) By Block



Oneway Anova
Summary of Fit

Rsquare	0.376735
Adj Rsquare	0.16898
Root Mean Square Error	0.069442
Mean of Response	9.815556
Observations (or Sum Wgts)	9

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block	2	0.01748889	0.008744	1.8134	0.2421
Error	6	0.02893333	0.004822		
C. Total	8	0.04642222			

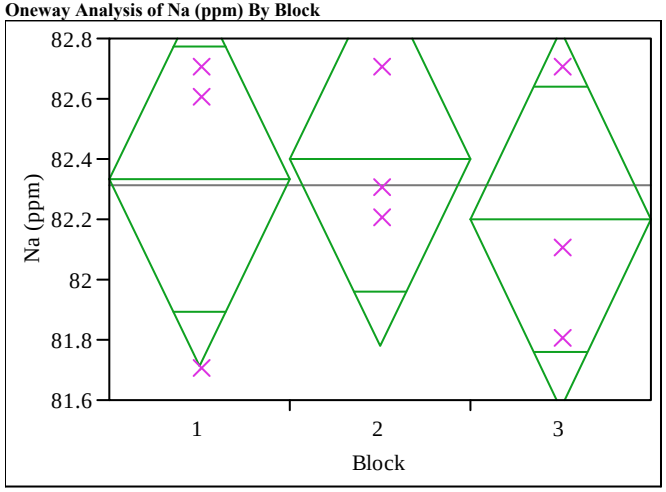
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	9.84333	0.04009	9.7452	9.9414
2	3	9.75333	0.04009	9.6552	9.8514
3	3	9.85000	0.04009	9.7519	9.9481

Std Error uses a pooled estimate of error variance

Exhibit D2. Measurements of the Multi-Element Solution Standard by ICP Block for Thorium Glasses

Oneway Analysis of Na (ppm) By Block



Oneway Anova
Summary of Fit

Rsquare	0.050633
Adj Rsquare	-0.26582
Root Mean Square Error	0.440959
Mean of Response	82.31111
Observations (or Sum Wgts)	9

Analysis of Variance

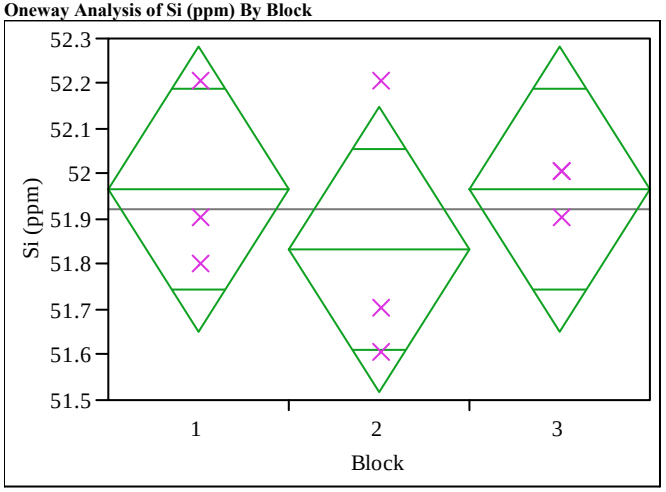
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block	2	0.0622222	0.031111	0.1600	0.8557
Error	6	1.1666667	0.194444		
C. Total	8	1.2288889			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	82.3333	0.25459	81.710	82.956
2	3	82.4000	0.25459	81.777	83.023
3	3	82.2000	0.25459	81.577	82.823

Std Error uses a pooled estimate of error variance

Oneway Analysis of Si (ppm) By Block



Oneway Anova
Summary of Fit

Rsquare	0.10596
Adj Rsquare	-0.19205
Root Mean Square Error	0.223607
Mean of Response	51.92222
Observations (or Sum Wgts)	9

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block	2	0.03555556	0.017778	0.3556	0.7146
Error	6	0.30000000	0.050000		
C. Total	8	0.33555556			

