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The Sludge Batch 7a Glass Variability Study with Frit 418 and Frit 702

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EXECUTIVE SUMMARY

The Defense Waste Processing Facility (DWPF) is preparing to initiate processing of Sludge Batch 7a (SB7a) in May 2011. To support qualification of SB7a, the Savannah River National Laboratory (SRNL) was requested to execute a variability study (VS) to assess the applicability of the current Product Composition Control System (PCCS) durability models for the Frit 418-SB7a compositional region of interest. The objective of this study was to demonstrate applicability of the current durability models to the SB7a compositional region of interest and acceptability of the SB7a glasses with respect to the Environmental Assessment (EA) glass in terms of durability as defined by the Product Consistency Test (PCT).

To support programmatic objectives, twenty-eight SB7a glasses were selected based on the nominal sludge projections used to support the frit recommendation. Twenty-three of the SB7a VS glasses were based on the use of Frit 418, while 5 glasses were based on the use of Frit 702. Frit 702 was also identified as a viable candidate for SB7a, especially if SO_4 concentrations are found to be higher than anticipated. Frit 702 has shown a higher SO_4 retention capability as compared to Frit 418.

With respect to acceptability, the PCT results of the SB7a-VS glasses are acceptable relative to the EA glass regardless of thermal history (quenched or canister centerline cooled) or compositional view (target or measured). More specifically, all of the SB7a glasses have normalized boron release values (NL [B]) less than 0.9 g/L as compared to the benchmark NL [B] value for EA of 16.695 g/L.

With respect to the applicability of the current durability models to the SB7a VS compositional region of interest, all of the study glasses (based on target compositions) lie within the 95% confidence intervals of the model predictions. When model applicability is based on the measured compositions, all of the SB7a VS glasses are predictable with the exception of SB7aVS-02 and SB7aVS-06. Although the NL [B] values of these two glasses range from 0.66 to 0.73 g/L (considered very acceptable), the PCT responses are not considered predictable by the current durability models. The current durability models are conservative for these glasses since they are more durable than predicted by the models. These two glasses are extreme vertices (EV) based compositions coupled with Frit 418 at 36% WL and target the maximum Na_2O content (15.01 wt% Na_2O) of the SB7a VS glasses. Higher alkali glasses for which the model over-predicts the PCT response have been observed previously in the Sludge Batch 3 (SB3) Phase 1 VS and the Sludge Batch 6 (SB6) VS.

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LIST OF ABBREVIATIONS

AD	Analytical Development
AES	Atomic Emission Spectroscopy
ANOVA	Analysis of Variance
AR	Aqua Regia
ARM	Actinide Removal Process
ARP	Approved Reference Material
CCC	Centerline Canister Cooling
DWPF	Defense Waste Processing Facility
EA	Environmental Assessment
EV	Extreme Vertices
ICP	Inductively Coupled Plasma
MAR	Measurement Acceptability Region
NL	Normalized Leachate
PCCS	Product Composition Control System
PCT	Product Consistency Test
PF	Peroxide Fusion
S&SP	Sludge and Salt Planning
SB7a	Sludge Batch 7a
SO	Sludge Only
SRAT	Sludge Receipt and Adjustment Tank
SRNL	Savannah River National Laboratory
T_L	Liquidus Temperature
U_{std}	Uranium Standard
VS	Variability Study
WL	Waste Loading
XRD	X-Ray Diffraction

1.0 Introduction

The Defense Waste Processing Facility (DWPF) is preparing to initiate processing of Sludge Batch 7a (SB7a) in May 2011. In support of the upcoming processing, the Savannah River National Laboratory (SRNL) provided a recommendation to utilize Frit 418 to process SB7a.[1] This recommendation was based on assessments of the compositional projections for SB7a available at the time from the Sludge and Salt Planning (S&SP) group of the Liquid Waste System Planning organization and SRNL (using a model-based approach) and the desire by DWPF to use Frit 418. In addition to Frit 418, Frit 702 was also identified as a viable candidate for SB7a, especially if SO_4 concentrations are later found to be higher than anticipated. To support qualification of SB7a, SRNL was requested to execute a variability study (VS) to assess the applicability of the current Process Composition Control System (PCCS) durability models to the Frit 418-SB7a compositional region of interest.[2] Although the primary focus was on Frit 418, the VS also included a series of Frit 702 based glasses. These glasses were included in case it became necessary for DWPF to use Frit 702 for SB7a processing due to sulfate solubility concerns.

2.0 Objective

The objective of this study was to demonstrate the applicability of the current durability models to the SB7a composition region of interest and the acceptability of the SB7a glasses with respect to the Environmental Assessment (EA) glass in terms of durability as defined by the Product Consistency Test (PCT).

3.0 Waste and Frit Compositions

Three SB7a sludge-only projections received from S&SP in November 2010[a] were used to support the development of the test matrix. The differences in the projections were associated with the Tank 40 heel volume remaining before Tank 51 material is transferred to Tank 40 (i.e., 40", 60", and 80"). Table 1 summarizes the nominal SB7a sludge-only projections as well as the coupled processing projections including the addition of the Actinide Removal Process (ARP) stream.[b] As previously mentioned, Frit 418 and Frit 702 were identified as viable candidates for processing each of these streams with projected operating windows of 25-43% and 25-45% waste loading (WL), respectively.[c] The nominal compositions of Frit 418 and Frit 702 are shown in Table 2.

[a] SB7a projections from SRR received by personal communication (email) from H. Shah on 11-3-2010 (see SRNL-NB-2010-00108, page 65 for more details).
[b] Introduction of the ARP stream were based on information from S.G. Subosits, "Actinide Removal Process Material Balance Calculation with Low Curie Salt Feed," *X-CLC-S-00113 Rev 0,* Appendix J, September 24, 2004.
[c] The results of the Measurement Acceptability Region (MAR) study were presented to SRR on November 9, 2010 – see SRNL-NB-2010-00108, pages 65-70.

Table 1. Nominal SB7a Projections Used to Support the Development of the SB7a Test Matrix (wt%)

	Sludge-Only			ARP		
Oxide	**Tank 40 Heel 40"**	**Tank 40 Heel 60"**	**Tank 40 Heel 80"**	**Tank 40 Heel 40"**	**Tank 40 Heel 60"**	**Tank 40 Heel 80"**
Al_2O_3	24.78	24.96	25.09	23.87	24.04	24.16
BaO	0.03	0.05	0.05	0.04	0.05	0.05
CaO	1.26	1.30	1.33	1.24	1.29	1.32
Ce_2O_3	0.05	0.06	0.07	0.05	0.07	0.08
Cr_2O_3	0.35	0.35	0.35	0.34	0.34	0.34
CuO	0.09	0.09	0.09	0.09	0.09	0.09
Fe_2O_3	23.80	24.02	24.21	23.23	23.43	23.62
K_2O	0.66	0.60	0.55	0.63	0.57	0.53
La_2O_3	0.02	0.04	0.04	0.03	0.04	0.04
MgO	0.72	0.75	0.77	0.69	0.72	0.74
MnO	5.49	5.66	5.80	5.45	5.61	5.74
Na_2O	24.81	24.71	24.64	25.57	25.47	25.41
NiO	3.43	3.41	3.39	3.33	3.31	3.29
PbO	0.01	0.01	0.01	0.02	0.02	0.02
RuO_2	0.00	0.00	0.00	0.01	0.01	0.01
SO_4	1.58	1.52	1.49	1.64	1.59	1.56
SiO_2	4.62	4.40	4.23	4.42	4.22	4.05
ThO_2	1.25	1.13	1.02	1.18	1.07	0.97
TiO_2	0.02	0.02	0.02	1.32	1.32	1.32
U_3O_8	6.60	6.50	6.42	6.43	6.34	6.26
ZnO	0.03	0.03	0.04	0.03	0.03	0.04
ZrO_2	0.40	0.40	0.39	0.39	0.39	0.38

Table 2. Nominal Compositions of Frit 418 and Frit 702 (wt%)

Oxide	Frit 418	Frit 702
B_2O_3	8	8
Li_2O	8	10
Na_2O	8	6
SiO_2	76	76

4.0 Glass Compositions

Twenty-eight SB7a glasses were selected for the variability study based on the nominal sludge projections (see Table 1) and the compositions of Frit 418 and Frit 702 (see Table 2). Twenty-three of the SB7a VS glasses were based on the use of Frit 418, while 5 glasses were based on the use of Frit 702. Ten of the twenty-three Frit 418 based glasses used the nominal sludge-only and the nominal coupled operations projections for SB7a (specifically the Tank 40, 60" heel option[d]) while targeting WLs of 34, 36, 38, 40, and 42%. Thirteen additional Frit 418 based glasses were developed using extreme vertices (EVs) of the sludge region (bounding both sludge-only and coupled operations) for SB7a with all EV-based glasses targeting 36% WL (the nominal DWPF contractual WL). To develop the sludge EVs, the minimum and maximum concentrations for each oxide component were determined over all six nominal sludge compositions shown in Table 1. A variation of ±7.5% was then applied to the major oxides (Al_2O_3, Fe_2O_3, MnO, Na_2O, and U_3O_8), ±0.5 wt% was applied to the minor oxides (CaO, MgO, NiO, SiO_2, ThO_2, and TiO_2), while ±0.1 wt% was applied to the SO_4 minimum and maximum values.[e] This process generated 9162 sludge EVs, from which 13 were D-optimally selected using JMP™. [f]

The five Frit 702 based glasses used the coupled processing flowsheet based on ARP additions to the nominal Tank 40, 60" heel projection targeting WLs of 34, 36, 38, 40, and 42%.

Table 3 summarizes the target compositions of the thirteen EV-based Frit 418 glasses at 36% WL (i.e., SB7aVS-01 through SB7aVS-13). Table 4 shows the ten Frit 418 glasses based on the nominal sludge-only and nominal coupled operations projections spanning a WL interval of 34-42% (i.e., SB7aVS-14 through SB7aVS-23). Note in Table 4 the nominal sludge only and nominal coupled operations glasses are paired (as identified by the shading) at each WL (34, 36, 38, 40, and 42%). Table 5 summarizes the five Frit 702-SB7a based compositions assessed in this study (i.e., glass IDs SB7a-702-01 through SB7a-702-05). These glasses are based on the nominal coupled operations waste composition combined with Frit 702 at WLs of 34, 36, 38, 40, and 42%.

[d] The Tank 40, 60" heel option was identified as the baseline and therefore used as the basis for developing the VS test matrix.
[e] The variation accounted for in this stage is based on historical variation in the analytical measurements or uncertainties of the Sludge Receipt and Adjustment Tank (SRAT) product.
[f] JMP Version 7.0.2, SAS Institute, Inc., Cary, North Carolina, 1989-2007.

Table 3. Target Compositions of the Frit 418 – EV Based SB7a VS Glasses (wt%)

Glass ID	SB7aVS-01	SB7aVS-02	SB7aVS-03	SB7aVS-04	SB7aVS-05	SB7aVS-06	SB7aVS-07	SB7aVS-08	SB7aVS-09	SB7aVS-10	SB7aVS-11	SB7aVS-12	SB7aVS-13
Frit	418	418	418	418	418	418	418	418	418	418	418	418	418
Sludge	EV	EV	EV	EV	EV	EV	EV	EV	EV	EV	EV	EV	EV
WL	36	36	36	36	36	36	36	36	36	36	36	36	36
Al_2O_3	7.948	7.948	8.346	7.948	7.948	8.018	9.711	8.621	9.711	9.711	9.344	9.485	9.652
B_2O_3	5.120	5.120	5.120	5.120	5.120	5.120	5.120	5.120	5.120	5.120	5.120	5.120	5.120
BaO	0.009	0.009	0.021	0.009	0.021	0.021	0.021	0.021	0.021	0.009	0.009	0.009	0.021
CaO	0.660	0.268	0.268	0.660	0.660	0.660	0.660	0.268	0.660	0.660	0.268	0.268	0.268
Ce_2O_3	0.014	0.014	0.031	0.014	0.031	0.031	0.031	0.031	0.031	0.014	0.014	0.014	0.031
Cr_2O_3	0.075	0.075	0.171	0.075	0.171	0.171	0.171	0.171	0.171	0.075	0.075	0.075	0.171
CuO	0.020	0.020	0.045	0.020	0.045	0.045	0.045	0.045	0.045	0.020	0.020	0.020	0.045
Fe_2O_3	9.370	7.735	9.370	8.023	9.370	7.735	7.735	9.370	7.735	8.615	7.735	9.370	7.735
K_2O	0.130	0.130	0.297	0.130	0.297	0.297	0.297	0.297	0.297	0.130	0.130	0.130	0.297
La_2O_3	0.007	0.007	0.016	0.007	0.016	0.016	0.016	0.016	0.016	0.007	0.007	0.007	0.016
Li_2O	5.120	5.120	5.120	5.120	5.120	5.120	5.120	5.120	5.120	5.120	5.120	5.120	5.120
MgO	0.458	0.458	0.068	0.068	0.068	0.458	0.068	0.068	0.458	0.068	0.068	0.458	0.458
MnO	2.245	2.245	1.814	1.814	2.245	1.814	2.245	1.814	1.814	1.814	2.245	1.814	2.245
Na_2O	14.934	15.014	15.014	15.014	13.325	15.014	14.310	13.325	13.330	13.325	15.014	13.325	13.325
NiO	1.003	1.415	1.415	1.415	1.415	1.003	1.003	1.003	1.415	1.415	1.003	1.003	1.415
PbO	0.003	0.003	0.007	0.003	0.007	0.007	0.007	0.007	0.007	0.003	0.003	0.003	0.007
SO_4	0.627	0.500	0.500	0.627	0.500	0.500	0.500	0.627	0.627	0.500	0.627	0.500	0.627
SiO_2	49.919	50.482	49.919	50.482	50.245	49.919	50.482	50.482	50.482	49.919	49.919	50.482	49.919
ThO_2	0.171	0.171	0.171	0.629	0.629	0.629	0.171	0.171	0.171	0.171	0.629	0.629	0.587
TiO_2	0.000	0.616	0.000	0.653	0.000	0.653	0.000	0.653	0.000	0.653	0.000	0.000	0.653
U_3O_8	2.075	2.556	2.075	2.075	2.556	2.556	2.075	2.556	2.556	2.556	2.556	2.075	2.075
ZnO	0.007	0.007	0.017	0.007	0.017	0.017	0.017	0.017	0.017	0.007	0.007	0.007	0.017
ZrO_2	0.087	0.087	0.197	0.087	0.197	0.197	0.197	0.197	0.197	0.087	0.087	0.087	0.197

Table 4. Target Compositions of the Frit 418 - Nominal Sludge Only (SO) and Nominal Coupled (ARP) SB7a VS Glasses (wt%)

Glass ID	SB7aVS-14	SB7aVS-15	SB7aVS-16	SB7aVS-17	SB7aVS-18	SB7aVS-19	SB7aVS-20	SB7aVS-21	SB7aVS-22	SB7aVS-23
Frit	418	418	418	418	418	418	418	418	418	418
Sludge	SO	ARP	SO	ARP	SO	ARP	SO	ARP	SO	ARP
WL	34	34	36	36	38	38	40	40	42	42
Al_2O_3	8.488	8.174	8.987	8.654	9.487	9.135	9.986	9.616	10.485	10.097
B_2O_3	5.280	5.280	5.120	5.120	4.960	4.960	4.800	4.800	4.640	4.640
BaO	0.016	0.016	0.017	0.017	0.017	0.018	0.018	0.019	0.019	0.020
CaO	0.443	0.438	0.469	0.463	0.495	0.489	0.521	0.515	0.547	0.541
Ce_2O_3	0.021	0.022	0.022	0.024	0.023	0.025	0.024	0.026	0.026	0.028
Cr_2O_3	0.118	0.114	0.125	0.121	0.132	0.128	0.139	0.134	0.146	0.141
CuO	0.031	0.030	0.033	0.032	0.035	0.033	0.036	0.035	0.038	0.037
Fe_2O_3	8.166	7.968	8.647	8.437	9.127	8.905	9.608	9.374	10.088	9.843
K_2O	0.203	0.195	0.215	0.207	0.227	0.218	0.239	0.230	0.251	0.241
La_2O_3	0.012	0.013	0.013	0.014	0.014	0.014	0.014	0.015	0.015	0.016
Li_2O	5.280	5.280	5.120	5.120	4.960	4.960	4.800	4.800	4.640	4.640
MgO	0.256	0.245	0.271	0.260	0.287	0.274	0.302	0.289	0.317	0.303
MnO	1.924	1.906	2.038	2.018	2.151	2.130	2.264	2.242	2.377	2.355
Na_2O	13.681	13.940	14.015	14.289	14.349	14.639	14.684	14.988	15.018	15.337
NiO	1.158	1.124	1.227	1.190	1.295	1.256	1.363	1.322	1.431	1.389
PbO	0.004	0.006	0.004	0.006	0.004	0.006	0.004	0.007	0.005	0.007
SO_4	0.516	0.539	0.546	0.571	0.577	0.602	0.607	0.634	0.637	0.666
SiO_2	51.656	51.594	50.224	50.158	48.792	48.723	47.360	47.287	45.928	45.852
ThO_2	0.384	0.365	0.407	0.386	0.429	0.408	0.452	0.429	0.474	0.451
TiO_2	0.006	0.447	0.006	0.473	0.006	0.500	0.007	0.526	0.007	0.552
U_3O_8	2.209	2.155	2.339	2.281	2.469	2.408	2.599	2.535	2.729	2.662
ZnO	0.009	0.010	0.009	0.010	0.010	0.011	0.010	0.011	0.011	0.012
ZrO_2	0.138	0.134	0.146	0.142	0.154	0.150	0.162	0.158	0.170	0.166

Table 5. Target Compositions of the Frit 702 – Nominal Coupled (ARP) SB7a VS Glasses (wt%)

Glass ID	SB7a-702-01	SB7a-702-02	SB7a-702-03	SB7a-702-04	SB7a-702-05
Frit	702	702	702	702	702
Sludge	ARP	ARP	ARP	ARP	ARP
WL	34	36	38	40	42
Al_2O_3	8.174	8.654	9.135	9.616	10.097
B_2O_3	5.280	5.120	4.960	4.800	4.640
BaO	0.016	0.017	0.018	0.019	0.020
CaO	0.438	0.463	0.489	0.515	0.541
Ce_2O_3	0.022	0.024	0.025	0.026	0.028
Cr_2O_3	0.114	0.121	0.128	0.134	0.141
CuO	0.030	0.032	0.033	0.035	0.037
Fe_2O_3	7.968	8.437	8.905	9.374	9.843
K_2O	0.195	0.207	0.218	0.230	0.241
La_2O_3	0.013	0.014	0.014	0.015	0.016
Li_2O	6.600	6.400	6.200	6.000	5.800
MgO	0.245	0.260	0.274	0.289	0.303
MnO	1.906	2.018	2.130	2.242	2.355
Na_2O	12.620	13.009	13.399	13.788	14.177
NiO	1.124	1.190	1.256	1.322	1.389
PbO	0.006	0.006	0.006	0.007	0.007
SO_4	0.539	0.571	0.602	0.634	0.666
SiO_2	51.594	50.158	48.723	47.287	45.852
ThO_2	0.365	0.386	0.408	0.429	0.451
TiO_2	0.447	0.473	0.500	0.526	0.552
U_3O_8	2.155	2.281	2.408	2.535	2.662
ZnO	0.010	0.010	0.011	0.011	0.012
ZrO_2	0.134	0.142	0.150	0.158	0.166

5.0 Experimental

5.1 Glass Fabrication

Each SB7a variability study glass was prepared from the proper proportions of reagent-grade metal oxides, carbonates, H_3BO_3, and salts in 150 g batches. 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 sampling stock for the various property measurements (i.e., chemical composition, durability testing and X-ray diffraction (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. This cooling schedule is referred to as the centerline canister cooling (CCC) curve.[3]

5.2 Compositional Analysis

To confirm that the as-fabricated glasses met the target compositions, a representative sample from each glass was submitted to Analytical Development (AD) for chemical analysis under the auspices of an analytical plan.[4] Two dissolution methods were utilized in measuring these chemical compositions: peroxide fusion (PF) and aqua regia (AR). For each study glass, measurements were obtained from samples prepared in duplicate by each of these dissolution methods. 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.

5.3 XRD

Representative samples of each CCC SB7a VS glass were submitted to AD for XRD analysis. Samples were run under conditions providing a detection limit of approximately 0.5 vol %. That is, if crystals (or unincorporated batch material) were present at 0.5 vol % or greater, the diffractometer would not only be capable of detecting the crystals but would also allow a qualitative determination of the type of crystal(s) present. Otherwise, a characteristically high background signal (amorphous hump) devoid of crystalline peaks indicates that the glass is free of crystallization, suggesting either a completely amorphous product or that the degree of crystallization is below the detection limit.

5.4 PCT

The PCT was performed in triplicate on each quenched and CCC SB7a VS glass to assess chemical durability using Method A of the PCT procedure.[5] Also included in the experimental test matrix was the 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 an analytical plan.[6] Samples of a multi-element, standard solution were also included in the analytical plan as a check on the accuracy of the ICP-AES. Normalized release rates were calculated based on target and measured compositions using the average of the logs of the leachate concentrations.

6.0 Results and Discussion

6.1 Chemical Compositions

Tables A1 and A2 in Appendix A provide (in two parts) the elemental concentration measurements in micrograms of element per gram of glass (μg/g) from the SB7a VS glasses that were prepared using AR, and Table A3 and Table A4 in Appendix A provide the measurements from the samples of the glasses prepared using PF. Measurements for samples of the SB7ref[g] glass and of the uranium standard (U_{std}) glass are also provided in these tables of Appendix A.

Elemental concentrations were converted to oxide weight percent (wt%) concentrations of the glasses by multiplying the μg/g values for each element by the gravimetric factor for the corresponding oxide and dividing by 10,000. 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.

6.1.1 *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., AR and PF) for the first 2 analytical blocks, and Exhibit A2 in Appendix A provides similar plots for the analytical blocks 3 and 4. These plots include all of the measurement data, and in addition to showing the analytical sequence of the measurements they show the laboratory identifier of the sample. Different colors and symbols are used to represent the various study and standard glasses. While these are rather busy plots, they do provide the reader with opportunities for a high-level review of the measurements generated for the study glasses. However, the data reported in these exhibits are presented in analytical sequence and it may be difficult to ascertain specific issues with the measured data for an individual SB7a VS glasses. In the next section, the measured data are compiled and presented to provide assessments of reproducibility and comparison between target and measured compositions. Specific and/or general issues with the compositional measurements of the SB7a VS glasses are discussed below.

6.1.2 *Composition Measurements by Glass Identifier*

Exhibit A3 in Appendix A provides plots of the oxide concentration measurements by Glass ID/Lab ID (including the standards except for the blanks) for the glasses processed in analytical blocks 1 and 2. Similar plots for the glasses of analytical blocks 3 and 4 are provided in Exhibit

[g] The SB7ref glass was developed as a non-radioactive internal standard representing Frit 418 coupled with the Tank 40 60" heel nominal projection (after removing U_3O_8 and ThO_2 and renormalizing) at 36% WL. This glass was not only submitted to AD but to the Process Science Analytical Laboratory (PSAL) for compositional analysis. The analysis of the SB7ref glass at PSAL was performed under the auspices of a separate analytical plan and the results will provide insight into the actual composition of this glass. Of particular interest is the measure of Na_2O in this glass given this element resulted in significant issues in the SB6 VS study. For more information on the SB7ref glass see SRNL-NB-2010-00162 pages 31 – 32.

A4 of Appendix A. For these plots, the measurements are arranged by the targeted 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. The plots of the exhibits are arranged to provide a point of comparison between the two preparation methods (for oxides where both were used): AR and PF. 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.

A review of the results in Exhibit A3 reveals a pattern in the differences between the measured and targeted oxide concentrations for the SB7aVS-01 and SB7aVS-02 glasses. It appears that the labels for these two glasses were switched prior to their being submitted for chemical analysis. The measurements for these glasses will be switched to correct this problem in the subsequent analyses of these measurements. A review of the results in Exhibit A4 indicates a preparation issue for the K23PF1 measurements; this is a PF preparation of the SB7aVS-11 glass. All of the measurements associated with this prepared sample will be excluded and only the measurements from the K23PF2 prepared sample will be combined with the AR measurements to determine a representative measured composition for the SB7aVS-11 glass. In addition, the SO_4 values reported by AD are much higher than targeted. Based on the information reported in Exhibit Table A2 and Table A4 (Appendix A) the reported values appear to be a detection limit issue (i.e., values reported as "<"). In Exhibit A3, the MgO values for SB7aVS-04 appear to be at or just above the detection limit of the ICP-AES. A review of the batch sheets for this particular glass suggests that MgO was added to the glass at the appropriate concentration.[h] One additional comment is in reference to the Cr_2O_3 content of the U_{std} glass. The reference value for Cr_2O_3 in the U_{std} d glass is 0.0 wt% whereas AD measurements (see Exhibit A3) consistently shows measured Cr_2O_3 values on the order of 0.25 wt%. These measured values are consistent with previous measurements and indicate that the U_{std} glass does contain a small fraction of Cr_2O_3 which is not reported in its reference composition.

Although specific compositional issues are highlighted above, none of these issues are considered of practical significance and are inconsequential to the conclusions drawn in this study.

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

Exhibit A5 in Appendix A provides statistical analyses of the SB7ref and U_{std} results by calibration block for each oxide of interest for both the AR 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. For both the SB7ref results and the U_{std} results, there was a significant ICP-AES calibration effect on the block averages at the 5% significance level for all of the oxides for both preparation methods except the PF SiO_2 results. Significant calibration effects have been observed in previous studies and, although no corrective actions have been taken (i.e., bias-correction), are inconsequential to the conclusions drawn in this study.

Reference values for the oxide concentrations of the standards are given in the header for each set of measurements in Exhibit A5. As mentioned in Section 6.1, the SB7ref glass was developed as a non-radioactive internal standard representing Frit 418 coupled with the Tank 40 60" heel nominal projection (after removing U_3O_8 and ThO_2 and renormalizing) at 36% WL. This glass was not only submitted to AD but to the Process Science Analytical Laboratory (PSAL) for

[h] Batch sheet for the SB7aVS-04 glass can be found on page 22 of SRNL-NB-2010-00162.

compositional analysis. The analysis of the SB7ref glass at PSAL was performed under the auspices of a separate analytical plan[i] and the results provide additional insight into the actual composition of this glass. Of particular interest is the measure of Na_2O in this glass given this element resulted in significant issues in the SB6 VS study.[11] Therefore a comparison of the AD and PSAL measurements for Na_2O in this glass are warranted. Prior to evaluating this particular glass, Figure 1 shows the measured (red X's) Na_2O values compared to the targeted values (blue line) for all of the SB7a VS glasses including the SB7ref and U_{std} glass standards. In general, for the SB7aVS glasses, the AD Na_2O measurements were higher than targeted with most being approximately 0.6 to 1 wt% higher than targeted. The difference in the measured Na_2O value versus targeted value for the SB7ref glass is in line with the SB7a VS glass data. More specifically, the SB7ref measured value was 15.6 wt% as compared to the target value of 14.6 wt%. The averaged measured Na_2O value from the PSAL analysis of the SB7ref glass was 14.8 wt% compared to the 14.6 wt% target value.[j] These data suggest that the Na_2O concentrations reported by AD may be biased high.

Figure 1. Target Versus Measured Na_2O Values for the SB7a VS Glasses by AD

6.1.4 *Measured versus Targeted Compositions*

Table A5 in Appendix A provides a summary of the average compositions of the SB7a VS glasses as well as the target compositions and some associated differences and relative differences. Exhibit A6 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 SB7a VS glasses. The measured sums of oxides for all of the study glasses fall within the interval of 95 to 105 wt%. In fact, most of sum of oxides are > 100% for the SB7a VS glasses which is a reflection of the higher measured values as compared to target or detection limit issues (e.g., SO_4).

[i] T.B. Edwards, "An Analytical Plan for Measuring the Chemical compositions of Two Reference Glasses," SRNL-L4221-2010-00005, December 16, 2010.
[j] More information on the PSAL analysis of the SB7ref glass can be found in SRNL-NB-2010-00162.

Although some differences between targeted and measured compositions are highlighted in Appendix A, none impact the conclusions drawn as part of this study.

6.2 MAR Assessments

Measurement Acceptability Region (MAR) assessment results based on target and measured compositions are provided in Table 6. 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)). Although slight differences in predicted property values for a specific glass based on its target composition as compared to its measured compositions do result, there are no differences with respect to the classification of acceptability. That is, all of the SB7a VS glasses are classified as acceptable based on PCCS model predictions regardless of the compositional view.

Table 6. Predicted Properties and MAR Assessment Results for SB7a VS Glasses

Glass ID	Comp View	B Del Gp Value	NL [B (g/L)]	TL Pred (°C)	Visc Pred (P)	Al_2O_3 wt%	TiO_2 wt%	R_2O wt%	Neph Value	MAR Status
SB7aVS-01	targeted	-11.67	1.63	866.30	39.70	7.95	0.00	20.18	0.69	acceptable
SB7aVS-02	targeted	-11.64	1.61	868.10	45.12	7.95	0.62	20.26	0.69	acceptable
SB7aVS-03	targeted	-11.40	1.46	921.59	40.01	8.35	0.00	20.43	0.68	acceptable
SB7aVS-04	targeted	-11.44	1.48	864.05	44.37	7.95	0.65	20.26	0.69	acceptable
SB7aVS-05	targeted	-10.30	0.92	946.73	51.04	7.95	0.00	18.74	0.70	acceptable
SB7aVS-06	targeted	-11.68	1.64	871.67	42.73	8.02	0.65	20.43	0.68	acceptable
SB7aVS-07	targeted	-10.65	1.07	888.28	57.88	9.71	0.00	19.73	0.68	acceptable
SB7aVS-08	targeted	-9.69	0.72	928.33	55.23	8.62	0.65	18.74	0.70	acceptable
SB7aVS-09	targeted	-9.73	0.73	948.61	67.01	9.71	0.00	18.75	0.69	acceptable
SB7aVS-10	targeted	-9.37	0.63	927.25	62.22	9.71	0.65	18.58	0.68	acceptable
SB7aVS-11	targeted	-11.19	1.34	841.90	49.08	9.34	0.00	20.26	0.67	acceptable
SB7aVS-12	targeted	-9.40	0.63	913.96	60.73	9.49	0.00	18.58	0.69	acceptable
SB7aVS-13	targeted	-9.67	0.71	953.09	64.09	9.65	0.65	18.74	0.68	acceptable
SB7aVS-14	targeted	-10.38	0.95	887.66	57.43	8.49	0.01	19.16	0.70	acceptable
SB7aVS-15	targeted	-10.64	1.06	874.55	54.18	8.17	0.45	19.42	0.70	acceptable
SB7aVS-16	targeted	-10.44	0.98	910.45	53.12	8.99	0.01	19.35	0.69	acceptable
SB7aVS-17	targeted	-10.71	1.10	896.69	49.86	8.65	0.47	19.62	0.69	acceptable
SB7aVS-18	targeted	-10.50	1.00	932.11	48.92	9.49	0.01	19.54	0.67	acceptable
SB7aVS-19	targeted	-10.79	1.13	917.74	45.65	9.14	0.50	19.82	0.67	acceptable
SB7aVS-20	targeted	-10.56	1.03	952.70	44.82	9.99	0.01	19.72	0.66	acceptable
SB7aVS-21	targeted	-10.86	1.17	937.53	41.58	9.62	0.53	20.02	0.66	acceptable
SB7aVS-22	targeted	-10.62	1.05	972.33	40.84	10.49	0.01	19.91	0.64	acceptable
SB7aVS-23	targeted	-10.93	1.20	956.73	37.65	10.10	0.55	20.22	0.64	acceptable
SB7a-702-01	targeted	-10.57	1.03	875.10	44.03	8.17	0.45	19.42	0.71	acceptable
SB7a-702-02	targeted	-10.64	1.07	897.39	40.54	8.65	0.47	19.62	0.70	acceptable
SB7a-702-03	targeted	-10.72	1.10	918.57	37.14	9.14	0.50	19.82	0.68	acceptable
SB7a-702-04	targeted	-10.80	1.14	938.49	33.85	9.62	0.53	20.02	0.67	acceptable
SB7a-702-05	targeted	-10.87	1.17	957.80	30.67	10.10	0.55	20.22	0.65	acceptable
SB7aVS-01	measured	-11.95	1.84	854.34	45.94	8.45	0.59	20.83	0.68	acceptable
SB7aVS-02	measured	-12.35	2.17	853.76	37.22	8.49	0.01	21.21	0.67	acceptable
SB7aVS-03	measured	-11.79	1.72	908.95	36.86	8.78	0.01	20.98	0.67	acceptable
SB7aVS-04	measured	-11.75	1.69	856.43	45.48	8.39	0.64	20.80	0.68	acceptable
SB7aVS-05	measured	-10.85	1.16	933.32	50.84	8.55	0.01	19.69	0.69	acceptable
SB7aVS-06	measured	-12.44	2.25	842.13	43.00	8.62	0.65	21.56	0.68	acceptable
SB7aVS-07	measured	-10.70	1.09	874.49	66.45	10.22	0.01	20.05	0.68	acceptable
SB7aVS-08	measured	-9.82	0.76	918.05	57.24	9.04	0.65	19.07	0.69	acceptable
SB7aVS-09	measured	-10.20	0.89	924.02	62.95	10.21	0.01	19.44	0.68	acceptable
SB7aVS-10	measured	-9.60	0.69	915.75	70.57	10.38	0.64	19.21	0.68	acceptable
SB7aVS-11	measured	-11.44	1.48	838.66	51.68	10.02	0.01	20.86	0.66	acceptable
SB7aVS-12	measured	-9.82	0.75	896.53	63.16	10.13	0.01	19.34	0.68	acceptable
SB7aVS-13	measured	-10.00	0.81	929.17	63.75	10.19	0.65	19.33	0.68	acceptable
SB7aVS-14	measured	-11.00	1.23	872.92	50.81	9.06	0.02	20.03	0.68	acceptable
SB7aVS-15	measured	-10.88	1.18	862.24	55.81	8.63	0.44	19.87	0.69	acceptable
SB7aVS-16	measured	-11.24	1.37	886.36	48.56	9.71	0.01	20.50	0.67	acceptable
SB7aVS-17	measured	-11.06	1.26	883.66	51.95	9.19	0.45	20.24	0.68	acceptable
SB7aVS-18	measured	-11.41	1.46	909.98	45.23	10.28	0.02	20.96	0.66	acceptable
SB7aVS-19	measured	-11.06	1.27	904.26	45.74	9.61	0.49	20.27	0.66	acceptable
SB7aVS-20	measured	-10.65	1.07	940.02	50.41	10.60	0.02	20.10	0.65	acceptable
SB7aVS-21	measured	-11.68	1.64	914.29	40.69	10.37	0.47	21.30	0.65	acceptable
SB7aVS-22	measured	-11.57	1.57	943.93	38.50	11.34	0.02	21.34	0.63	acceptable
SB7aVS-23	measured	-11.66	1.63	930.07	36.96	10.76	0.53	21.26	0.63	acceptable
SB7a-702-01	measured	-11.16	1.32	866.83	43.19	8.84	0.46	20.38	0.70	acceptable
SB7a-702-02	measured	-10.60	1.05	893.13	46.40	9.21	0.47	19.81	0.69	acceptable
SB7a-702-03	measured	-11.26	1.38	898.80	34.81	9.71	0.43	20.56	0.67	acceptable
SB7a-702-04	measured	-11.03	1.25	926.14	34.73	10.07	0.51	20.45	0.66	acceptable
SB7a-702-05	measured	-11.06	1.27	938.78	32.95	10.58	0.53	20.60	0.65	acceptable

6.3 XRD

Table 7 summarizes the results of the XRD analysis of the CCC SB7a VS glasses. All but one of the CCC SB7a VS glasses are amorphous (i.e., void of crystallization at a detection limit of approximately 0.5 vol%).[k] Trevorite (a spinel – $NiFe_2O_4$) was detected in SB7a-702-05ccc, which is a typical crystal found in slowly cooled, higher WL DWPF-like glasses. This glass targets 42% WL, which is the highest for this series of glasses. It should be noted that nepheline was not detected in any of the CCC SB7a VS glasses.

Table 7. XRD Results for SB7a VS Glasses (CCC Glasses)

Glass	Frit	Sludge	WL	XRD Result
SB7aVS-01	418	EV	36	Amorphous
SB7aVS-02	418	EV	36	Amorphous
SB7aVS-03	418	EV	36	Amorphous
SB7aVS-04	418	EV	36	Amorphous
SB7aVS-05	418	EV	36	Amorphous
SB7aVS-06	418	EV	36	Amorphous
SB7aVS-07	418	EV	36	Amorphous
SB7aVS-08	418	EV	36	Amorphous
SB7aVS-09	418	EV	36	Amorphous
SB7aVS-10	418	EV	36	Amorphous
SB7aVS-11	418	EV	36	Amorphous
SB7aVS-12	418	EV	36	Amorphous
SB7aVS-13	418	EV	36	Amorphous
SB7aVS-14	418	SB7a sludge-only	34	Amorphous
SB7aVS-15	418	SB7a coupled	34	Amorphous
SB7aVS-16	418	SB7a sludge-only	36	Amorphous
SB7aVS-17	418	SB7a coupled	36	Amorphous
SB7aVS-18	418	SB7a sludge-only	38	Amorphous
SB7aVS-19	418	SB7a coupled	38	Amorphous
SB7aVS-20	418	SB7a sludge-only	40	Amorphous
SB7aVS-21	418	SB7a coupled	40	Amorphous
SB7aVS-22	418	SB7a sludge-only	42	Amorphous
SB7aVS-23	418	SB7a coupled	42	Amorphous
SB7a-702-01	702	SB7a coupled	34	Amorphous
SB7a-702-02	702	SB7a coupled	36	Amorphous
SB7a-702-03	702	SB7a coupled	38	Amorphous
SB7a-702-04	702	SB7a coupled	40	Amorphous
SB7a-702-05	702	SB7a coupled	42	Spinel

[k] XRD patterns for the SB7a VS CCC glasses can be found in SRNL-NB-2010-00162, pages 40-55.

6.4 PCT

The PCT solutions were analyzed by AD under the auspices of an analytical plan.[6] The reported ppm values were adjusted for any dilution effects and normalized to both target and measured compositions. It should be mentioned that there were no water loss issues for any of the PCT vessels and the ARM glass ppm values for B, Li, Na, and Si were within the control chart limits as noted by Jantzen et al.[7]

Table B1 in Appendix B provides the elemental leachate concentration measurements for the solution samples generated by the PCTs for the study glasses. Any measurement below the detection limit of the analytical procedure (indicated by a "<") was replaced by ½ of the detection limit in subsequent analyses.[1] 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 B1 in Appendix B provides the resulting values.

6.4.1 *Measurements in Analytical Sequence*

Exhibits B1 through B3 in Appendix B provide plots of the common logarithms of the leachate (ppm) concentrations in analytical sequence for the twelve ICP-AES calibration blocks. No issues were observed in these plots.

6.4.2 *Results from the Samples of the Multi-Element Solution Standard*

Exhibit B4 in Appendix B provides analyses of measurements of the multi-element solution standard by analytical set/ICP-AES calibration block, and ANOVA investigations for each element of interest. A statistically significant difference (at a 5% level) among the averages of these measurements was indicated for all four analytes.

Table 8 summarizes the average measurements and the reference values for the four elements of interest in the multi-element standard solution for each of the twelve ICP-AES blocks. The results indicate consistent and accurate measurements throughout the measurement process.

[1] The approach of taking ½ of the detection limit is consistent with the United States Environmental Protection Agency approach as defined in "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, U.S. Environmental Protection Agency, Washington, D.C., 530-SW-89-026, 1989.

Table 8. Results from Samples of the Multi-Element Solution Standard

Block	Mean (B (ppm))	Mean (Li (ppm))	Mean (Na (ppm))	Mean (Si (ppm))
A	20.1	10.0	81.5	52.0
B	19.8	9.8	80.1	51.7
C	20.1	9.9	80.4	51.9
D	19.9	9.9	80.1	51.9
E	20.1	9.9	81.2	51.8
F	20.2	9.9	81.1	52.0
G	19.7	9.8	79.9	51.3
H	19.9	9.9	81.3	52.0
I	20.1	9.8	79.6	51.6
J	19.8	9.9	78.9	51.5
K	19.9	9.9	80.6	51.5
L	19.8	9.9	80.6	51.4
Grand Average	20.0	9.9	80.4	51.7
Reference Value	20	10	81	50

6.4.3 *Measurements by Glass Identifier*

Exhibit B5 in Appendix B provides plots of the leachate concentrations for both the quenched and CCC version of each of the study glasses, as well as the standards (EA, ARM, multi-element solution standard and blanks). 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.

6.4.4 *Normalized PCT Release Values*

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. Exhibit B6 in Appendix B provides scatter plots that contain normalized released rates for both the quenched and CCC version of the study glasses based on the target and measured compositions. These plots offer an opportunity to investigate the consistency in the leaching across the elements of interest 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 Li and Na, with a value of 93.7%, which demonstrates the consistency of the results among the four analytes.

Table 9 summarizes the normalized elemental release values for the quenched and CCC SB7a-VS glasses based on both target and measured compositions. A review of the data shows that all of the SB7a-VS glasses are acceptable relative to the EA glass regardless of thermal history (quenched or CCC) or compositional view (target or measured). For example, all of the SB7a

glasses have normalized boron release values (NL [B]) less than 0.92 g/L as compared to the benchmark NL [B] value for EA of 16.695 g/L.[8] It is noted that the NL [B] release for the EA glass from this study was relatively low (i.e., 13.4 g/L) as compared to the reported values of 16.695 g/L. Variations in the EA glass response have been observed in previous studies. All of the SB7a-VS glasses are acceptable relative to the EA glass regardless of the historical release value (16.695 g/L) or the value observed in this study (13.4 g/L).

Table 9. Normalized Elemental Releases for Quenched and CCC SB7a VS 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)
ARM	ref	reference	-0.247	-0.198	-0.255	-0.517	0.57	0.63	0.56	0.30
EA	ref	reference	1.125	0.911	1.015	0.545	13.35	8.15	10.36	3.51
SB7a-702-01	ccc	measured	-0.051	0.147	0.002	-0.124	0.89	1.40	1.00	0.75
SB7a-702-01	ccc	targeted	-0.043	0.146	0.034	-0.115	0.91	1.40	1.08	0.77
SB7a-702-01	quenched	measured	-0.112	-0.011	-0.035	-0.208	0.77	0.97	0.92	0.62
SB7a-702-01	quenched	targeted	-0.104	-0.013	-0.003	-0.199	0.79	0.97	0.99	0.63
SB7a-702-02	ccc	measured	-0.066	0.055	-0.004	-0.176	0.86	1.13	0.99	0.67
SB7a-702-02	ccc	targeted	-0.078	0.044	0.008	-0.168	0.84	1.11	1.02	0.68
SB7a-702-02	quenched	measured	-0.099	-0.019	-0.017	-0.208	0.80	0.96	0.96	0.62
SB7a-702-02	quenched	targeted	-0.110	-0.030	-0.005	-0.199	0.78	0.93	0.99	0.63
SB7a-702-03	ccc	measured	-0.088	-0.011	-0.028	-0.199	0.82	0.98	0.94	0.63
SB7a-702-03	ccc	targeted	-0.092	-0.008	-0.007	-0.201	0.81	0.98	0.98	0.63
SB7a-702-03	quenched	measured	-0.084	-0.028	0.001	-0.197	0.82	0.94	1.00	0.63
SB7a-702-03	quenched	targeted	-0.088	-0.025	0.021	-0.199	0.82	0.94	1.05	0.63
SB7a-702-04	ccc	measured	-0.055	0.003	0.009	-0.194	0.88	1.01	1.02	0.64
SB7a-702-04	ccc	targeted	-0.067	-0.002	0.019	-0.193	0.86	0.99	1.05	0.64
SB7a-702-04	quenched	measured	-0.068	-0.041	0.007	-0.209	0.85	0.91	1.02	0.62
SB7a-702-04	quenched	targeted	-0.080	-0.046	0.017	-0.208	0.83	0.90	1.04	0.62
SB7a-702-05	ccc	measured	-0.091	-0.036	-0.009	-0.217	0.81	0.92	0.98	0.61
SB7a-702-05	ccc	targeted	-0.100	-0.041	0.000	-0.213	0.79	0.91	1.00	0.61
SB7a-702-05	quenched	measured	-0.078	-0.058	0.013	-0.220	0.84	0.87	1.03	0.60
SB7a-702-05	quenched	targeted	-0.086	-0.064	0.021	-0.216	0.82	0.86	1.05	0.61
SB7aVS-01	ccc	measured	-0.119	-0.053	-0.039	-0.235	0.76	0.88	0.91	0.58
SB7aVS-01	ccc	targeted	-0.129	-0.055	-0.025	-0.228	0.74	0.88	0.94	0.59
SB7aVS-01	quenched	measured	-0.125	-0.077	-0.017	-0.235	0.75	0.84	0.96	0.58
SB7aVS-01	quenched	targeted	-0.135	-0.079	-0.002	-0.228	0.73	0.83	0.99	0.59
SB7aVS-02	ccc	measured	-0.156	-0.078	-0.061	-0.245	0.70	0.84	0.87	0.57
SB7aVS-02	ccc	targeted	-0.159	-0.078	-0.039	-0.246	0.69	0.84	0.91	0.57
SB7aVS-02	quenched	measured	-0.134	-0.067	-0.022	-0.223	0.73	0.86	0.95	0.60
SB7aVS-02	quenched	targeted	-0.137	-0.067	0.001	-0.224	0.73	0.86	1.00	0.60
SB7aVS-03	ccc	measured	-0.191	-0.113	-0.080	-0.262	0.64	0.77	0.83	0.55
SB7aVS-03	ccc	targeted	-0.189	-0.116	-0.064	-0.266	0.65	0.77	0.86	0.54
SB7aVS-03	quenched	measured	-0.182	-0.114	-0.046	-0.259	0.66	0.77	0.90	0.55
SB7aVS-03	quenched	targeted	-0.180	-0.117	-0.030	-0.263	0.66	0.76	0.93	0.55
SB7aVS-04	ccc	measured	-0.173	-0.106	-0.063	-0.271	0.67	0.78	0.87	0.54
SB7aVS-04	ccc	targeted	-0.184	-0.108	-0.052	-0.267	0.65	0.78	0.89	0.54
SB7aVS-04	quenched	measured	-0.168	-0.114	-0.031	-0.262	0.68	0.77	0.93	0.55

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)
SB7aVS-04	quenched	targeted	-0.179	-0.116	-0.021	-0.258	0.66	0.77	0.95	0.55
SB7aVS-05	ccc	measured	-0.219	-0.140	-0.177	-0.330	0.60	0.72	0.67	0.47
SB7aVS-05	ccc	targeted	-0.220	-0.143	-0.144	-0.319	0.60	0.72	0.72	0.48
SB7aVS-05	quenched	measured	-0.202	-0.137	-0.143	-0.322	0.63	0.73	0.72	0.48
SB7aVS-05	quenched	targeted	-0.203	-0.140	-0.110	-0.311	0.63	0.72	0.78	0.49
SB7aVS-06	ccc	measured	-0.178	-0.094	-0.075	-0.284	0.66	0.81	0.84	0.52
SB7aVS-06	ccc	targeted	-0.180	-0.089	-0.050	-0.274	0.66	0.82	0.89	0.53
SB7aVS-06	quenched	measured	-0.163	-0.099	-0.036	-0.276	0.69	0.80	0.92	0.53
SB7aVS-06	quenched	targeted	-0.164	-0.094	-0.011	-0.266	0.68	0.81	0.98	0.54
SB7aVS-07	ccc	measured	-0.250	-0.148	-0.153	-0.326	0.56	0.71	0.70	0.47
SB7aVS-07	ccc	targeted	-0.263	-0.157	-0.139	-0.313	0.55	0.70	0.73	0.49
SB7aVS-07	quenched	measured	-0.240	-0.158	-0.118	-0.322	0.58	0.69	0.76	0.48
SB7aVS-07	quenched	targeted	-0.253	-0.167	-0.104	-0.309	0.56	0.68	0.79	0.49
SB7aVS-08	ccc	measured	-0.233	-0.133	-0.162	-0.299	0.59	0.74	0.69	0.50
SB7aVS-08	ccc	targeted	-0.243	-0.137	-0.153	-0.296	0.57	0.73	0.70	0.51
SB7aVS-08	quenched	measured	-0.248	-0.156	-0.163	-0.316	0.56	0.70	0.69	0.48
SB7aVS-08	quenched	targeted	-0.259	-0.160	-0.154	-0.312	0.55	0.69	0.70	0.49
SB7aVS-09	ccc	measured	-0.243	-0.155	-0.179	-0.316	0.57	0.70	0.66	0.48
SB7aVS-09	ccc	targeted	-0.244	-0.154	-0.158	-0.317	0.57	0.70	0.70	0.48
SB7aVS-09	quenched	measured	-0.238	-0.162	-0.158	-0.318	0.58	0.69	0.70	0.48
SB7aVS-09	quenched	targeted	-0.240	-0.161	-0.137	-0.320	0.58	0.69	0.73	0.48
SB7aVS-10	ccc	measured	-0.242	-0.145	-0.187	-0.321	0.57	0.72	0.65	0.48
SB7aVS-10	ccc	targeted	-0.246	-0.153	-0.165	-0.304	0.57	0.70	0.68	0.50
SB7aVS-10	quenched	measured	-0.232	-0.141	-0.164	-0.316	0.59	0.72	0.69	0.48
SB7aVS-10	quenched	targeted	-0.237	-0.150	-0.142	-0.299	0.58	0.71	0.72	0.50
SB7aVS-11	ccc	measured	-0.198	-0.107	-0.086	-0.269	0.63	0.78	0.82	0.54
SB7aVS-11	ccc	targeted	-0.204	-0.112	-0.068	-0.261	0.63	0.77	0.85	0.55
SB7aVS-11	quenched	measured	-0.184	-0.107	-0.045	-0.259	0.65	0.78	0.90	0.55
SB7aVS-11	quenched	targeted	-0.189	-0.112	-0.027	-0.251	0.65	0.77	0.94	0.56
SB7aVS-12	ccc	measured	-0.219	-0.143	-0.178	-0.303	0.60	0.72	0.66	0.50
SB7aVS-12	ccc	targeted	-0.227	-0.140	-0.160	-0.296	0.59	0.72	0.69	0.51
SB7aVS-12	quenched	measured	-0.203	-0.133	-0.138	-0.278	0.63	0.74	0.73	0.53
SB7aVS-12	quenched	targeted	-0.211	-0.130	-0.120	-0.271	0.61	0.74	0.76	0.54
SB7aVS-13	ccc	measured	-0.244	-0.168	-0.192	-0.329	0.57	0.68	0.64	0.47
SB7aVS-13	ccc	targeted	-0.255	-0.171	-0.175	-0.328	0.56	0.67	0.67	0.47
SB7aVS-13	quenched	measured	-0.239	-0.168	-0.172	-0.323	0.58	0.68	0.67	0.48
SB7aVS-13	quenched	targeted	-0.249	-0.171	-0.156	-0.322	0.56	0.67	0.70	0.48
SB7aVS-14	ccc	measured	-0.253	-0.164	-0.179	-0.306	0.56	0.69	0.66	0.49
SB7aVS-14	ccc	targeted	-0.260	-0.162	-0.155	-0.312	0.55	0.69	0.70	0.49
SB7aVS-14	quenched	measured	-0.220	-0.139	-0.126	-0.281	0.60	0.73	0.75	0.52
SB7aVS-14	quenched	targeted	-0.227	-0.137	-0.102	-0.287	0.59	0.73	0.79	0.52
SB7aVS-15	ccc	measured	-0.226	-0.140	-0.143	-0.294	0.59	0.73	0.72	0.51
SB7aVS-15	ccc	targeted	-0.237	-0.143	-0.133	-0.292	0.58	0.72	0.74	0.51
SB7aVS-15	quenched	measured	-0.230	-0.155	-0.121	-0.304	0.59	0.70	0.76	0.50
SB7aVS-15	quenched	targeted	-0.242	-0.158	-0.111	-0.302	0.57	0.70	0.77	0.50
SB7aVS-16	ccc	measured	-0.252	-0.161	-0.179	-0.312	0.56	0.69	0.66	0.49

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)
SB7aVS-16	ccc	targeted	-0.254	-0.158	-0.151	-0.313	0.56	0.69	0.71	0.49
SB7aVS-16	quenched	measured	-0.242	-0.160	-0.149	-0.306	0.57	0.69	0.71	0.49
SB7aVS-16	quenched	targeted	-0.243	-0.157	-0.120	-0.306	0.57	0.70	0.76	0.49
SB7aVS-17	ccc	measured	-0.197	-0.121	-0.114	-0.267	0.63	0.76	0.77	0.54
SB7aVS-17	ccc	targeted	-0.207	-0.122	-0.100	-0.261	0.62	0.76	0.79	0.55
SB7aVS-17	quenched	measured	-0.216	-0.158	-0.111	-0.300	0.61	0.70	0.77	0.50
SB7aVS-17	quenched	targeted	-0.226	-0.159	-0.097	-0.294	0.59	0.69	0.80	0.51
SB7aVS-18	ccc	measured	-0.171	-0.110	-0.113	-0.278	0.67	0.78	0.77	0.53
SB7aVS-18	ccc	targeted	-0.170	-0.103	-0.079	-0.270	0.68	0.79	0.83	0.54
SB7aVS-18	quenched	measured	-0.172	-0.128	-0.091	-0.280	0.67	0.75	0.81	0.53
SB7aVS-18	quenched	targeted	-0.171	-0.121	-0.056	-0.271	0.67	0.76	0.88	0.54
SB7aVS-19	ccc	measured	-0.158	-0.096	-0.062	-0.255	0.70	0.80	0.87	0.56
SB7aVS-19	ccc	targeted	-0.168	-0.098	-0.048	-0.255	0.68	0.80	0.89	0.56
SB7aVS-19	quenched	measured	-0.160	-0.110	-0.057	-0.259	0.69	0.78	0.88	0.55
SB7aVS-19	quenched	targeted	-0.170	-0.112	-0.044	-0.259	0.68	0.77	0.90	0.55
SB7aVS-20	ccc	measured	-0.153	-0.098	-0.077	-0.284	0.70	0.80	0.84	0.52
SB7aVS-20	ccc	targeted	-0.163	-0.108	-0.062	-0.274	0.69	0.78	0.87	0.53
SB7aVS-20	quenched	measured	-0.159	-0.113	-0.063	-0.290	0.69	0.77	0.86	0.51
SB7aVS-20	quenched	targeted	-0.170	-0.123	-0.048	-0.280	0.68	0.75	0.89	0.52
SB7aVS-21	ccc	measured	-0.144	-0.089	-0.068	-0.263	0.72	0.81	0.85	0.55
SB7aVS-21	ccc	targeted	-0.144	-0.084	-0.039	-0.252	0.72	0.82	0.91	0.56
SB7aVS-21	quenched	measured	-0.150	-0.118	-0.052	-0.268	0.71	0.76	0.89	0.54
SB7aVS-21	quenched	targeted	-0.150	-0.112	-0.023	-0.257	0.71	0.77	0.95	0.55
SB7aVS-22	ccc	measured	-0.136	-0.090	-0.055	-0.254	0.73	0.81	0.88	0.56
SB7aVS-22	ccc	targeted	-0.132	-0.084	-0.022	-0.246	0.74	0.82	0.95	0.57
SB7aVS-22	quenched	measured	-0.165	-0.143	-0.077	-0.290	0.68	0.72	0.84	0.51
SB7aVS-22	quenched	targeted	-0.161	-0.137	-0.044	-0.282	0.69	0.73	0.90	0.52
SB7aVS-23	ccc	measured	-0.158	-0.119	-0.084	-0.279	0.69	0.76	0.82	0.53
SB7aVS-23	ccc	targeted	-0.165	-0.119	-0.059	-0.275	0.68	0.76	0.87	0.53
SB7aVS-23	quenched	measured	-0.155	-0.146	-0.056	-0.281	0.70	0.71	0.88	0.52
SB7aVS-23	quenched	targeted	-0.162	-0.146	-0.031	-0.278	0.69	0.71	0.93	0.53

6.4.5 *Effects of Heat Treatment*

Exhibit B7 in Appendix B provides plots of the normalized PCT responses between the two heat treatments for the 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 as seen in Figure 2, which shows the plot of the NL boron releases of the CCC versions of the study glasses versus their quenched counterparts for the measured composition view. The results indicate that there is very little (if any) practical difference between the quenched and CCC versions of the SB7a VS glasses. To provide some perspective, consider the PCT response of the quenched and CCC SB7a-702-01 glasses (the Frit 702 based glass (orange point) furthest from the 45° line in Figure 2). The quenched and CCC NL [B] values for this glass are 0.77 and 0.91 g/L, respectively, suggesting

no practical difference in PCT response – especially with respect to acceptability as compared to the benchmark EA glass release of 16.695 g/L.[8]

Based on the XRD results, the lack of significant impact of the thermal history on PCT response is not surprising given that all of the CCC glasses (with the exception of SB7a-702-05 CCC) were X-ray amorphous suggesting no microstructural changes (more specifically crystallization) during the slow cooling process. In fact, the presence of spinels in SB7a-702-05 CCC had very little impact (if any) on the PCT response as the quenched and CCC NL [B] values for this glass were 0.84 and 0.81 g/L, respectively (based on measured compositions). The fact that spinel formation had no impact on the PCT response is in line with expectations.

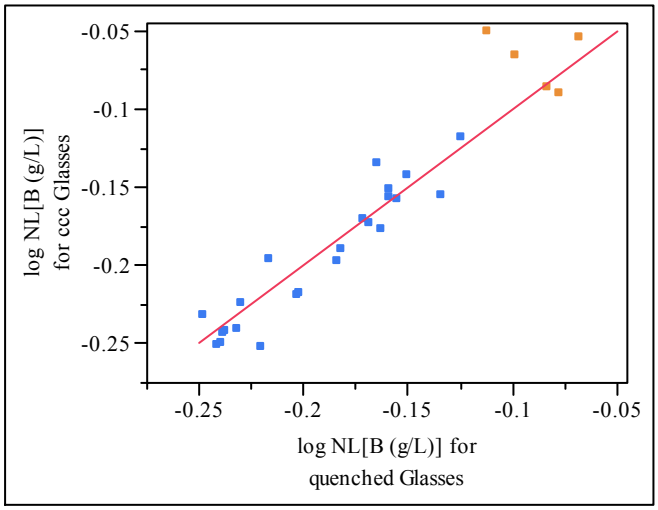

Figure 2. Quenched Versus CCC for the SB7a VS Glasses.

(orange – Frit 702 glasses, blue – Frit 418 glasses)

6.4.6 *Predicted versus Measured PCTs*

Peeler and Edwards[9] provided details regarding the applicability of the current durability models to the SB7a VS compositional region of interest based on target compositions. In that memorandum it was shown that based on the measured PCT responses and targeted glass compositions, all of the glasses were (i) acceptable as compared to the EA reference glass regardless of the thermal history (quenched or slow cooled), and (ii) predictable using the current PCCS models for durability. Exhibit B8 provides the free energy of hydration term (ΔGp (or del Gp) kcal/100g glass) versus the common logarithm of the normalized leachate values for B, Li, Na, and Si based on the SB7a VS glass target compositions.

Figure 3 shows the log NL [B] values (for both quenched and CCC) versus ΔGp derived from measured compositions. Prediction limits (at a 95% confidence) for an individual PCT result are plotted along with the linear fit. PCT results for the EA and ARM glasses used in this study are also indicated on this plot.

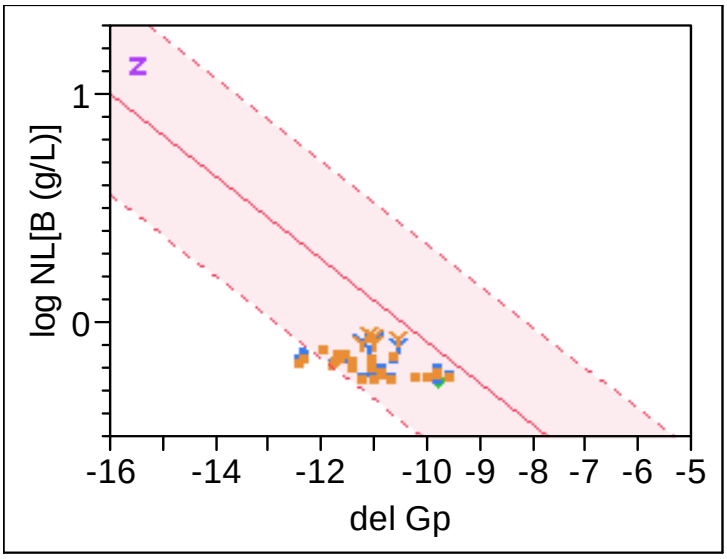

Figure 3. Del Gp versus log NL [B] Values for the SB7a VS Glasses Based on Measured Compositions.

Legend

Symbol	Standard/ Comp View-Heat Treatment
Z	EA
◊	ARM
▪	Frit 418 Glasses - Measured-ccc
▪	Frit 418 Glasses - Measured-quenched
Y	Frit 702 Glasses - Measured-ccc
Y	Frit 702 Glasses - Measured-quenched

With respect to model applicability based on the measured compositions, all of the SB7a VS glasses are predictable with the exception of SB7aVS-02 and SB7aVS-06 (i.e., the four points lying just below and to the left of the lower 95% confidence band represent the quenched and CCC versions of SB7aVS-02 and SB7aVS-06). Although the NL [B] values of these glasses ranged from 0.66 to 0.73 g/L (very acceptable), these glasses are not predictable by the current durability model. In fact, the current durability models are conservative for these glasses since they are more durable than predicted by the models.

These two glasses are EV based compositions coupled with Frit 418 at 36% WL (refer to Table 1). It should be noted that based on the targeted and measured compositions, these glasses have the most negative ΔGp values of the SB7a VS glasses (i.e., on the order of -12.5 kcal/100g glass). Although the overall composition ultimately defines the ΔGp value, these two glasses are based on the maximum targeted Na_2O content (15.014 wt% Na_2O). Coupling this fact with the slightly higher Na_2O measured values (as compared to targets – see Section 6.1.3) from the AD analysis may have been enough to push these two glass compositions just outside of the lower 95% confidence limits. Higher alkali glasses for which the model over-predicts the PCT response have been observed in the Sludge Batch 3 (SB3) Phase 1 VS and more recently in the Sludge Batch 6 (SB6) VS.[10,11] As in this study, although the glasses were outside the lower 95% confidence band, the glasses were very acceptable relative to the benchmark EA glass PCT response. Exhibit B9 shows the NL [B, Li, Na, and Si] plots for the quenched and CCC versions of the SB7a VS glasses based on measured compositions.

7.0 Conclusions

Twenty-eight SB7a glasses were selected for the variability study based on the nominal sludge projections used to support the frit recommendation. Twenty-three of the SB7a VS glasses were based on the use of Frit 418, while 5 glasses were based on the use of Frit 702. Ten of the twenty-three Frit 418 based glasses used the nominal sludge-only and the nominal coupled operations projections for SB7a (specifically the Tank 40, 60" heel option) while targeting WLs of 34, 36, 38, 40, and 42%. Thirteen additional Frit 418 based glasses were developed using EVs of the sludge region (bounding both sludge-only and coupled operations) for SB7a with all EV-based glasses targeting 36% WL (the nominal DWPF contractual WL). The five Frit 702 based glasses used the coupled operations nominal projection targeting WLs of 34, 36, 38, 40, and 42%. These glasses were fabricated and characterized using chemical composition analysis, XRD and the PCT. Both quenched and CCC glasses were evaluated with XRD and the PCT.

The objective of this study was to demonstrate the applicability of the current durability models to the SB7a composition region of interest and the acceptability of the SB7a glasses with respect to the EA glass in terms of durability as defined by the PCT.

With respect to the applicability of the current durability models based on measured compositions, all of the SB7a VS glasses are predictable with the exception of SB7aVS-02 and SB7aVS-06. Although the NL [B] values of these two glasses range from 0.66 to 0.73 g/L (very acceptable), the PCT responses are not predictable by the current durability models. These two glasses are more durable than predicted by the model. These two glasses are EV based compositions coupled with Frit 418 at 36% WL and they target the maximum Na_2O content (15.01 wt% Na_2O) of the SB7a VS EV-based glasses. Coupling this fact with the slightly higher Na_2O measured values (as compared to targets) from the AD analysis, this may have been enough to push these two glasses compositions just outside of the lower 95% confidence limits. Higher alkali glasses for which the model over-predicts the PCT response have been observed in the Sludge Batch 3 (SB3) Phase 1 VS and more recently in the Sludge Batch 6 (SB6) VS. [10,11] As in this study, although the glasses were outside the lower 95% confidence band, the glasses were very acceptable relative to the benchmark EA glass PCT response.

With respect to acceptability, the PCT results indicate that all of the SB7a-VS glasses are acceptable relative to the EA glass regardless of thermal history (quenched or CCC) or compositional view (target or measured). The SB7a glasses have normalized boron release values (NL [B]) less than 0.92 g/L as compared to the benchmark NL [B] value for EA of 16.695 g/L.[8]

8.0 References

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Appendix A

Tables and Exhibits Supporting the Analysis of the Chemical Composition Measurements of the SB7a VS Glasses

Table A1. Measured Elemental Concentrations (µg/g) for the Study Glasses Prepared Using Aqua Regia (part 1)

Glass ID	Block	Sub-Blk	Sequence	Lab ID	LIMS	Al (ug/g)	B (ug/g)	Ba (ug/g)	Ca (ug/g)	Ce (ug/g)	Cr (ug/g)	Cu (ug/g)	Fe (ug/g)	K (ug/g)	La (ug/g)	Li (ug/g)	Mg (ug/g)
SB7ref	1	1	1	SB7REFAR11	300280605	48300	15500	172	3820	204	886	249	60700	2240	113	23700	1630
Ustd	1	1	2	USTDAR11	300280606	20400	27000	14.9	9830	< 51.5	1560	< 11.1	91500	23200	14.3	13600	7020
SB7aVS-17	1	1	3	K24AR2	300280607	49000	15700	159	3870	277	742	221	58100	1730	115	24100	1620
SB7aVS-12	1	1	4	K22AR2	300280608	52900	15400	104	2320	197	438	161	62200	1120	79.8	23700	2230
SB7aVS-01	1	1	5	K01AR1	300280609	45000	15800	87.4	2340	194	404	125	53600	1080	69.5	24100	2520
SB7aVS-04	1	1	6	K09AR2	300280610	44600	15700	102	5420	211	482	150	56300	1110	52.7	24000	313
SB7a-702-05	1	1	7	K06AR2	300280611	54700	13800	188	4300	329	644	261	66400	1910	119	26100	1820
SB7a-702-04	1	1	8	K18AR1	300280612	54100	14800	183	4250	311	733	263	66600	1910	134	28100	1800
SB7aVS-01	1	1	9	K01AR2	300280613	44400	15600	85.9	2270	193	417	125	53000	1060	66.7	23700	2470
SB7ref	1	1	10	SB7REFAR12	300280614	50000	16200	178	3950	218	916	257	63100	2320	117	24700	1690
Ustd	1	1	11	USTDAR12	300280615	20600	26300	14.3	9500	< 51.5	1520	< 11.1	89400	22600	14.1	13300	6820
SB7aVS-04	1	1	12	K09AR1	300280616	44000	15500	101	5350	211	464	150	55600	1130	52.9	23700	309
SB7aVS-15	1	1	13	K07AR1	300280617	45400	16100	160	3590	250	625	231	54700	1630	110	24400	1540
SB7a-702-04	1	1	14	K18AR2	300280618	51700	14300	177	4090	305	709	249	64000	1820	127	26900	1750
SB7aVS-17	1	1	15	K24AR1	300280619	47700	15600	157	3770	274	771	213	57300	1700	113	23600	1610
SB7aVS-12	1	1	16	K22AR1	300280669	54700	16100	109	2350	206	460	169	65200	1150	83.3	24800	2340
SB7a-702-05	1	1	17	K06AR1	300280670	55800	14300	195	4450	333	667	269	68300	1980	124	26900	1870
SB7aVS-15	1	1	18	K07AR2	300280671	45000	16000	158	3570	243	699	236	54500	1590	109	24400	1520
blank	1	1	19	BLANKAR1	300280672	< 75.4	41.9	< 1.04	61.4	< 52.8	< 11.1	< 11.4	44	< 160	< 8.64	< 60.5	5.92
SB7ref	1	1	20	SB7REFAR13	300280673	49500	16200	177	3920	216	922	256	62700	2380	117	24600	1690
Ustd	1	1	21	USTDAR13	300280674	20500	26900	14.6	9770	< 51.5	1540	< 11.1	91400	23300	14.4	13700	6940
SB7ref	1	2	1	SB7REFAR11	300280605	48900	15900	178	3840	214	915	255	61600	2300	119	23900	1640
Ustd	1	2	2	USTDAR11	300280606	20700	27100	15.4	9840	54.8	1610	< 11.1	92200	23200	14.7	13700	7040
SB7aVS-04	1	2	3	K09AR2	300280610	45000	16000	106	5420	218	497	153	56900	1170	55	23900	313
SB7aVS-01	1	2	4	K01AR1	300280609	45600	16100	90.7	2350	205	418	128	54400	1090	70.9	24100	2510
SB7a-702-05	1	2	5	K06AR2	300280611	55200	14100	196	4300	339	666	274	66900	1940	124	26100	1820
SB7aVS-12	1	2	6	K22AR1	300280669	55900	16400	114	2370	214	472	176	66000	1120	88.4	24800	2340
SB7aVS-12	1	2	7	K22AR2	300280608	53400	15700	109	2320	213	453	162	62900	1110	83.5	23700	2230
SB7aVS-17	1	2	8	K24AR1	300280619	48800	15900	164	3800	287	792	222	58000	1670	117	23700	1610
SB7a-702-04	1	2	9	K18AR1	300280612	54600	15000	190	4260	325	756	269	67200	1890	138	28100	1800
SB7ref	1	2	10	SB7REFAR12	300280614	51000	16500	185	4020	223	949	263	64100	2360	124	24700	1690
Ustd	1	2	11	USTDAR12	300280615	21000	26500	15.1	9560	< 51.5	1560	< 11.1	90700	22700	14.7	13300	6820
SB7aVS-15	1	2	12	K07AR1	300280617	46500	16500	168	3620	262	646	242	55300	1660	115	24600	1540
SB7a-702-04	1	2	13	K18AR2	300280618	53100	14600	186	4140	320	729	256	65000	1850	135	27200	1740
SB7aVS-15	1	2	14	K07AR2	300280671	46500	16400	166	3620	258	724	248	55500	1600	114	24600	1530
SB7aVS-17	1	2	15	K24AR2	300280607	50100	16100	167	3890	295	768	229	59200	1740	120	24200	1620
SB7aVS-04	1	2	16	K09AR1	300280616	45200	15900	106	5410	217	480	157	56700	1090	55	23900	309
SB7aVS-01	1	2	17	K01AR2	300280613	45400	16000	90.4	2280	206	432	129	53700	1040	69.5	23800	2480
SB7a-702-05	1	2	18	K06AR1	300280670	57700	14700	205	4490	348	690	286	69200	1980	129	27100	1880
blank	1	2	19	BLANKAR1	300280672	< 75.4	44.6	< 1.04	62.5	< 52.8	< 11.1	< 11.4	41.6	< 160	< 8.64	< 60.5	5.96
SB7ref	1	2	20	SB7REFAR13	300280673	51300	16600	187	3970	229	956	265	63900	2410	125	24700	1700
Ustd	1	2	21	USTDAR13	300280674	21600	27400	15.5	9870	54.3	1600	< 11.1	93300	23200	13.8	13800	6950
SB7ref	2	1	1	SB7REFAR21	300280620	52700	17300	188	4190	236	886	271	67100	2510	126	26300	1820
Ustd	2	1	2	USTDAR21	300280621	19900	26500	14.7	9490	< 51.7	1540	< 11.1	90000	22400	12.1	13400	6970

Table A1. Measured Elemental Concentrations (µg/g) for the Study Glasses Prepared Using Aqua Regia (part 1)

Glass ID	Block	Sub-Blk	Sequence	Lab ID	LIMS	Al (ug/g)	B (ug/g)	Ba (ug/g)	Ca (ug/g)	Ce (ug/g)	Cr (ug/g)	Cu (ug/g)	Fe (ug/g)	K (ug/g)	La (ug/g)	Li (ug/g)	Mg (ug/g)
SB7aVS-16	2	1	3	K15AR1	300280622	52200	16400	168	4000	271	624	249	61200	1890	116	25000	1790
SB7aVS-21	2	1	4	K21AR2	300280623	55500	15300	215	4400	313	651	277	67300	1990	123	23500	1910
SB7aVS-22	2	1	5	K17AR1	300280624	61700	15100	222	4730	315	702	269	72100	2220	135	23000	2110
SB7aVS-06	2	1	6	K02AR1	300280625	45400	16000	208	5460	371	951	348	52000	2570	135	24600	2390
SB7aVS-21	2	1	7	K21AR1	300280626	54900	15200	214	4350	322	644	275	66600	1960	123	23300	1890
SB7aVS-18	2	1	8	K04AR2	300280627	54600	15700	172	4210	274	674	255	66400	1930	130	24200	1860
SB7aVS-23	2	1	9	K19AR1	300280628	56500	14300	216	4500	340	726	270	65700	2040	135	22000	1940
SB7ref	2	1	10	SB7REFAR22	300280629	52700	17400	189	4250	236	890	272	66900	2550	125	26300	1820
Ustd	2	1	11	USTDAR22	300280630	20300	27000	14.8	9680	< 51.7	1550	< 11.1	91600	22900	12.5	13700	6990
SB7aVS-23	2	1	12	K19AR2	300280631	57900	14700	220	4570	340	740	279	67200	2100	137	22500	1990
SB7aVS-02	2	1	13	K14AR2	300280632	44900	16100	131	5540	195	389	148	67500	1190	70.9	24500	2710
SB7aVS-06	2	1	14	K02AR2	300280633	45700	16200	211	5510	379	964	352	52300	2600	137	24900	2410
SB7aVS-22	2	1	15	K17AR2	300280634	59400	14700	215	4580	300	689	268	69700	2150	131	22300	2050
SB7aVS-18	2	1	16	K04AR1	300280675	55300	16100	176	4280	287	689	267	67300	1980	132	24600	1910
SB7aVS-02	2	1	17	K14AR1	300280676	45200	16300	132	5490	187	393	145	68400	1180	71.9	24700	2740
SB7aVS-16	2	1	18	K15AR2	300280677	50600	16100	165	3970	266	611	246	59400	1880	113	24400	1760
blank	2	1	19	BLANKAR2	300280678	< 75.4	53.6	< 1.04	36.6	< 52.8	< 11.1	< 11.4	64.8	< 160	< 8.64	< 60.5	6.12
SB7ref	2	1	20	SB7REFAR23	300280679	52000	17400	189	4150	243	886	271	66900	2540	125	26300	1820
Ustd	2	1	21	USTDAR23	300280680	20000	26700	14.8	9580	57.3	1550	< 11.1	91000	22400	12.2	13600	7000
SB7ref	2	2	1	SB7REFAR21	300280620	54300	17500	200	3920	248	906	280	67300	2610	132	26600	1790
Ustd	2	2	2	USTDAR21	300280621	20500	26600	15.7	9310	60.9	1590	< 11.1	90400	22700	12	13500	6890
SB7aVS-23	2	2	3	K19AR1	300280628	58200	14600	230	4200	356	743	286	65700	2100	143	22000	1920
SB7aVS-23	2	2	4	K19AR2	300280631	59900	14800	234	4300	358	756	295	67500	2160	145	22600	1960
SB7aVS-06	2	2	5	K02AR1	300280625	47100	16300	222	5210	393	976	362	52200	2610	141	24800	2360
SB7aVS-22	2	2	6	K17AR2	300280634	61700	14900	230	4330	320	706	279	70300	2190	138	22400	2020
SB7aVS-02	2	2	7	K14AR2	300280632	46500	16300	139	5290	206	396	153	68100	1200	73.5	24500	2670
SB7aVS-21	2	2	8	K21AR2	300280623	57700	15600	229	4140	339	662	294	67600	2020	131	23700	1880
SB7aVS-06	2	2	9	K02AR2	300280633	47900	16500	225	5290	396	983	367	52900	2610	144	25000	2380
SB7ref	2	2	10	SB7REFAR22	300280629	54900	17700	201	4000	242	910	281	67600	2640	132	26500	1800
Ustd	2	2	11	USTDAR22	300280630	21000	27200	15.8	9510	60.2	1590	< 11.1	92500	23200	11.5	13700	6900
SB7aVS-18	2	2	12	K04AR2	300280627	57000	15900	184	3960	295	688	269	67000	1970	136	24300	1840
SB7aVS-16	2	2	13	K15AR1	300280622	54800	16700	180	3750	288	637	268	61800	1920	122	25200	1770
SB7aVS-16	2	2	14	K15AR2	300280677	53000	16300	176	3730	270	621	256	60000	1860	120	24500	1720
SB7aVS-02	2	2	15	K14AR1	300280676	47600	16400	141	5270	204	399	153	69100	1160	72.2	24900	2690
SB7aVS-22	2	2	16	K17AR1	300280624	64600	15400	238	4490	328	721	286	73100	2270	141	23300	2090
SB7aVS-18	2	2	17	K04AR1	300280675	58100	16300	188	4050	304	703	280	68000	2010	140	24700	1880
SB7aVS-21	2	2	18	K21AR1	300280626	57700	15500	228	4120	329	659	286	67400	1960	128	23600	1860
blank	2	2	19	BLANKAR2	300280678	< 754	47	< 1.04	< 21.6	< 52.8	< 11.1	< 11.4	119	< 160	< 8.64	< 605	2.2
Ustd	2	2	20	USTDAR23	300280680	21300	27100	15.7	9510	60.6	1580	< 11.1	92500	23500	11.8	13700	6890
SB7ref	2	2	21	SB7REFAR23	300280679	55200	17600	200	3930	250	904	280	67800	2610	131	26600	1790
SB7ref	3	1	1	SB7REFAR31	300280639	50100	15900	178	3890	218	814	253	62700	2330	118	24700	1680
Ustd	3	1	2	USTDAR31	300280640	22300	29400	16.2	9420	52.8	1680	< 11.2	101000	24800	15.5	14900	7520
SB7aVS-05	3	1	3	K26AR2	300280641	46300	16200	216	5100	365	955	343	68800	2490	136	24900	466
SB7a-702-02	3	1	4	K10AR1	300280642	48700	15600	169	3650	291	676	240	57900	1650	116	29900	1610
SB7aVS-05	3	1	5	K26AR1	300280643	46300	16200	216	5090	360	962	342	69000	2510	137	25000	466
SB7aVS-11	3	1	6	K23AR2	300280644	51700	15400	98.9	2050	216	395	160	52900	1080	72.6	23800	405
SB7a-702-01	3	1	7	K03AR1	300280645	47200	16900	158	3460	288	583	202	57400	1760	105	31900	1610

Table A1. Measured Elemental Concentrations (µg/g) for the Study Glasses Prepared Using Aqua Regia (part 1)

Glass ID	Block	Sub-Blk	Sequence	Lab ID	LIMS	Al (ug/g)	B (ug/g)	Ba (ug/g)	Ca (ug/g)	Ce (ug/g)	Cr (ug/g)	Cu (ug/g)	Fe (ug/g)	K (ug/g)	La (ug/g)	Li (ug/g)	Mg (ug/g)
SB7a-702-02	3	1	8	K10AR2	300280646	48500	15500	168	3530	291	676	240	57700	1650	115	30000	1600
SB7aVS-11	3	1	9	K23AR1	300280647	54000	16100	103	2160	219	411	169	55200	1140	76.5	24800	425
SB7ref	3	1	10	SB7REFAR32	300280648	49100	15800	175	3830	210	804	250	61700	2310	116	24400	1670
Ustd	3	1	11	USTDAR32	300280649	22000	28900	15.8	9250	< 52	1660	< 11.2	98700	24800	14.9	14800	7420
SB7aVS-07	3	1	12	K13AR1	300280650	52900	15300	206	4840	324	914	335	51400	2330	120	23700	356
SB7a-702-01	3	1	13	K03AR2	300280651	48000	17200	161	3530	292	593	205	58000	1730	108	32400	1640
SB7aVS-07	3	1	14	K13AR2	300280652	54900	15900	214	5020	339	947	351	53500	2420	126	24600	371
SB7aVS-10	3	1	15	K08AR2	300280653	55800	16200	107	5110	237	408	136	60700	1150	58.8	24900	322
SB7aVS-20	3	1	16	K27AR1	300280681	54200	14200	180	3860	288	656	268	64000	1920	132	22100	1850
SB7aVS-10	3	1	17	K08AR1	300280682	54100	15600	103	4920	224	394	133	59000	1090	54.9	24100	311
SB7aVS-20	3	1	18	K27AR2	300280683	56800	15000	190	4050	308	688	284	67100	2010	138	23200	1940
blank	3	1	19	BLANKAR3	300280684	< 754	54.4	< 1.04	< 2.16	< 52.8	< 11.1	< 11.4	< 84	< 160	< 8.64	< 605	4.56
SB7ref	3	1	20	SB7REFAR33	300280685	49200	16000	177	3950	218	814	254	62100	2370	117	24700	1700
Ustd	3	1	21	USTDAR33	300280686	22000	29100	16.2	9440	54.2	1690	< 11.2	99200	24900	15.4	15000	7590
SB7ref	3	2	1	SB7REFAR31	300280639	50600	16400	185	4010	228	838	260	62600	2440	123	24700	1690
Ustd	3	2	2	USTDAR31	300280640	22700	29700	16.9	9660	59.4	1730	< 11.2	101000	25300	15.1	15000	7540
SB7aVS-07	3	2	3	K13AR2	300280652	56700	16300	223	5190	355	977	360	54300	2570	131	24700	370
SB7a-702-01	3	2	4	K03AR2	300280651	49400	17700	169	3650	302	608	213	58800	1900	111	32600	1630
SB7a-702-02	3	2	5	K10AR1	300280642	50100	16000	176	3770	295	692	249	58400	1770	120	30100	1600
SB7aVS-11	3	2	6	K23AR1	300280647	55600	16600	108	2270	234	424	176	56000	1240	78.5	24800	427
SB7aVS-11	3	2	7	K23AR2	300280644	53400	15900	104	2160	223	408	166	53700	1160	76.9	23900	407
SB7a-702-01	3	2	8	K03AR1	300280645	48500	17400	167	3590	303	601	210	58000	1850	111	32000	1610
SB7aVS-05	3	2	9	K26AR2	300280641	47500	16700	226	5270	379	982	353	69200	2650	142	25100	467
SB7ref	3	2	10	SB7REFAR32	300280648	50600	16200	184	3990	219	829	257	62400	2420	122	24600	1670
Ustd	3	2	11	USTDAR32	300280649	22600	29400	16.8	9530	54.5	1700	< 11.2	99600	25200	13.4	14900	7400
SB7aVS-05	3	2	12	K26AR1	300280643	47800	16700	227	5280	382	992	354	69500	2660	142	25300	468
SB7aVS-07	3	2	13	K13AR1	300280650	54600	15700	217	5010	335	938	346	52100	2470	126	23800	355
SB7aVS-20	3	2	14	K27AR2	300280683	59300	15500	201	4210	318	709	295	68600	2170	143	23400	1940
SB7aVS-10	3	2	15	K08AR1	300280682	56300	16000	109	5100	235	402	138	60100	1200	56.6	24200	310
SB7aVS-20	3	2	16	K27AR1	300280681	56400	14600	191	4010	306	673	277	65200	2010	137	22200	1840
SB7a-702-02	3	2	17	K10AR2	300280646	50300	15900	177	3670	298	691	251	58700	1740	119	30100	1600
SB7aVS-10	3	2	18	K08AR2	300280653	58300	16700	114	5300	247	419	141	62100	1210	59.3	25000	321
blank	3	2	19	BLANKAR3	300280684	< 754	72.1	< 1.04	< 2.16	< 52.8	< 11.1	< 11.4	< 84	< 160	< 8.64	< 605	5.32
SB7ref	3	2	20	SB7REFAR33	300280685	51600	16400	187	4100	229	835	261	63700	2500	123	24800	1680
Ustd	3	2	21	USTDAR33	300280686	23000	30200	17.3	9740	60.7	1730	< 11.2	102000	25600	14.7	15000	7550
SB7ref	4	1	1	SB7REFAR41	300280654	52900	17200	188	3950	223	890	270	67000	2540	127	26500	1810
Ustd	4	1	2	USTDAR41	300280655	21600	28700	15.3	9270	< 52.7	1650	< 11.3	97900	24300	18.8	14600	7360
SB7aVS-13	4	1	3	K16AR1	300280656	52500	15300	212	2120	335	783	320	52700	2390	130	23500	2300
SB7aVS-14	4	1	4	K05AR1	300280657	48700	16600	163	3520	258	616	215	58200	1770	109	25600	1490
SB7a-702-03	4	1	5	K20AR1	300280658	50400	15000	149	3750	298	641	227	59700	1830	132	28800	1710
SB7aVS-08	4	1	6	K28AR2	300280659	47600	15500	191	2140	308	870	304	65900	2420	131	23900	456
SB7aVS-03	4	1	7	K25AR2	300280660	47000	16300	206	2190	317	966	303	67500	2510	132	24300	428
SB7aVS-19	4	1	8	K12AR2	300280661	51900	15500	174	3860	289	742	257	62400	1840	130	23800	1760
SB7aVS-14	4	1	9	K05AR2	300280662	48400	16500	163	3520	251	618	217	58000	1770	110	25400	1480
SB7ref	4	1	10	SB7REFAR42	300280663	52700	17200	189	3970	224	890	270	67000	2560	126	26300	1810
Ustd	4	1	11	USTDAR42	300280664	21200	28300	15.2	9190	< 52.7	1630	< 11.3	96700	23700	18.4	14400	7270
SB7aVS-19	4	1	12	K12AR1	300280665	49500	14700	165	3690	272	708	246	59600	1750	123	22700	1680

Table A1. Measured Elemental Concentrations (µg/g) for the Study Glasses Prepared Using Aqua Regia (part 1)

Glass ID	Block	Sub-Blk	Sequence	Lab ID	LIMS	Al (ug/g)	B (ug/g)	Ba (ug/g)	Ca (ug/g)	Ce (ug/g)	Cr (ug/g)	Cu (ug/g)	Fe (ug/g)	K (ug/g)	La (ug/g)	Li (ug/g)	Mg (ug/g)
SB7aVS-08	4	1	13	K28AR1	300280666	47700	15700	193	2160	326	873	305	66200	2450	133	24000	459
SB7aVS-09	4	1	14	K11AR1	300280667	54100	16100	194	5080	328	839	326	54300	2420	134	24500	2350
SB7aVS-13	4	1	15	K16AR2	300280668	54500	16000	221	2200	345	803	333	54900	2510	135	24500	2390
SB7a-702-03	4	1	16	K20AR2	300280687	52300	15700	156	3920	312	663	239	62400	1940	140	30000	1800
SB7aVS-03	4	1	17	K25AR1	300280688	46300	16100	205	2170	320	962	296	67000	2490	132	24000	425
SB7aVS-09	4	1	18	K11AR2	300280689	54300	16200	194	5100	328	830	327	54400	2430	134	24500	2360
blank	4	1	19	BLANKAR4	300280690	< 754	83.3	< 1.04	19.6	< 52.8	< 11.1	< 11.4	< 84	< 160	< 8.64	< 605	5.32
SB7ref	4	1	20	SB7REFAR43	300280691	52300	17100	188	3950	224	883	268	66800	2510	125	26200	1810
Ustd	4	1	21	USTDAR43	300280692	21300	28400	15.3	9310	< 52.7	1640	< 11.3	97300	24000	17.7	14500	7360
SB7ref	4	2	1	SB7REFAR41	300280654	54400	17500	198	4030	238	909	276	67500	2620	131	26400	1810
Ustd	4	2	2	USTDAR41	300280655	22300	28900	16.3	9480	53.9	1690	< 11.3	98700	24800	18	14600	7370
SB7aVS-19	4	2	3	K12AR1	300280665	51100	15100	175	3770	301	728	253	60100	1850	129	22800	1690
SB7aVS-09	4	2	4	K11AR1	300280667	56100	16500	205	5180	357	865	339	54800	2510	139	24500	2360
SB7a-702-03	4	2	5	K20AR2	300280687	54300	16200	165	4020	333	687	250	63000	2060	146	30100	1800
SB7aVS-03	4	2	6	K25AR2	300280660	48200	16600	218	2240	327	998	308	67900	2630	138	24200	431
SB7aVS-08	4	2	7	K28AR1	300280666	49100	16000	205	2210	343	901	315	66800	2610	139	23900	462
SB7aVS-13	4	2	8	K16AR1	300280656	54200	15700	225	2170	358	805	331	53100	2500	135	23500	2310
SB7aVS-08	4	2	9	K28AR2	300280659	48700	15800	202	2190	327	898	311	66100	2570	138	23700	459
SB7ref	4	2	10	SB7REFAR42	300280663	54000	17600	199	4040	241	916	276	67400	2650	132	26300	1820
Ustd	4	2	11	USTDAR42	300280664	21900	28200	16	9370	< 52.7	1680	< 11.3	97500	24300	17.7	14400	7310
SB7aVS-14	4	2	12	K05AR2	300280662	49900	16900	172	3600	272	633	223	58600	1850	113	25400	1490
SB7aVS-14	4	2	13	K05AR1	300280657	50200	16900	173	3600	277	636	224	59000	1870	115	25600	1500
SB7aVS-09	4	2	14	K11AR2	300280689	56500	16600	206	5220	365	856	338	55200	2580	140	24700	2370
SB7a-702-03	4	2	15	K20AR1	300280658	51900	15400	158	3840	314	662	238	60400	1910	139	28800	1720
SB7aVS-03	4	2	16	K25AR1	300280688	48200	16500	218	2220	328	999	304	67800	2600	138	24200	427
SB7aVS-19	4	2	17	K12AR2	300280661	53800	15800	184	3940	319	762	266	63100	1950	134	24000	1760
SB7aVS-13	4	2	18	K16AR2	300280668	57000	16300	235	2260	368	829	343	55700	2690	140	24800	2400
blank	4	2	19	BLANKAR4	300280690	< 754	53	< 1.04	28.2	< 52.8	< 11.1	< 11.4	< 84	< 160	< 8.64	< 605	5.56
SB7ref	4	2	20	SB7REFAR43	300280691	54500	17500	199	4040	235	912	276	67600	2670	132	26400	1810
Ustd	4	2	21	USTDAR43	300280692	22400	28500	16.4	9510	< 52.7	1710	< 11.3	98700	24800	17.7	14700	7390

Table A2. Measured Elemental Concentrations (µg/g)) for the Study Glasses Prepared Using Aqua Regia (part 2)

Glass ID	Block	Sub-Blk	Sequence	Lab ID	LIMS	Mn (ug/g)	Na (ug/g)	Ni (ug/g)	P (ug/g)	Pb (ug/g)	S (ug/g)	Th (ug/g)	Ti (ug/g)	U (ug/g)	Zn (ug/g)	Zr (ug/g)
SB7ref	1	1	1	SB7REFAR11	300280605	16100	109000	9370	< 67.3	< 58	1730	< 187	2660	< 6890	158	452
Ustd	1	1	2	USTDAR11	300280606	21100	85400	8310	< 66.2	< 57	1070	406	5120	20300	66.7	13.4
SB7aVS-17	1	1	3	K24AR2	300280607	16200	110000	9330	< 65.7	< 56.5	1990	3780	2610	20000	149	752
SB7aVS-12	1	1	4	K22AR2	300280608	14300	100000	7600	< 66.1	60.3	1520	5740	52.3	17500	123	555
SB7aVS-01	1	1	5	K01AR1	300280609	17900	115000	11100	< 67.2	< 57.9	1650	1830	3420	21100	127	418
SB7aVS-04	1	1	6	K09AR2	300280610	14500	114000	11000	< 66.7	< 57.5	1960	5730	3710	18100	118	533
SB7a-702-05	1	1	7	K06AR2	300280611	18200	105000	10200	< 65.8	< 56.6	2160	4210	2960	22400	176	679
SB7a-702-04	1	1	8	K18AR1	300280612	18100	106000	10300	< 67.4	< 58	2070	4190	3000	22300	163	958
SB7aVS-01	1	1	9	K01AR2	300280613	17600	113000	10900	< 66.6	< 57.3	1670	1810	3410	20500	139	391
SB7ref	1	1	10	SB7REFAR12	300280614	16700	113000	9690	< 67.3	< 58	2060	< 187	2760	< 6890	165	452
Ustd	1	1	11	USTDAR12	300280615	20500	83300	8120	< 66.2	< 57	727	392	4940	19700	65.2	13.3
SB7aVS-04	1	1	12	K09AR1	300280616	14300	113000	11000	< 67	< 57.7	1960	5690	3680	18000	114	418
SB7aVS-15	1	1	13	K07AR1	300280617	15100	105000	8680	< 65.4	< 56.3	1740	3260	2530	16200	135	629
SB7a-702-04	1	1	14	K18AR2	300280618	17300	102000	9870	< 66.2	< 57	2050	4080	2810	21300	155	1040
SB7aVS-17	1	1	15	K24AR1	300280619	16000	108000	9160	< 66.3	< 57	1770	3720	2570	19700	150	719
SB7aVS-12	1	1	16	K22AR1	300280669	14900	105000	7910	< 67.4	< 58	1640	6050	54.8	18300	123	602
SB7a-702-05	1	1	17	K06AR1	300280670	18700	108000	10500	< 65.5	< 56.4	2400	4360	3060	23000	180	888
SB7aVS-15	1	1	18	K07AR2	300280671	15000	105000	8690	< 65.8	< 56.7	1710	3210	2460	16100	137	446
blank	1	1	19	BLANKAR1	300280672	< 8.8	< 556	< 74.4	< 67.9	< 58.5	< 600	< 189	< 8.8	< 695	2.48	< 7.12
SB7ref	1	1	20	SB7REFAR13	300280673	16600	112000	9660	< 67.3	< 58	1880	< 187	2740	< 6890	164	487
Ustd	1	1	21	USTDAR13	300280674	21000	85700	8310	< 66.2	< 57	748	398	5000	20200	66.5	14
SB7ref	1	2	1	SB7REFAR11	300280605	16300	110000	9450	< 67.3	< 58	2130	< 187	2730	< 6890	166	440
Ustd	1	2	2	USTDAR11	300280606	21300	86500	8380	< 66.2	< 57	957	413	5210	20200	69.2	12.1
SB7aVS-04	1	2	3	K09AR2	300280610	14600	115000	11100	< 66.7	< 57.5	1960	5820	3810	18200	123	541
SB7aVS-01	1	2	4	K01AR1	300280609	18100	116000	11200	< 67.2	< 57.9	2050	1860	3490	21100	132	430
SB7a-702-05	1	2	5	K06AR2	300280611	18300	106000	10300	< 65.8	< 56.6	2450	4270	3040	22200	184	690
SB7aVS-12	1	2	6	K22AR1	300280669	15100	106000	8090	< 67.4	< 58	1900	6130	56.9	18400	129	617
SB7aVS-12	1	2	7	K22AR2	300280608	14400	101000	7690	< 66.1	< 56.9	2190	5820	53.7	17500	126	556
SB7aVS-17	1	2	8	K24AR1	300280619	16200	109000	9290	< 66.3	< 57	1970	3790	2640	19600	155	734
SB7a-702-04	1	2	9	K18AR1	300280612	18200	107000	10300	< 67.4	< 58	2350	4240	3070	22200	170	959
SB7ref	1	2	10	SB7REFAR12	300280614	16900	114000	9810	< 67.3	< 58	2490	< 187	2840	< 6890	170	446
Ustd	1	2	11	USTDAR12	300280615	20900	84300	8240	< 66.2	< 57	1230	403	5050	19800	67.4	13.3
SB7aVS-15	1	2	12	K07AR1	300280617	15300	107000	8760	< 65.4	< 56.3	2120	3310	2600	16600	140	640
SB7a-702-04	1	2	13	K18AR2	300280618	17600	104000	9950	< 66.2	< 57	2080	4150	2890	21500	161	1080
SB7aVS-15	1	2	14	K07AR2	300280671	15300	106000	8750	< 65.8	< 56.7	2120	3280	2550	16400	142	457
SB7aVS-17	1	2	15	K24AR2	300280607	16500	111000	9430	< 65.7	< 56.5	2230	3850	2690	20100	157	776
SB7aVS-04	1	2	16	K09AR1	300280616	14600	114000	11100	< 67	< 57.7	2080	5840	3810	18300	119	432
SB7aVS-01	1	2	17	K01AR2	300280613	17900	114000	11100	< 66.6	< 57.3	1930	1850	3510	21000	147	389
SB7a-702-05	1	2	18	K06AR1	300280670	19000	110000	10700	< 65.5	< 56.4	2630	4440	3170	23200	188	914
blank	1	2	19	BLANKAR1	300280672	< 8.8	< 556	< 74.4	< 67.9	< 58.5	< 600	< 189	< 8.8	< 695	2.4	< 7.12
SB7ref	1	2	20	SB7REFAR13	300280673	16900	114000	9820	< 67.3	< 58	2630	< 187	2830	< 6890	173	492
Ustd	1	2	21	USTDAR13	300280674	21500	86800	8470	< 66.2	< 57	727	413	5160	20300	68.9	14.1
SB7ref	2	1	1	SB7REFAR21	300280620	17700	120000	10400	< 66.7	< 57.5	1990	< 186	2920	< 6830	178	392
Ustd	2	1	2	USTDAR21	300280621	20600	83800	8240	< 66.5	< 57.3	1030	411	5210	19700	66.8	18.1
SB7aVS-16	2	1	3	K15AR1	300280622	16900	112000	9900	< 67.7	< 58.3	2140	4120	80.9	20800	156	639
SB7aVS-21	2	1	4	K21AR2	300280623	18500	119000	10700	< 66.5	< 57.2	2110	4300	2780	22500	162	912
SB7aVS-22	2	1	5	K17AR1	300280624	20100	121000	11900	< 66.7	60.5	2590	4650	104	23200	157	881