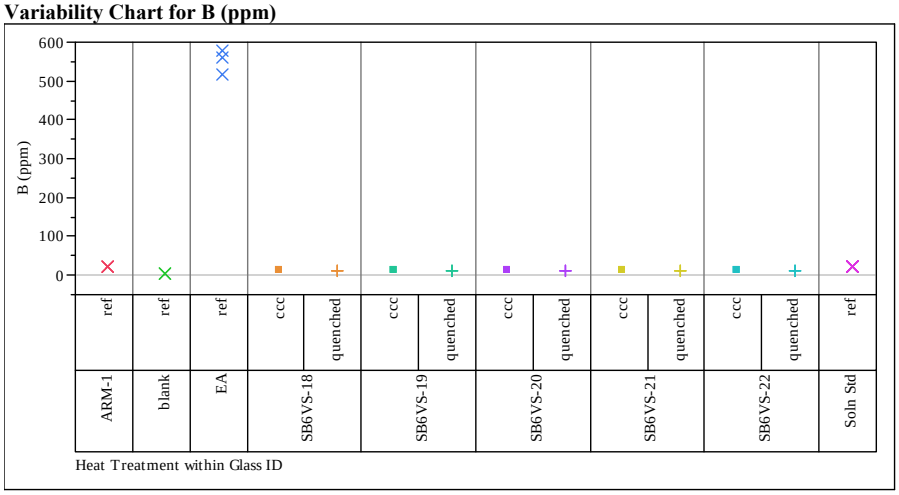
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	51.9667	0.12910	51.651	52.283
2	3	51.8333	0.12910	51.517	52.149
3	3	51.9667	0.12910	51.651	52.283

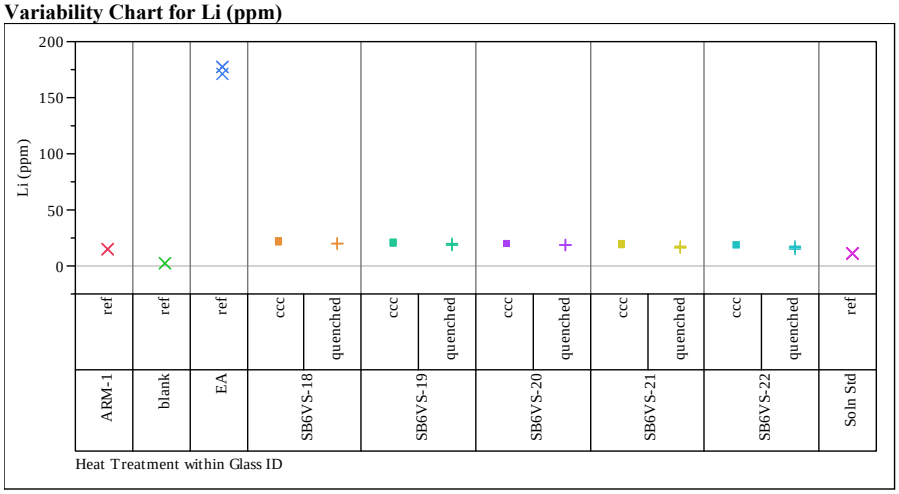
Std Error uses a pooled estimate of error variance

Exhibit D3. Laboratory PCT Measurements by Glass Identifier for Thorium Study Glasses and Standards

Variability Chart for B (ppm)



Variability Chart for Li (ppm)



Variability Chart for Na (ppm)

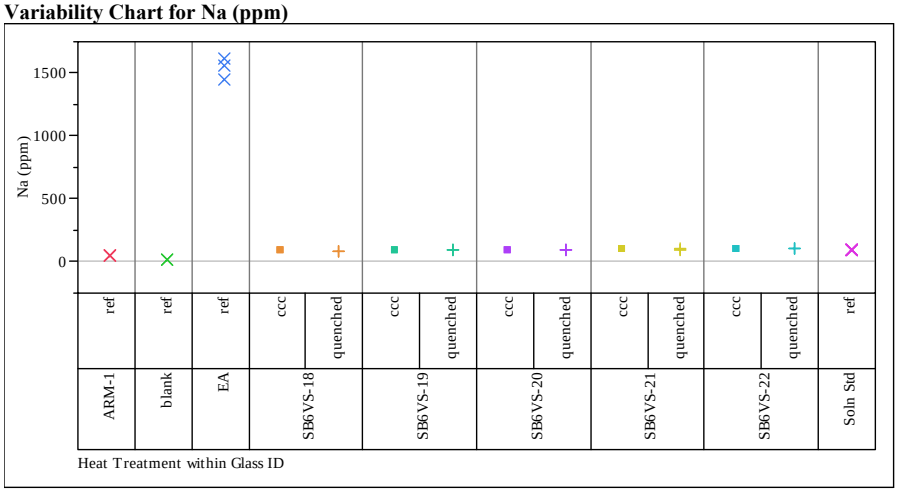
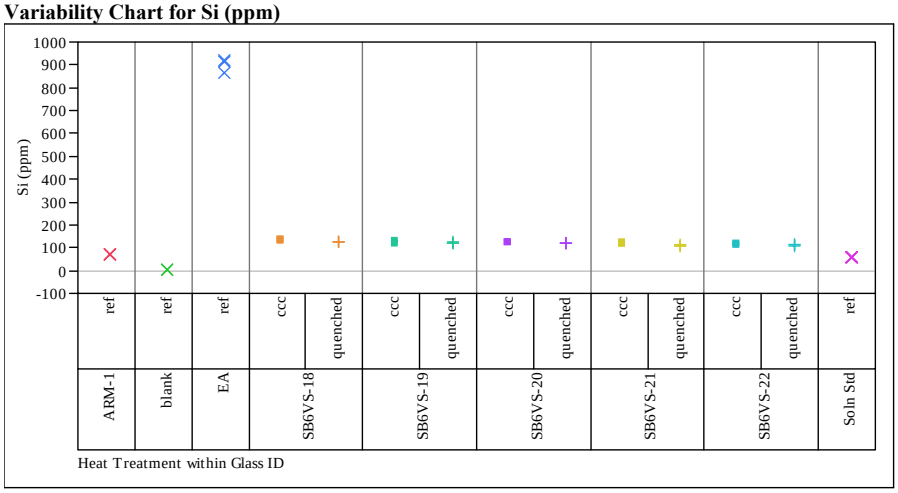
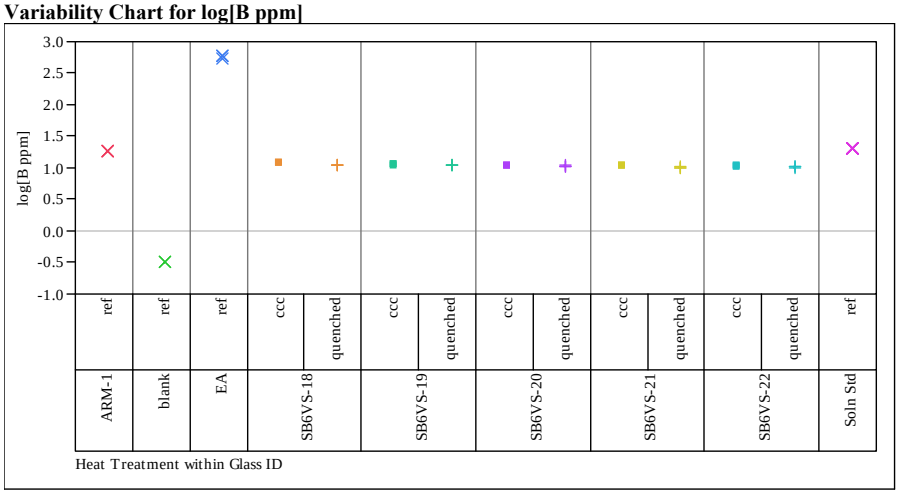


Exhibit D3. Laboratory PCT Measurements by Glass Identifier for Thorium Study Glasses and Standards

Variability Chart for Si (ppm)



Variability Chart for log[B ppm]



Variability Chart for log[Li ppm]