Table A2. Measured Elemental Concentrations (µg/g)) for the Study Glasses Prepared Using Aqua Regia (part 2)

Glass ID	Block	Sub-Blk	Sequence	Lab ID	LIMS	Mn (ug/g)	Na (ug/g)	Ni (ug/g)	P (ug/g)	Pb (ug/g)	S (ug/g)	Th (ug/g)	Ti (ug/g)	U (ug/g)	Zn (ug/g)	Zr (ug/g)
SB7aVS-06	2	1	6	K02AR1	300280625	14800	117000	8140	< 67.5	< 58.2	1670	6010	3750	22500	191	656
SB7aVS-21	2	1	7	K21AR1	300280626	18400	118000	10600	< 67.9	< 58.4	1950	4280	2750	22400	160	894
SB7aVS-18	2	1	8	K04AR2	300280627	17700	114000	10400	< 67.9	< 58.5	2040	4290	101	21700	160	906
SB7aVS-23	2	1	9	K19AR1	300280628	18900	119000	11000	< 67.5	< 58.1	2020	4430	3060	23100	175	776
SB7ref	2	1	10	SB7REFAR22	300280629	17700	120000	10400	< 66.7	< 57.5	1920	< 186	2910	< 6830	176	411
Ustd	2	1	11	USTDAR22	300280630	21000	85600	8370	< 66.5	< 57.3	1030	411	5260	20000	66.1	20.1
SB7aVS-23	2	1	12	K19AR2	300280631	19500	122000	11300	< 67.4	< 58	2350	4530	3140	23600	178	832
SB7aVS-02	2	1	13	K14AR2	300280632	18100	116000	8000	< 66.1	< 57	2450	1880	72	18200	118	340
SB7aVS-06	2	1	14	K02AR2	300280633	14800	118000	8180	< 67.2	< 57.9	1790	6100	3830	22600	192	1040
SB7aVS-22	2	1	15	K17AR2	300280634	19300	118000	11400	< 67.1	67.3	2340	4510	101	22600	153	905
SB7aVS-18	2	1	16	K04AR1	300280675	17900	116000	10500	< 65.7	56.8	2060	4380	104	22000	167	1040
SB7aVS-02	2	1	17	K14AR1	300280676	18400	118000	8060	< 66.7	< 57.4	2390	1900	73.5	18200	118	388
SB7aVS-16	2	1	18	K15AR2	300280677	16400	109000	9590	< 66.6	< 57.3	2050	4020	80.6	20200	152	846
blank	2	1	19	BLANKAR2	300280678	< 8.8	503	< 74.4	< 67.9	< 58.5	< 600	< 189	< 8.8	< 695	5.6	< 7.12
SB7ref	2	1	20	SB7REFAR23	300280679	17600	119000	10400	< 66.7	< 57.5	2100	< 186	2930	< 6830	176	376
Ustd	2	1	21	USTDAR23	300280680	20800	84700	8300	< 66.5	< 57.3	941	415	5250	19700	66.7	20.3
SB7ref	2	2	1	SB7REFAR21	300280620	17900	121000	10300	< 66.7	< 57.5	2380	< 186	3000	< 6830	142	396
Ustd	2	2	2	USTDAR21	300280621	20900	84600	8210	< 66.5	< 57.3	1170	426	5410	19200	28.8	18.6
SB7aVS-23	2	2	3	K19AR1	300280628	19200	119000	10900	< 67.5	< 58.1	2500	4510	3180	22600	140	813
SB7aVS-23	2	2	4	K19AR2	300280631	19700	122000	11300	< 67.4	< 58	2370	4610	3230	23100	140	862
SB7aVS-06	2	2	5	K02AR1	300280625	15000	118000	8100	< 67.5	< 58.2	1550	6090	3890	22000	154	677
SB7aVS-22	2	2	6	K17AR2	300280634	19700	119000	11500	< 67.1	61.1	2570	4600	106	22100	117	947
SB7aVS-02	2	2	7	K14AR2	300280632	18500	117000	8000	< 66.1	< 57	2390	1920	75.4	17600	80	360
SB7aVS-21	2	2	8	K21AR2	300280623	18900	120000	10700	< 66.5	< 57.2	2370	4380	2870	22100	126	950
SB7aVS-06	2	2	9	K02AR2	300280633	15200	119000	8240	< 67.2	< 57.9	1570	6210	3960	22300	157	1090
SB7ref	2	2	10	SB7REFAR22	300280629	18100	121000	10400	< 66.7	< 57.5	2000	< 186	3010	< 6830	140	421
Ustd	2	2	11	USTDAR22	300280630	21400	85700	8400	< 66.5	< 57.3	1110	431	5440	19500	27.8	22
SB7aVS-18	2	2	12	K04AR2	300280627	18100	115000	10400	< 67.9	< 58.5	2110	4370	106	21100	123	950
SB7aVS-16	2	2	13	K15AR1	300280622	17300	113000	9910	< 67.7	< 58.3	2000	4190	85.1	20700	118	667
SB7aVS-16	2	2	14	K15AR2	300280677	16800	110000	9600	< 66.6	< 57.3	1880	4090	84.7	19800	115	884
SB7aVS-02	2	2	15	K14AR1	300280676	18700	118000	8060	< 66.7	< 57.4	2310	1930	75.8	17800	79.8	403
SB7aVS-22	2	2	16	K17AR1	300280624	20500	123000	11800	< 66.7	76.3	2490	4750	109	22900	121	928
SB7aVS-18	2	2	17	K04AR1	300280675	18300	116000	10500	< 65.7	< 56.5	2200	4460	110	21700	130	1090
SB7aVS-21	2	2	18	K21AR1	300280626	18800	119000	10700	< 67.9	< 58.4	2200	4360	2860	21900	123	937
blank	2	2	19	BLANKAR2	300280678	< 88	< 5560	< 744	< 67.9	< 58.5	< 600	< 189	< 8.8	< 6950	< 1.76	< 7.12
Ustd	2	2	20	USTDAR23	300280680	21400	85700	8350	< 66.5	< 57.3	899	427	5410	19600	27.4	19.6
SB7ref	2	2	21	SB7REFAR23	300280679	18100	121000	10400	< 66.7	< 57.5	2210	< 186	3020	< 6830	139	386
SB7ref	3	1	1	SB7REFAR31	300280639	16700	112000	9690	< 65.9	< 56.8	2060	< 183	2740	< 6740	148	635
Ustd	3	1	2	USTDAR31	300280640	23200	93400	9200	< 66.9	< 57.6	1390	448	5680	21900	54.1	16.1
SB7aVS-05	3	1	3	K26AR2	300280641	18600	106000	11400	< 67.3	67.6	2020	6200	63	22700	178	1040
SB7a-702-02	3	1	4	K10AR1	300280642	16200	98500	9360	< 66.4	< 57.1	1780	3800	2740	19300	129	797
SB7aVS-05	3	1	5	K26AR1	300280643	18600	106000	11500	< 65.5	< 56.4	1840	6200	62.6	22800	179	928
SB7aVS-11	3	1	6	K23AR2	300280644	17700	113000	7800	< 66	< 56.9	2050	5910	55.8	21100	105	554
SB7a-702-01	3	1	7	K03AR1	300280645	15800	99600	9080	< 65.7	< 56.6	2080	3660	2680	19300	130	720
SB7a-702-02	3	1	8	K10AR2	300280646	16100	99000	9300	< 66.2	< 57	2010	3790	2730	19500	129	755
SB7aVS-11	3	1	9	K23AR1	300280647	18500	118000	8070	< 67.5	< 58.2	2160	6150	57.3	22100	113	621
SB7ref	3	1	10	SB7REFAR32	300280648	16400	111000	9520	< 65.9	< 56.8	2100	< 183	2710	< 6740	146	601

Table A2. Measured Elemental Concentrations (µg/g)) for the Study Glasses Prepared Using Aqua Regia (part 2)

Glass ID	Block	Sub-Blk	Sequence	Lab ID	LIMS	Mn (ug/g)	Na (ug/g)	Ni (ug/g)	P (ug/g)	Pb (ug/g)	S (ug/g)	Th (ug/g)	Ti (ug/g)	U (ug/g)	Zn (ug/g)	Zr (ug/g)
Ustd	3	1	11	USTDAR32	300280649	22700	92300	8960	< 66.9	< 57.6	1340	440	5570	21600	52.9	15.7
SB7aVS-07	3	1	12	K13AR1	300280650	17400	107000	7640	< 66	57.5	1600	1840	54.6	17500	172	952
SB7a-702-01	3	1	13	K03AR2	300280651	16000	101000	9150	< 67.2	< 57.9	2030	3720	2700	19600	133	805
SB7aVS-07	3	1	14	K13AR2	300280652	18200	111000	7930	< 67.1	70.5	2110	1910	56.5	18200	179	1040
SB7aVS-10	3	1	15	K08AR2	300280653	14900	105000	11200	< 66.9	< 57.6	1640	2010	3780	22400	130	326
SB7aVS-20	3	1	16	K27AR1	300280681	17500	110000	10200	< 66.4	< 57.2	2180	4280	84.4	21400	141	832
SB7aVS-10	3	1	17	K08AR1	300280682	14400	102000	10800	< 66.5	< 57.3	1770	1940	3650	21600	121	298
SB7aVS-20	3	1	18	K27AR2	300280683	18400	115000	10800	< 66.6	< 57.4	2450	4490	89.3	22500	151	880
blank	3	1	19	BLANKAR3	300280684	< 88	< 5560	< 744	< 67.9	< 58.5	< 600	< 189	< 8.8	< 6950	< 1.76	< 7.12
SB7ref	3	1	20	SB7REFAR33	300280685	16500	112000	9620	< 65.9	< 56.8	2190	< 183	2760	< 6740	148	582
Ustd	3	1	21	USTDAR33	300280686	22800	93000	9040	< 66.9	< 57.6	1380	451	5730	21800	53.7	15.6
SB7ref	3	2	1	SB7REFAR31	300280639	16700	113000	9760	< 65.9	< 56.8	1720	< 183	2830	< 6740	163	643
Ustd	3	2	2	USTDAR31	300280640	23300	94400	9190	< 66.9	< 57.6	< 591	455	5870	22000	64.9	15
SB7aVS-07	3	2	3	K13AR2	300280652	18600	113000	8110	< 67.1	70.9	2010	1920	59.2	18500	197	1070
SB7a-702-01	3	2	4	K03AR2	300280651	16300	103000	9410	< 67.2	< 57.9	1430	3770	2800	19900	148	830
SB7a-702-02	3	2	5	K10AR1	300280642	16400	99600	9440	< 66.4	< 57.1	1820	3840	2840	20000	143	828
SB7aVS-11	3	2	6	K23AR1	300280647	18900	119000	8230	< 67.5	< 58.2	2050	6230	60.5	22500	127	650
SB7aVS-11	3	2	7	K23AR2	300280644	18100	114000	7850	< 66	< 56.9	2140	5980	58.9	21800	119	569
SB7a-702-01	3	2	8	K03AR1	300280645	16100	100000	9170	< 65.7	< 56.6	1630	3690	2790	19500	146	745
SB7aVS-05	3	2	9	K26AR2	300280641	18800	107000	11600	< 67.3	64.4	1820	6280	65.1	23200	194	1060
SB7ref	3	2	10	SB7REFAR32	300280648	16600	112000	9620	< 65.9	< 56.8	1900	< 183	2810	< 6740	160	616
Ustd	3	2	11	USTDAR32	300280649	23100	93300	9050	< 66.9	< 57.6	< 591	452	5800	22300	63.4	16
SB7aVS-05	3	2	12	K26AR1	300280643	18900	107000	11600	< 65.5	67.6	1740	6300	65.4	23400	195	947
SB7aVS-07	3	2	13	K13AR1	300280650	17800	108000	7800	< 66	66.6	1790	1860	57.6	17700	187	989
SB7aVS-20	3	2	14	K27AR2	300280683	19000	116000	11000	< 66.6	68.9	2170	4580	93.6	23100	166	920
SB7aVS-10	3	2	15	K08AR1	300280682	14800	102000	11100	< 66.5	< 57.3	1260	1970	3780	22200	133	299
SB7aVS-20	3	2	16	K27AR1	300280681	18000	110000	10400	< 66.4	66	2040	4340	88.9	22000	155	871
SB7a-702-02	3	2	17	K10AR2	300280646	16400	99500	9450	< 66.2	< 57	1760	3850	2840	20000	142	785
SB7aVS-10	3	2	18	K08AR2	300280653	15300	107000	11500	< 66.9	< 57.6	1310	2040	3940	22900	143	331
blank	3	2	19	BLANKAR3	300280684	< 88	< 5560	< 744	< 67.9	< 58.5	< 600	< 189	< 8.8	< 6950	< 1.76	< 7.12
SB7ref	3	2	20	SB7REFAR33	300280685	17000	113000	9850	< 65.9	< 56.8	1610	< 183	2860	< 6740	162	596
Ustd	3	2	21	USTDAR33	300280686	23500	93700	9270	< 66.9	< 57.6	< 591	463	5950	22300	64.7	15
SB7ref	4	1	1	SB7REFAR41	300280654	17700	120000	10400	< 67.9	< 58.5	2120	< 189	2940	< 6950	176	643
Ustd	4	1	2	USTDAR41	300280655	22400	91500	8970	< 67.8	< 58.4	695	418	5560	21700	70.3	21
SB7aVS-13	4	1	3	K16AR1	300280656	17500	100000	10700	< 66.8	< 57.5	1940	5270	3650	17300	211	693
SB7aVS-14	4	1	4	K05AR1	300280657	15700	108000	9400	< 66.1	< 56.9	2030	3860	91.1	19900	136	678
SB7a-702-03	4	1	5	K20AR1	300280658	16900	102000	9800	< 67.5	< 58.2	2140	3890	2390	20800	168	820
SB7aVS-08	4	1	6	K28AR2	300280659	14300	101000	7840	< 66.1	< 57	2080	1880	3700	20700	172	883
SB7aVS-03	4	1	7	K25AR2	300280660	14500	116000	11200	< 66.3	61.1	1920	1880	65.2	17100	217	844
SB7aVS-19	4	1	8	K12AR2	300280661	17400	114000	9990	< 67.6	< 58.2	2280	3990	2890	21300	152	619
SB7aVS-14	4	1	9	K05AR2	300280662	15600	107000	9350	< 67.9	< 58.4	1870	3840	91.2	19500	134	639
SB7ref	4	1	10	SB7REFAR42	300280663	17700	120000	10400	< 67.9	< 58.5	2320	< 189	2950	< 6950	174	610
Ustd	4	1	11	USTDAR42	300280664	22100	89900	8870	< 67.8	< 58.4	831	412	5510	21200	67.8	22.6
SB7aVS-19	4	1	12	K12AR1	300280665	16600	109000	9580	< 66.5	< 57.3	2170	3800	2780	20300	146	853
SB7aVS-08	4	1	13	K28AR1	300280666	14300	101000	7860	< 66.5	< 57.3	2170	1920	3760	21000	175	887
SB7aVS-09	4	1	14	K11AR1	300280667	14700	103000	11100	< 66	66.5	2330	1940	55.4	22200	188	948
SB7aVS-13	4	1	15	K16AR2	300280668	18200	105000	11200	< 66.8	< 57.5	1940	5570	3850	18100	218	1250

Table A2. Measured Elemental Concentrations (µg/g)) for the Study Glasses Prepared Using Aqua Regia (part 2)

Glass ID	Block	Sub-Blk	Sequence	Lab ID	LIMS	Mn (ug/g)	Na (ug/g)	Ni (ug/g)	P (ug/g)	Pb (ug/g)	S (ug/g)	Th (ug/g)	Ti (ug/g)	U (ug/g)	Zn (ug/g)	Zr (ug/g)
SB7a-702-03	4	1	16	K20AR2	300280687	17700	106000	10200	< 65.4	< 56.3	2090	4070	2530	21800	155	948
SB7aVS-03	4	1	17	K25AR1	300280688	14500	115000	11200	< 66.2	61.5	1850	1870	64.1	17200	216	528
SB7aVS-09	4	1	18	K11AR2	300280689	14800	104000	11100	< 67	59	2440	1950	56.7	22200	188	1090
blank	4	1	19	BLANKAR4	300280690	< 88	< 5560	< 744	< 67.9	< 58.5	< 600	< 189	< 8.8	< 6950	< 1.76	< 7.12
SB7ref	4	1	20	SB7REFAR43	300280691	17600	119000	10400	< 67.9	< 58.5	2220	< 189	2940	< 6950	173	632
Ustd	4	1	21	USTDAR43	300280692	22300	90400	8970	< 67.8	< 58.4	858	420	5610	21400	69	22.7
SB7ref	4	2	1	SB7REFAR41	300280654	18000	121000	10400	< 67.9	< 58.5	2010	< 189	3010	< 6950	183	661
Ustd	4	2	2	USTDAR41	300280655	22800	91700	9030	< 67.8	< 58.4	< 599	429	5740	21700	73.1	21.9
SB7aVS-19	4	2	3	K12AR1	300280665	16800	110000	9550	< 66.5	< 57.3	1950	3860	2880	20200	155	880
SB7aVS-09	4	2	4	K11AR1	300280667	15000	104000	11200	< 66	70.3	2200	1970	57.6	22300	199	985
SB7a-702-03	4	2	5	K20AR2	300280687	18000	107000	10200	< 65.4	< 56.3	2230	4140	2620	21700	165	992
SB7aVS-03	4	2	6	K25AR2	300280660	14800	116000	11200	< 66.3	81.4	1870	1900	68.3	17300	229	878
SB7aVS-08	4	2	7	K28AR1	300280666	14500	101000	7830	< 66.5	< 57.3	1870	1940	3870	20900	185	918
SB7aVS-13	4	2	8	K16AR1	300280656	17700	99800	10700	< 66.8	< 57.5	1760	5360	3780	17300	221	724
SB7aVS-08	4	2	9	K28AR2	300280659	14400	101000	7810	< 66.1	< 57	1890	1910	3830	20700	181	919
SB7ref	4	2	10	SB7REFAR42	300280663	17900	120000	10300	< 67.9	< 58.5	1990	< 189	3030	< 6950	184	616
Ustd	4	2	11	USTDAR42	300280664	22500	90100	8850	< 67.8	< 58.4	1070	422	5680	21400	73	23.8
SB7aVS-14	4	2	12	K05AR2	300280662	15900	107000	9350	< 67.9	< 58.4	1710	3900	95.1	19500	142	655
SB7aVS-14	4	2	13	K05AR1	300280657	16000	107000	9460	< 66.1	< 56.9	1830	3900	95	19700	143	704
SB7aVS-09	4	2	14	K11AR2	300280689	15000	104000	11300	< 67	63.2	2380	1980	59.7	22100	199	1130
SB7a-702-03	4	2	15	K20AR1	300280658	17200	102000	9780	< 67.5	< 58.2	1940	3950	2490	20600	176	856
SB7aVS-03	4	2	16	K25AR1	300280688	14700	115000	11200	< 66.2	71.6	1750	1890	67.3	17100	228	551
SB7aVS-19	4	2	17	K12AR2	300280661	17700	115000	10000	< 67.6	< 58.2	2110	4030	2980	21000	159	641
SB7aVS-13	4	2	18	K16AR2	300280668	18600	106000	11200	< 66.8	< 57.5	2040	5630	3970	18100	230	1300
blank	4	2	19	BLANKAR4	300280690	< 88	< 5560	< 744	< 67.9	< 58.5	< 600	< 189	< 8.8	< 6950	1.84	< 7.12
SB7ref	4	2	20	SB7REFAR43	300280691	18000	120000	10400	< 67.9	< 58.5	2100	< 189	3040	< 6950	183	657
Ustd	4	2	21	USTDAR43	300280692	22800	91200	8970	< 67.8	< 58.4	658	429	5800	21700	73.1	23.9

Table A3. Measured Elemental Concentrations (µg/g) for the Study Glasses Prepared Using Peroxide Fusion (part 1)

Glass ID	Block	Sub-Blk	Sequence	Lab ID	LIMS	Al (ug/g)	B (ug/g)	Ba (ug/g)	Ca (ug/g)	Ce (ug/g)	Cr (ug/g)	Cu (ug/g)	Fe (ug/g)	K (ug/g)	La (ug/g)	Li (ug/g)
SB7ref	1	1	1	SB7REFPF11	300280964	49500	15800	225	5220	< 521	851	255	59300	3640	111	23700
Ustd	1	1	2	USTDPF11	300280965	21800	27600	76.4	11400	< 554	1690	< 119	92100	27300	< 83.9	13800
SB7aVS-15	1	1	3	K07PF1	300280966	45400	15600	185	4930	< 516	666	243	51600	4000	110	23700
SB7a-702-05	1	1	4	K06PF2	300280967	56700	14100	251	5780	< 524	811	286	65500	4200	125	26400
SB7aVS-01	1	1	5	K01PF2	300280968	44400	15200	113	3640	< 514	436	135	49900	3700	< 77.9	23100
SB7aVS-17	1	1	6	K24PF2	300280969	48500	15400	202	4740	< 524	777	229	54700	4660	100	23300
SB7a-702-04	1	1	7	K18PF1	300280970	53000	14400	214	4780	< 522	803	279	62300	4770	109	27000
SB7aVS-01	1	1	8	K01PF1	300280971	44300	15300	131	3600	< 524	437	144	50400	4250	< 79.4	23200
SB7a-702-04	1	1	9	K18PF2	300280972	53400	14500	243	5570	< 522	820	272	62900	4830	120	27100
SB7ref	1	1	10	SB7REFPF12	300280973	49600	15900	226	5220	< 521	850	261	59300	4770	107	23900
Ustd	1	1	11	USTDPF12	300280974	21800	27700	75.5	11500	< 554	1700	< 119	92300	28700	< 83.9	14000
SB7a-702-05	1	1	12	K06PF1	300280975	55800	14000	221	5460	< 518	799	291	65000	5310	117	26200
SB7aVS-12	1	1	13	K22PF2	300280976	53200	15500	160	3500	< 516	524	169	60400	3950	110	23500
SB7aVS-04	1	1	14	K09PF2	300280977	44200	15300	161	6680	< 509	494	159	53000	4250	100	23200
SB7aVS-04	1	1	15	K09PF1	300280978	43900	15300	131	6290	< 522	483	141	52900	4470	< 79.1	23200
SB7aVS-17	1	1	16	K24PF1	300280693	48300	15300	200	4600	< 509	773	223	55100	4630	88.7	23300
SB7aVS-15	1	1	17	K07PF2	300280694	45500	15800	203	4540	< 516	665	255	52600	4890	101	24000
SB7aVS-12	1	1	18	K22PF1	300280695	52700	15300	128	4000	< 525	525	173	60300	3980	119	23300
blank	1	1	19	BLANKPF1	300280696	1140	< 886	91.2	1940	< 528	< 111	< 114	176	2580	< 80	< 605
SB7ref	1	1	20	SB7REFPF13	300280697	49500	15700	226	5230	< 521	843	255	59700	5310	108	23800
Ustd	1	1	21	USTDPF13	300280698	21500	27500	74.7	11500	< 554	1690	< 119	92200	28500	< 83.9	13900
SB7ref	1	2	1	SB7REFPF11	300280964	49700	15800	221	5250	< 521	860	249	60400	3710	86	23900
Ustd	1	2	2	USTDPF11	300280965	21900	27600	73	11600	< 554	1720	< 119	93800	27200	< 83.9	14200
SB7aVS-17	1	2	3	K24PF1	300280693	48400	15300	197	4610	< 509	788	222	55800	3430	87.9	23700
SB7aVS-01	1	2	4	K01PF2	300280968	44400	15200	111	3670	< 514	431	138	51200	3370	< 77.9	23600
SB7a-702-05	1	2	5	K06PF1	300280975	55800	14000	220	5510	< 518	803	284	66300	5260	91	26900
SB7aVS-12	1	2	6	K22PF2	300280976	53300	15300	156	3530	< 516	535	164	61400	3460	91.5	24100
SB7aVS-15	1	2	7	K07PF2	300280694	45600	15800	198	4560	< 516	672	240	53200	4270	82.2	24600
SB7aVS-12	1	2	8	K22PF1	300280695	52600	15200	125	4020	< 525	521	167	61100	3730	93.2	23800
SB7aVS-17	1	2	9	K24PF2	300280969	48400	15200	196	4780	< 524	773	230	55900	4730	91.3	23900
SB7ref	1	2	10	SB7REFPF12	300280973	49200	15700	219	5250	< 521	849	258	60300	5290	104	24400
Ustd	1	2	11	USTDPF12	300280974	21800	27600	72.2	11600	< 554	1720	< 119	94200	28100	< 83.9	14400
SB7aVS-04	1	2	12	K09PF2	300280977	44200	15200	158	6720	< 509	502	155	53900	4690	78.7	23800
SB7a-702-04	1	2	13	K18PF2	300280972	53400	14200	239	5610	< 522	816	264	64000	5010	109	27900
SB7a-702-05	1	2	14	K06PF2	300280967	56400	14000	246	5830	< 524	827	282	67000	5010	102	27100
SB7aVS-04	1	2	15	K09PF1	300280978	43900	15200	128	6340	< 522	498	159	54000	4310	< 79.1	23800
SB7aVS-15	1	2	16	K07PF1	300280966	45300	15600	181	5000	< 516	676	248	52900	4610	88.4	24600
SB7a-702-04	1	2	17	K18PF1	300280970	53100	14200	210	4860	< 522	825	263	63700	4920	96.5	27800
SB7aVS-01	1	2	18	K01PF1	300280971	44200	15100	127	3650	< 524	435	129	51300	3990	< 79.4	23800
blank	1	2	19	BLANKPF1	300280696	1130	< 886	88.8	1970	< 528	< 111	< 114	162	2840	< 80	< 605
SB7ref	1	2	20	SB7REFPF13	300280697	49500	15700	220	5270	< 521	854	263	60300	5230	87.6	24400
Ustd	1	2	21	USTDPF13	300280698	21600	27300	72.2	11500	< 554	1700	< 119	93100	27800	< 83.9	14300
SB7ref	2	1	1	SB7REFPF21	300281280	49000	15800	206	5080	< 510	844	276	59600	3590	98.9	23600
Ustd	2	1	2	USTDPF21	300281281	21700	27500	71.3	11100	< 511	1700	< 110	92900	26400	< 77.5	13800
SB7aVS-22	2	1	3	K17PF1	300281282	57800	14100	231	5870	< 524	855	258	65600	4210	132	20900
SB7aVS-21	2	1	4	K21PF2	300281283	53200	14500	238	5360	< 509	808	275	61700	4090	112	21700
SB7aVS-23	2	1	5	K19PF2	300281284	55400	13700	261	5140	< 511	892	264	61700	4020	104	20700
SB7aVS-18	2	1	6	K04PF2	300281285	52400	14900	183	5310	< 509	753	255	61200	4560	106	22500
SB7aVS-06	2	1	7	K02PF1	300281286	44900	15500	249	6900	< 523	980	348	48800	5270	143	23400

Table A3. Measured Elemental Concentrations (µg/g) for the Study Glasses Prepared Using Peroxide Fusion (part 1)

Glass ID	Block	Sub-Blk	Sequence	Lab ID	LIMS	Al (ug/g)	B (ug/g)	Ba (ug/g)	Ca (ug/g)	Ce (ug/g)	Cr (ug/g)	Cu (ug/g)	Fe (ug/g)	K (ug/g)	La (ug/g)	Li (ug/g)
SB7aVS-18	2	1	8	K04PF1	300281287	52300	14800	202	4580	< 523	734	258	60900	4110	116	22300
SB7aVS-02	2	1	9	K14PF1	300281288	43800	15300	160	6490	< 512	400	144	63400	3460	< 77.5	23000
SB7ref	2	1	10	SB7REFPF22	300281289	49100	15700	206	5060	< 510	839	258	59500	4650	101	23600
Ustd	2	1	11	USTDPF22	300281290	21600	27200	71.3	11100	< 511	1700	< 110	92100	26900	< 77.5	13800
SB7aVS-06	2	1	12	K02PF2	300281291	44400	15300	227	6240	< 508	982	344	48400	4650	144	23200
SB7aVS-23	2	1	13	K19PF1	300281292	55900	13800	255	5110	< 514	888	281	62300	4120	106	20900
SB7aVS-21	2	1	14	K21PF1	300281293	53200	14400	239	5340	< 516	786	273	62000	4680	102	21700
SB7aVS-22	2	1	15	K17PF2	300281294	58200	14000	259	5480	< 522	851	272	65600	4880	115	21000
SB7aVS-16	2	1	16	K15PF1	300280946	50100	15300	183	5340	< 525	689	266	56100	4370	108	23100
SB7aVS-16	2	1	17	K15PF2	300280947	50100	15300	211	4590	< 508	697	259	56200	4190	91.6	23100
SB7aVS-02	2	1	18	K14PF2	300280948	43700	15300	159	5500	< 516	405	135	63200	3250	< 78.2	22900
blank	2	1	19	BLANKPF2	300280949	1580	< 886	114	1860	< 528	< 111	< 114	195	2320	< 80	< 605
SB7ref	2	1	20	SB7REFPF23	300280950	49100	15700	206	5050	< 510	836	267	59700	5020	111	23500
Ustd	2	1	21	USTDPF23	300280951	21500	27200	71.3	11100	< 511	1690	< 110	92300	27100	< 77.5	13800
SB7ref	2	2	1	SB7REFPF21	300281280	49200	15800	206	5080	< 510	850	260	60000	3990	104	23600
Ustd	2	2	2	USTDPF21	300281281	21700	27600	71.3	11200	< 511	1720	< 110	93700	26200	< 77.5	13700
SB7aVS-02	2	2	3	K14PF1	300281288	44000	15400	160	6510	< 512	416	147	63800	3710	< 77.5	22900
SB7aVS-23	2	2	4	K19PF2	300281284	55600	13700	259	5160	< 511	902	284	62300	4120	108	20700
SB7aVS-18	2	2	5	K04PF2	300281285	52800	14900	184	5330	< 509	745	265	61700	4240	138	22500
SB7aVS-16	2	2	6	K15PF2	300280947	50200	15400	209	4630	< 508	685	255	56500	4270	87	23200
SB7aVS-06	2	2	7	K02PF1	300281286	45100	15500	250	6940	< 523	1010	359	49200	5570	156	23500
SB7aVS-06	2	2	8	K02PF2	300281291	44600	15400	225	6260	< 508	1000	345	49100	5330	165	23200
SB7aVS-21	2	2	9	K21PF2	300281283	53300	14400	237	5370	< 509	809	277	62300	4630	117	21600
SB7ref	2	2	10	SB7REFPF22	300281289	49200	15800	206	5090	< 510	850	258	60300	4770	98.9	23500
Ustd	2	2	11	USTDPF22	300281290	21800	27400	72	11200	< 511	1710	< 110	93700	26600	< 77.5	13800
SB7aVS-23	2	2	12	K19PF1	300281292	56100	13900	255	5130	< 514	904	293	63300	4490	109	20800
SB7aVS-22	2	2	13	K17PF2	300281294	58600	14100	259	5500	< 522	853	263	66500	5030	115	21000
SB7aVS-02	2	2	14	K14PF2	300280948	43900	15300	157	5520	< 516	412	138	64100	3840	< 78.2	22800
SB7aVS-21	2	2	15	K21PF1	300281293	53500	14400	240	5370	< 516	799	275	62700	4720	107	21600
SB7aVS-22	2	2	16	K17PF1	300281282	58100	14000	232	5880	< 524	840	269	65900	5070	125	20900
SB7aVS-16	2	2	17	K15PF1	300280946	50300	15300	183	5360	< 525	705	257	56600	5060	94.6	23000
SB7aVS-18	2	2	18	K04PF1	300281287	52600	14800	204	4580	< 523	761	259	61600	4590	97.4	22100
blank	2	2	19	BLANKPF2	300280949	1580	< 886	114	1870	< 528	< 111	< 114	208	2760	< 80	< 605
SB7ref	2	2	20	SB7REFPF23	300280950	49400	15700	207	5080	< 510	854	260	60300	5000	108	23500
Ustd	2	2	21	USTDPF23	300280951	21600	27200	72	11100	< 511	1710	< 110	93200	27100	< 77.5	13700
SB7ref	3	1	1	SB7REFPF31	300281295	47900	15200	196	5370	< 1040	808	256	61600	3250	< 158	23000
Ustd	3	1	2	USTDPF31	300281296	21000	26700	42.7	10600	< 1040	1660	< 224	96000	24300	< 158	12700
SB7aVS-20	3	1	3	K27PF2	300281297	55700	14600	207	4890	< 1040	837	262	69200	< 3160	< 158	20100
SB7aVS-10	3	1	4	K08PF2	300281298	53400	15500	122	6050	< 1060	376	< 227	61600	< 3200	< 160	21300
SB7a-702-01	3	1	5	K03PF2	300281299	45000	16300	173	4170	< 1030	622	< 221	58400	< 3120	< 156	27600
SB7aVS-11	3	1	6	K23PF2	300281300	51300	15400	142	3640	< 1040	418	< 224	55700	< 3160	< 158	21100
SB7aVS-10	3	1	7	K08PF1	300281301	53400	15500	125	6880	< 1050	395	< 225	62100	< 3180	< 159	21500
SB7a-702-02	3	1	8	K10PF1	300281302	47800	15400	176	4730	< 1050	716	< 225	60500	< 3170	< 158	26800
SB7aVS-20	3	1	9	K27PF1	300281303	55000	14300	203	5570	< 1040	835	261	68700	< 3150	< 157	20200
SB7ref	3	1	10	SB7REFPF32	300281304	48200	15700	191	5240	< 1040	868	240	64600	< 3160	< 158	22100
Ustd	3	1	11	USTDPF32	300281305	21500	27500	41.1	10800	< 1040	1710	< 224	99200	24200	< 158	12900
SB7a-702-02	3	1	12	K10PF2	300281306	47800	15400	176	5280	< 1040	712	239	60400	< 3170	< 158	27300
SB7aVS-07	3	1	13	K13PF2	300281307	52500	15200	215	6390	< 1020	1000	327	54300	< 3100	< 155	21600
SB7aVS-05	3	1	14	K26PF1	300281308	43200	15300	222	5530	< 1030	1030	320	68100	< 3130	< 156	21400

Table A3. Measured Elemental Concentrations (µg/g) for the Study Glasses Prepared Using Peroxide Fusion (part 1)

Glass ID	Block	Sub-Blk	Sequence	Lab ID	LIMS	Al (ug/g)	B (ug/g)	Ba (ug/g)	Ca (ug/g)	Ce (ug/g)	Cr (ug/g)	Cu (ug/g)	Fe (ug/g)	K (ug/g)	La (ug/g)	Li (ug/g)
SB7aVS-11	3	1	15	K23PF1	300281309	75700	21700	181	4990	< 1020	614	232	81500	< 3100	< 155	31100
SB7a-702-01	3	1	16	K03PF1	300280952	45000	16200	167	4900	< 1050	606	< 226	58200	< 3180	< 159	28200
SB7aVS-07	3	1	17	K13PF1	300280953	53300	15300	243	6130	< 1020	1040	333	54800	< 3100	< 155	21800
SB7aVS-05	3	1	18	K26PF2	300280954	43100	15400	210	6550	< 1020	992	323	68200	< 3090	< 154	21700
blank	3	1	19	BLANKPF3	300280955	< 1510	< 1770	32	1720	< 1060	< 222	< 227	< 91.2	< 3200	< 160	< 1210
SB7ref	3	1	20	SB7REFPF33	300280956	48000	15600	191	5230	< 1040	825	266	64300	< 3160	< 158	22200
Ustd	3	1	21	USTDPF33	300280957	21500	27400	42.7	10700	< 1040	1710	< 224	98700	24000	< 158	12900
SB7ref	3	2	1	SB7REFPF31	300281295	48900	15500	209	5460	< 1040	830	270	61400	< 3160	< 158	23500
Ustd	3	2	2	USTDPF31	300281296	21500	26800	45.8	11000	< 1040	1630	< 224	93000	23400	< 158	13400
SB7aVS-05	3	2	3	K26PF1	300281308	44100	15100	239	5750	< 1030	984	317	65700	< 3130	< 156	22700
SB7aVS-10	3	2	4	K08PF1	300281301	54300	15200	135	7130	< 1050	422	< 225	59100	< 3180	< 159	22900
SB7aVS-10	3	2	5	K08PF2	300281298	53700	15100	133	6280	< 1060	409	< 227	58400	< 3200	< 160	22700
SB7aVS-05	3	2	6	K26PF2	300280954	43800	15100	224	6790	< 1020	988	332	65100	< 3090	159	22900
SB7aVS-11	3	2	7	K23PF1	300281309	42700	12700	113	2960	< 1020	354	< 220	43700	< 3100	< 155	19300
SB7aVS-07	3	2	8	K13PF2	300281307	53100	14800	231	6610	< 1020	990	332	51600	< 3100	< 155	22900
SB7aVS-20	3	2	9	K27PF1	300281303	55400	14100	217	5780	< 1040	838	297	64900	< 3150	< 157	21500
SB7ref	3	2	10	SB7REFPF32	300281304	48600	15400	205	5420	< 1040	861	262	61200	< 3160	< 158	23500
Ustd	3	2	11	USTDPF32	300281305	21800	27100	45.8	11200	< 1040	1670	< 224	94400	23900	< 158	13700
SB7a-702-01	3	2	12	K03PF1	300280952	45600	16000	181	5080	< 1050	633	< 226	55300	< 3180	< 159	29900
SB7a-702-02	3	2	13	K10PF1	300281302	48000	15100	192	4910	< 1050	701	228	57000	< 3170	< 158	28800
SB7aVS-20	3	2	14	K27PF2	300281297	55900	14100	226	5080	< 1040	848	280	65400	< 3160	< 158	21500
SB7a-702-01	3	2	15	K03PF2	300281299	45500	15900	187	4370	< 1030	601	< 221	55300	< 3120	< 156	29800
SB7aVS-07	3	2	16	K13PF1	300280953	54500	15000	263	6390	< 1020	1000	347	52700	< 3100	< 155	23300
SB7aVS-11	3	2	17	K23PF2	300281300	52100	14800	153	3810	< 1040	465	< 224	52500	< 3160	< 158	22800
SB7a-702-02	3	2	18	K10PF2	300281306	48800	15000	192	5490	< 1040	711	253	57800	< 3170	< 158	29000
blank	3	2	19	BLANKPF3	300280955	< 1510	< 600	35.2	1800	< 1060	< 222	< 227	97.6	< 3200	< 160	< 1210
SB7ref	3	2	20	SB7REFPF33	300280956	49400	15200	209	5430	< 1040	858	247	61800	< 3160	< 158	23600
Ustd	3	2	21	USTDPF33	300280957	21900	26900	49	11200	< 1040	1670	< 224	94600	23800	< 158	13700
SB7ref	4	1	1	SB7REFPF41	300281310	48300	15300	231	5270	< 1010	790	240	60500	4180	< 153	23300
Ustd	4	1	2	USTDPF41	300281311	21700	27200	44.3	11400	< 1040	1640	< 224	94700	26200	< 158	13700
SB7aVS-03	4	1	3	K25PF2	300281312	45500	15500	229	3760	< 1040	968	318	65200	3660	< 158	23100
SB7aVS-13	4	1	4	K16PF2	300281313	53600	15200	239	4030	< 1040	1000	343	53000	4640	< 157	23300
SB7aVS-14	4	1	5	K05PF1	300281314	46900	15700	192	4940	< 1030	658	< 222	55700	3910	< 156	23900
SB7aVS-13	4	1	6	K16PF1	300281315	53900	15300	256	3410	< 1040	1010	316	53400	4280	< 158	23200
SB7aVS-14	4	1	7	K05PF2	300281316	46600	15500	205	4410	< 1030	652	< 222	55500	3700	< 156	23700
SB7a-702-03	4	1	8	K20PF2	300281317	51000	15100	187	5210	< 1040	658	< 225	60400	3180	< 158	28800
SB7aVS-09	4	1	9	K11PF2	300281318	52900	15300	219	6950	< 1020	1020	311	52200	4030	< 154	23100
SB7ref	4	1	10	SB7REFPF42	300281319	48900	15500	237	5300	< 1010	817	235	61100	4510	< 153	23600
Ustd	4	1	11	USTDPF42	300281320	21500	27000	44.3	11300	< 1040	1620	< 224	93300	25900	< 158	13700
SB7aVS-19	4	1	12	K12PF2	300281321	50700	14900	206	4840	< 1020	807	252	60600	< 3090	< 155	22800
SB7aVS-08	4	1	13	K28PF2	300281322	48000	15400	237	3750	< 1050	1090	290	66000	4160	< 159	23400
SB7aVS-03	4	1	14	K25PF1	300281323	46100	15800	234	3700	< 1040	994	293	65600	4570	< 158	23300
SB7aVS-19	4	1	15	K12PF1	300281324	50700	14800	213	5060	< 1040	831	257	60200	3860	< 157	22500
SB7aVS-08	4	1	16	K28PF1	300280958	47600	15300	222	3870	< 1050	1110	291	65500	3730	< 159	23200
SB7a-702-03	4	1	17	K20PF1	300280959	51000	14900	186	5760	< 1050	692	< 225	60000	3570	< 159	28500
SB7aVS-09	4	1	18	K11PF1	300280960	53800	15500	217	6390	< 1040	1010	317	53100	4150	< 157	23400
blank	4	1	19	BLANKPF4	300280961	< 1510	< 1770	52.8	1870	< 1060	< 222	< 227	110	< 3200	< 160	< 1210
SB7ref	4	1	20	SB7REFPF43	300280962	48500	15300	234	5330	< 1010	839	229	61000	4630	< 153	23500
Ustd	4	1	21	USTDPF43	300280963	21800	27400	47.4	11500	< 1040	1640	< 224	94900	26500	< 158	13900

Table A3. Measured Elemental Concentrations (µg/g) for the Study Glasses Prepared Using Peroxide Fusion (part 1)

Glass ID	Block	Sub-Blk	Sequence	Lab ID	LIMS	Al (ug/g)	B (ug/g)	Ba (ug/g)	Ca (ug/g)	Ce (ug/g)	Cr (ug/g)	Cu (ug/g)	Fe (ug/g)	K (ug/g)	La (ug/g)	Li (ug/g)
SB7ref	4	2	1	SB7REFPF41	300281310	47700	15300	228	5240	< 1010	799	280	60000	3630	< 153	23300
Ustd	4	2	2	USTDPF41	300281311	21600	27200	44.3	11400	< 1040	1630	< 224	94200	25200	< 158	13700
SB7aVS-14	4	2	3	K05PF1	300281314	46700	15500	189	4900	< 1030	666	227	55400	< 3130	< 156	23600
SB7aVS-03	4	2	4	K25PF2	300281312	45400	15500	222	3730	< 1040	939	351	65000	< 3160	< 158	22900
SB7aVS-09	4	2	5	K11PF2	300281318	52000	15100	214	6890	< 1020	956	350	51700	< 3090	< 154	22800
SB7aVS-13	4	2	6	K16PF2	300281313	52700	15100	234	4000	< 1040	930	347	52300	4040	< 157	23100
SB7aVS-08	4	2	7	K28PF2	300281322	47300	15200	230	3710	< 1050	1040	327	65200	3920	< 159	23200
SB7aVS-19	4	2	8	K12PF1	300281324	49800	14600	205	5010	< 1040	755	267	59500	< 3140	< 157	22300
SB7aVS-03	4	2	9	K25PF1	300281323	45200	15500	227	3660	< 1040	959	314	64800	< 3160	< 158	23100
SB7ref	4	2	10	SB7REFPF42	300281319	47900	15300	228	5250	< 1010	801	266	60100	3170	< 153	23300
Ustd	4	2	11	USTDPF42	300281320	21200	26800	42.7	11200	< 1040	1620	< 224	92300	24200	< 158	13600
SB7aVS-08	4	2	12	K28PF1	300280958	46800	15200	214	3840	< 1050	1040	303	64600	3680	< 159	23100
SB7aVS-09	4	2	13	K11PF1	300280960	52500	15400	207	6300	< 1040	1010	331	52100	< 3150	< 157	23100
SB7a-702-03	4	2	14	K20PF1	300280959	49900	14800	178	5700	< 1050	625	233	59000	< 3180	< 159	28300
SB7aVS-19	4	2	15	K12PF2	300281321	49500	14800	195	4770	< 1020	782	281	59500	< 3090	< 155	22500
SB7aVS-14	4	2	16	K05PF2	300281316	46100	15500	199	4380	< 1030	634	< 222	55000	< 3130	< 156	23700
SB7a-702-03	4	2	17	K20PF2	300281317	50200	14900	180	5160	< 1040	647	251	59600	< 3170	< 158	28500
SB7aVS-13	4	2	18	K16PF1	300281315	53100	15300	250	3380	< 1040	962	331	52900	3700	< 158	23100
blank	4	2	19	BLANKPF4	300280961	< 1510	< 600	49.6	1850	< 1060	< 222	< 227	110	< 3200	< 160	< 1210
SB7ref	4	2	20	SB7REFPF43	300280962	47700	15200	228	5270	< 1010	791	254	60000	3130	< 153	23200
Ustd	4	2	21	USTDPF43	300280963	21300	27100	44.3	11300	< 1040	1620	< 224	93200	25500	< 158	13700

Table A4. Measured Elemental Concentrations (µg/g) for the Study Glasses Prepared Using Peroxide Fusion (part 2)

Glass ID	Block	Sub-Blk	Sequence	Lab ID	LIMS	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)
SB7ref	1	1	1	SB7REFPF11	300280964	1560	15900	9480	< 670	< 577	< 5920	230000	< 1860	2940	< 6850	167
Ustd	1	1	2	USTDPF11	300280965	7220	21500	8570	< 713	< 613	< 6290	210000	< 1980	5970	21000	68.8
SB7aVS-15	1	1	3	K07PF1	300280966	1420	14600	8600	< 664	< 572	< 5870	241000	3080	2650	16000	127
SB7a-702-05	1	1	4	K06PF2	300280967	1760	18200	10500	< 674	< 580	< 5950	216000	4360	3340	23000	190
SB7aVS-01	1	1	5	K01PF2	300280968	2320	17000	10700	< 662	< 570	< 5850	236000	1870	3570	19900	123
SB7aVS-17	1	1	6	K24PF2	300280969	1460	15500	9130	< 674	< 580	< 5950	240000	3330	2730	18200	156
SB7a-702-04	1	1	7	K18PF1	300280970	1600	17100	9970	< 672	< 578	< 5930	220000	3390	3160	20200	162
SB7aVS-01	1	1	8	K01PF1	300280971	2300	17100	10700	< 674	< 581	< 5960	238000	1930	3580	19600	137
SB7a-702-04	1	1	9	K18PF2	300280972	1660	17300	10100	< 672	< 579	< 5940	222000	4120	3180	21500	169
SB7ref	1	1	10	SB7REFPF12	300280973	1550	16000	9430	< 670	< 577	< 5920	246000	< 1860	2930	< 6850	167
Ustd	1	1	11	USTDPF12	300280974	7230	21500	8600	< 713	< 613	< 6290	218000	< 1980	5970	20900	69.7
SB7a-702-05	1	1	12	K06PF1	300280975	1730	18100	10500	< 666	< 574	< 5880	216000	3920	3320	22200	187
SB7aVS-12	1	1	13	K22PF2	300280976	2100	14000	7720	< 664	< 572	< 5870	242000	5170	< 86.1	16400	136
SB7aVS-04	1	1	14	K09PF2	300280977	299	13800	10800	< 655	< 564	< 5780	239000	5850	3940	18000	120
SB7aVS-04	1	1	15	K09PF1	300280978	269	13800	10800	< 672	< 578	< 5930	237000	5310	3920	17300	115
SB7aVS-17	1	1	16	K24PF1	300280693	1450	15500	9180	< 655	< 564	< 5780	237000	3130	2730	17900	147
SB7aVS-15	1	1	17	K07PF2	300280694	1390	14600	8740	< 664	< 572	< 5870	243000	2880	2680	15000	136
SB7aVS-12	1	1	18	K22PF1	300280695	2190	14000	7760	< 676	< 582	< 5970	240000	5540	< 87.6	17400	128
blank	1	1	19	BLANKPF1	300280696	< 20	< 88	< 188	< 679	< 585	< 6000	< 763	< 1890	< 88	< 6950	< 17.6
SB7ref	1	1	20	SB7REFPF13	300280697	1550	15900	9540	< 670	< 577	< 5920	245000	< 1860	2930	< 6850	167
Ustd	1	1	21	USTDPF13	300280698	7200	21400	8690	< 713	< 613	< 6290	216000	< 1980	5930	20900	72.2
SB7ref	1	2	1	SB7REFPF11	300280964	1580	16000	9770	< 670	< 577	< 5920	235000	< 1860	2960	< 6850	180
Ustd	1	2	2	USTDPF11	300280965	7320	21500	8890	< 713	< 613	< 6290	214000	< 1980	6030	21200	76.4
SB7aVS-17	1	2	3	K24PF1	300280693	1460	15500	9380	< 655	< 564	< 5780	233000	3180	2750	17900	158
SB7aVS-01	1	2	4	K01PF2	300280968	2370	17000	11000	< 662	< 570	< 5850	236000	1910	3600	20200	143
SB7a-702-05	1	2	5	K06PF1	300280975	1760	18100	10900	< 666	< 574	< 5880	215000	3990	3360	22700	191
SB7aVS-12	1	2	6	K22PF2	300280976	2130	13900	7930	< 664	< 572	< 5870	240000	5180	81.8	16600	138
SB7aVS-15	1	2	7	K07PF2	300280694	1410	14500	8920	< 664	< 572	< 5870	242000	2940	2700	15600	142
SB7aVS-12	1	2	8	K22PF1	300280695	2210	13900	7940	< 676	< 582	< 5970	238000	5610	< 87.6	17800	127
SB7aVS-17	1	2	9	K24PF2	300280969	1480	15500	9440	< 674	< 580	< 5950	240000	3390	2770	18700	162
SB7ref	1	2	10	SB7REFPF12	300280973	1560	15700	9720	< 670	< 577	< 5920	245000	< 1860	2960	< 6850	174
Ustd	1	2	11	USTDPF12	300280974	7330	21400	8930	< 713	< 613	< 6290	218000	< 1980	6040	21800	78.1
SB7aVS-04	1	2	12	K09PF2	300280977	304	13700	11100	< 655	< 564	< 5780	239000	5910	3980	18500	132
SB7a-702-04	1	2	13	K18PF2	300280972	1680	17100	10400	< 672	< 579	< 5940	222000	4170	3210	22000	173
SB7a-702-05	1	2	14	K06PF2	300280967	1790	18100	10900	< 674	< 580	< 5950	218000	4390	3380	23300	209
SB7aVS-04	1	2	15	K09PF1	300280978	273	13700	11100	< 672	< 578	< 5930	237000	5410	3980	17700	123
SB7aVS-15	1	2	16	K07PF1	300280966	1450	14400	8980	< 664	< 572	< 5870	243000	3170	2690	16800	143
SB7a-702-04	1	2	17	K18PF1	300280970	1630	17000	10300	< 672	< 578	< 5930	222000	3440	3200	20200	179
SB7aVS-01	1	2	18	K01PF1	300280971	2320	16900	11100	< 674	< 581	< 5960	239000	1940	3630	19900	137
blank	1	2	19	BLANKPF1	300280696	< 20	< 88	< 188	< 679	< 585	< 6000	< 763	< 1890	< 88	< 6950	< 17.6
SB7ref	1	2	20	SB7REFPF13	300280697	1560	15700	9770	< 670	< 577	< 5920	244000	< 1860	2970	< 6850	178
Ustd	1	2	21	USTDPF13	300280698	7250	21100	8850	< 713	< 613	< 6290	217000	< 1980	5990	21300	83.9
SB7ref	2	1	1	SB7REFPF21	300281280	1500	15900	9580	< 656	< 565	< 5800	235000	< 1830	2930	< 6710	192
Ustd	2	1	2	USTDPF21	300281281	7200	21600	8740	< 658	< 566	< 5810	213000	< 1830	5900	20600	109
SB7aVS-22	2	1	3	K17PF1	300281282	1880	18500	11200	< 674	< 580	< 5950	218000	4310	112	22300	180
SB7aVS-21	2	1	4	K21PF2	300281283	1710	17300	10200	< 655	< 564	< 5780	226000	3800	2830	20900	187
SB7aVS-23	2	1	5	K19PF2	300281284	1730	18000	10700	< 657	< 566	6390	214000	3750	3230	21500	191
SB7aVS-18	2	1	6	K04PF2	300281285	1690	16600	9890	< 654	< 563	< 5780	232000	3910	109	20800	179

Table A4. Measured Elemental Concentrations (µg/g) for the Study Glasses Prepared Using Peroxide Fusion (part 2)

Glass ID	Block	Sub-Blk	Sequence	Lab ID	LIMS	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)
SB7aVS-06	2	1	7	K02PF1	300281286	2210	14000	7960	< 673	< 579	< 5950	240000	5850	3970	22000	220
SB7aVS-18	2	1	8	K04PF1	300281287	1620	16500	9830	< 672	< 579	6050	233000	3400	105	19200	186
SB7aVS-02	2	1	9	K14PF1	300281288	2500	17300	7740	< 658	< 567	< 5810	235000	2060	< 85.3	17600	133
SB7ref	2	1	10	SB7REFPF22	300281289	1500	15900	9490	< 656	< 565	< 5800	228000	< 1830	2910	< 6710	192
Ustd	2	1	11	USTDPF22	300281290	7150	21500	8610	< 658	< 566	< 5810	212000	< 1830	5850	20300	106
SB7aVS-06	2	1	12	K02PF2	300281291	2200	14000	7890	< 653	< 562	< 5770	237000	5520	3930	21600	210
SB7aVS-23	2	1	13	K19PF1	300281292	1740	18300	10700	< 661	< 569	< 5840	217000	3800	3260	21100	209
SB7aVS-21	2	1	14	K21PF1	300281293	1700	17400	10200	< 663	< 571	< 5860	227000	3840	2830	21000	182
SB7aVS-22	2	1	15	K17PF2	300281294	1820	18500	11100	< 671	< 578	< 5930	219000	3800	111	20700	183
SB7aVS-16	2	1	16	K15PF1	300280946	1620	15800	9400	< 675	< 581	< 5960	241000	3850	< 87.5	19900	184
SB7aVS-16	2	1	17	K15PF2	300280947	1540	15800	9360	< 653	< 563	< 5770	229000	3300	88.5	18300	178
SB7aVS-02	2	1	18	K14PF2	300280948	2420	17300	7680	< 664	< 572	< 5870	236000	< 1850	< 86	16000	129
blank	2	1	19	BLANKPF2	300280949	< 20	< 88	< 188	< 679	< 585	< 6000	832	< 1890	< 88	< 6950	19.2
SB7ref	2	1	20	SB7REFPF23	300280950	1500	16000	9460	< 656	< 565	< 5800	227000	< 1830	2910	< 6710	189
Ustd	2	1	21	USTDPF23	300280951	7150	21600	8560	< 658	< 566	< 5810	213000	< 1830	5850	20200	93
SB7ref	2	2	1	SB7REFPF21	300281280	1500	15900	9610	< 656	< 565	< 5800	222000	< 1830	2920	< 6710	193
Ustd	2	2	2	USTDPF21	300281281	7230	21600	8850	< 658	< 566	< 5810	209000	< 1830	5900	20900	102
SB7aVS-02	2	2	3	K14PF1	300281288	2520	17300	7870	< 658	< 567	< 5810	234000	1990	< 85.3	18000	136
SB7aVS-23	2	2	4	K19PF2	300281284	1750	18100	10900	< 657	< 566	< 5810	215000	3790	3240	21800	202
SB7aVS-18	2	2	5	K04PF2	300281285	1700	16600	10000	< 654	< 563	< 5780	233000	3900	107	21000	166
SB7aVS-16	2	2	6	K15PF2	300280947	1550	15700	9520	< 653	< 563	< 5770	227000	3300	89.8	18800	185
SB7aVS-06	2	2	7	K02PF1	300281286	2230	14100	8070	< 673	< 579	< 5950	240000	5850	3990	22600	208
SB7aVS-06	2	2	8	K02PF2	300281291	2220	14000	8120	< 653	< 562	< 5770	238000	5490	3960	22100	215
SB7aVS-21	2	2	9	K21PF2	300281283	1720	17400	10400	< 655	< 564	< 5780	227000	3810	2840	21900	183
SB7ref	2	2	10	SB7REFPF22	300281289	1510	15900	9690	< 656	< 565	< 5800	228000	< 1830	2930	< 6710	185
Ustd	2	2	11	USTDPF22	300281290	7230	21600	8860	< 658	< 566	< 5810	212000	< 1830	5900	20800	105
SB7aVS-23	2	2	12	K19PF1	300281292	1760	18300	11100	< 661	< 569	< 5840	218000	3810	3280	21500	202
SB7aVS-22	2	2	13	K17PF2	300281294	1840	18500	11400	< 671	< 578	< 5930	219000	3820	117	21500	171
SB7aVS-02	2	2	14	K14PF2	300280948	2450	17300	7980	< 664	< 572	< 5870	236000	< 1850	< 86	16600	136
SB7aVS-21	2	2	15	K21PF1	300281293	1710	17400	10400	< 663	< 571	< 5860	227000	3790	2850	21700	179
SB7aVS-22	2	2	16	K17PF1	300281282	1890	18500	11300	< 674	< 580	< 5950	219000	4300	115	23100	175
SB7aVS-16	2	2	17	K15PF1	300280946	1630	15800	9580	< 675	< 581	< 5960	241000	3870	87.8	20700	181
SB7aVS-18	2	2	18	K04PF1	300281287	1630	16500	9950	< 672	< 579	< 5940	232000	3450	111	19100	178
blank	2	2	19	BLANKPF2	300280949	< 20	< 88	< 188	< 679	< 585	< 6000	807	< 1890	< 88	< 6950	< 17.6
SB7ref	2	2	20	SB7REFPF23	300280950	1510	16000	9670	< 656	< 565	< 5800	226000	< 1830	2930	< 6710	189
Ustd	2	2	21	USTDPF23	300280951	7200	21500	8750	< 658	< 566	< 5810	213000	< 1830	5870	21100	108
SB7ref	3	1	1	SB7REFPF31	300281295	1600	16300	9540	< 1340	< 1160	< 11900	222000	< 823	2890	< 13700	182
Ustd	3	1	2	USTDPF31	300281296	7490	22100	8920	< 1340	< 1160	< 11900	205000	< 823	5740	19600	101
SB7aVS-20	3	1	3	K27PF2	300281297	1870	18900	11100	< 1340	< 1150	< 11800	223000	4180	< 174	19400	186
SB7aVS-10	3	1	4	K08PF2	300281298	317	15100	11300	< 1360	< 1170	< 12000	244000	2280	3890	19000	163
SB7a-702-01	3	1	5	K03PF2	300281299	1530	16100	9460	< 1320	< 1140	< 11700	248000	3340	2780	15700	185
SB7aVS-11	3	1	6	K23PF2	300281300	418	18600	8440	< 1340	< 1150	< 11800	240000	5370	< 174	17500	170
SB7aVS-10	3	1	7	K08PF1	300281301	333	15200	11800	< 1350	< 1160	< 11900	247000	2290	3910	20300	167
SB7a-702-02	3	1	8	K10PF1	300281302	1640	16900	9650	< 1340	< 1160	< 11900	238000	3840	2870	16800	168
SB7aVS-20	3	1	9	K27PF1	300281303	1940	18900	11200	< 1330	< 1150	< 11800	235000	4600	< 173	20400	193
SB7ref	3	1	10	SB7REFPF32	300281304	1680	17200	10100	< 1340	< 1160	< 11900	251000	< 823	2910	< 13700	209
Ustd	3	1	11	USTDPF32	300281305	7770	22800	9210	< 1340	< 1160	< 11900	218000	< 823	5850	19200	91.7
SB7a-702-02	3	1	12	K10PF2	300281306	1680	16800	9790	< 1340	< 1160	< 11900	244000	4230	2890	18000	187

Table A4. Measured Elemental Concentrations (µg/g) for the Study Glasses Prepared Using Peroxide Fusion (part 2)

Glass ID	Block	Sub-Blk	Sequence	Lab ID	LIMS	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)
SB7aVS-07	3	1	13	K13PF2	300281307	378	18400	8440	< 1320	< 1130	< 11600	243000	2090	< 170	16400	228
SB7aVS-05	3	1	14	K26PF1	300281308	436	18400	11400	< 1330	< 1140	< 11700	243000	5390	< 172	18300	217
SB7aVS-11	3	1	15	K23PF1	300281309	599	27100	12000	< 1310	< 1130	< 11600	359000	8110	< 170	27200	224
SB7a-702-01	3	1	16	K03PF1	300280952	1610	16100	9420	< 1350	< 1160	< 11900	250000	3810	2790	17500	162
SB7aVS-07	3	1	17	K13PF1	300280953	359	18600	8360	< 1320	< 1130	< 11600	248000	2280	< 170	15800	237
SB7aVS-05	3	1	18	K26PF2	300280954	475	18500	11700	< 1310	< 1130	< 11600	243000	6230	< 170	20900	218
blank	3	1	19	BLANKPF3	300280955	< 35.2	< 176	< 1490	< 1360	< 1170	< 12000	< 1530	< 834	< 176	< 13900	< 35.2
SB7ref	3	1	20	SB7REFPF33	300280956	1680	17100	10000	< 1340	< 1160	< 11900	250000	< 823	2910	< 13700	188
Ustd	3	1	21	USTDPF33	300280957	7750	22700	9390	< 1340	< 1160	< 11900	218000	< 823	5830	19700	101
SB7ref	3	2	1	SB7REFPF31	300281295	1550	16200	9590	< 1340	< 1160	< 11900	233000	< 823	2930	< 13700	174
Ustd	3	2	2	USTDPF31	300281296	7080	21300	8640	< 1340	< 1160	< 11900	204000	< 823	5800	20600	79
SB7aVS-05	3	2	3	K26PF1	300281308	406	17600	11200	< 1330	< 1140	< 11700	240000	5440	< 172	19500	198
SB7aVS-10	3	2	4	K08PF1	300281301	313	14400	11100	< 1350	< 1160	< 11900	240000	2220	3930	21700	143
SB7aVS-10	3	2	5	K08PF2	300281298	294	14200	11000	< 1360	< 1170	< 12000	240000	2040	3900	21100	141
SB7aVS-05	3	2	6	K26PF2	300280954	443	17600	11000	< 1310	< 1130	< 11600	238000	6190	< 170	21600	188
SB7aVS-11	3	2	7	K23PF1	300281309	319	14600	6550	< 1310	< 1130	< 11600	193000	4550	< 170	16800	105
SB7aVS-07	3	2	8	K13PF2	300281307	350	17500	7790	< 1320	< 1130	< 11600	237000	2150	< 170	17600	189
SB7aVS-20	3	2	9	K27PF1	300281303	1790	17800	10600	< 1330	< 1150	< 11800	226000	4520	< 173	22100	160
SB7ref	3	2	10	SB7REFPF32	300281304	1550	16200	9480	< 1340	< 1160	< 11900	245000	< 823	2920	< 13700	160
Ustd	3	2	11	USTDPF32	300281305	7230	21600	8710	< 1340	< 1160	< 11900	214000	< 823	5880	21000	96.4
SB7a-702-01	3	2	12	K03PF1	300280952	1490	15200	8900	< 1350	< 1160	< 11900	244000	3740	2810	18500	148
SB7a-702-02	3	2	13	K10PF1	300281302	1510	15800	9290	< 1340	< 1160	< 11900	234000	3710	2880	19400	144
SB7aVS-20	3	2	14	K27PF2	300281297	1730	17900	10600	< 1340	< 1150	< 11800	222000	3980	< 174	20400	166
SB7a-702-01	3	2	15	K03PF2	300281299	1410	15100	8910	< 1320	< 1140	< 11700	242000	3210	2810	16800	148
SB7aVS-07	3	2	16	K13PF1	300280953	335	17700	7950	< 1320	< 1130	< 11600	245000	2410	< 170	17300	187
SB7aVS-11	3	2	17	K23PF2	300281300	385	17500	7840	< 1340	< 1150	< 11800	235000	5240	< 174	18800	133
SB7a-702-02	3	2	18	K10PF2	300281306	1550	16000	9450	< 1340	< 1160	< 11900	240000	4040	2920	19900	141
blank	3	2	19	BLANKPF3	300280955	< 35.2	< 176	< 1490	< 1360	< 1170	< 12000	1300	< 834	< 176	< 13900	< 35.2
SB7ref	3	2	20	SB7REFPF33	300280956	1550	16300	9570	< 1340	< 1160	< 11900	247000	< 823	2940	< 13700	180
Ustd	3	2	21	USTDPF33	300280957	7200	21700	8690	< 1340	< 1160	< 11900	214000	< 823	5880	21200	69.5
SB7ref	4	1	1	SB7REFPF41	300281310	1480	16000	9290	< 1300	< 1120	< 11500	222000	< 796	2910	< 11500	170
Ustd	4	1	2	USTDPF41	300281311	7270	21700	8600	< 1340	< 1160	< 11900	205000	< 823	5930	19500	79
SB7aVS-03	4	1	3	K25PF2	300281312	405	14100	10700	< 1340	< 1150	< 11800	229000	1820	< 173	16000	232
SB7aVS-13	4	1	4	K16PF2	300281313	2280	17600	10700	< 1330	< 1150	< 11800	234000	5430	4030	17500	239
SB7aVS-14	4	1	5	K05PF1	300281314	1340	15000	8850	< 1330	< 1140	< 11700	241000	3620	< 172	18200	130
SB7aVS-13	4	1	6	K16PF1	300281315	2200	17700	10700	< 1340	< 1160	< 11900	237000	4720	4060	15800	217
SB7aVS-14	4	1	7	K05PF2	300281316	1300	14900	8780	< 1330	< 1140	< 11700	240000	3460	< 172	16800	131
SB7a-702-03	4	1	8	K20PF2	300281317	1640	17000	9690	< 1340	< 1160	< 11900	229000	3830	2670	20300	152
SB7aVS-09	4	1	9	K11PF2	300281318	2200	14100	10600	< 1310	< 1130	< 11600	236000	1980	< 170	20200	204
SB7ref	4	1	10	SB7REFPF42	300281319	1490	16100	9300	< 1300	< 1120	< 11500	240000	< 796	2950	< 11500	159
Ustd	4	1	11	USTDPF42	300281320	7150	21400	8420	< 1340	< 1160	< 11900	214000	< 823	5850	19200	88.5
SB7aVS-19	4	1	12	K12PF2	300281321	1610	16800	9580	< 1310	< 1130	< 11600	231000	3750	3050	19000	156
SB7aVS-08	4	1	13	K28PF2	300281322	427	14200	7710	< 1350	< 1160	< 11900	241000	1930	4080	18800	200
SB7aVS-03	4	1	14	K25PF1	300281323	387	14200	10800	< 1340	< 1150	< 11800	235000	1790	< 174	15800	235
SB7aVS-19	4	1	15	K12PF1	300281324	1570	16700	9480	< 1330	< 1150	< 11800	229000	3610	3030	18300	155
SB7aVS-08	4	1	16	K28PF1	300280958	438	14100	7700	< 1350	< 1160	< 11900	240000	1960	4040	19600	187
SB7a-702-03	4	1	17	K20PF1	300280959	1680	17000	9680	< 1350	< 1160	< 11900	228000	4160	2640	20600	149
SB7aVS-09	4	1	18	K11PF1	300280960	2200	14300	10700	< 1330	< 1150	< 11800	239000	1930	< 173	19600	190

Table A4. Measured Elemental Concentrations (µg/g) for the Study Glasses Prepared Using Peroxide Fusion (part 2)

Glass ID	Block	Sub-Blk	Sequence	Lab ID	LIMS	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)
blank	4	1	19	BLANKPF4	300280961	< 35.2	< 176	< 1490	< 1360	< 1170	< 12000	< 1530	< 834	< 176	< 12000	< 35.2
SB7ref	4	1	20	SB7REFPF43	300280962	1480	16100	9330	< 1300	< 1120	< 11500	236000	< 796	2940	< 11500	170
Ustd	4	1	21	USTDPF43	300280963	7250	21800	8480	< 1340	< 1160	< 11900	215000	< 823	5970	20200	88.5
SB7ref	4	2	1	SB7REFPF41	300281310	1500	15900	9560	< 1300	< 1120	< 11500	219000	819	2880	< 11500	173
Ustd	4	2	2	USTDPF41	300281311	7300	21600	8650	< 1340	< 1160	< 11900	203000	891	5880	19800	96.4
SB7aVS-14	4	2	3	K05PF1	300281314	1360	14900	9110	< 1330	< 1140	< 11700	238000	3870	< 172	18000	155
SB7aVS-03	4	2	4	K25PF2	300281312	413	14100	10900	< 1340	< 1150	< 11800	231000	2100	< 173	16100	232
SB7aVS-09	4	2	5	K11PF2	300281318	2230	14100	10800	< 1310	< 1130	< 11600	232000	2250	< 170	20600	190
SB7aVS-13	4	2	6	K16PF2	300281313	2290	17500	10900	< 1330	< 1150	< 11800	231000	5610	3960	17500	231
SB7aVS-08	4	2	7	K28PF2	300281322	435	14100	7940	< 1350	< 1160	< 11900	235000	2200	4010	20000	205
SB7aVS-19	4	2	8	K12PF1	300281324	1590	16500	9670	< 1330	< 1150	< 11800	226000	3840	2980	18700	169
SB7aVS-03	4	2	9	K25PF1	300281323	393	14000	11000	< 1340	< 1150	< 11800	230000	1990	< 174	16000	229
SB7ref	4	2	10	SB7REFPF42	300281319	1500	16000	9500	< 1300	< 1120	< 11500	236000	976	2870	< 11500	182
Ustd	4	2	11	USTDPF42	300281320	7210	21200	8640	< 1340	< 1160	< 11900	211000	< 823	5760	19800	88.5
SB7aVS-08	4	2	12	K28PF1	300280958	446	14100	7850	< 1350	< 1160	< 11900	235000	2090	3980	20500	210
SB7aVS-09	4	2	13	K11PF1	300280960	2220	14200	11000	< 1330	< 1150	< 11800	234000	2100	< 173	19800	209
SB7a-702-03	4	2	14	K20PF1	300280959	1700	16800	9820	< 1350	< 1160	< 11900	226000	4180	2590	20100	163
SB7aVS-19	4	2	15	K12PF2	300281321	1630	16600	9780	< 1310	< 1130	< 11600	225000	3930	2970	18900	173
SB7aVS-14	4	2	16	K05PF2	300281316	1330	14900	9020	< 1330	< 1140	< 11700	233000	3680	< 172	16300	138
SB7a-702-03	4	2	17	K20PF2	300281317	1660	16900	9870	< 1340	< 1160	< 11900	224000	3880	2610	19400	166
SB7aVS-13	4	2	18	K16PF1	300281315	2220	17600	10900	< 1340	< 1160	< 11900	234000	4900	4000	15800	228
blank	4	2	19	BLANKPF4	300280961	< 35.2	< 176	< 1490	< 1360	< 1170	< 12000	< 1530	< 834	< 176	< 12000	< 35.2
SB7ref	4	2	20	SB7REFPF43	300280962	1500	15900	9560	< 1300	< 1120	< 11500	234000	866	2870	< 11500	180
Ustd	4	2	21	USTDPF43	300280963	7310	21500	8660	< 1340	< 1160	< 11900	212000	< 823	5810	19400	85.3

Table A5. Average Measured Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID

Glass ID	Oxide	Measured (wt%)	Targeted (wt%)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
SB7a-702-01	Al_2O_3	8.8381	8.1736	0.6645	8.1%
SB7a-702-01	B_2O_3	5.3772	5.2800	0.0972	1.8%
SB7a-702-01	BaO	0.0190	0.0163	0.0027	16.7%
SB7a-702-01	CaO	0.5728	0.4376	0.1352	30.9%
SB7a-702-01	Ce_2O_3	0.0478	0.0224	0.0254	113.4%
SB7a-702-01	Cr_2O_3	0.0886	0.1142	-0.0256	-22.5%
SB7a-702-01	CuO	0.0200	0.0299	-0.0099	-33.2%
SB7a-702-01	Fe_2O_3	8.2101	7.9679	0.2422	3.0%
SB7a-702-01	K_2O	0.2039	0.1952	0.0087	4.4%
SB7a-702-01	La_2O_3	0.0110	0.0129	-0.0019	-14.8%
SB7a-702-01	Li_2O	6.5771	6.6000	-0.0229	-0.3%
SB7a-702-01	MgO	0.2597	0.2455	0.0142	5.8%
SB7a-702-01	MnO	2.0449	1.9060	0.1389	7.3%
SB7a-702-01	Na_2O	13.6013	12.6198	0.9815	7.8%
SB7a-702-01	NiO	1.1691	1.1240	0.0451	4.0%
SB7a-702-01	PbO	0.0325	0.0058	0.0267	460.5%
SB7a-702-01	SiO_2	52.6268	51.5941	1.0327	2.0%
SB7a-702-01	SO_4	1.1523	0.5390	0.6133	113.8%
SB7a-702-01	ThO_2	0.4116	0.3650	0.0466	12.8%
SB7a-702-01	TiO_2	0.4620	0.4471	0.0149	3.3%
SB7a-702-01	U_3O_8	2.1638	2.1546	0.0092	0.4%
SB7a-702-01	ZnO	0.0187	0.0095	0.0092	96.5%
SB7a-702-01	ZrO_2	0.1047	0.1343	-0.0296	-22.0%
SB7a-702-01	Sum	104.0131	99.9947	4.0184	4.0%
SB7a-702-02	Al_2O_3	9.2113	8.6544	0.5569	6.4%
SB7a-702-02	B_2O_3	4.9868	5.1200	-0.1332	-2.6%
SB7a-702-02	BaO	0.0199	0.0173	0.0026	15.0%
SB7a-702-02	CaO	0.6127	0.4633	0.1494	32.2%
SB7a-702-02	Ce_2O_3	0.0478	0.0238	0.0240	100.9%
SB7a-702-02	Cr_2O_3	0.1019	0.1210	-0.0191	-15.8%
SB7a-702-02	CuO	0.0284	0.0317	-0.0033	-10.5%
SB7a-702-02	Fe_2O_3	8.3709	8.4366	-0.0657	-0.8%
SB7a-702-02	K_2O	0.1980	0.2066	-0.0086	-4.2%
SB7a-702-02	La_2O_3	0.0115	0.0137	-0.0022	-15.9%
SB7a-702-02	Li_2O	6.2434	6.4000	-0.1566	-2.4%
SB7a-702-02	MgO	0.2651	0.2599	0.0052	2.0%
SB7a-702-02	MnO	2.1079	2.0182	0.0897	4.4%
SB7a-702-02	Na_2O	13.3654	13.0092	0.3562	2.7%
SB7a-702-02	NiO	1.2046	1.1902	0.0144	1.2%
SB7a-702-02	PbO	0.0328	0.0061	0.0267	437.3%
SB7a-702-02	SiO_2	51.1293	50.1585	0.9708	1.9%
SB7a-702-02	SO_4	1.1673	0.5708	0.5965	104.5%
SB7a-702-02	ThO_2	0.4424	0.3865	0.0559	14.5%
SB7a-702-02	TiO_2	0.4735	0.4734	0.0001	0.0%
SB7a-702-02	U_3O_8	2.2537	2.2813	-0.0276	-1.2%
SB7a-702-02	ZnO	0.0184	0.0101	0.0083	82.3%
SB7a-702-02	ZrO_2	0.1069	0.1422	-0.0353	-24.8%
SB7a-702-02	Sum	102.3998	99.9948	2.4050	2.4%
SB7a-702-03	Al_2O_3	9.7073	9.1352	0.5721	6.3%
SB7a-702-03	B_2O_3	4.9103	4.9600	-0.0497	-1.0%
SB7a-702-03	BaO	0.0190	0.0182	0.0008	4.2%
SB7a-702-03	CaO	0.6534	0.4891	0.1643	33.6%
SB7a-702-03	Ce_2O_3	0.0490	0.0251	0.0239	95.2%
SB7a-702-03	Cr_2O_3	0.0964	0.1277	-0.0313	-24.5%
SB7a-702-03	CuO	0.0260	0.0334	-0.0074	-22.1%
SB7a-702-03	Fe_2O_3	8.6586	8.9053	-0.2467	-2.8%
SB7a-702-03	K_2O	0.2660	0.2181	0.0479	22.0%
SB7a-702-03	La_2O_3	0.0128	0.0144	-0.0016	-11.0%
SB7a-702-03	Li_2O	6.2380	6.2000	0.0380	0.6%
SB7a-702-03	MgO	0.2842	0.2744	0.0098	3.6%
SB7a-702-03	MnO	2.2193	2.1303	0.0890	4.2%
SB7a-702-03	Na_2O	14.0529	13.3986	0.6543	4.9%

Table A5. Average Measured Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID

Glass ID	Oxide	Measured (wt%)	Targeted (wt%)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
SB7a-702-03	NiO	1.2572	1.2563	0.0009	0.1%
SB7a-702-03	PbO	0.0328	0.0065	0.0263	404.3%
SB7a-702-03	SiO_2	48.5086	48.7228	-0.2142	-0.4%
SB7a-702-03	SO_4	1.2058	0.6025	0.6033	100.1%
SB7a-702-03	ThO_2	0.4566	0.4080	0.0486	11.9%
SB7a-702-03	TiO_2	0.4283	0.4997	-0.0714	-14.3%
SB7a-702-03	U_3O_8	2.4365	2.4081	0.0284	1.2%
SB7a-702-03	ZnO	0.0201	0.0106	0.0095	89.9%
SB7a-702-03	ZrO_2	0.1221	0.1501	-0.0280	-18.6%
SB7a-702-03	Sum	101.6613	99.9944	1.6669	1.7%
SB7a-702-04	Al_2O_3	10.0710	9.6160	0.4550	4.7%
SB7a-702-04	B_2O_3	4.6689	4.8000	-0.1311	-2.7%
SB7a-702-04	BaO	0.0229	0.0192	0.0037	19.4%
SB7a-702-04	CaO	0.6569	0.5148	0.1421	27.6%
SB7a-702-04	Ce_2O_3	0.0337	0.0264	0.0073	27.8%
SB7a-702-04	Cr_2O_3	0.1131	0.1344	-0.0213	-15.8%
SB7a-702-04	CuO	0.0331	0.0352	-0.0021	-6.0%
SB7a-702-04	Fe_2O_3	9.2162	9.3740	-0.1578	-1.7%
SB7a-702-04	K_2O	0.4066	0.2296	0.1770	77.1%
SB7a-702-04	La_2O_3	0.0142	0.0152	-0.0010	-6.6%
SB7a-702-04	Li_2O	5.9232	6.0000	-0.0768	-1.3%
SB7a-702-04	MgO	0.2832	0.2888	-0.0056	-2.0%
SB7a-702-04	MnO	2.2548	2.2424	0.0124	0.6%
SB7a-702-04	Na_2O	14.1203	13.7880	0.3323	2.4%
SB7a-702-04	NiO	1.2914	1.3224	-0.0310	-2.3%
SB7a-702-04	PbO	0.0171	0.0068	0.0103	151.9%
SB7a-702-04	SiO_2	47.3855	47.2872	0.0983	0.2%
SB7a-702-04	SO_4	0.7647	0.6342	0.1305	20.6%
SB7a-702-04	ThO_2	0.4520	0.4294	0.0226	5.3%
SB7a-702-04	TiO_2	0.5112	0.5260	-0.0148	-2.8%
SB7a-702-04	U_3O_8	2.5235	2.5348	-0.0113	-0.4%
SB7a-702-04	ZnO	0.0207	0.0112	0.0095	85.1%
SB7a-702-04	ZrO_2	0.1363	0.1580	-0.0217	-13.7%
SB7a-702-04	Sum	100.9206	99.9940	0.9266	0.9%
SB7a-702-05	Al_2O_3	10.5836	10.0968	0.4868	4.8%
SB7a-702-05	B_2O_3	4.5481	4.6400	-0.0919	-2.0%
SB7a-702-05	BaO	0.0240	0.0202	0.0038	19.0%
SB7a-702-05	CaO	0.7017	0.5405	0.1612	29.8%
SB7a-702-05	Ce_2O_3	0.0350	0.0277	0.0073	26.4%
SB7a-702-05	Cr_2O_3	0.1079	0.1411	-0.0332	-23.5%
SB7a-702-05	CuO	0.0349	0.0370	-0.0021	-5.6%
SB7a-702-05	Fe_2O_3	9.5540	9.8427	-0.2887	-2.9%
SB7a-702-05	K_2O	0.4154	0.2411	0.1743	72.3%
SB7a-702-05	La_2O_3	0.0136	0.0160	-0.0024	-14.7%
SB7a-702-05	Li_2O	5.7267	5.8000	-0.0733	-1.3%
SB7a-702-05	MgO	0.2991	0.3032	-0.0041	-1.3%
SB7a-702-05	MnO	2.3677	2.3545	0.0132	0.6%
SB7a-702-05	Na_2O	14.4573	14.1774	0.2799	2.0%
SB7a-702-05	NiO	1.3441	1.3885	-0.0444	-3.2%
SB7a-702-05	PbO	0.0171	0.0071	0.0100	140.3%
SB7a-702-05	SiO_2	46.2624	45.8516	0.4108	0.9%
SB7a-702-05	SO_4	0.8040	0.6659	0.1381	20.7%
SB7a-702-05	ThO_2	0.4828	0.4509	0.0319	7.1%
SB7a-702-05	TiO_2	0.5344	0.5523	-0.0179	-3.2%
SB7a-702-05	U_3O_8	2.6827	2.6615	0.0212	0.8%
SB7a-702-05	ZnO	0.0234	0.0118	0.0116	98.5%
SB7a-702-05	ZrO_2	0.1071	0.1659	-0.0588	-35.5%
SB7a-702-05	Sum	101.1270	99.9937	1.1333	1.1%
SB7aVS-01	Al_2O_3	8.4933	7.9477	0.5456	6.9%
SB7aVS-01	B_2O_3	5.0874	5.1200	-0.0326	-0.6%
SB7aVS-01	BaO	0.0165	0.0091	0.0074	80.8%
SB7aVS-01	CaO	0.7977	0.6595	0.1382	21.0%

Table A5. Average Measured Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID

Glass ID	Oxide	Measured (wt%)	Targeted (wt%)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
SB7aVS-01	Ce_2O_3	0.0266	0.0138	0.0128	93.1%
SB7aVS-01	Cr_2O_3	0.0586	0.0751	-0.0165	-21.9%
SB7aVS-01	CuO	0.0182	0.0197	-0.0015	-7.6%
SB7aVS-01	Fe_2O_3	9.4289	9.3697	0.0592	0.6%
SB7aVS-01	K_2O	0.2859	0.1304	0.1555	119.3%
SB7aVS-01	La_2O_3	0.0065	0.0068	-0.0003	-4.2%
SB7aVS-01	Li_2O	5.1185	5.1200	-0.0015	0.0%
SB7aVS-01	MgO	0.4291	0.4579	-0.0288	-6.3%
SB7aVS-01	MnO	2.3064	2.2450	0.0614	2.7%
SB7aVS-01	Na_2O	15.8053	14.9336	0.8717	5.8%
SB7aVS-01	NiO	1.0083	1.0026	0.0057	0.6%
SB7aVS-01	PbO	0.0169	0.0031	0.0138	444.4%
SB7aVS-01	SiO_2	50.3270	49.9194	0.4076	0.8%
SB7aVS-01	SO_4	0.7947	0.6275	0.1672	26.6%
SB7aVS-01	ThO_2	0.1924	0.1706	0.0218	12.8%
SB7aVS-01	TiO_2	0.0098	0.0000	0.0098	
SB7aVS-01	U_3O_8	2.0636	2.0747	-0.0111	-0.5%
SB7aVS-01	ZnO	0.0145	0.0073	0.0072	98.2%
SB7aVS-01	ZrO_2	0.0504	0.0865	-0.0361	-41.8%
SB7aVS-01	Sum	102.3565	100.0000	2.3565	2.4%
SB7aVS-02	Al_2O_3	8.4484	7.9477	0.5007	6.3%
SB7aVS-02	B_2O_3	5.0029	5.1200	-0.1171	-2.3%
SB7aVS-02	BaO	0.0117	0.0091	0.0026	28.3%
SB7aVS-02	CaO	0.4163	0.2678	0.1485	55.4%
SB7aVS-02	Ce_2O_3	0.0269	0.0138	0.0131	94.8%
SB7aVS-02	Cr_2O_3	0.0623	0.0751	-0.0128	-17.0%
SB7aVS-02	CuO	0.0165	0.0197	-0.0032	-16.4%
SB7aVS-02	Fe_2O_3	7.4612	7.7353	-0.2741	-3.5%
SB7aVS-02	K_2O	0.2948	0.1304	0.1644	126.1%
SB7aVS-02	La_2O_3	0.0064	0.0068	-0.0004	-6.5%
SB7aVS-02	Li_2O	5.0970	5.1200	-0.0230	-0.4%
SB7aVS-02	MgO	0.3999	0.4579	-0.0580	-12.7%
SB7aVS-02	MnO	2.2515	2.2450	0.0065	0.3%
SB7aVS-02	Na_2O	15.4346	15.0139	0.4207	2.8%
SB7aVS-02	NiO	1.3966	1.4148	-0.0182	-1.3%
SB7aVS-02	PbO	0.0170	0.0031	0.0139	450.0%
SB7aVS-02	SiO_2	50.7549	50.4825	0.2724	0.5%
SB7aVS-02	SO_4	0.7156	0.5000	0.2156	43.1%
SB7aVS-02	ThO_2	0.2134	0.1706	0.0428	25.1%
SB7aVS-02	TiO_2	0.5882	0.6163	-0.0281	-4.6%
SB7aVS-02	U_3O_8	2.4070	2.5564	-0.1494	-5.8%
SB7aVS-02	ZnO	0.0169	0.0073	0.0096	131.3%
SB7aVS-02	ZrO_2	0.0550	0.0865	-0.0315	-36.4%
SB7aVS-02	Sum	101.0949	100.0000	1.0949	1.1%
SB7aVS-03	Al_2O_3	8.7838	8.3462	0.4376	5.2%
SB7aVS-03	B_2O_3	5.1438	5.1200	0.0238	0.5%
SB7aVS-03	BaO	0.0245	0.0207	0.0038	18.6%
SB7aVS-03	CaO	0.4140	0.2678	0.1462	54.6%
SB7aVS-03	Ce_2O_3	0.0494	0.0314	0.0180	57.2%
SB7aVS-03	Cr_2O_3	0.1422	0.1709	-0.0287	-16.8%
SB7aVS-03	CuO	0.0389	0.0447	-0.0058	-12.9%
SB7aVS-03	Fe_2O_3	9.4861	9.3697	0.1164	1.2%
SB7aVS-03	K_2O	0.3255	0.2967	0.0288	9.7%
SB7aVS-03	La_2O_3	0.0125	0.0156	-0.0031	-19.6%
SB7aVS-03	Li_2O	5.0889	5.1200	-0.0311	-0.6%
SB7aVS-03	MgO	0.0686	0.0680	0.0006	0.9%
SB7aVS-03	MnO	1.8545	1.8144	0.0401	2.2%
SB7aVS-03	Na_2O	15.5694	15.0139	0.5555	3.7%
SB7aVS-03	NiO	1.4029	1.4148	-0.0119	-0.8%
SB7aVS-03	PbO	0.0347	0.0069	0.0278	402.6%
SB7aVS-03	SiO_2	49.4713	49.9194	-0.4481	-0.9%
SB7aVS-03	SO_4	1.1605	0.5000	0.6605	132.1%

Table A5. Average Measured Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID

Glass ID	Oxide	Measured (wt%)	Targeted (wt%)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
SB7aVS-03	ThO_2	0.2168	0.1706	0.0462	27.1%
SB7aVS-03	TiO_2	0.0128	0.0000	0.0128	
SB7aVS-03	U_3O_8	1.9545	2.0747	-0.1202	-5.8%
SB7aVS-03	ZnO	0.0283	0.0166	0.0117	70.4%
SB7aVS-03	ZrO_2	0.0946	0.1968	-0.1022	-51.9%
SB7aVS-03	Sum	101.3786	99.9998	1.3788	1.4%
SB7aVS-04	Al_2O_3	8.3847	7.9477	0.4370	5.5%
SB7aVS-04	B_2O_3	4.9949	5.1200	-0.1251	-2.4%
SB7aVS-04	BaO	0.0139	0.0091	0.0048	52.3%
SB7aVS-04	CaO	0.8330	0.6595	0.1735	26.3%
SB7aVS-04	Ce_2O_3	0.0276	0.0138	0.0138	100.3%
SB7aVS-04	Cr_2O_3	0.0713	0.0751	-0.0038	-5.1%
SB7aVS-04	CuO	0.0192	0.0197	-0.0005	-2.8%
SB7aVS-04	Fe_2O_3	7.8508	8.0233	-0.1725	-2.1%
SB7aVS-04	K_2O	0.3346	0.1304	0.2042	156.6%
SB7aVS-04	La_2O_3	0.0069	0.0068	0.0001	2.1%
SB7aVS-04	Li_2O	5.0997	5.1200	-0.0203	-0.4%
SB7aVS-04	MgO	0.0495	0.0680	-0.0185	-27.2%
SB7aVS-04	MnO	1.8238	1.8144	0.0094	0.5%
SB7aVS-04	Na_2O	15.3672	15.0139	0.3533	2.4%
SB7aVS-04	NiO	1.3998	1.4148	-0.0151	-1.1%
SB7aVS-04	PbO	0.0169	0.0031	0.0138	446.1%
SB7aVS-04	SiO_2	50.9153	50.4825	0.4328	0.9%
SB7aVS-04	SO_4	0.7366	0.6275	0.1091	17.4%
SB7aVS-04	ThO_2	0.6480	0.6286	0.0194	3.1%
SB7aVS-04	TiO_2	0.6428	0.6534	-0.0106	-1.6%
SB7aVS-04	U_3O_8	2.1240	2.0747	0.0493	2.4%
SB7aVS-04	ZnO	0.0150	0.0073	0.0077	105.5%
SB7aVS-04	ZrO_2	0.0650	0.0865	-0.0215	-24.9%
SB7aVS-04	Sum	101.4405	100.0001	1.4404	1.4%
SB7aVS-05	Al_2O_3	8.5523	7.9477	0.6046	7.6%
SB7aVS-05	B_2O_3	5.0995	5.1200	-0.0205	-0.4%
SB7aVS-05	BaO	0.0248	0.0207	0.0041	20.0%
SB7aVS-05	CaO	0.7933	0.6595	0.1338	20.3%
SB7aVS-05	Ce_2O_3	0.0518	0.0314	0.0204	64.9%
SB7aVS-05	Cr_2O_3	0.1441	0.1709	-0.0268	-15.7%
SB7aVS-05	CuO	0.0420	0.0447	-0.0027	-6.0%
SB7aVS-05	Fe_2O_3	9.7148	9.3697	0.3451	3.7%
SB7aVS-05	K_2O	0.2489	0.2967	-0.0478	-16.1%
SB7aVS-05	La_2O_3	0.0139	0.0156	-0.0017	-10.8%
SB7aVS-05	Li_2O	5.0862	5.1200	-0.0338	-0.7%
SB7aVS-05	MgO	0.0752	0.0680	0.0072	10.6%
SB7aVS-05	MnO	2.3726	2.2450	0.1276	5.7%
SB7aVS-05	Na_2O	14.3562	13.3255	1.0307	7.7%
SB7aVS-05	NiO	1.4538	1.4148	0.0390	2.8%
SB7aVS-05	PbO	0.0336	0.0069	0.0267	387.4%
SB7aVS-05	SiO_2	51.5571	50.2445	1.3126	2.6%
SB7aVS-05	SO_4	1.1504	0.5000	0.6504	130.1%
SB7aVS-05	ThO_2	0.6860	0.6286	0.0574	9.1%
SB7aVS-05	TiO_2	0.0125	0.0000	0.0125	
SB7aVS-05	U_3O_8	2.5412	2.5564	-0.0152	-0.6%
SB7aVS-05	ZnO	0.0244	0.0166	0.0078	46.9%
SB7aVS-05	ZrO_2	0.1342	0.1968	-0.0626	-31.8%
SB7aVS-05	Sum	104.1690	100.0000	4.1690	4.2%
SB7aVS-06	Al_2O_3	8.6232	8.0183	0.6049	7.5%
SB7aVS-06	B_2O_3	5.0995	5.1200	-0.0205	-0.4%
SB7aVS-06	BaO	0.0254	0.0207	0.0047	22.5%
SB7aVS-06	CaO	0.8362	0.6595	0.1767	26.8%
SB7aVS-06	Ce_2O_3	0.0376	0.0314	0.0062	19.8%
SB7aVS-06	Cr_2O_3	0.1433	0.1709	-0.0276	-16.1%
SB7aVS-06	CuO	0.0442	0.0447	-0.0005	-1.1%
SB7aVS-06	Fe_2O_3	7.2361	7.7353	-0.4992	-6.5%

Table A5. Average Measured Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID

Glass ID	Oxide	Measured (wt%)	Targeted (wt%)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
SB7aVS-06	K_2O	0.4699	0.2967	0.1732	58.4%
SB7aVS-06	La_2O_3	0.0171	0.0156	0.0015	9.5%
SB7aVS-06	Li_2O	5.1831	5.1200	0.0631	1.2%
SB7aVS-06	MgO	0.3814	0.4579	-0.0765	-16.7%
SB7aVS-06	MnO	1.8706	1.8144	0.0562	3.1%
SB7aVS-06	Na_2O	15.9064	15.0139	0.8925	5.9%
SB7aVS-06	NiO	1.0291	1.0026	0.0265	2.6%
SB7aVS-06	PbO	0.0169	0.0069	0.0100	145.3%
SB7aVS-06	SiO_2	51.0758	49.9194	1.1564	2.3%
SB7aVS-06	SO_4	0.6853	0.5000	0.1853	37.1%
SB7aVS-06	ThO_2	0.6702	0.6286	0.0416	6.6%
SB7aVS-06	TiO_2	0.6522	0.6534	-0.0012	-0.2%
SB7aVS-06	U_3O_8	2.6193	2.5564	0.0629	2.5%
SB7aVS-06	ZnO	0.0241	0.0166	0.0075	45.0%
SB7aVS-06	ZrO_2	0.1169	0.1968	-0.0799	-40.6%
SB7aVS-06	Sum	102.7640	100.0000	2.7640	2.8%
SB7aVS-07	Al_2O_3	10.2151	9.7110	0.5041	5.2%
SB7aVS-07	B_2O_3	4.9707	5.1200	-0.1493	-2.9%
SB7aVS-07	BaO	0.0253	0.0207	0.0046	22.2%
SB7aVS-07	CaO	0.7972	0.6595	0.1377	20.9%
SB7aVS-07	Ce_2O_3	0.0497	0.0314	0.0183	58.2%
SB7aVS-07	Cr_2O_3	0.1426	0.1709	-0.0283	-16.6%
SB7aVS-07	CuO	0.0427	0.0447	-0.0020	-4.4%
SB7aVS-07	Fe_2O_3	7.5899	7.7353	-0.1454	-1.9%
SB7aVS-07	K_2O	0.2408	0.2967	-0.0559	-18.9%
SB7aVS-07	La_2O_3	0.0119	0.0156	-0.0037	-23.6%
SB7aVS-07	Li_2O	5.0163	5.1200	-0.1037	-2.0%
SB7aVS-07	MgO	0.0596	0.0680	-0.0084	-12.4%
SB7aVS-07	MnO	2.3274	2.2450	0.0824	3.7%
SB7aVS-07	Na_2O	14.7943	14.3104	0.4839	3.4%
SB7aVS-07	NiO	1.0183	1.0026	0.0157	1.6%
SB7aVS-07	PbO	0.0340	0.0069	0.0271	392.8%
SB7aVS-07	SiO_2	52.0385	50.4825	1.5560	3.1%
SB7aVS-07	SO_4	1.1501	0.5000	0.6501	130.0%
SB7aVS-07	ThO_2	0.2341	0.1706	0.0635	37.2%
SB7aVS-07	TiO_2	0.0118	0.0000	0.0118	
SB7aVS-07	U_3O_8	2.0489	2.0747	-0.0258	-1.2%
SB7aVS-07	ZnO	0.0245	0.0166	0.0079	47.7%
SB7aVS-07	ZrO_2	0.1368	0.1968	-0.0600	-30.5%
SB7aVS-07	Sum	102.9805	99.9999	2.9806	3.0%
SB7aVS-08	Al_2O_3	9.0413	8.6213	0.4200	4.9%
SB7aVS-08	B_2O_3	4.9949	5.1200	-0.1251	-2.4%
SB7aVS-08	BaO	0.0236	0.0207	0.0029	14.2%
SB7aVS-08	CaO	0.4175	0.2678	0.1497	55.9%
SB7aVS-08	Ce_2O_3	0.0498	0.0314	0.0184	58.7%
SB7aVS-08	Cr_2O_3	0.1429	0.1709	-0.0280	-16.4%
SB7aVS-08	CuO	0.0383	0.0447	-0.0064	-14.4%
SB7aVS-08	Fe_2O_3	9.4056	9.3697	0.0359	0.4%
SB7aVS-08	K_2O	0.3846	0.2967	0.0879	29.6%
SB7aVS-08	La_2O_3	0.0126	0.0156	-0.0030	-19.3%
SB7aVS-08	Li_2O	5.0701	5.1200	-0.0499	-1.0%
SB7aVS-08	MgO	0.0743	0.0680	0.0063	9.2%
SB7aVS-08	MnO	1.8400	1.8144	0.0256	1.4%
SB7aVS-08	Na_2O	13.6148	13.3255	0.2893	2.2%
SB7aVS-08	NiO	0.9948	1.0026	-0.0078	-0.8%
SB7aVS-08	PbO	0.0328	0.0069	0.0259	375.0%
SB7aVS-08	SiO_2	50.8619	50.4825	0.3794	0.8%
SB7aVS-08	SO_4	1.1912	0.6275	0.5637	89.8%
SB7aVS-08	ThO_2	0.2252	0.1706	0.0546	32.0%
SB7aVS-08	TiO_2	0.6520	0.6534	-0.0014	-0.2%
SB7aVS-08	U_3O_8	2.3908	2.5564	-0.1656	-6.5%
SB7aVS-08	ZnO	0.0236	0.0166	0.0070	42.0%