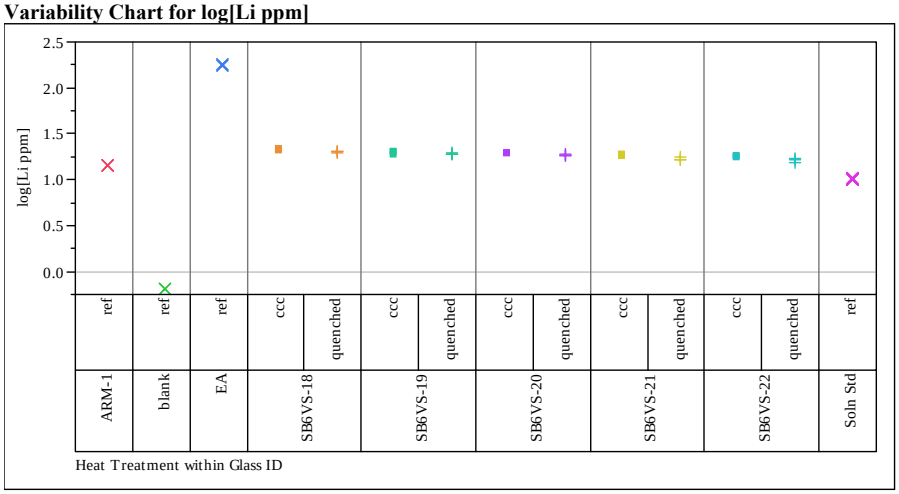
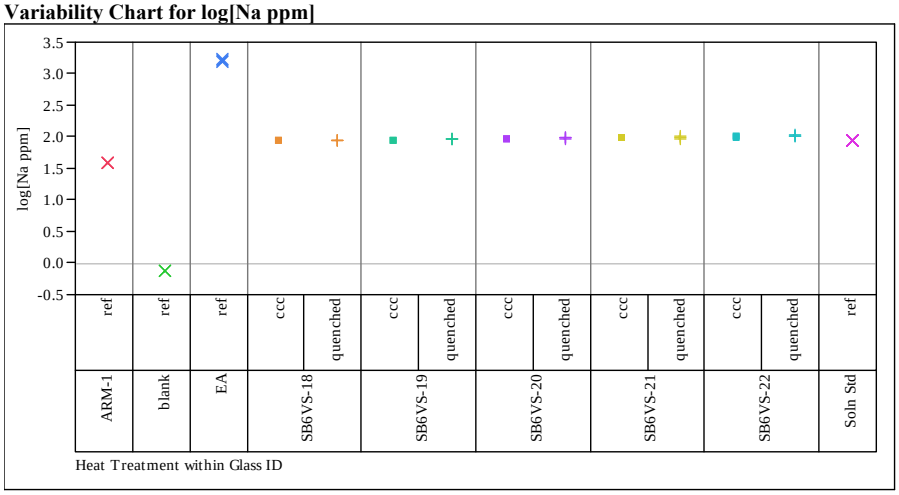


Exhibit D3. Laboratory PCT Measurements by Glass Identifier for Thorium Study Glasses and Standards

Variability Chart for log[Na ppm]



Variability Chart for log[Si ppm]

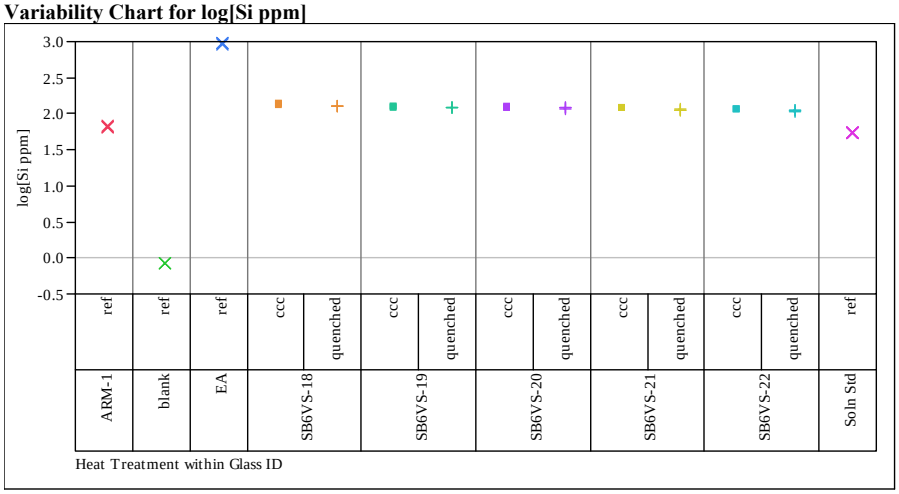


Exhibit D4. Correlations and Scatter Plots of Normalized PCTs Over All Compositional Views and Heat Treatments for the Thorium Glasses

Multivariate Correlations

	log NL[B (g/L)]	log NL[Li(g/L)]	log NL[Na (g/L)]	log NL[Si (g/L)]
log NL[B (g/L)]	1.0000	0.9971	0.9909	0.9850
log NL[Li(g/L)]	0.9971	1.0000	0.9856	0.9872
log NL[Na (g/L)]	0.9909	0.9856	1.0000	0.9892
log NL[Si (g/L)]	0.9850	0.9872	0.9892	1.0000

Scatterplot Matrix

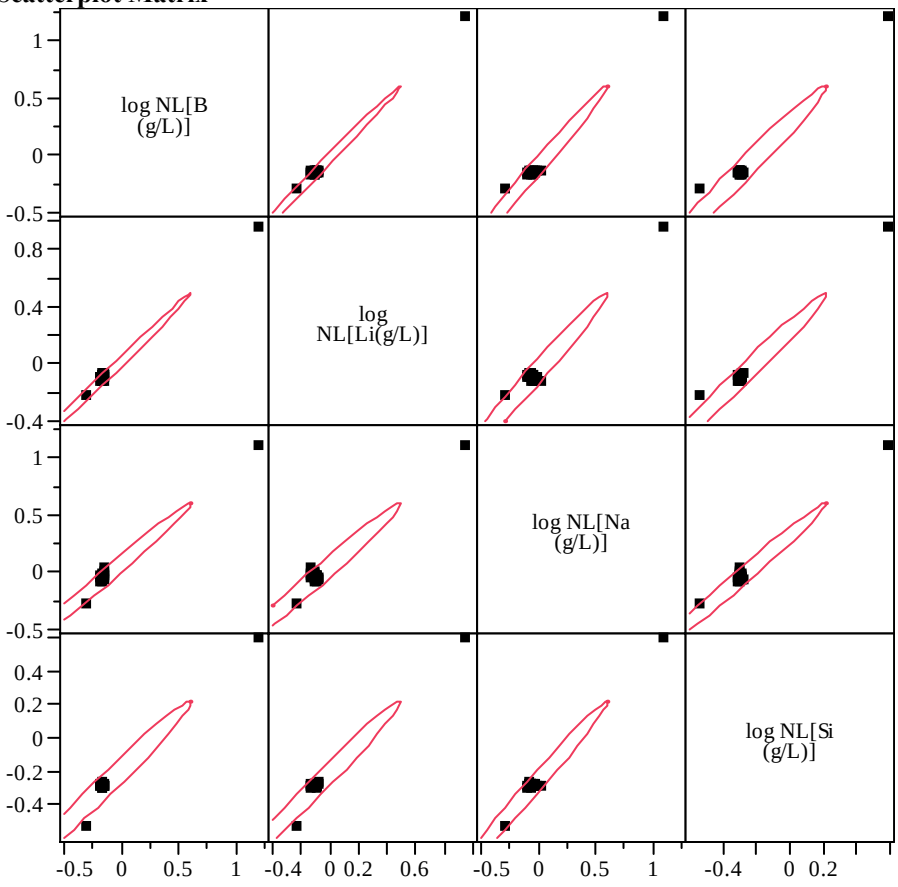


Exhibit D5. Effects of Heat Treatment for Thorium Study Glasses by Compositional View