Table A5. Average Measured Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID

Glass ID	Oxide	Measured (wt%)	Targeted (wt%)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
SB7aVS-08	ZrO_2	0.1218	0.1968	-0.0750	-38.1%
SB7aVS-08	Sum	101.6042	100.0000	1.6042	1.6%
SB7aVS-09	Al_2O_3	10.2080	9.7110	0.4970	5.1%
SB7aVS-09	B_2O_3	5.0995	5.1200	-0.0205	-0.4%
SB7aVS-09	BaO	0.0231	0.0207	0.0024	11.7%
SB7aVS-09	CaO	0.8240	0.6595	0.1645	24.9%
SB7aVS-09	Ce_2O_3	0.0503	0.0314	0.0189	60.3%
SB7aVS-09	Cr_2O_3	0.1349	0.1709	-0.0360	-21.0%
SB7aVS-09	CuO	0.0413	0.0447	-0.0034	-7.6%
SB7aVS-09	Fe_2O_3	7.6453	7.7353	-0.0900	-1.2%
SB7aVS-09	K_2O	0.3198	0.2967	0.0231	7.8%
SB7aVS-09	La_2O_3	0.0126	0.0156	-0.0030	-19.4%
SB7aVS-09	Li_2O	5.1293	5.1200	0.0093	0.2%
SB7aVS-09	MgO	0.3791	0.4579	-0.0788	-17.2%
SB7aVS-09	MnO	1.8755	1.8144	0.0611	3.4%
SB7aVS-09	Na_2O	13.9855	13.3298	0.6557	4.9%
SB7aVS-09	NiO	1.3966	1.4148	-0.0182	-1.3%
SB7aVS-09	PbO	0.0342	0.0069	0.0273	395.5%
SB7aVS-09	SiO_2	50.3270	50.4825	-0.1555	-0.3%
SB7aVS-09	SO_4	1.2264	0.6275	0.5989	95.4%
SB7aVS-09	ThO_2	0.2290	0.1706	0.0584	34.2%
SB7aVS-09	TiO_2	0.0119	0.0000	0.0119	
SB7aVS-09	U_3O_8	2.4911	2.5564	-0.0653	-2.6%
SB7aVS-09	ZnO	0.0244	0.0166	0.0078	46.9%
SB7aVS-09	ZrO_2	0.1402	0.1968	-0.0566	-28.7%
SB7aVS-09	Sum	101.6091	100.0000	1.6091	1.6%
SB7aVS-10	Al_2O_3	10.3757	9.7110	0.6647	6.8%
SB7aVS-10	B_2O_3	5.0633	5.1200	-0.0567	-1.1%
SB7aVS-10	BaO	0.0132	0.0091	0.0041	45.4%
SB7aVS-10	CaO	0.8180	0.6595	0.1585	24.0%
SB7aVS-10	Ce_2O_3	0.0447	0.0138	0.0309	223.9%
SB7aVS-10	Cr_2O_3	0.0589	0.0751	-0.0162	-21.5%
SB7aVS-10	CuO	0.0156	0.0197	-0.0041	-20.6%
SB7aVS-10	Fe_2O_3	8.6336	8.6152	0.0184	0.2%
SB7aVS-10	K_2O	0.1661	0.1304	0.0357	27.4%
SB7aVS-10	La_2O_3	0.0080	0.0068	0.0012	18.3%
SB7aVS-10	Li_2O	5.0216	5.1200	-0.0984	-1.9%
SB7aVS-10	MgO	0.0523	0.0680	-0.0157	-23.2%
SB7aVS-10	MnO	1.9094	1.8144	0.0950	5.2%
SB7aVS-10	Na_2O	14.0192	13.3255	0.6937	5.2%
SB7aVS-10	NiO	1.4284	1.4148	0.0136	1.0%
SB7aVS-10	PbO	0.0329	0.0031	0.0298	962.0%
SB7aVS-10	SiO_2	51.9315	49.9194	2.0121	4.0%
SB7aVS-10	SO_4	1.1190	0.5000	0.6190	123.8%
SB7aVS-10	ThO_2	0.2388	0.1706	0.0682	40.0%
SB7aVS-10	TiO_2	0.6418	0.6534	-0.0116	-1.8%
SB7aVS-10	U_3O_8	2.5235	2.5564	-0.0329	-1.3%
SB7aVS-10	ZnO	0.0178	0.0073	0.0105	143.2%
SB7aVS-10	ZrO_2	0.0423	0.0865	-0.0442	-51.0%
SB7aVS-10	Sum	104.1756	100.0000	4.1756	4.2%
SB7aVS-11	Al_2O_3	10.0175	9.3438	0.6737	7.2%
SB7aVS-11	B_2O_3	5.0552	5.1200	-0.0648	-1.3%
SB7aVS-11	BaO	0.0132	0.0091	0.0041	45.0%
SB7aVS-11	CaO	0.3752	0.2678	0.1074	40.1%
SB7aVS-11	Ce_2O_3	0.0377	0.0138	0.0239	173.3%
SB7aVS-11	Cr_2O_3	0.0614	0.0751	-0.0137	-18.2%
SB7aVS-11	CuO	0.0187	0.0197	-0.0010	-5.2%
SB7aVS-11	Fe_2O_3	7.7680	7.7353	0.0327	0.4%
SB7aVS-11	K_2O	0.1562	0.1304	0.0258	19.8%
SB7aVS-11	La_2O_3	0.0090	0.0068	0.0022	32.9%
SB7aVS-11	Li_2O	5.0665	5.1200	-0.0535	-1.0%
SB7aVS-11	MgO	0.0682	0.0680	0.0002	0.3%

Table A5. Average Measured Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID

Glass ID	Oxide	Measured (wt%)	Targeted (wt%)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
SB7aVS-11	MnO	2.3521	2.2450	0.1071	4.8%
SB7aVS-11	Na_2O	15.6368	15.0139	0.6229	4.1%
SB7aVS-11	NiO	1.0229	1.0026	0.0203	2.0%
SB7aVS-11	PbO	0.0227	0.0031	0.0196	632.7%
SB7aVS-11	SiO_2	50.8084	49.9194	0.8890	1.8%
SB7aVS-11	SO_4	1.0086	0.6275	0.3811	60.7%
SB7aVS-11	ThO_2	0.6615	0.6286	0.0329	5.2%
SB7aVS-11	TiO_2	0.0113	0.0000	0.0113	
SB7aVS-11	U_3O_8	2.4331	2.5564	-0.1233	-4.8%
SB7aVS-11	ZnO	0.0159	0.0073	0.0086	118.0%
SB7aVS-11	ZrO_2	0.0808	0.0865	-0.0057	-6.5%
SB7aVS-11	Sum	102.7011	100.0001	2.7010	2.7%
SB7aVS-12	Al_2O_3	10.1254	9.4846	0.6408	6.8%
SB7aVS-12	B_2O_3	5.0271	5.1200	-0.0929	-1.8%
SB7aVS-12	BaO	0.0140	0.0091	0.0049	54.1%
SB7aVS-12	CaO	0.4269	0.2678	0.1591	59.4%
SB7aVS-12	Ce_2O_3	0.0274	0.0138	0.0136	98.5%
SB7aVS-12	Cr_2O_3	0.0718	0.0751	-0.0033	-4.4%
SB7aVS-12	CuO	0.0210	0.0197	0.0013	6.5%
SB7aVS-12	Fe_2O_3	8.9267	9.3697	-0.4430	-4.7%
SB7aVS-12	K_2O	0.2954	0.1304	0.1650	126.6%
SB7aVS-12	La_2O_3	0.0110	0.0068	0.0042	61.4%
SB7aVS-12	Li_2O	5.1589	5.1200	0.0389	0.8%
SB7aVS-12	MgO	0.3683	0.4579	-0.0896	-19.6%
SB7aVS-12	MnO	1.8480	1.8144	0.0336	1.9%
SB7aVS-12	Na_2O	13.8844	13.3255	0.5589	4.2%
SB7aVS-12	NiO	0.9964	1.0026	-0.0062	-0.6%
SB7aVS-12	PbO	0.0175	0.0031	0.0144	465.0%
SB7aVS-12	SiO_2	51.3432	50.4825	0.8607	1.7%
SB7aVS-12	SO_4	0.7149	0.5000	0.2149	43.0%
SB7aVS-12	ThO_2	0.6435	0.6286	0.0149	2.4%
SB7aVS-12	TiO_2	0.0090	0.0000	0.0090	
SB7aVS-12	U_3O_8	2.0621	2.0747	-0.0126	-0.6%
SB7aVS-12	ZnO	0.0160	0.0073	0.0087	119.5%
SB7aVS-12	ZrO_2	0.0787	0.0865	-0.0078	-9.0%
SB7aVS-12	Sum	102.0876	100.0001	2.0875	2.1%
SB7aVS-13	Al_2O_3	10.1915	9.6516	0.5399	5.6%
SB7aVS-13	B_2O_3	4.9989	5.1200	-0.1211	-2.4%
SB7aVS-13	BaO	0.0261	0.0207	0.0054	26.2%
SB7aVS-13	CaO	0.4122	0.2678	0.1444	53.9%
SB7aVS-13	Ce_2O_3	0.0510	0.0314	0.0196	62.5%
SB7aVS-13	Cr_2O_3	0.1301	0.1709	-0.0408	-23.9%
SB7aVS-13	CuO	0.0417	0.0447	-0.0030	-6.7%
SB7aVS-13	Fe_2O_3	7.6489	7.7353	-0.0864	-1.1%
SB7aVS-13	K_2O	0.4028	0.2967	0.1061	35.8%
SB7aVS-13	La_2O_3	0.0125	0.0156	-0.0031	-19.7%
SB7aVS-13	Li_2O	5.0862	5.1200	-0.0338	-0.7%
SB7aVS-13	MgO	0.3812	0.4579	-0.0767	-16.8%
SB7aVS-13	MnO	2.2983	2.2450	0.0533	2.4%
SB7aVS-13	Na_2O	13.8440	13.3255	0.5185	3.9%
SB7aVS-13	NiO	1.3838	1.4148	-0.0310	-2.2%
SB7aVS-13	PbO	0.0327	0.0069	0.0258	373.2%
SB7aVS-13	SiO_2	50.0596	49.9194	0.1402	0.3%
SB7aVS-13	SO_4	1.1751	0.6275	0.5476	87.3%
SB7aVS-13	ThO_2	0.6044	0.5868	0.0176	3.0%
SB7aVS-13	TiO_2	0.6526	0.6534	-0.0008	-0.1%
SB7aVS-13	U_3O_8	2.0253	2.0747	-0.0494	-2.4%
SB7aVS-13	ZnO	0.0279	0.0166	0.0113	68.3%
SB7aVS-13	ZrO_2	0.1340	0.1968	-0.0628	-31.9%
SB7aVS-13	Sum	101.6209	100.0000	1.6209	1.6%
SB7aVS-14	Al_2O_3	9.0578	8.4881	0.5697	6.7%
SB7aVS-14	B_2O_3	5.1961	5.2800	-0.0839	-1.6%

Table A5. Average Measured Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID

Glass ID	Oxide	Measured (wt%)	Targeted (wt%)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
SB7aVS-14	BaO	0.0203	0.0156	0.0047	30.3%
SB7aVS-14	CaO	0.5749	0.4427	0.1322	29.9%
SB7aVS-14	Ce_2O_3	0.0457	0.0207	0.0250	120.5%
SB7aVS-14	Cr_2O_3	0.0934	0.1183	-0.0249	-21.0%
SB7aVS-14	CuO	0.0225	0.0309	-0.0084	-27.1%
SB7aVS-14	Fe_2O_3	8.1386	8.1665	-0.0279	-0.3%
SB7aVS-14	K_2O	0.2710	0.2033	0.0677	33.3%
SB7aVS-14	La_2O_3	0.0111	0.0122	-0.0011	-8.8%
SB7aVS-14	Li_2O	5.2988	5.2800	0.0188	0.4%
SB7aVS-14	MgO	0.2340	0.2564	-0.0224	-8.7%
SB7aVS-14	MnO	1.9836	1.9244	0.0592	3.1%
SB7aVS-14	Na_2O	14.4573	13.6811	0.7762	5.7%
SB7aVS-14	NiO	1.1662	1.1584	0.0078	0.7%
SB7aVS-14	PbO	0.0323	0.0037	0.0286	771.7%
SB7aVS-14	SiO_2	50.9153	51.6563	-0.7410	-1.4%
SB7aVS-14	SO_4	1.1549	0.5160	0.6389	123.8%
SB7aVS-14	ThO_2	0.4286	0.3840	0.0446	11.6%
SB7aVS-14	TiO_2	0.0149	0.0058	0.0091	157.5%
SB7aVS-14	U_3O_8	2.1800	2.2093	-0.0293	-1.3%
SB7aVS-14	ZnO	0.0173	0.0088	0.0085	96.1%
SB7aVS-14	ZrO_2	0.0904	0.1377	-0.0473	-34.4%
SB7aVS-14	Sum	101.4051	100.0002	1.4049	1.4%
SB7aVS-15	Al_2O_3	8.6256	8.1736	0.4520	5.5%
SB7aVS-15	B_2O_3	5.1438	5.2800	-0.1362	-2.6%
SB7aVS-15	BaO	0.0198	0.0163	0.0035	21.5%
SB7aVS-15	CaO	0.5847	0.4376	0.1471	33.6%
SB7aVS-15	Ce_2O_3	0.0299	0.0224	0.0075	33.7%
SB7aVS-15	Cr_2O_3	0.0982	0.1142	-0.0160	-14.0%
SB7aVS-15	CuO	0.0304	0.0299	0.0005	1.7%
SB7aVS-15	Fe_2O_3	7.6900	7.9679	-0.2779	-3.5%
SB7aVS-15	K_2O	0.3651	0.1952	0.1699	87.1%
SB7aVS-15	La_2O_3	0.0122	0.0129	-0.0007	-5.7%
SB7aVS-15	Li_2O	5.2450	5.2800	-0.0350	-0.7%
SB7aVS-15	MgO	0.2446	0.2455	-0.0009	-0.4%
SB7aVS-15	MnO	1.9174	1.9060	0.0114	0.6%
SB7aVS-15	Na_2O	14.2551	13.9398	0.3153	2.3%
SB7aVS-15	NiO	1.1153	1.1240	-0.0087	-0.8%
SB7aVS-15	PbO	0.0169	0.0058	0.0111	191.8%
SB7aVS-15	SiO_2	51.8245	51.5941	0.2304	0.4%
SB7aVS-15	SO_4	0.7276	0.5390	0.1886	35.0%
SB7aVS-15	ThO_2	0.3574	0.3650	-0.0076	-2.1%
SB7aVS-15	TiO_2	0.4349	0.4471	-0.0122	-2.7%
SB7aVS-15	U_3O_8	1.8970	2.1546	-0.2576	-12.0%
SB7aVS-15	ZnO	0.0171	0.0095	0.0076	80.5%
SB7aVS-15	ZrO_2	0.0733	0.1343	-0.0610	-45.4%
SB7aVS-15	Sum	100.7262	99.9947	0.7315	0.7%
SB7aVS-16	Al_2O_3	9.7144	8.9874	0.7270	8.1%
SB7aVS-16	B_2O_3	5.1035	5.1200	-0.0165	-0.3%
SB7aVS-16	BaO	0.0206	0.0166	0.0040	24.0%
SB7aVS-16	CaO	0.6186	0.4687	0.1499	32.0%
SB7aVS-16	Ce_2O_3	0.0312	0.0220	0.0092	41.6%
SB7aVS-16	Cr_2O_3	0.0963	0.1253	-0.0290	-23.2%
SB7aVS-16	CuO	0.0322	0.0328	-0.0006	-1.9%
SB7aVS-16	Fe_2O_3	8.3602	8.6468	-0.2866	-3.3%
SB7aVS-16	K_2O	0.3831	0.2153	0.1678	77.9%
SB7aVS-16	La_2O_3	0.0125	0.0130	-0.0005	-3.9%
SB7aVS-16	Li_2O	5.1535	5.1200	0.0335	0.7%
SB7aVS-16	MgO	0.2774	0.2714	0.0060	2.2%
SB7aVS-16	MnO	2.1063	2.0376	0.0687	3.4%
SB7aVS-16	Na_2O	14.9628	14.0152	0.9476	6.8%
SB7aVS-16	NiO	1.2226	1.2265	-0.0039	-0.3%
SB7aVS-16	PbO	0.0170	0.0040	0.0130	324.0%

Table A5. Average Measured Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID

Glass ID	Oxide	Measured (wt%)	Targeted (wt%)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
SB7aVS-16	SiO_2	50.1666	50.2244	-0.0578	-0.1%
SB7aVS-16	SO_4	0.7415	0.5464	0.1951	35.7%
SB7aVS-16	ThO_2	0.4372	0.4065	0.0307	7.6%
SB7aVS-16	TiO_2	0.0134	0.0061	0.0073	119.1%
SB7aVS-16	U_3O_8	2.3466	2.3393	0.0073	0.3%
SB7aVS-16	ZnO	0.0197	0.0094	0.0103	110.1%
SB7aVS-16	ZrO_2	0.1025	0.1458	-0.0433	-29.7%
SB7aVS-16	Sum	101.9395	100.0005	1.9390	1.9%
SB7aVS-17	Al_2O_3	9.1924	8.6544	0.5380	6.2%
SB7aVS-17	B_2O_3	5.0110	5.1200	-0.1090	-2.1%
SB7aVS-17	BaO	0.0201	0.0173	0.0028	16.3%
SB7aVS-17	CaO	0.5957	0.4633	0.1324	28.6%
SB7aVS-17	Ce_2O_3	0.0317	0.0238	0.0079	33.2%
SB7aVS-17	Cr_2O_3	0.1130	0.1210	-0.0080	-6.6%
SB7aVS-17	CuO	0.0280	0.0317	-0.0037	-11.7%
SB7aVS-17	Fe_2O_3	8.1153	8.4366	-0.3213	-3.8%
SB7aVS-17	K_2O	0.3657	0.2066	0.1591	77.0%
SB7aVS-17	La_2O_3	0.0122	0.0137	-0.0015	-10.9%
SB7aVS-17	Li_2O	5.1078	5.1200	-0.0122	-0.2%
SB7aVS-17	MgO	0.2552	0.2599	-0.0047	-1.8%
SB7aVS-17	MnO	2.0482	2.0182	0.0300	1.5%
SB7aVS-17	Na_2O	14.7606	14.2892	0.4714	3.3%
SB7aVS-17	NiO	1.1825	1.1902	-0.0077	-0.6%
SB7aVS-17	PbO	0.0169	0.0061	0.0108	177.6%
SB7aVS-17	SiO_2	50.8084	50.1585	0.6499	1.3%
SB7aVS-17	SO_4	0.7374	0.5708	0.1666	29.2%
SB7aVS-17	ThO_2	0.4007	0.3865	0.0142	3.7%
SB7aVS-17	TiO_2	0.4481	0.4734	-0.0253	-5.4%
SB7aVS-17	U_3O_8	2.2420	2.2813	-0.0393	-1.7%
SB7aVS-17	ZnO	0.0192	0.0101	0.0091	90.1%
SB7aVS-17	ZrO_2	0.1007	0.1422	-0.0415	-29.2%
SB7aVS-17	Sum	101.6126	99.9948	1.6178	1.6%
SB7aVS-18	Al_2O_3	10.2765	9.4867	0.7898	8.3%
SB7aVS-18	B_2O_3	4.9667	4.9600	0.0067	0.1%
SB7aVS-18	BaO	0.0208	0.0175	0.0033	19.1%
SB7aVS-18	CaO	0.6349	0.4948	0.1401	28.3%
SB7aVS-18	Ce_2O_3	0.0321	0.0232	0.0089	38.3%
SB7aVS-18	Cr_2O_3	0.1050	0.1322	-0.0272	-20.6%
SB7aVS-18	CuO	0.0330	0.0346	-0.0016	-4.7%
SB7aVS-18	Fe_2O_3	9.1876	9.1272	0.0604	0.7%
SB7aVS-18	K_2O	0.3823	0.2272	0.1551	68.3%
SB7aVS-18	La_2O_3	0.0146	0.0137	0.0009	6.5%
SB7aVS-18	Li_2O	5.0378	4.9600	0.0778	1.6%
SB7aVS-18	MgO	0.2929	0.2865	0.0064	2.2%
SB7aVS-18	MnO	2.2305	2.1508	0.0797	3.7%
SB7aVS-18	Na_2O	15.5357	14.3494	1.1863	8.3%
SB7aVS-18	NiO	1.2959	1.2947	0.0012	0.1%
SB7aVS-18	PbO	0.0173	0.0042	0.0131	312.1%
SB7aVS-18	SiO_2	49.7387	48.7924	0.9463	1.9%
SB7aVS-18	SO_4	0.8692	0.5767	0.2925	50.7%
SB7aVS-18	ThO_2	0.4574	0.4291	0.0283	6.6%
SB7aVS-18	TiO_2	0.0178	0.0065	0.0113	173.6%
SB7aVS-18	U_3O_8	2.4557	2.4692	-0.0135	-0.5%
SB7aVS-18	ZnO	0.0201	0.0099	0.0102	102.6%
SB7aVS-18	ZrO_2	0.1346	0.1539	-0.0193	-12.5%
SB7aVS-18	Sum	103.7571	100.0004	3.7567	3.8%
SB7aVS-19	Al_2O_3	9.6128	9.1352	0.4776	5.2%
SB7aVS-19	B_2O_3	4.8379	4.9600	-0.1221	-2.5%
SB7aVS-19	BaO	0.0212	0.0182	0.0030	16.3%
SB7aVS-19	CaO	0.6111	0.4891	0.1220	24.9%
SB7aVS-19	Ce_2O_3	0.0475	0.0251	0.0224	89.1%
SB7aVS-19	Cr_2O_3	0.1117	0.1277	-0.0160	-12.5%

Table A5. Average Measured Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID

Glass ID	Oxide	Measured (wt%)	Targeted (wt%)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
SB7aVS-19	CuO	0.0325	0.0334	-0.0009	-2.6%
SB7aVS-19	Fe_2O_3	8.6676	8.9053	-0.2377	-2.7%
SB7aVS-19	K_2O	0.2396	0.2181	0.0215	9.8%
SB7aVS-19	La_2O_3	0.0121	0.0144	-0.0023	-15.7%
SB7aVS-19	Li_2O	4.9355	4.9600	-0.0245	-0.5%
SB7aVS-19	MgO	0.2755	0.2744	0.0011	0.4%
SB7aVS-19	MnO	2.1805	2.1303	0.0502	2.4%
SB7aVS-19	Na_2O	15.0976	14.6386	0.4590	3.1%
SB7aVS-19	NiO	1.2348	1.2563	-0.0215	-1.7%
SB7aVS-19	PbO	0.0323	0.0065	0.0258	396.2%
SB7aVS-19	SiO_2	48.7226	48.7228	-0.0002	0.0%
SB7aVS-19	SO_4	1.1950	0.6025	0.5925	98.3%
SB7aVS-19	ThO_2	0.4382	0.4080	0.0302	7.4%
SB7aVS-19	TiO_2	0.4912	0.4997	-0.0085	-1.7%
SB7aVS-19	U_3O_8	2.3245	2.4081	-0.0836	-3.5%
SB7aVS-19	ZnO	0.0197	0.0106	0.0091	85.7%
SB7aVS-19	ZrO_2	0.1011	0.1501	-0.0490	-32.7%
SB7aVS-19	Sum	101.2424	99.9944	1.2480	1.2%
SB7aVS-20	Al_2O_3	10.5977	9.9860	0.6117	6.1%
SB7aVS-20	B_2O_3	4.6850	4.8000	-0.1150	-2.4%
SB7aVS-20	BaO	0.0225	0.0184	0.0041	22.5%
SB7aVS-20	CaO	0.6550	0.5208	0.1342	25.8%
SB7aVS-20	Ce_2O_3	0.0483	0.0244	0.0239	98.0%
SB7aVS-20	Cr_2O_3	0.1112	0.1392	-0.0280	-20.1%
SB7aVS-20	CuO	0.0348	0.0364	-0.0016	-4.4%
SB7aVS-20	Fe_2O_3	9.5272	9.6076	-0.0804	-0.8%
SB7aVS-20	K_2O	0.2171	0.2392	-0.0221	-9.2%
SB7aVS-20	La_2O_3	0.0127	0.0144	-0.0017	-11.9%
SB7aVS-20	Li_2O	4.6879	4.8000	-0.1121	-2.3%
SB7aVS-20	MgO	0.3089	0.3016	0.0073	2.4%
SB7aVS-20	MnO	2.3629	2.2640	0.0989	4.4%
SB7aVS-20	Na_2O	15.1987	14.6836	0.5151	3.5%
SB7aVS-20	NiO	1.3663	1.3628	0.0035	0.3%
SB7aVS-20	PbO	0.0336	0.0044	0.0292	662.7%
SB7aVS-20	SiO_2	48.4551	47.3604	1.0947	2.3%
SB7aVS-20	SO_4	1.2148	0.6071	0.6077	100.1%
SB7aVS-20	ThO_2	0.4974	0.4517	0.0457	10.1%
SB7aVS-20	TiO_2	0.0147	0.0068	0.0079	115.6%
SB7aVS-20	U_3O_8	2.5250	2.5992	-0.0742	-2.9%
SB7aVS-20	ZnO	0.0205	0.0104	0.0101	97.2%
SB7aVS-20	ZrO_2	0.1183	0.1620	-0.0437	-27.0%
SB7aVS-20	Sum	102.7156	100.0004	2.7152	2.7%
SB7aVS-21	Al_2O_3	10.3686	9.6160	0.7526	7.8%
SB7aVS-21	B_2O_3	4.8017	4.8000	0.0017	0.0%
SB7aVS-21	BaO	0.0257	0.0192	0.0065	33.7%
SB7aVS-21	CaO	0.6725	0.5148	0.1577	30.6%
SB7aVS-21	Ce_2O_3	0.0341	0.0264	0.0077	29.1%
SB7aVS-21	Cr_2O_3	0.1063	0.1344	-0.0281	-20.9%
SB7aVS-21	CuO	0.0349	0.0352	-0.0003	-0.8%
SB7aVS-21	Fe_2O_3	9.2502	9.3740	-0.1238	-1.3%
SB7aVS-21	K_2O	0.3922	0.2296	0.1626	70.8%
SB7aVS-21	La_2O_3	0.0138	0.0152	-0.0014	-9.1%
SB7aVS-21	Li_2O	4.8629	4.8000	0.0629	1.3%
SB7aVS-21	MgO	0.2981	0.2888	0.0093	3.2%
SB7aVS-21	MnO	2.3258	2.2424	0.0834	3.7%
SB7aVS-21	Na_2O	16.0412	14.9880	1.0532	7.0%
SB7aVS-21	NiO	1.3345	1.3224	0.0121	0.9%
SB7aVS-21	PbO	0.0168	0.0068	0.0100	147.6%
SB7aVS-21	SiO_2	48.5086	47.2872	1.2214	2.6%
SB7aVS-21	SO_4	0.7591	0.6342	0.1249	19.7%
SB7aVS-21	ThO_2	0.4631	0.4294	0.0337	7.9%
SB7aVS-21	TiO_2	0.4714	0.5260	-0.0546	-10.4%

Table A5. Average Measured Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID

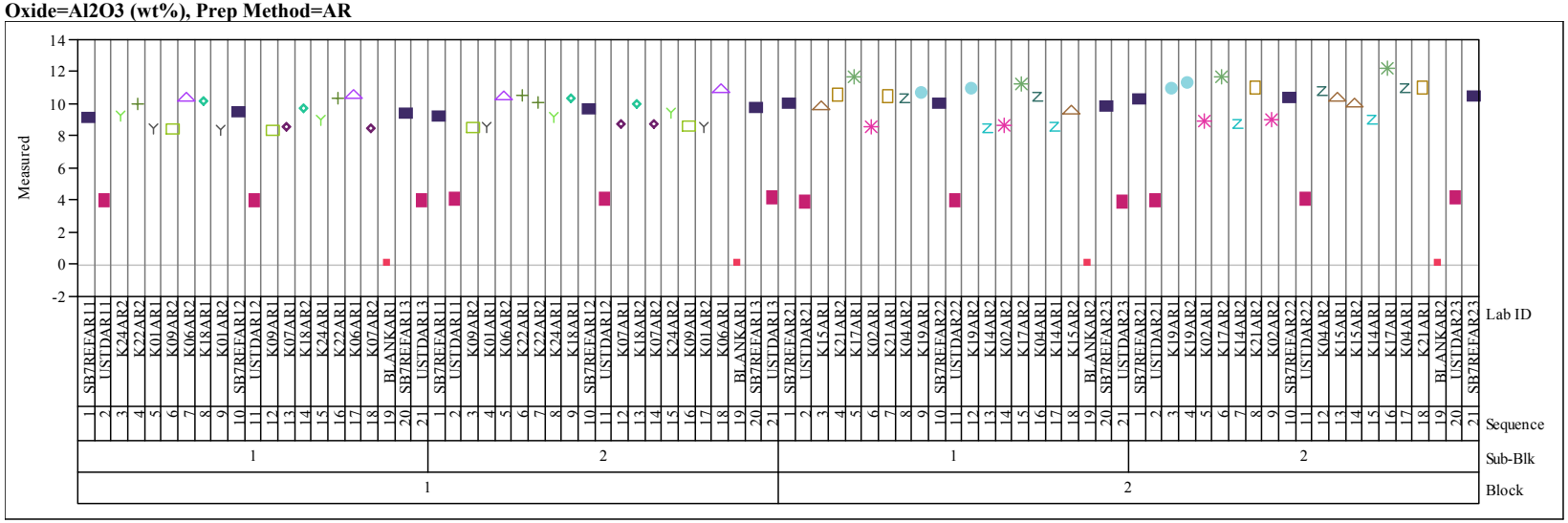
Glass ID	Oxide	Measured (wt%)	Targeted (wt%)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
SB7aVS-21	U_3O_8	2.5707	2.5348	0.0359	1.4%
SB7aVS-21	ZnO	0.0203	0.0112	0.0091	80.9%
SB7aVS-21	ZrO_2	0.1247	0.1580	-0.0333	-21.1%
SB7aVS-21	Sum	103.4972	99.9940	3.5032	3.5%
SB7aVS-22	Al_2O_3	11.3394	10.4853	0.8541	8.1%
SB7aVS-22	B_2O_3	4.6809	4.6400	0.0409	0.9%
SB7aVS-22	BaO	0.0263	0.0193	0.0070	36.4%
SB7aVS-22	CaO	0.7146	0.5468	0.1678	30.7%
SB7aVS-22	Ce_2O_3	0.0338	0.0256	0.0082	32.1%
SB7aVS-22	Cr_2O_3	0.1136	0.1462	-0.0326	-22.3%
SB7aVS-22	CuO	0.0339	0.0382	-0.0043	-11.4%
SB7aVS-22	Fe_2O_3	9.8077	10.0880	-0.2803	-2.8%
SB7aVS-22	K_2O	0.4219	0.2512	0.1707	68.0%
SB7aVS-22	La_2O_3	0.0151	0.0151	0.0000	0.2%
SB7aVS-22	Li_2O	4.7041	4.6400	0.0641	1.4%
SB7aVS-22	MgO	0.3254	0.3167	0.0087	2.8%
SB7aVS-22	MnO	2.4791	2.3772	0.1019	4.3%
SB7aVS-22	Na_2O	16.2097	15.0178	1.1919	7.9%
SB7aVS-22	NiO	1.4570	1.4309	0.0261	1.8%
SB7aVS-22	PbO	0.0192	0.0046	0.0146	316.6%
SB7aVS-22	SiO_2	46.7972	45.9284	0.8688	1.9%
SB7aVS-22	SO_4	0.8190	0.6374	0.1816	28.5%
SB7aVS-22	ThO_2	0.4941	0.4743	0.0198	4.2%
SB7aVS-22	TiO_2	0.0182	0.0071	0.0111	157.0%
SB7aVS-22	U_3O_8	2.6296	2.7292	-0.0996	-3.6%
SB7aVS-22	ZnO	0.0196	0.0109	0.0087	79.4%
SB7aVS-22	ZrO_2	0.1236	0.1701	-0.0465	-27.3%
SB7aVS-22	Sum	103.2832	100.0003	3.2829	3.3%
SB7aVS-23	Al_2O_3	10.7583	10.0968	0.6615	6.6%
SB7aVS-23	B_2O_3	4.5682	4.6400	-0.0718	-1.5%
SB7aVS-23	BaO	0.0269	0.0202	0.0067	33.3%
SB7aVS-23	CaO	0.6665	0.5405	0.1260	23.3%
SB7aVS-23	Ce_2O_3	0.0354	0.0277	0.0077	27.9%
SB7aVS-23	Cr_2O_3	0.1197	0.1411	-0.0214	-15.2%
SB7aVS-23	CuO	0.0352	0.0370	-0.0018	-4.8%
SB7aVS-23	Fe_2O_3	9.2162	9.8427	-0.6265	-6.4%
SB7aVS-23	K_2O	0.3787	0.2411	0.1376	57.1%
SB7aVS-23	La_2O_3	0.0145	0.0160	-0.0015	-9.6%
SB7aVS-23	Li_2O	4.6341	4.6400	-0.0059	-0.1%
SB7aVS-23	MgO	0.3066	0.3032	0.0034	1.1%
SB7aVS-23	MnO	2.4210	2.3545	0.0665	2.8%
SB7aVS-23	Na_2O	16.2434	15.3374	0.9060	5.9%
SB7aVS-23	NiO	1.3982	1.3885	0.0097	0.7%
SB7aVS-23	PbO	0.0168	0.0071	0.0097	137.3%
SB7aVS-23	SiO_2	46.2089	45.8516	0.3573	0.8%
SB7aVS-23	SO_4	0.9128	0.6659	0.2469	37.1%
SB7aVS-23	ThO_2	0.4727	0.4509	0.0218	4.8%
SB7aVS-23	TiO_2	0.5342	0.5523	-0.0181	-3.3%
SB7aVS-23	U_3O_8	2.6281	2.6615	-0.0334	-1.3%
SB7aVS-23	ZnO	0.0224	0.0118	0.0106	89.5%
SB7aVS-23	ZrO_2	0.1109	0.1659	-0.0550	-33.2%
SB7aVS-23	Sum	101.7298	99.9937	1.7361	1.7%
SB7ref	Al_2O_3	9.5058	8.8920	0.6138	6.9%
SB7ref	B_2O_3	5.2068	5.2610	-0.0542	-1.0%
SB7ref	BaO	0.0225	0.0170	0.0055	32.1%
SB7ref	CaO	0.6454	0.4760	0.1694	35.6%
SB7ref	Ce_2O_3	0.0359	0.0240	0.0119	49.6%
SB7ref	Cr_2O_3	0.1258	0.1240	0.0018	1.5%
SB7ref	CuO	0.0327	0.0330	-0.0003	-0.9%
SB7ref	Fe_2O_3	8.9788	8.6680	0.3108	3.6%
SB7ref	K_2O	0.3733	0.2120	0.1613	76.1%
SB7ref	La_2O_3	0.0125	0.0140	-0.0015	-10.4%

Table A5. Average Measured Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID

Glass ID	Oxide	Measured (wt%)	Targeted (wt%)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
SB7ref	Li_2O	5.2674	5.2610	0.0064	0.1%
SB7ref	MgO	0.2722	0.0270	0.2452	908.0%
SB7ref	MnO	2.1507	2.0740	0.0767	3.7%
SB7ref	Na_2O	15.6537	14.6820	0.9717	6.6%
SB7ref	NiO	1.2473	1.2230	0.0243	2.0%
SB7ref	PbO	0.0246	0.0060	0.0186	309.9%
SB7ref	SiO_2	50.3270	51.5360	-1.2090	-2.3%
SB7ref	SO_4	0.9688	0.5860	0.3828	65.3%
SB7ref	ThO_2	0.0465	0.0000	0.0465	
SB7ref	TiO_2	0.4834	0.4860	-0.0026	-0.5%
SB7ref	U_3O_8	0.4877	0.0000	0.4877	
SB7ref	ZnO	0.0214	0.0100	0.0114	113.9%
SB7ref	ZrO_2	0.0712	0.1460	-0.0748	-51.3%
SB7ref	Sum	101.9613	99.7580	2.2033	2.2%
Ustd	Al_2O_3	4.0612	4.1000	-0.0388	-0.9%
Ustd	B_2O_3	8.8849	9.2090	-0.3241	-3.5%
Ustd	BaO	0.0041	0.0000	0.0041	
Ustd	CaO	1.4520	1.3010	0.1510	11.6%
Ustd	Ce_2O_3	0.0255	0.0000	0.0255	
Ustd	Cr_2O_3	0.2413	0.0000	0.2413	
Ustd	CuO	0.0056	0.0000	0.0056	
Ustd	Fe_2O_3	13.5193	13.1960	0.3233	2.5%
Ustd	K_2O	3.0035	2.9990	0.0045	0.1%
Ustd	La_2O_3	0.0044	0.0000	0.0044	
Ustd	Li_2O	2.9988	3.0570	-0.0582	-1.9%
Ustd	MgO	1.1989	1.2100	-0.0111	-0.9%
Ustd	MnO	2.8113	2.8920	-0.0807	-2.8%
Ustd	Na_2O	11.9467	11.7950	0.1517	1.3%
Ustd	NiO	1.1081	1.1200	-0.0119	-1.1%
Ustd	PbO	0.0251	0.0000	0.0251	
Ustd	SiO_2	45.4423	45.3530	0.0893	0.2%
Ustd	SO_4	0.8036	0.0000	0.8036	
Ustd	ThO_2	0.0641	0.0000	0.0641	
Ustd	TiO_2	0.9464	1.0490	-0.1026	-9.8%
Ustd	U_3O_8	2.4306	2.4060	0.0246	1.0%
Ustd	ZnO	0.0093	0.0000	0.0093	
Ustd	ZrO_2	0.0024	0.0000	0.0024	
Ustd	Sum	100.9895	99.6870	1.3025	1.3%

Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 1 and 2

Oxide=Al2O3 (wt%), Prep Method=AR



Oxide=Al2O3 (wt%), Prep Method=PF

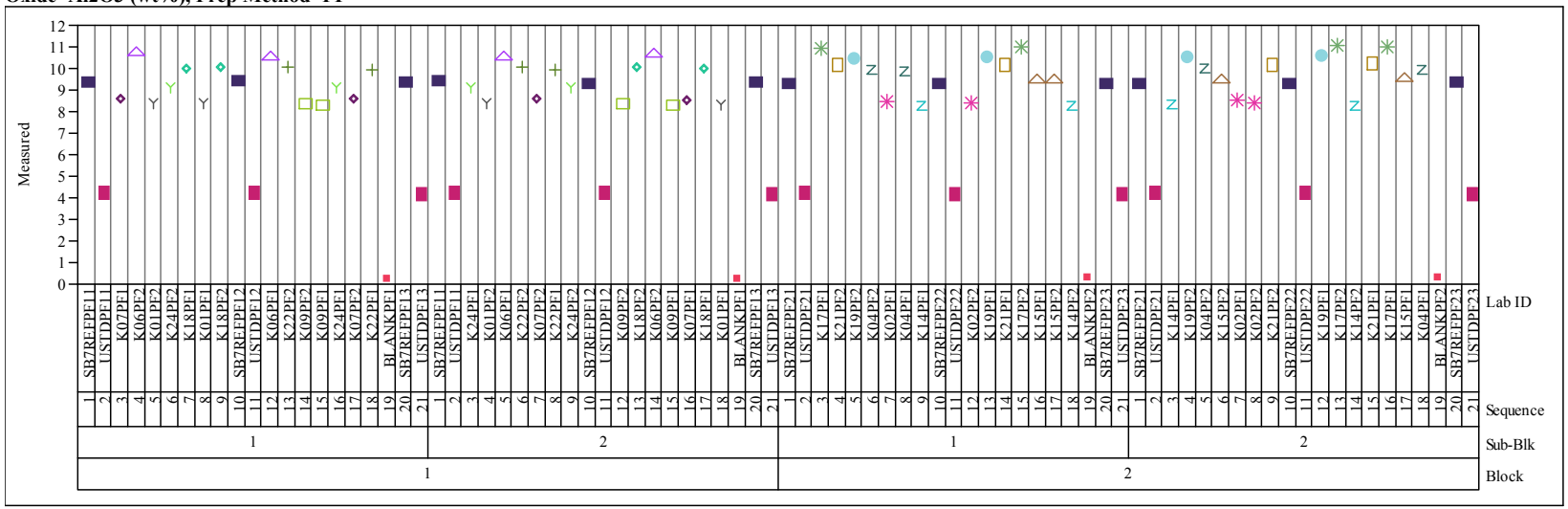
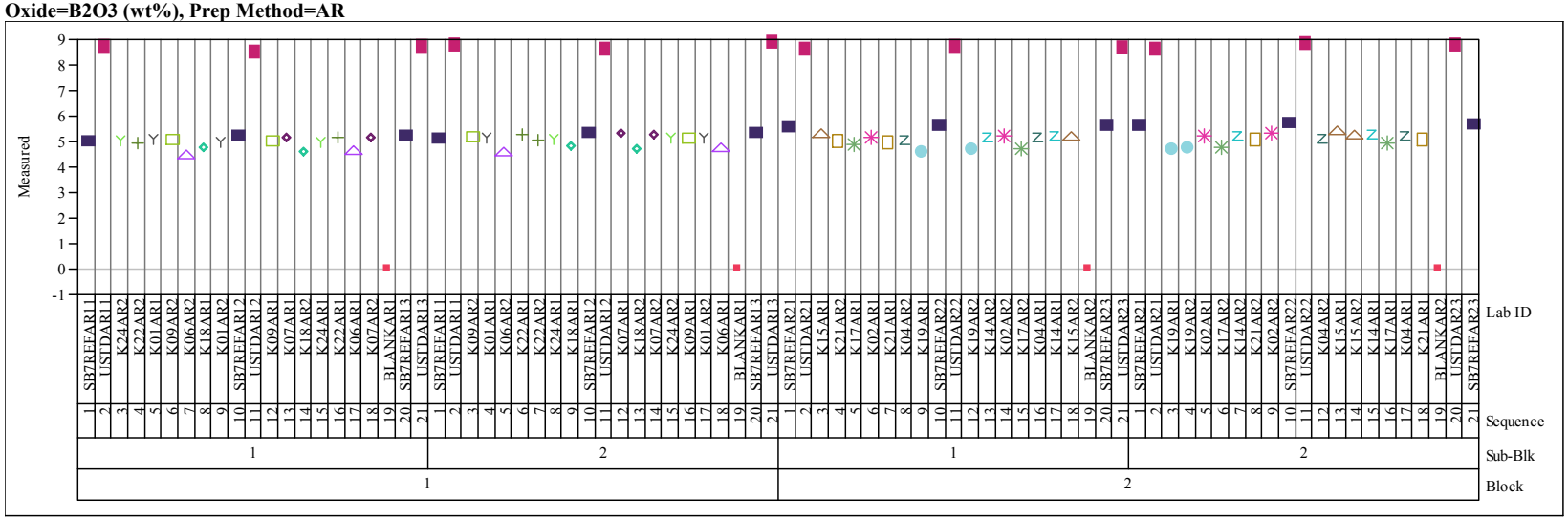


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 1 and 2

Oxide=B2O3 (wt%), Prep Method=AR



Oxide=B2O3 (wt%), Prep Method=PF

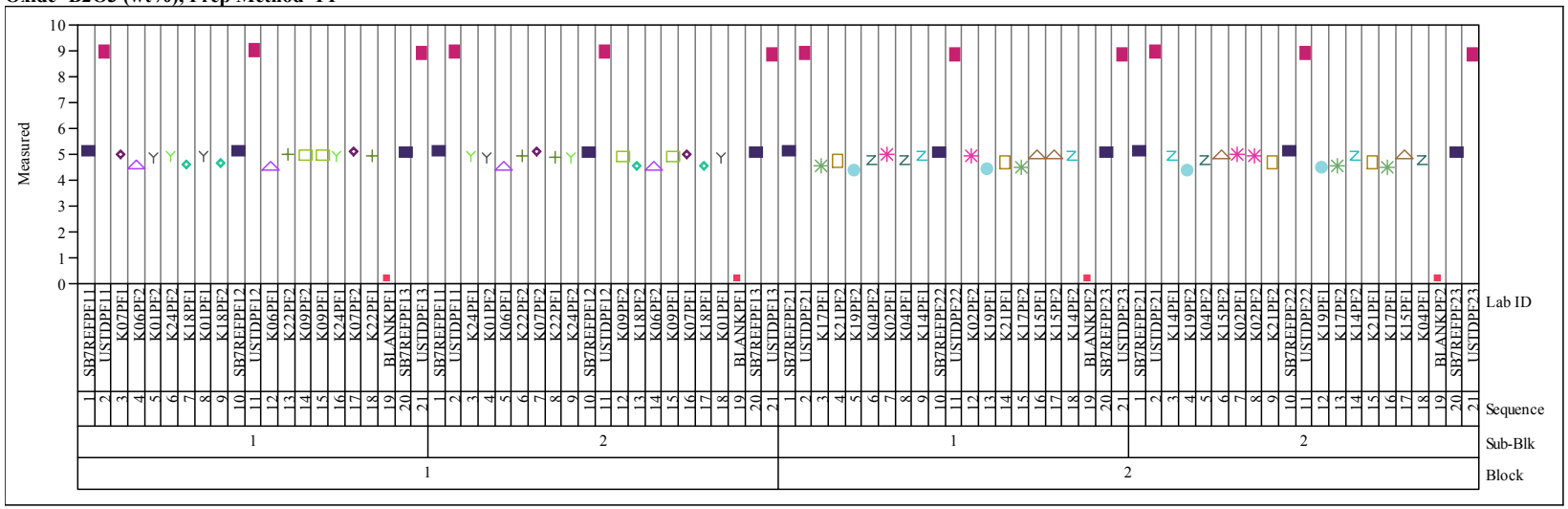
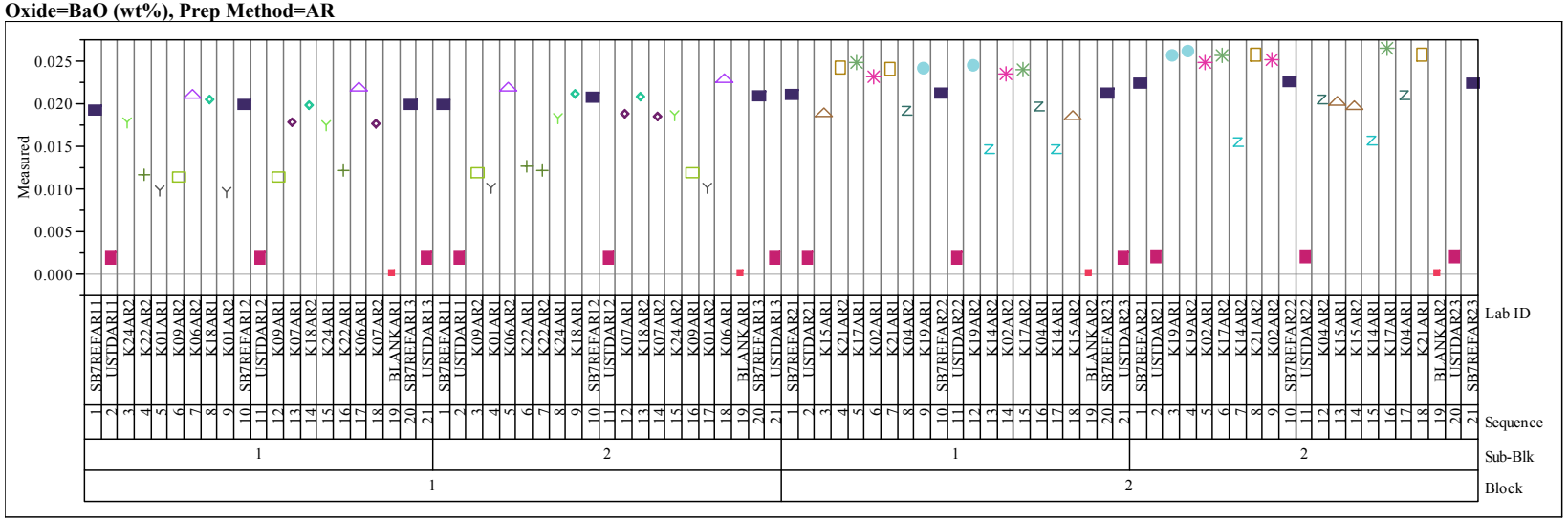


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 1 and 2

Oxide=BaO (wt%), Prep Method=AR



Oxide=BaO (wt%), Prep Method=PF

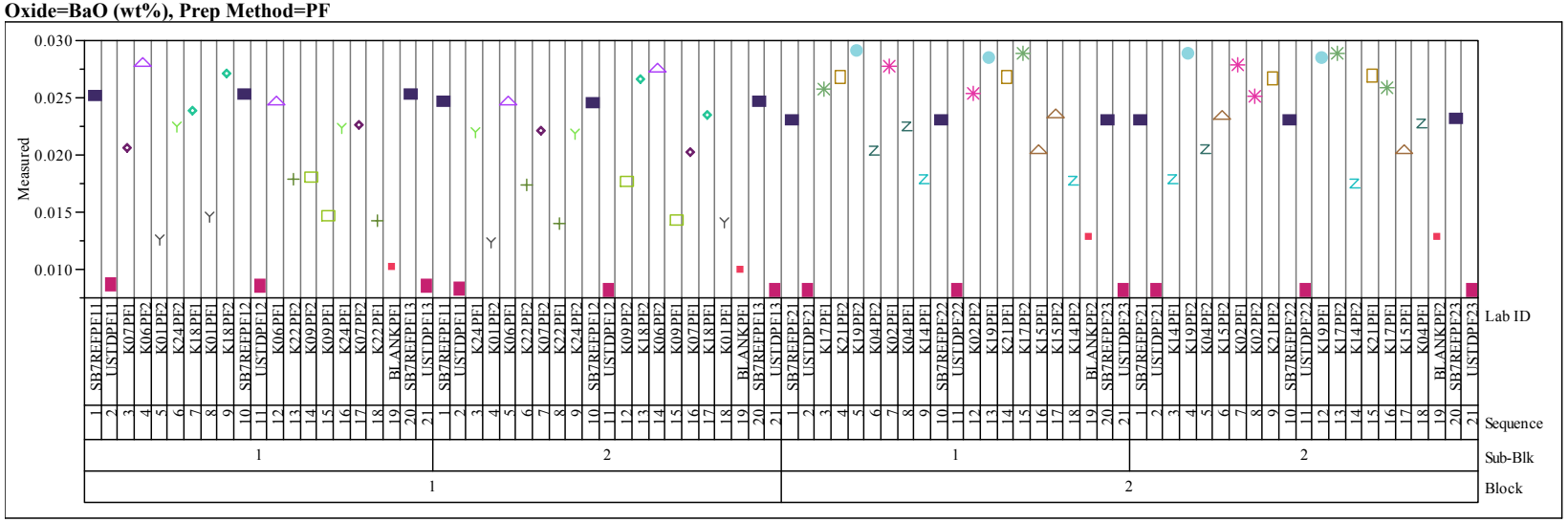
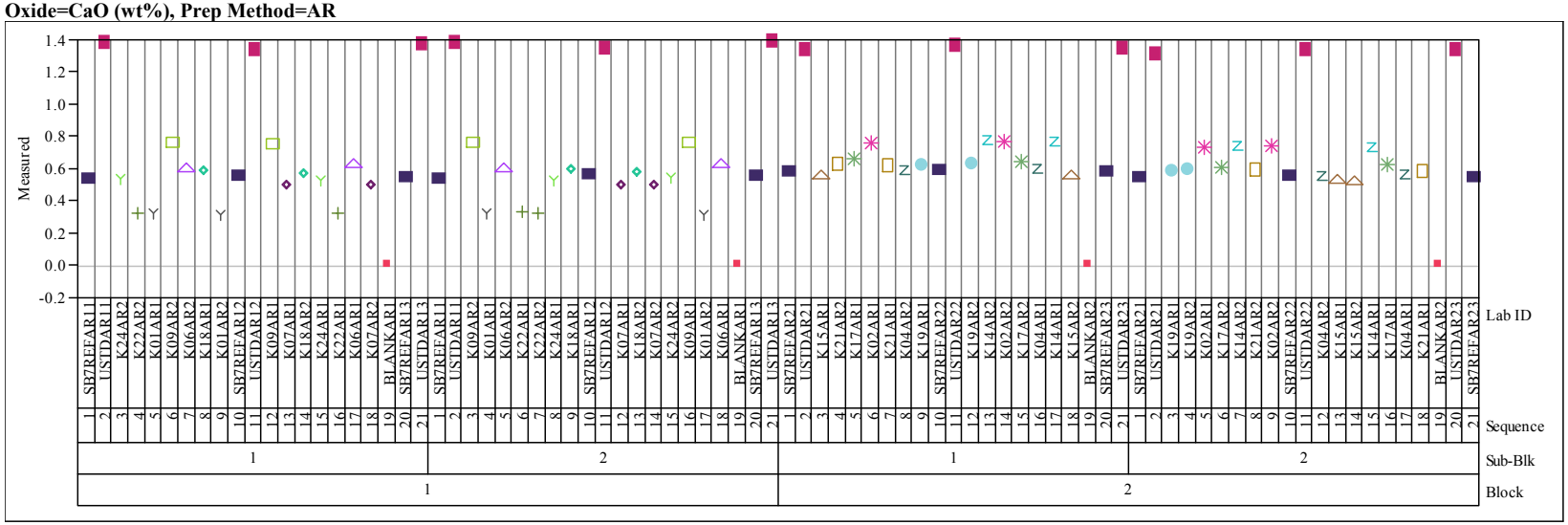


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 1 and 2

Oxide=CaO (wt%), Prep Method=AR



Oxide=CaO (wt%), Prep Method=PF

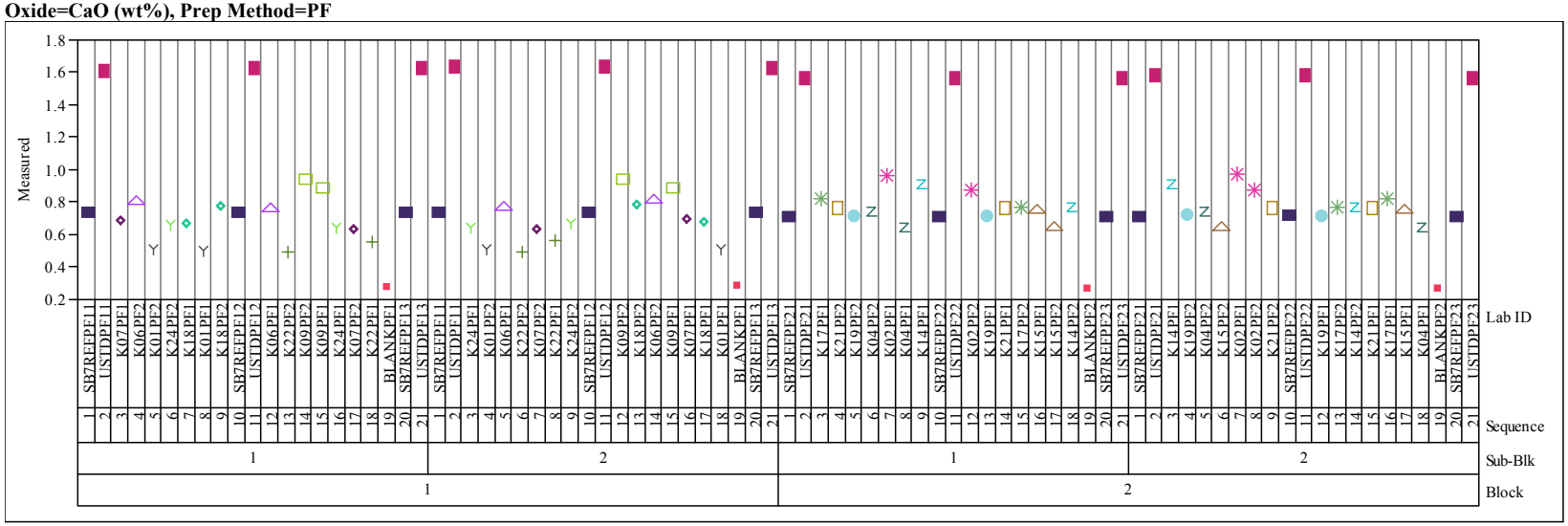
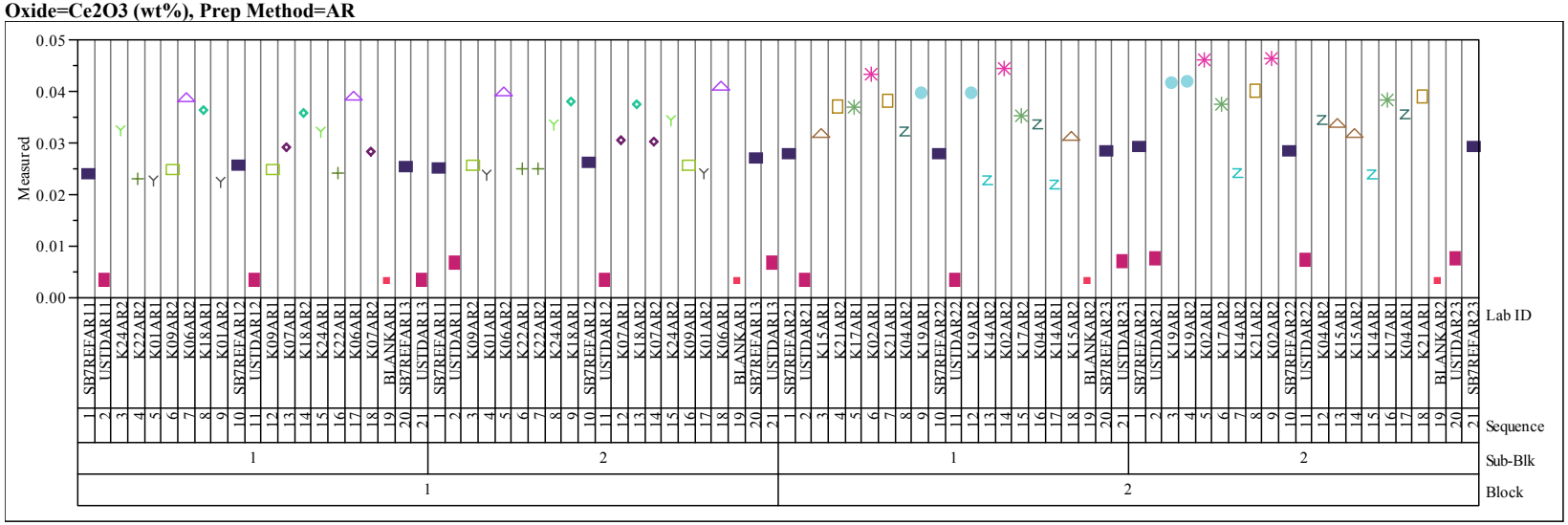


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 1 and 2

Oxide=Ce2O3 (wt%), Prep Method=AR



Oxide=Ce2O3 (wt%), Prep Method=PF

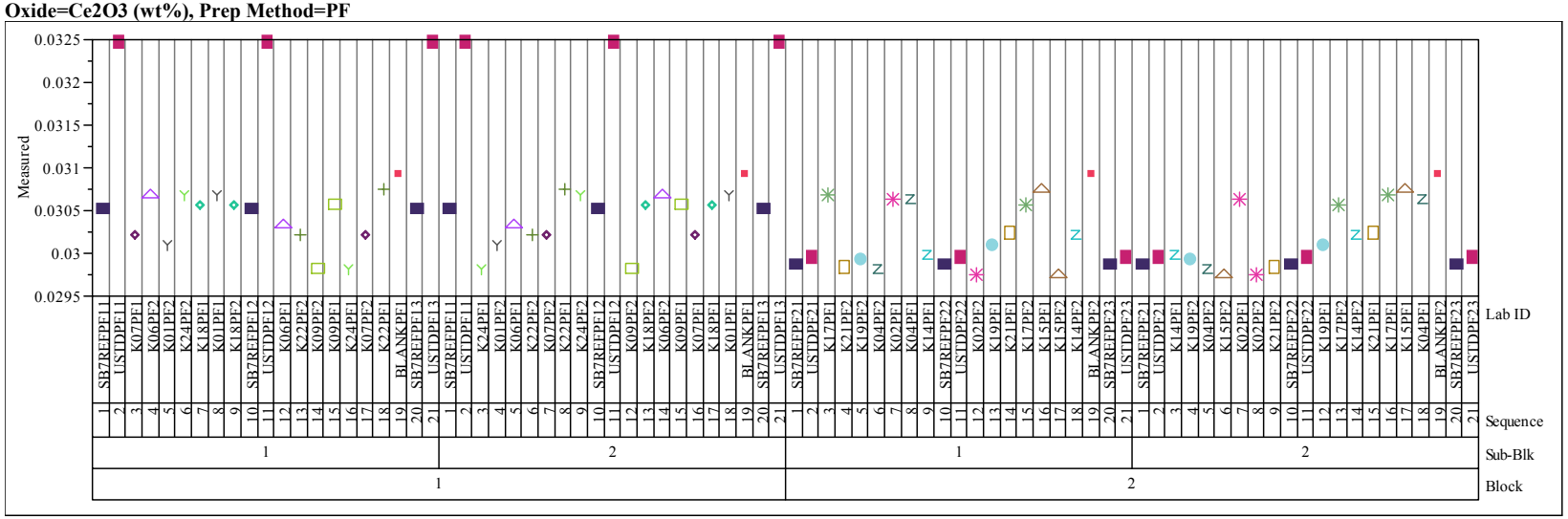
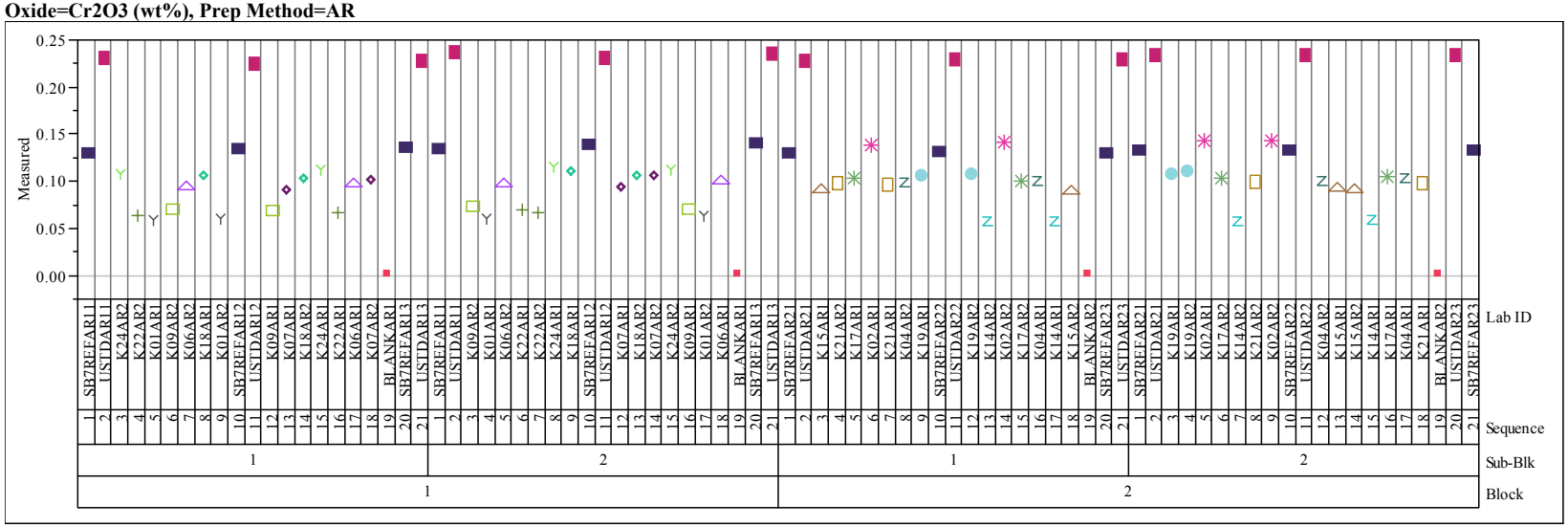


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 1 and 2

Oxide=Cr2O3 (wt%), Prep Method=AR



Oxide=Cr2O3 (wt%), Prep Method=PF

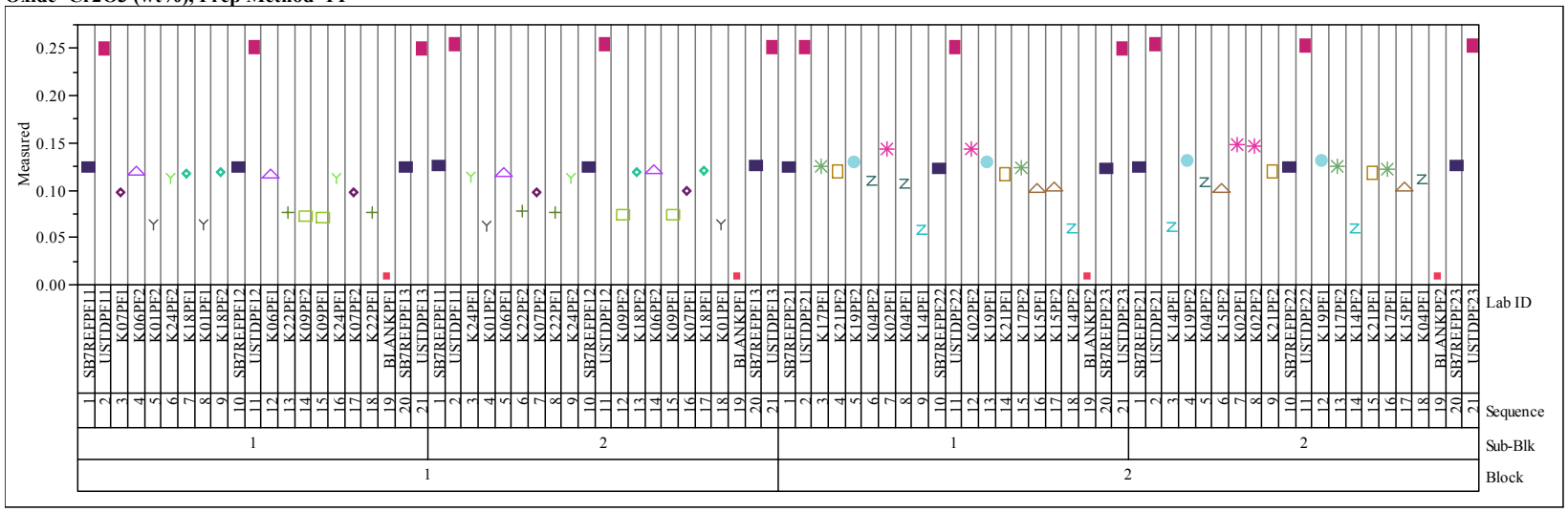
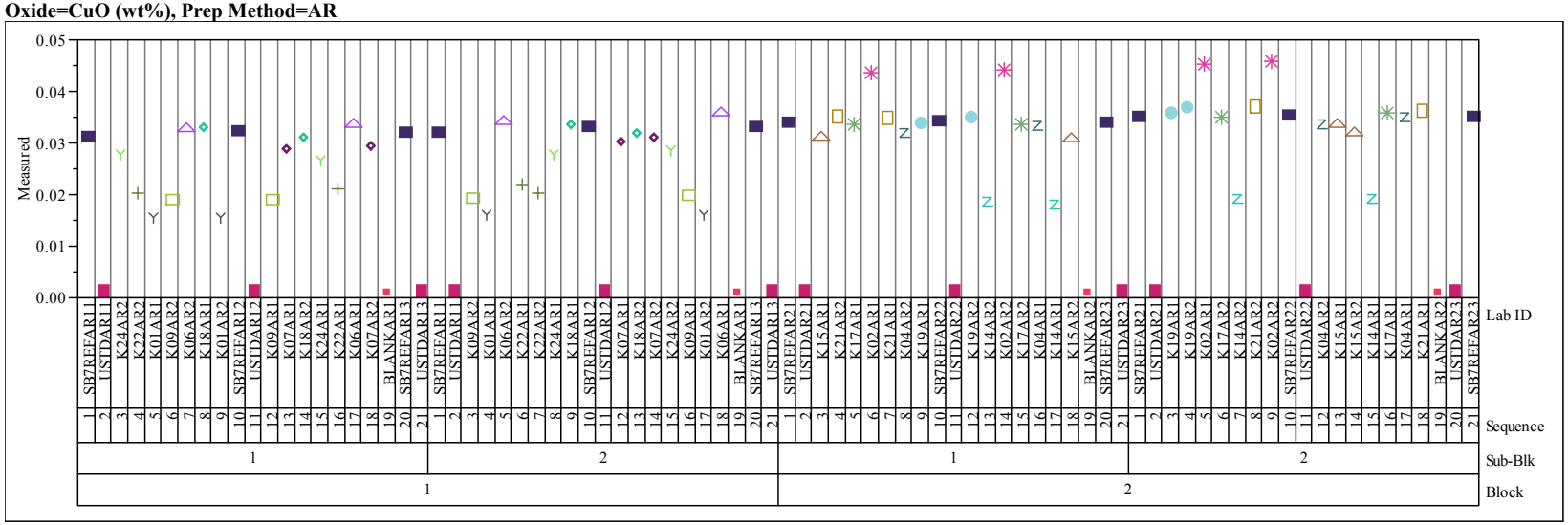


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 1 and 2

Oxide=CuO (wt%), Prep Method=AR



Oxide=CuO (wt%), Prep Method=PF

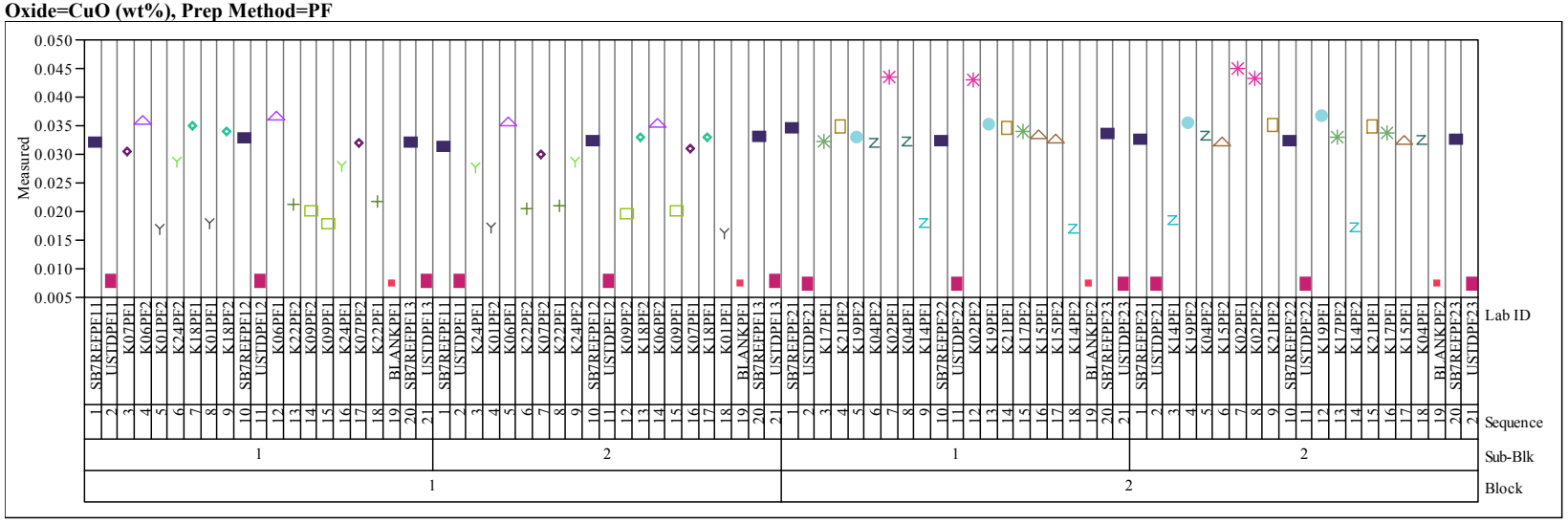
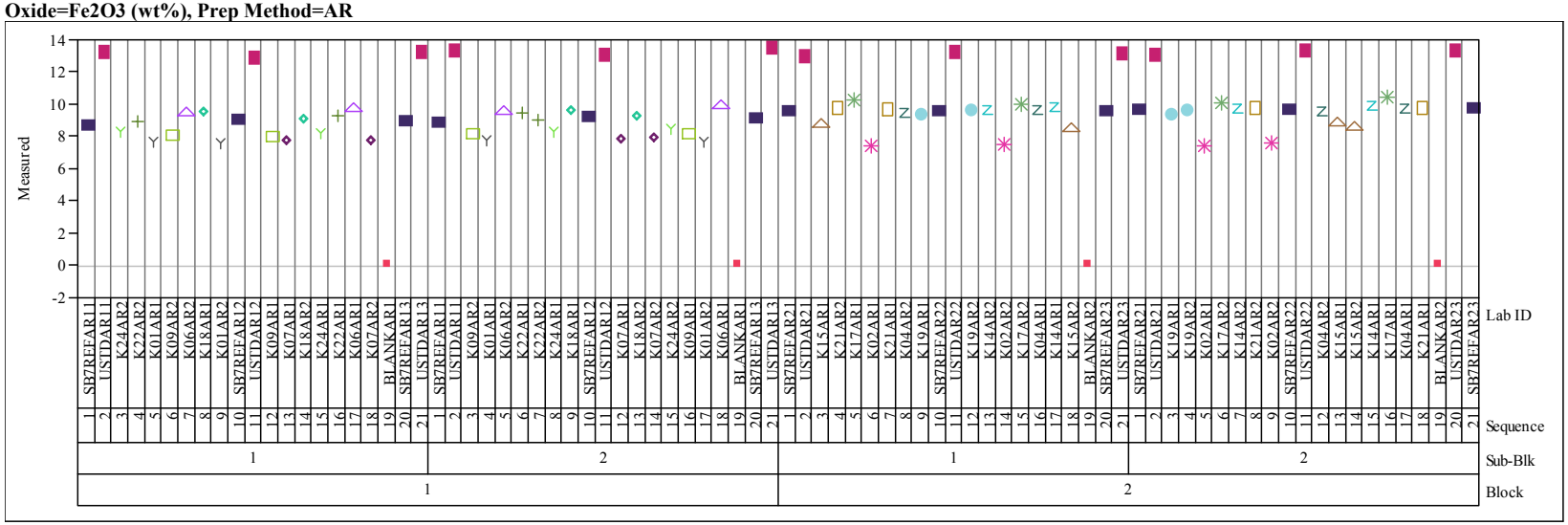


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 1 and 2

Oxide=Fe2O3 (wt%), Prep Method=AR



Oxide=Fe2O3 (wt%), Prep Method=PF

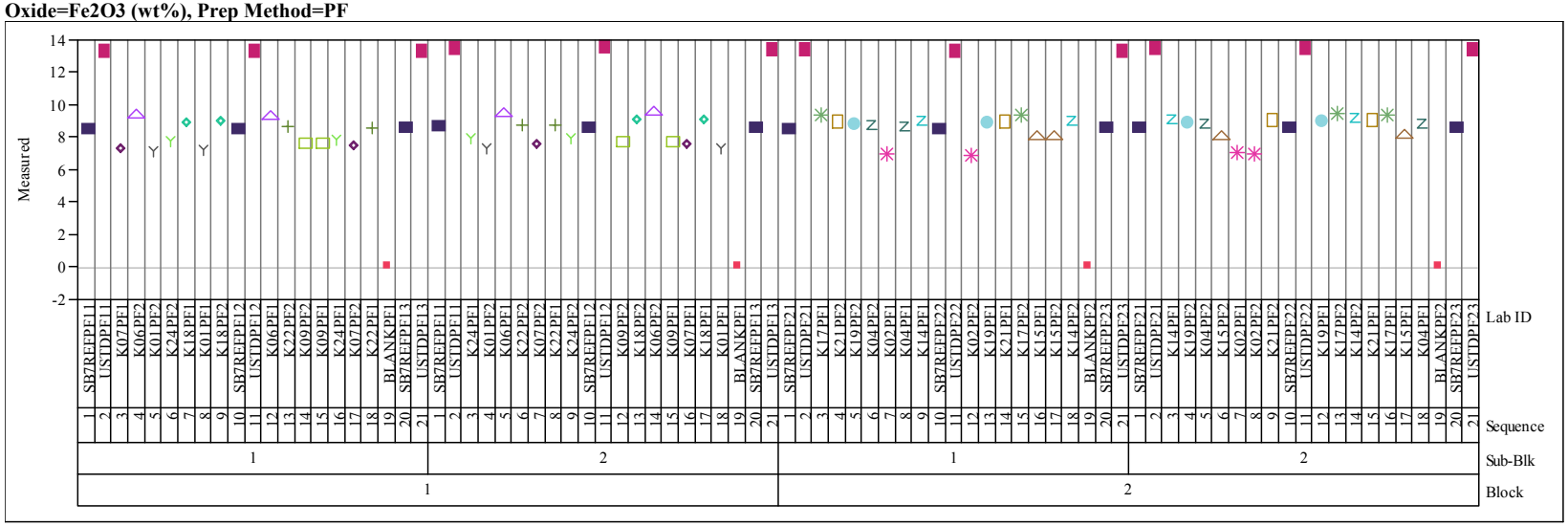
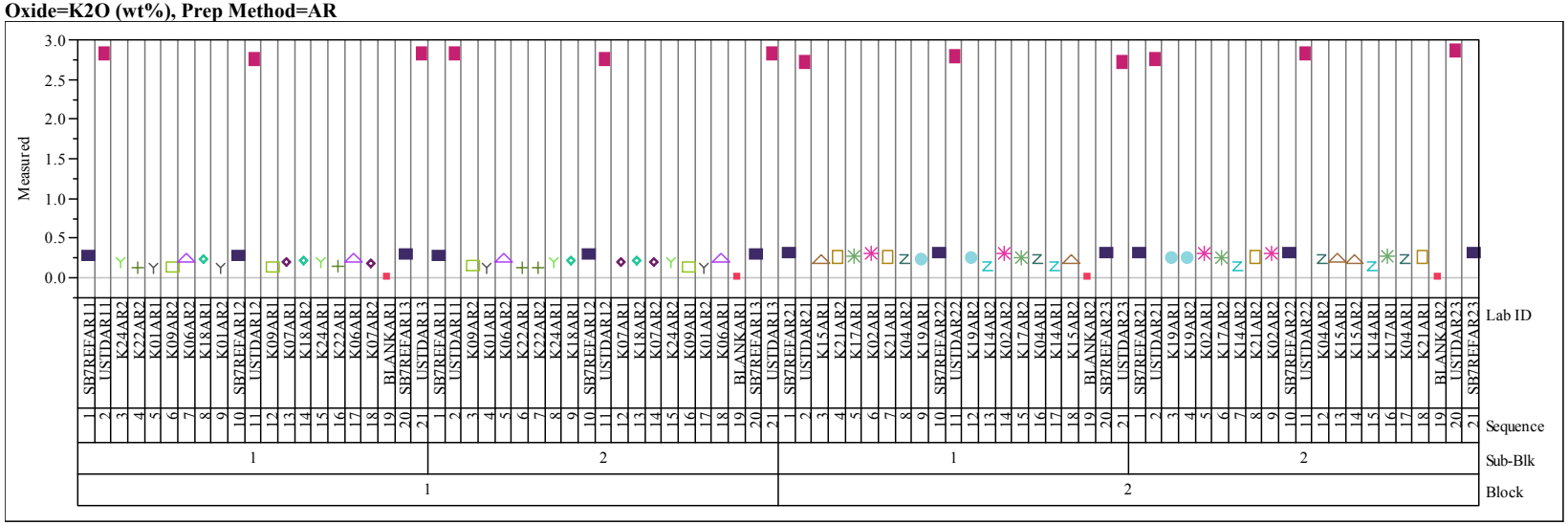


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 1 and 2

Oxide=K2O (wt%), Prep Method=AR



Oxide=K2O (wt%), Prep Method=PF

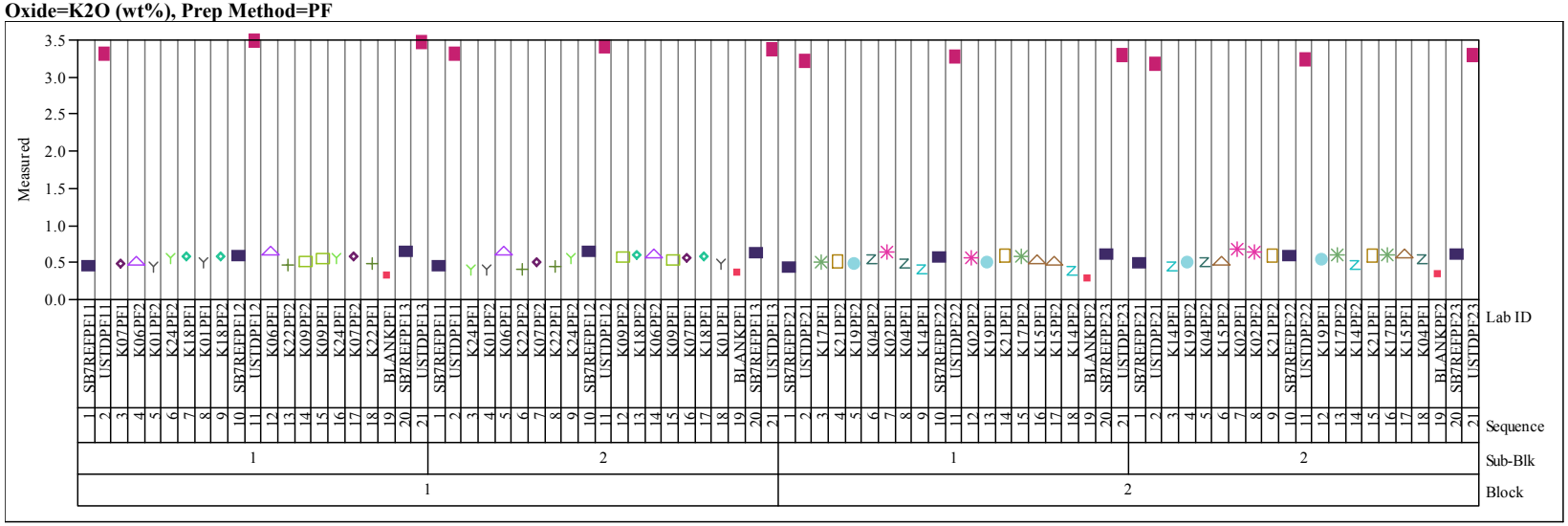
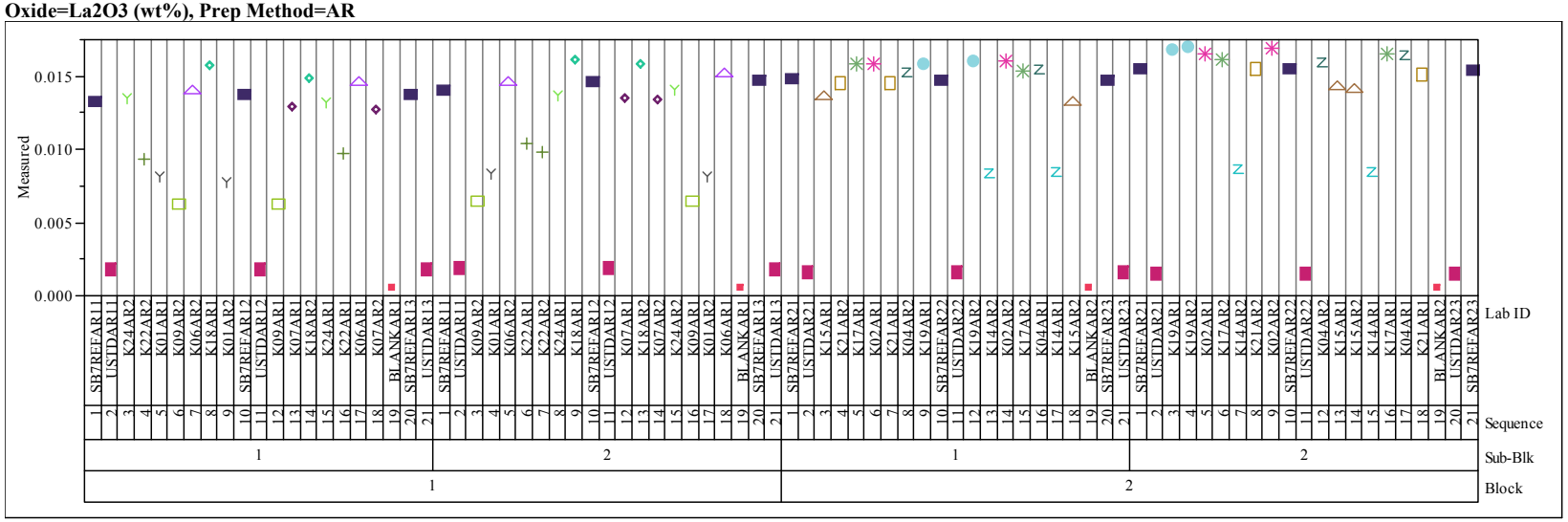


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 1 and 2

Oxide=La2O3 (wt%), Prep Method=AR



Oxide=La2O3 (wt%), Prep Method=PF

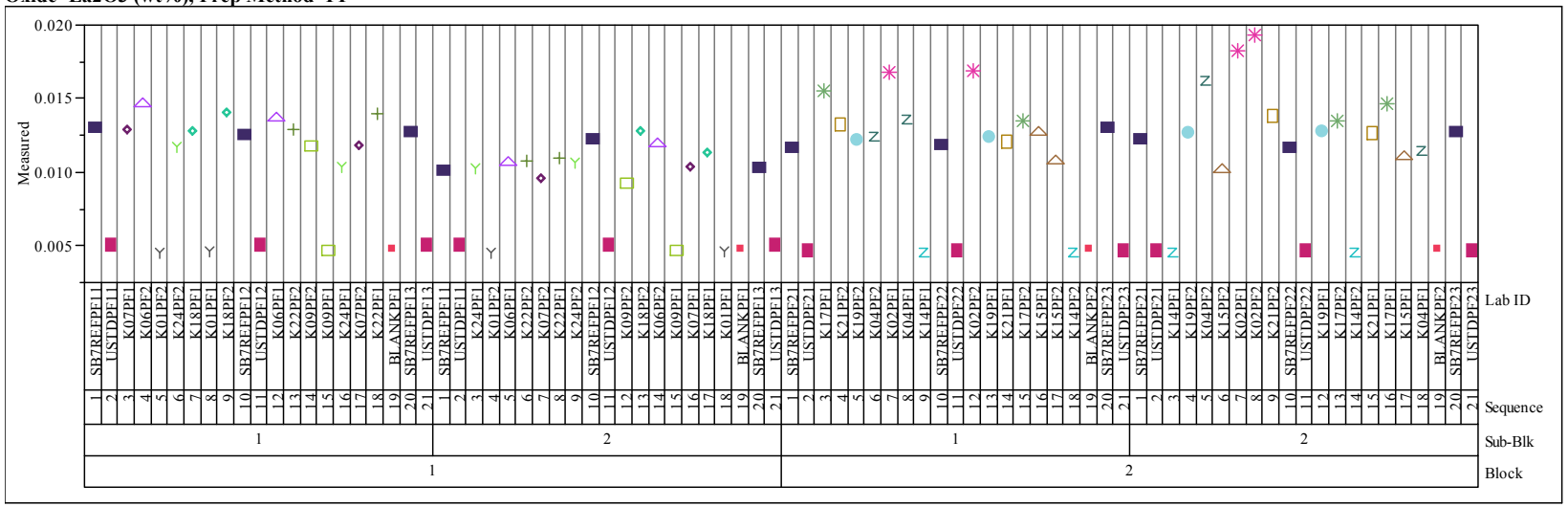
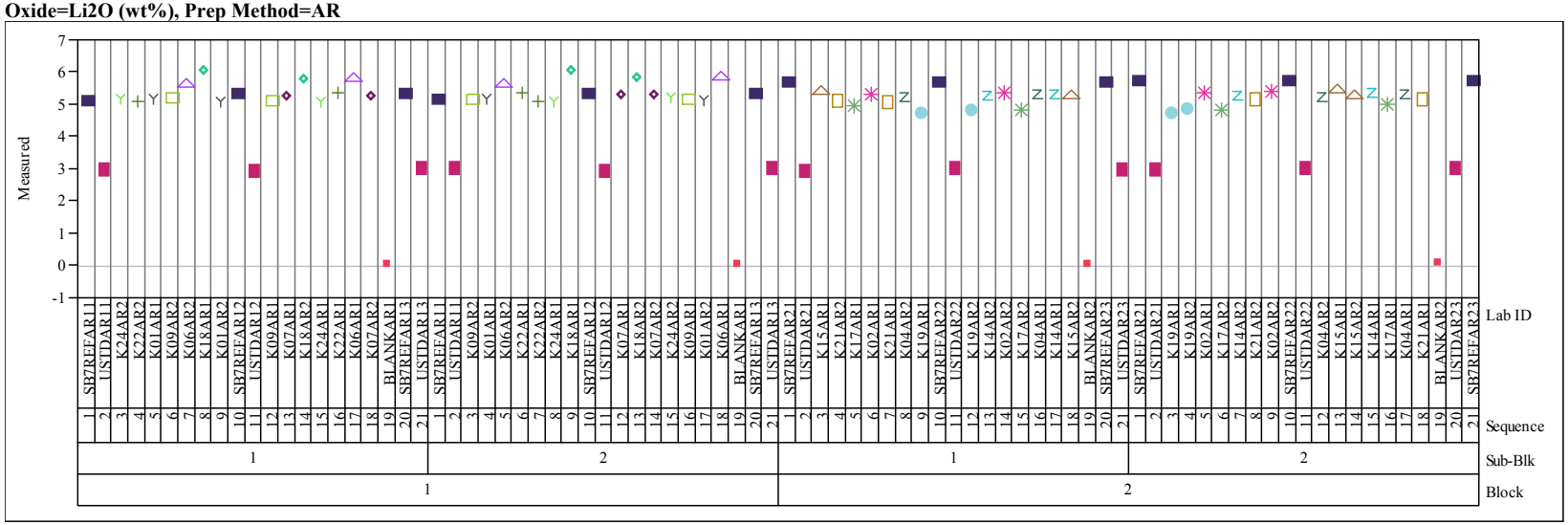


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 1 and 2

Oxide=Li2O (wt%), Prep Method=AR



Oxide=Li2O (wt%), Prep Method=PF

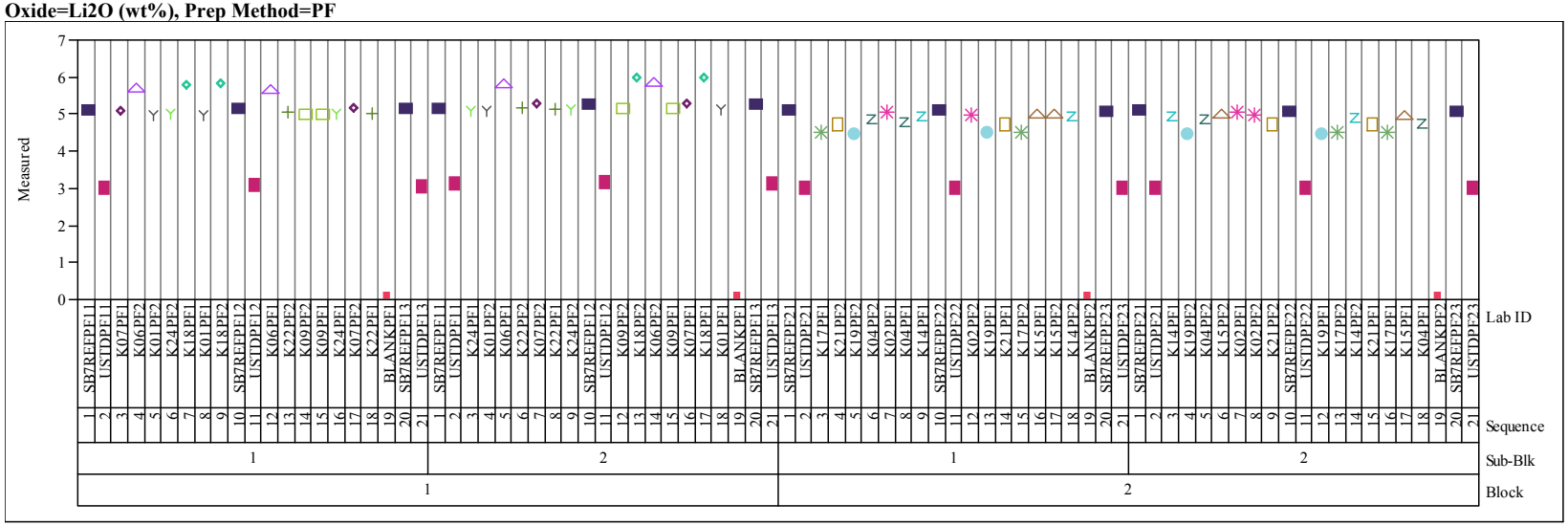
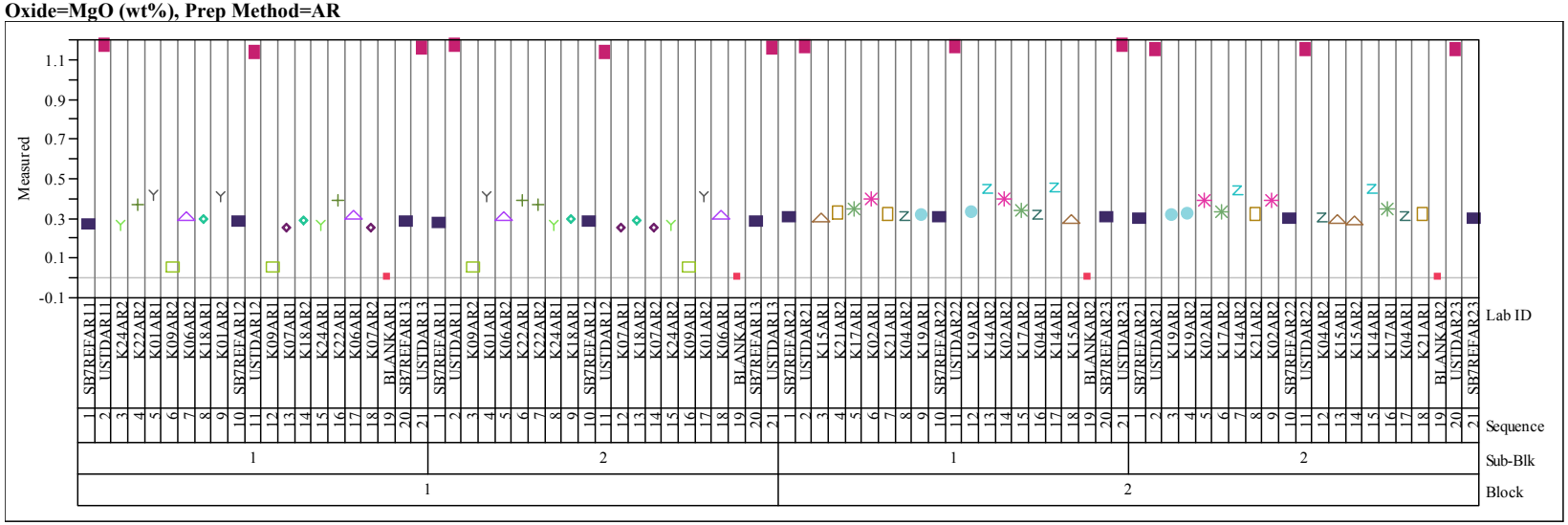