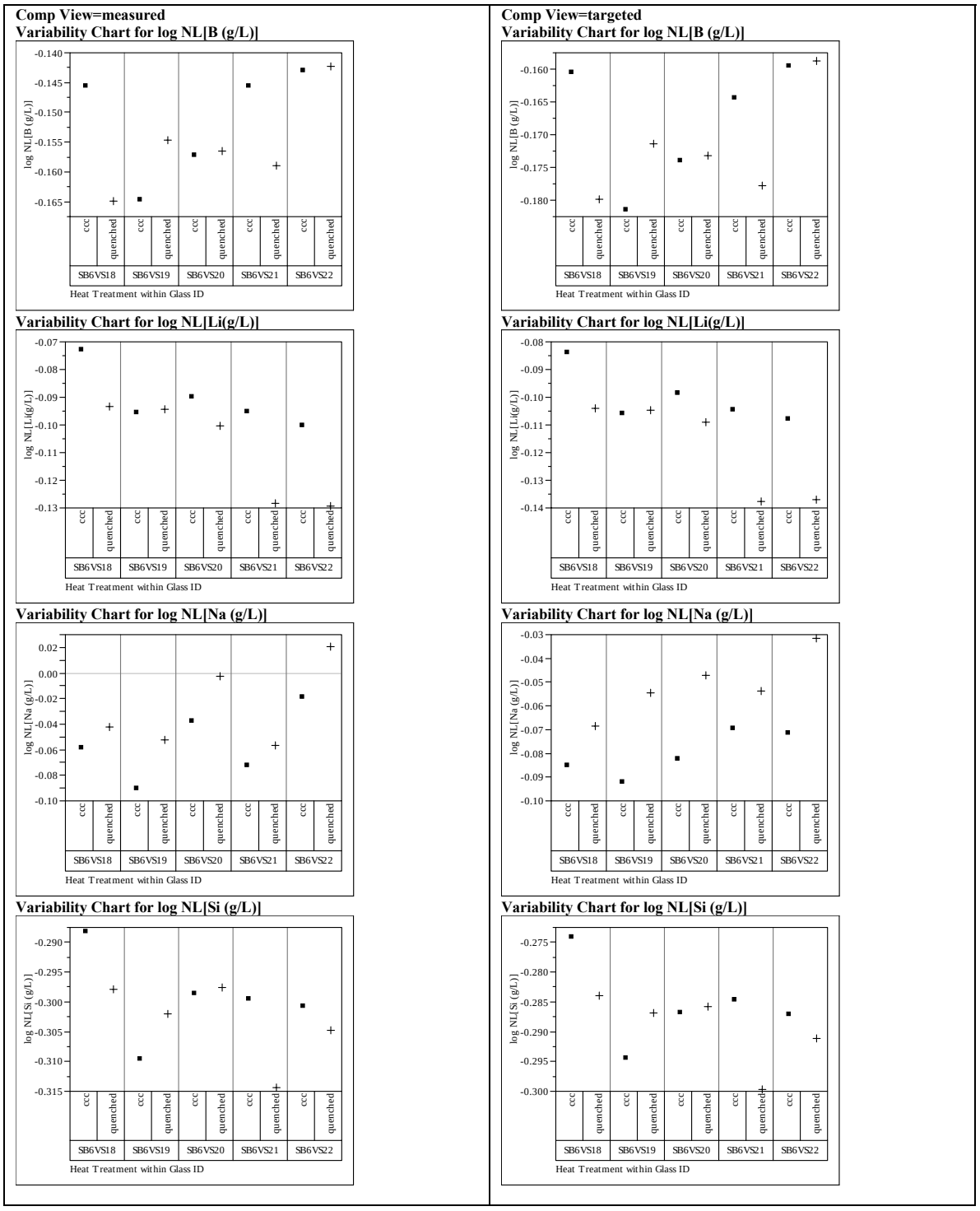


Exhibit D6. del Gp (ΔG_p) Predictions versus the Common Logarithm of the Normalized Leachate (log NL[.]) for B, Li, Na and Si for Targeted Compositions for the Thorium Glasses for Both Heat Treatments

Legend

Symbol	Standard/ Comp View-Heat Treatment
Z	EA
◊	ARM
×	Targeted-ccc
●	Targeted-quenched

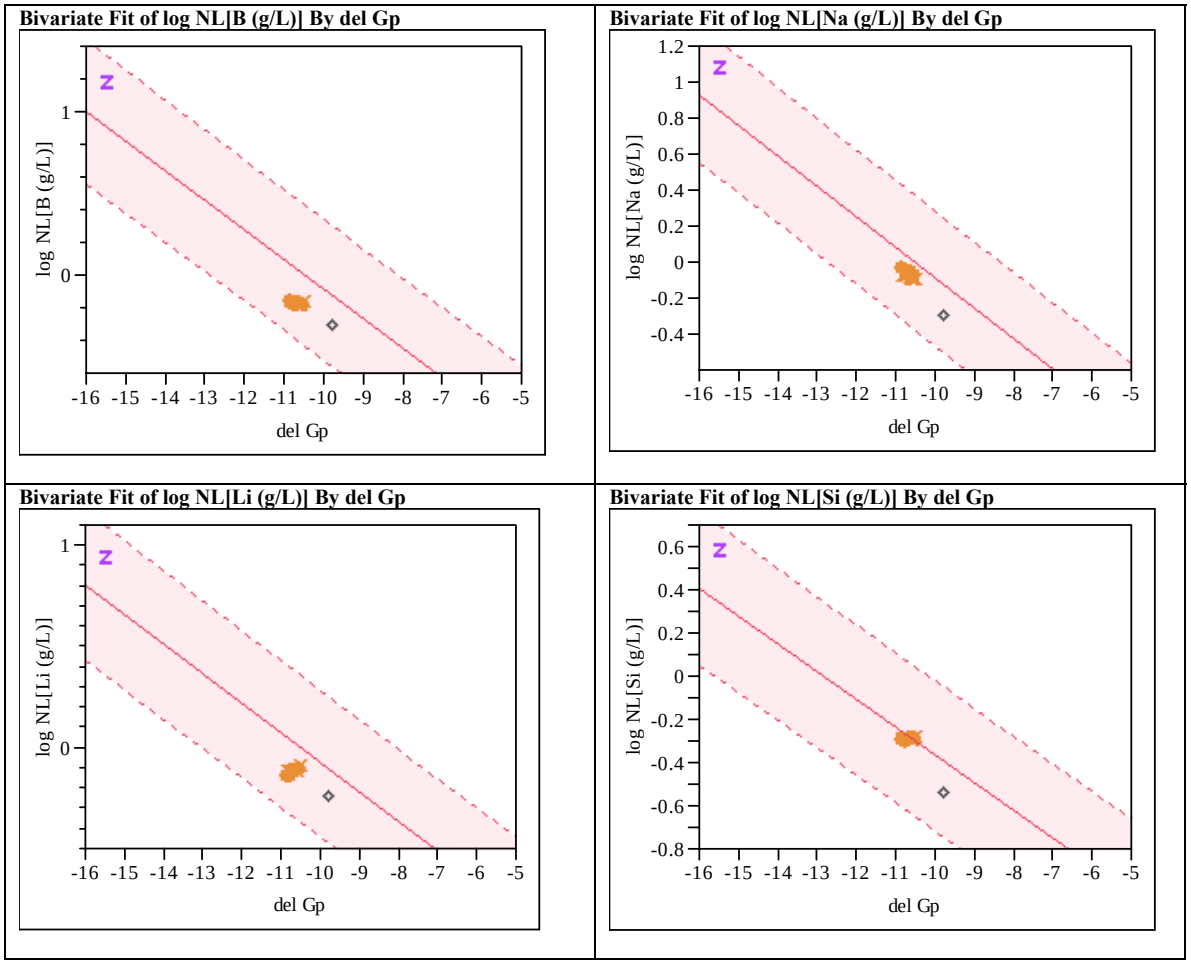
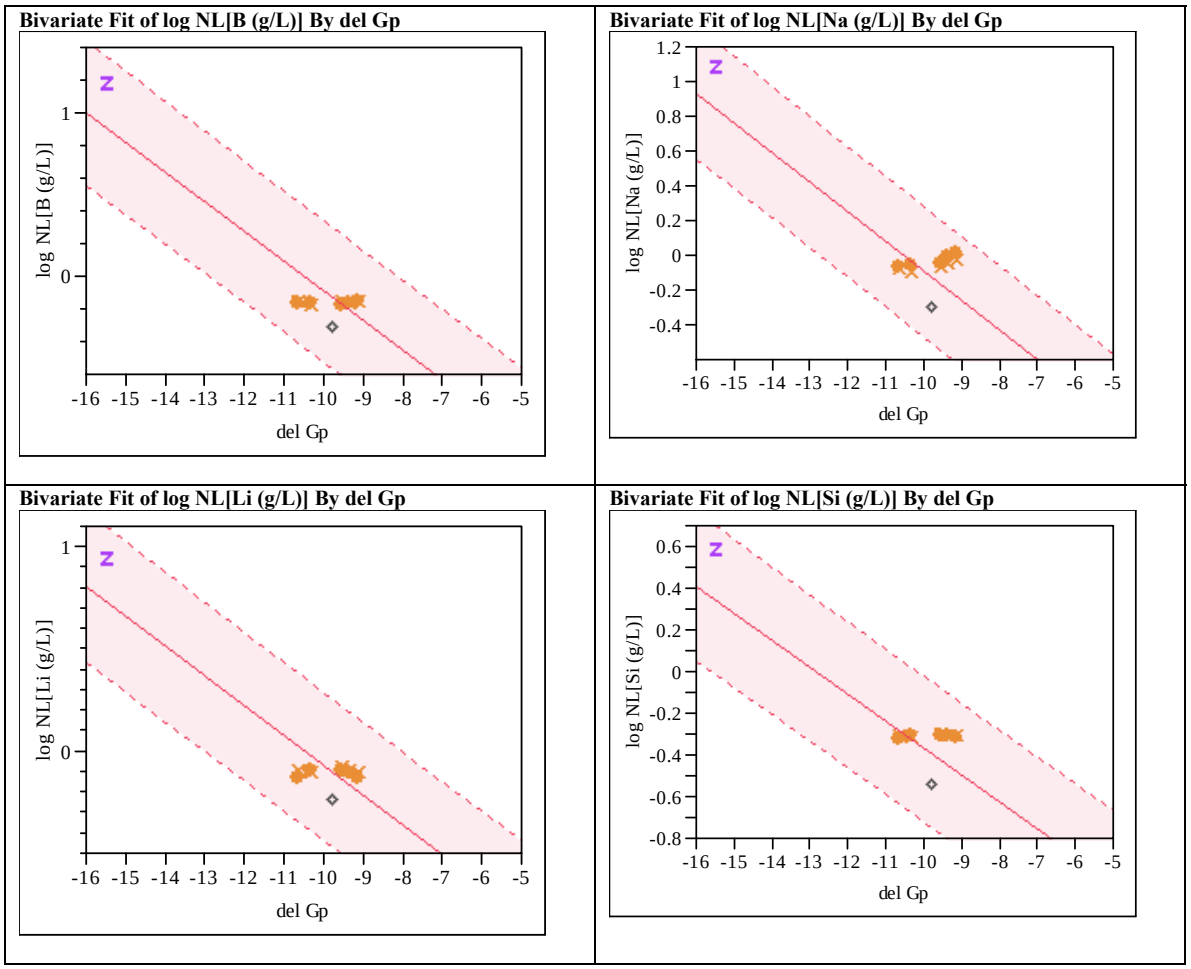