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 1 and 2

Oxide=MgO (wt%), Prep Method=AR



Oxide=MgO (wt%), Prep Method=PF

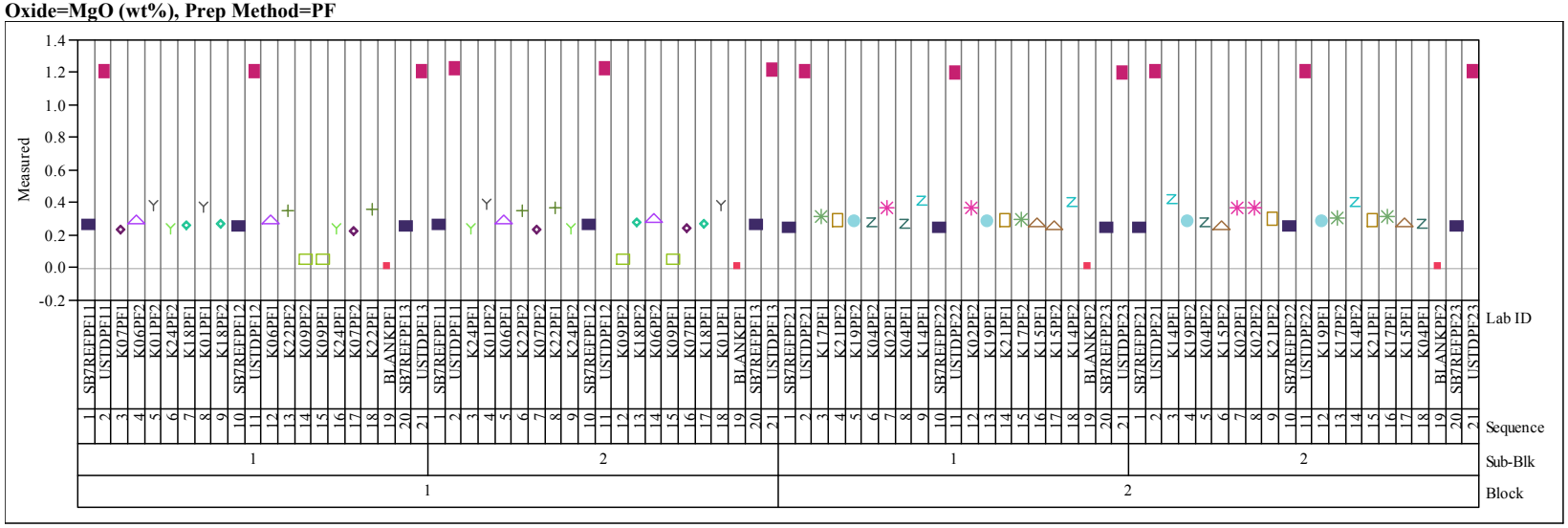
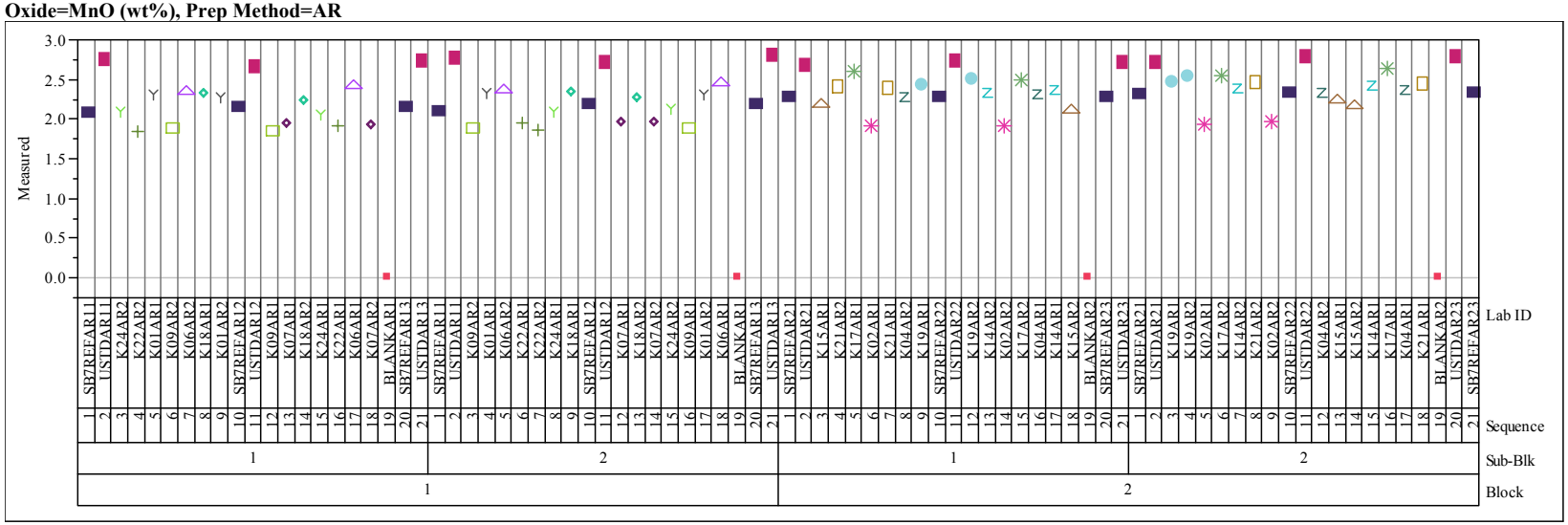


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 1 and 2

Oxide=MnO (wt%), Prep Method=AR



Oxide=MnO (wt%), Prep Method=PF

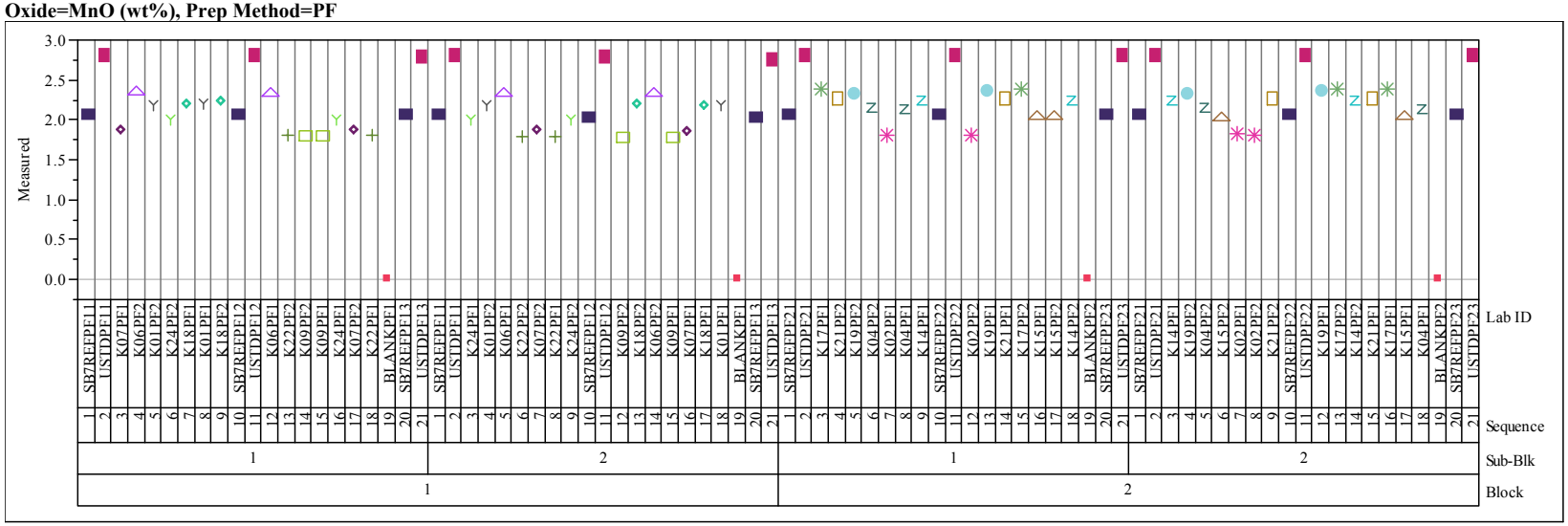
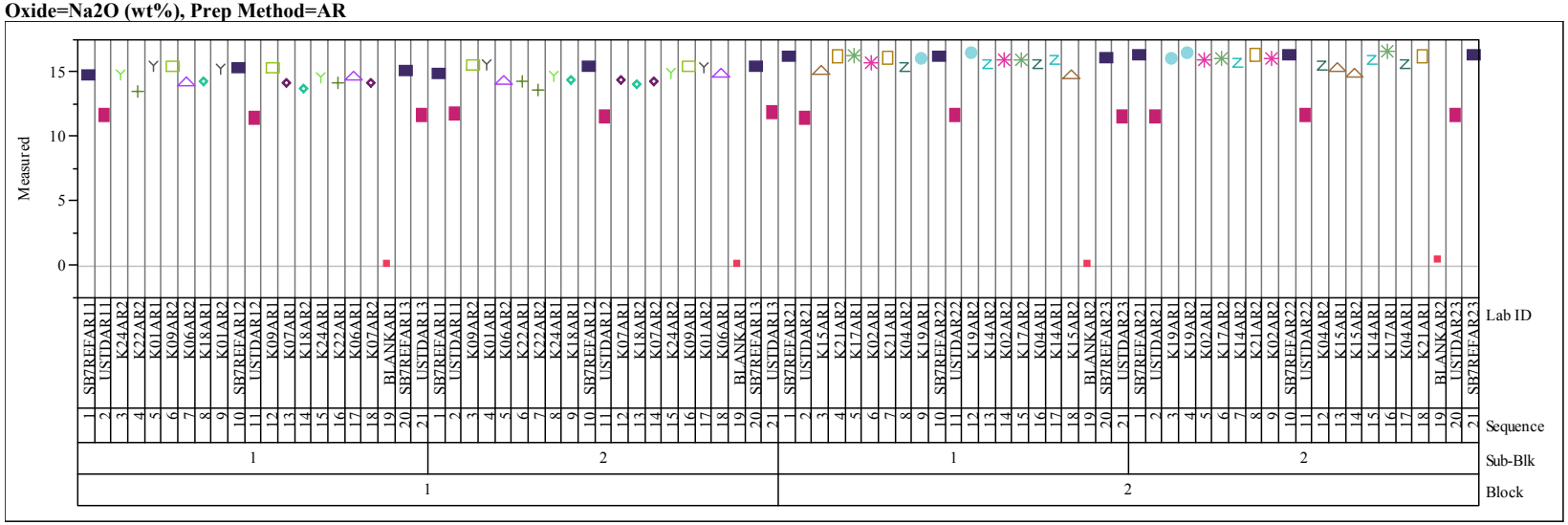


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 1 and 2

Oxide=Na2O (wt%), Prep Method=AR



Oxide=NiO (wt%), Prep Method=AR

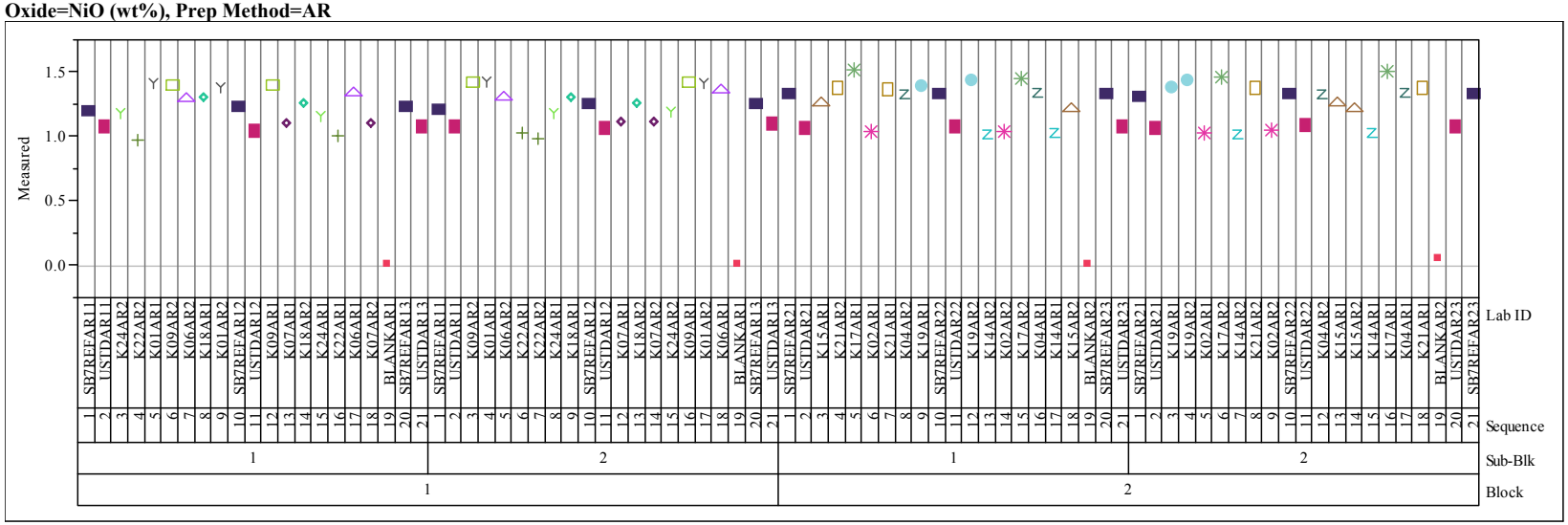
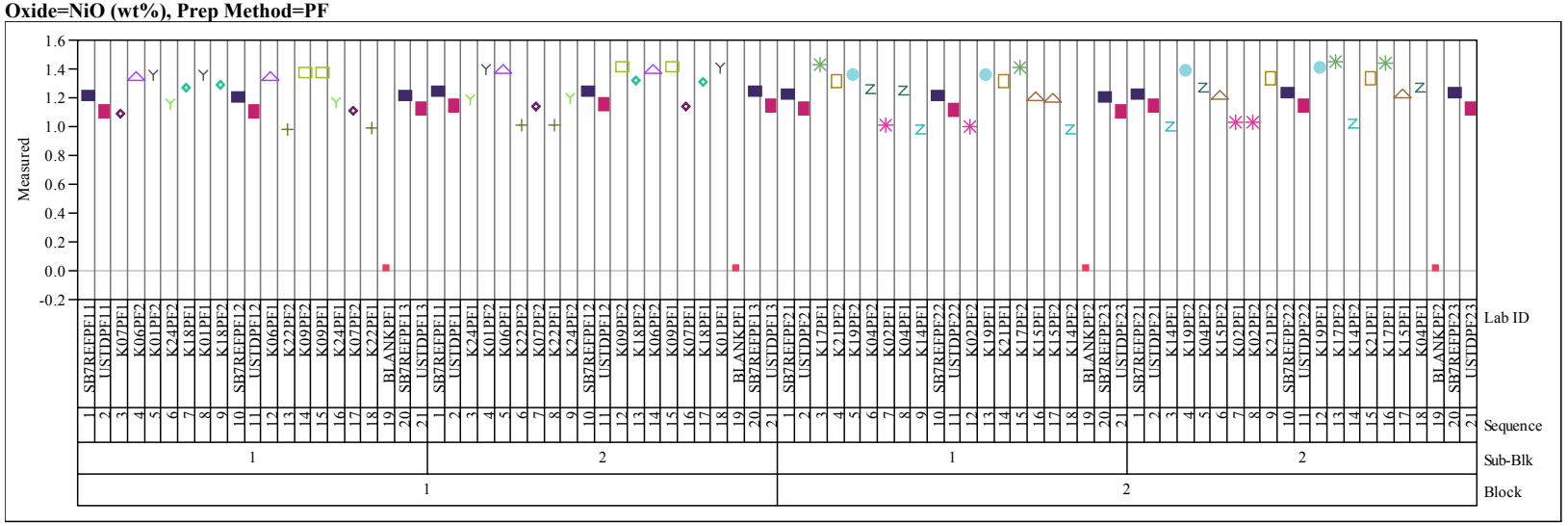


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 1 and 2

Oxide=NiO (wt%), Prep Method=PF



Oxide=PbO (wt%), Prep Method=AR

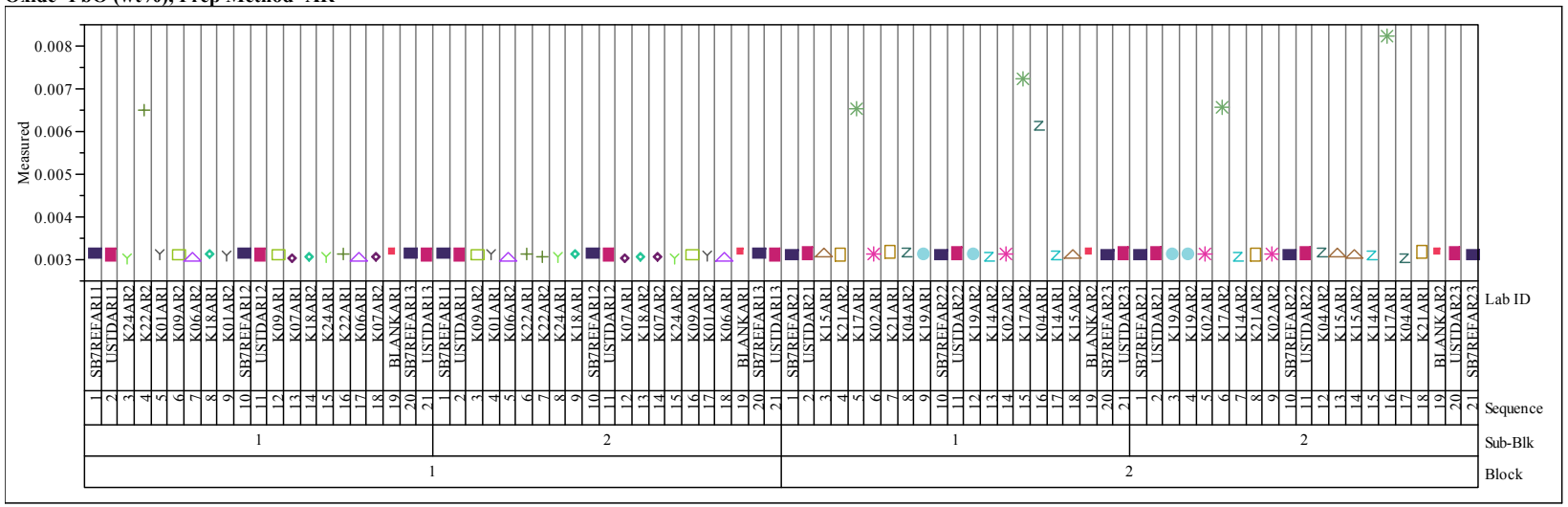
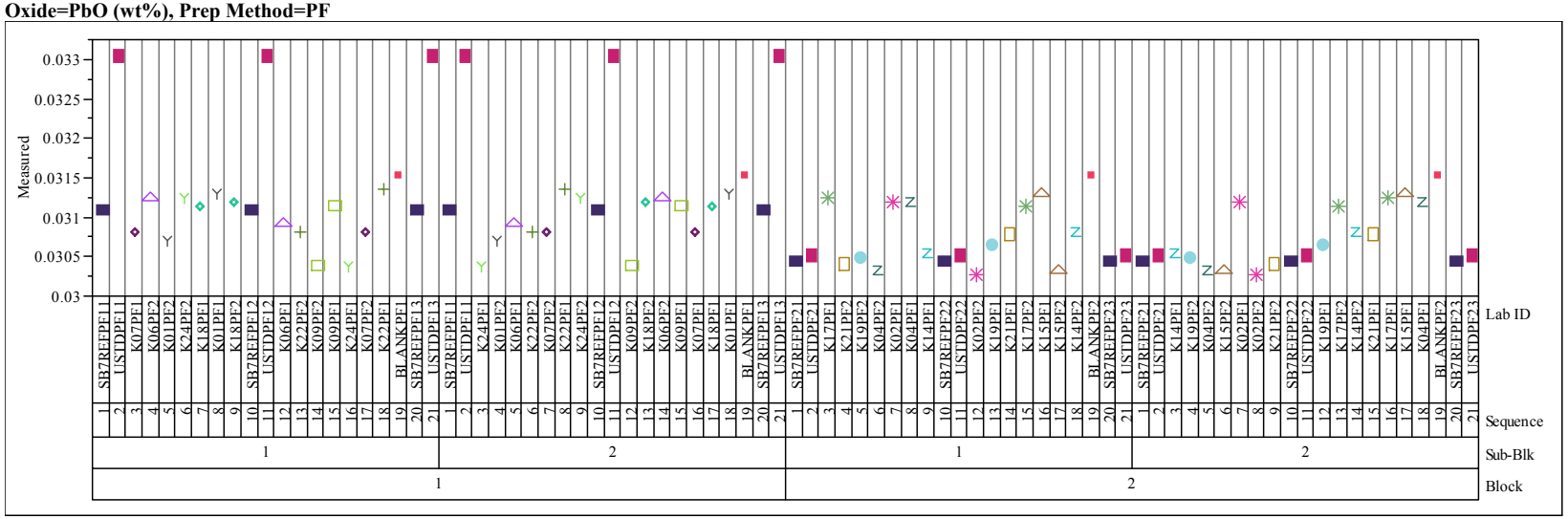


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 1 and 2

Oxide=PbO (wt%), Prep Method=PF



Oxide=SiO2 (wt%), Prep Method=PF

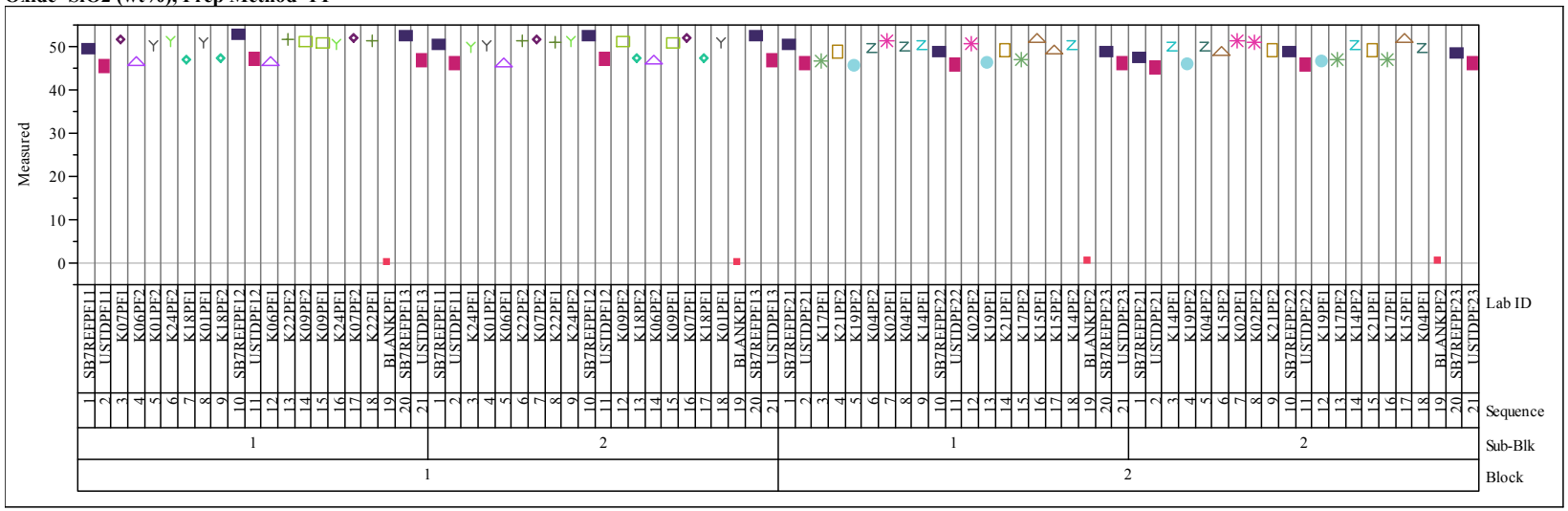
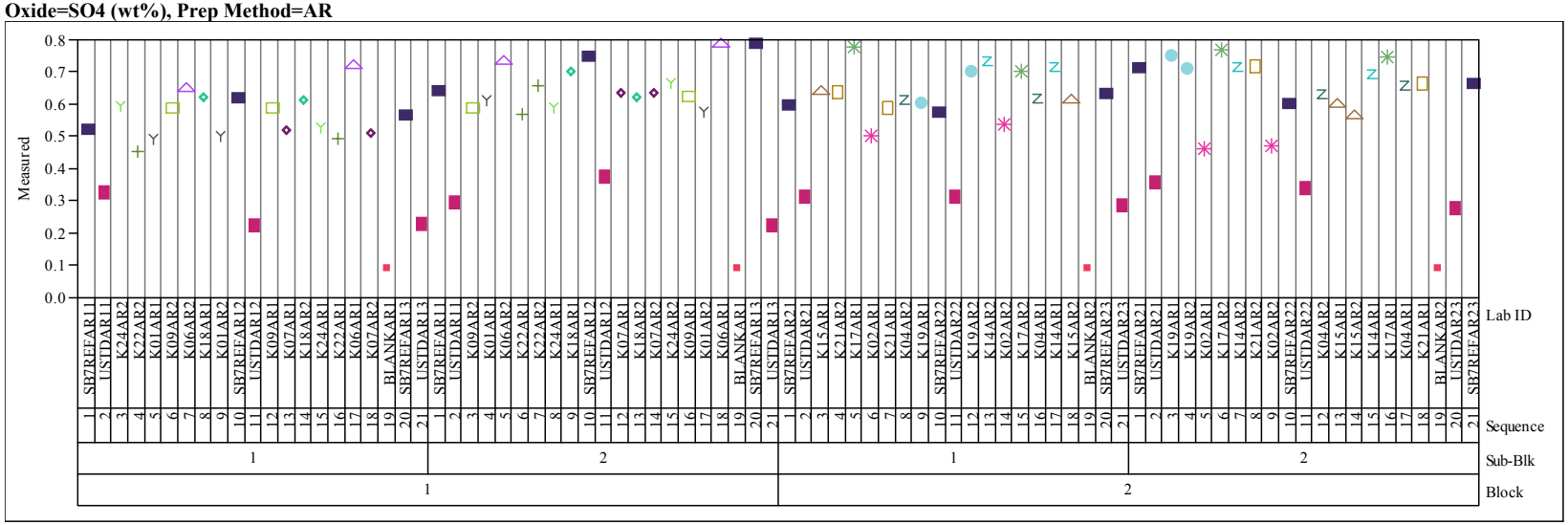


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 1 and 2

Oxide=SO4 (wt%), Prep Method=AR



Oxide=SO4 (wt%), Prep Method=PF

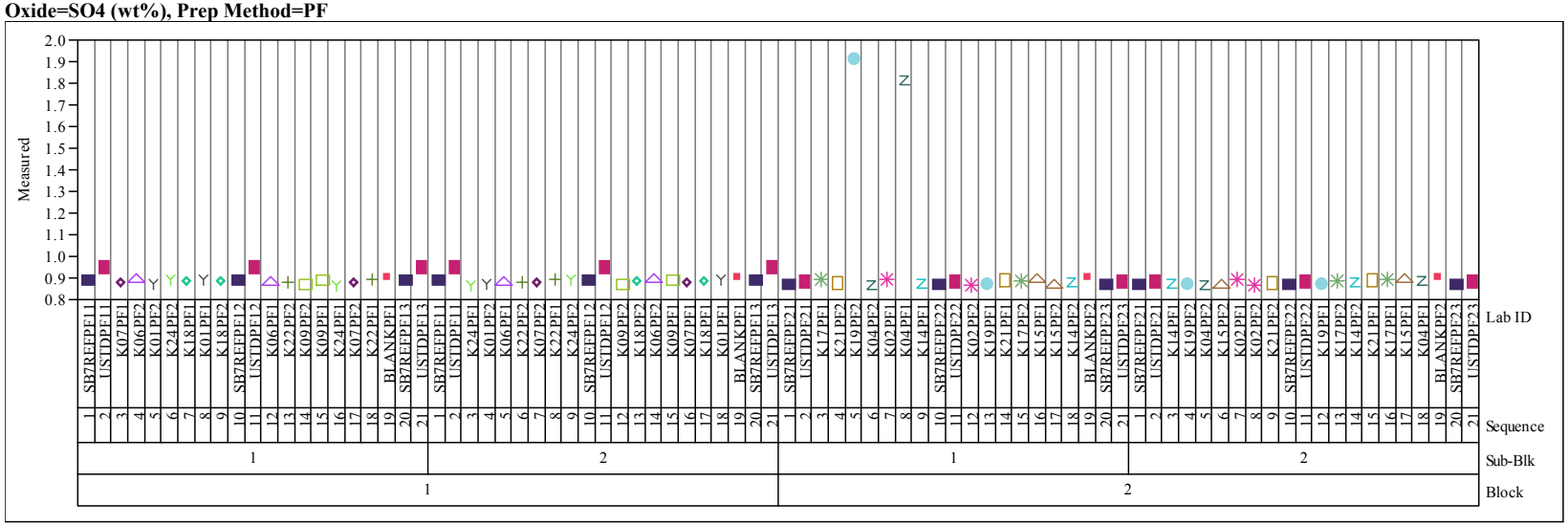
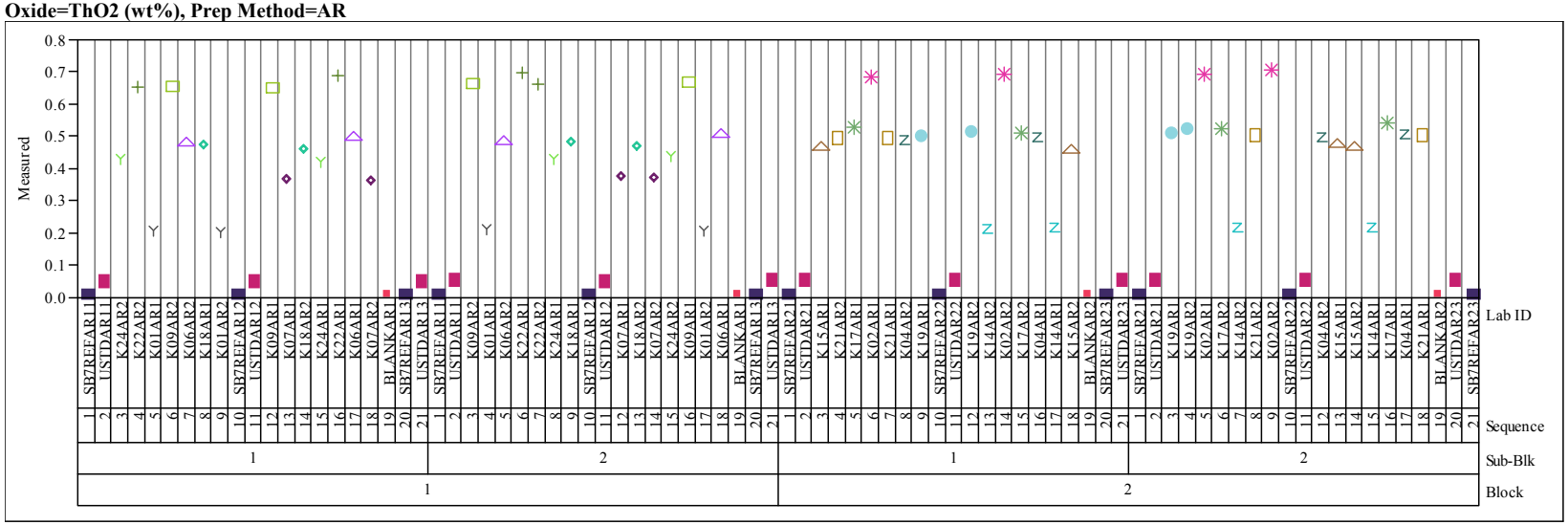


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 1 and 2

Oxide=ThO2 (wt%), Prep Method=AR



Oxide=ThO2 (wt%), Prep Method=PF

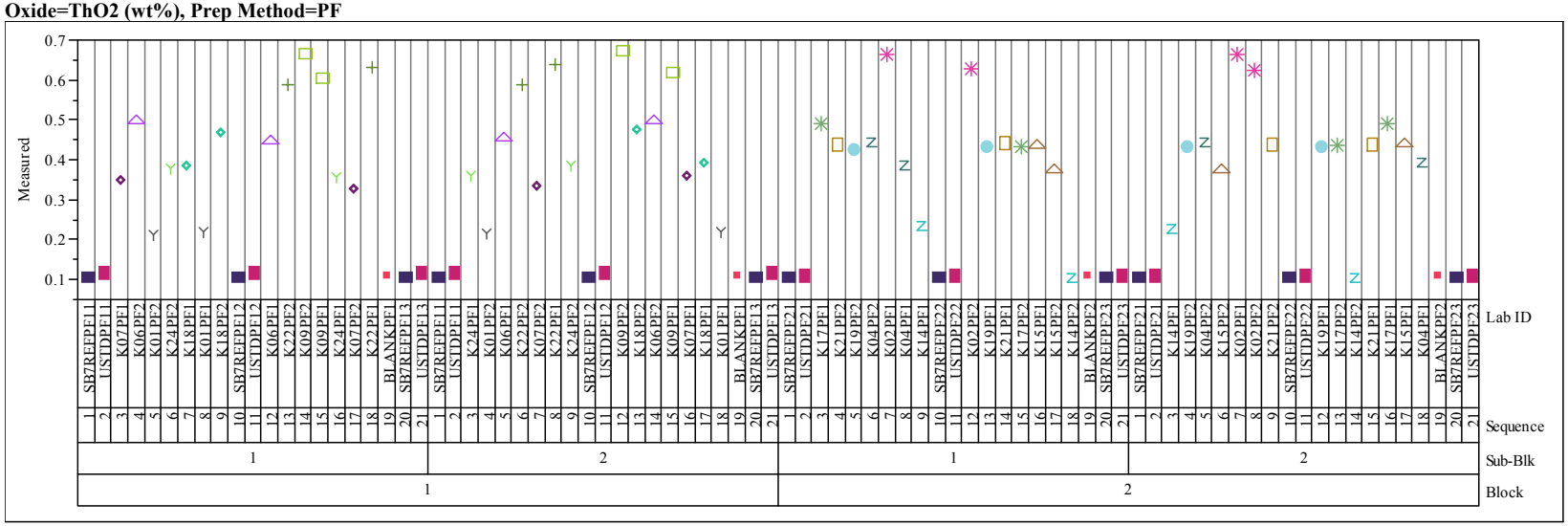
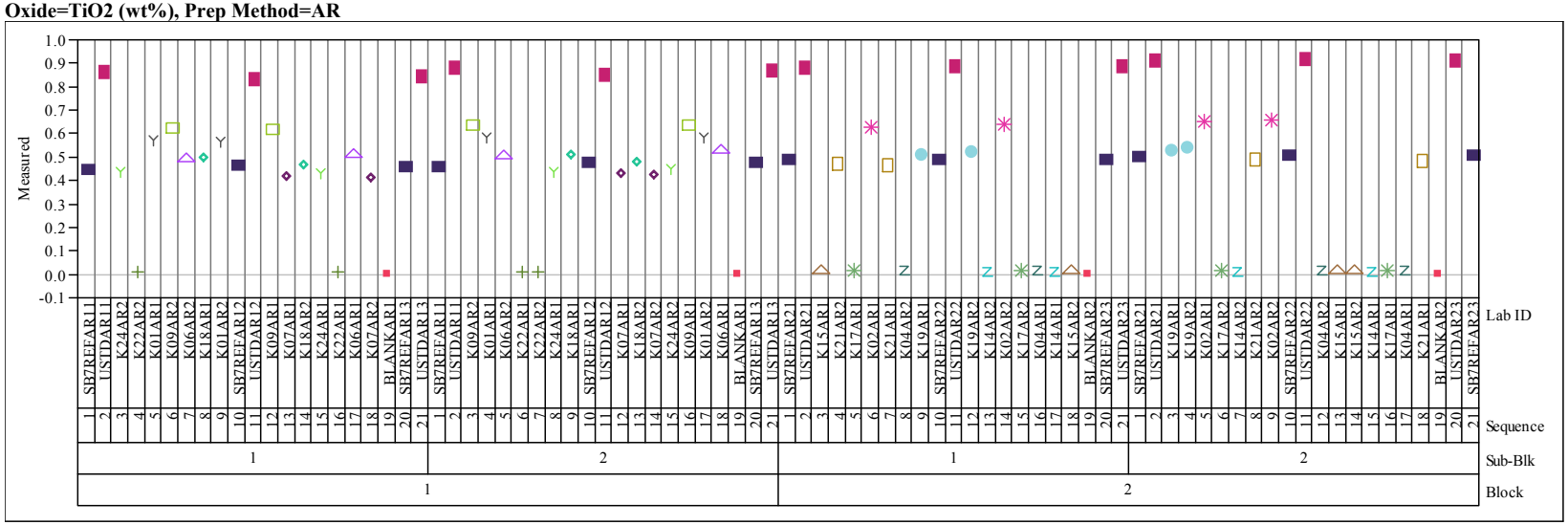


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 1 and 2

Oxide=TiO2 (wt%), Prep Method=AR



Oxide=TiO2 (wt%), Prep Method=PF

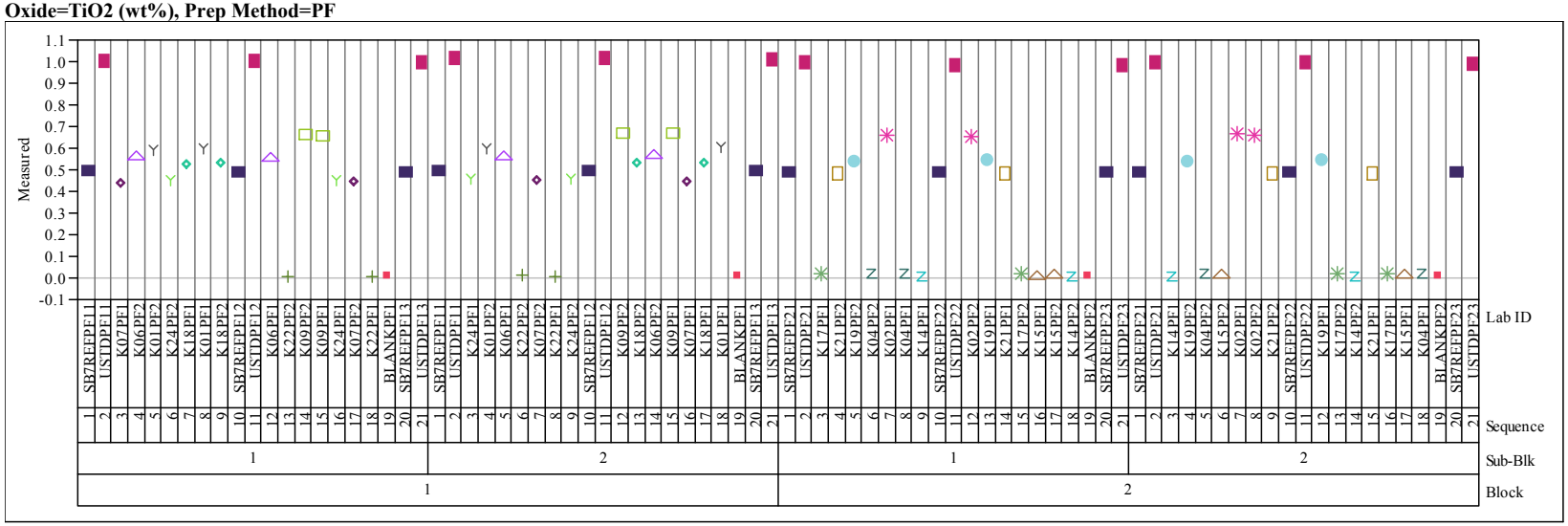
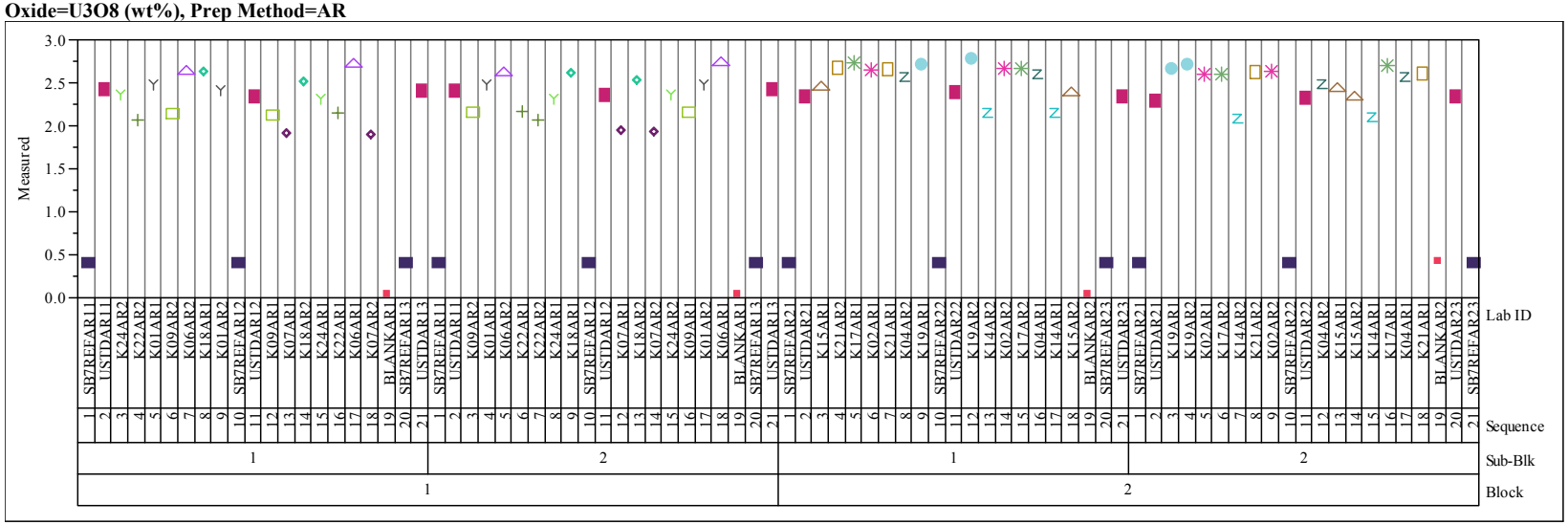


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 1 and 2

Oxide=U3O8 (wt%), Prep Method=AR



Oxide=U3O8 (wt%), Prep Method=PF

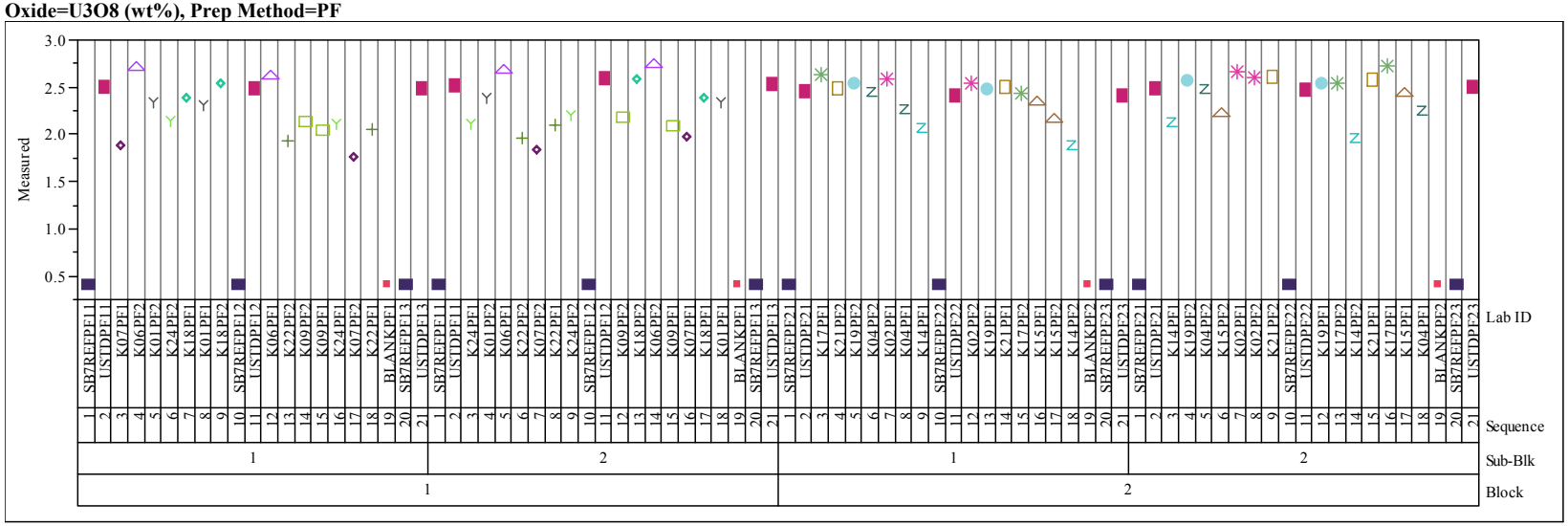
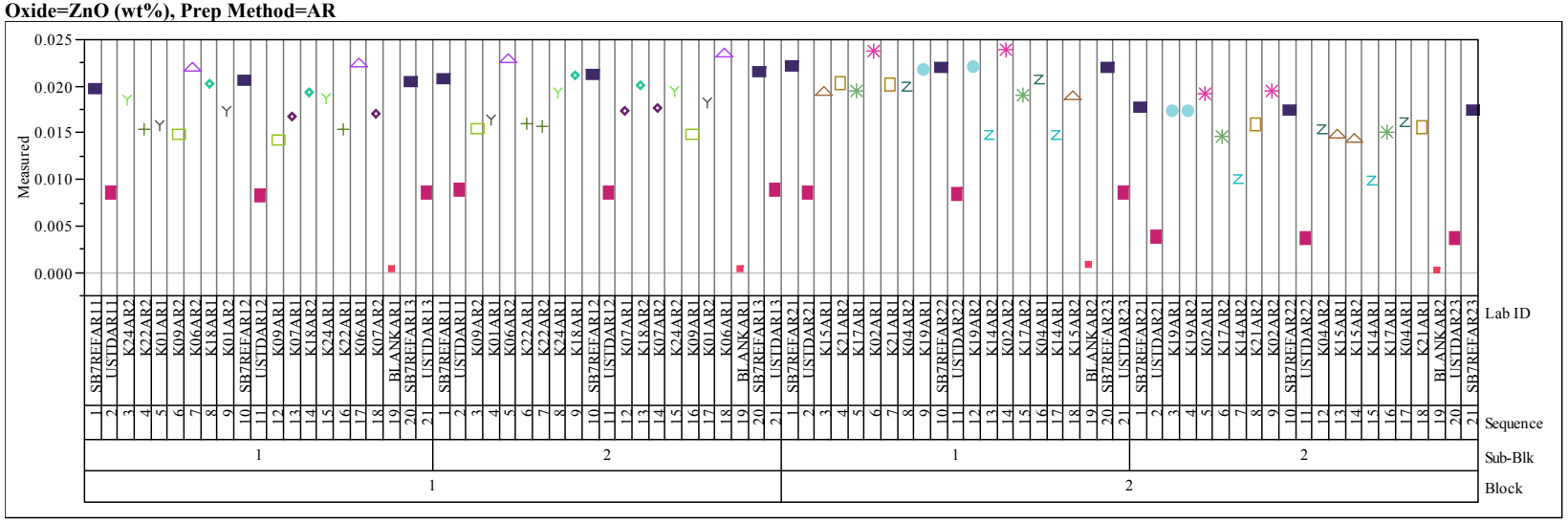


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 1 and 2

Oxide=ZnO (wt%), Prep Method=AR



Oxide=ZnO (wt%), Prep Method=PF

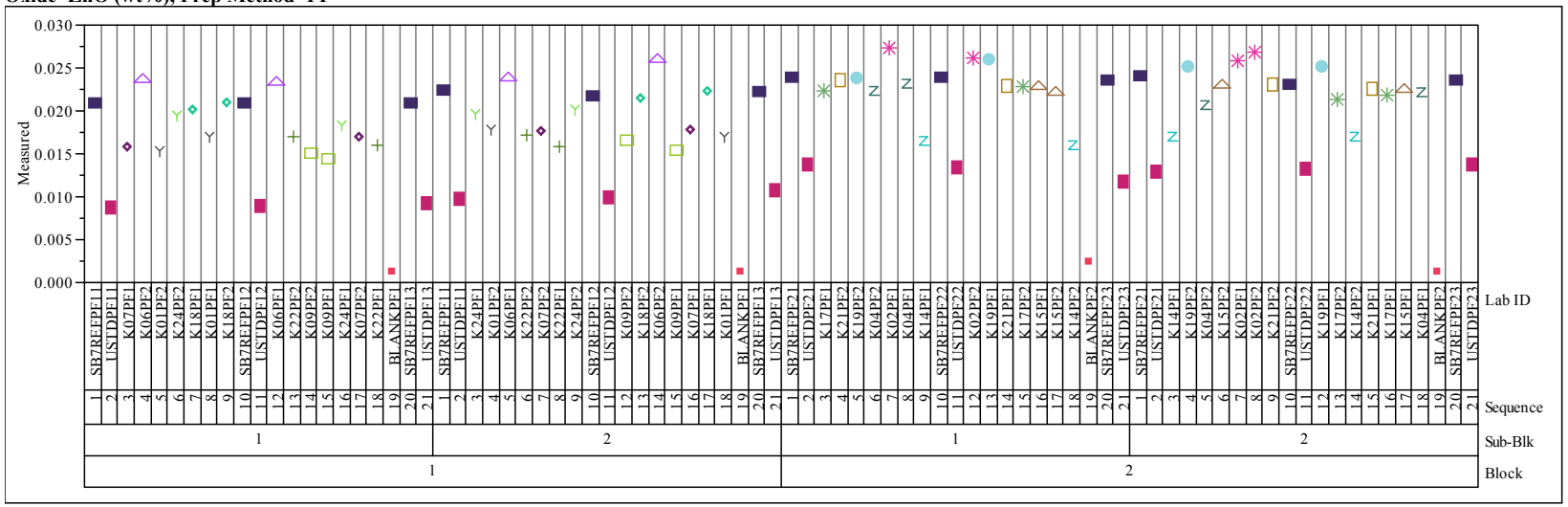


Exhibit A1. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 1 and 2

Oxide=ZrO2 (wt%), Prep Method=AR

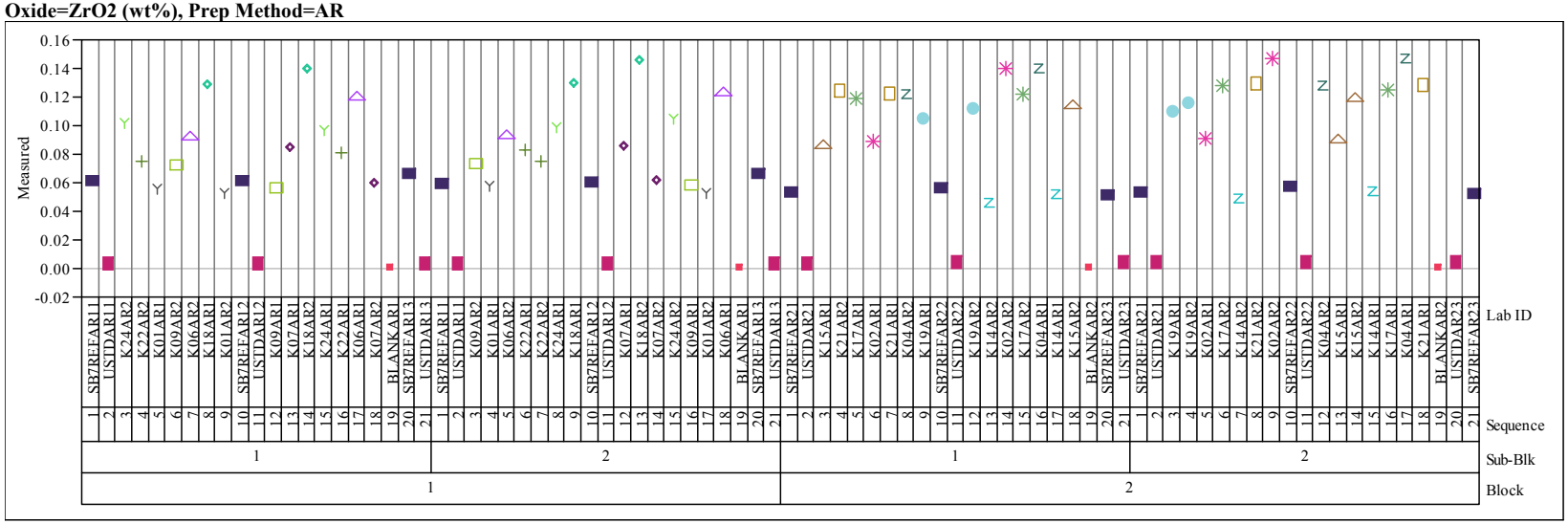
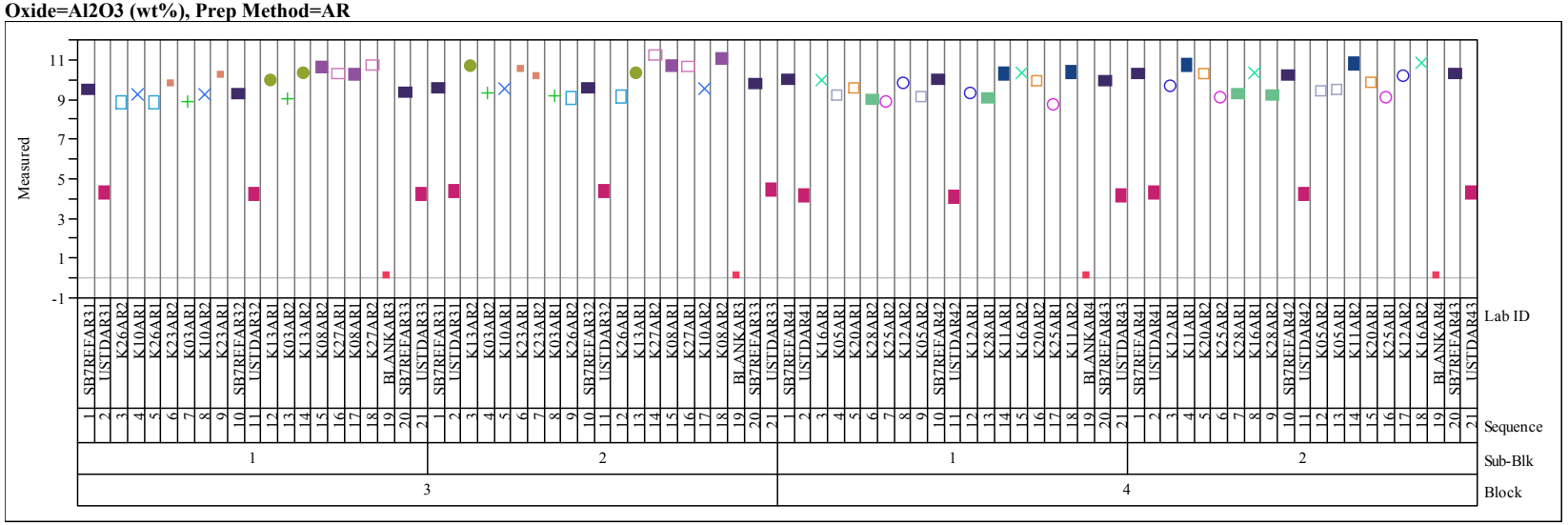


Exhibit A2. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 3 and 4

Oxide=Al2O3 (wt%), Prep Method=AR



Oxide=Al2O3 (wt%), Prep Method=PF

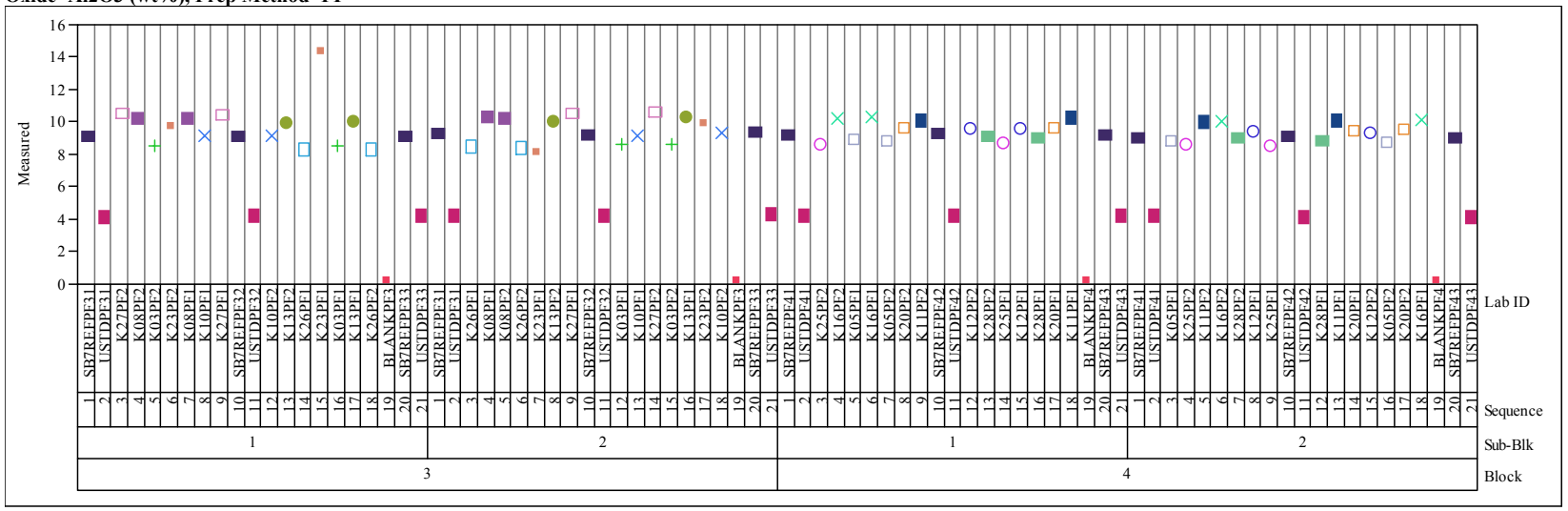
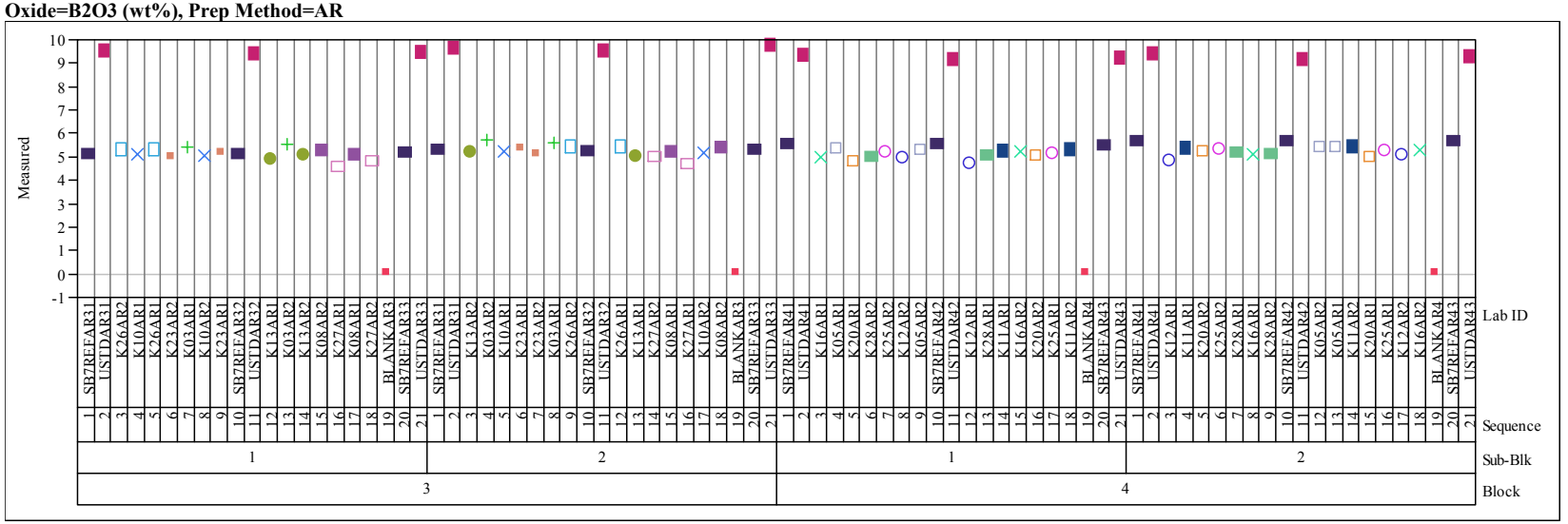


Exhibit A2. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 3 and 4

Oxide=B2O3 (wt%), Prep Method=AR



Oxide=B2O3 (wt%), Prep Method=PF

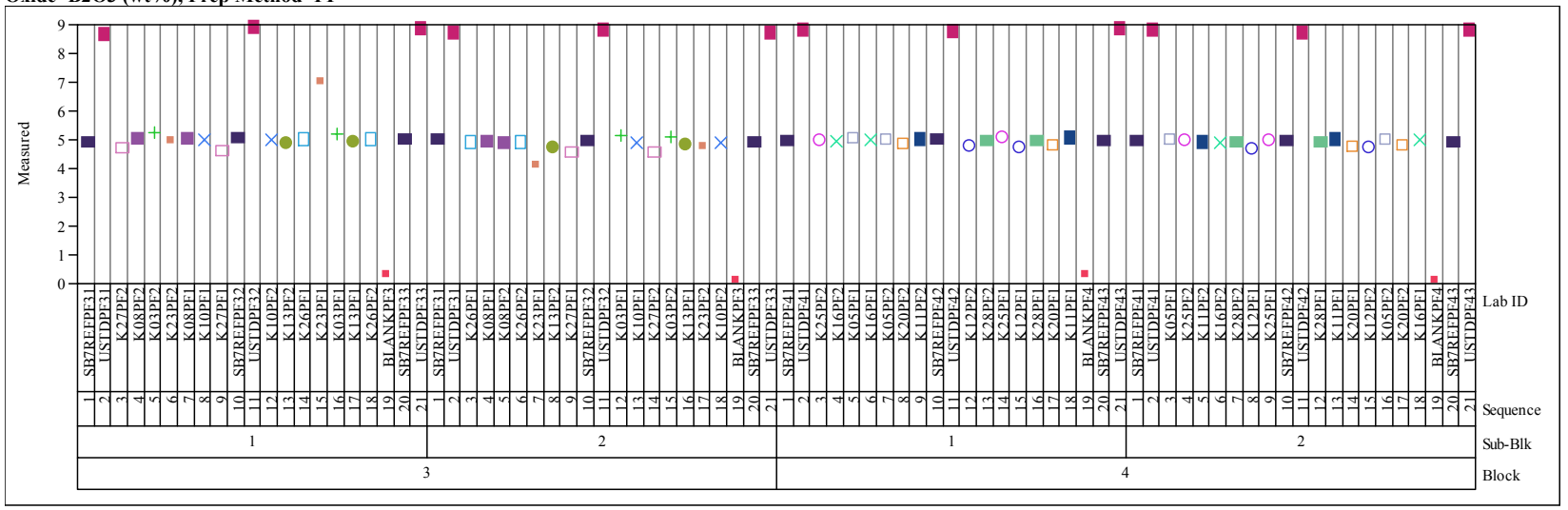
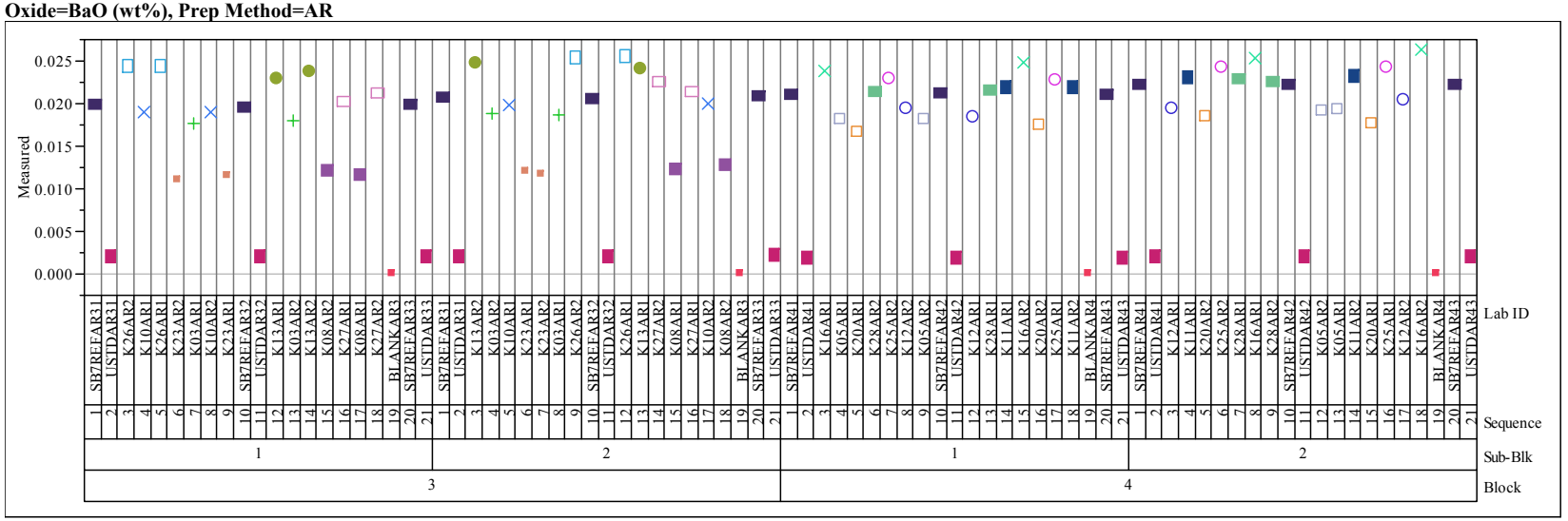


Exhibit A2. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 3 and 4

Oxide=BaO (wt%), Prep Method=AR



Oxide=BaO (wt%), Prep Method=PF

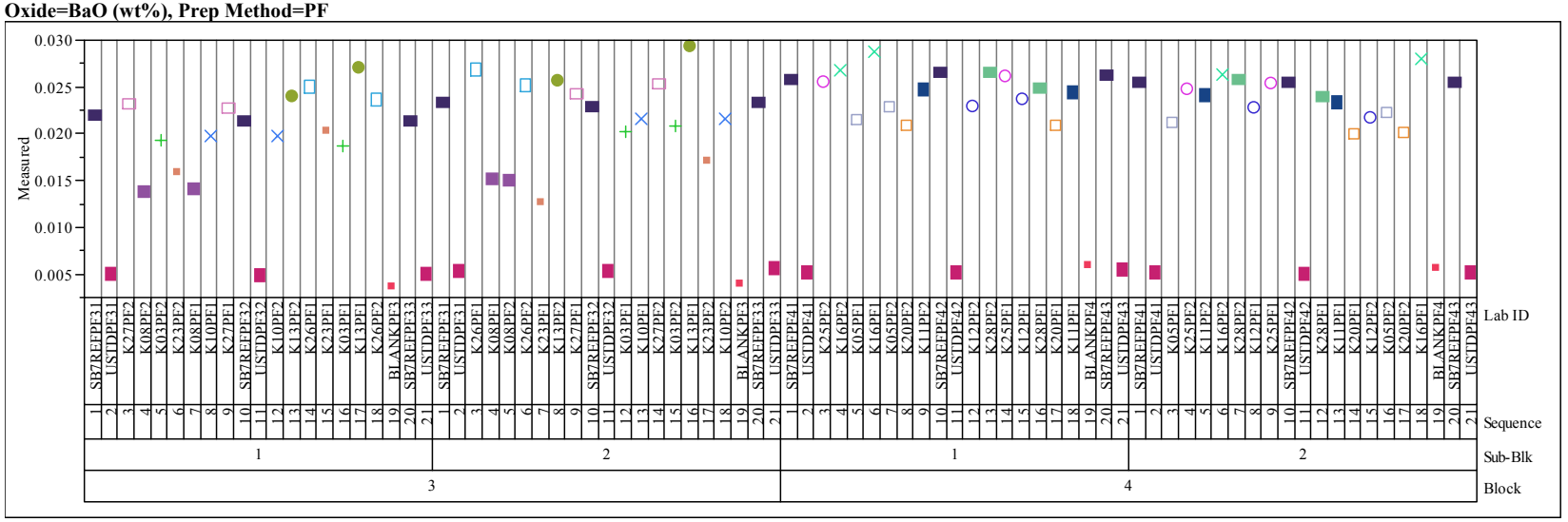
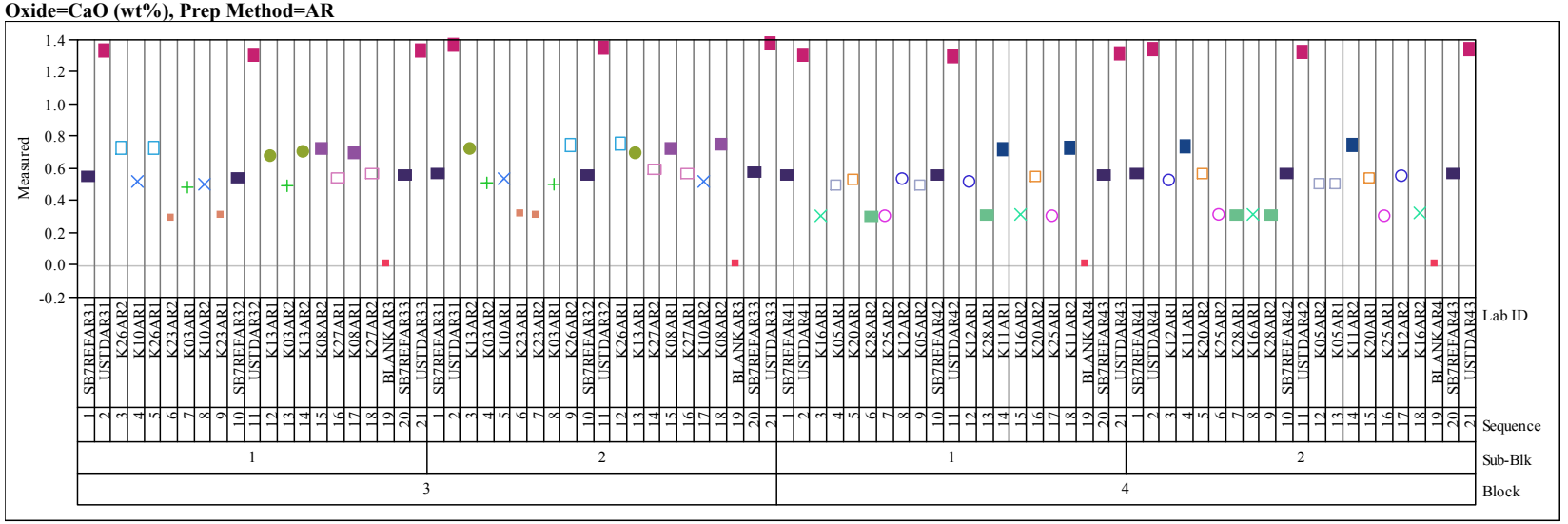


Exhibit A2. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 3 and 4

Oxide=CaO (wt%), Prep Method=AR



Oxide=CaO (wt%), Prep Method=PF

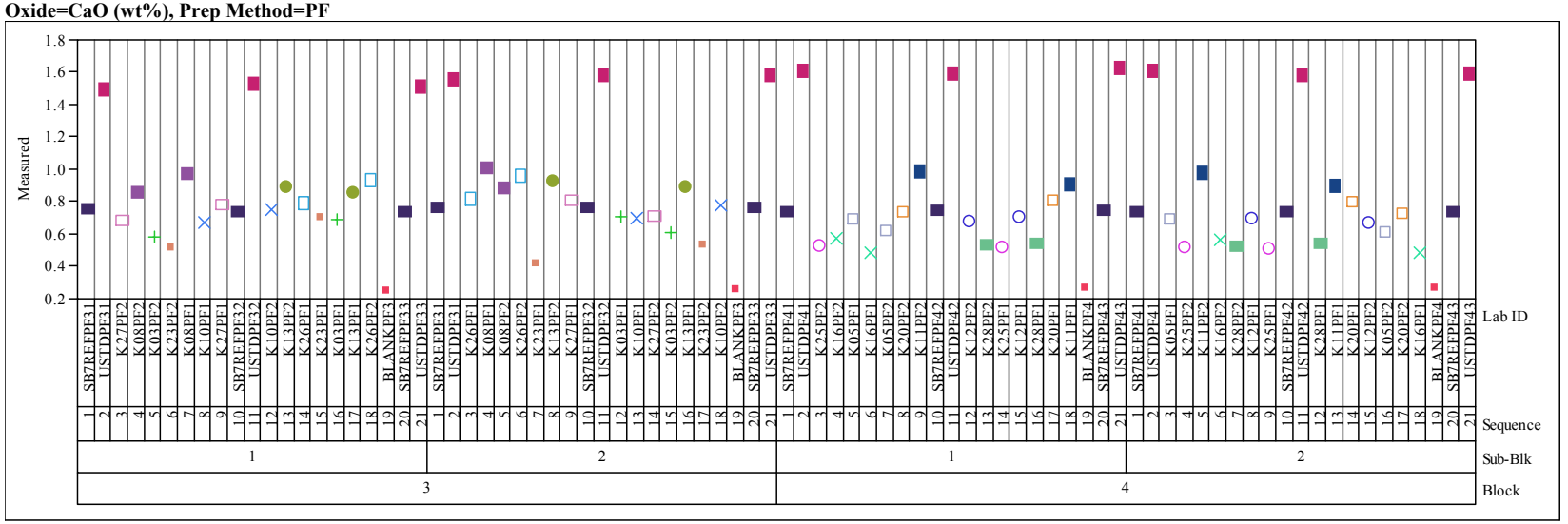
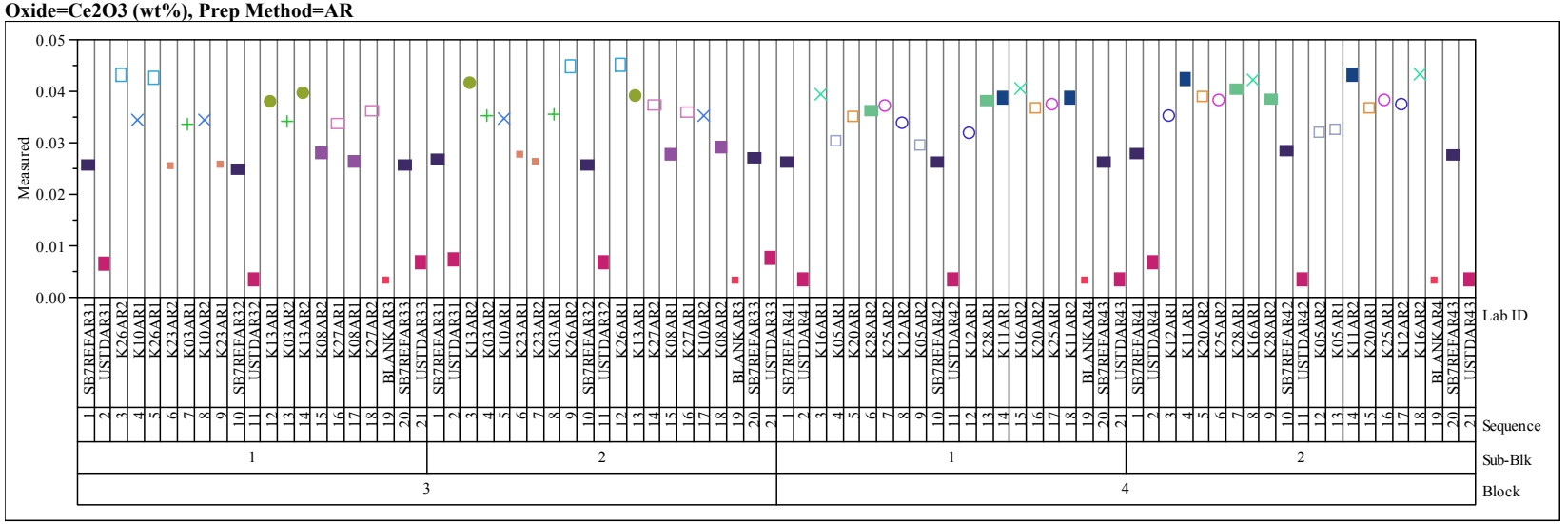


Exhibit A2. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 3 and 4

Oxide=Ce2O3 (wt%), Prep Method=AR



Oxide=Ce2O3 (wt%), Prep Method=PF

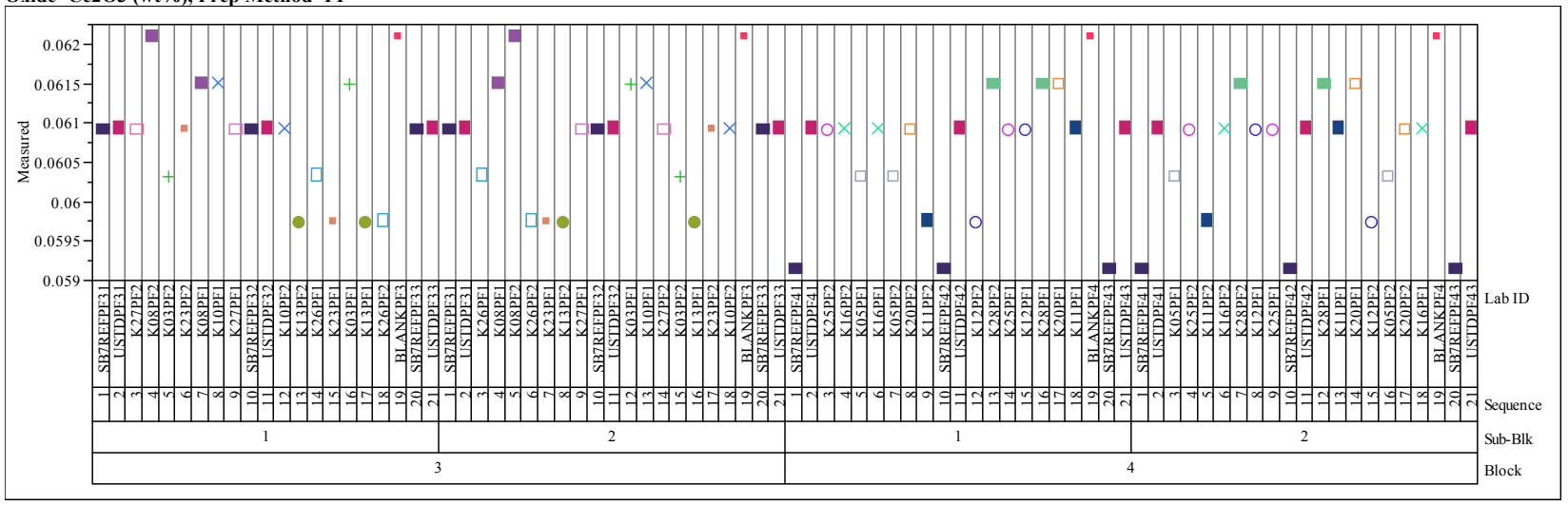
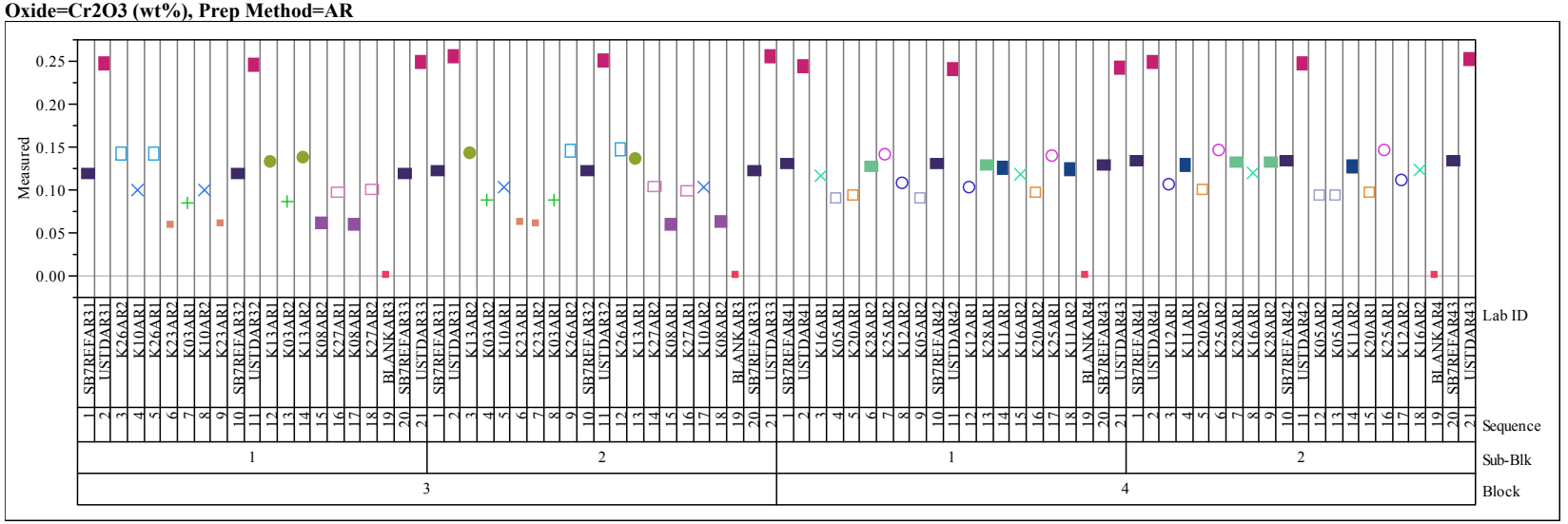


Exhibit A2. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 3 and 4

Oxide=Cr2O3 (wt%), Prep Method=AR



Oxide=Cr2O3 (wt%), Prep Method=PF

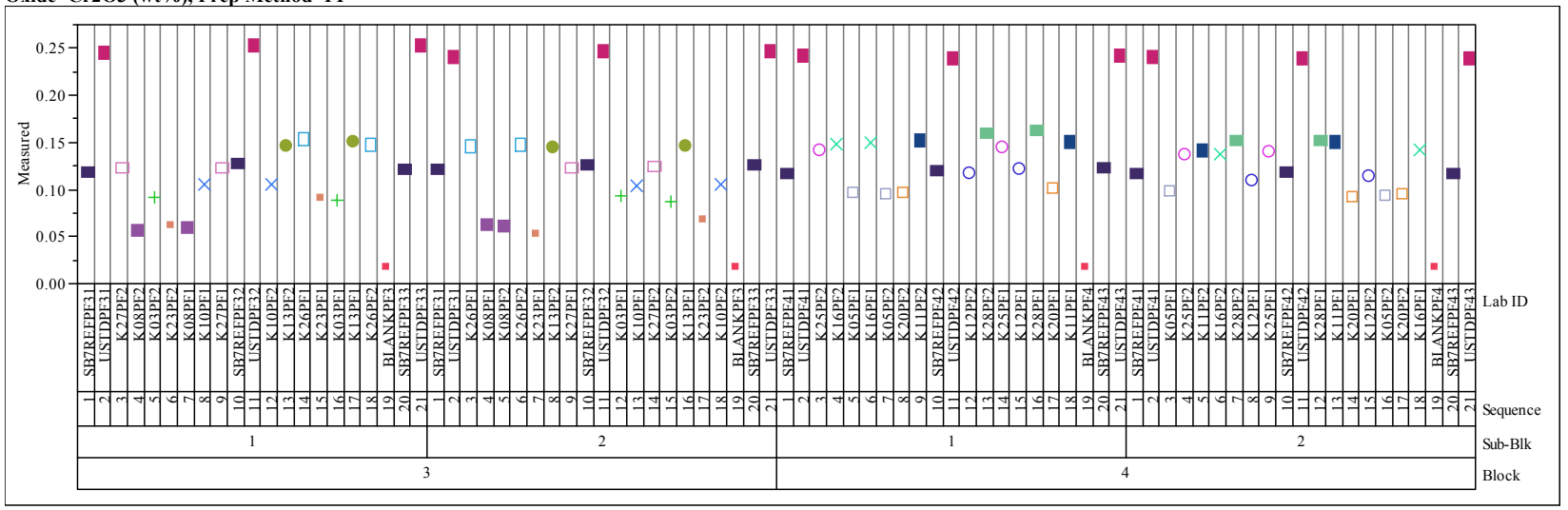
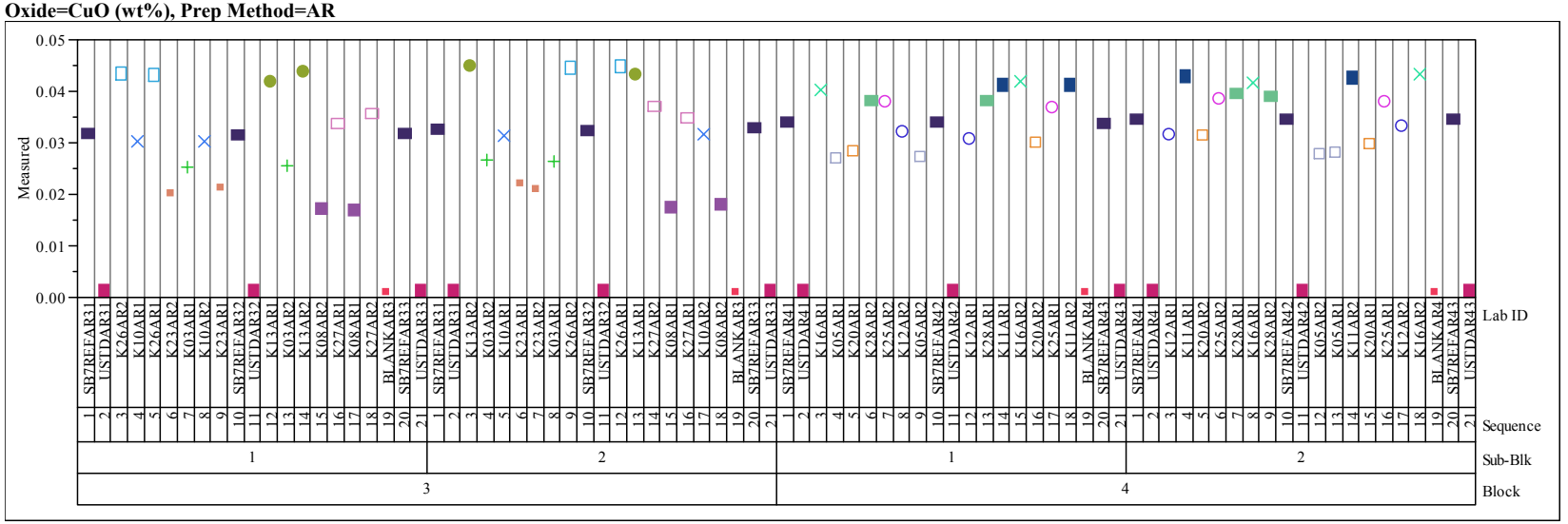


Exhibit A2. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 3 and 4

Oxide=CuO (wt%), Prep Method=AR



Oxide=CuO (wt%), Prep Method=PF

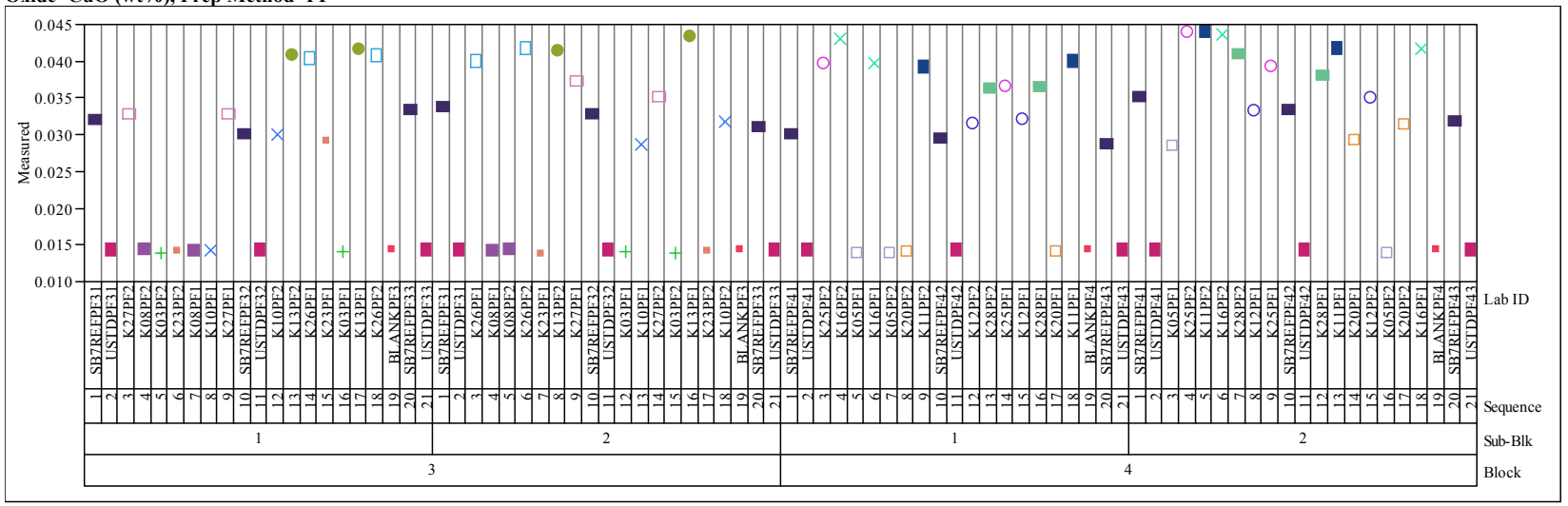
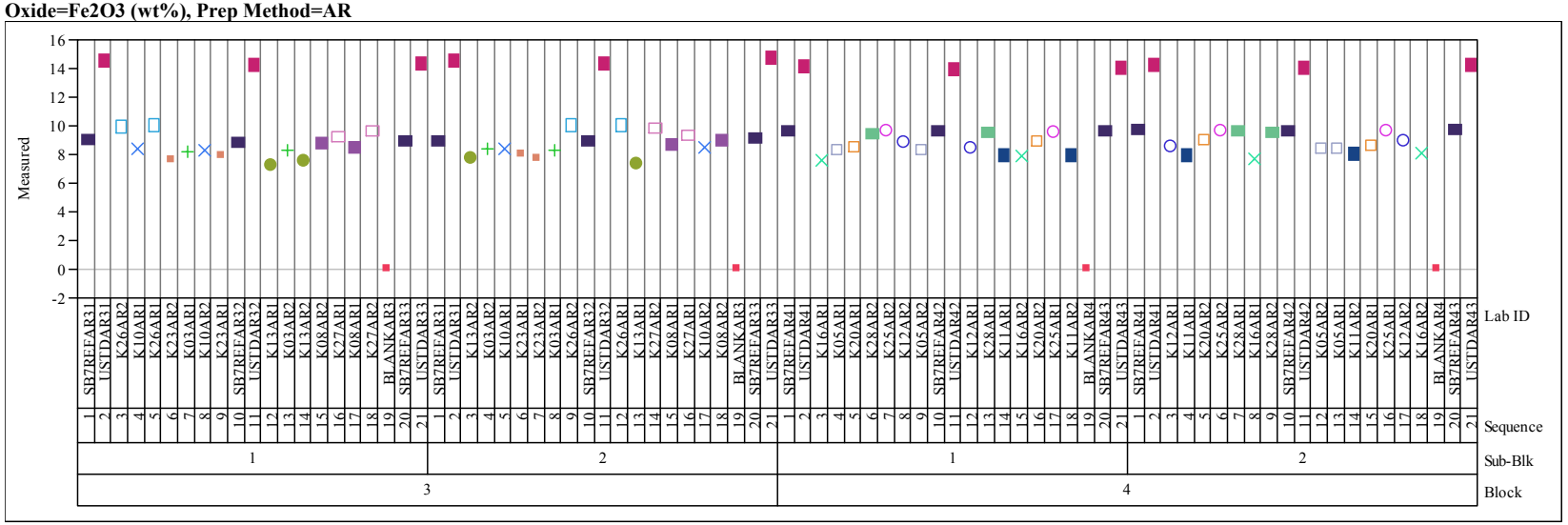


Exhibit A2. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 3 and 4

Oxide=Fe2O3 (wt%), Prep Method=AR



Oxide=Fe2O3 (wt%), Prep Method=PF

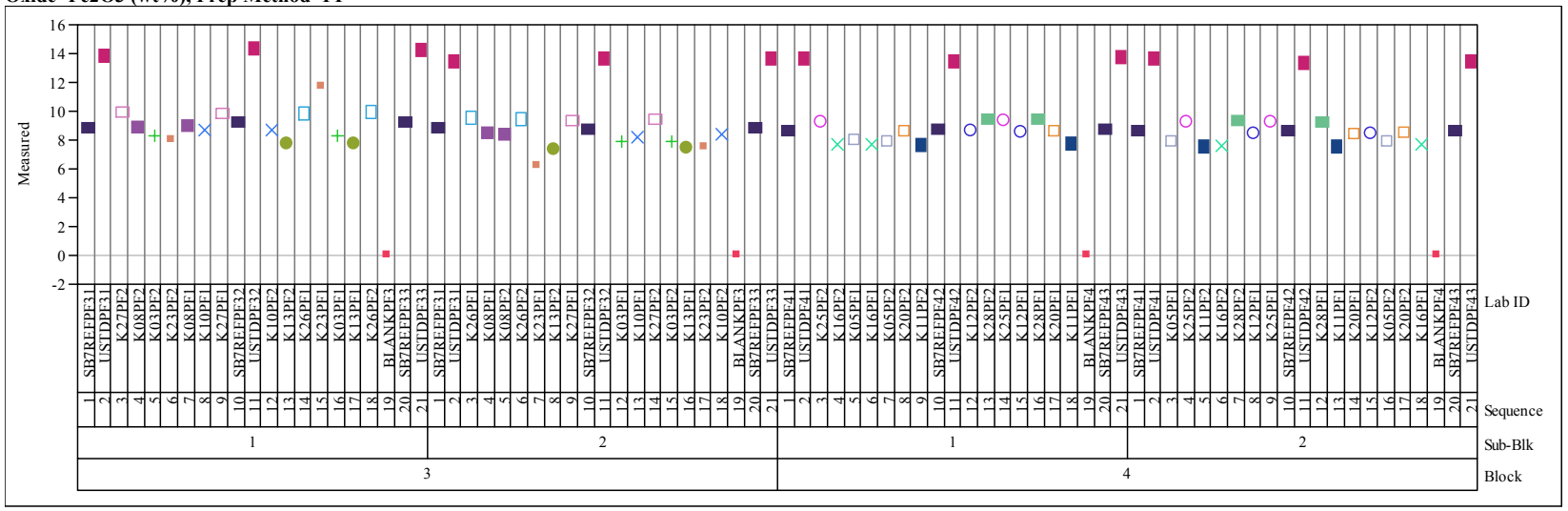
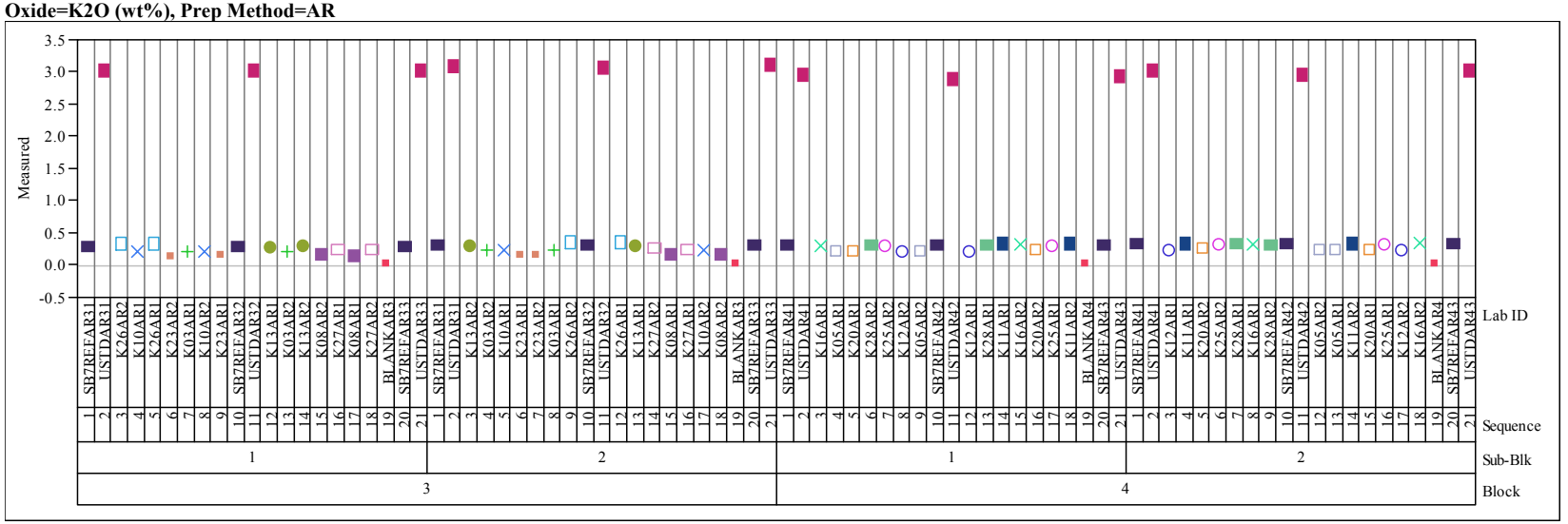


Exhibit A2. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 3 and 4

Oxide=K2O (wt%), Prep Method=AR



Oxide=K2O (wt%), Prep Method=PF

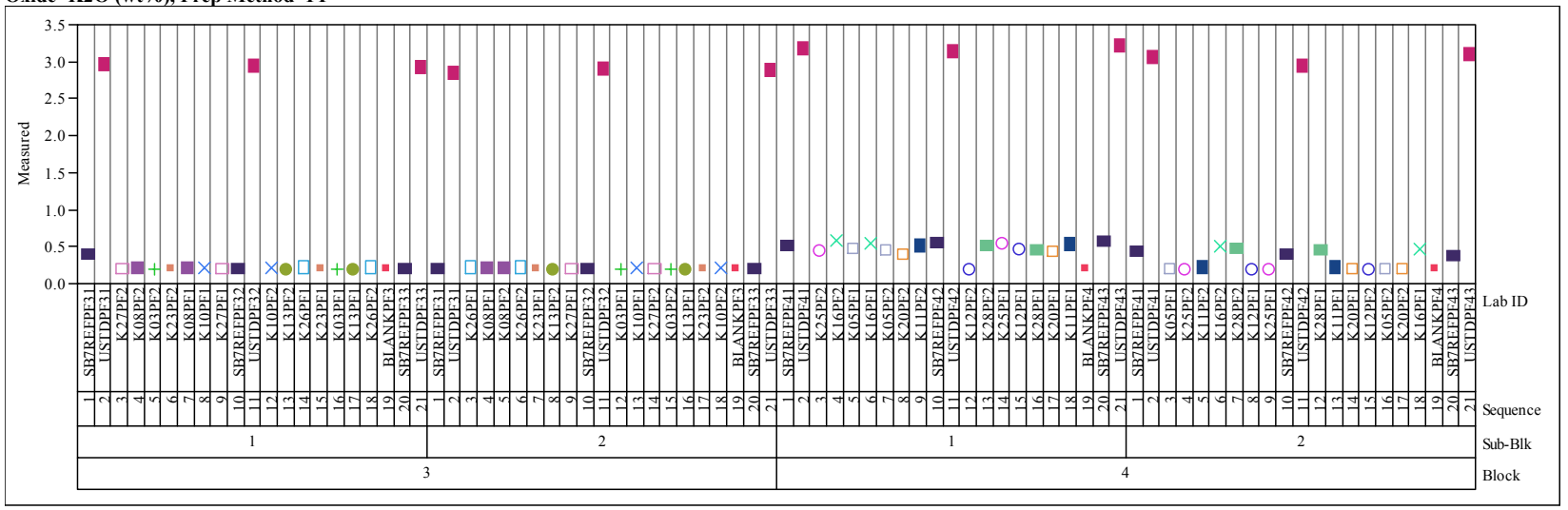
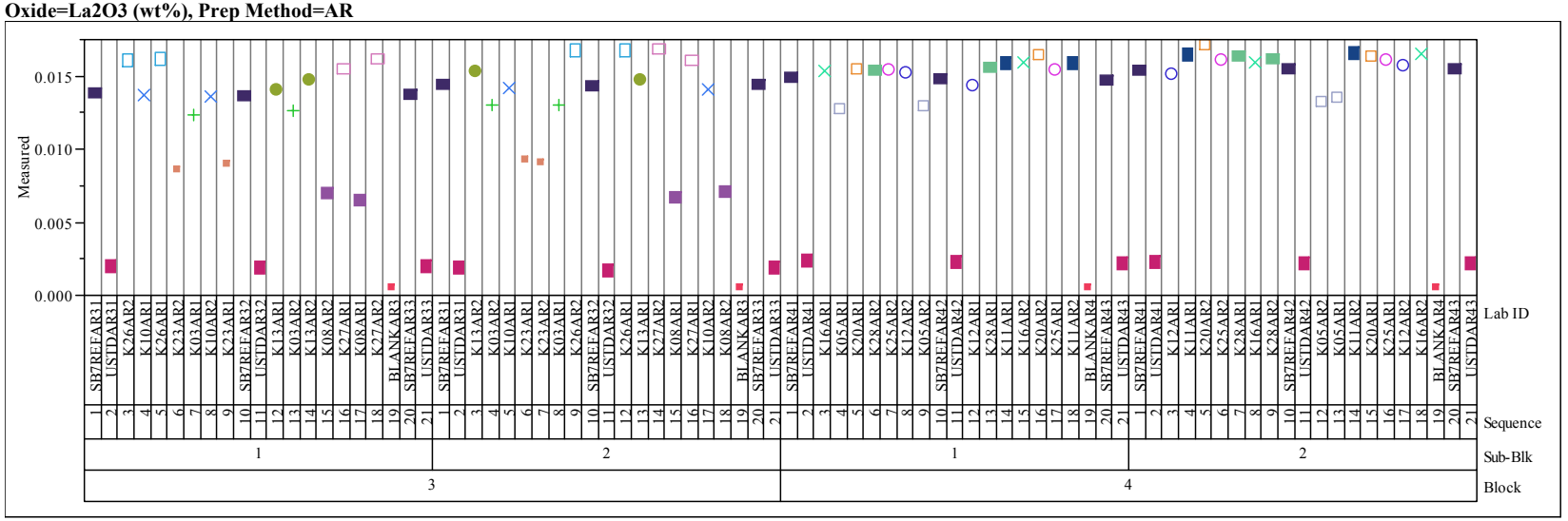


Exhibit A2. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 3 and 4

Oxide=La2O3 (wt%), Prep Method=AR



Oxide=La2O3 (wt%), Prep Method=PF

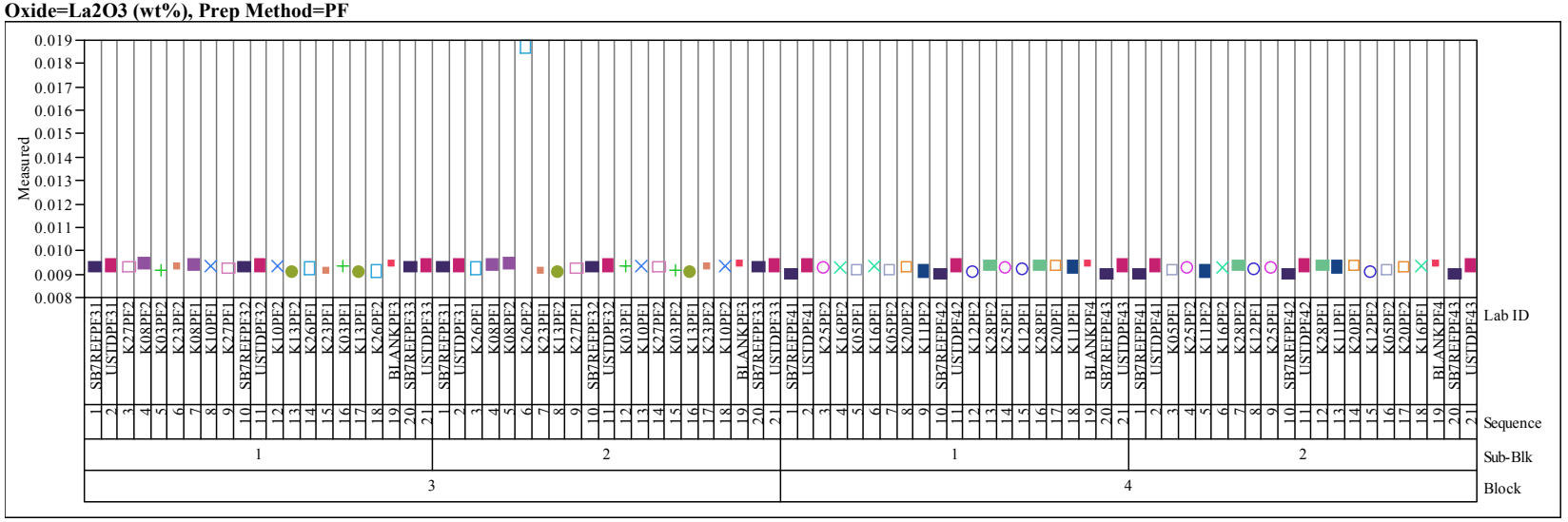
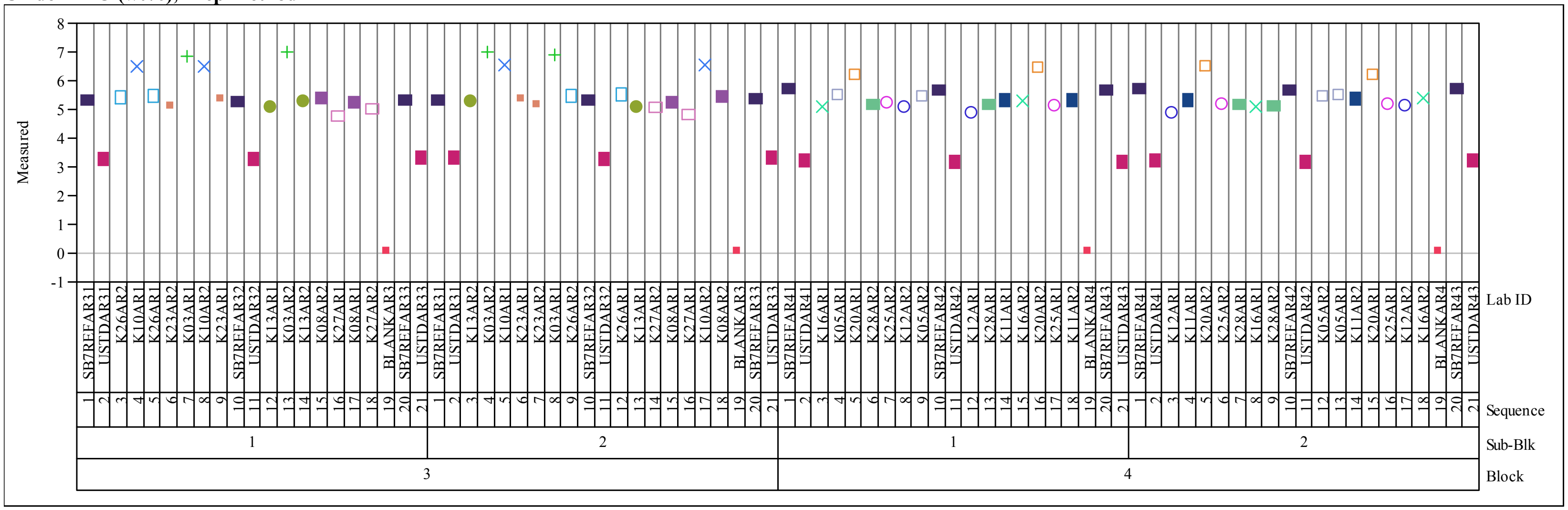


Exhibit A2. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 3 and 4

Oxide=Li2O (wt%), Prep Method=AR



Oxide=Li2O (wt%), Prep Method=PF

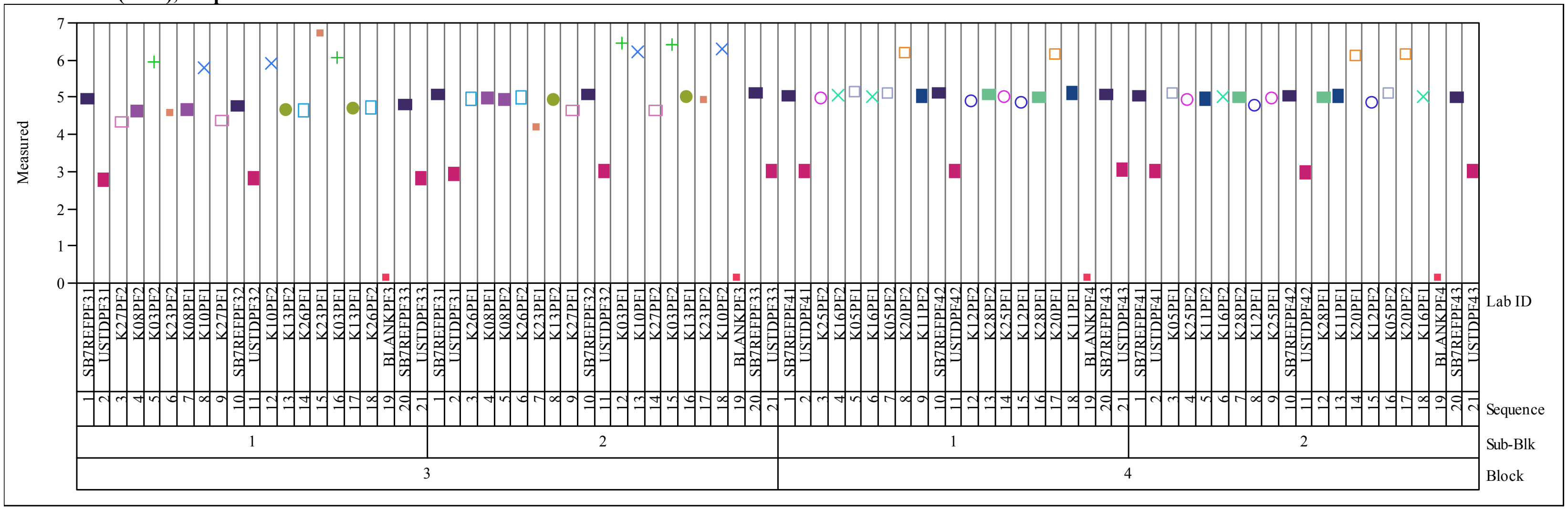
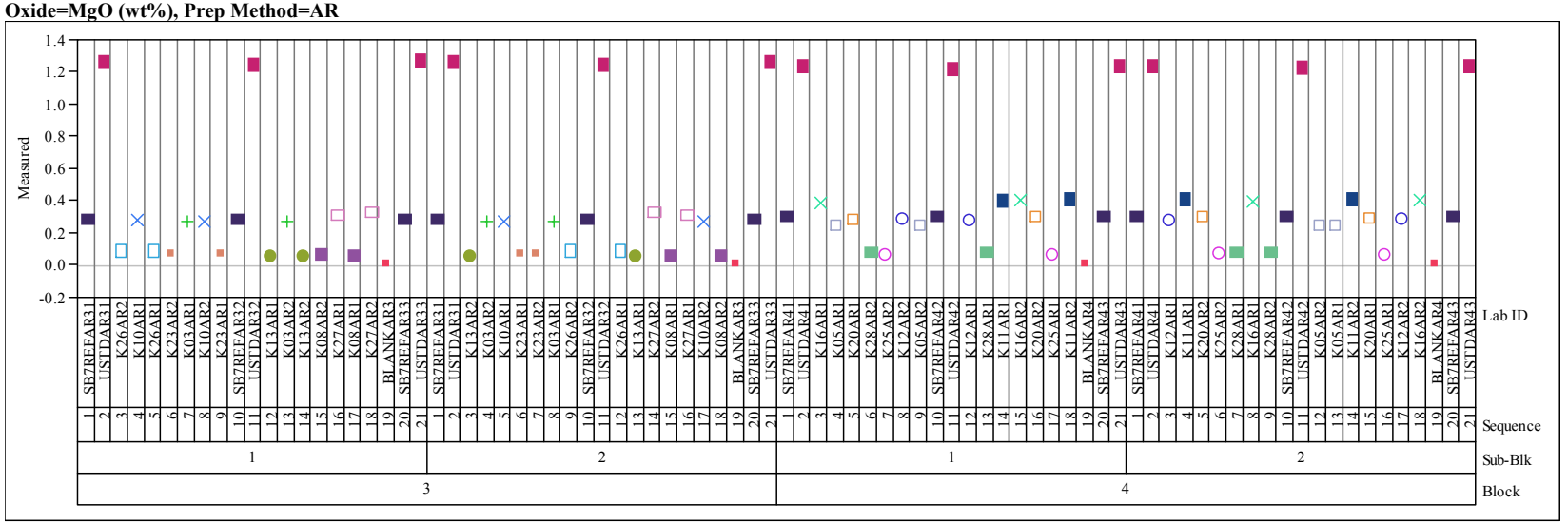


Exhibit A2. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 3 and 4

Oxide=MgO (wt%), Prep Method=AR



Oxide=MgO (wt%), Prep Method=PF

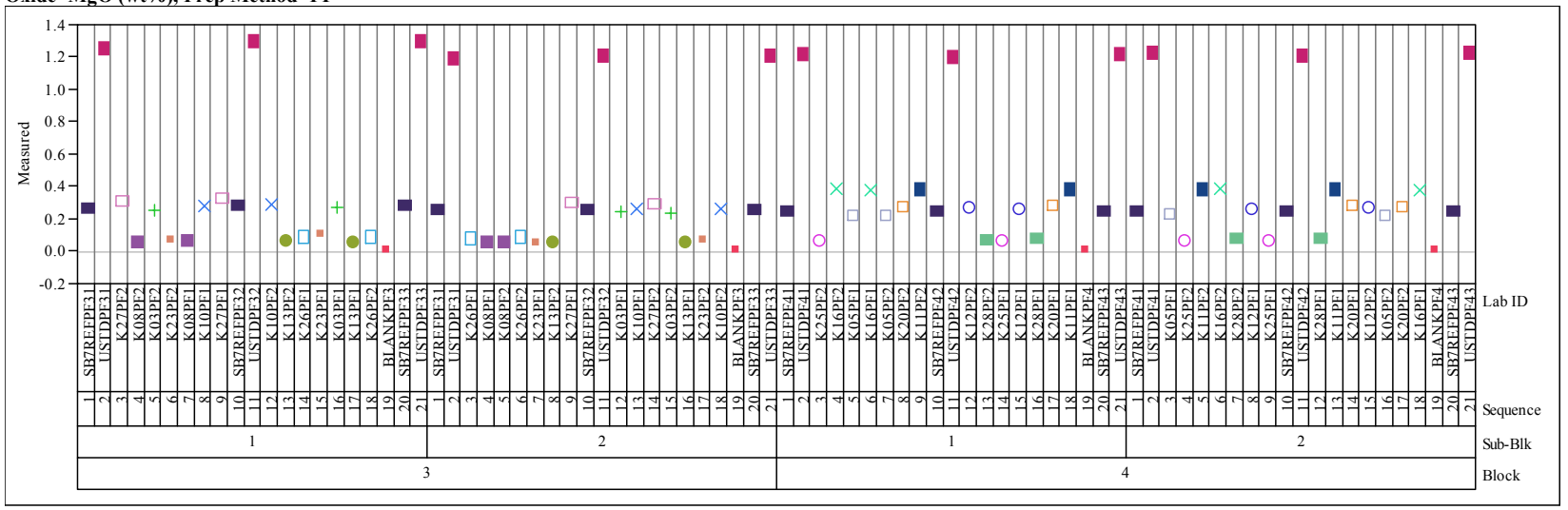
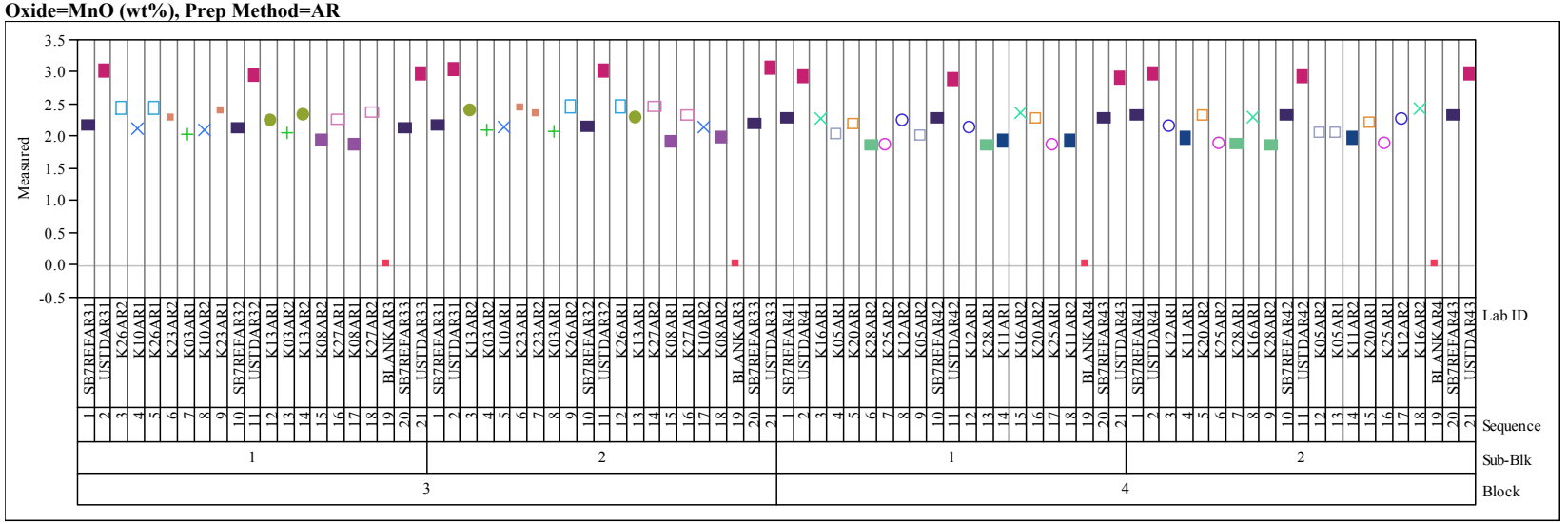


Exhibit A2. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 3 and 4

Oxide=MnO (wt%), Prep Method=AR



Oxide=MnO (wt%), Prep Method=PF

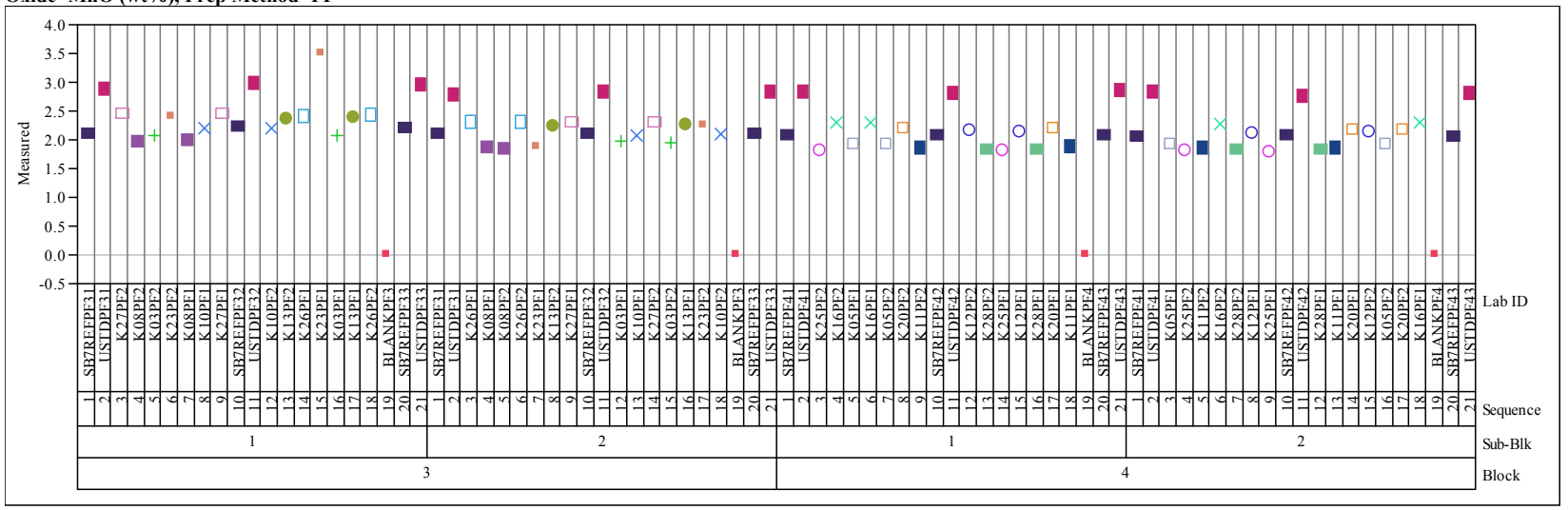
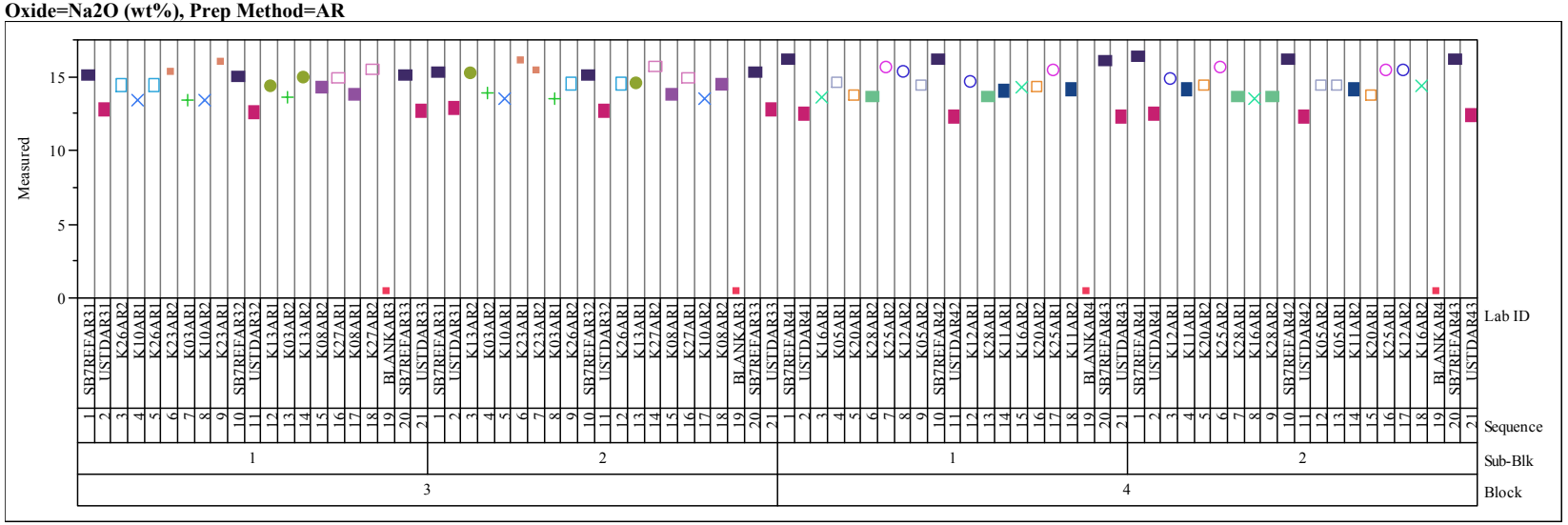


Exhibit A2. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 3 and 4

Oxide=Na2O (wt%), Prep Method=AR



Oxide=NiO (wt%), Prep Method=AR

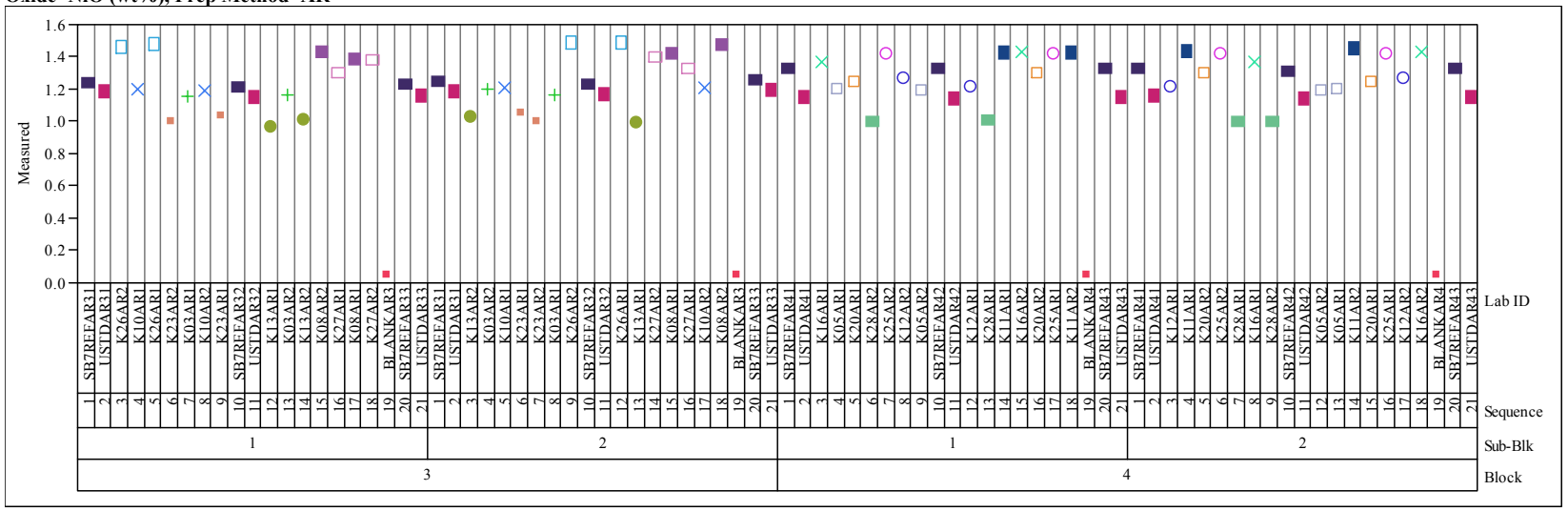
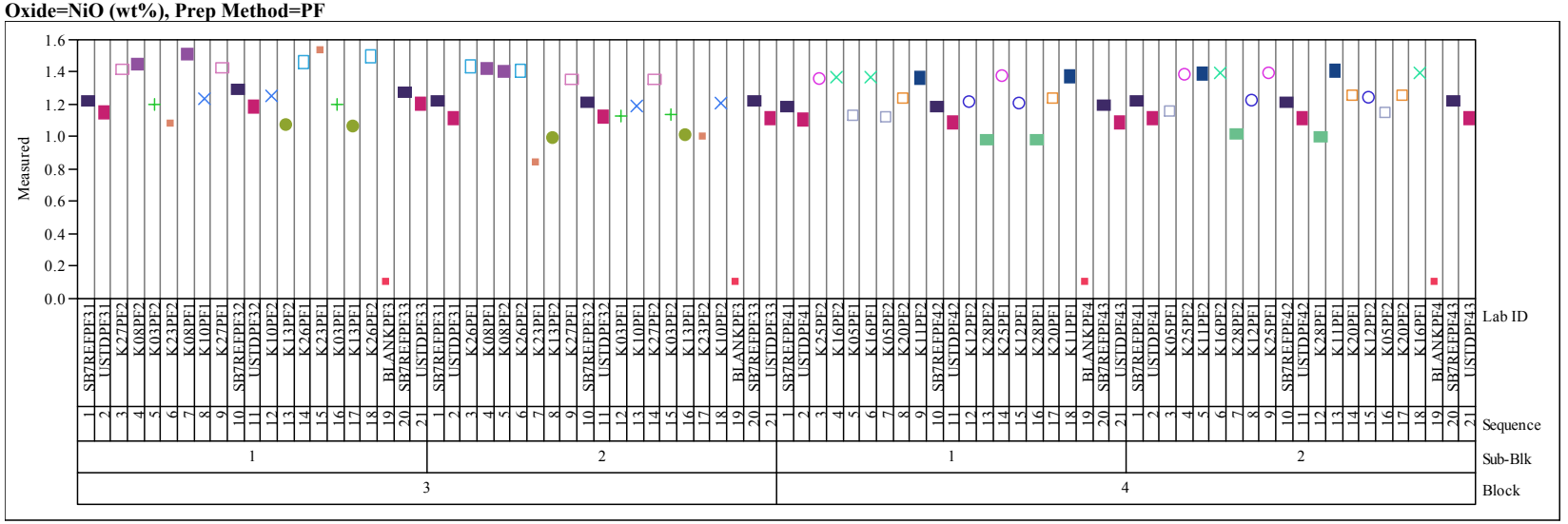


Exhibit A2. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 3 and 4

Oxide=NiO (wt%), Prep Method=PF



Oxide=PbO (wt%), Prep Method=AR

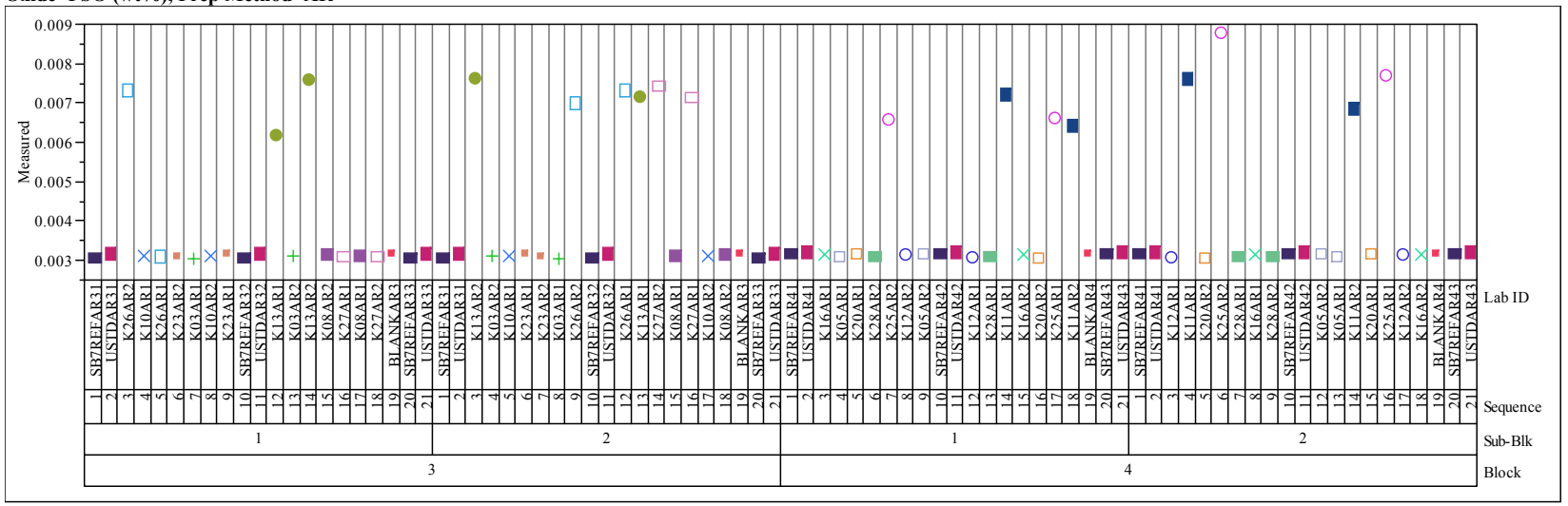
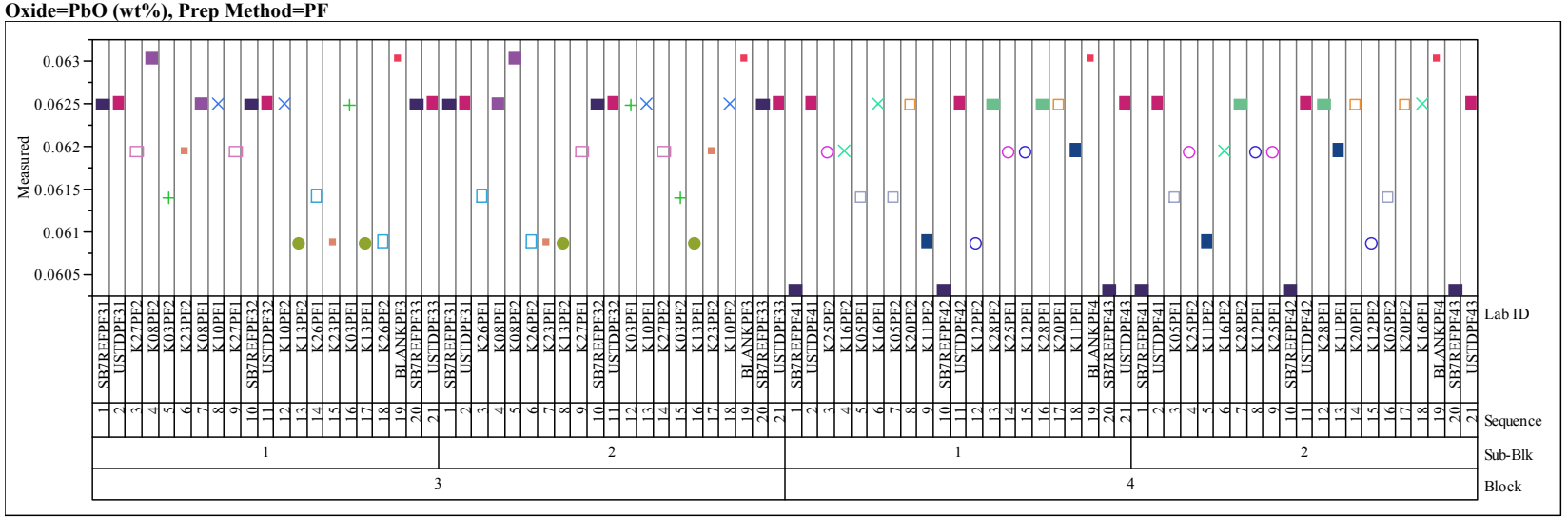


Exhibit A2. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 3 and 4

Oxide=PbO (wt%), Prep Method=PF



Oxide=SiO2 (wt%), Prep Method=PF

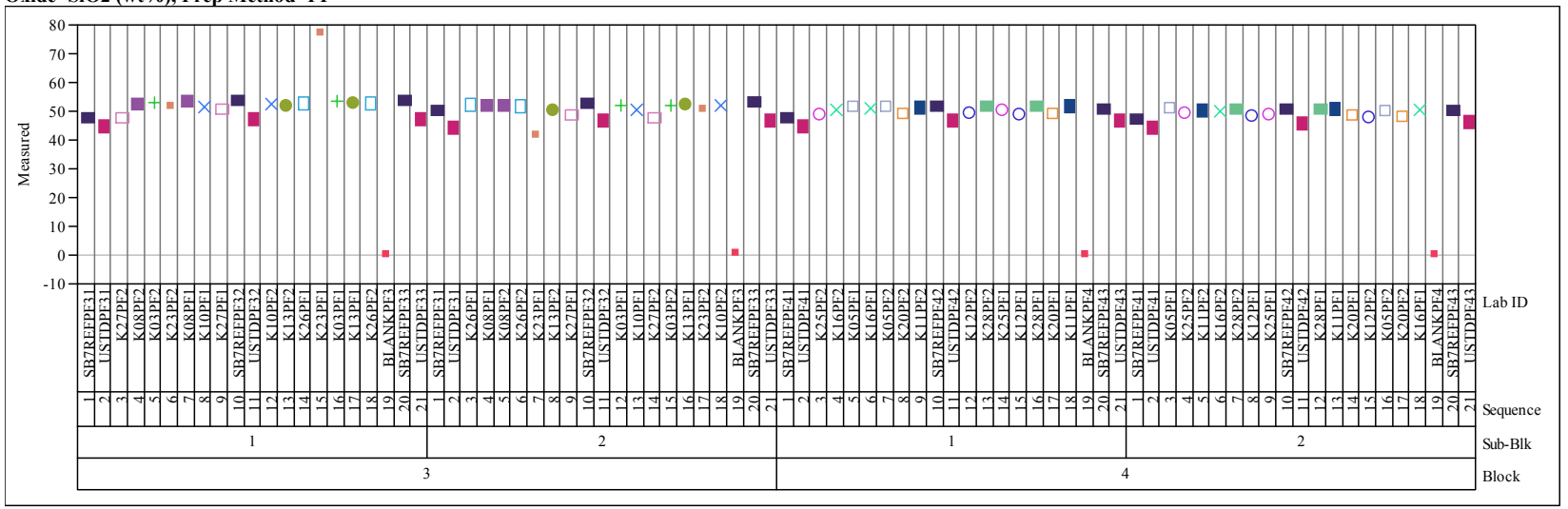
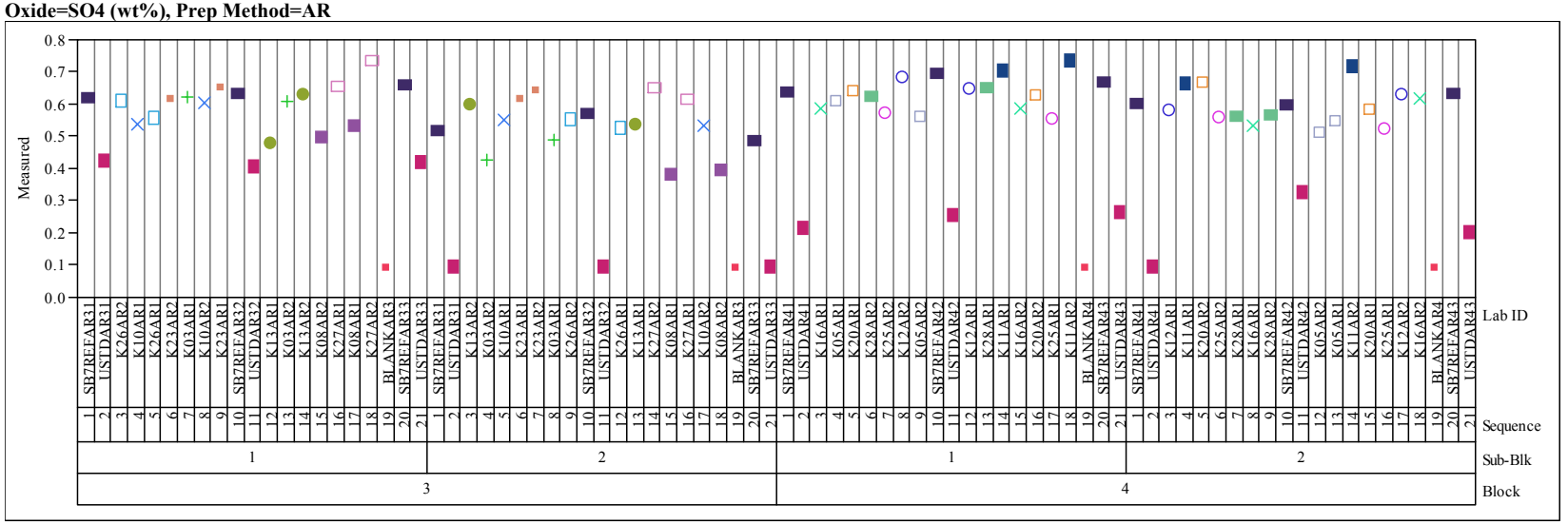


Exhibit A2. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 3 and 4

Oxide=SO4 (wt%), Prep Method=AR



Oxide=SO4 (wt%), Prep Method=PF

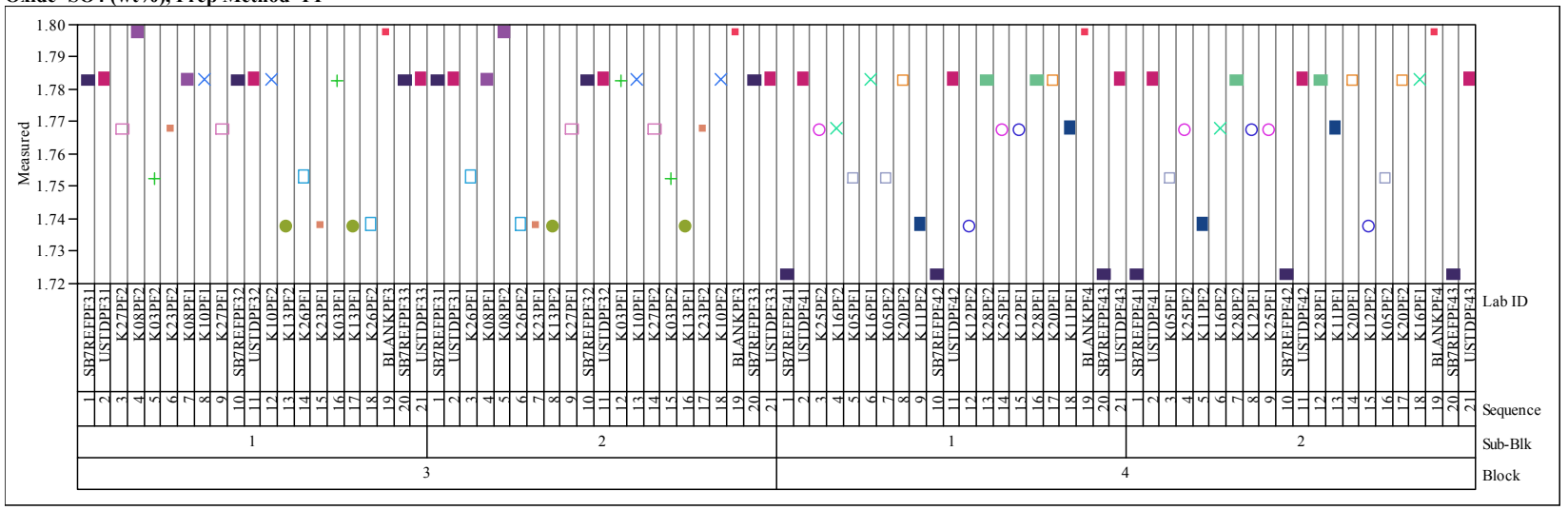
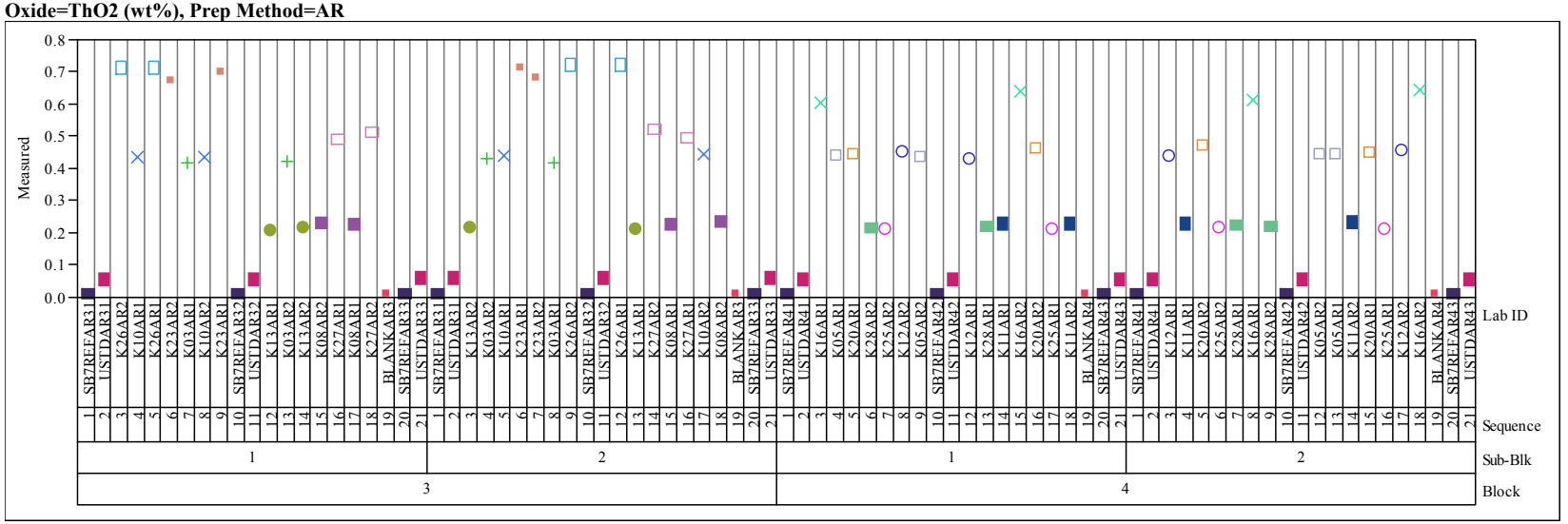


Exhibit A2. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 3 and 4

Oxide=ThO2 (wt%), Prep Method=AR



Oxide=ThO2 (wt%), Prep Method=PF

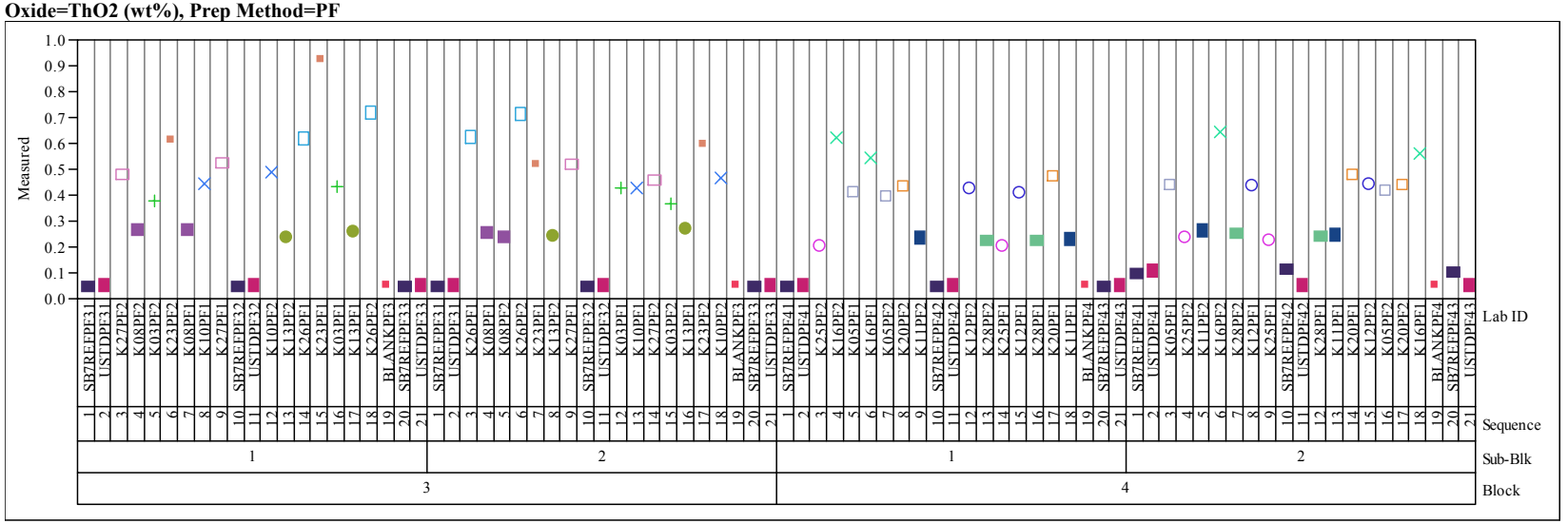
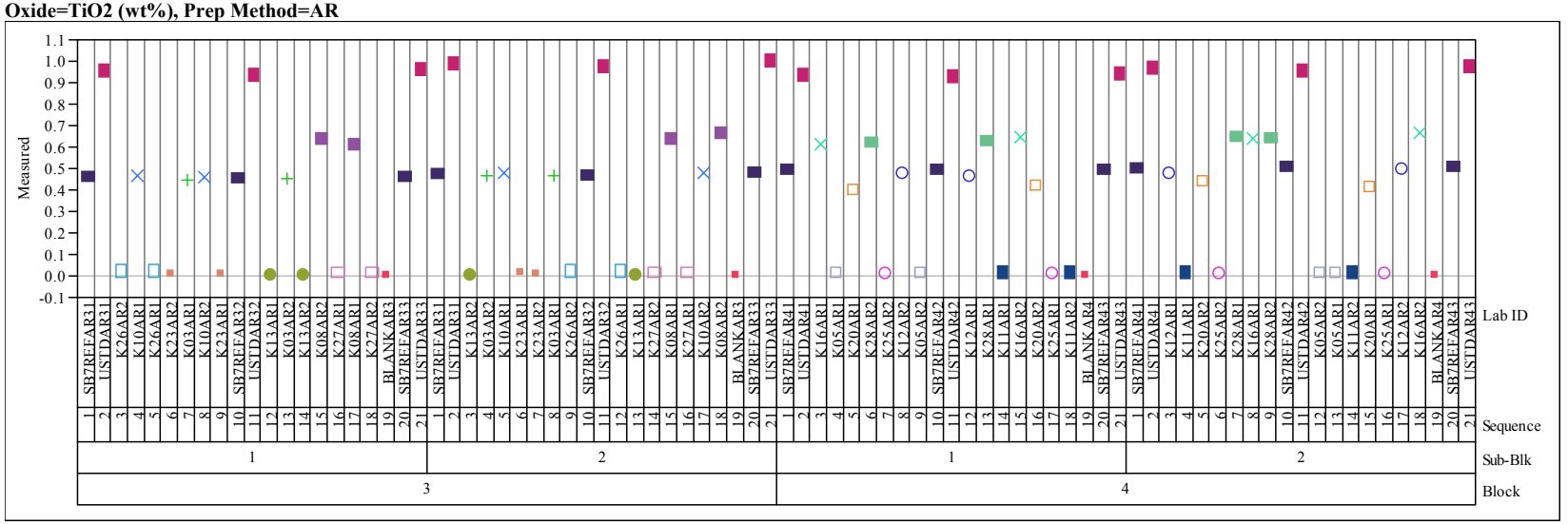


Exhibit A2. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 3 and 4

Oxide=TiO2 (wt%), Prep Method=AR



Oxide=TiO2 (wt%), Prep Method=PF

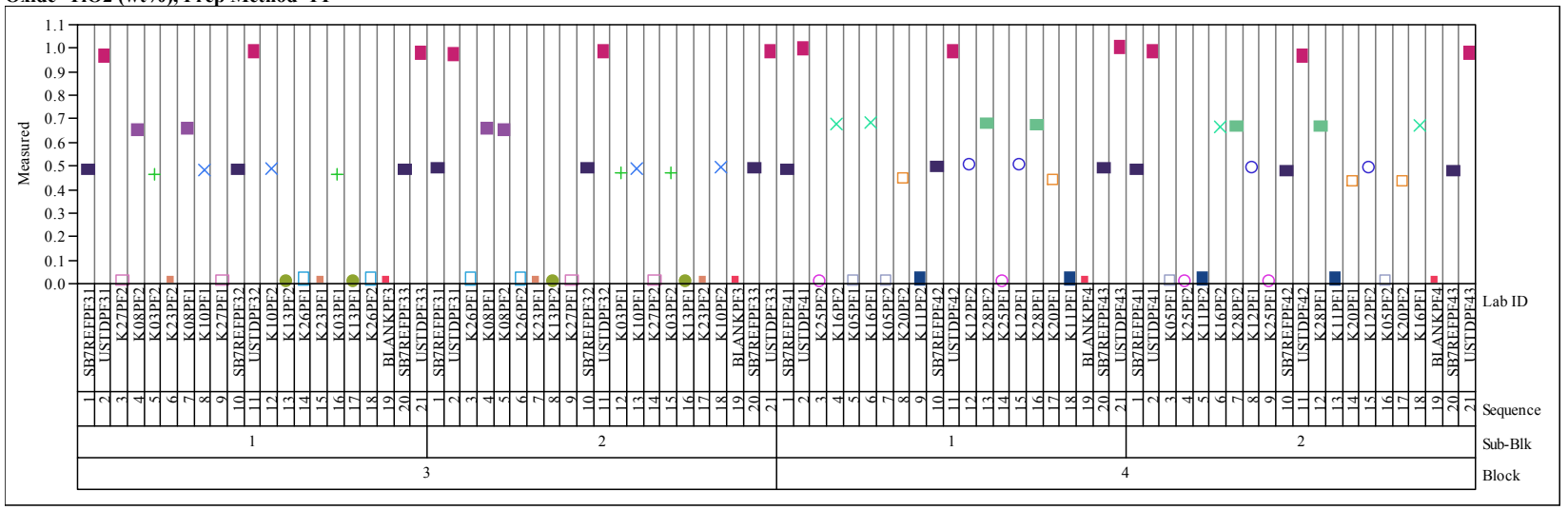
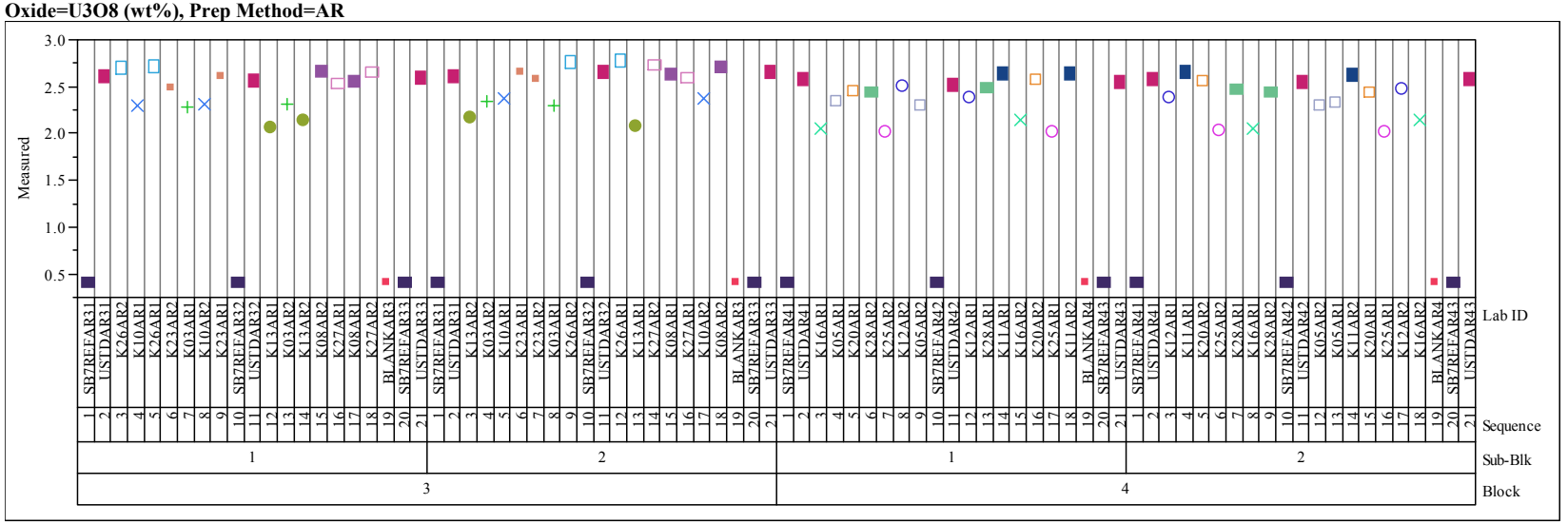


Exhibit A2. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 3 and 4

Oxide=U3O8 (wt%), Prep Method=AR



Oxide=U3O8 (wt%), Prep Method=PF

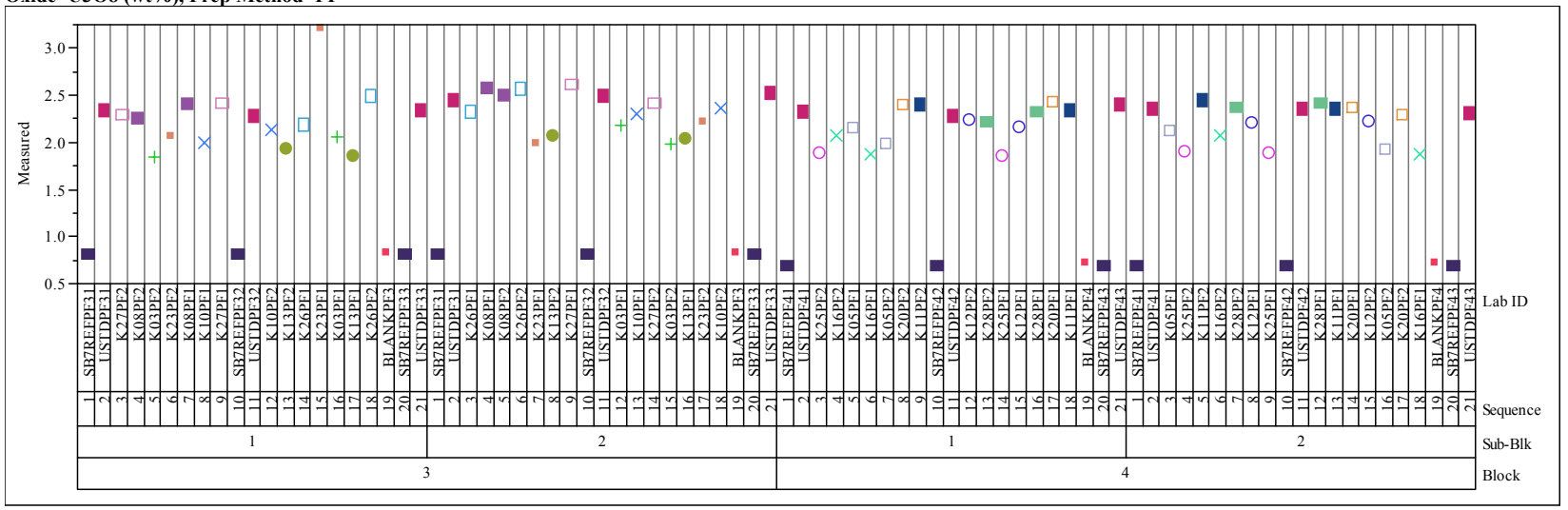
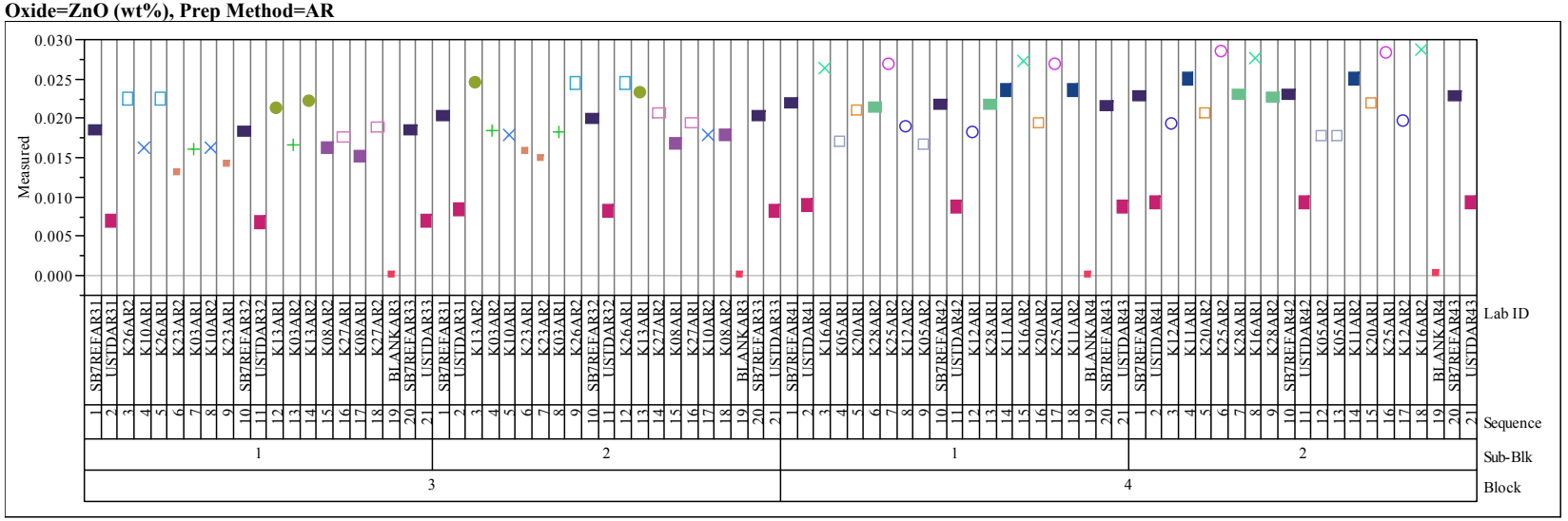


Exhibit A2. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 3 and 4

Oxide=ZnO (wt%), Prep Method=AR



Oxide=ZnO (wt%), Prep Method=PF

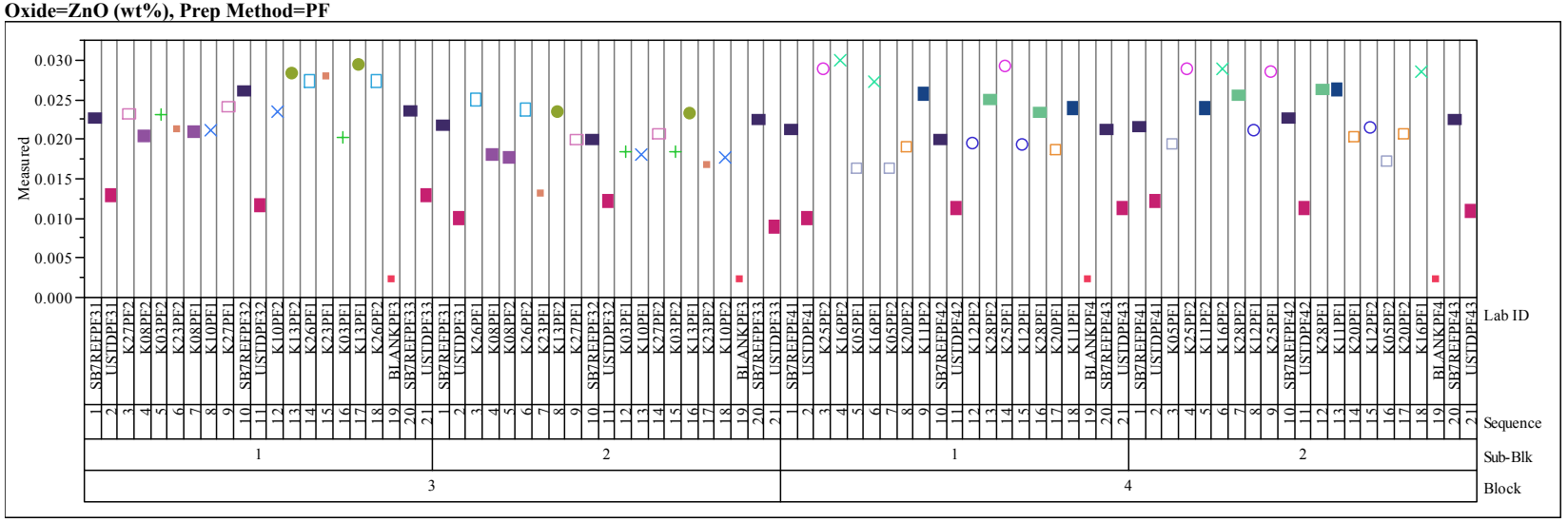


Exhibit A2. Measurements of Initial Glasses in Analytical Sequence for Samples by Oxide and Preparation Method for Analytical Blocks 3 and 4

Oxide=ZrO2 (wt%), Prep Method=AR

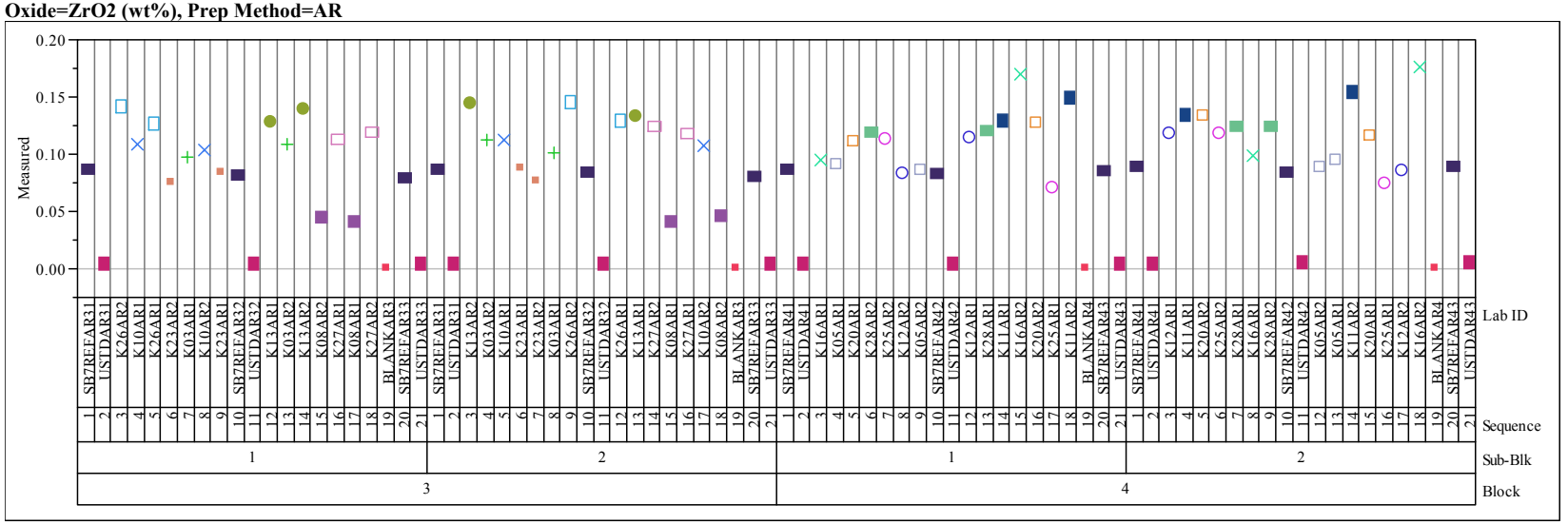
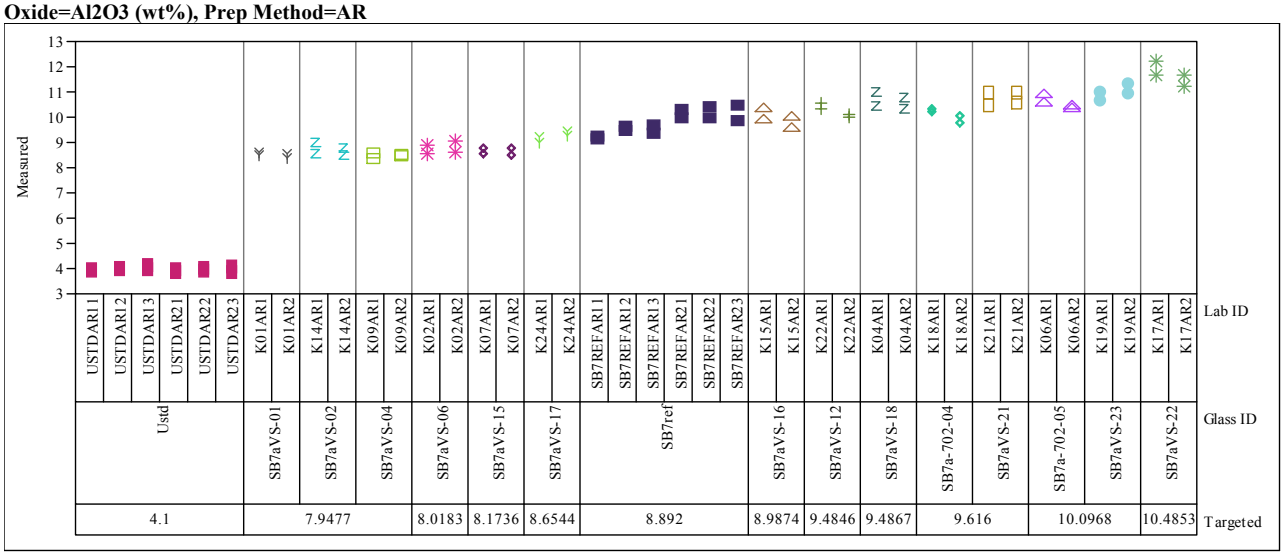


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=Al2O3 (wt%), Prep Method=AR



Oxide=Al2O3 (wt%), Prep Method=PF

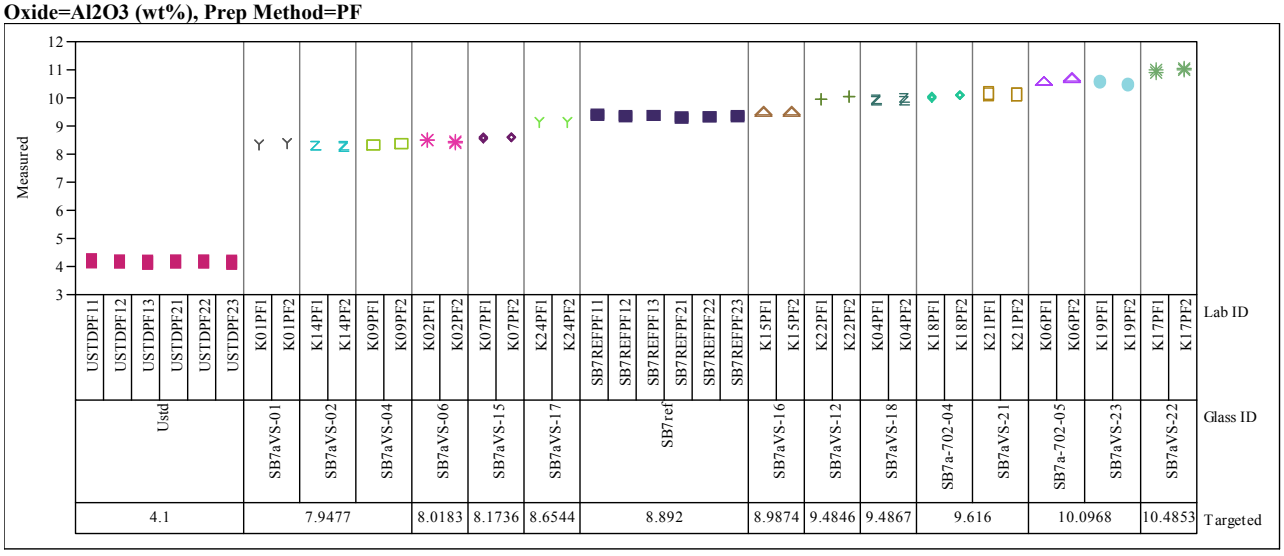
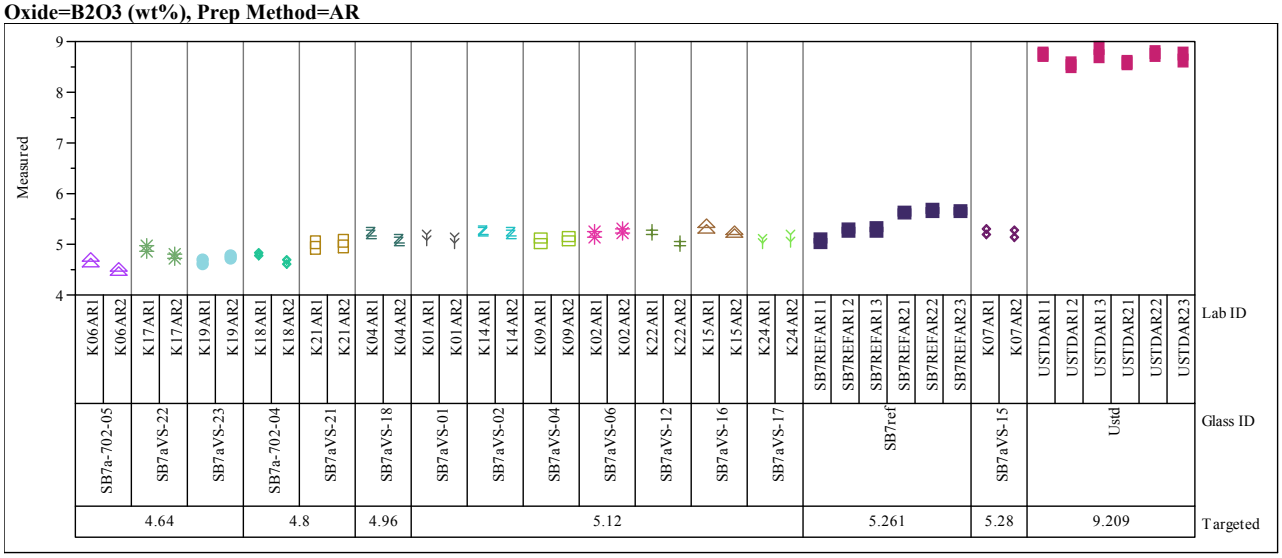


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=B2O3 (wt%), Prep Method=AR



Oxide=B2O3 (wt%), Prep Method=PF

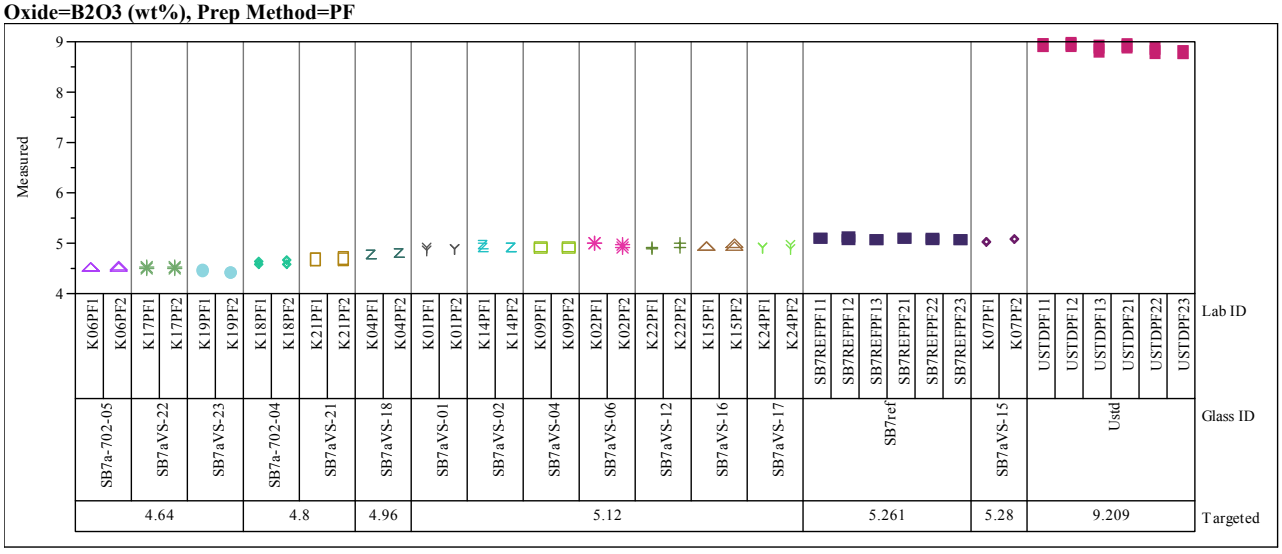
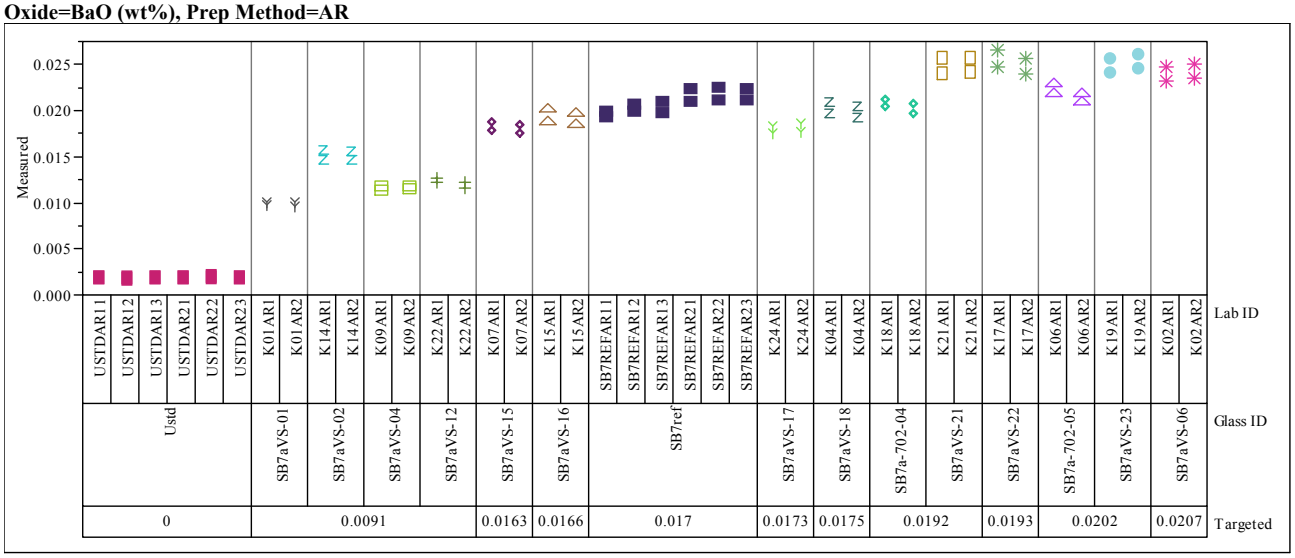


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=BaO (wt%), Prep Method=AR



Oxide=BaO (wt%), Prep Method=PF

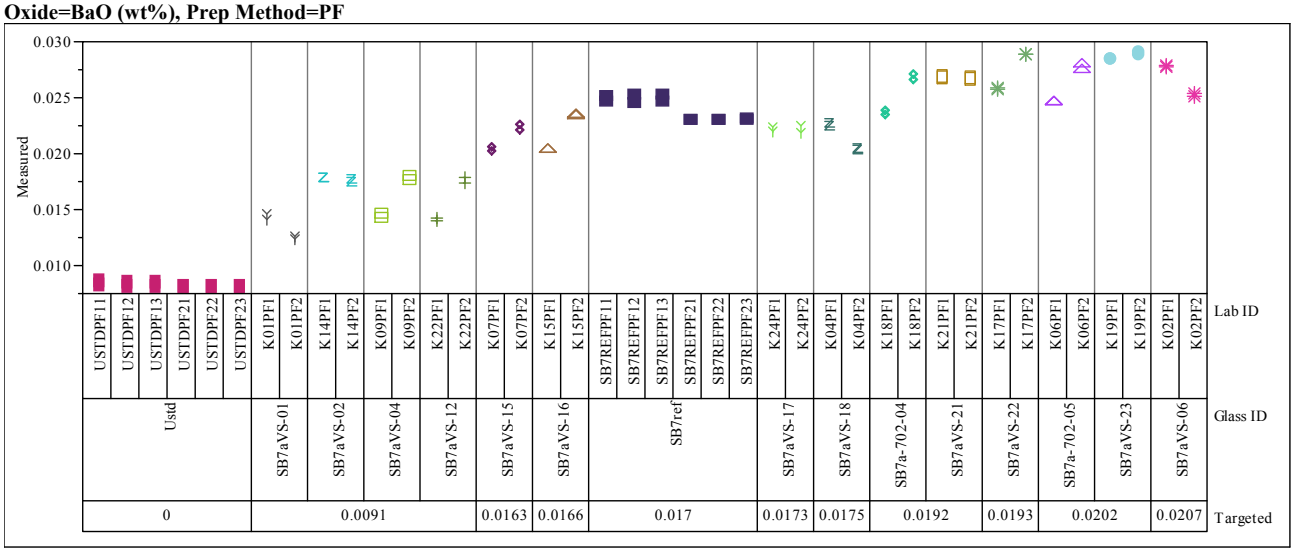
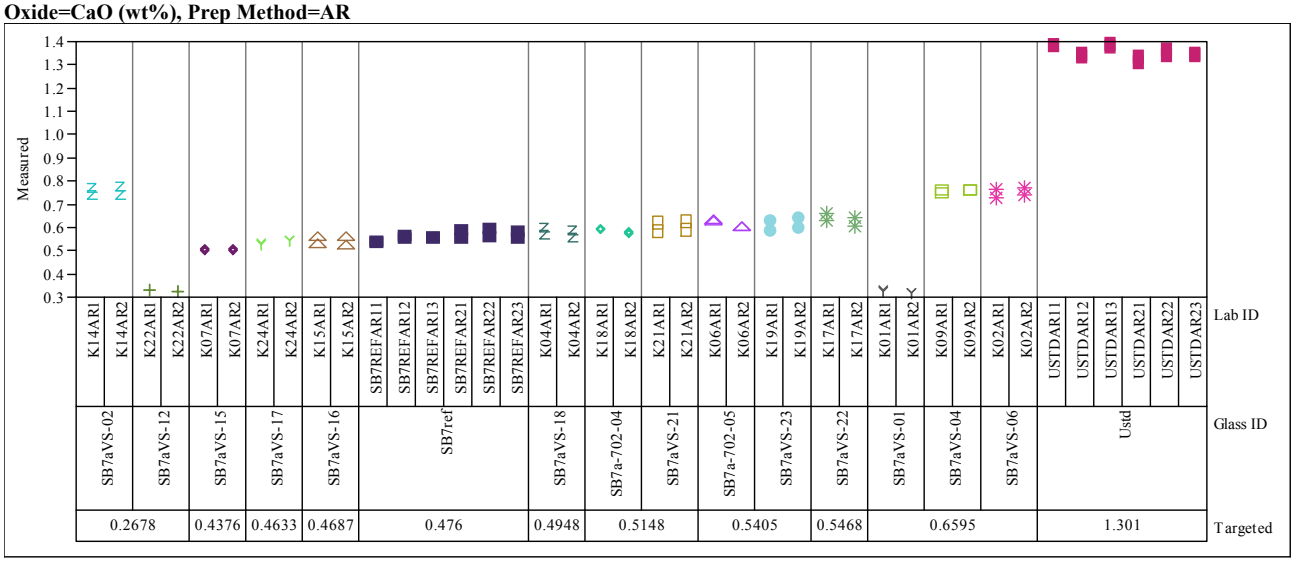


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=CaO (wt%), Prep Method=AR



Oxide=CaO (wt%), Prep Method=PF

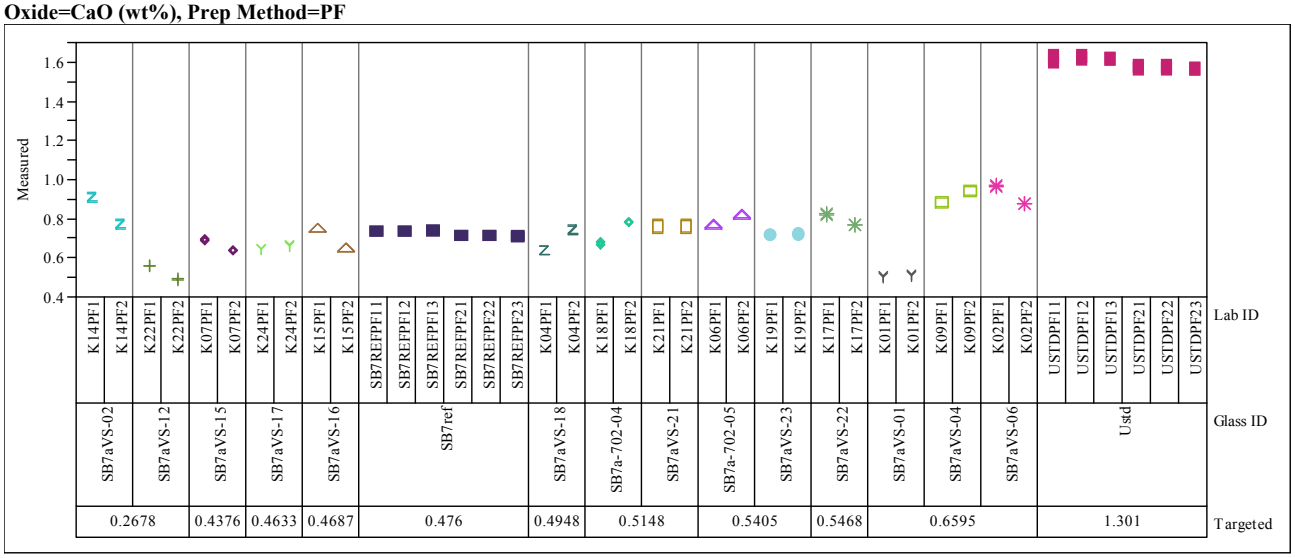
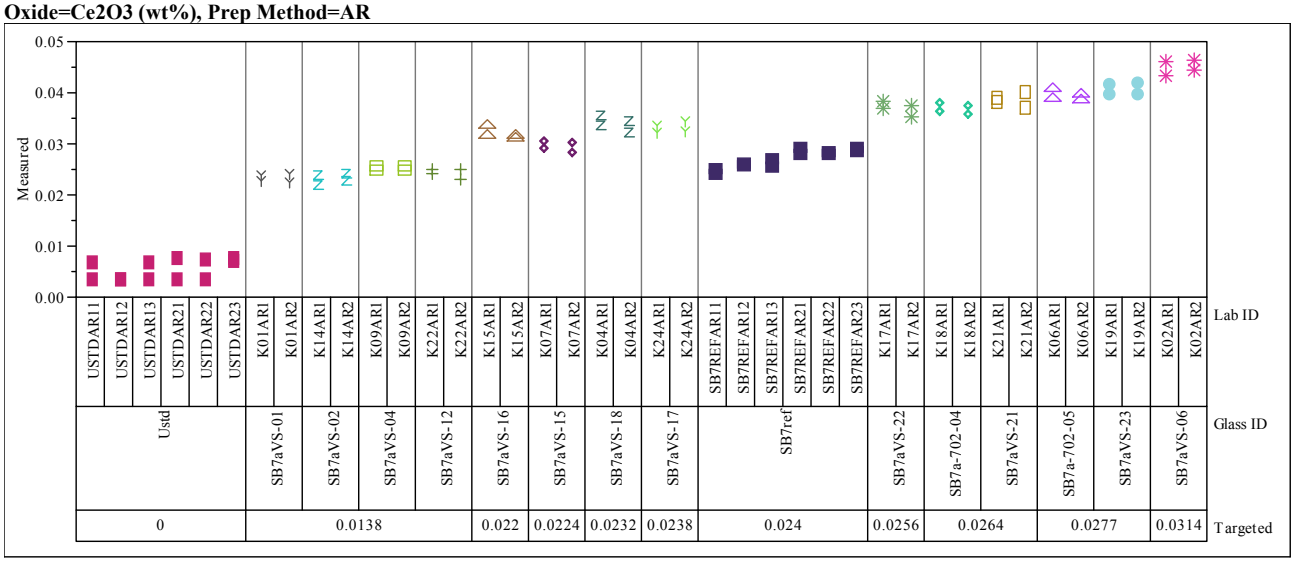


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=Ce2O3 (wt%), Prep Method=AR



Oxide=Ce2O3 (wt%), Prep Method=PF

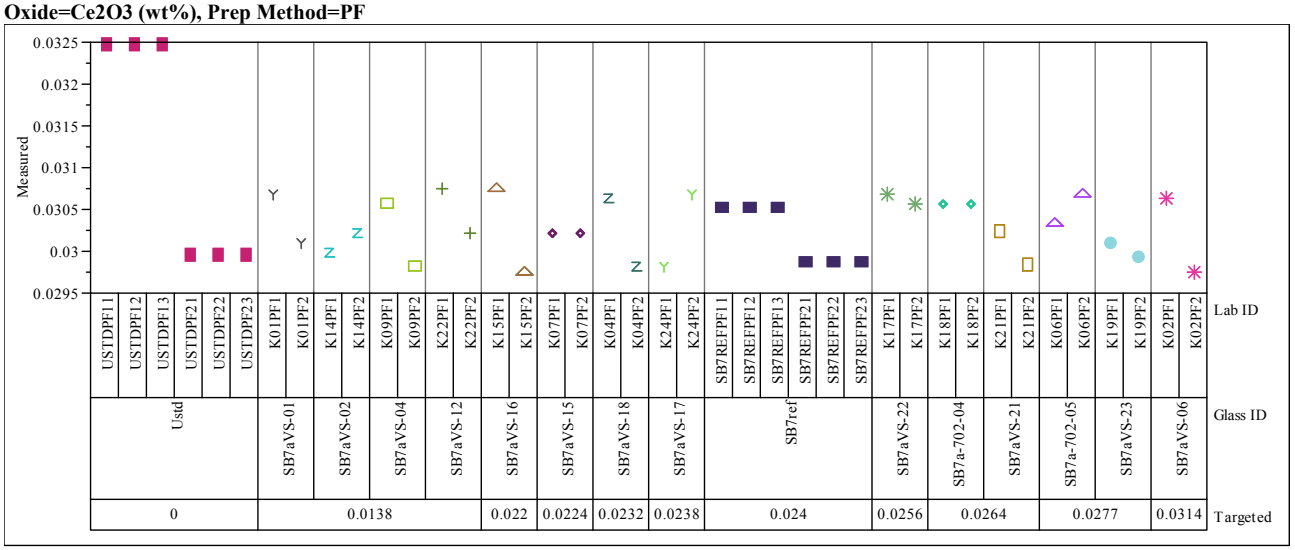
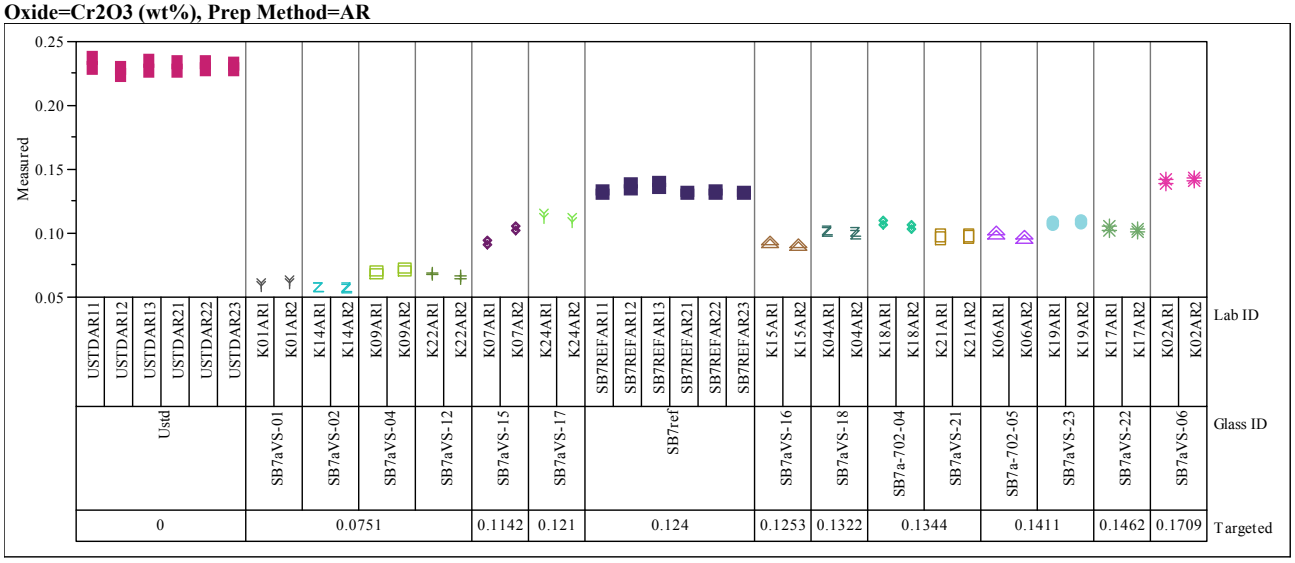


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=Cr2O3 (wt%), Prep Method=AR



Oxide=Cr2O3 (wt%), Prep Method=PF

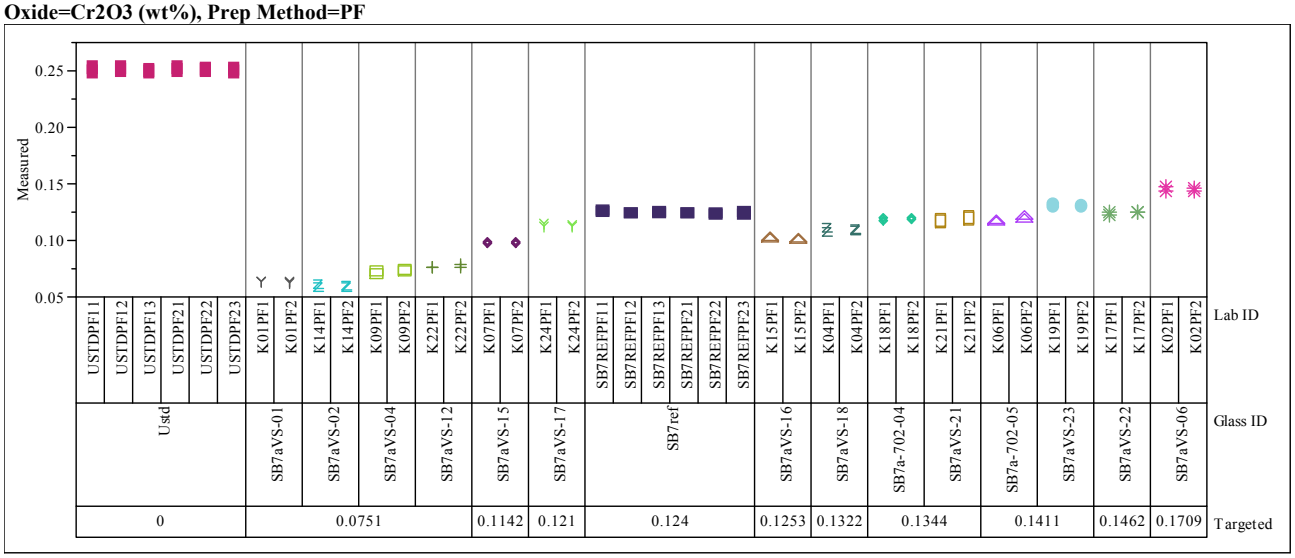
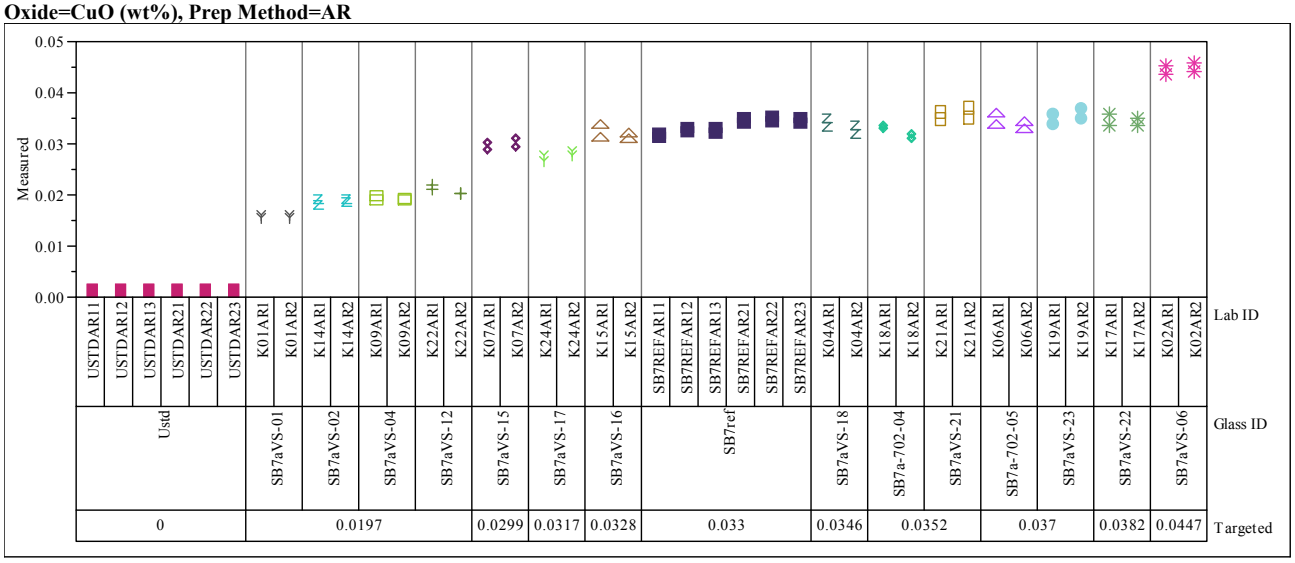