Exhibit D7. del Gp (ΔG_p) Predictions versus the Common Logarithm of the Normalized Leachate (log NL[.]) for B, Li, Na and Si for Measured Compositions of the Thorium Glasses for Both Heat Treatments

Legend

Symbol	Standard/ Comp View-Heat Treatment
Z	EA
◊	ARM
×	Measured-ccc
●	Measured-quenched



Distribution:

J.W. Amoroso, 999-W
C. J. Bannochie, 773-42A
A. B. Barnes, 999-W
A.L. Billings, 999-W
J. M. Bricker, 704-27S
M. A. Broome, 704-29S
D. A. Crowley, 773-43A
T.B. Edwards, 999-W
T. L. Fellinger, 704-26S
S. D. Fink, 773-A
K.M. Fox, 999-W
B. J. Giddings, 786-5A
J. M. Gillam, 766-H
B. A. Hamm, 766-H
C. C. Herman, 999-W
R. N. Hinds, 704-S
E. W. Holtzscheiter, 704-15S
J. F. Iaukea, 704-30S
P.R. Jackson, 703-46A
F.C. Johnson, 999-W
M. T. Keefer, 766-H
S. L. Marra, 773-A
D.H. Miller, 999-W
F. M. Pennebaker, 773-42A
J. E. Occhipinti, 704-S
D. K. Peeler, 999-W
J. W. Ray, 704-S
H. B. Shah, 766-H
D. C. Sherburne, 704-S
A.V. Staub, 704-27S
M. E. Stone, 999-W
J. P. Vaughan, 773-41A