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=CuO (wt%), Prep Method=AR



Oxide=CuO (wt%), Prep Method=PF

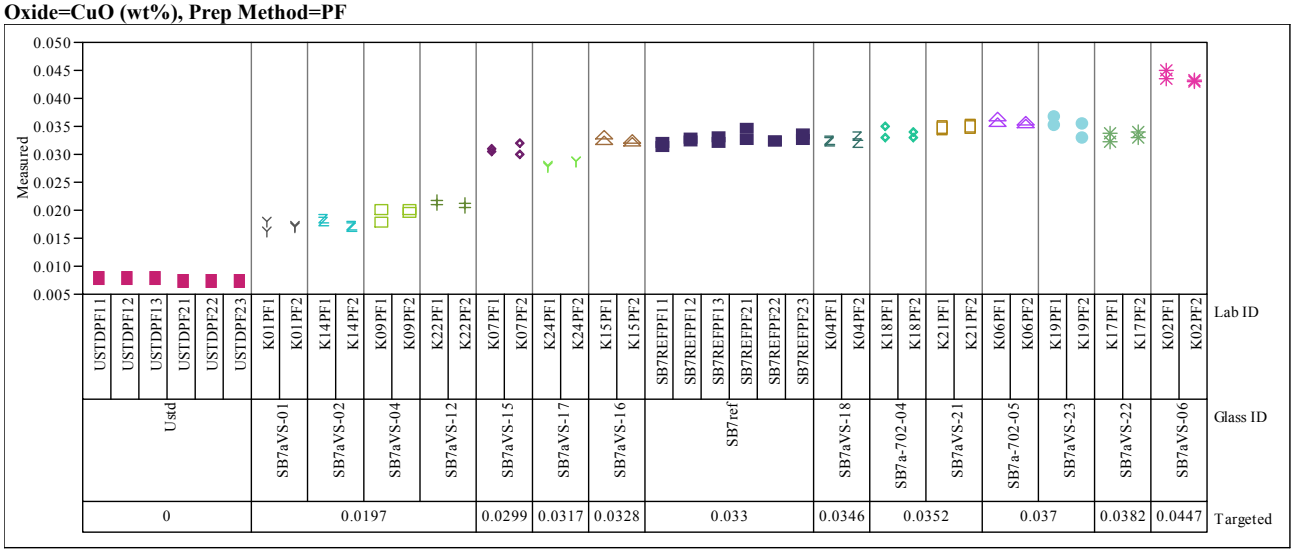
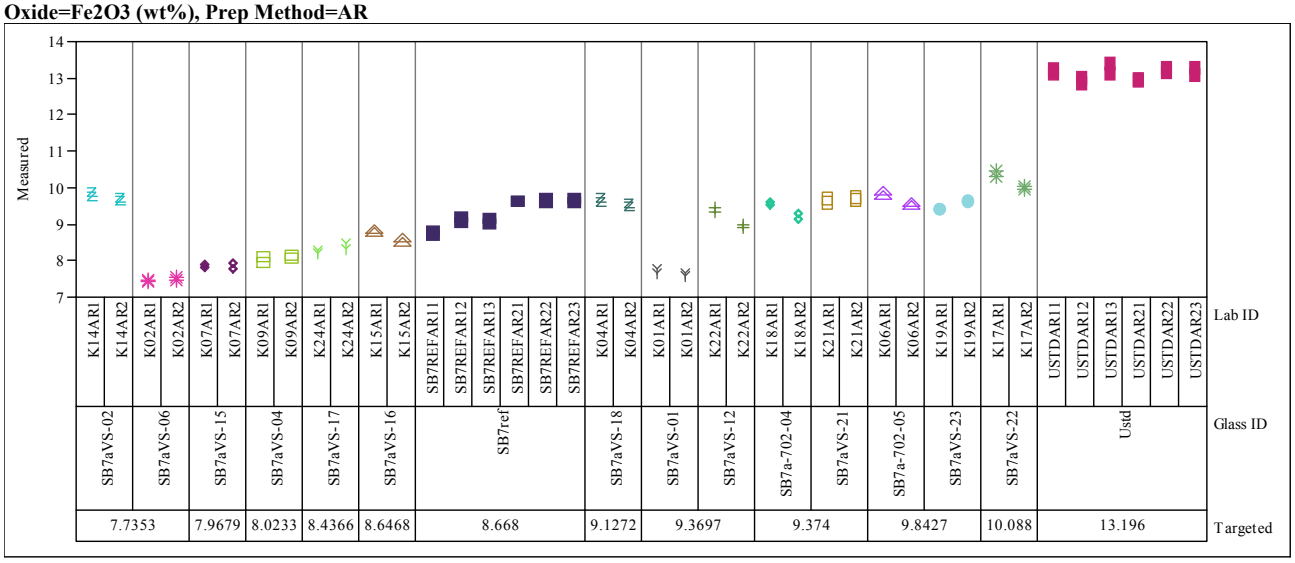


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=Fe2O3 (wt%), Prep Method=AR



Oxide=Fe2O3 (wt%), Prep Method=PF

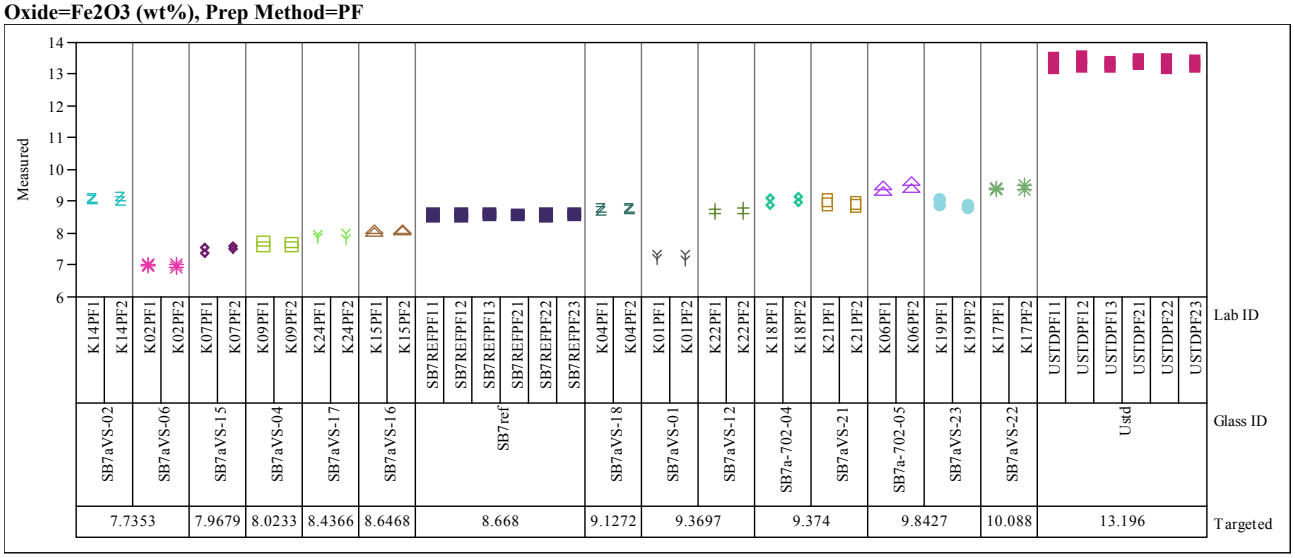
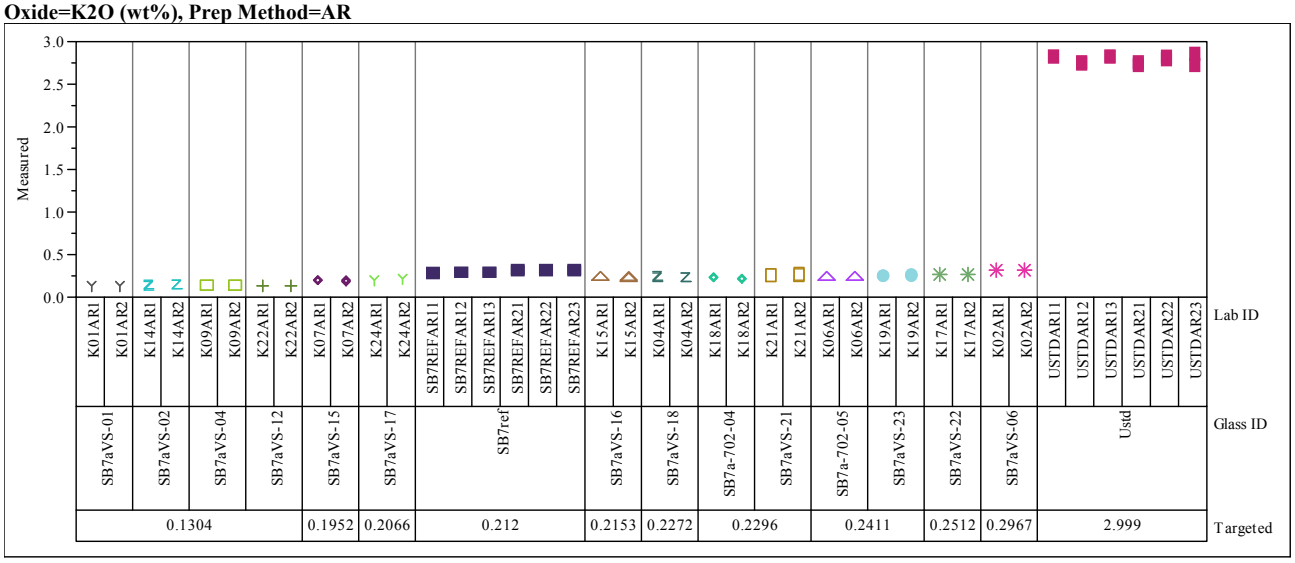


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=K2O (wt%), Prep Method=AR



Oxide=K2O (wt%), Prep Method=PF

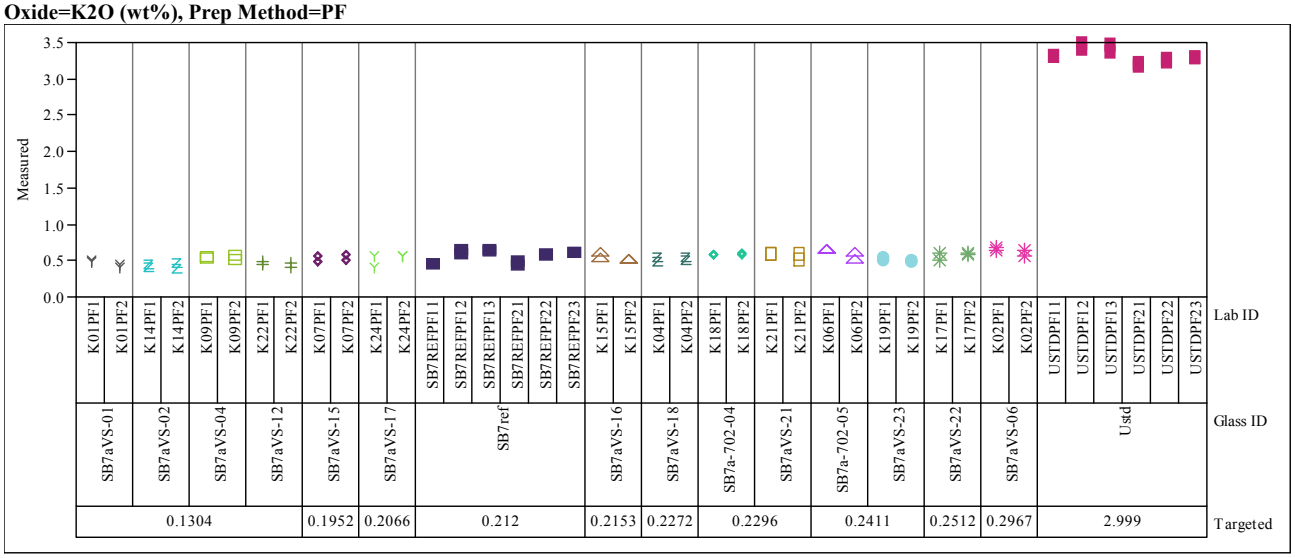
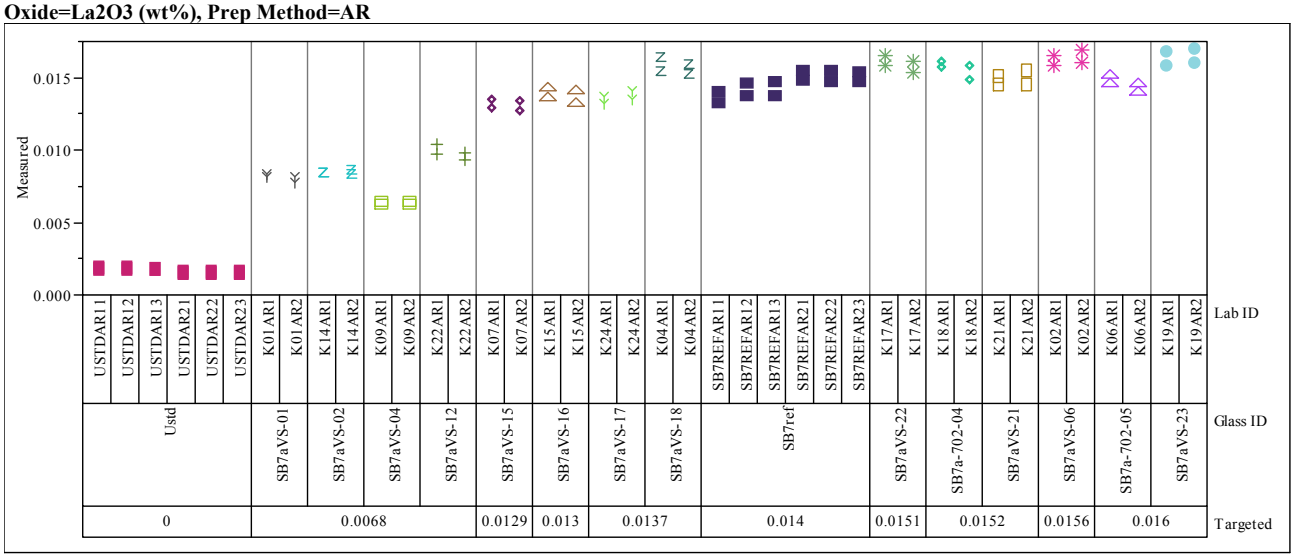


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=La2O3 (wt%), Prep Method=AR



Oxide=La2O3 (wt%), Prep Method=PF

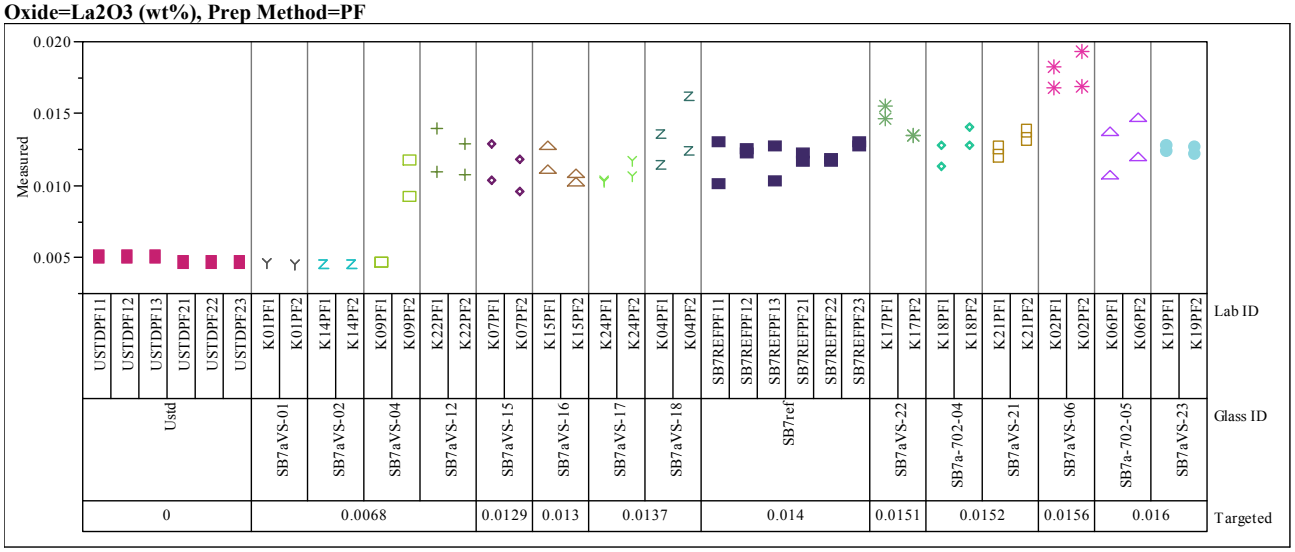
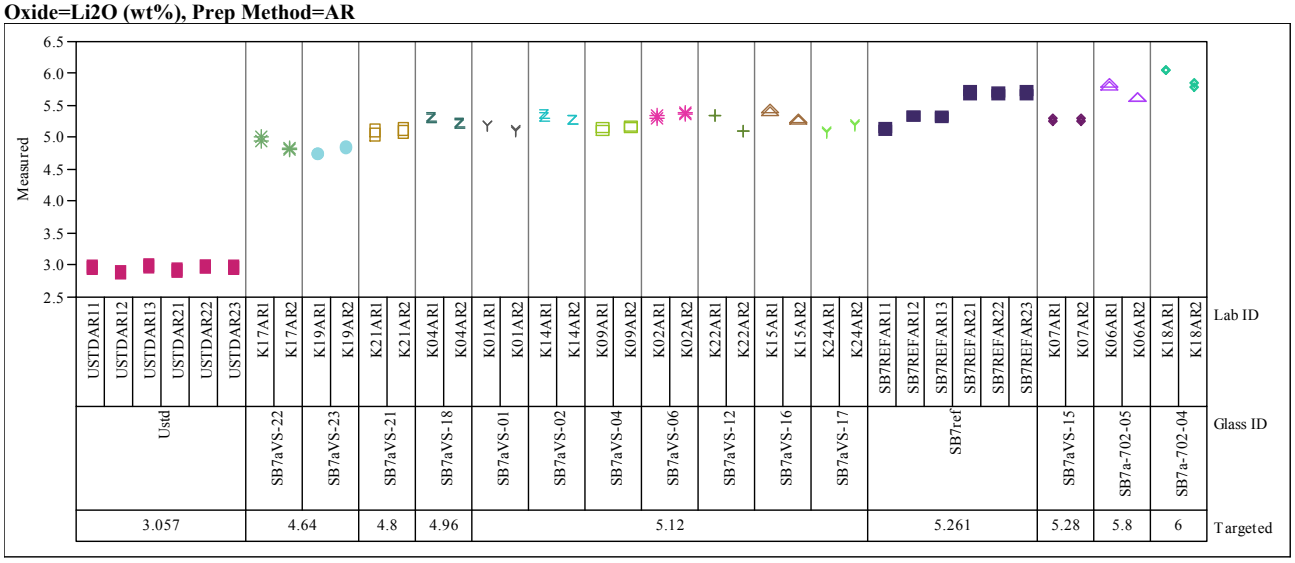


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=Li2O (wt%), Prep Method=AR



Oxide=Li2O (wt%), Prep Method=PF

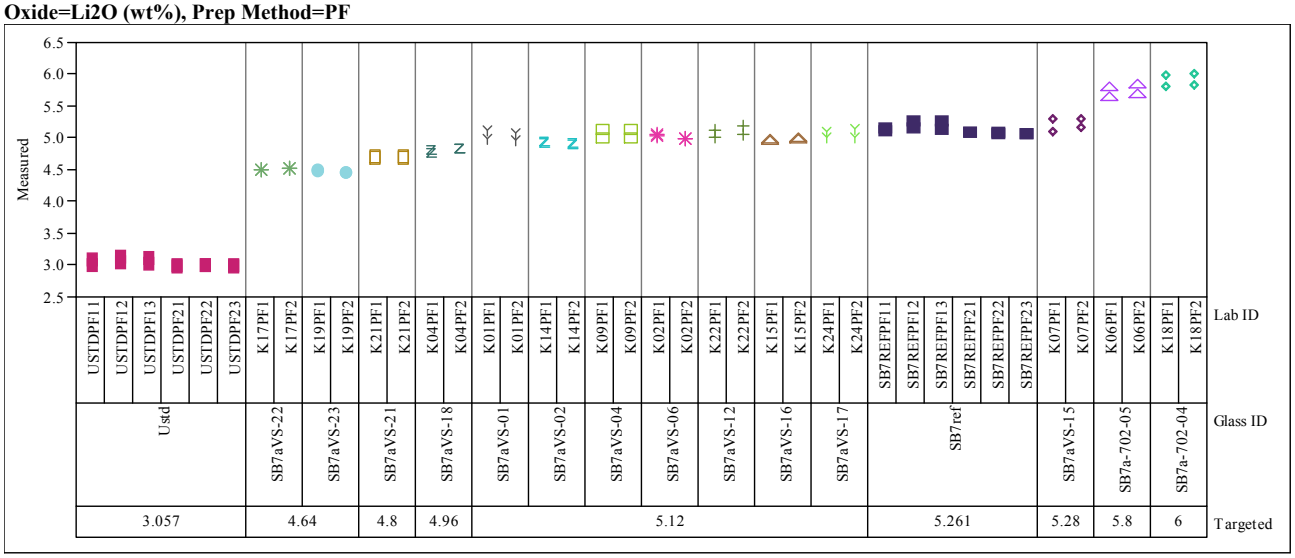
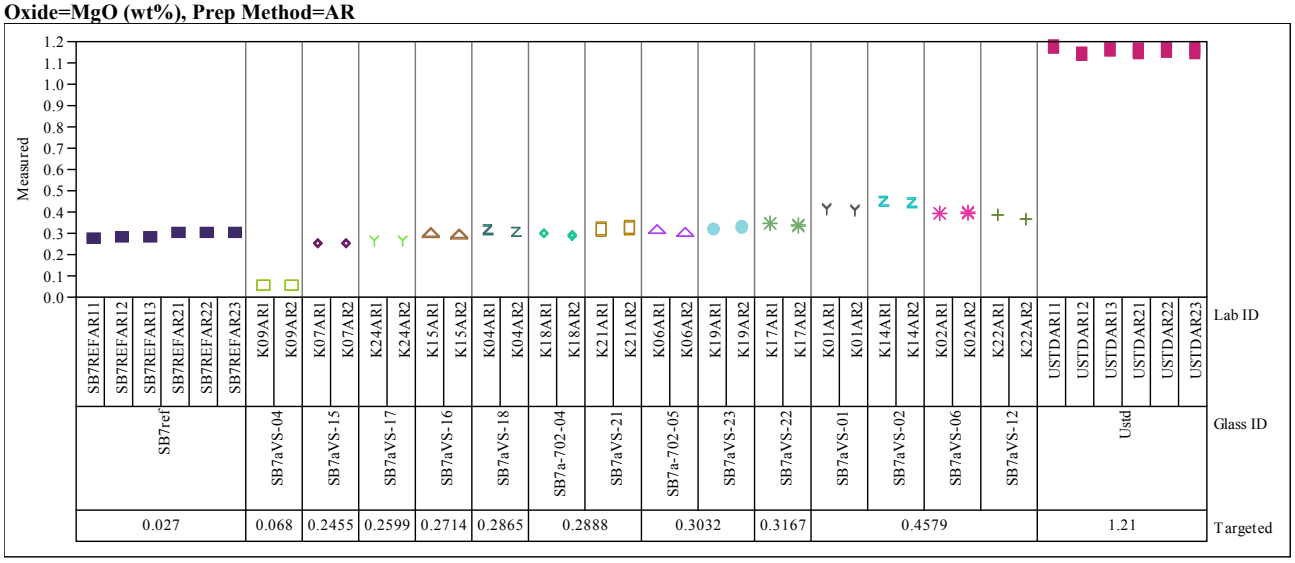


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=MgO (wt%), Prep Method=AR



Oxide=MgO (wt%), Prep Method=PF

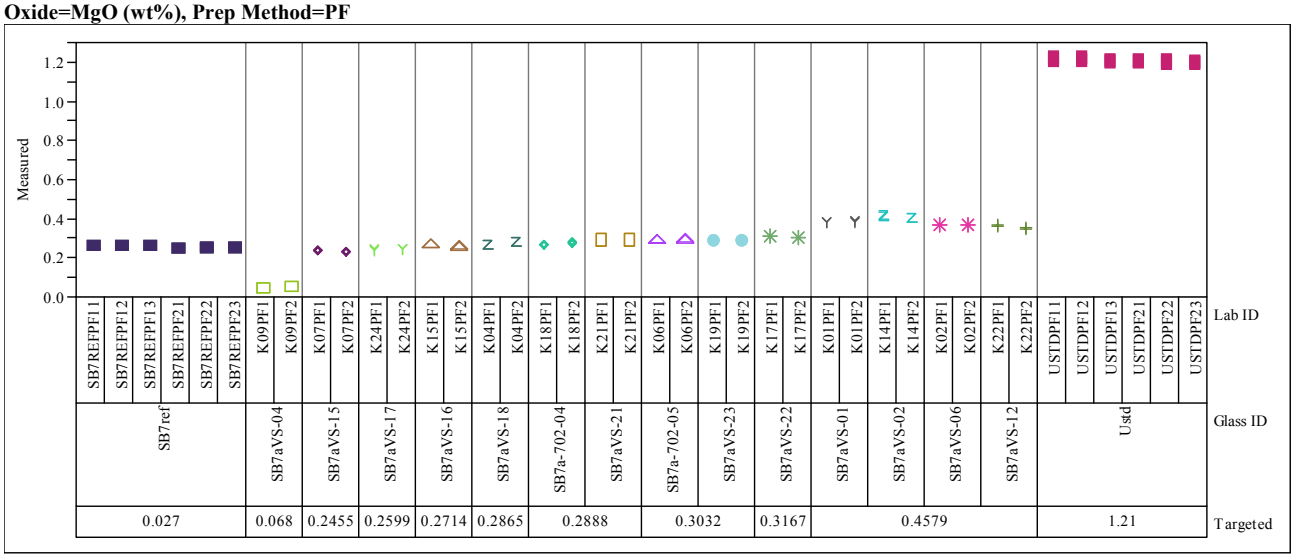
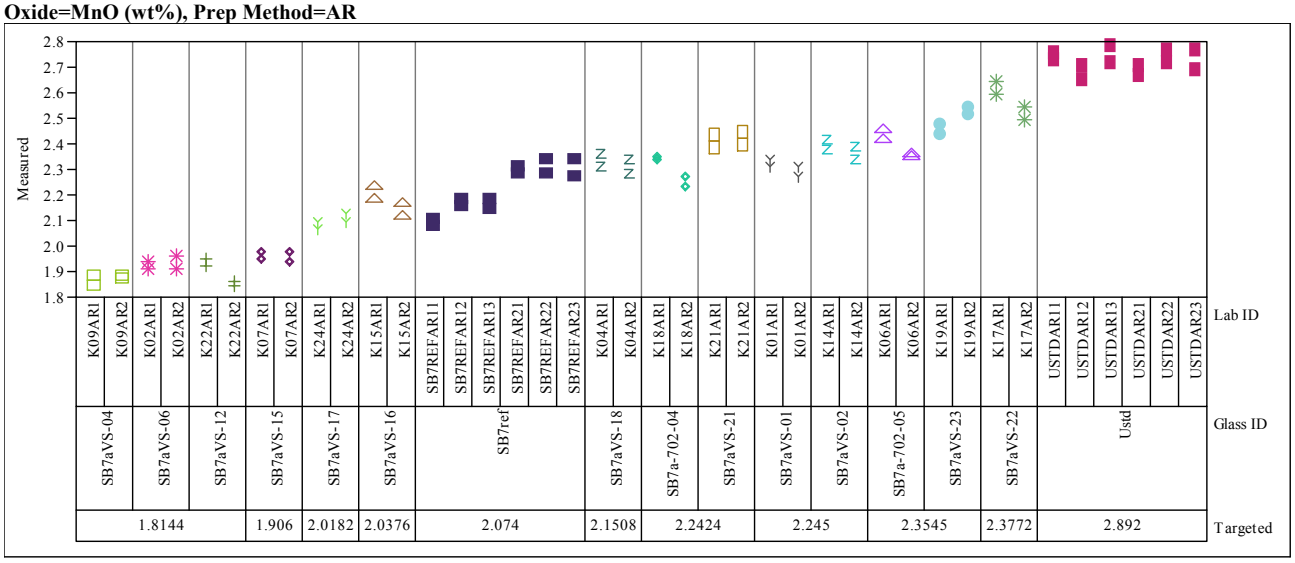


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=MnO (wt%), Prep Method=AR



Oxide=MnO (wt%), Prep Method=PF

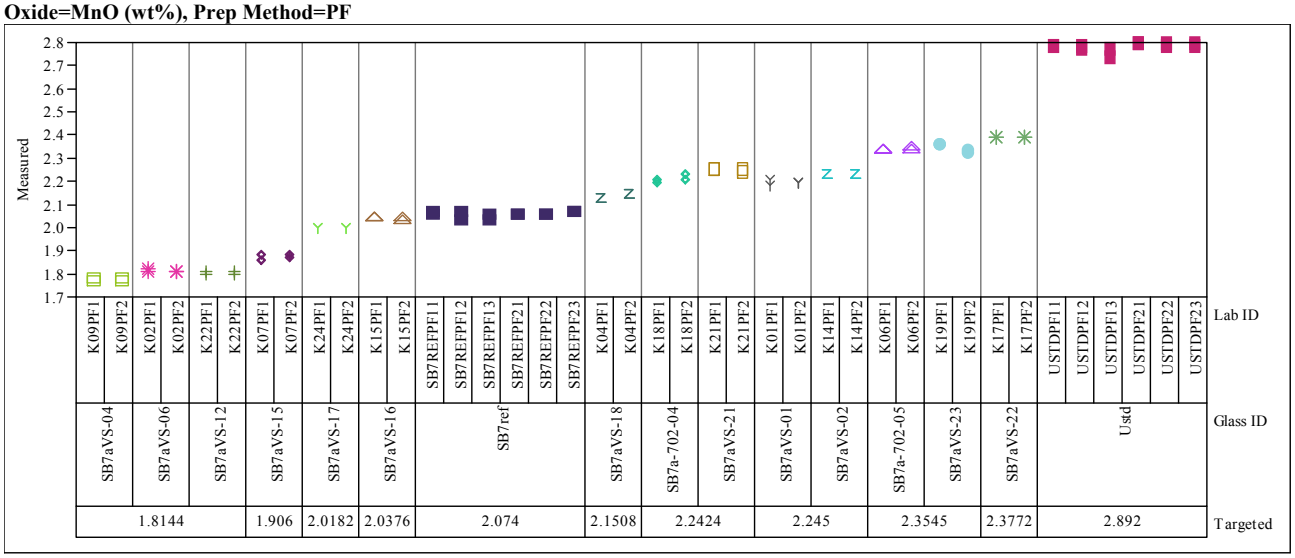


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=Na2O (wt%), Prep Method=AR

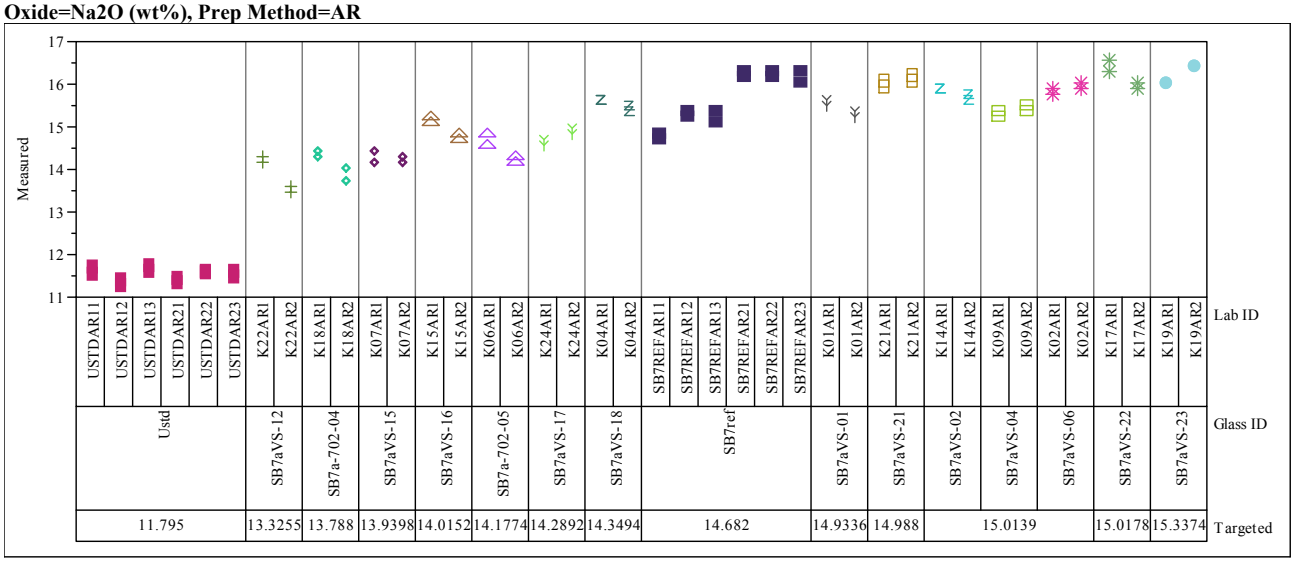
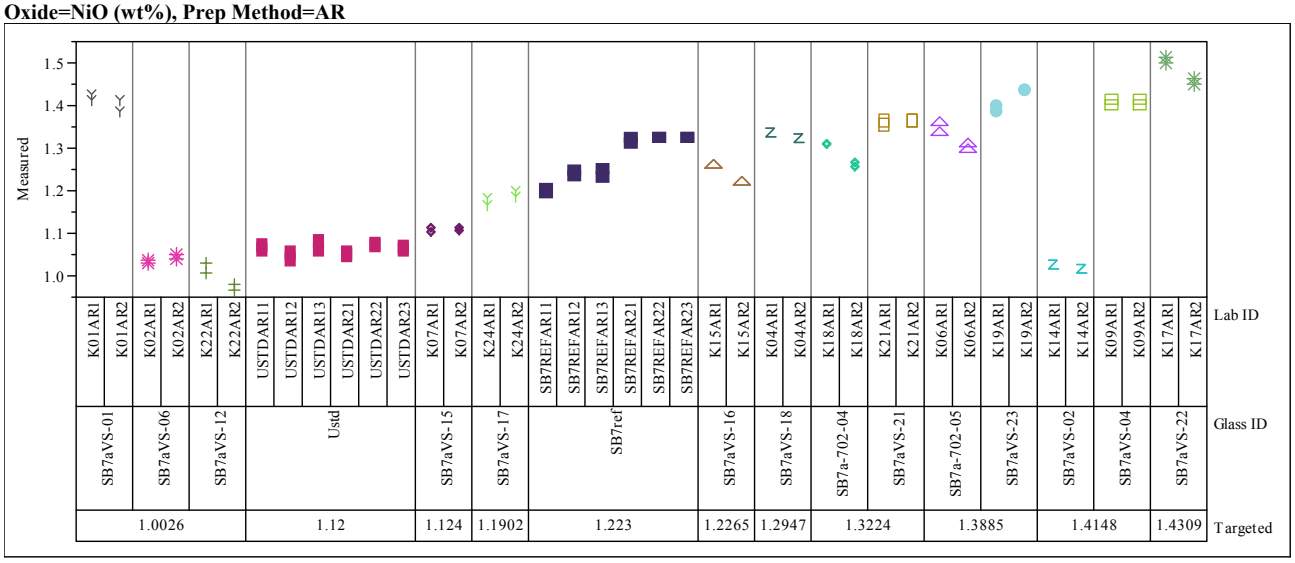


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=NiO (wt%), Prep Method=AR



Oxide=NiO (wt%), Prep Method=PF

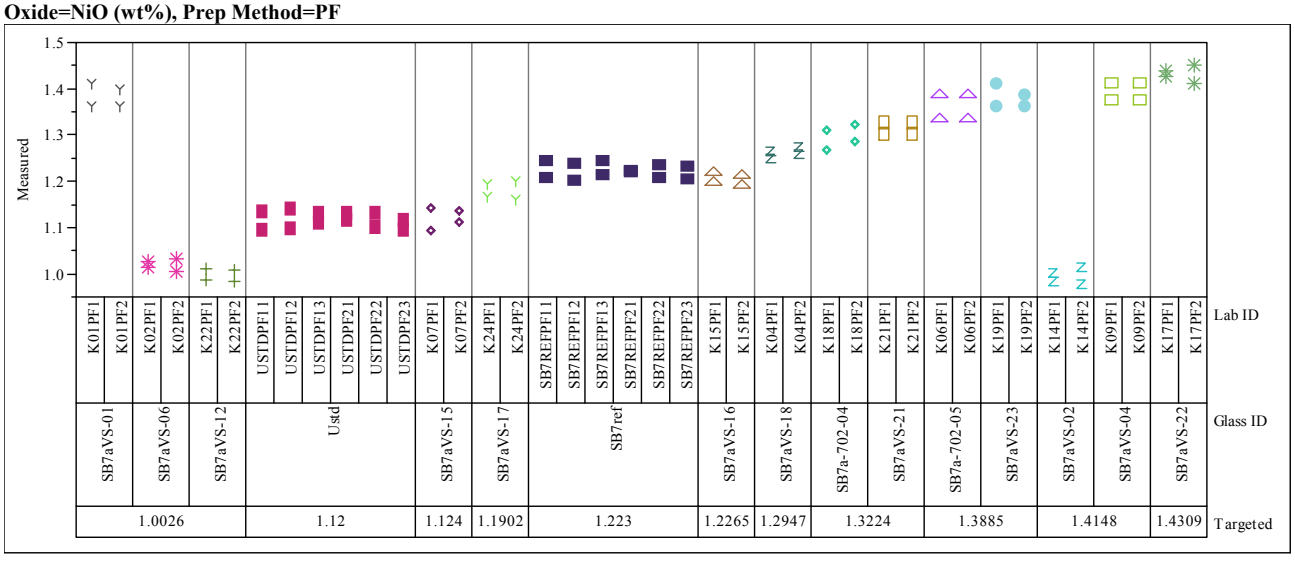
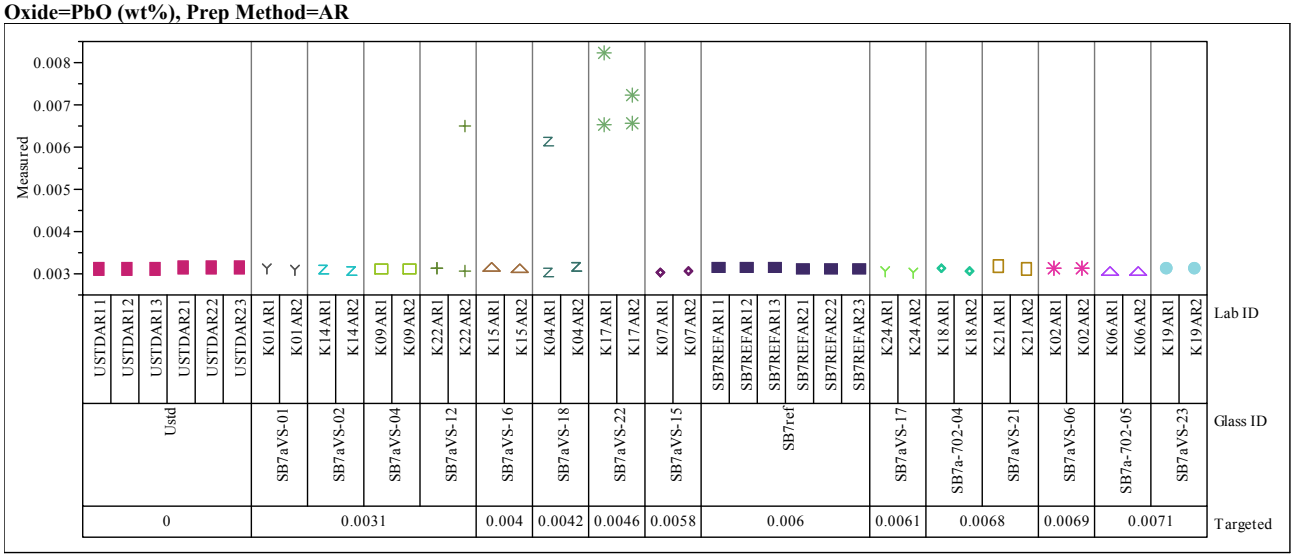


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=PbO (wt%), Prep Method=AR



Oxide=PbO (wt%), Prep Method=PF

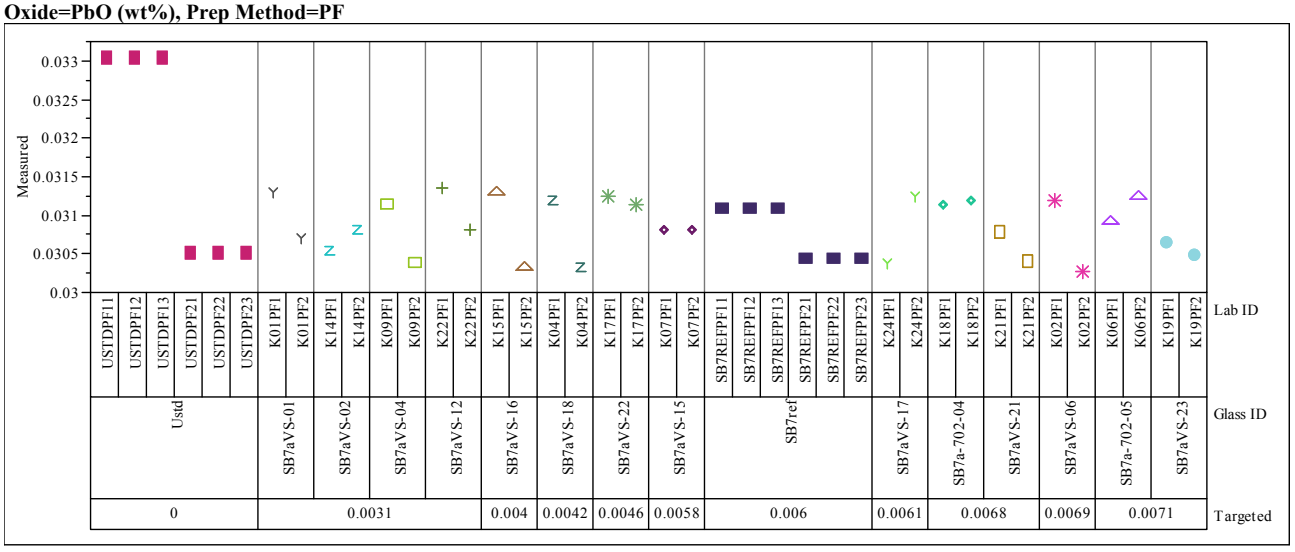


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=SiO2 (wt%), Prep Method=PF

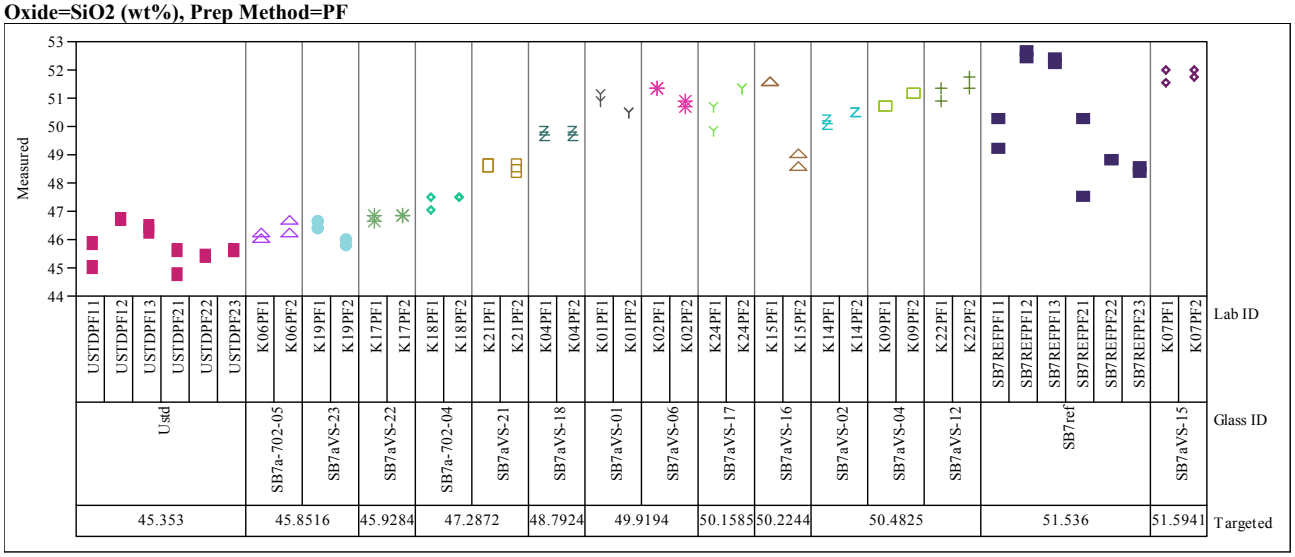
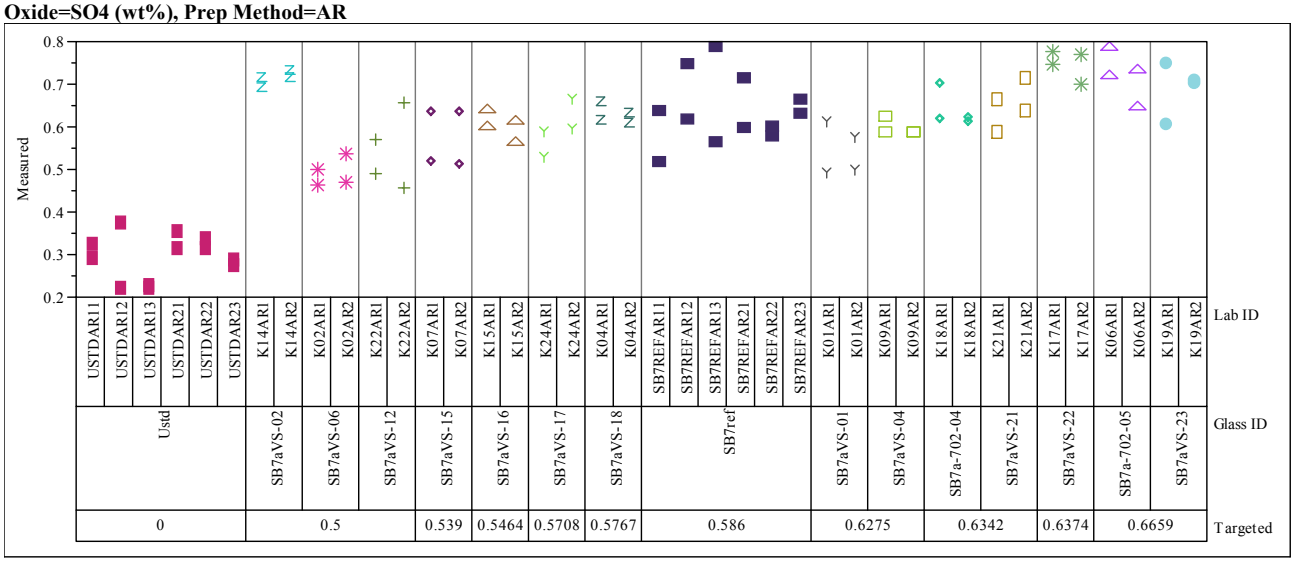


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=SO4 (wt%), Prep Method=AR



Oxide=SO4 (wt%), Prep Method=PF

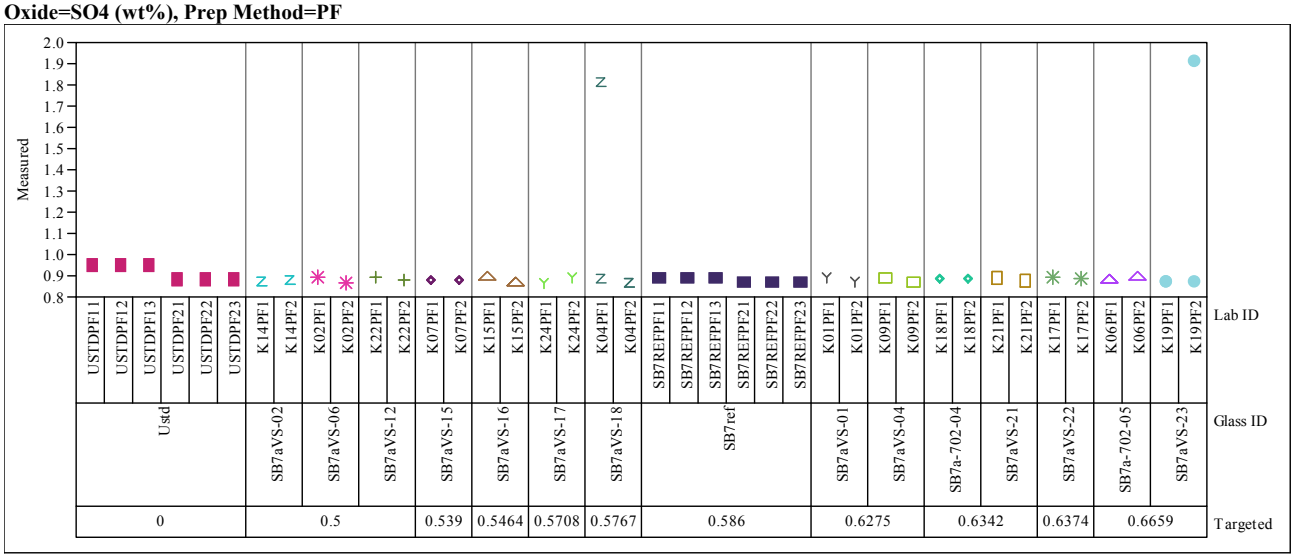
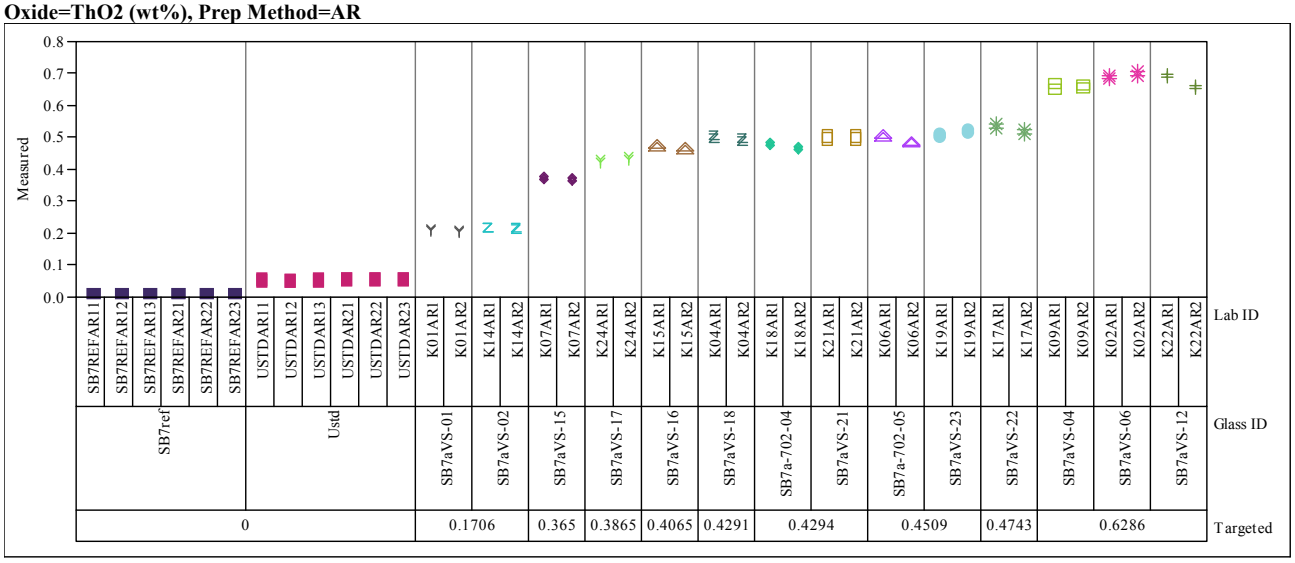


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=ThO2 (wt%), Prep Method=AR



Oxide=ThO2 (wt%), Prep Method=PF

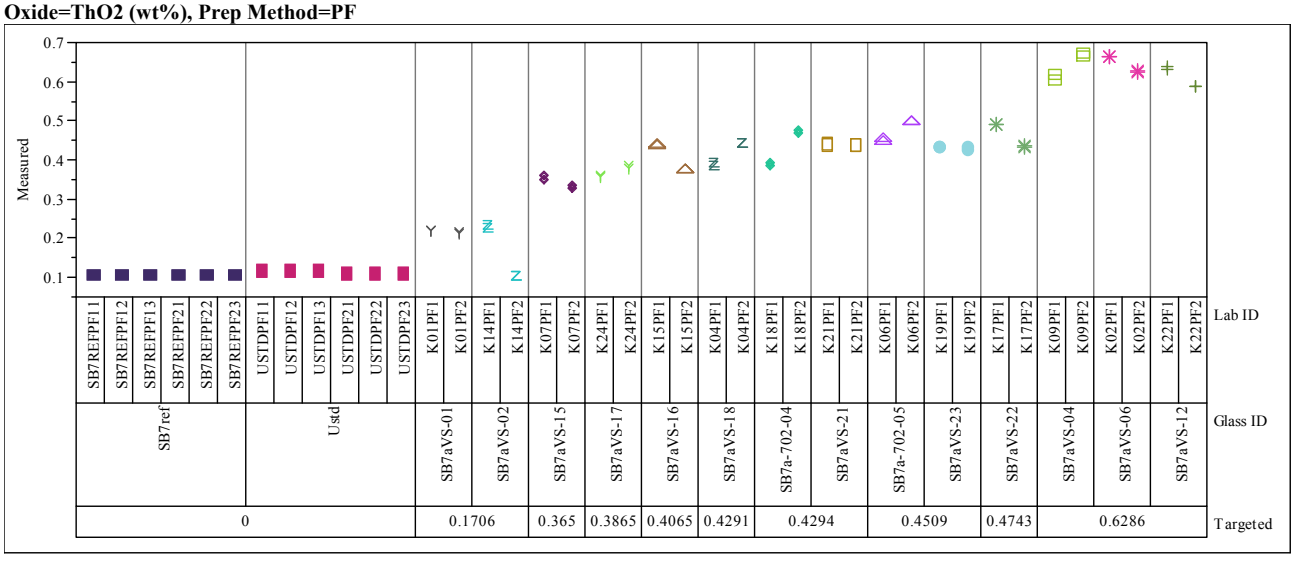
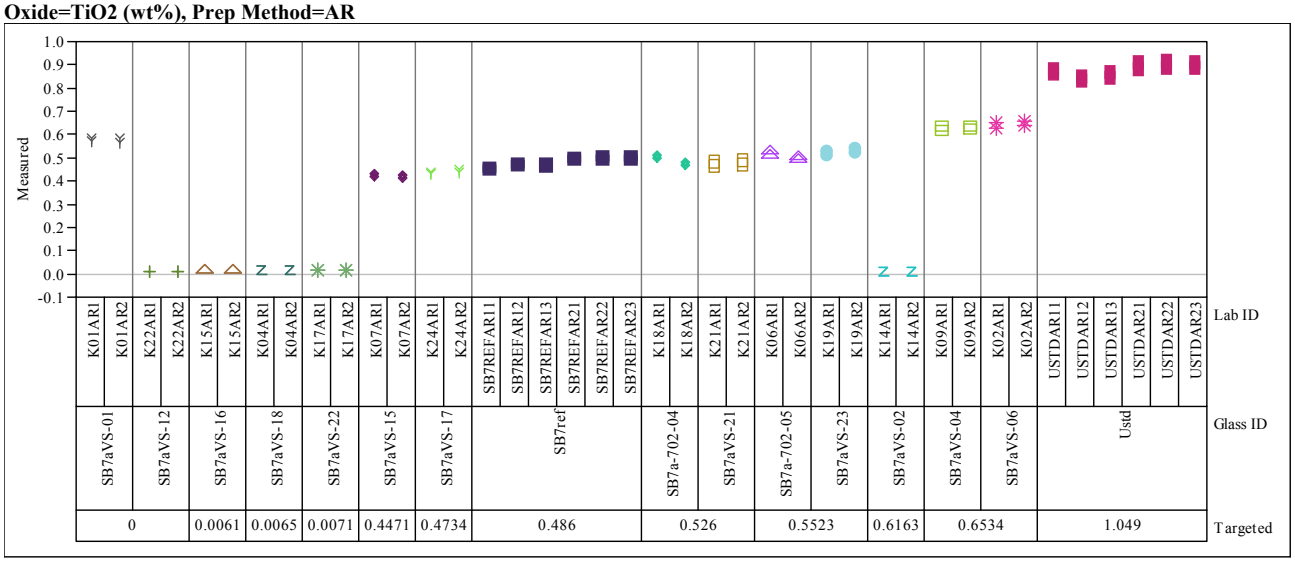


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=TiO2 (wt%), Prep Method=AR



Oxide=TiO2 (wt%), Prep Method=PF

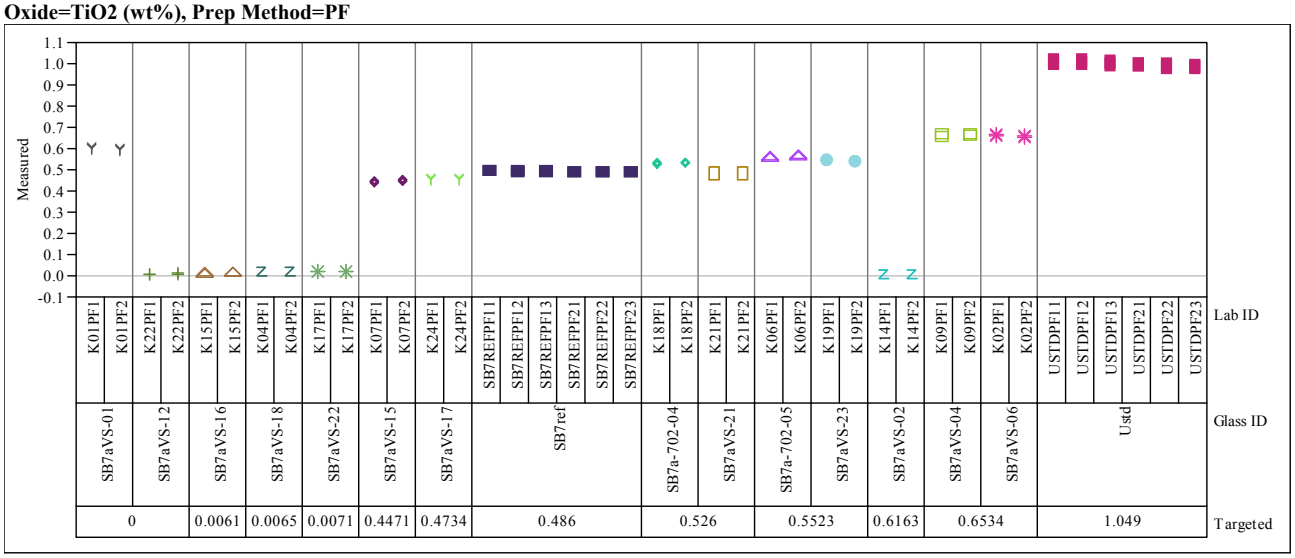
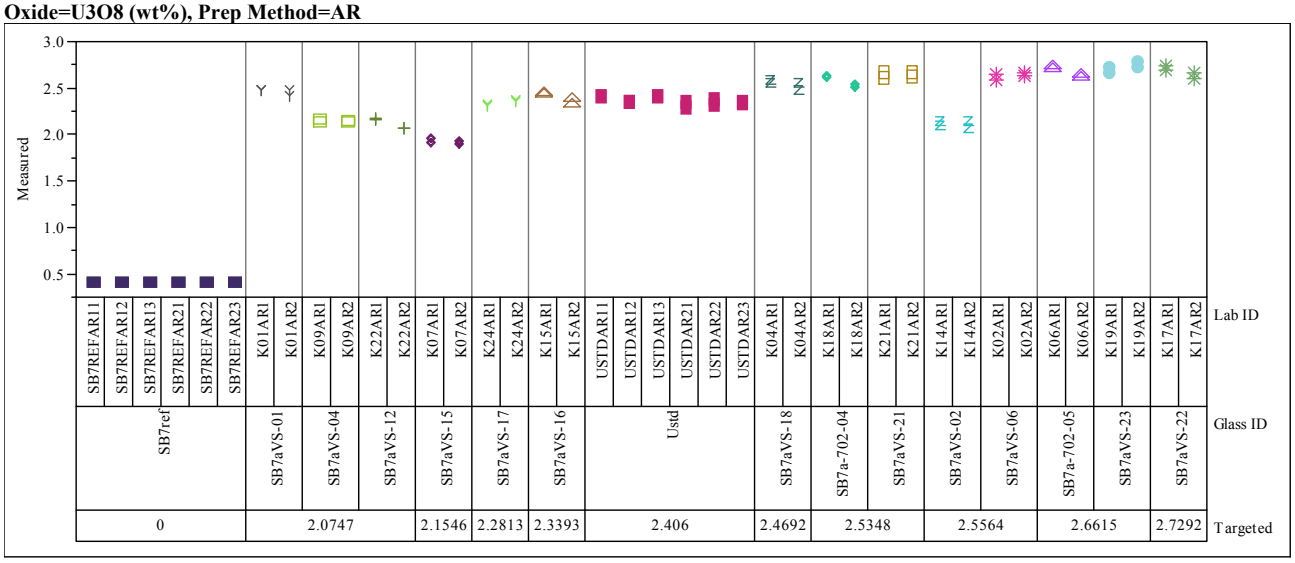


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=U3O8 (wt%), Prep Method=AR



Oxide=U3O8 (wt%), Prep Method=PF

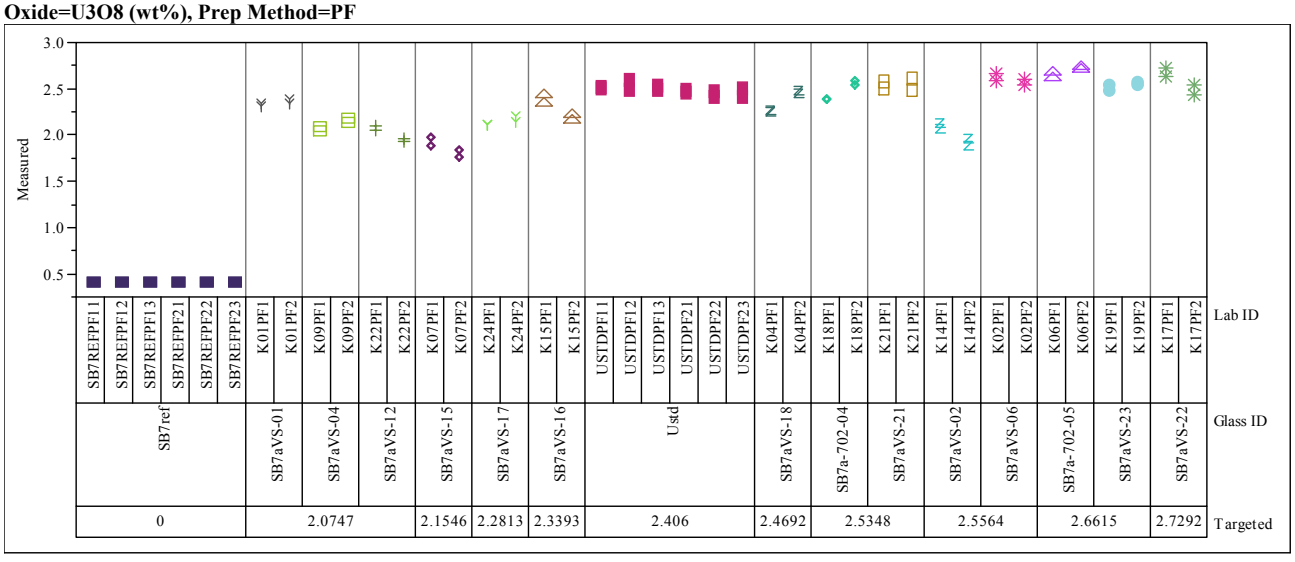
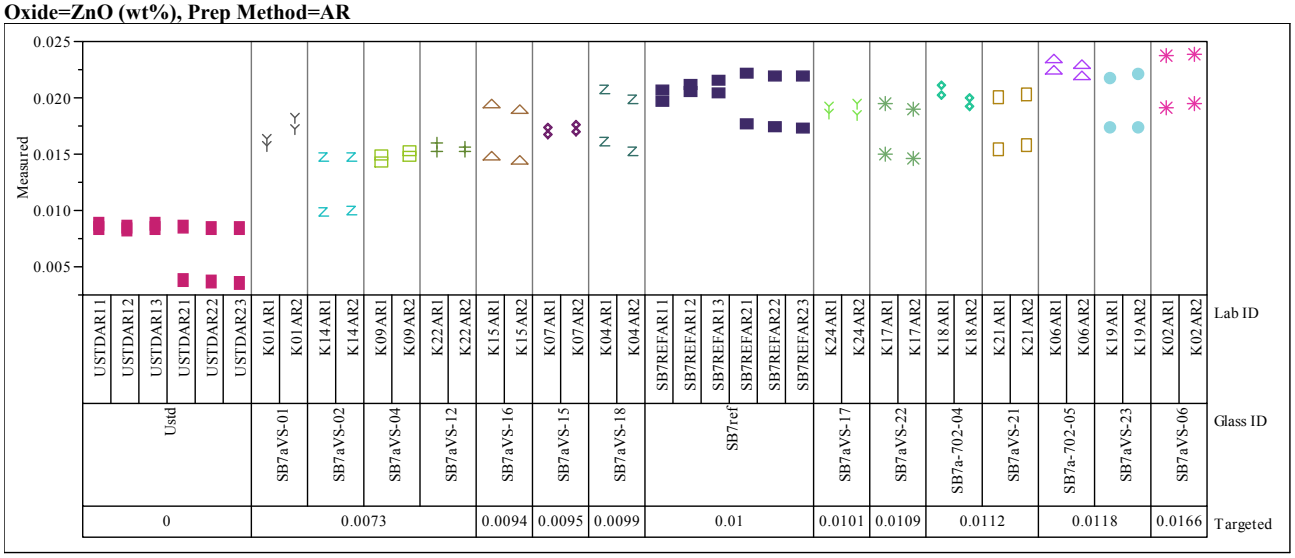


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=ZnO (wt%), Prep Method=AR



Oxide=ZnO (wt%), Prep Method=PF

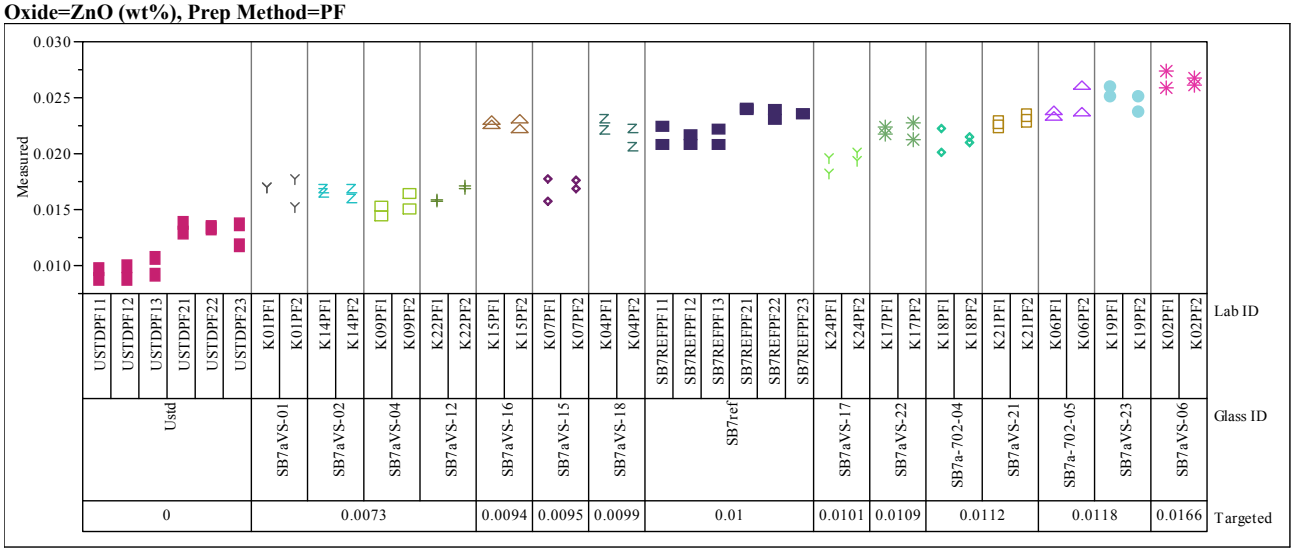


Exhibit A3. Measurements from Analytical Blocks 1 and 2 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=ZrO2 (wt%), Prep Method=AR

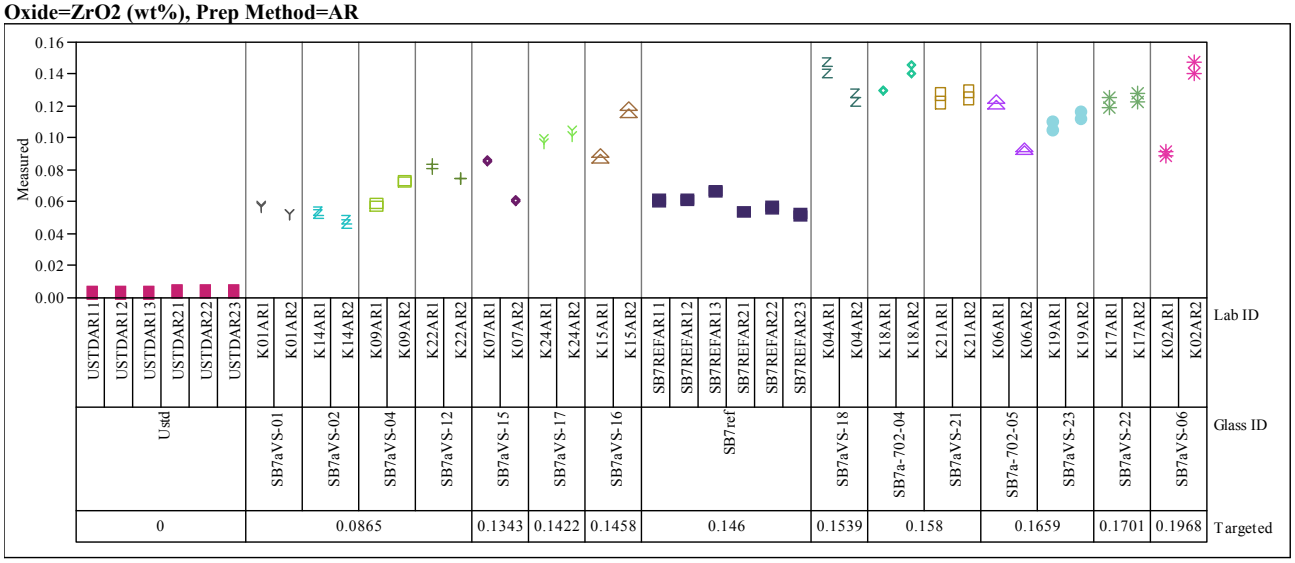
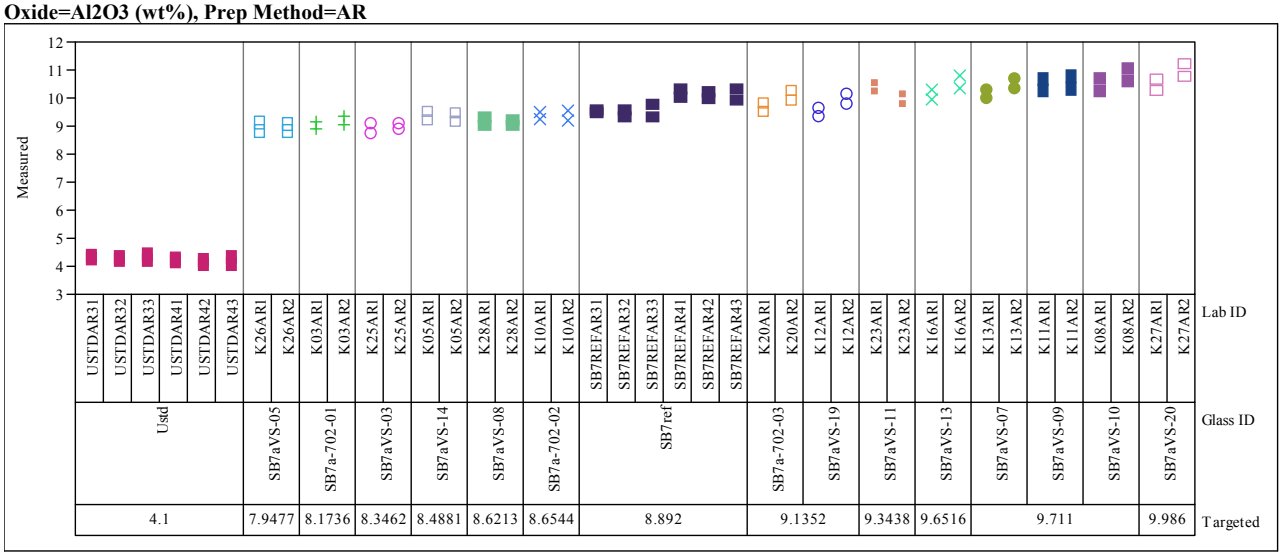


Exhibit A4. Measurements from Analytical Blocks 3 and 4 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=Al2O3 (wt%), Prep Method=AR



Oxide=Al2O3 (wt%), Prep Method=PF

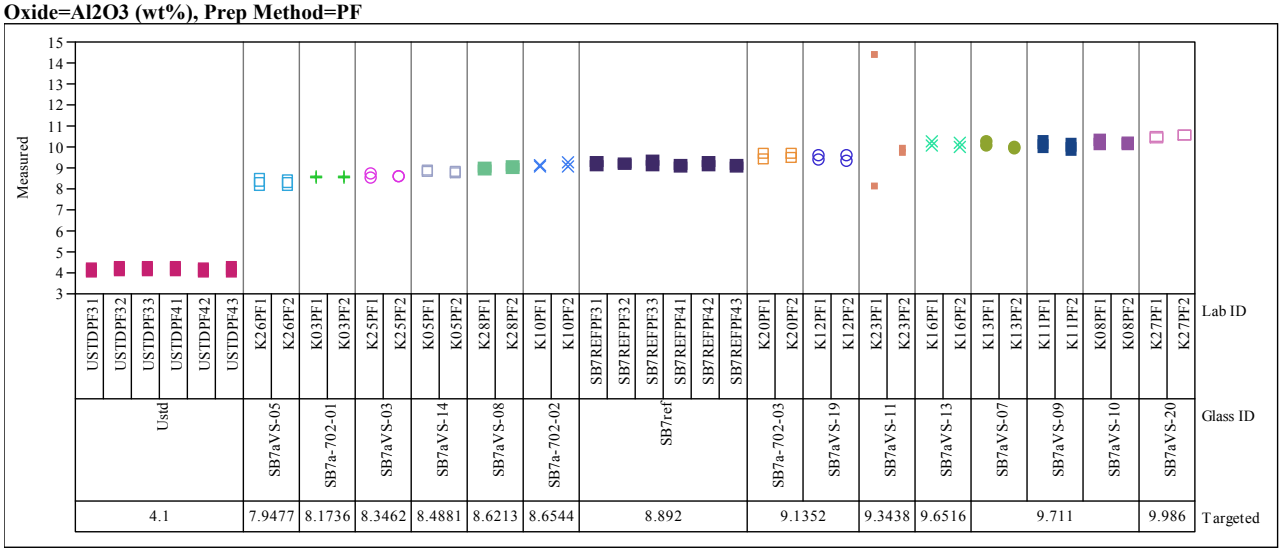
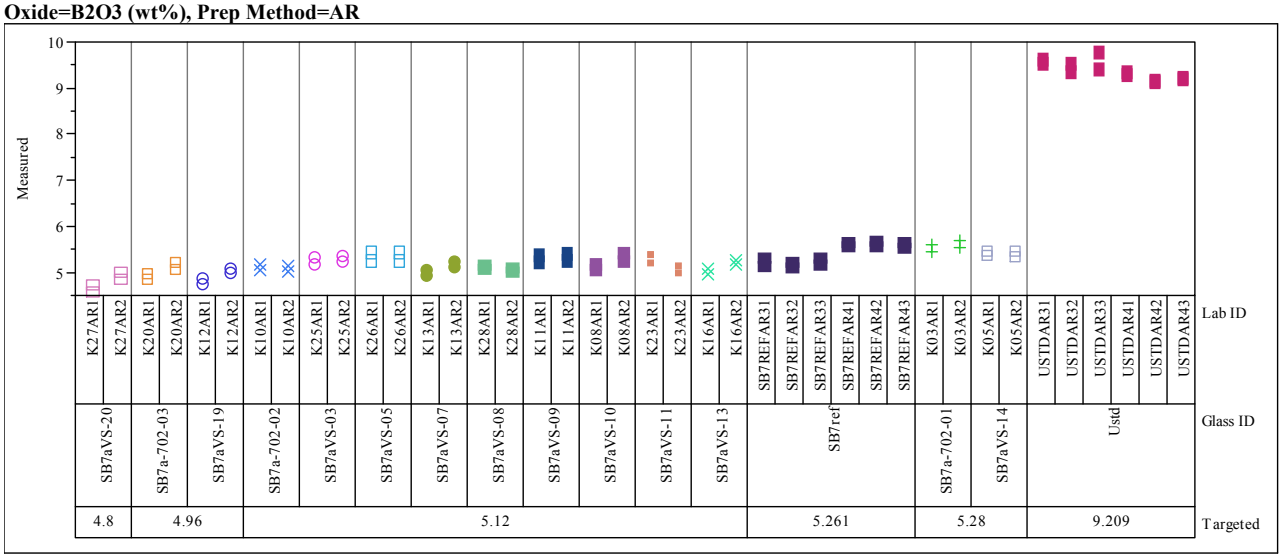


Exhibit A4. Measurements from Analytical Blocks 3 and 4 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=B2O3 (wt%), Prep Method=AR



Oxide=B2O3 (wt%), Prep Method=PF

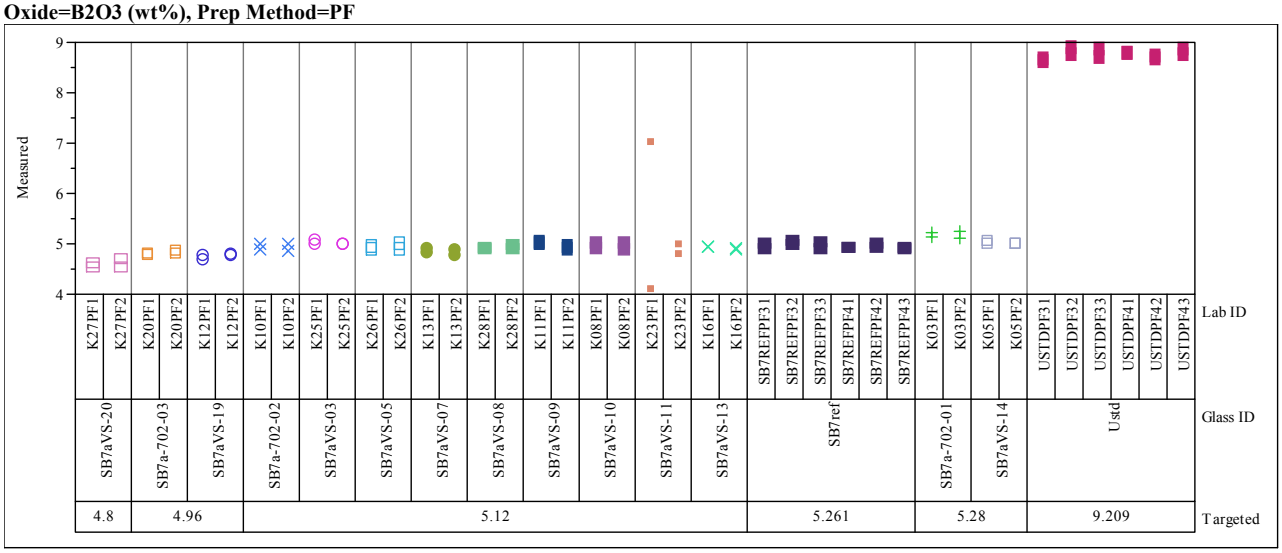
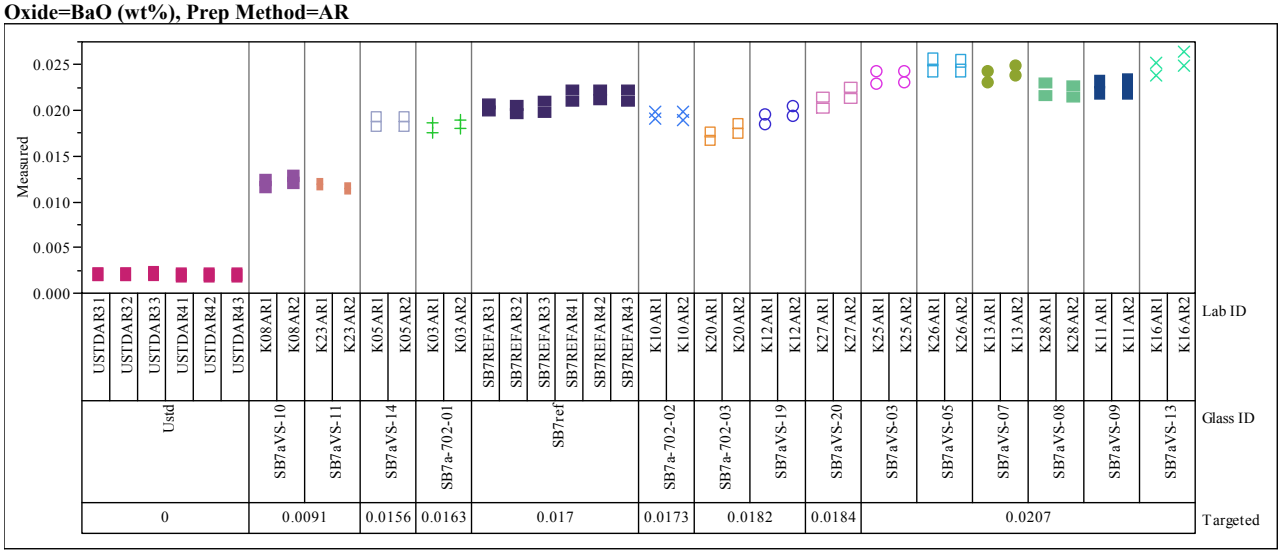


Exhibit A4. Measurements from Analytical Blocks 3 and 4 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=BaO (wt%), Prep Method=AR



Oxide=BaO (wt%), Prep Method=PF

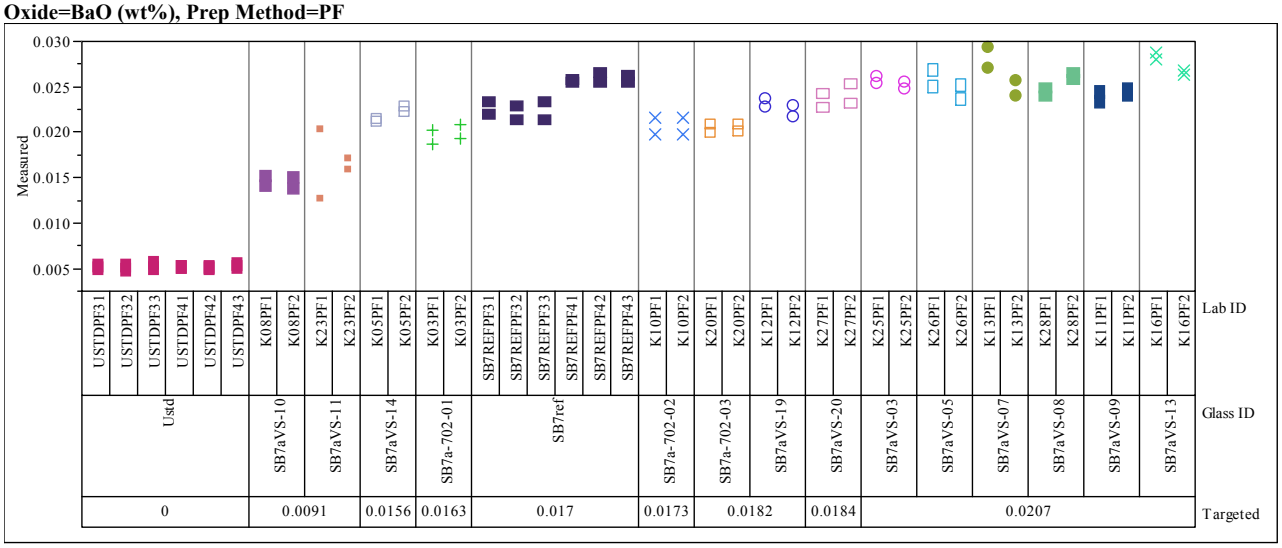
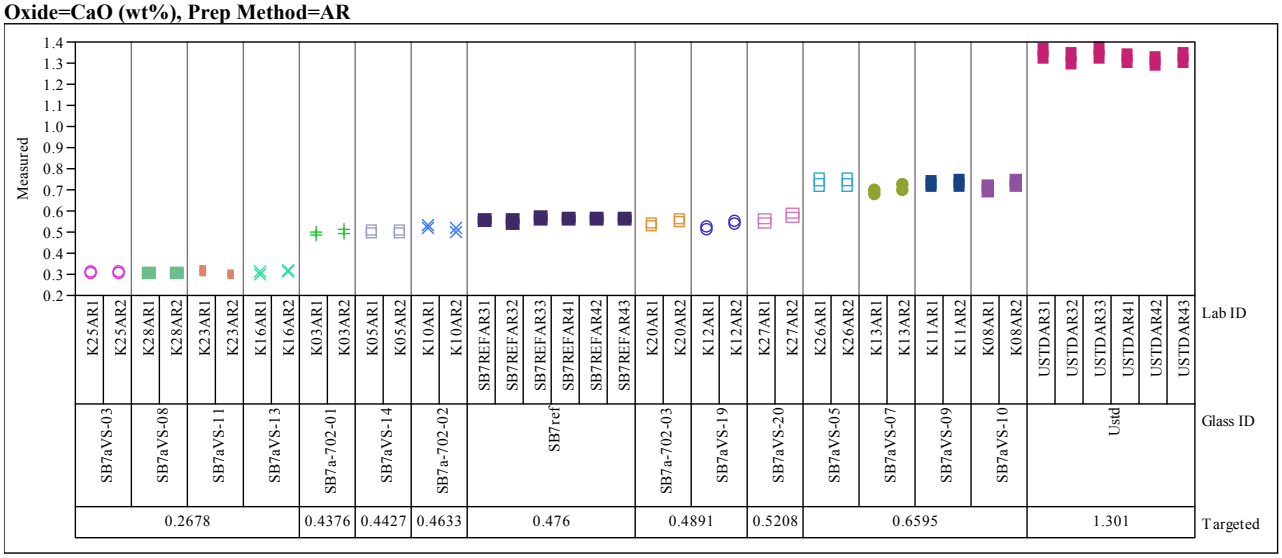


Exhibit A4. Measurements from Analytical Blocks 3 and 4 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=CaO (wt%), Prep Method=AR



Oxide=CaO (wt%), Prep Method=PF

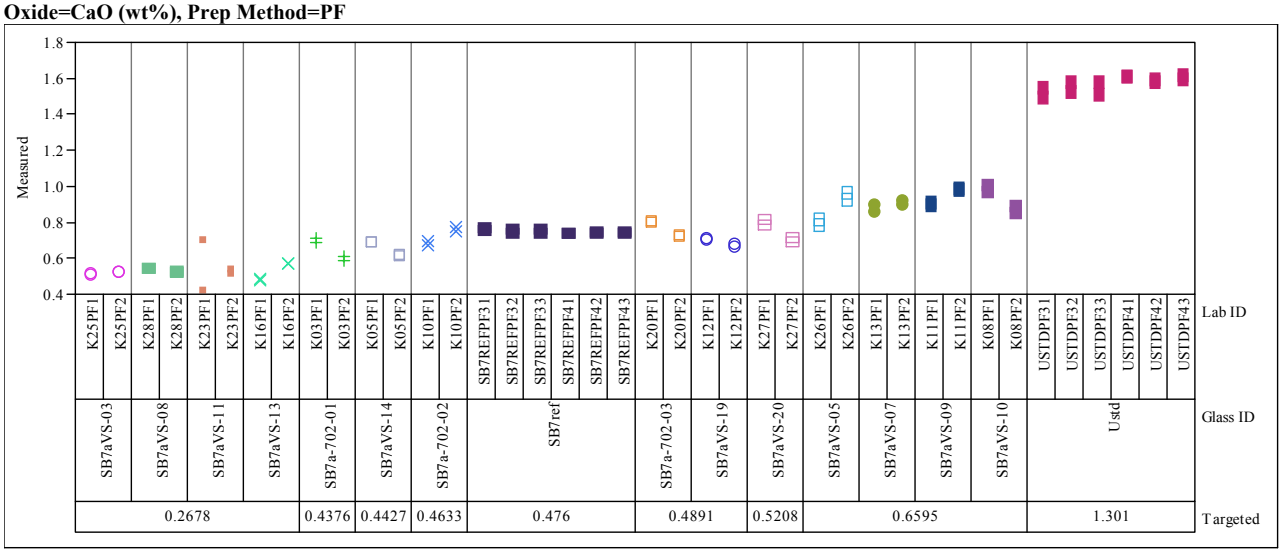
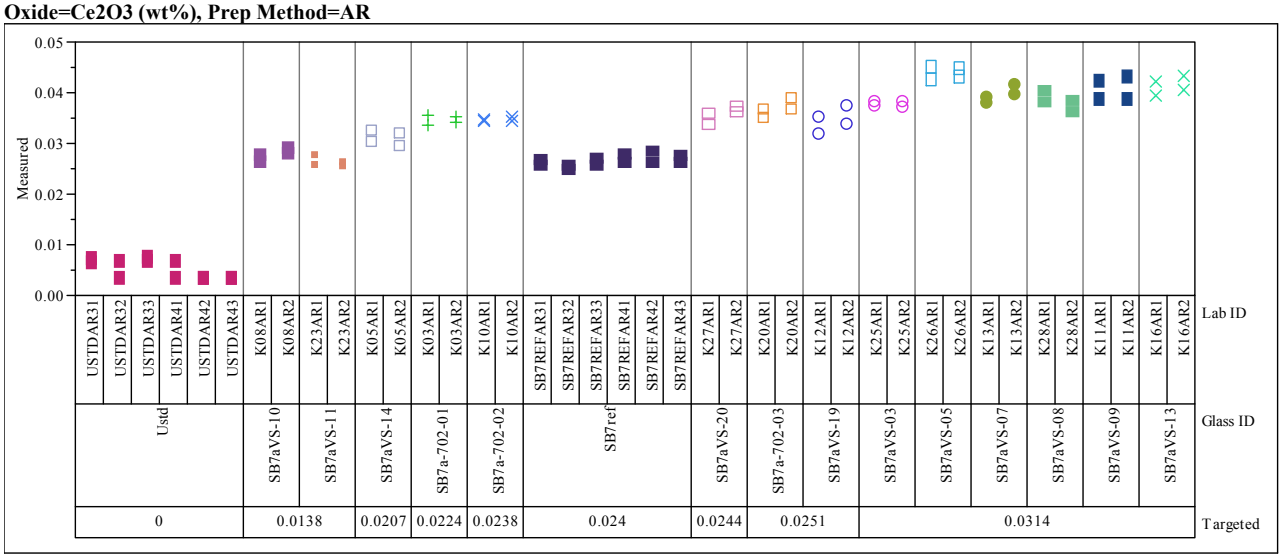


Exhibit A4. Measurements from Analytical Blocks 3 and 4 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=Ce2O3 (wt%), Prep Method=AR



Oxide=Ce2O3 (wt%), Prep Method=PF

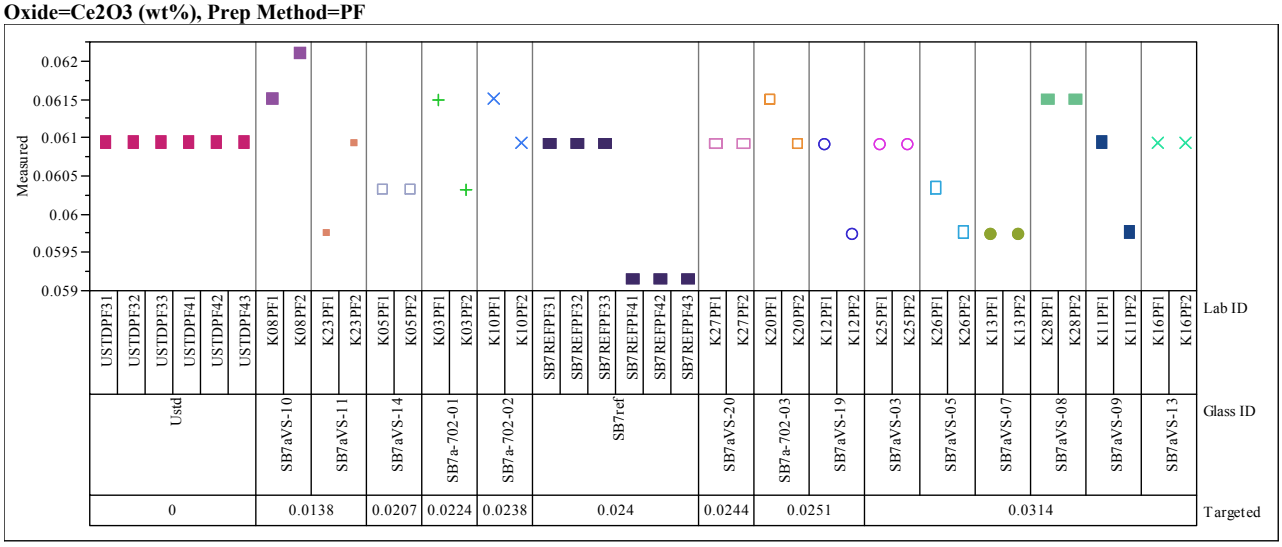
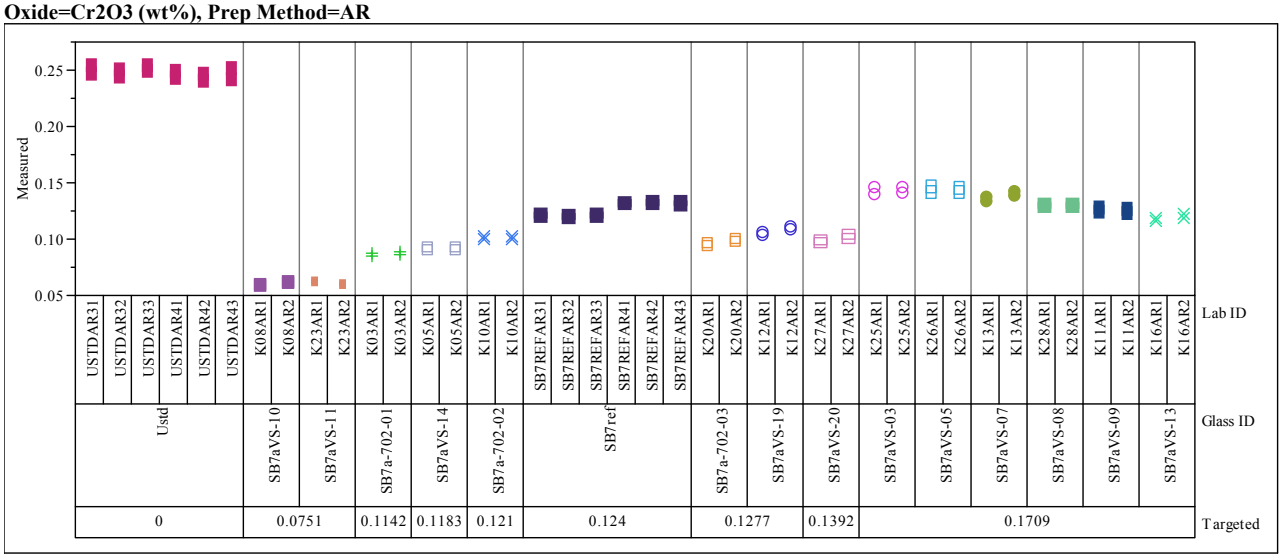


Exhibit A4. Measurements from Analytical Blocks 3 and 4 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=Cr2O3 (wt%), Prep Method=AR



Oxide=Cr2O3 (wt%), Prep Method=PF

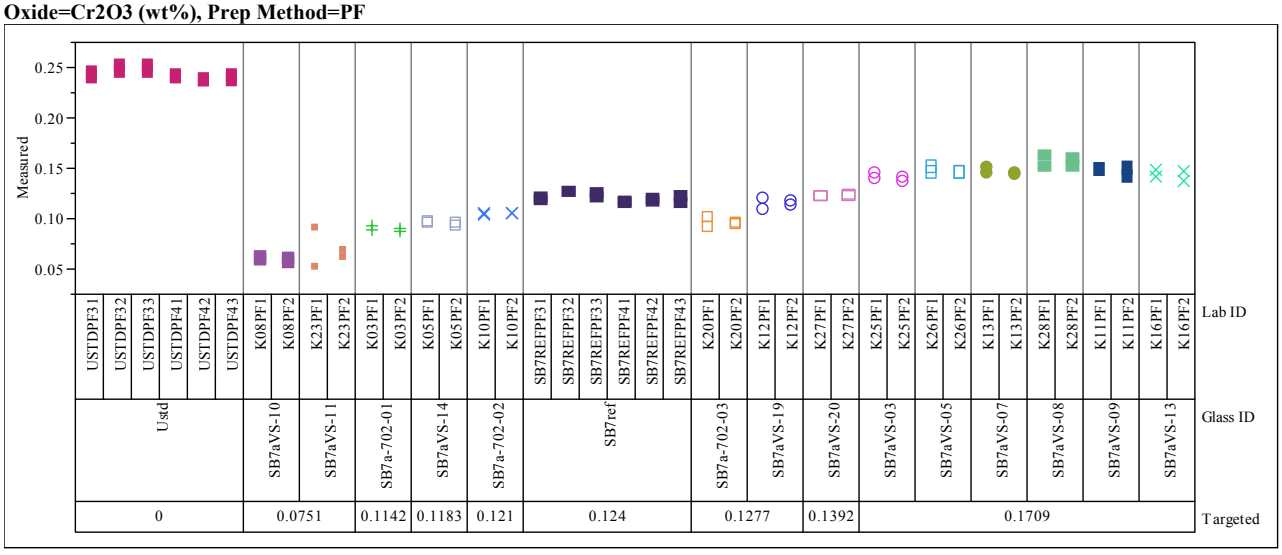
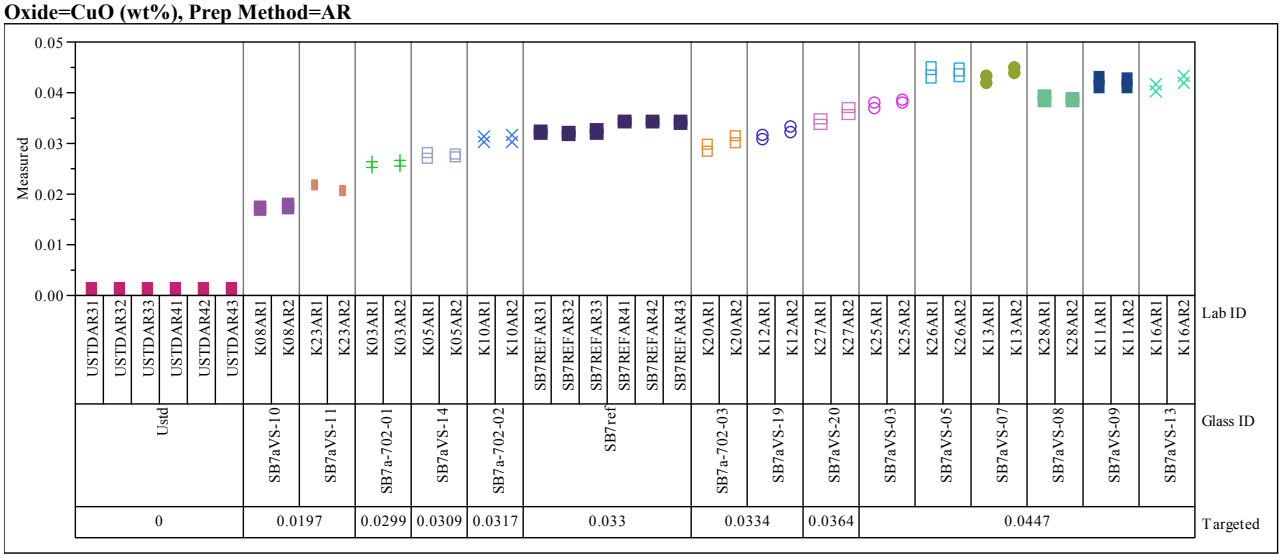


Exhibit A4. Measurements from Analytical Blocks 3 and 4 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=CuO (wt%), Prep Method=AR



Oxide=CuO (wt%), Prep Method=PF

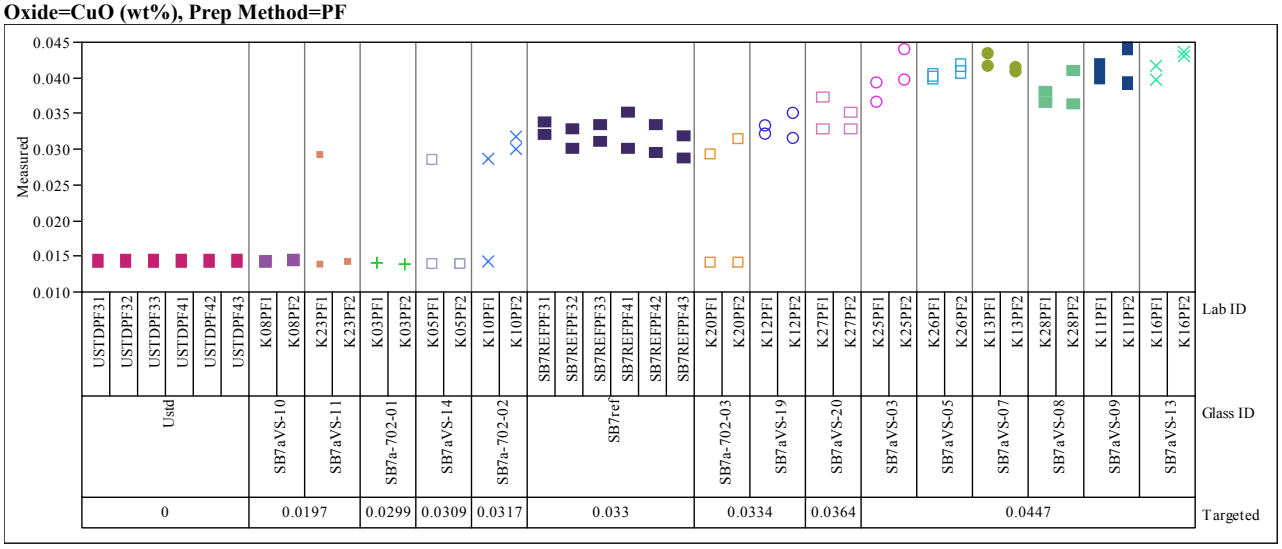
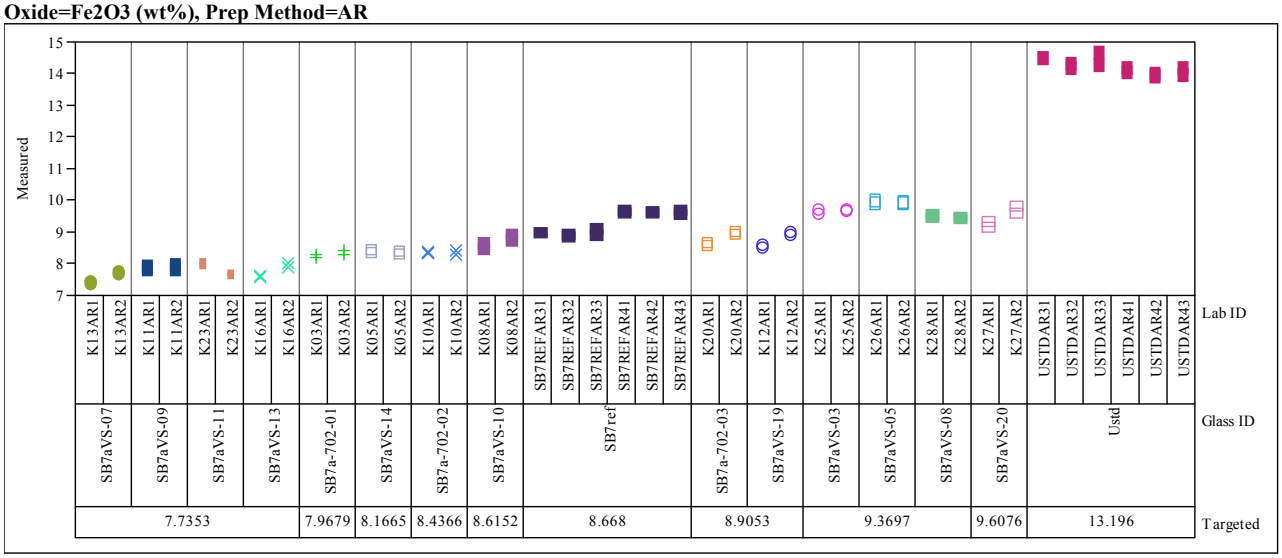


Exhibit A4. Measurements from Analytical Blocks 3 and 4 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=Fe2O3 (wt%), Prep Method=AR



Oxide=Fe2O3 (wt%), Prep Method=PF

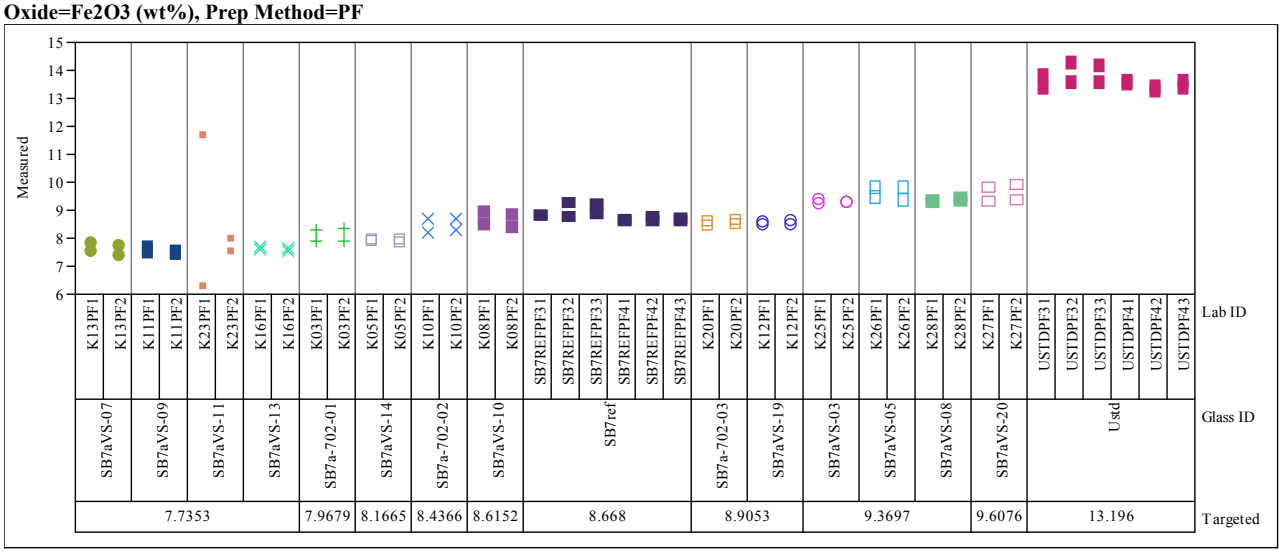
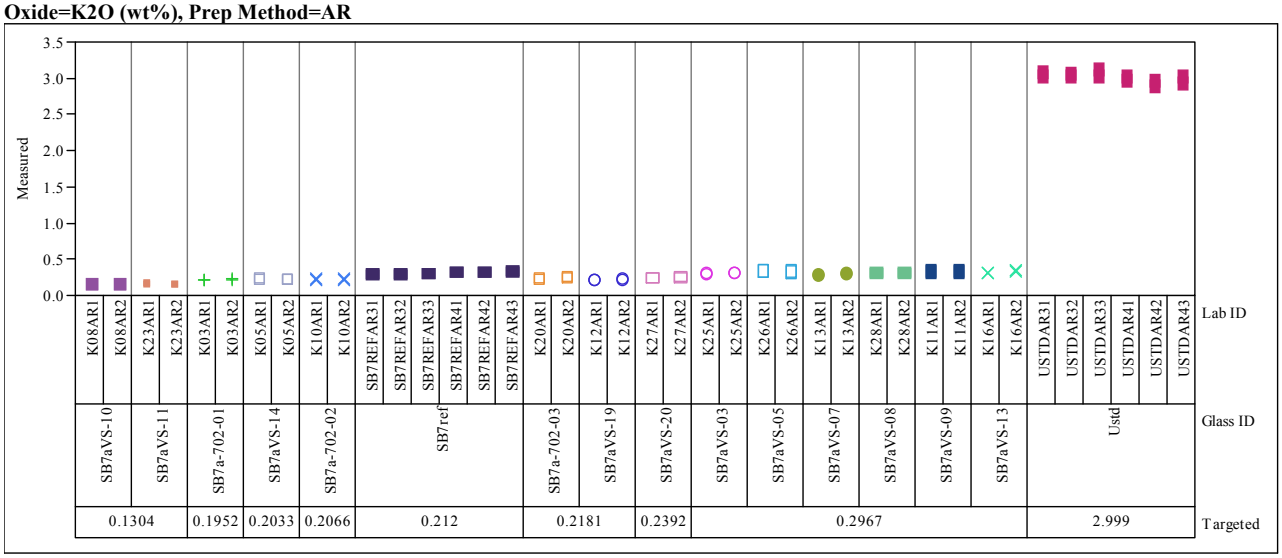


Exhibit A4. Measurements from Analytical Blocks 3 and 4 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=K2O (wt%), Prep Method=AR



Oxide=K2O (wt%), Prep Method=PF

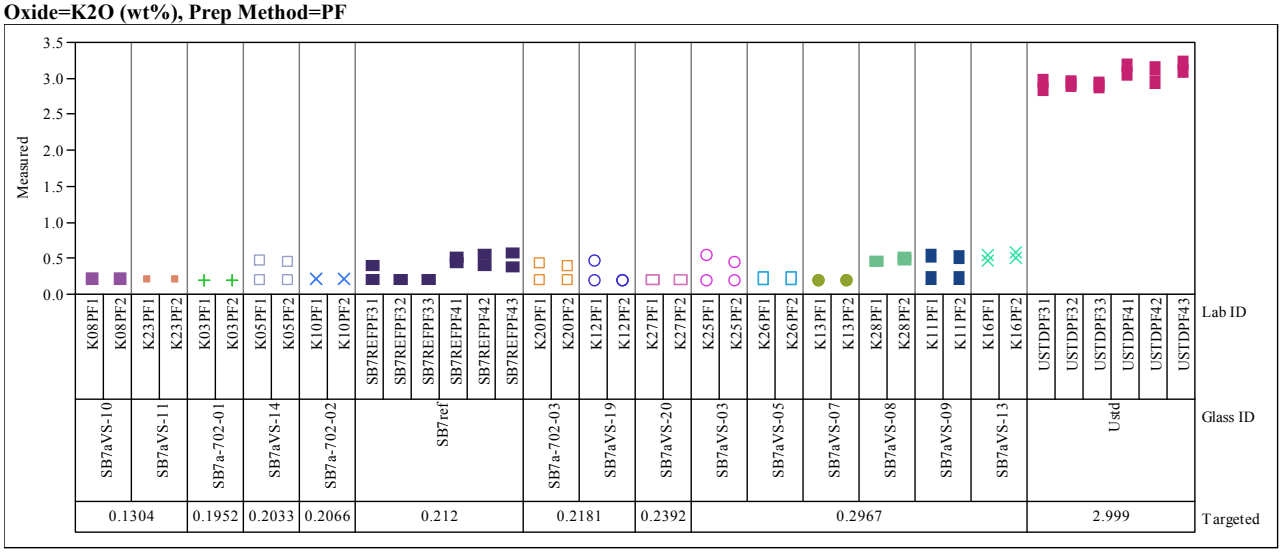
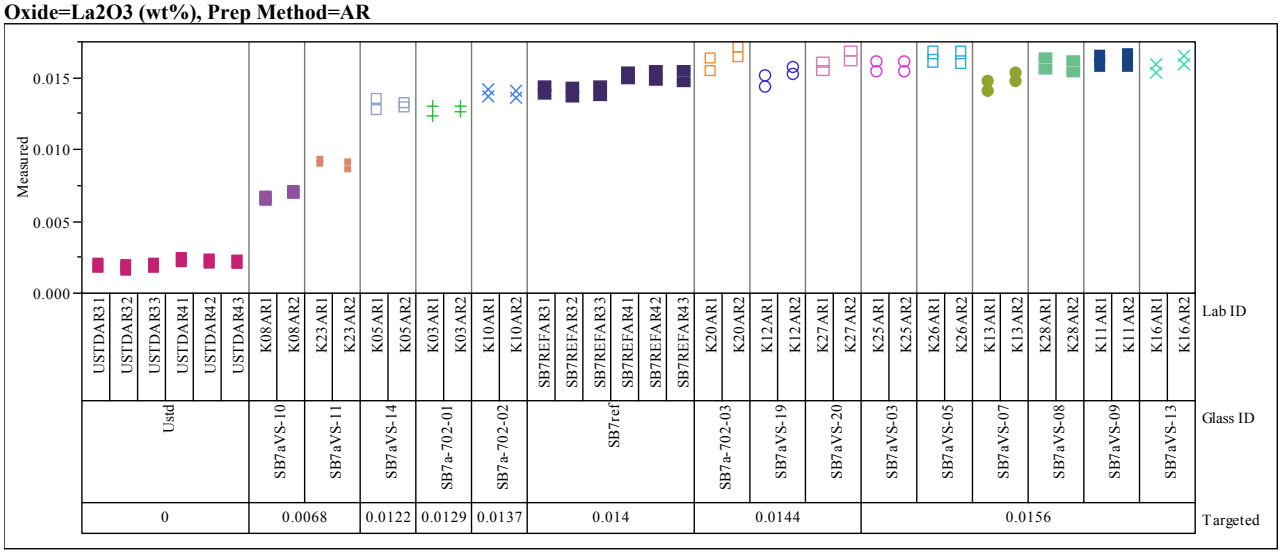


Exhibit A4. Measurements from Analytical Blocks 3 and 4 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=La2O3 (wt%), Prep Method=AR



Oxide=La2O3 (wt%), Prep Method=PF

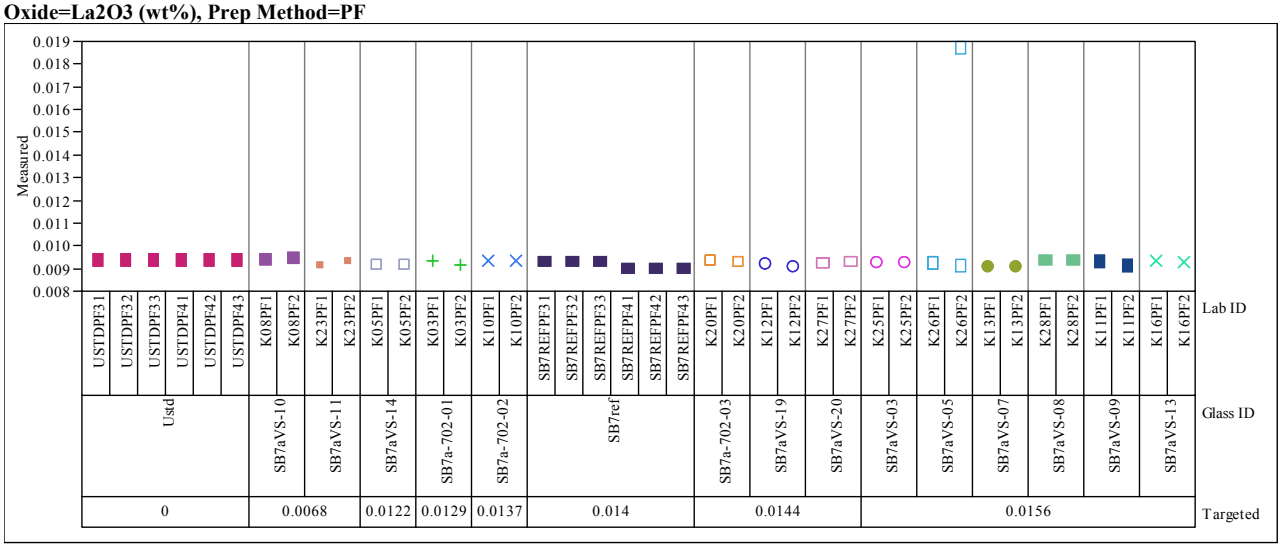
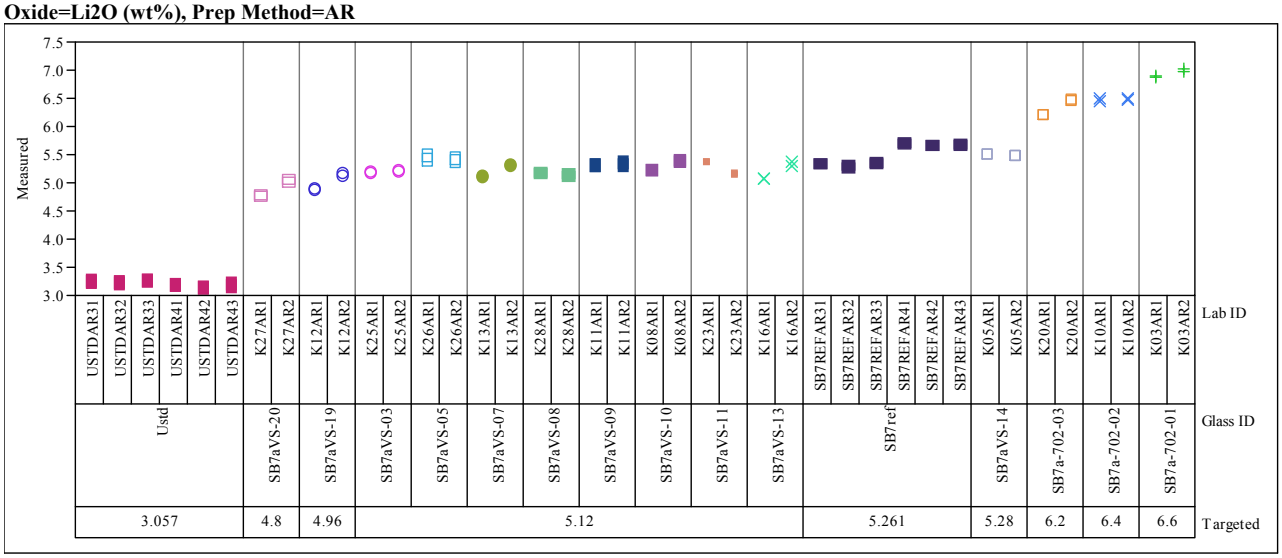


Exhibit A4. Measurements from Analytical Blocks 3 and 4 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=Li2O (wt%), Prep Method=AR



Oxide=Li2O (wt%), Prep Method=PF

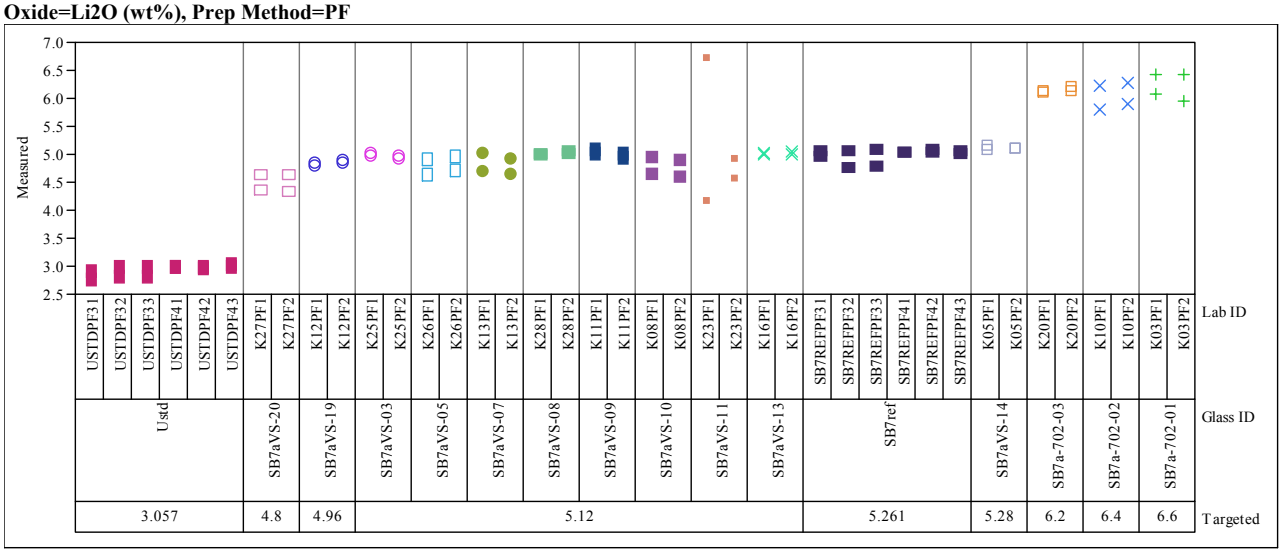
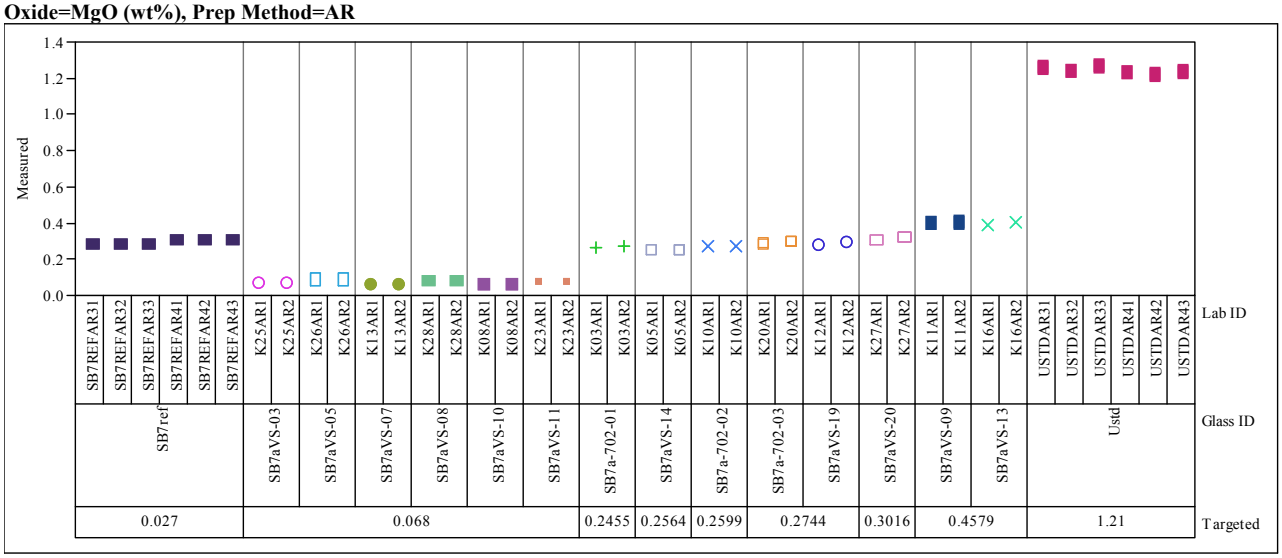


Exhibit A4. Measurements from Analytical Blocks 3 and 4 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=MgO (wt%), Prep Method=AR



Oxide=MgO (wt%), Prep Method=PF

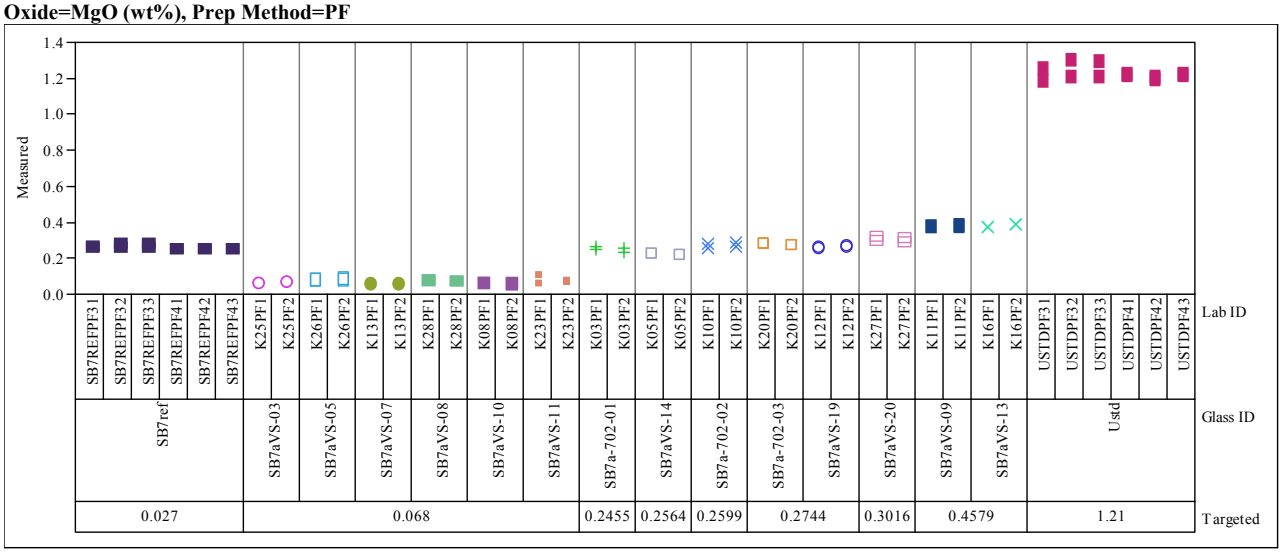
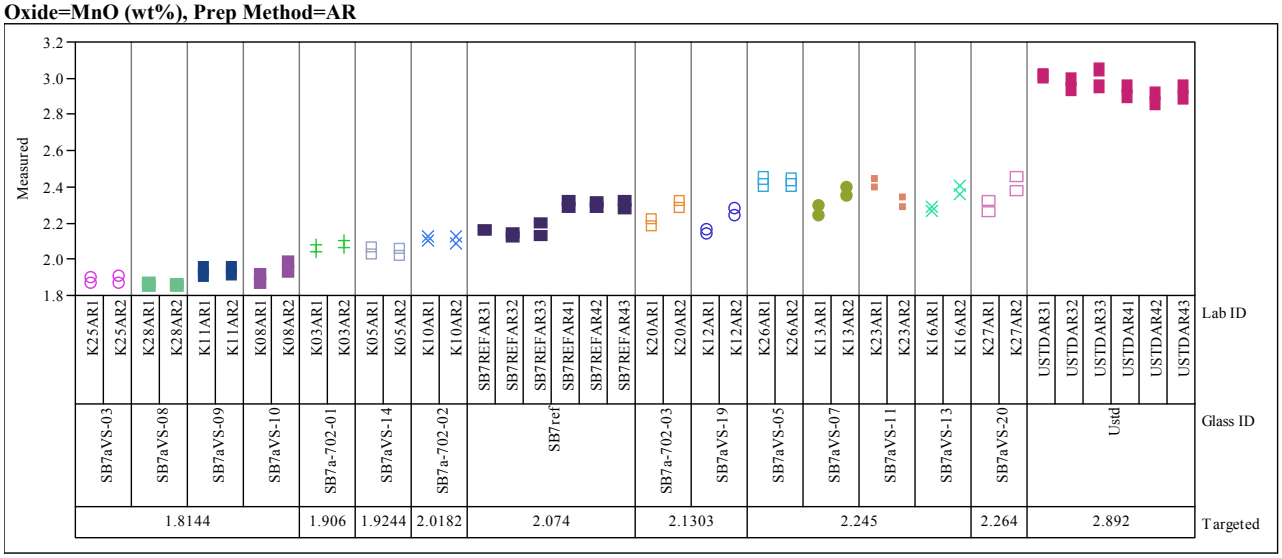


Exhibit A4. Measurements from Analytical Blocks 3 and 4 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=MnO (wt%), Prep Method=AR



Oxide=MnO (wt%), Prep Method=PF

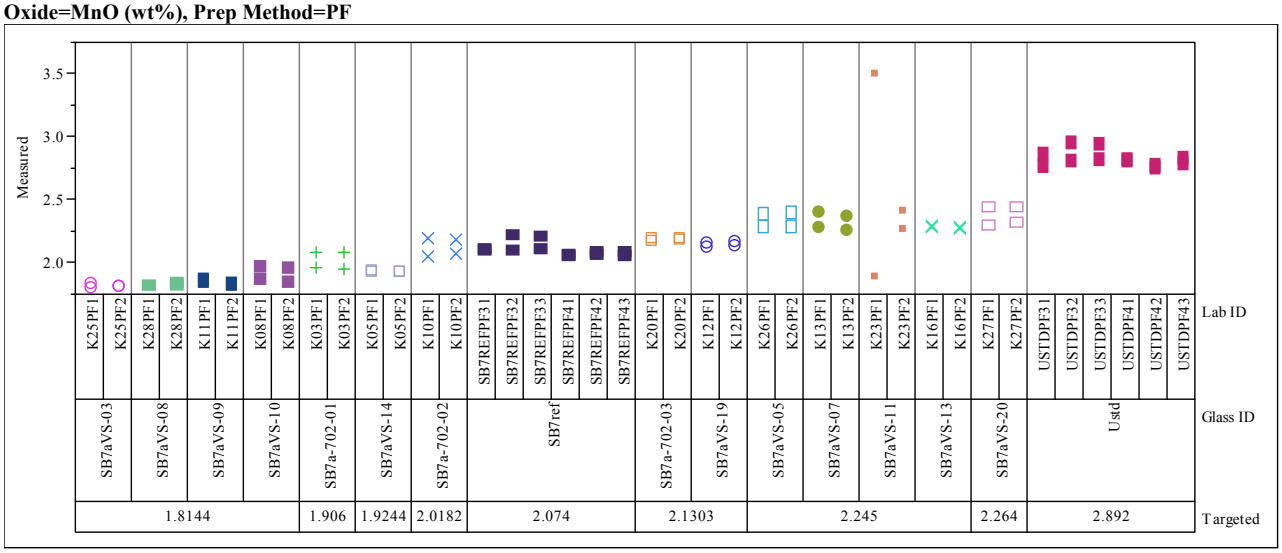
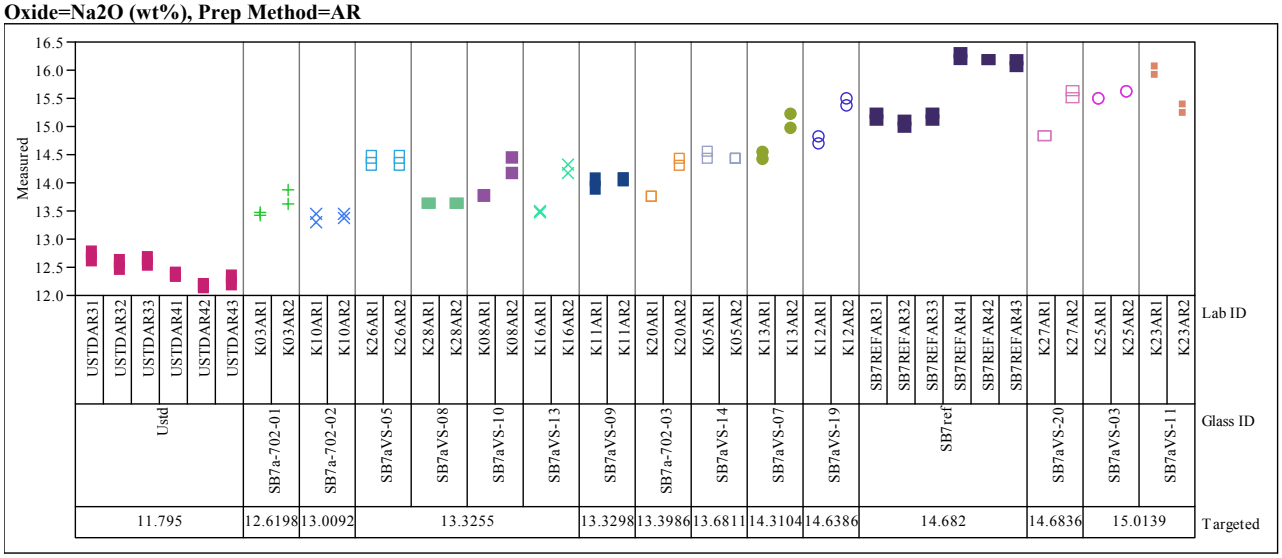


Exhibit A4. Measurements from Analytical Blocks 3 and 4 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=Na2O (wt%), Prep Method=AR



Oxide=NiO (wt%), Prep Method=AR

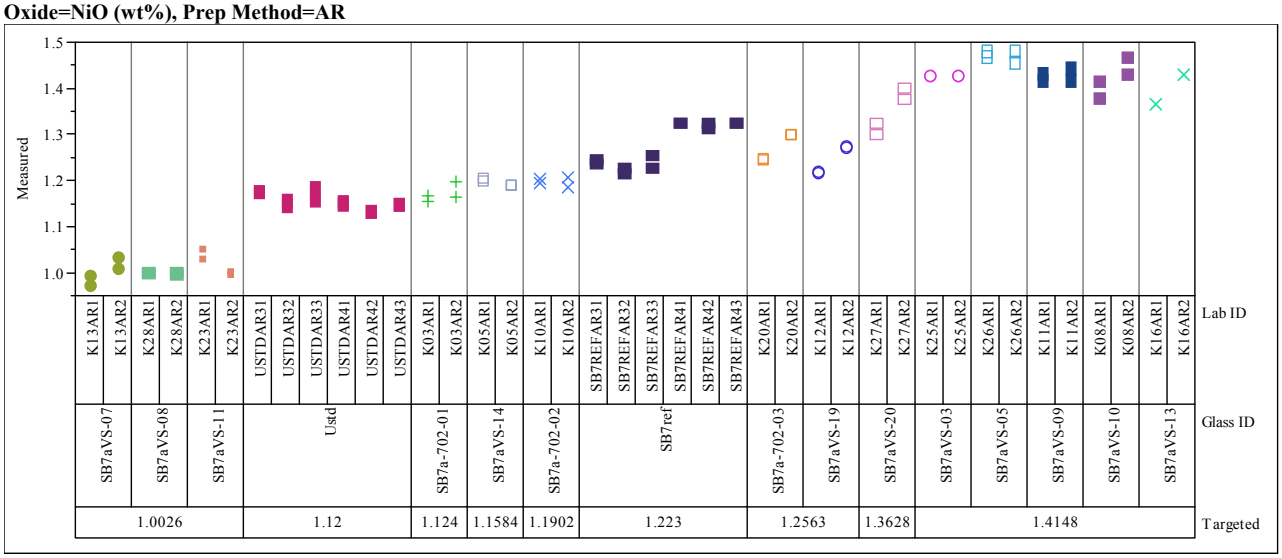
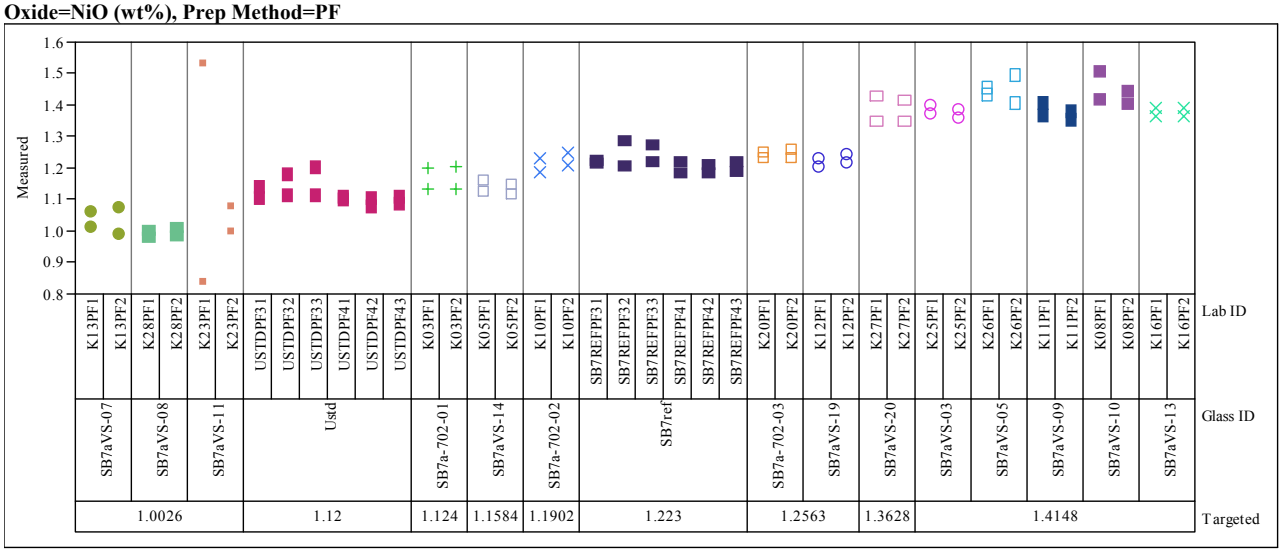


Exhibit A4. Measurements from Analytical Blocks 3 and 4 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=NiO (wt%), Prep Method=PF



Oxide=PbO (wt%), Prep Method=AR

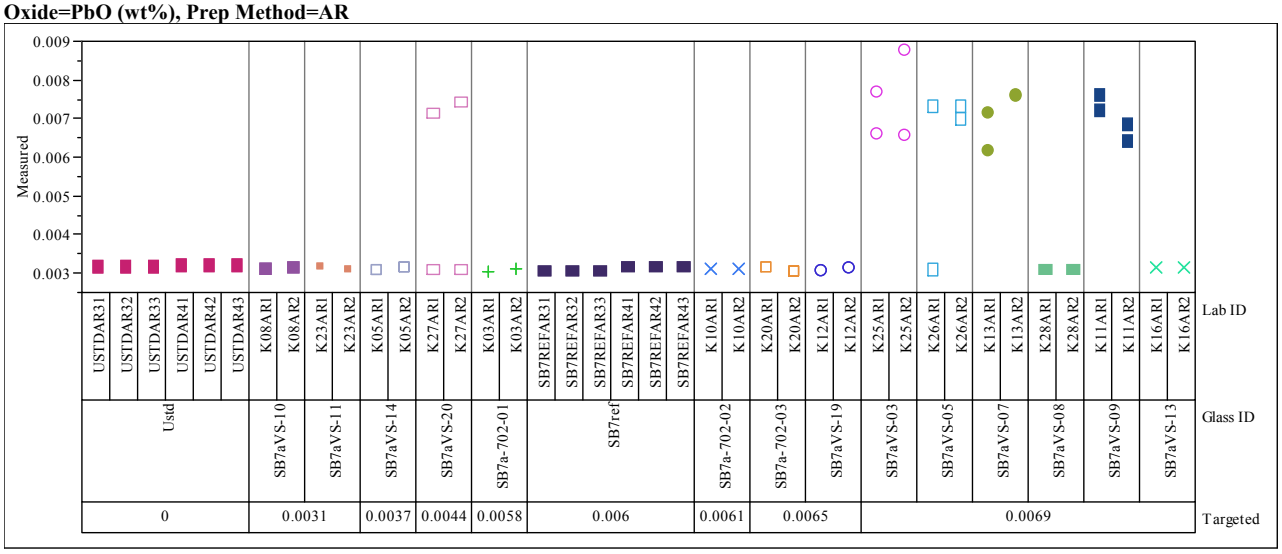
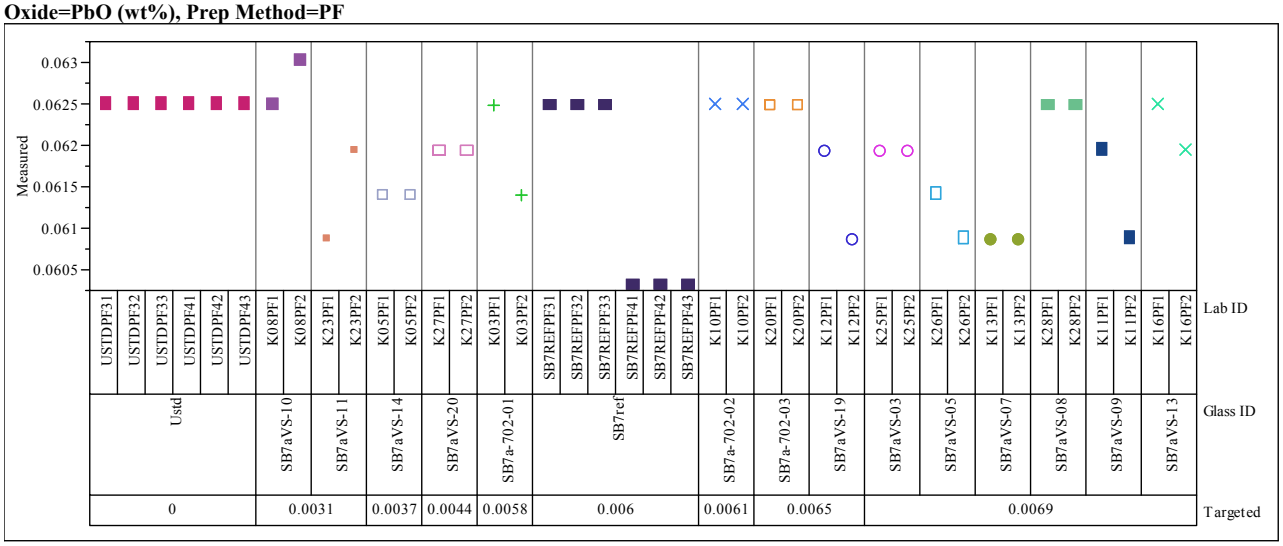


Exhibit A4. Measurements from Analytical Blocks 3 and 4 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=PbO (wt%), Prep Method=PF



Oxide=SiO2 (wt%), Prep Method=PF

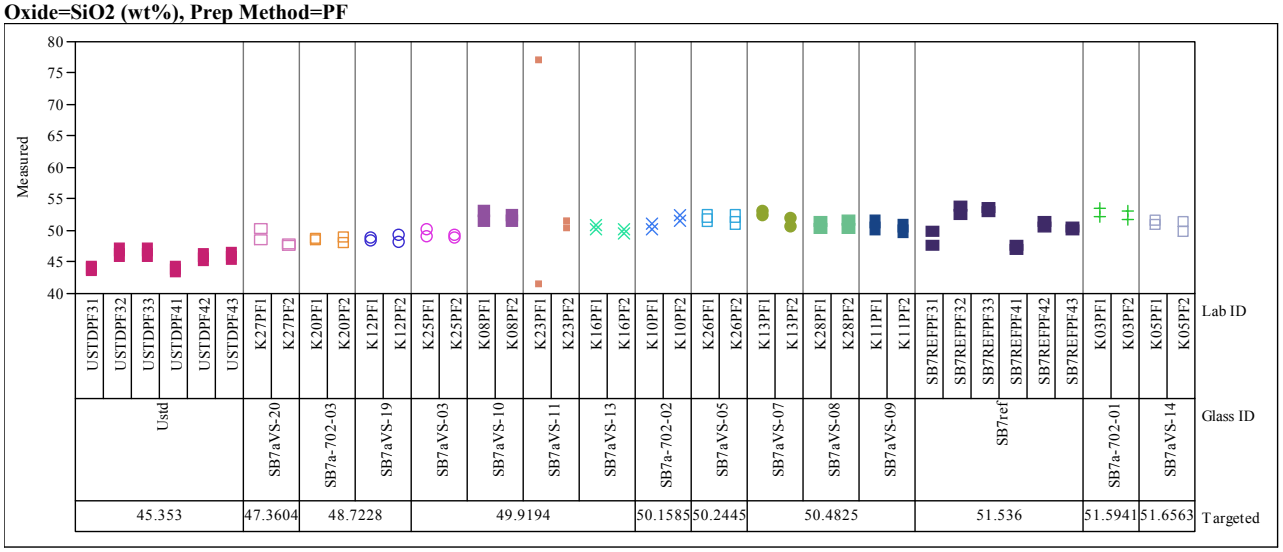
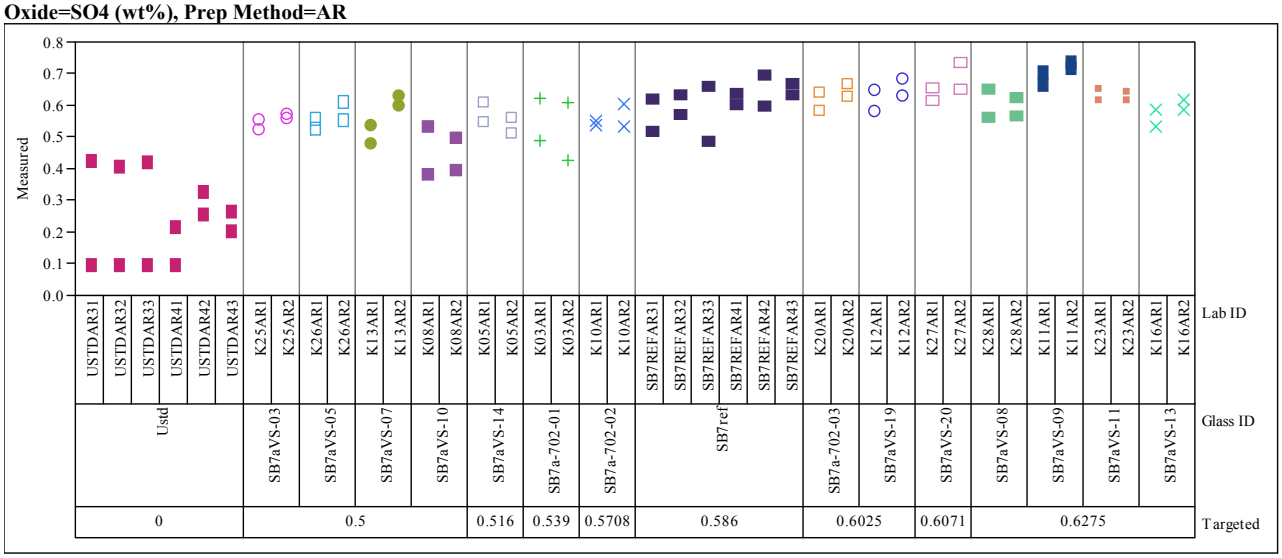


Exhibit A4. Measurements from Analytical Blocks 3 and 4 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=SO4 (wt%), Prep Method=AR



Oxide=SO4 (wt%), Prep Method=PF

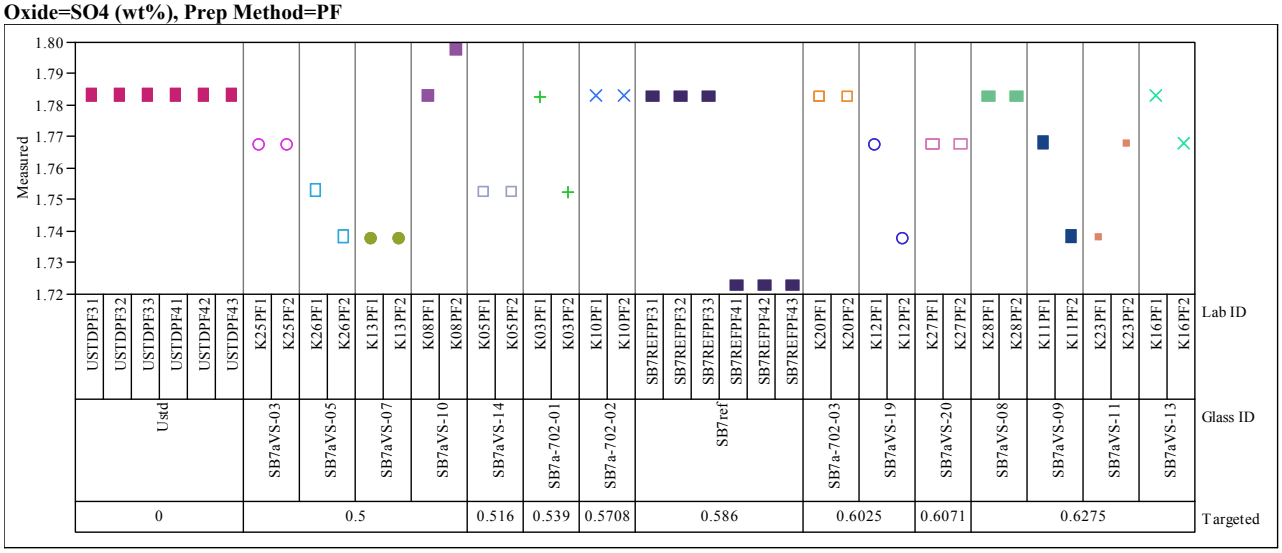
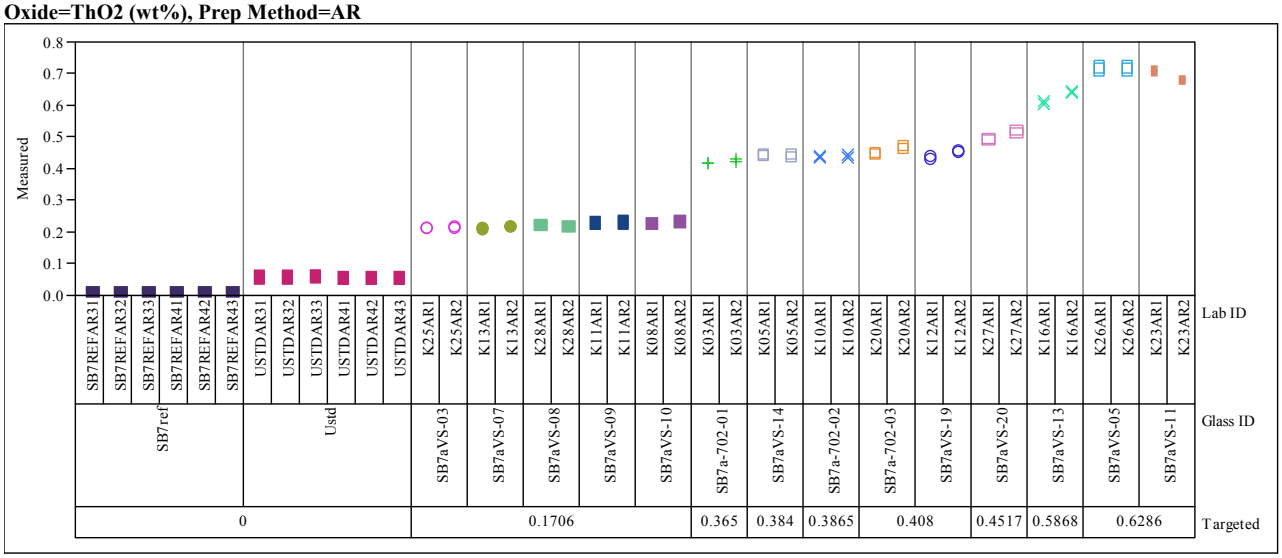


Exhibit A4. Measurements from Analytical Blocks 3 and 4 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=ThO2 (wt%), Prep Method=AR



Oxide=ThO2 (wt%), Prep Method=PF

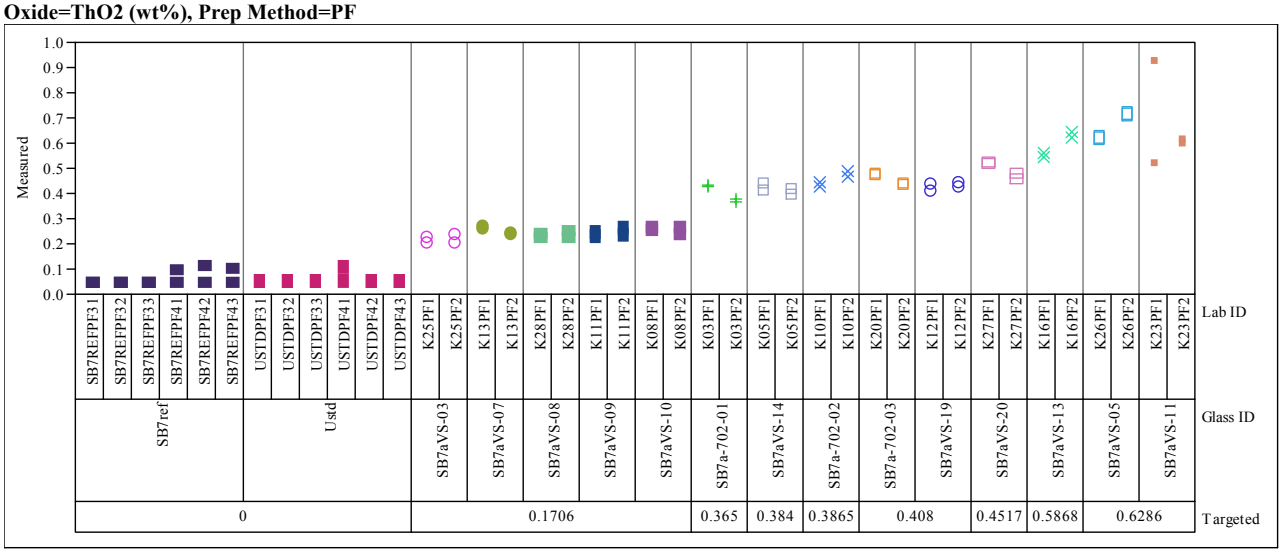
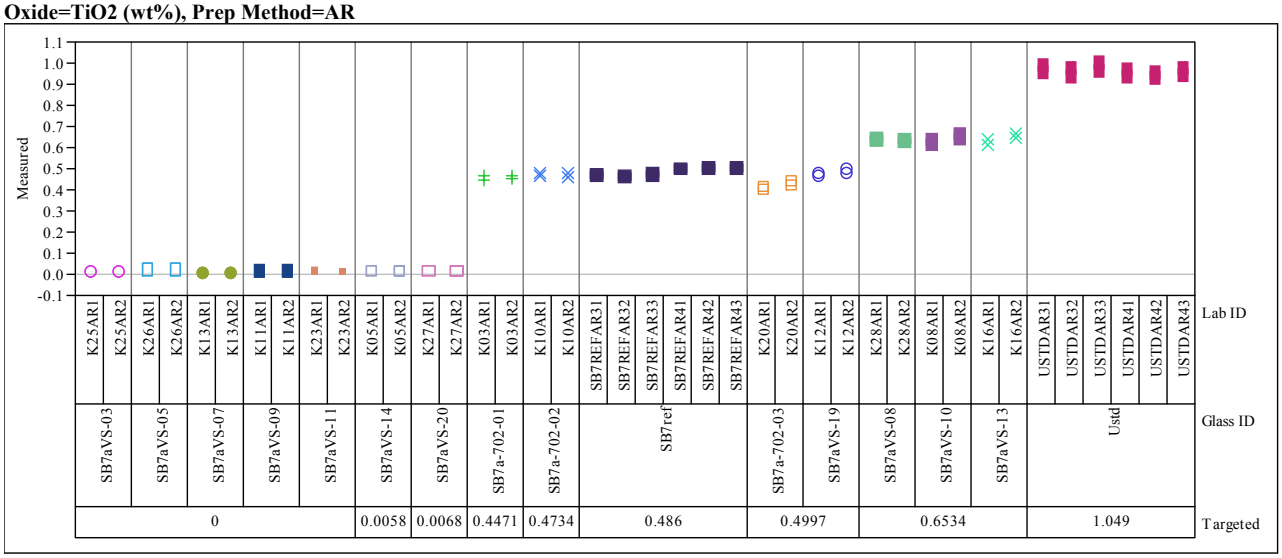


Exhibit A4. Measurements from Analytical Blocks 3 and 4 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=TiO2 (wt%), Prep Method=AR



Oxide=TiO2 (wt%), Prep Method=PF

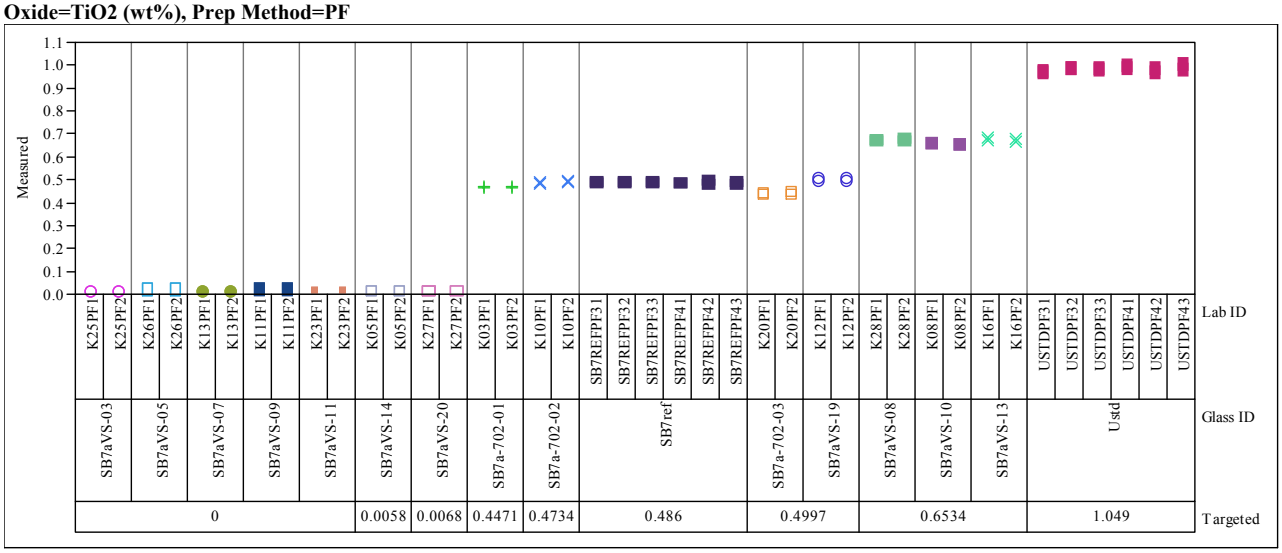
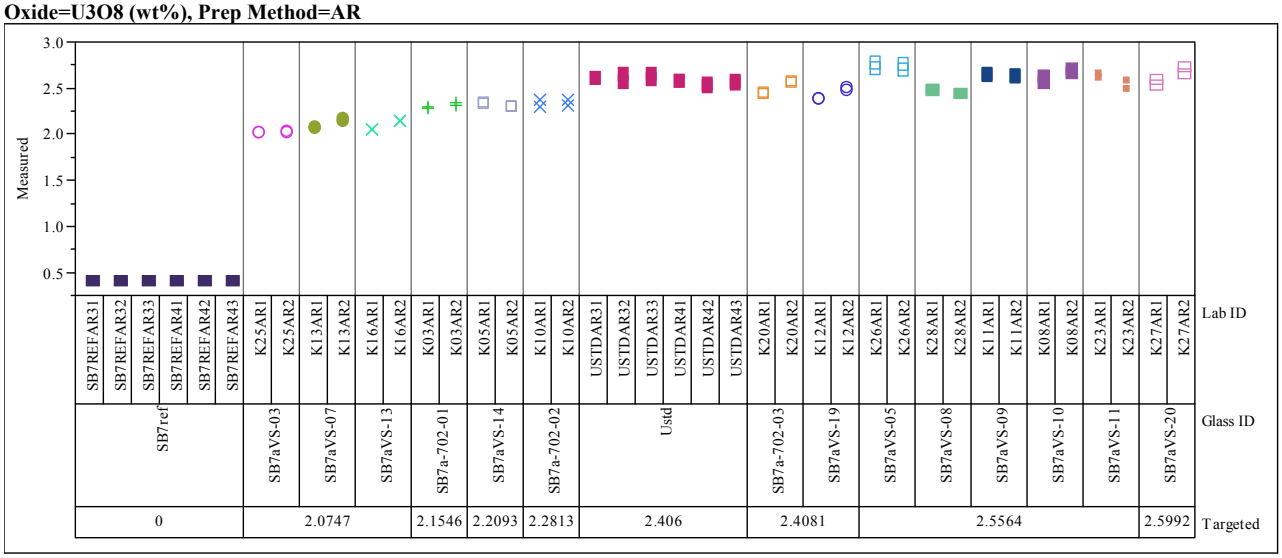


Exhibit A4. Measurements from Analytical Blocks 3 and 4 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=U3O8 (wt%), Prep Method=AR



Oxide=U3O8 (wt%), Prep Method=PF

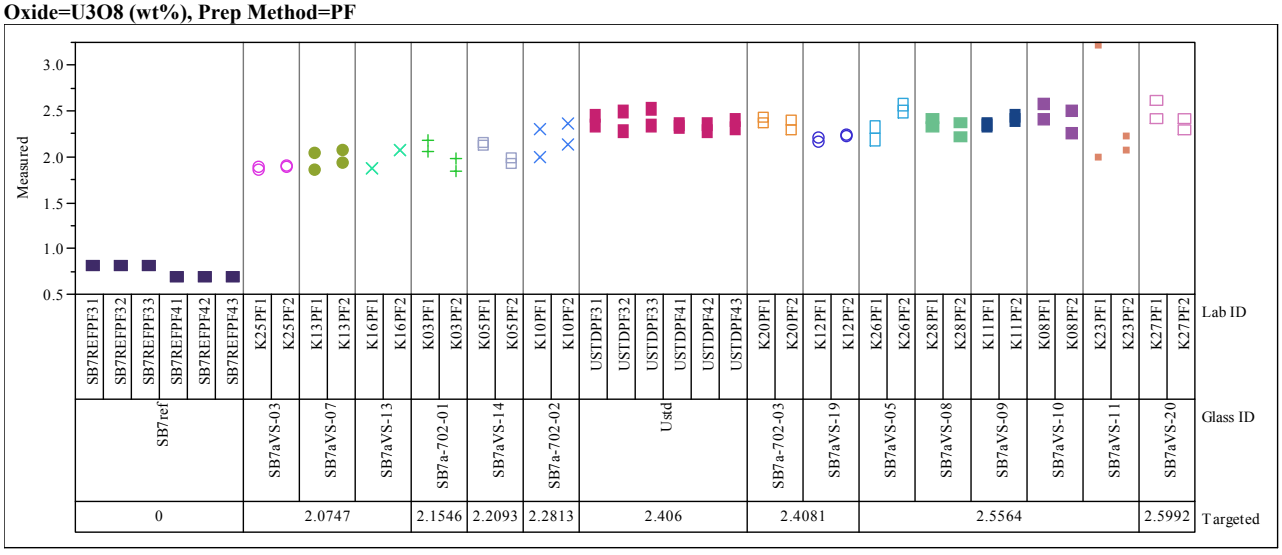
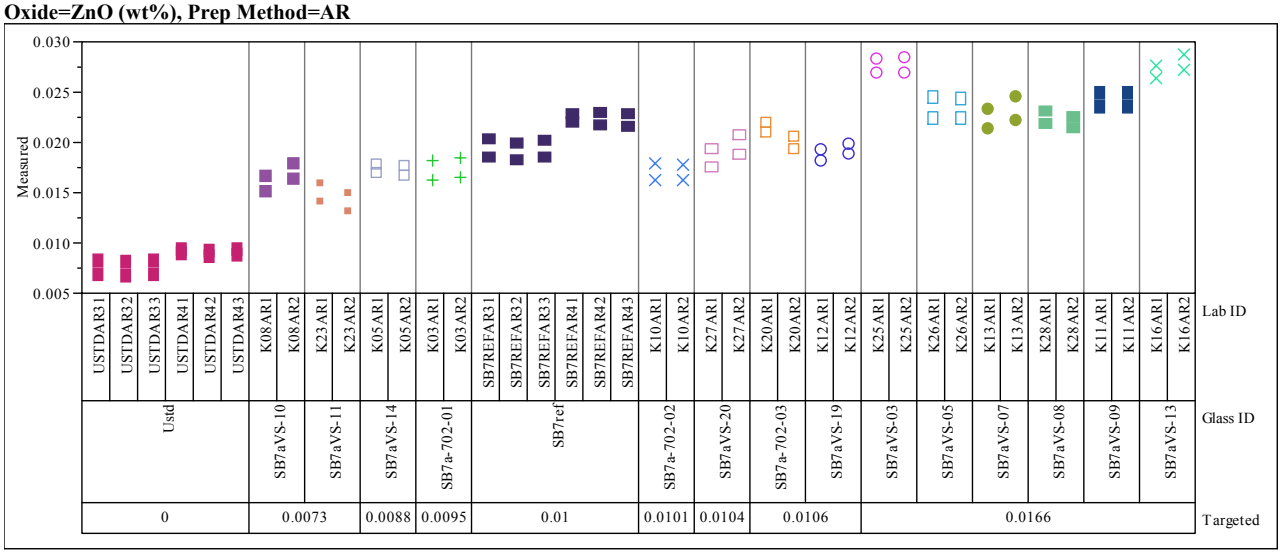


Exhibit A4. Measurements from Analytical Blocks 3 and 4 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=ZnO (wt%), Prep Method=AR



Oxide=ZnO (wt%), Prep Method=PF

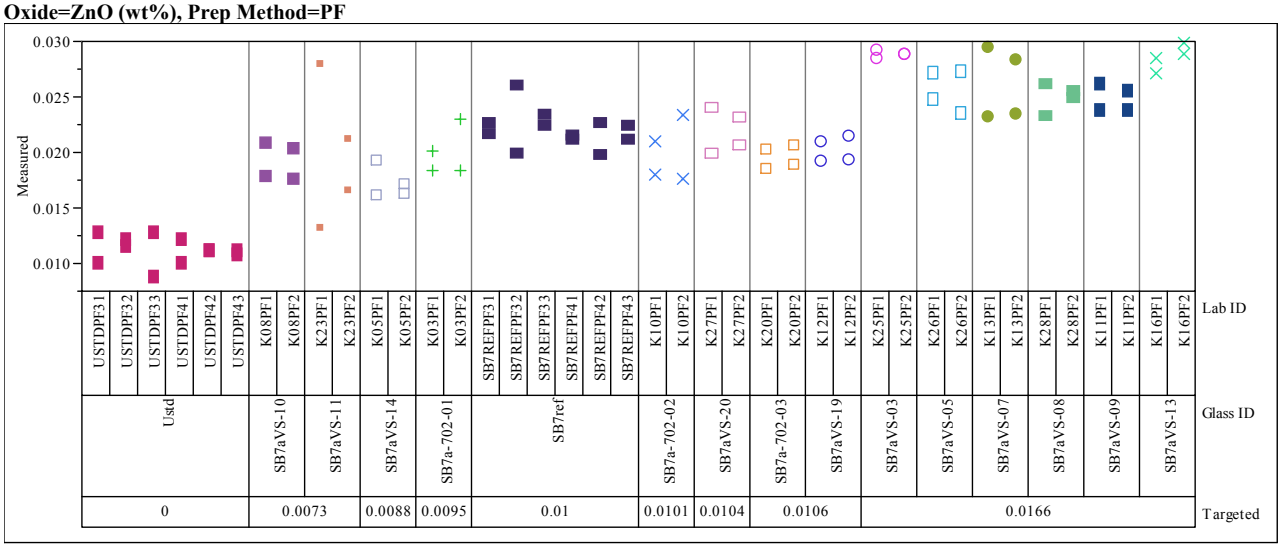


Exhibit A4. Measurements from Analytical Blocks 3 and 4 by Lab ID within Glass ID (excluding blanks) by Targeted Concentration for Each Oxide for Each Prep

Oxide=ZrO2 (wt%), Prep Method=AR

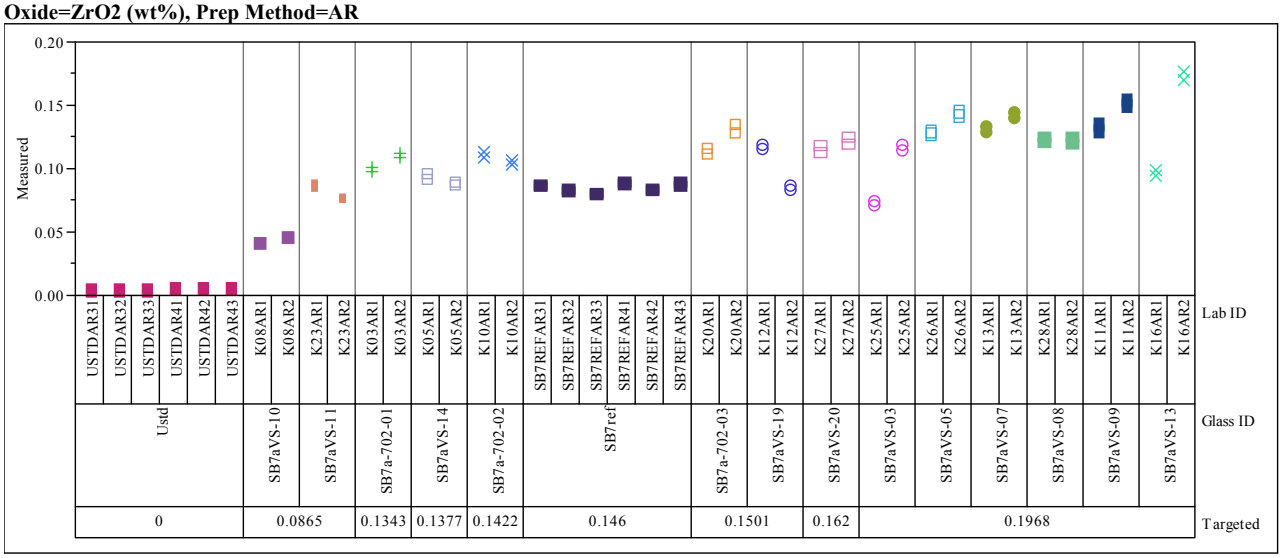
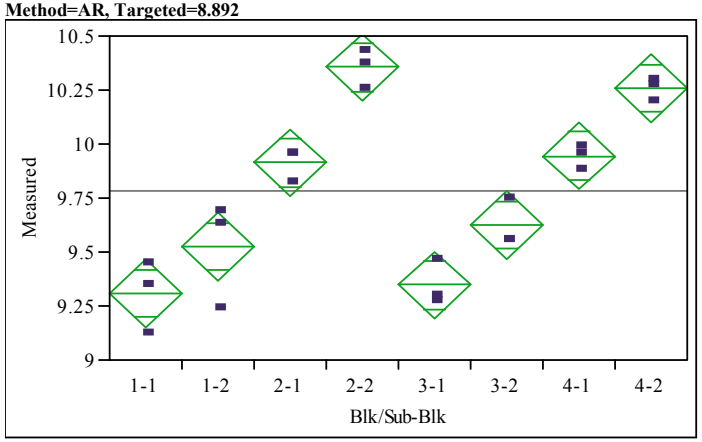


Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=Al2O3 (wt%), Prep Method=AR, Targeted=8.892



Oneway Anova
Summary of Fit

Rsquare	0.927193
Adj Rsquare	0.89534
Root Mean Square Error	0.12757
Mean of Response	9.784461
Observations (or Sum Wgts)	24

Analysis of Variance

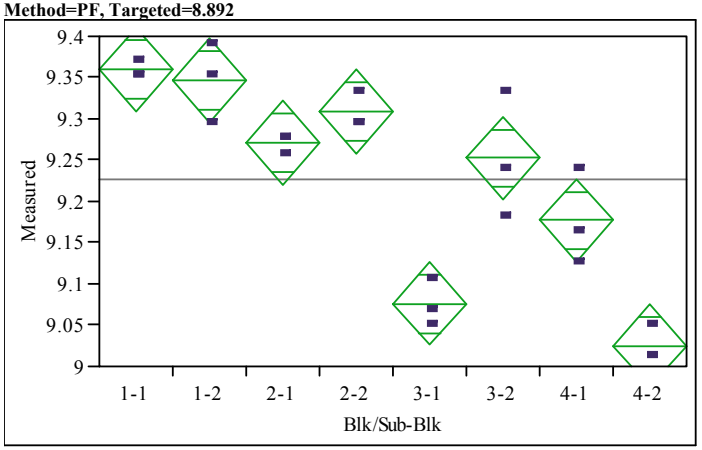
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	3.3160113	0.473716	29.1084	<.0001
Error	16	0.2603873	0.016274		
C. Total	23	3.5763986			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	9.3089	0.07365	9.153	9.465
1-2	3	9.5231	0.07365	9.367	9.679
2-1	3	9.9136	0.07365	9.757	10.070
2-2	3	10.3545	0.07365	10.198	10.511
3-1	3	9.3467	0.07365	9.191	9.503
3-2	3	9.6239	0.07365	9.468	9.780
4-1	3	9.9451	0.07365	9.789	10.101
4-2	3	10.2600	0.07365	10.104	10.416

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=Al2O3 (wt%), Prep Method=PF, Targeted=8.892**



Oneway Anova
Summary of Fit

Rsquare	0.922761
Adj Rsquare	0.88897
Root Mean Square Error	0.041
Mean of Response	9.227058
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.32131892	0.045903	27.3072	<.0001
Error	16	0.02689558	0.001681		
C. Total	23	0.34821451			

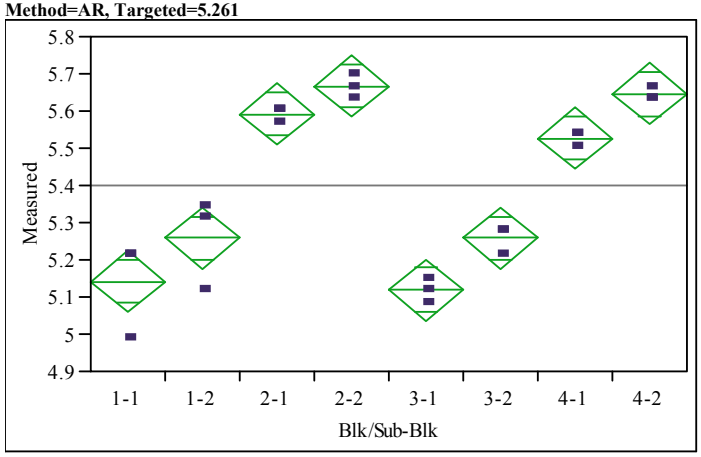
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	9.35932	0.02367	9.3091	9.4095
1-2	3	9.34673	0.02367	9.2965	9.3969
2-1	3	9.27115	0.02367	9.2210	9.3213
2-2	3	9.30894	0.02367	9.2588	9.3591
3-1	3	9.07590	0.02367	9.0257	9.1261
3-2	3	9.25225	0.02367	9.2021	9.3024
4-1	3	9.17667	0.02367	9.1265	9.2269
4-2	3	9.02551	0.02367	8.9753	9.0757

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=B2O3 (wt%), Prep Method=AR, Targeted=5.261**



Oneway **Anova**
Summary of Fit

Rsquare	0.938623
Adj Rsquare	0.911771
Root Mean Square Error	0.067349
Mean of Response	5.401382
Observations (or Sum Wgts)	24

Analysis of Variance

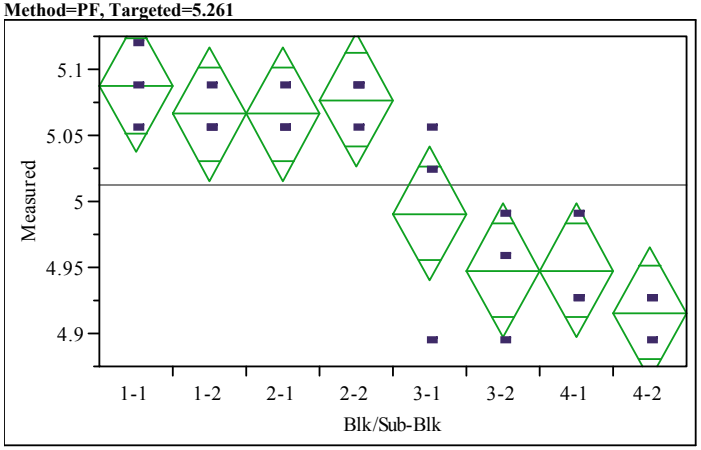
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	1.1098683	0.158553	34.9551	<.0001
Error	16	0.0725743	0.004536		
C. Total	23	1.1824426			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	5.14111	0.03888	5.0587	5.2235
1-2	3	5.25917	0.03888	5.1767	5.3416
2-1	3	5.59189	0.03888	5.5095	5.6743
2-2	3	5.66702	0.03888	5.5846	5.7495
3-1	3	5.11964	0.03888	5.0372	5.2021
3-2	3	5.25917	0.03888	5.1767	5.3416
4-1	3	5.52750	0.03888	5.4451	5.6099
4-2	3	5.64556	0.03888	5.5631	5.7280

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=B2O3 (wt%), Prep Method=PF, Targeted=5.261**



Oneway **Anova**
Summary of Fit

Rsquare	0.789189
Adj Rsquare	0.696959
Root Mean Square Error	0.041046
Mean of Response	5.012311
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.10091283	0.014416	8.5568	0.0002
Error	16	0.02695617	0.001685		
C. Total	23	0.12786899			

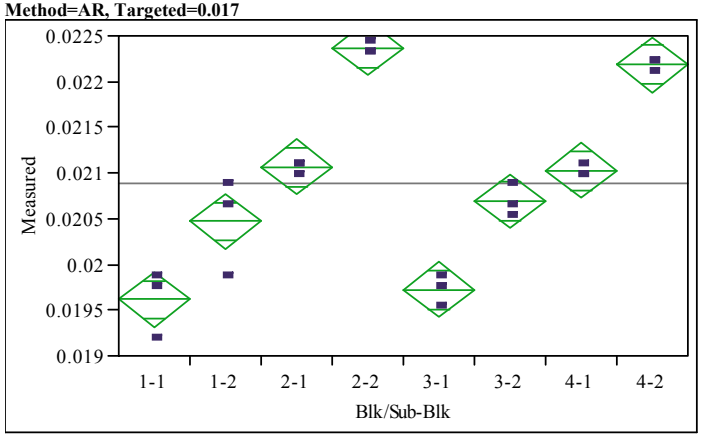
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	5.08744	0.02370	5.0372	5.1377
1-2	3	5.06598	0.02370	5.0157	5.1162
2-1	3	5.06598	0.02370	5.0157	5.1162
2-2	3	5.07671	0.02370	5.0265	5.1269
3-1	3	4.99085	0.02370	4.9406	5.0411
3-2	3	4.94791	0.02370	4.8977	4.9982
4-1	3	4.94791	0.02370	4.8977	4.9982
4-2	3	4.91571	0.02370	4.8655	4.9660

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=BaO (wt%), Prep Method=AR, Targeted=0.017**



Oneway **Anova**
Summary of Fit

Rsquare	0.956715
Adj Rsquare	0.937778
Root Mean Square Error	0.000245
Mean of Response	0.020893
Observations (or Sum Wgts)	24

Analysis of Variance

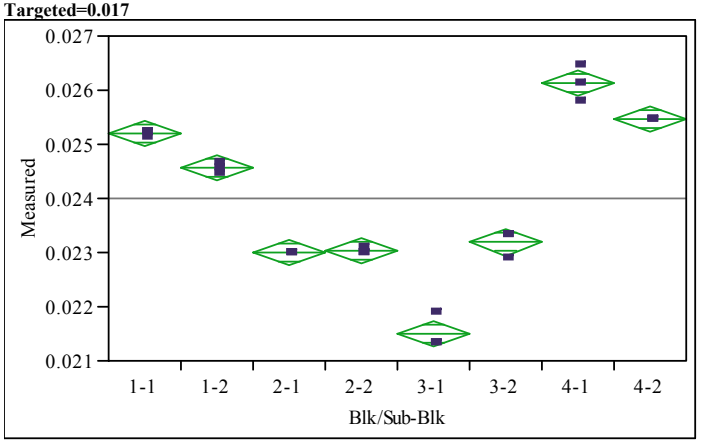
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00002131	3.0439e-6	50.5209	<.0001
Error	16	0.00000096	6.0251e-8		
C. Total	23	0.00002227			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.019613	0.00014	0.01931	0.01991
1-2	3	0.020469	0.00014	0.02017	0.02077
2-1	3	0.021065	0.00014	0.02076	0.02137
2-2	3	0.022367	0.00014	0.02207	0.02267
3-1	3	0.019725	0.00014	0.01942	0.02003
3-2	3	0.020692	0.00014	0.02039	0.02099
4-1	3	0.021027	0.00014	0.02073	0.02133
4-2	3	0.022181	0.00014	0.02188	0.02248

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=BaO (wt%), Prep Method=PF, Targeted=0.017**



Oneway **Anova**
Summary of Fit

Rsquare	0.98836
Adj Rsquare	0.983267
Root Mean Square Error	0.000195
Mean of Response	0.024009
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00005151	7.3589e-6	194.0802	<.0001
Error	16	0.00000061	3.7917e-8		
C. Total	23	0.00005212			

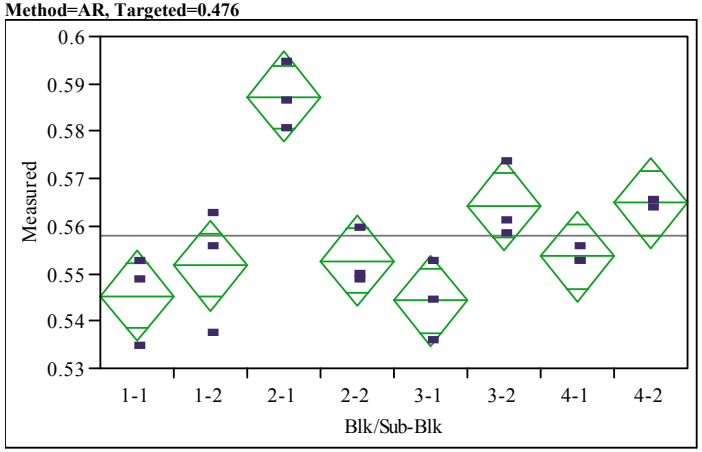
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.025196	0.00011	0.02496	0.02543
1-2	3	0.024563	0.00011	0.02432	0.02480
2-1	3	0.023000	0.00011	0.02276	0.02324
2-2	3	0.023037	0.00011	0.02280	0.02328
3-1	3	0.021511	0.00011	0.02127	0.02175
3-2	3	0.023186	0.00011	0.02295	0.02342
4-1	3	0.026126	0.00011	0.02589	0.02636
4-2	3	0.025456	0.00011	0.02522	0.02569

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=CaO (wt%), Prep Method=AR, Targeted=0.476**



Oneway **Anova**
Summary of Fit

Rsquare	0.809046
Adj Rsquare	0.725504
Root Mean Square Error	0.007806
Mean of Response	0.557989
Observations (or Sum Wgts)	24

Analysis of Variance

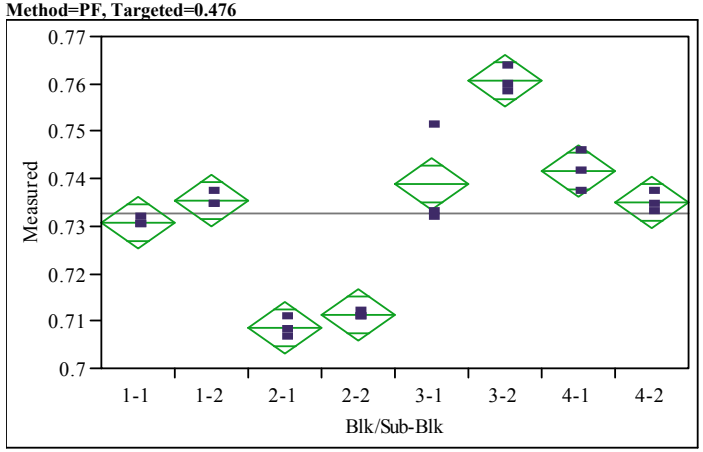
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00413079	0.000590	9.6843	<.0001
Error	16	0.00097496	0.000061		
C. Total	23	0.00510576			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.545222	0.00451	0.53567	0.55478
1-2	3	0.551751	0.00451	0.54220	0.56131
2-1	3	0.587198	0.00451	0.57764	0.59675
2-2	3	0.552684	0.00451	0.54313	0.56224
3-1	3	0.544289	0.00451	0.53473	0.55384
3-2	3	0.564344	0.00451	0.55479	0.57390
4-1	3	0.553617	0.00451	0.54406	0.56317
4-2	3	0.564810	0.00451	0.55526	0.57436

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=CaO (wt%), Prep Method=PF, Targeted=0.476**



Oneway **Anova**
Summary of Fit

Rsquare	0.948911
Adj Rsquare	0.92656
Root Mean Square Error	0.004452
Mean of Response	0.732773
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00589082	0.000842	42.4544	<.0001
Error	16	0.00031716	0.000020		
C. Total	23	0.00620798			

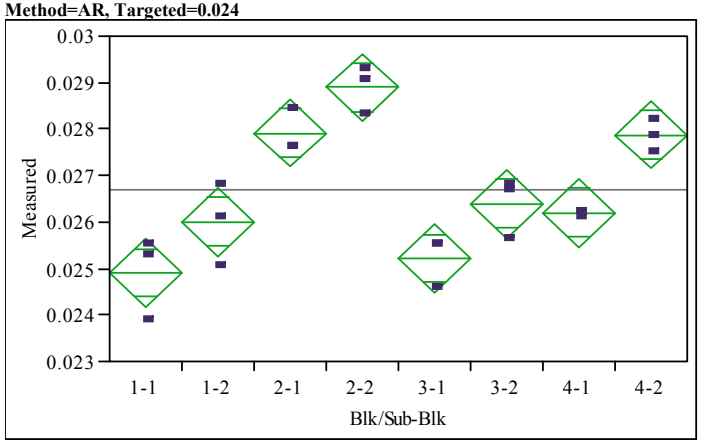
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.730849	0.00257	0.72540	0.73630
1-2	3	0.735513	0.00257	0.73006	0.74096
2-1	3	0.708462	0.00257	0.70301	0.71391
2-2	3	0.711260	0.00257	0.70581	0.71671
3-1	3	0.738778	0.00257	0.73333	0.74423
3-2	3	0.760698	0.00257	0.75525	0.76615
4-1	3	0.741576	0.00257	0.73613	0.74703
4-2	3	0.735046	0.00257	0.72960	0.74050

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=Ce2O3 (wt%), Prep Method=AR, Targeted=0.024**



Oneway **Anova**
Summary of Fit

Rsquare	0.878998
Adj Rsquare	0.82606
Root Mean Square Error	0.000599
Mean of Response	0.026676
Observations (or Sum Wgts)	24

Analysis of Variance

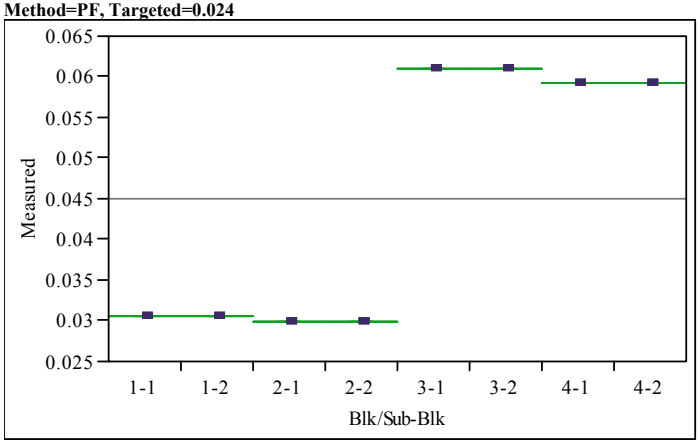
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00004166	5.9513e-6	16.6042	<.0001
Error	16	0.00000573	3.5842e-7		
C. Total	23	0.00004739			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.024910	0.00035	0.02418	0.02564
1-2	3	0.026003	0.00035	0.02527	0.02674
2-1	3	0.027916	0.00035	0.02718	0.02865
2-2	3	0.028892	0.00035	0.02816	0.02962
3-1	3	0.025222	0.00035	0.02449	0.02595
3-2	3	0.026393	0.00035	0.02566	0.02713
4-1	3	0.026198	0.00035	0.02547	0.02693
4-2	3	0.027877	0.00035	0.02714	0.02861

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=Ce2O3 (wt%), Prep Method=PF, Targeted=0.024**



Oneway **Anova**
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	2.33e-10
Mean of Response	0.04511
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00535265	0.000765	1.41e+16	<.0001
Error	16	8.6736e-19	5.42e-20		
C. Total	23	0.00535265			

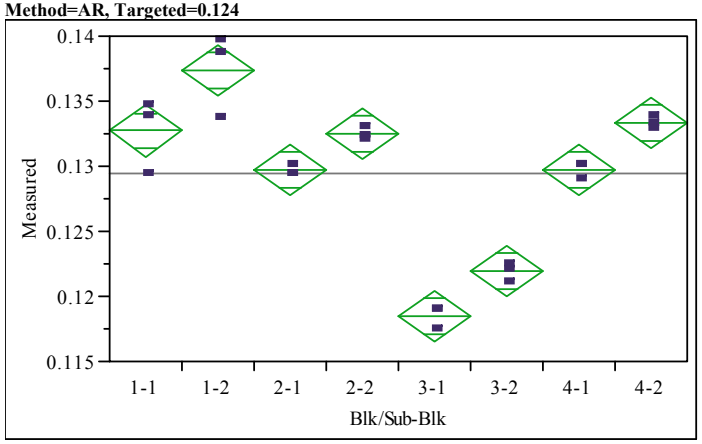
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.030512	1.344e-10	0.03051	0.03051
1-2	3	0.030512	1.344e-10	0.03051	0.03051
2-1	3	0.029868	1.344e-10	0.02987	0.02987
2-2	3	0.029868	1.344e-10	0.02987	0.02987
3-1	3	0.060908	1.344e-10	0.06091	0.06091
3-2	3	0.060908	1.344e-10	0.06091	0.06091
4-1	3	0.059151	1.344e-10	0.05915	0.05915
4-2	3	0.059151	1.344e-10	0.05915	0.05915

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=Cr2O3 (wt%), Prep Method=AR, Targeted=0.124**



Oneway **Anova**
Summary of Fit

Rsquare	0.953185
Adj Rsquare	0.932703
Root Mean Square Error	0.001593
Mean of Response	0.129473
Observations (or Sum Wgts)	24

Analysis of Variance

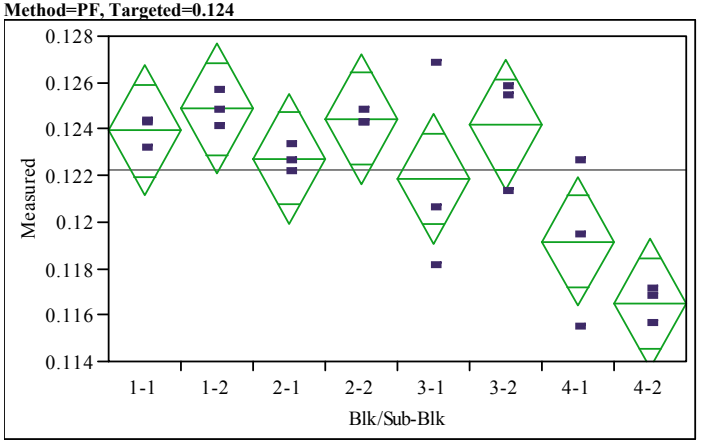
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00082699	0.000118	46.5382	<.0001
Error	16	0.00004062	2.539e-6		
C. Total	23	0.00086761			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.132713	0.00092	0.13076	0.13466
1-2	3	0.137390	0.00092	0.13544	0.13934
2-1	3	0.129693	0.00092	0.12774	0.13164
2-2	3	0.132518	0.00092	0.13057	0.13447
3-1	3	0.118487	0.00092	0.11654	0.12044
3-2	3	0.121897	0.00092	0.11995	0.12385
4-1	3	0.129741	0.00092	0.12779	0.13169
4-2	3	0.133347	0.00092	0.13140	0.13530

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=Cr2O3 (wt%), Prep Method=PF, Targeted=0.124**



Oneway **Anova**
Summary of Fit

Rsquare	0.688165
Adj Rsquare	0.551738
Root Mean Square Error	0.002282
Mean of Response	0.122208
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00018386	0.000026	5.0442	0.0035
Error	16	0.00008331	5.207e-6		
C. Total	23	0.00026718			

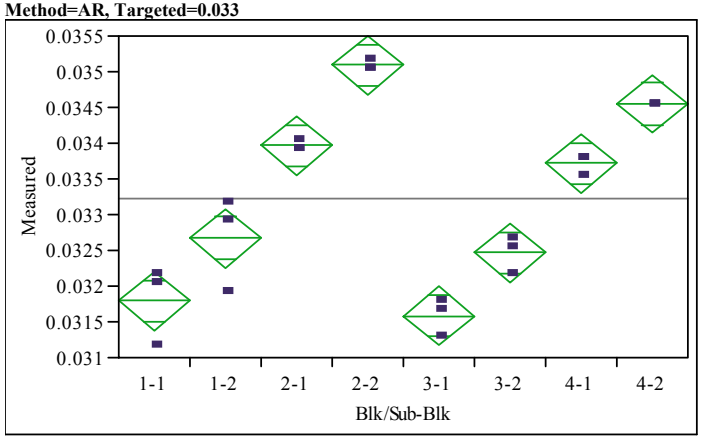
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.123944	0.00132	0.12115	0.12674
1-2	3	0.124869	0.00132	0.12208	0.12766
2-1	3	0.122726	0.00132	0.11993	0.12552
2-2	3	0.124431	0.00132	0.12164	0.12722
3-1	3	0.121849	0.00132	0.11906	0.12464
3-2	3	0.124187	0.00132	0.12139	0.12698
4-1	3	0.119169	0.00132	0.11638	0.12196
4-2	3	0.116490	0.00132	0.11370	0.11928

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=CuO (wt%), Prep Method=AR, Targeted=0.033**



Oneway **Anova**
Summary of Fit

Rsquare	0.950795
Adj Rsquare	0.929269
Root Mean Square Error	0.000336
Mean of Response	0.03323
Observations (or Sum Wgts)	24

Analysis of Variance

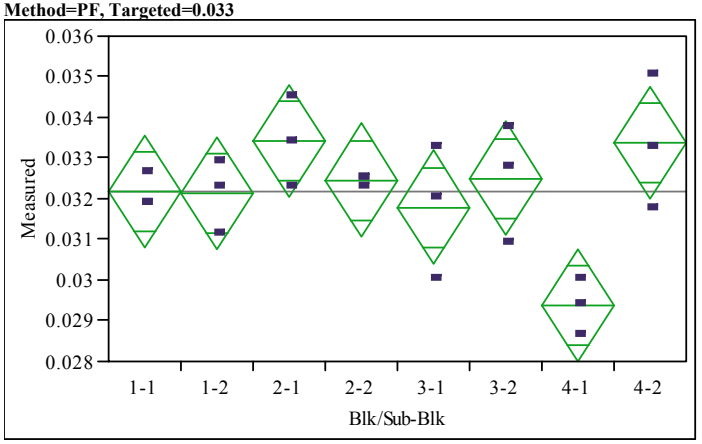
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00003492	4.9889e-6	44.1676	<.0001
Error	16	0.00000181	1.1295e-7		
C. Total	23	0.00003673			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.031796	0.00019	0.03138	0.03221
1-2	3	0.032672	0.00019	0.03226	0.03308
2-1	3	0.033966	0.00019	0.03355	0.03438
2-2	3	0.035092	0.00019	0.03468	0.03550
3-1	3	0.031587	0.00019	0.03118	0.03200
3-2	3	0.032463	0.00019	0.03205	0.03287
4-1	3	0.033715	0.00019	0.03330	0.03413
4-2	3	0.034550	0.00019	0.03414	0.03496

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=CuO (wt%), Prep Method=PF, Targeted=0.033**



Oneway **Anova**
Summary of Fit

Rsquare	0.621272
Adj Rsquare	0.455579
Root Mean Square Error	0.001131
Mean of Response	0.032156
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00003355	4.7934e-6	3.7495	0.0136
Error	16	0.00002045	1.2784e-6		
C. Total	23	0.00005401			

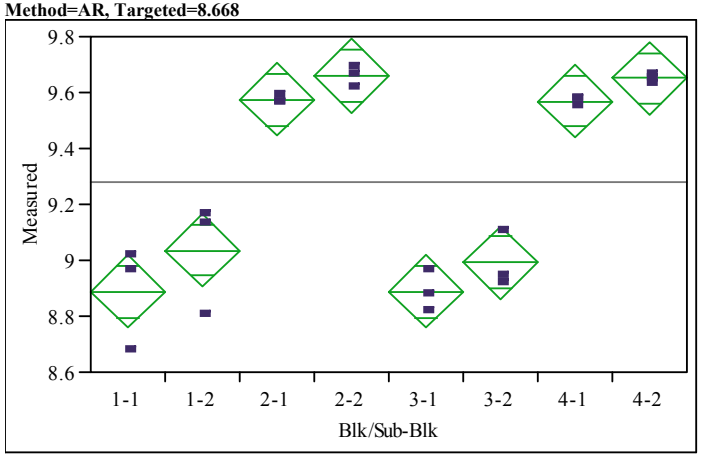
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.032171	0.00065	0.03079	0.03356
1-2	3	0.032130	0.00065	0.03075	0.03351
2-1	3	0.033423	0.00065	0.03204	0.03481
2-2	3	0.032463	0.00065	0.03108	0.03385
3-1	3	0.031796	0.00065	0.03041	0.03318
3-2	3	0.032505	0.00065	0.03112	0.03389
4-1	3	0.029376	0.00065	0.02799	0.03076
4-2	3	0.033381	0.00065	0.03200	0.03477

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=Fe2O3 (wt%), Prep Method=AR, Targeted=8.668**



Oneway **Anova**
Summary of Fit

Rsquare	0.937284
Adj Rsquare	0.909845
Root Mean Square Error	0.10635
Mean of Response	9.282327
Observations (or Sum Wgts)	24

Analysis of Variance

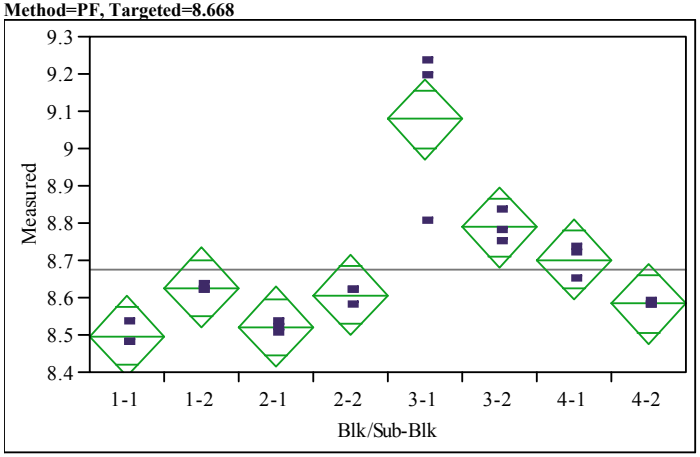
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	2.7045062	0.386358	34.1596	<.0001
Error	16	0.1809659	0.011310		
C. Total	23	2.8854720			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	8.88797	0.06140	8.7578	9.0181
1-2	3	9.03570	0.06140	8.9055	9.1659
2-1	3	9.57422	0.06140	9.4441	9.7044
2-2	3	9.66001	0.06140	9.5298	9.7902
3-1	3	8.88797	0.06140	8.7578	9.0181
3-2	3	8.99281	0.06140	8.8626	9.1230
4-1	3	9.56946	0.06140	9.4393	9.6996
4-2	3	9.65048	0.06140	9.5203	9.7806

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=Fe2O3 (wt%), Prep Method=PF, Targeted=8.668**



Oneway **Anova**
Summary of Fit

Rsquare	0.857029
Adj Rsquare	0.794479
Root Mean Square Error	0.087939
Mean of Response	8.6753
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.74170622	0.105958	13.7015	<.0001
Error	16	0.12373268	0.007733		
C. Total	23	0.86543890			

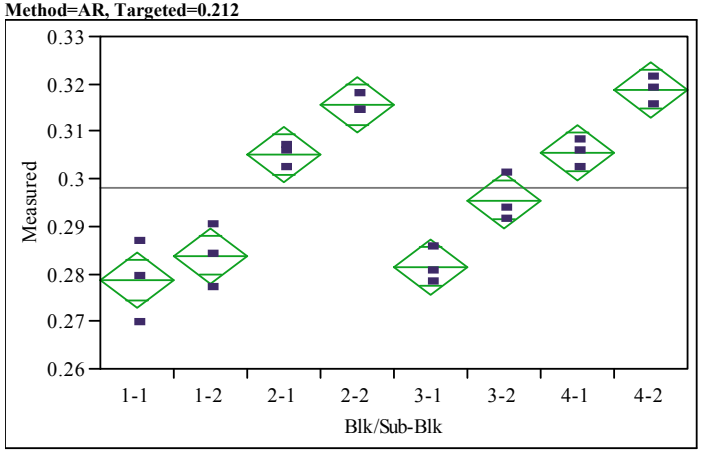
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	8.49718	0.05077	8.3896	8.6048
1-2	3	8.62586	0.05077	8.5182	8.7335
2-1	3	8.52101	0.05077	8.4134	8.6286
2-2	3	8.60679	0.05077	8.4992	8.7144
3-1	3	9.07860	0.05077	8.9710	9.1862
3-2	3	8.78789	0.05077	8.6803	8.8955
4-1	3	8.70211	0.05077	8.5945	8.8097
4-2	3	8.58297	0.05077	8.4753	8.6906

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=K2O (wt%), Prep Method=AR, Targeted=0.212**



Oneway **Anova**
Summary of Fit

Rsquare	0.933085
Adj Rsquare	0.90381
Root Mean Square Error	0.004787
Mean of Response	0.298088
Observations (or Sum Wgts)	24

Analysis of Variance

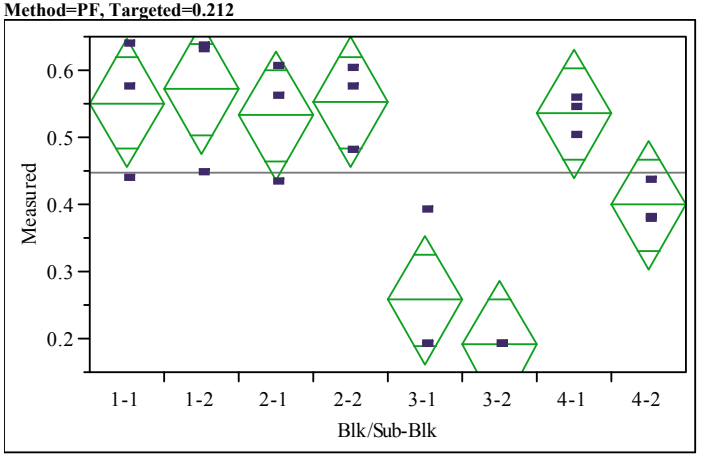
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00511251	0.000730	31.8730	<.0001
Error	16	0.00036663	0.000023		
C. Total	23	0.00547915			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.278664	0.00276	0.27281	0.28452
1-2	3	0.283884	0.00276	0.27803	0.28974
2-1	3	0.305165	0.00276	0.29931	0.31102
2-2	3	0.315605	0.00276	0.30975	0.32146
3-1	3	0.281475	0.00276	0.27562	0.28733
3-2	3	0.295529	0.00276	0.28967	0.30139
4-1	3	0.305567	0.00276	0.29971	0.31143
4-2	3	0.318817	0.00276	0.31296	0.32468

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=K2O (wt%), Prep Method=PF, Targeted=0.212**



Oneway **Anova**
Summary of Fit

Rsquare	0.825537
Adj Rsquare	0.74921
Root Mean Square Error	0.078764
Mean of Response	0.448563
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.46968377	0.067098	10.8157	<.0001
Error	16	0.09925935	0.006204		
C. Total	23	0.56894312			

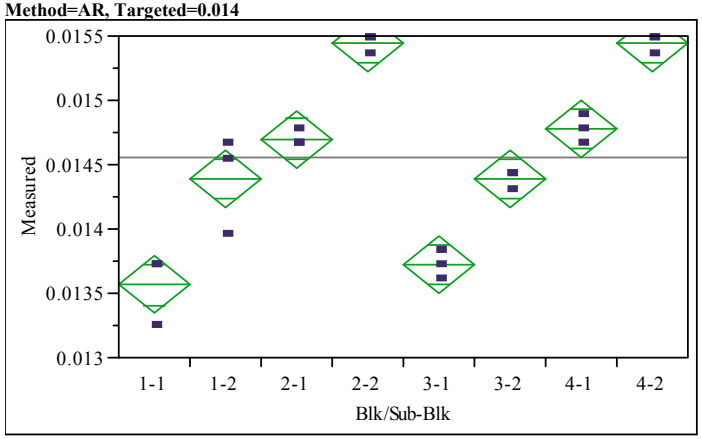
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.550904	0.04547	0.45450	0.64730
1-2	3	0.571382	0.04547	0.47498	0.66778
2-1	3	0.532433	0.04547	0.43603	0.62883
2-2	3	0.552510	0.04547	0.45611	0.64891
3-1	3	0.257383	0.04547	0.16098	0.35378
3-2	3	0.190327	0.04547	0.09393	0.28673
4-1	3	0.534842	0.04547	0.43844	0.63124
4-2	3	0.398723	0.04547	0.30232	0.49512

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=La2O3 (wt%), Prep Method=AR, Targeted=0.014**



Oneway **Anova**
Summary of Fit

Rsquare	0.950894
Adj Rsquare	0.92941
Root Mean Square Error	0.000181
Mean of Response	0.014552
Observations (or Sum Wgts)	24

Analysis of Variance

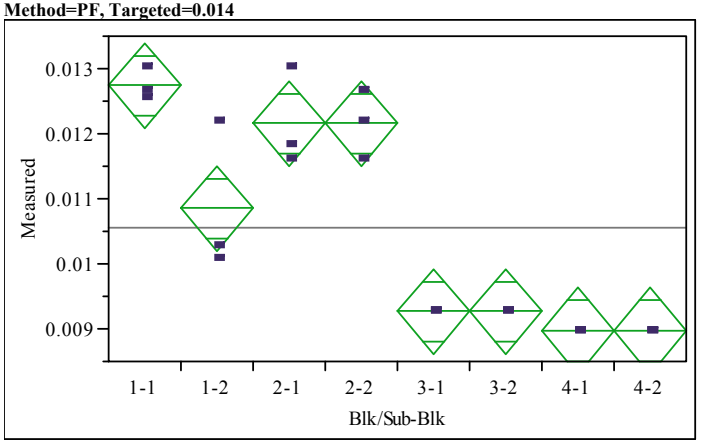
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00001012	1.4459e-6	44.2607	<.0001
Error	16	0.00000052	3.2667e-8		
C. Total	23	0.00001064			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.013565	0.00010	0.01334	0.01379
1-2	3	0.014386	0.00010	0.01417	0.01461
2-1	3	0.014699	0.00010	0.01448	0.01492
2-2	3	0.015442	0.00010	0.01522	0.01566
3-1	3	0.013722	0.00010	0.01350	0.01394
3-2	3	0.014386	0.00010	0.01417	0.01461
4-1	3	0.014777	0.00010	0.01456	0.01500
4-2	3	0.015442	0.00010	0.01522	0.01566

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=La2O3 (wt%), Prep Method=PF, Targeted=0.014**



Oneway **Anova**
Summary of Fit

Rsquare	0.923264
Adj Rsquare	0.889692
Root Mean Square Error	0.000535
Mean of Response	0.010547
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00005501	7.8582e-6	27.5011	<.0001
Error	16	0.00000457	2.8574e-7		
C. Total	23	0.00005958			

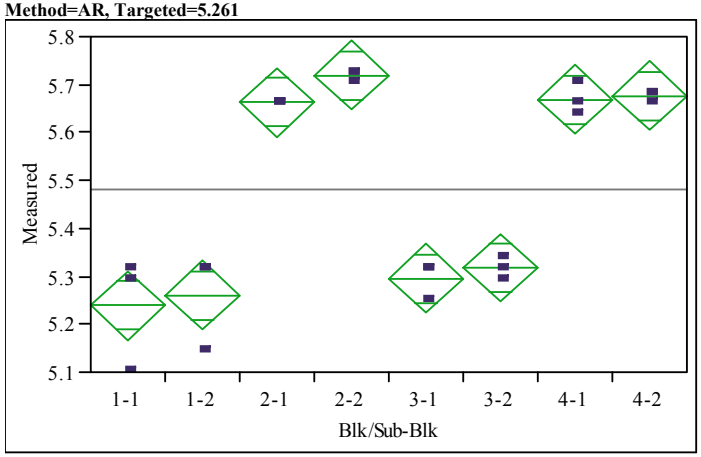
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.012744	0.00031	0.01209	0.01340
1-2	3	0.010852	0.00031	0.01020	0.01151
2-1	3	0.012154	0.00031	0.01150	0.01281
2-2	3	0.012154	0.00031	0.01150	0.01281
3-1	3	0.009265	0.00031	0.00861	0.00992
3-2	3	0.009265	0.00031	0.00861	0.00992
4-1	3	0.008972	0.00031	0.00832	0.00963
4-2	3	0.008972	0.00031	0.00832	0.00963

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=Li2O (wt%), Prep Method=AR, Targeted=5.261**



Oneway **Anova**
Summary of Fit

Rsquare	0.948173
Adj Rsquare	0.925499
Root Mean Square Error	0.058301
Mean of Response	5.480028
Observations (or Sum Wgts)	24

Analysis of Variance

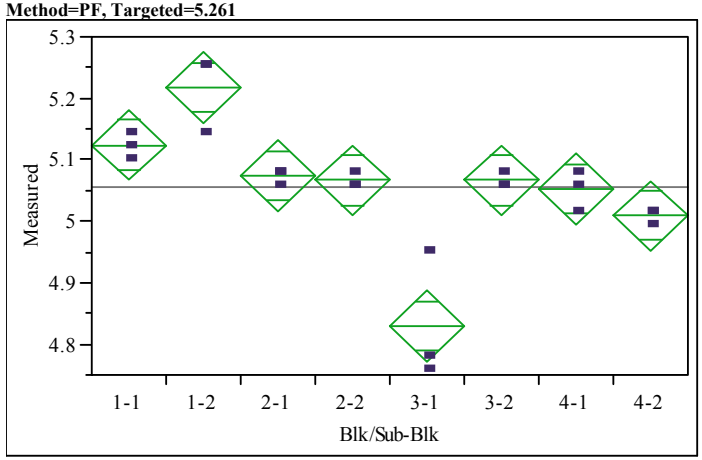
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.9949561	0.142137	41.8174	<.0001
Error	16	0.0543837	0.003399		
C. Total	23	1.0493398			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	5.23872	0.03366	5.1674	5.3101
1-2	3	5.26025	0.03366	5.1889	5.3316
2-1	3	5.66213	0.03366	5.5908	5.7335
2-2	3	5.71954	0.03366	5.6482	5.7909
3-1	3	5.29613	0.03366	5.2248	5.3675
3-2	3	5.31766	0.03366	5.2463	5.3890
4-1	3	5.66930	0.03366	5.5979	5.7407
4-2	3	5.67648	0.03366	5.6051	5.7478

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=Li2O (wt%), Prep Method=PF, Targeted=5.261**



Oneway **Anova**
Summary of Fit

Rsquare	0.879949
Adj Rsquare	0.827427
Root Mean Square Error	0.046508
Mean of Response	5.05483
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.25366851	0.036238	16.7538	<.0001
Error	16	0.03460784	0.002163		
C. Total	23	0.28827634			

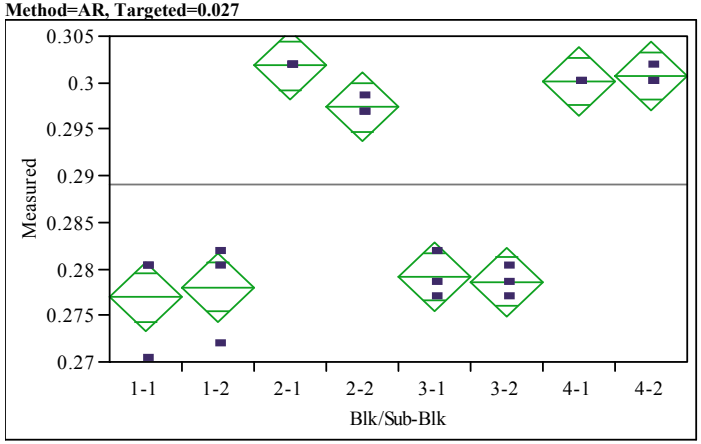
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	5.12390	0.02685	5.0670	5.1808
1-2	3	5.21719	0.02685	5.1603	5.2741
2-1	3	5.07367	0.02685	5.0167	5.1306
2-2	3	5.06649	0.02685	5.0096	5.1234
3-1	3	4.82967	0.02685	4.7727	4.8866
3-2	3	5.06649	0.02685	5.0096	5.1234
4-1	3	5.05214	0.02685	4.9952	5.1091
4-2	3	5.00908	0.02685	4.9522	5.0660

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=MgO (wt%), Prep Method=AR, Targeted=0.027**



Oneway **Anova**
Summary of Fit

Rsquare	0.952438
Adj Rsquare	0.93163
Root Mean Square Error	0.003009
Mean of Response	0.289097
Observations (or Sum Wgts)	24

Analysis of Variance

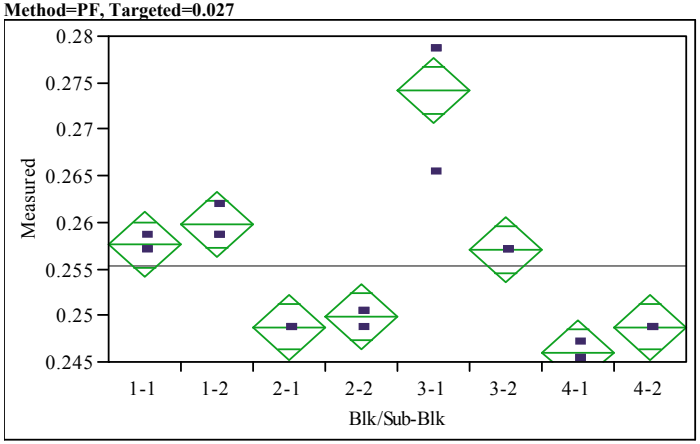
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00290029	0.000414	45.7722	<.0001
Error	16	0.00014483	9.052e-6		
C. Total	23	0.00304512			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.276936	0.00174	0.27325	0.28062
1-2	3	0.278042	0.00174	0.27436	0.28172
2-1	3	0.301811	0.00174	0.29813	0.30549
2-2	3	0.297388	0.00174	0.29371	0.30107
3-1	3	0.279147	0.00174	0.27546	0.28283
3-2	3	0.278594	0.00174	0.27491	0.28228
4-1	3	0.300152	0.00174	0.29647	0.30383
4-2	3	0.300705	0.00174	0.29702	0.30439

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=MgO (wt%), Prep Method=PF, Targeted=0.027**



Oneway **Anova**
Summary of Fit

Rsquare	0.931185
Adj Rsquare	0.901078
Root Mean Square Error	0.002852
Mean of Response	0.25524
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00176135	0.000252	30.9296	<.0001
Error	16	0.00013016	8.135e-6		
C. Total	23	0.00189151			

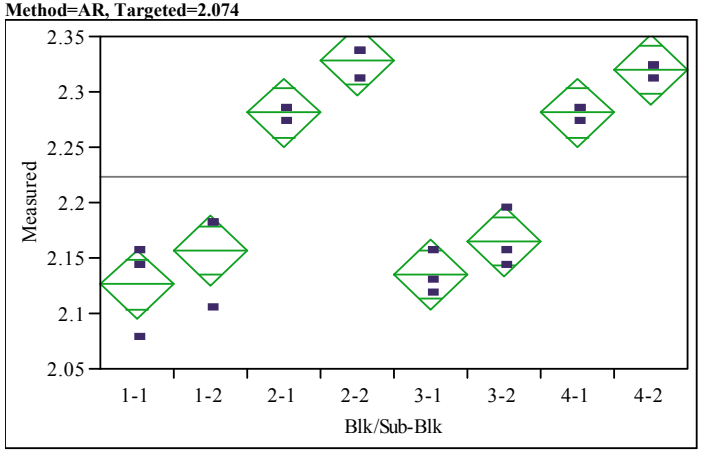
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.257589	0.00165	0.25410	0.26108
1-2	3	0.259800	0.00165	0.25631	0.26329
2-1	3	0.248745	0.00165	0.24525	0.25224
2-2	3	0.249851	0.00165	0.24636	0.25334
3-1	3	0.274172	0.00165	0.27068	0.27766
3-2	3	0.257037	0.00165	0.25355	0.26053
4-1	3	0.245981	0.00165	0.24249	0.24947
4-2	3	0.248745	0.00165	0.24525	0.25224

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=MnO (wt%), Prep Method=AR, Targeted=2.074**



Oneway **Anova**
Summary of Fit

Rsquare	0.93749
Adj Rsquare	0.910141
Root Mean Square Error	0.025554
Mean of Response	2.224092
Observations (or Sum Wgts)	24

Analysis of Variance

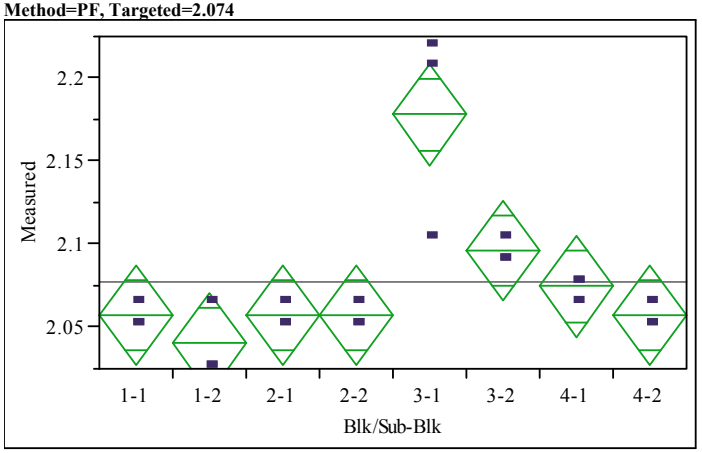
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.15668877	0.022384	34.2796	<.0001
Error	16	0.01044777	0.000653		
C. Total	23	0.16713654			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	2.12618	0.01475	2.0949	2.1575
1-2	3	2.15630	0.01475	2.1250	2.1876
2-1	3	2.28112	0.01475	2.2498	2.3124
2-2	3	2.32846	0.01475	2.2972	2.3597
3-1	3	2.13478	0.01475	2.1035	2.1661
3-2	3	2.16491	0.01475	2.1336	2.1962
4-1	3	2.28112	0.01475	2.2498	2.3124
4-2	3	2.31986	0.01475	2.2886	2.3511

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=MnO (wt%), Prep Method=PF, Targeted=2.074**



Oneway **Anova**
Summary of Fit

Rsquare	0.804851
Adj Rsquare	0.719473
Root Mean Square Error	0.024725
Mean of Response	2.077218
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.04033923	0.005763	9.4269	0.0001
Error	16	0.00978089	0.000611		
C. Total	23	0.05012012			

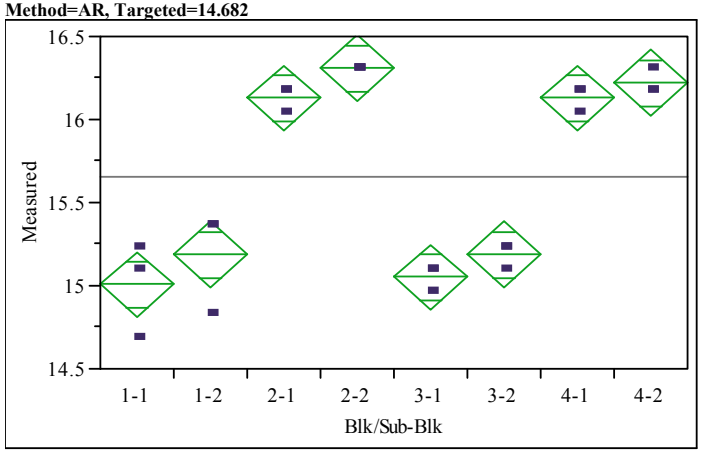
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	2.05731	0.01427	2.0271	2.0876
1-2	3	2.04010	0.01427	2.0098	2.0704
2-1	3	2.05731	0.01427	2.0271	2.0876
2-2	3	2.05731	0.01427	2.0271	2.0876
3-1	3	2.17782	0.01427	2.1476	2.2081
3-2	3	2.09605	0.01427	2.0658	2.1263
4-1	3	2.07453	0.01427	2.0443	2.1048
4-2	3	2.05731	0.01427	2.0271	2.0876

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=Na2O (wt%), Prep Method=AR, Targeted=14.682**



Oneway **Anova**
Summary of Fit

Rsquare	0.946367
Adj Rsquare	0.922902
Root Mean Square Error	0.160444
Mean of Response	15.65365
Observations (or Sum Wgts)	24

Analysis of Variance

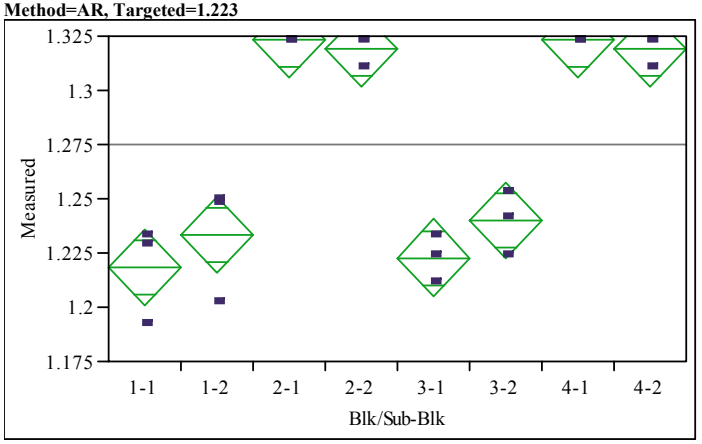
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	7.2676589	1.03824	40.3319	<.0001
Error	16	0.4118769	0.02574		
C. Total	23	7.6795358			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	15.0077	0.09263	14.811	15.204
1-2	3	15.1875	0.09263	14.991	15.384
2-1	3	16.1311	0.09263	15.935	16.327
2-2	3	16.3108	0.09263	16.114	16.507
3-1	3	15.0527	0.09263	14.856	15.249
3-2	3	15.1875	0.09263	14.991	15.384
4-1	3	16.1311	0.09263	15.935	16.327
4-2	3	16.2209	0.09263	16.025	16.417

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=NiO (wt%), Prep Method=AR, Targeted=1.223**



Oneway **Anova**
Summary of Fit

Rsquare	0.940185
Adj Rsquare	0.914016
Root Mean Square Error	0.014443
Mean of Response	1.274939
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.05246471	0.007495	35.9274	<.0001
Error	16	0.00333783	0.000209		
C. Total	23	0.05580254			

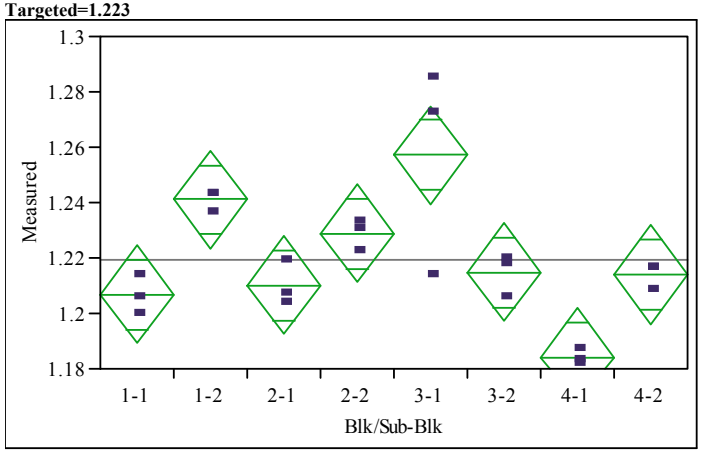
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	1.21821	0.00834	1.2005	1.2359
1-2	3	1.23348	0.00834	1.2158	1.2512
2-1	3	1.32340	0.00834	1.3057	1.3411
2-2	3	1.31916	0.00834	1.3015	1.3368
3-1	3	1.22287	0.00834	1.2052	1.2406
3-2	3	1.23984	0.00834	1.2222	1.2575
4-1	3	1.32340	0.00834	1.3057	1.3411
4-2	3	1.31916	0.00834	1.3015	1.3368

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=NiO (wt%), Prep Method=PF, Targeted=1.223**



Oneway **Anova**
Summary of Fit

Rsquare	0.758625
Adj Rsquare	0.653023
Root Mean Square Error	0.014492
Mean of Response	1.219638
Observations (or Sum Wgts)	24

Analysis of Variance

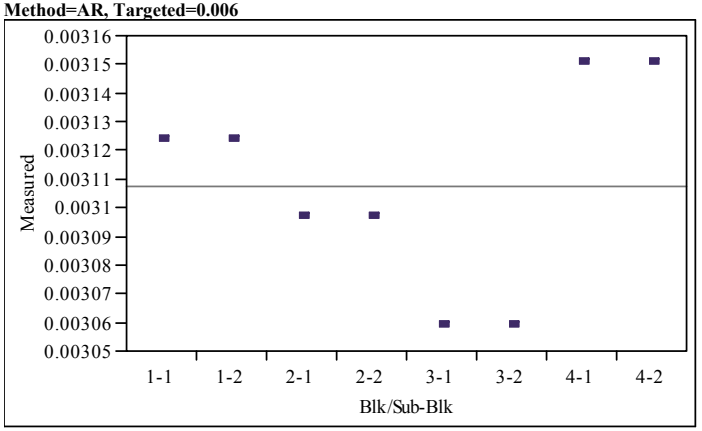
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.01056180	0.001509	7.1838	0.0006
Error	16	0.00336050	0.000210		
C. Total	23	0.01392230			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	1.20675	0.00837	1.1890	1.2245
1-2	3	1.24111	0.00837	1.2234	1.2588
2-1	3	1.21015	0.00837	1.1924	1.2279
2-2	3	1.22881	0.00837	1.2111	1.2465
3-1	3	1.25723	0.00837	1.2395	1.2750
3-2	3	1.21481	0.00837	1.1971	1.2326
4-1	3	1.18427	0.00837	1.1665	1.2020
4-2	3	1.21397	0.00837	1.1962	1.2317

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=PbO (wt%), Prep Method=AR, Targeted=0.006**



Oneway **Anova**
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	.
Mean of Response	0.003108
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	2.75005e-8	3.9286e-9	-1.9e+14	0.0000
Error	16	-3.342e-22	-2.09e-23		
C. Total	23	2.75005e-8			

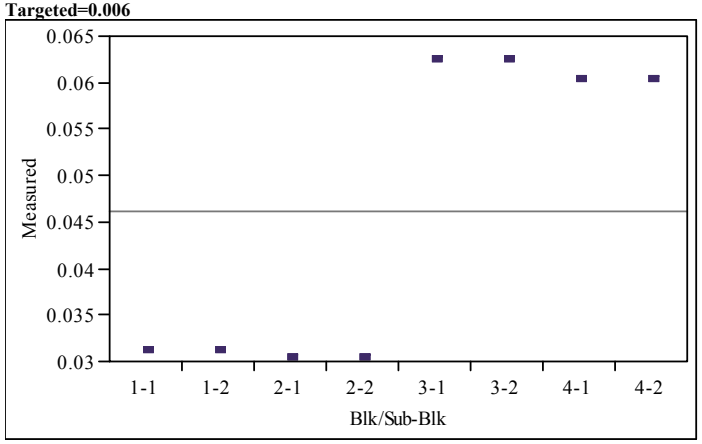
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.003124	.	.	.
1-2	3	0.003124	.	.	.
2-1	3	0.003097	.	.	.
2-2	3	0.003097	.	.	.
3-1	3	0.003059	.	.	.
3-2	3	0.003059	.	.	.
4-1	3	0.003151	.	.	.
4-2	3	0.003151	.	.	.

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=PbO (wt%), Prep Method=PF, Targeted=0.006**



Oneway **Anova**
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	.
Mean of Response	0.046077
Observations (or Sum Wgts)	24

Analysis of Variance

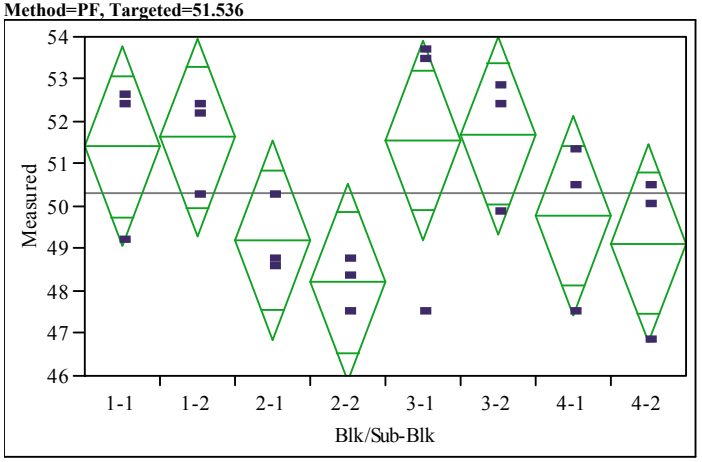
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.0056504	0.00081	-5e+15	0.0000
Error	16	-2.602e-18	-1.6e-19		
C. Total	23	0.0056504			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.031077	.	.	.
1-2	3	0.031077	.	.	.
2-1	3	0.030431	.	.	.
2-2	3	0.030431	.	.	.
3-1	3	0.062478	.	.	.
3-2	3	0.062478	.	.	.
4-1	3	0.060323	.	.	.
4-2	3	0.060323	.	.	.

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=SiO2 (wt%), Prep Method=PF, Targeted=51.536**



Oneway **Anova**
Summary of Fit

Rsquare	0.412383
Adj Rsquare	0.1553
Root Mean Square Error	1.917927
Mean of Response	50.32703
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	41.30386	5.90055	1.6041	0.2048
Error	16	58.85513	3.67845		
C. Total	23	100.15899			

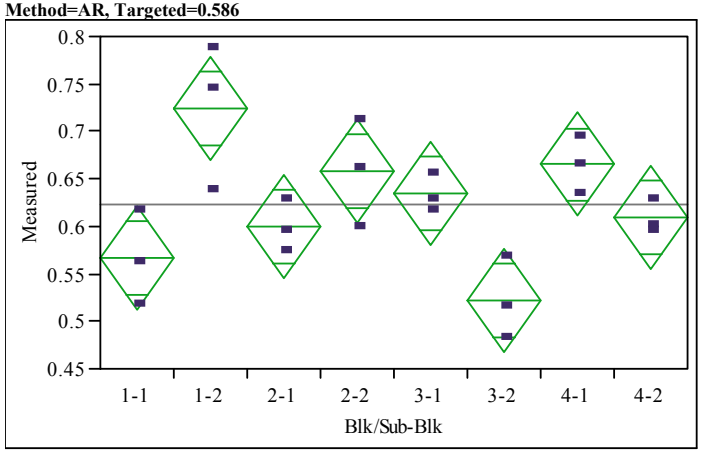
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	51.4145	1.1073	49.067	53.762
1-2	3	51.6284	1.1073	49.281	53.976
2-1	3	49.2039	1.1073	46.856	51.551
2-2	3	48.2056	1.1073	45.858	50.553
3-1	3	51.5571	1.1073	49.210	53.905
3-2	3	51.6998	1.1073	49.352	54.047
4-1	3	49.7744	1.1073	47.427	52.122
4-2	3	49.1326	1.1073	46.785	51.480

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=SO4 (wt%), Prep Method=AR, Targeted=0.586**



Oneway **Anova**
Summary of Fit

Rsquare	0.72059
Adj Rsquare	0.598348
Root Mean Square Error	0.044638
Mean of Response	0.622398
Observations (or Sum Wgts)	24

Analysis of Variance

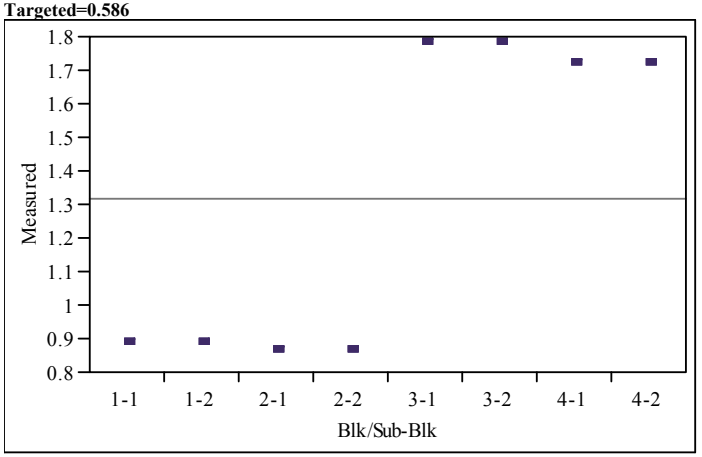
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.08221931	0.011746	5.8948	0.0016
Error	16	0.03188068	0.001993		
C. Total	23	0.11409999			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.566225	0.02577	0.51159	0.62086
1-2	3	0.724009	0.02577	0.66938	0.77864
2-1	3	0.600179	0.02577	0.54555	0.65481
2-2	3	0.658099	0.02577	0.60347	0.71273
3-1	3	0.634132	0.02577	0.57950	0.68877
3-2	3	0.522285	0.02577	0.46765	0.57692
4-1	3	0.665090	0.02577	0.61046	0.71972
4-2	3	0.609166	0.02577	0.55453	0.66380

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=SO4 (wt%), Prep Method=PF, Targeted=0.586**



Oneway **Anova**
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	.
Mean of Response	1.3152
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	4.603419	0.65763	-3e+15	0.0000
Error	16	-3.553e-15	-2.2e-16		
C. Total	23	4.603419			

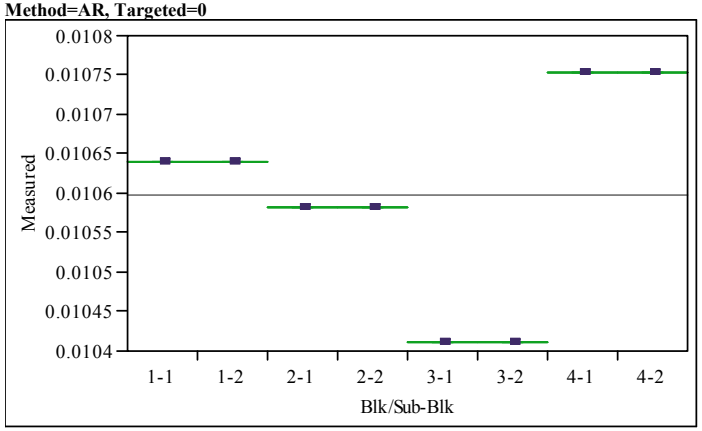
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.88679	.	.	.
1-2	3	0.88679	.	.	.
2-1	3	0.86881	.	.	.
2-2	3	0.86881	.	.	.
3-1	3	1.78256	.	.	.
3-2	3	1.78256	.	.	.
4-1	3	1.72264	.	.	.
4-2	3	1.72264	.	.	.

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=ThO2 (wt%), Prep Method=AR, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	4.81e-12
Mean of Response	0.010597
Observations (or Sum Wgts)	24

Analysis of Variance

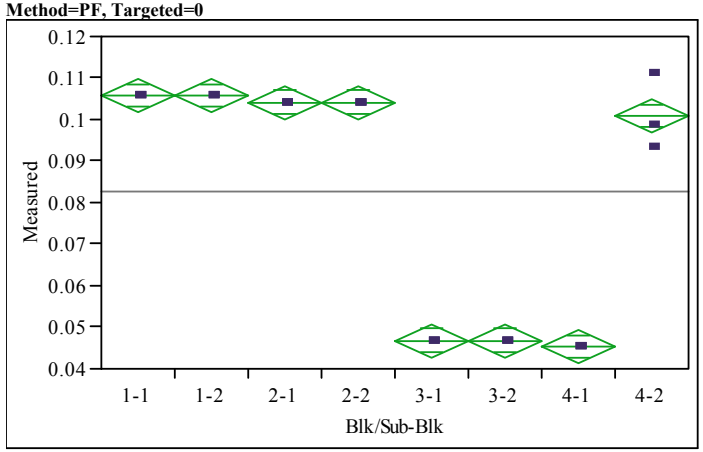
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	3.64167e-7	5.2024e-8	2.25e+15	<.0001
Error	16	3.7058e-22	2.316e-23		
C. Total	23	3.64167e-7			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.010639	2.779e-12	0.01064	0.01064
1-2	3	0.010639	2.779e-12	0.01064	0.01064
2-1	3	0.010582	2.779e-12	0.01058	0.01058
2-2	3	0.010582	2.779e-12	0.01058	0.01058
3-1	3	0.010412	2.779e-12	0.01041	0.01041
3-2	3	0.010412	2.779e-12	0.01041	0.01041
4-1	3	0.010753	2.779e-12	0.01075	0.01075
4-2	3	0.010753	2.779e-12	0.01075	0.01075

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=ThO2 (wt%), Prep Method=PF, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	0.991172
Adj Rsquare	0.987309
Root Mean Square Error	0.003242
Mean of Response	0.082469
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.01887792	0.002697	256.6212	<.0001
Error	16	0.00016814	0.000011		
C. Total	23	0.01904606			

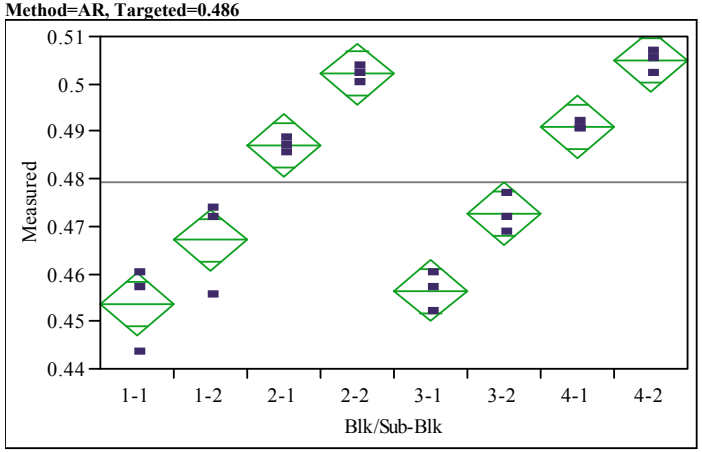
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.105825	0.00187	0.10186	0.10979
1-2	3	0.105825	0.00187	0.10186	0.10979
2-1	3	0.104118	0.00187	0.10015	0.10809
2-2	3	0.104118	0.00187	0.10015	0.10809
3-1	3	0.046825	0.00187	0.04286	0.05079
3-2	3	0.046825	0.00187	0.04286	0.05079
4-1	3	0.045288	0.00187	0.04132	0.04926
4-2	3	0.100932	0.00187	0.09696	0.10490

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=TiO2 (wt%), Prep Method=AR, Targeted=0.486**



Oneway **Anova**
Summary of Fit

Rsquare	0.947182
Adj Rsquare	0.924074
Root Mean Square Error	0.005351
Mean of Response	0.479342
Observations (or Sum Wgts)	24

Analysis of Variance

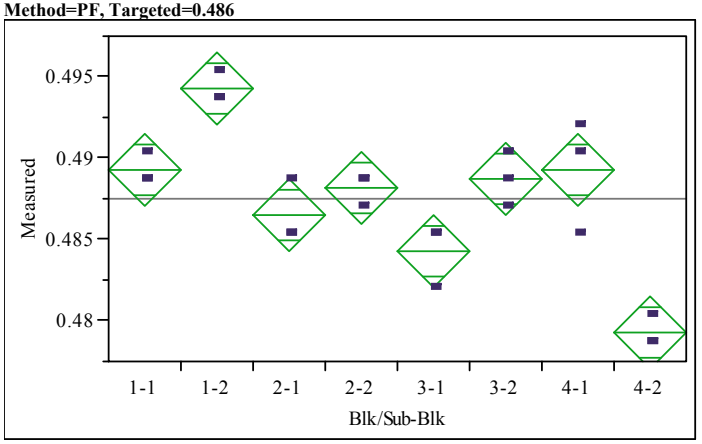
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00821579	0.001174	40.9896	<.0001
Error	16	0.00045814	0.000029		
C. Total	23	0.00867393			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.453696	0.00309	0.44715	0.46025
1-2	3	0.467040	0.00309	0.46049	0.47359
2-1	3	0.487056	0.00309	0.48051	0.49361
2-2	3	0.502068	0.00309	0.49552	0.50862
3-1	3	0.456476	0.00309	0.44993	0.46303
3-2	3	0.472600	0.00309	0.46605	0.47915
4-1	3	0.490948	0.00309	0.48440	0.49750
4-2	3	0.504848	0.00309	0.49830	0.51140

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=TiO2 (wt%), Prep Method=PF, Targeted=0.486**



Oneway **Anova**
Summary of Fit

Rsquare	0.885128
Adj Rsquare	0.834872
Root Mean Square Error	0.001802
Mean of Response	0.487473
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00040018	0.000057	17.6122	<.0001
Error	16	0.00005193	3.246e-6		
C. Total	23	0.00045211			

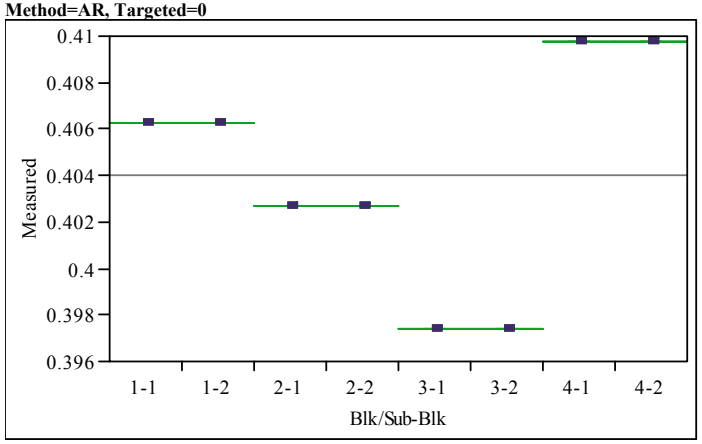
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.489280	0.00104	0.48707	0.49149
1-2	3	0.494284	0.00104	0.49208	0.49649
2-1	3	0.486500	0.00104	0.48429	0.48871
2-2	3	0.488168	0.00104	0.48596	0.49037
3-1	3	0.484276	0.00104	0.48207	0.48648
3-2	3	0.488724	0.00104	0.48652	0.49093
4-1	3	0.489280	0.00104	0.48707	0.49149
4-2	3	0.479272	0.00104	0.47707	0.48148

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=U3O8 (wt%), Prep Method=AR, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	8.23e-11
Mean of Response	0.404023
Observations (or Sum Wgts)	24

Analysis of Variance

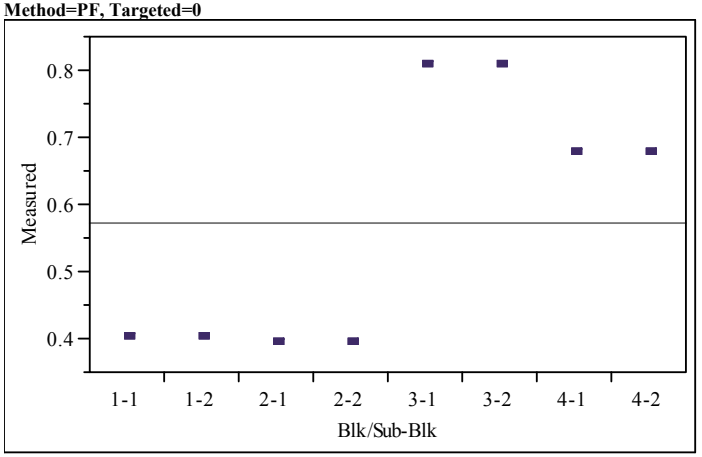
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00050215	0.000072	1.06e+16	<.0001
Error	16	1.0842e-19	6.78e-21		
C. Total	23	0.00050215			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.406234	4.753e-11	0.40623	0.40623
1-2	3	0.406234	4.753e-11	0.40623	0.40623
2-1	3	0.402697	4.753e-11	0.40270	0.40270
2-2	3	0.402697	4.753e-11	0.40270	0.40270
3-1	3	0.397390	4.753e-11	0.39739	0.39739
3-2	3	0.397390	4.753e-11	0.39739	0.39739
4-1	3	0.409772	4.753e-11	0.40977	0.40977
4-2	3	0.409772	4.753e-11	0.40977	0.40977

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=U3O8 (wt%), Prep Method=PF, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	.
Mean of Response	0.571322
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.7571800	0.10817	-3.1e+15	0.0000
Error	16	-5.551e-16	-3.5e-17		
C. Total	23	0.7571800			

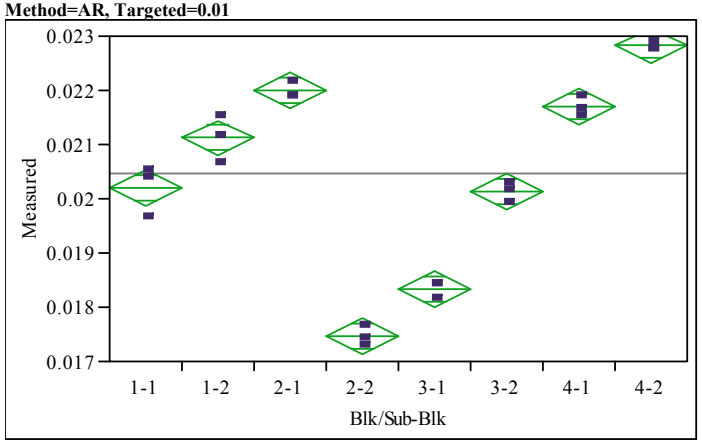
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.403876	.	.	.
1-2	3	0.403876	.	.	.
2-1	3	0.395622	.	.	.
2-2	3	0.395622	.	.	.
3-1	3	0.807752	.	.	.
3-2	3	0.807752	.	.	.
4-1	3	0.678040	.	.	.
4-2	3	0.678040	.	.	.

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=ZnO (wt%), Prep Method=AR, Targeted=0.01**



Oneway **Anova**
Summary of Fit

Rsquare	0.984147
Adj Rsquare	0.977212
Root Mean Square Error	0.000266
Mean of Response	0.020472
Observations (or Sum Wgts)	24

Analysis of Variance

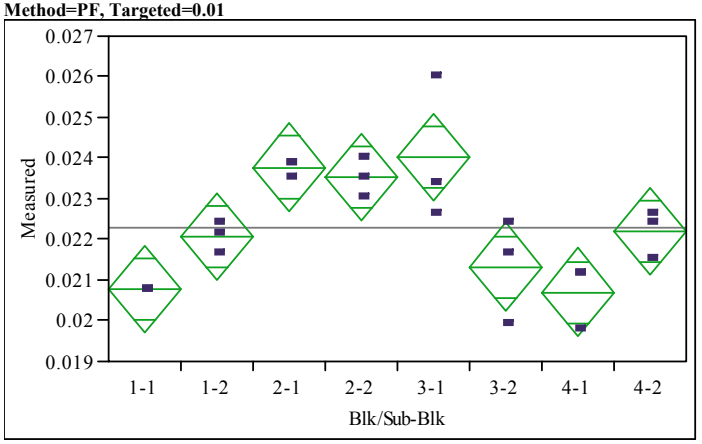
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00007054	0.000010	141.9000	<.0001
Error	16	0.00000114	7.102e-8		
C. Total	23	0.00007168			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.020207	0.00015	0.01988	0.02053
1-2	3	0.021120	0.00015	0.02079	0.02145
2-1	3	0.021991	0.00015	0.02167	0.02232
2-2	3	0.017469	0.00015	0.01714	0.01779
3-1	3	0.018340	0.00015	0.01801	0.01867
3-2	3	0.020124	0.00015	0.01980	0.02045
4-1	3	0.021701	0.00015	0.02137	0.02203
4-2	3	0.022821	0.00015	0.02250	0.02315

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=ZnO (wt%), Prep Method=PF, Targeted=0.01**



Oneway **Anova**
Summary of Fit

Rsquare	0.752697
Adj Rsquare	0.644502
Root Mean Square Error	0.000877
Mean of Response	0.022303
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00003748	5.354e-6	6.9569	0.0007
Error	16	0.00001231	7.696e-7		
C. Total	23	0.00004979			

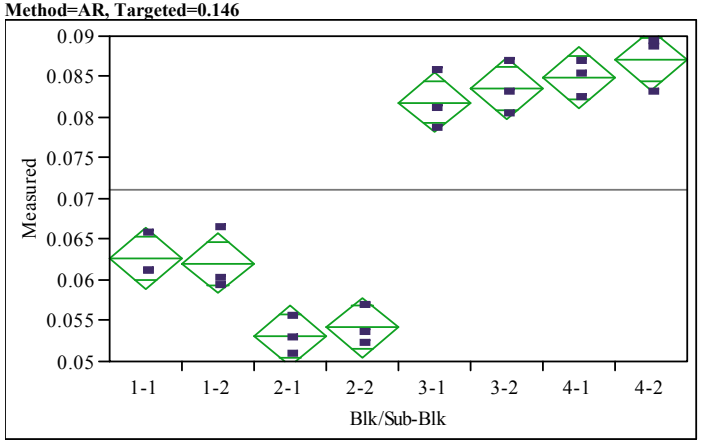
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.020788	0.00051	0.01971	0.02186
1-2	3	0.022074	0.00051	0.02100	0.02315
2-1	3	0.023776	0.00051	0.02270	0.02485
2-2	3	0.023527	0.00051	0.02245	0.02460
3-1	3	0.024025	0.00051	0.02295	0.02510
3-2	3	0.021328	0.00051	0.02025	0.02240
4-1	3	0.020705	0.00051	0.01963	0.02178
4-2	3	0.022199	0.00051	0.02113	0.02327

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=SB7ref, Oxide=ZrO2 (wt%), Prep Method=AR, Targeted=0.146**



Oneway **Anova**
Summary of Fit

Rsquare	0.967944
Adj Rsquare	0.953919
Root Mean Square Error	0.003032
Mean of Response	0.071159
Observations (or Sum Wgts)	24

Analysis of Variance

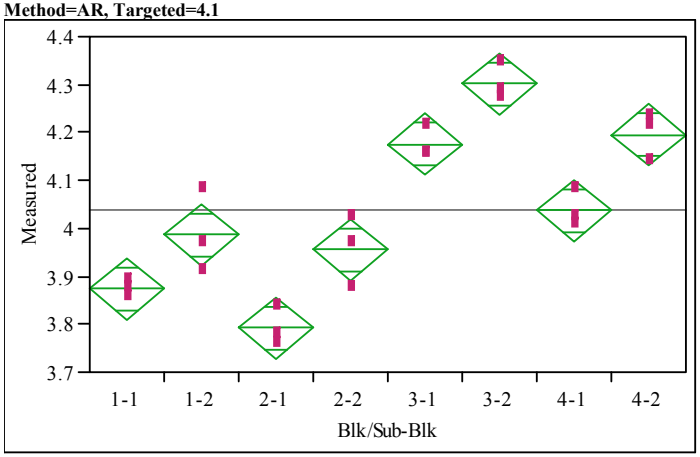
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00444040	0.000634	69.0180	<.0001
Error	16	0.00014706	9.191e-6		
C. Total	23	0.00458745			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.062632	0.00175	0.05892	0.06634
1-2	3	0.062047	0.00175	0.05834	0.06576
2-1	3	0.053086	0.00175	0.04938	0.05680
2-2	3	0.054167	0.00175	0.05046	0.05788
3-1	3	0.081858	0.00175	0.07815	0.08557
3-2	3	0.083524	0.00175	0.07981	0.08724
4-1	3	0.084875	0.00175	0.08116	0.08859
4-2	3	0.087082	0.00175	0.08337	0.09079

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=Al2O3 (wt%), Prep Method=AR, Targeted=4.1**



Oneway **Anova**
Summary of Fit

Rsquare	0.935096
Adj Rsquare	0.9067
Root Mean Square Error	0.052318
Mean of Response	4.039594
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.63096028	0.090137	32.9309	<.0001
Error	16	0.04379458	0.002737		
C. Total	23	0.67475486			

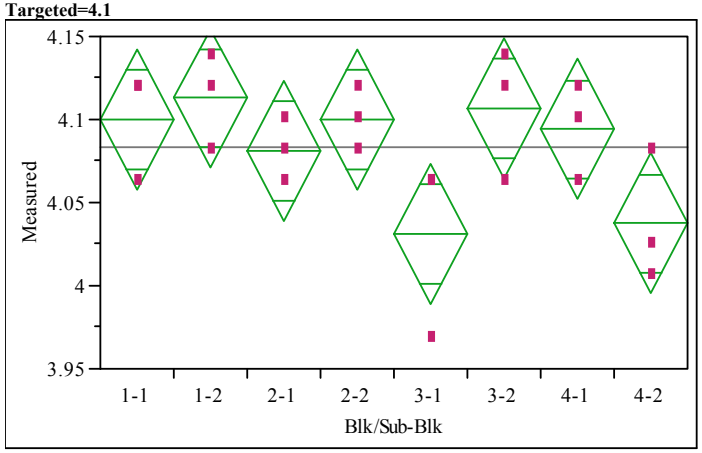
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	3.87348	0.03021	3.8094	3.9375
1-2	3	3.98685	0.03021	3.9228	4.0509
2-1	3	3.79160	0.03021	3.7276	3.8556
2-2	3	3.95535	0.03021	3.8913	4.0194
3-1	3	4.17580	0.03021	4.1118	4.2398
3-2	3	4.30176	0.03021	4.2377	4.3658
4-1	3	4.03723	0.03021	3.9732	4.1013
4-2	3	4.19469	0.03021	4.1307	4.2587

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=Al2O3 (wt%), Prep Method=PF, Targeted=4.1**



Oneway **Anova**
Summary of Fit

Rsquare	0.5231
Adj Rsquare	0.314456
Root Mean Square Error	0.034497
Mean of Response	4.082895
Observations (or Sum Wgts)	24

Analysis of Variance

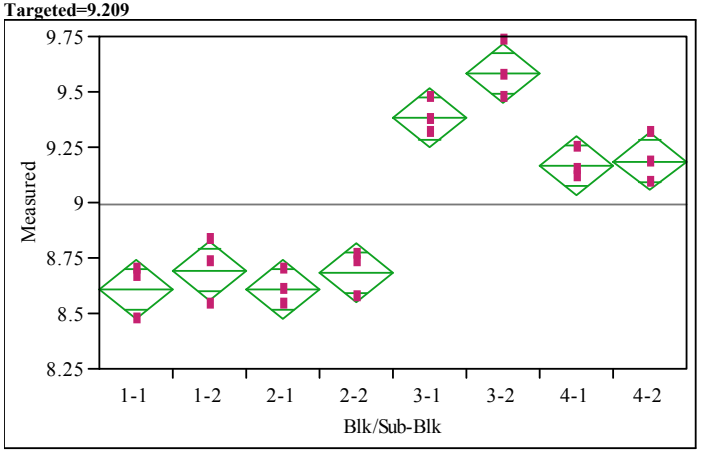
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.02088573	0.002984	2.5071	0.0606
Error	16	0.01904112	0.001190		
C. Total	23	0.03992685			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	4.10022	0.01992	4.0580	4.1424
1-2	3	4.11281	0.01992	4.0706	4.1550
2-1	3	4.08132	0.01992	4.0391	4.1235
2-2	3	4.10022	0.01992	4.0580	4.1424
3-1	3	4.03093	0.01992	3.9887	4.0732
3-2	3	4.10651	0.01992	4.0643	4.1487
4-1	3	4.09392	0.01992	4.0517	4.1361
4-2	3	4.03723	0.01992	3.9950	4.0795

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=B2O3 (wt%), Prep Method=AR, Targeted=9.209**



Oneway **Anova**
Summary of Fit

Rsquare	0.943295
Adj Rsquare	0.918486
Root Mean Square Error	0.108796
Mean of Response	8.988888
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	3.1504155	0.450059	38.0229	<.0001
Error	16	0.1893843	0.011837		
C. Total	23	3.3397998			

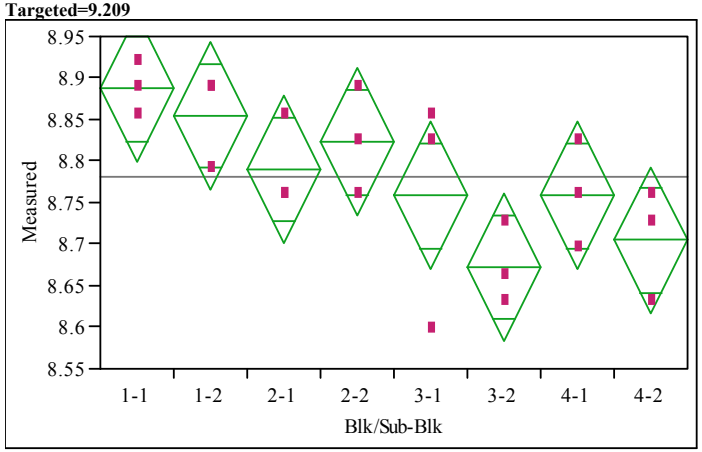
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	8.60787	0.06281	8.4747	8.7410
1-2	3	8.69373	0.06281	8.5606	8.8269
2-1	3	8.60787	0.06281	8.4747	8.7410
2-2	3	8.68300	0.06281	8.5498	8.8162
3-1	3	9.38064	0.06281	9.2475	9.5138
3-2	3	9.58457	0.06281	9.4514	9.7177
4-1	3	9.16598	0.06281	9.0328	9.2991
4-2	3	9.18745	0.06281	9.0543	9.3206

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=B2O3 (wt%), Prep Method=PF, Targeted=9.209**



Oneway **Anova**
Summary of Fit

Rsquare	0.56957
Adj Rsquare	0.381257
Root Mean Square Error	0.072597
Mean of Response	8.780936
Observations (or Sum Wgts)	24

Analysis of Variance

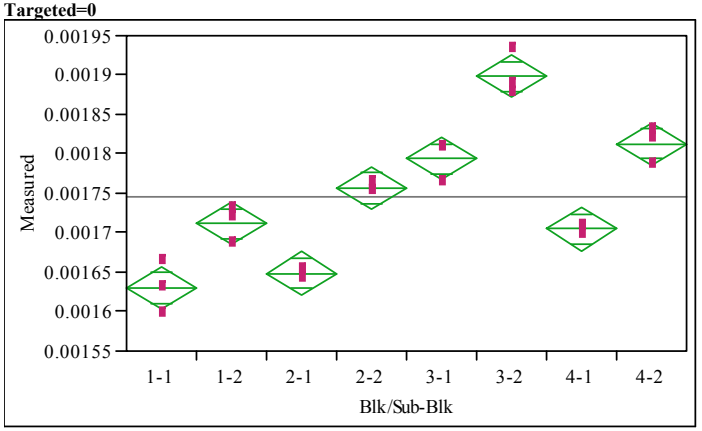
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.11158297	0.015940	3.0246	0.0316
Error	16	0.08432442	0.005270		
C. Total	23	0.19590739			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	8.88692	0.04191	8.7981	8.9758
1-2	3	8.85473	0.04191	8.7659	8.9436
2-1	3	8.79033	0.04191	8.7015	8.8792
2-2	3	8.82253	0.04191	8.7337	8.9114
3-1	3	8.75813	0.04191	8.6693	8.8470
3-2	3	8.67226	0.04191	8.5834	8.7611
4-1	3	8.75813	0.04191	8.6693	8.8470
4-2	3	8.70446	0.04191	8.6156	8.7933

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=BaO (wt%), Prep Method=AR, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	0.955793
Adj Rsquare	0.936453
Root Mean Square Error	0.000022
Mean of Response	0.001745
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	1.67103e-7	2.3872e-8	49.4194	<.0001
Error	16	7.72875e-9	4.83e-10		
C. Total	23	1.74832e-7			

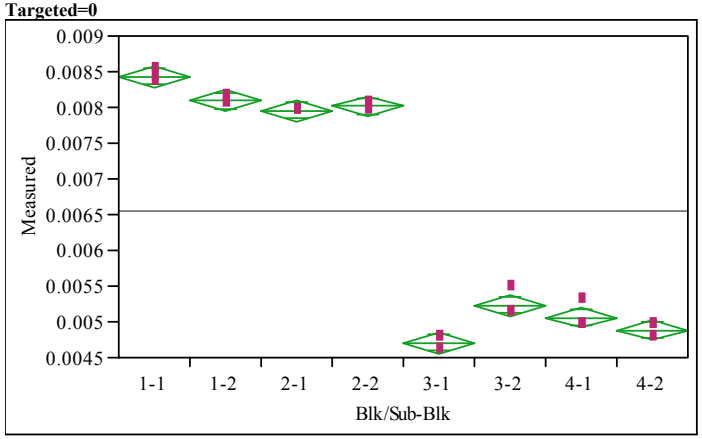
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.001630	1.27e-5	0.00160	0.00166
1-2	3	0.001712	1.27e-5	0.00169	0.00174
2-1	3	0.001649	1.27e-5	0.00162	0.00168
2-2	3	0.001757	1.27e-5	0.00173	0.00178
3-1	3	0.001794	1.27e-5	0.00177	0.00182
3-2	3	0.001898	1.27e-5	0.00187	0.00192
4-1	3	0.001705	1.27e-5	0.00168	0.00173
4-2	3	0.001812	1.27e-5	0.00179	0.00184

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=BaO (wt%), Prep Method=PF, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	0.996131
Adj Rsquare	0.994438
Root Mean Square Error	0.000121
Mean of Response	0.006548
Observations (or Sum Wgts)	24

Analysis of Variance

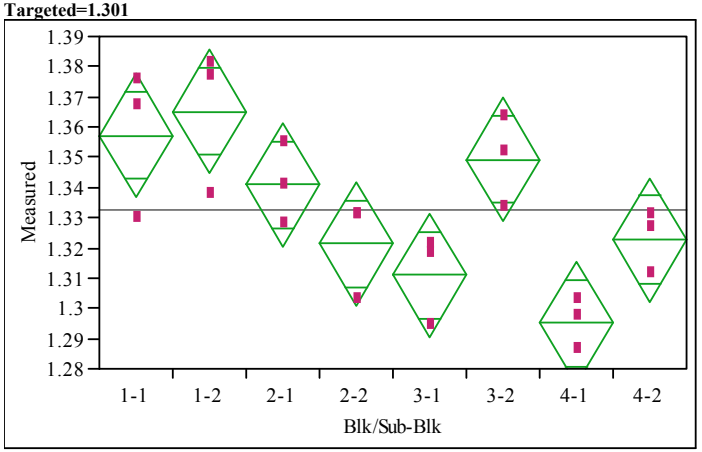
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00006049	8.6409e-6	588.4764	<.0001
Error	16	0.00000023	1.4684e-8		
C. Total	23	0.00006072			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.008433	0.00007	0.00828	0.00858
1-2	3	0.008091	0.00007	0.00794	0.00824
2-1	3	0.007961	0.00007	0.00781	0.00811
2-2	3	0.008013	0.00007	0.00786	0.00816
3-1	3	0.004708	0.00007	0.00456	0.00486
3-2	3	0.005233	0.00007	0.00508	0.00538
4-1	3	0.005061	0.00007	0.00491	0.00521
4-2	3	0.004887	0.00007	0.00474	0.00503

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=CaO (wt%), Prep Method=AR, Targeted=1.301**



Oneway **Anova**
Summary of Fit

Rsquare	0.734169
Adj Rsquare	0.617868
Root Mean Square Error	0.016688
Mean of Response	1.332855
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.01230616	0.001758	6.3127	0.0011
Error	16	0.00445586	0.000278		
C. Total	23	0.01676202			

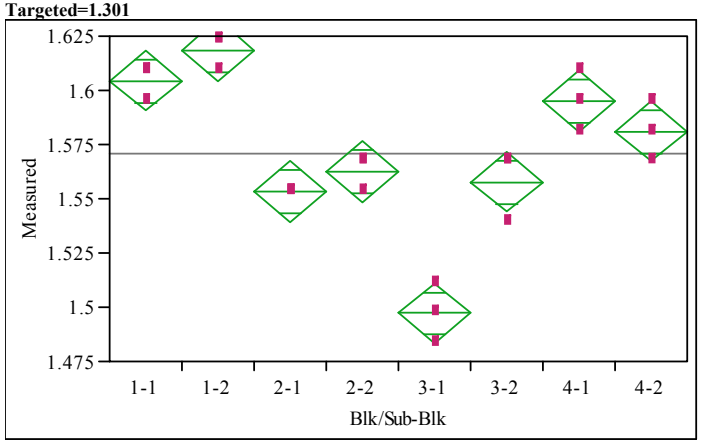
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	1.35722	0.00963	1.3368	1.3776
1-2	3	1.36515	0.00963	1.3447	1.3856
2-1	3	1.34090	0.00963	1.3205	1.3613
2-2	3	1.32131	0.00963	1.3009	1.3417
3-1	3	1.31105	0.00963	1.2906	1.3315
3-2	3	1.34930	0.00963	1.3289	1.3697
4-1	3	1.29519	0.00963	1.2748	1.3156
4-2	3	1.32271	0.00963	1.3023	1.3431

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=CaO (wt%), Prep Method=PF, Targeted=1.301**



Oneway **Anova**
Summary of Fit

Rsquare	0.935337
Adj Rsquare	0.907047
Root Mean Square Error	0.011424
Mean of Response	1.571185
Observations (or Sum Wgts)	24

Analysis of Variance

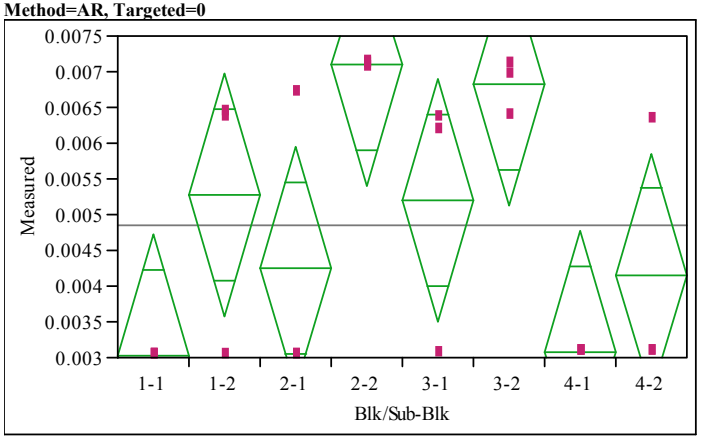
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.03020662	0.004315	33.0625	<.0001
Error	16	0.00208828	0.000131		
C. Total	23	0.03229489			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	1.60442	0.00660	1.5904	1.6184
1-2	3	1.61841	0.00660	1.6044	1.6324
2-1	3	1.55311	0.00660	1.5391	1.5671
2-2	3	1.56244	0.00660	1.5485	1.5764
3-1	3	1.49714	0.00660	1.4832	1.5111
3-2	3	1.55778	0.00660	1.5438	1.5718
4-1	3	1.59509	0.00660	1.5811	1.6091
4-2	3	1.58110	0.00660	1.5671	1.5951

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=Ce2O3 (wt%), Prep Method=AR, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	0.616324
Adj Rsquare	0.448466
Root Mean Square Error	0.001388
Mean of Response	0.004861
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00004948	7.0689e-6	3.6717	0.0148
Error	16	0.00003080	1.9252e-6		
C. Total	23	0.00008029			

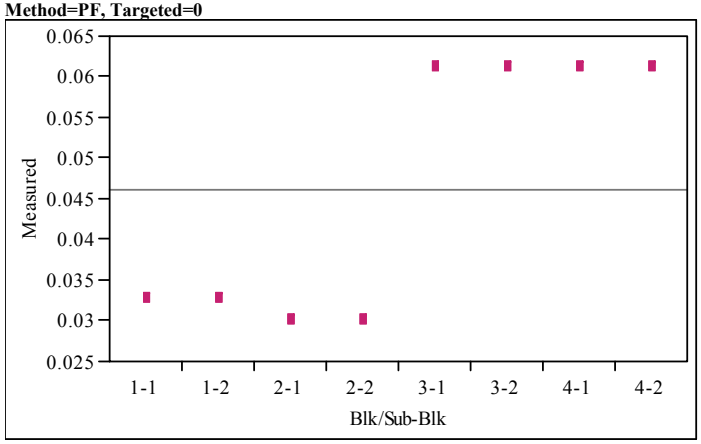
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.003016	0.00080	0.00132	0.00471
1-2	3	0.005265	0.00080	0.00357	0.00696
2-1	3	0.004256	0.00080	0.00256	0.00595
2-2	3	0.007094	0.00080	0.00540	0.00879
3-1	3	0.005193	0.00080	0.00349	0.00689
3-2	3	0.006817	0.00080	0.00512	0.00852
4-1	3	0.003086	0.00080	0.00139	0.00478
4-2	3	0.004162	0.00080	0.00246	0.00586

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=Ce2O3 (wt%), Prep Method=PF, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	.
Mean of Response	0.046047
Observations (or Sum Wgts)	24

Analysis of Variance

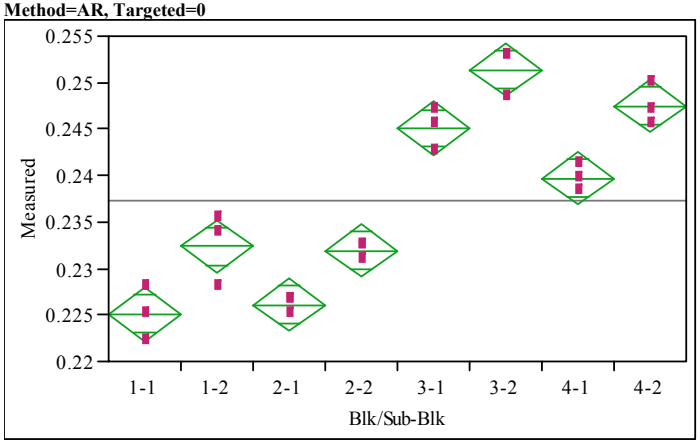
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.0053193	0.00076	-7e+15	0.0000
Error	16	-1.735e-18	-1.1e-19		
C. Total	23	0.0053193			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.032445	.	.	.
1-2	3	0.032445	.	.	.
2-1	3	0.029927	.	.	.
2-2	3	0.029927	.	.	.
3-1	3	0.060908	.	.	.
3-2	3	0.060908	.	.	.
4-1	3	0.060908	.	.	.
4-2	3	0.060908	.	.	.

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=Cr2O3 (wt%), Prep Method=AR, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	0.960124
Adj Rsquare	0.942679
Root Mean Square Error	0.00233
Mean of Response	0.237388
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00209177	0.000299	55.0351	<.0001
Error	16	0.00008688	5.43e-6		
C. Total	23	0.00217864			

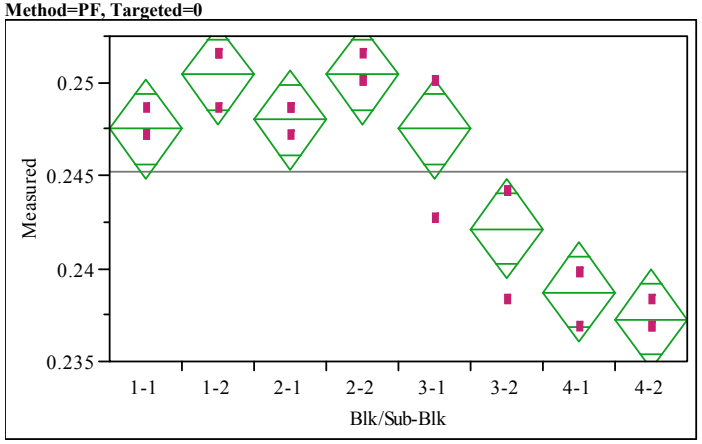
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.225086	0.00135	0.22223	0.22794
1-2	3	0.232394	0.00135	0.22954	0.23525
2-1	3	0.226061	0.00135	0.22321	0.22891
2-2	3	0.231907	0.00135	0.22906	0.23476
3-1	3	0.245062	0.00135	0.24221	0.24791
3-2	3	0.251395	0.00135	0.24854	0.25425
4-1	3	0.239702	0.00135	0.23685	0.24255
4-2	3	0.247498	0.00135	0.24465	0.25035

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=Cr2O3 (wt%), Prep Method=PF, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	0.881415
Adj Rsquare	0.829534
Root Mean Square Error	0.002172
Mean of Response	0.245244
Observations (or Sum Wgts)	24

Analysis of Variance

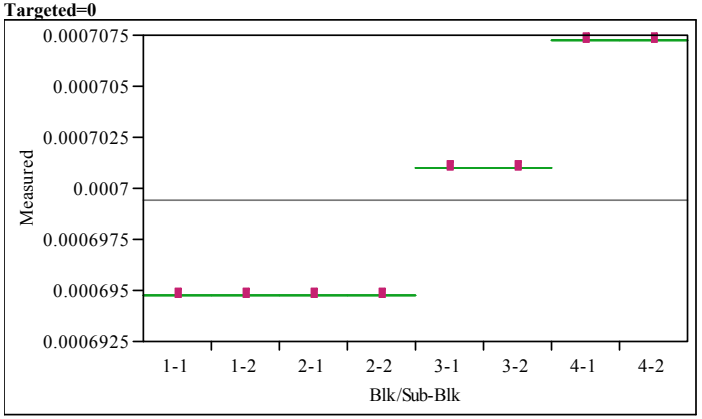
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00056104	0.000080	16.9892	<.0001
Error	16	0.00007548	4.718e-6		
C. Total	23	0.00063652			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.247498	0.00125	0.24484	0.25016
1-2	3	0.250421	0.00125	0.24776	0.25308
2-1	3	0.247985	0.00125	0.24533	0.25064
2-2	3	0.250421	0.00125	0.24776	0.25308
3-1	3	0.247498	0.00125	0.24484	0.25016
3-2	3	0.242138	0.00125	0.23948	0.24480
4-1	3	0.238728	0.00125	0.23607	0.24139
4-2	3	0.237266	0.00125	0.23461	0.23992

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=CuO (wt%), Prep Method=AR, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	0
Mean of Response	0.000699
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	6.4639e-10	9.234e-11	.	.
Error	16	0	0		
C. Total	23	6.4639e-10			

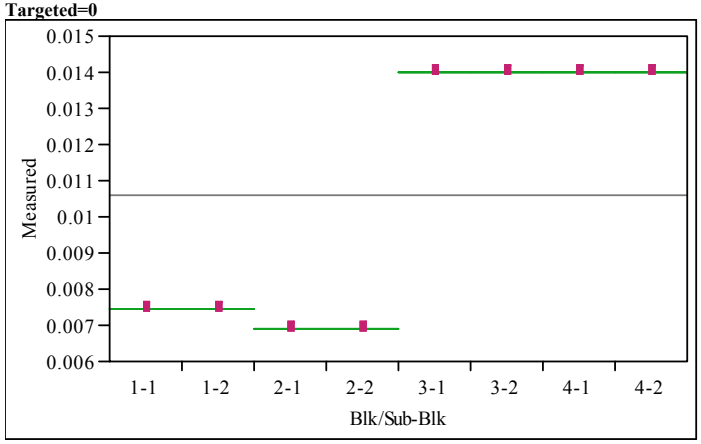
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.000695	0	0.00069	0.00069
1-2	3	0.000695	0	0.00069	0.00069
2-1	3	0.000695	0	0.00069	0.00069
2-2	3	0.000695	0	0.00069	0.00069
3-1	3	0.000701	0	0.00070	0.00070
3-2	3	0.000701	0	0.00070	0.00070
4-1	3	0.000707	0	0.00071	0.00071
4-2	3	0.000707	0	0.00071	0.00071

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=CuO (wt%), Prep Method=PF, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	0
Mean of Response	0.010593
Observations (or Sum Wgts)	24

Analysis of Variance

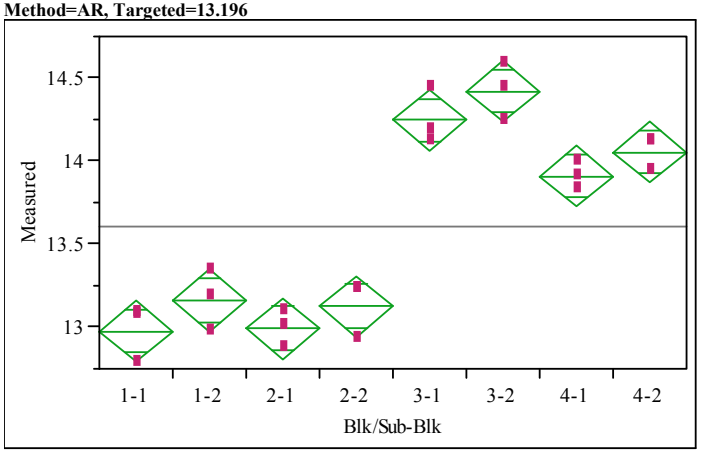
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00028278	0.000040	.	.
Error	16	0.00000000	0.000000		
C. Total	23	0.00028278			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.007448	0	0.00745	0.00745
1-2	3	0.007448	0	0.00745	0.00745
2-1	3	0.006885	0	0.00688	0.00688
2-2	3	0.006885	0	0.00688	0.00688
3-1	3	0.014020	0	0.01402	0.01402
3-2	3	0.014020	0	0.01402	0.01402
4-1	3	0.014020	0	0.01402	0.01402
4-2	3	0.014020	0	0.01402	0.01402

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=Fe2O3 (wt%), Prep Method=AR, Targeted=13.196**



Oneway **Anova**
Summary of Fit

Rsquare	0.95447
Adj Rsquare	0.934551
Root Mean Square Error	0.15153
Mean of Response	13.61074
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	7.7016781	1.10024	47.9169	<.0001
Error	16	0.3673825	0.02296		
C. Total	23	8.0690606			

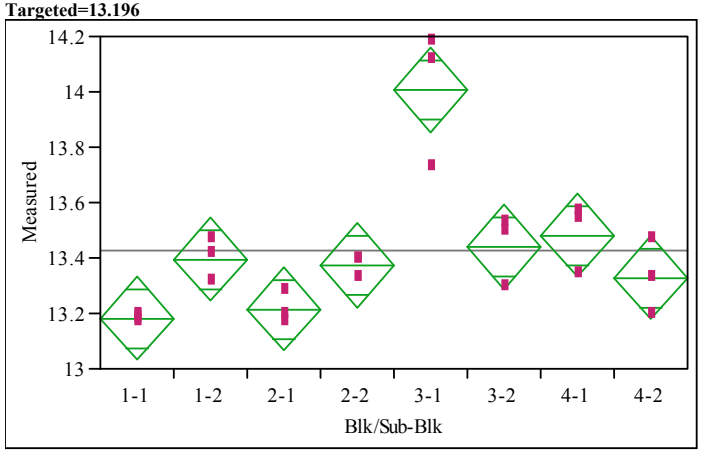
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	12.9769	0.08749	12.791	13.162
1-2	3	13.1628	0.08749	12.977	13.348
2-1	3	12.9912	0.08749	12.806	13.177
2-2	3	13.1246	0.08749	12.939	13.310
3-1	3	14.2446	0.08749	14.059	14.430
3-2	3	14.4209	0.08749	14.235	14.606
4-1	3	13.9110	0.08749	13.726	14.096
4-2	3	14.0540	0.08749	13.868	14.239

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=Fe2O3 (wt%), Prep Method=PF, Targeted=13.196**



Oneway **Anova**
Summary of Fit

Rsquare	0.849067
Adj Rsquare	0.783034
Root Mean Square Error	0.123437
Mean of Response	13.42786
Observations (or Sum Wgts)	24

Analysis of Variance

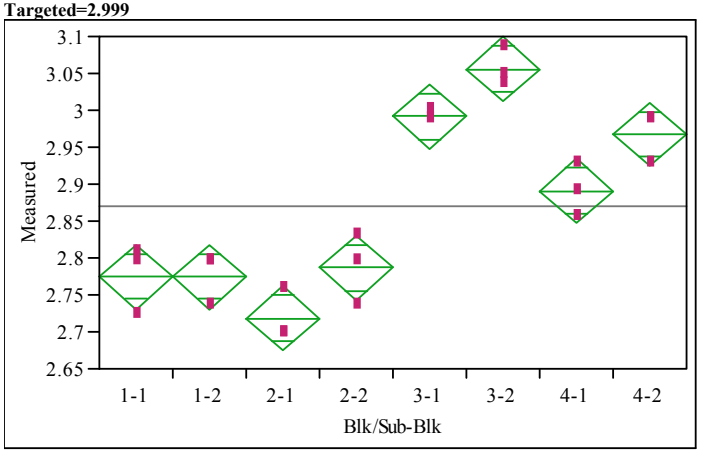
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	1.3714075	0.195915	12.8582	<.0001
Error	16	0.2437861	0.015237		
C. Total	23	1.6151935			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	13.1818	0.07127	13.031	13.333
1-2	3	13.3963	0.07127	13.245	13.547
2-1	3	13.2152	0.07127	13.064	13.366
2-2	3	13.3725	0.07127	13.221	13.524
3-1	3	14.0063	0.07127	13.855	14.157
3-2	3	13.4392	0.07127	13.288	13.590
4-1	3	13.4821	0.07127	13.331	13.633
4-2	3	13.3296	0.07127	13.178	13.481

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=K2O (wt%), Prep Method=AR, Targeted=2.999**



Oneway **Anova**
Summary of Fit

Rsquare	0.941156
Adj Rsquare	0.915411
Root Mean Square Error	0.035462
Mean of Response	2.86996
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.32182118	0.045974	36.5577	<.0001
Error	16	0.02012138	0.001258		
C. Total	23	0.34194256			

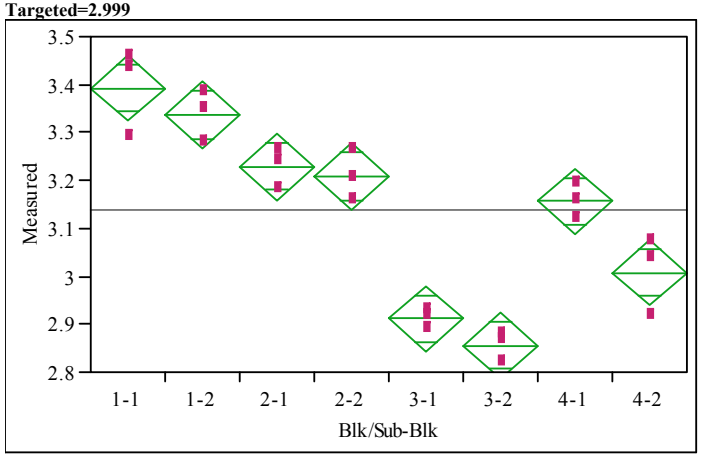
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	2.77460	0.02047	2.7312	2.8180
1-2	3	2.77460	0.02047	2.7312	2.8180
2-1	3	2.71838	0.02047	2.6750	2.7618
2-2	3	2.78664	0.02047	2.7432	2.8300
3-1	3	2.99142	0.02047	2.9480	3.0348
3-2	3	3.05567	0.02047	3.0123	3.0991
4-1	3	2.89104	0.02047	2.8476	2.9344
4-2	3	2.96733	0.02047	2.9239	3.0107

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=K2O (wt%), Prep Method=PF, Targeted=2.999**



Oneway **Anova**
Summary of Fit

Rsquare	0.939857
Adj Rsquare	0.913545
Root Mean Square Error	0.056554
Mean of Response	3.136979
Observations (or Sum Wgts)	24

Analysis of Variance

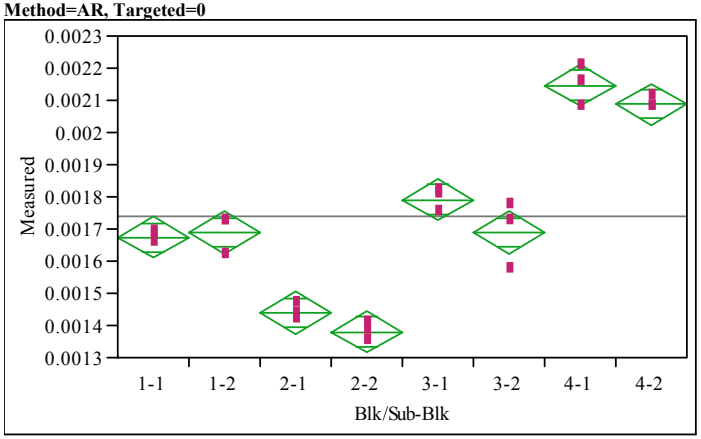
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.79970399	0.114243	35.7191	<.0001
Error	16	0.05117409	0.003198		
C. Total	23	0.85087808			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	3.39296	0.03265	3.3237	3.4622
1-2	3	3.33674	0.03265	3.2675	3.4060
2-1	3	3.22833	0.03265	3.1591	3.2975
2-2	3	3.20825	0.03265	3.1390	3.2775
3-1	3	2.91112	0.03265	2.8419	2.9803
3-2	3	2.85490	0.03265	2.7857	2.9241
4-1	3	3.15605	0.03265	3.0868	3.2253
4-2	3	3.00748	0.03265	2.9383	3.0767

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=La2O3 (wt%), Prep Method=AR, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	0.971921
Adj Rsquare	0.959636
Root Mean Square Error	0.000053
Mean of Response	0.001737
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	1.55526e-6	2.2218e-7	79.1172	<.0001
Error	16	4.49317e-8	2.8082e-9		
C. Total	23	1.60019e-6			

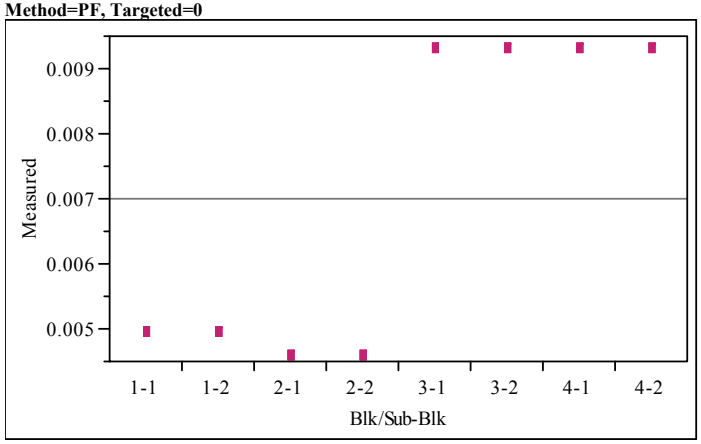
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.001673	0.00003	0.00161	0.00174
1-2	3	0.001689	0.00003	0.00162	0.00175
2-1	3	0.001439	0.00003	0.00137	0.00150
2-2	3	0.001380	0.00003	0.00132	0.00144
3-1	3	0.001790	0.00003	0.00173	0.00186
3-2	3	0.001689	0.00003	0.00162	0.00175
4-1	3	0.002146	0.00003	0.00208	0.00221
4-2	3	0.002088	0.00003	0.00202	0.00215

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=La2O3 (wt%), Prep Method=PF, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	.
Mean of Response	0.006999
Observations (or Sum Wgts)	24

Analysis of Variance

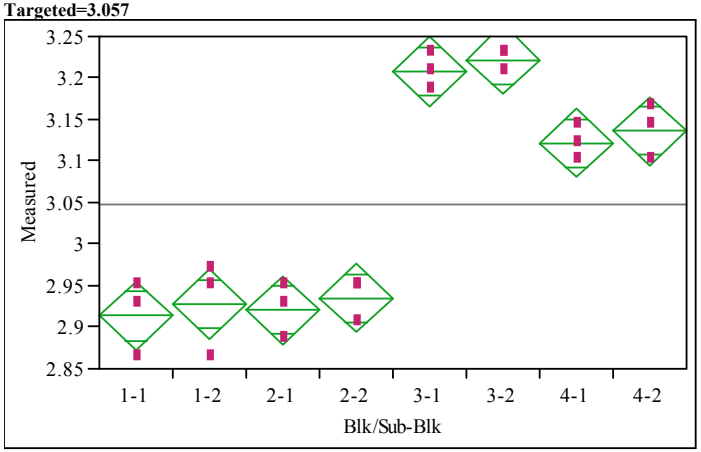
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.0001237	1.767e-5	-1e+16	0.0000
Error	16	-2.711e-20	-1.7e-21		
C. Total	23	0.0001237			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.004920	.	.	.
1-2	3	0.004920	.	.	.
2-1	3	0.004545	.	.	.
2-2	3	0.004545	.	.	.
3-1	3	0.009265	.	.	.
3-2	3	0.009265	.	.	.
4-1	3	0.009265	.	.	.
4-2	3	0.009265	.	.	.

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=Li2O (wt%), Prep Method=AR, Targeted=3.057**



Oneway **Anova**
Summary of Fit

Rsquare	0.955497
Adj Rsquare	0.936027
Root Mean Square Error	0.033755
Mean of Response	3.048148
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.39142393	0.055918	49.0751	<.0001
Error	16	0.01823092	0.001139		
C. Total	23	0.40965484			

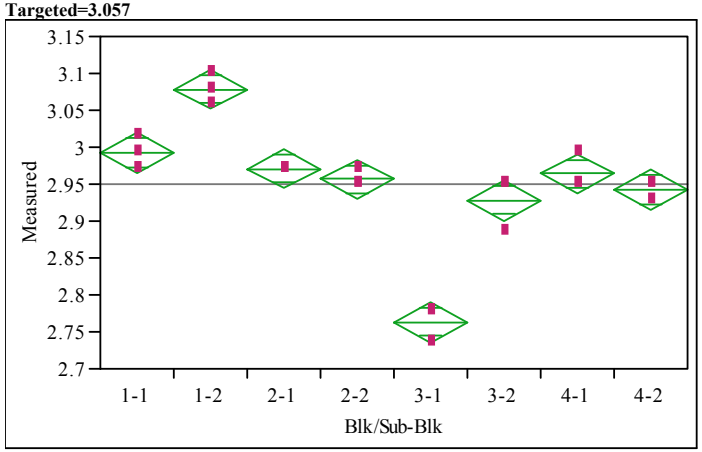
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	2.91359	0.01949	2.8723	2.9549
1-2	3	2.92794	0.01949	2.8866	2.9693
2-1	3	2.92077	0.01949	2.8795	2.9621
2-2	3	2.93512	0.01949	2.8938	2.9764
3-1	3	3.20782	0.01949	3.1665	3.2491
3-2	3	3.22217	0.01949	3.1809	3.2635
4-1	3	3.12171	0.01949	3.0804	3.1630
4-2	3	3.13606	0.01949	3.0947	3.1774

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=Li2O (wt%), Prep Method=PF, Targeted=3.057**



Oneway **Anova**
Summary of Fit

Rsquare	0.954955
Adj Rsquare	0.935248
Root Mean Square Error	0.021973
Mean of Response	2.949473
Observations (or Sum Wgts)	24

Analysis of Variance

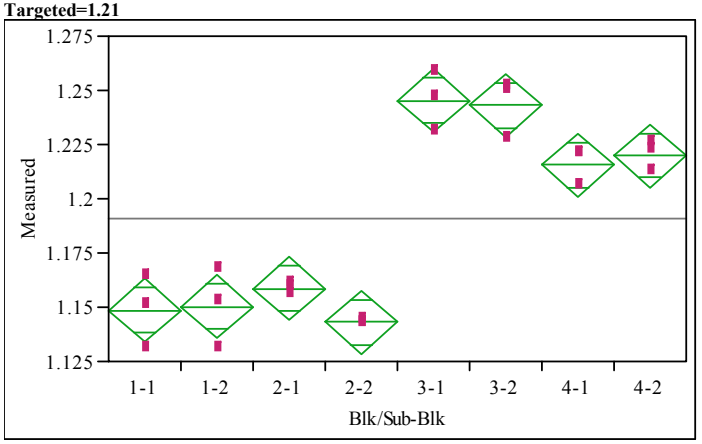
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.16376924	0.023396	48.4571	<.0001
Error	16	0.00772496	0.000483		
C. Total	23	0.17149420			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	2.99253	0.01269	2.9656	3.0194
1-2	3	3.07865	0.01269	3.0518	3.1055
2-1	3	2.97100	0.01269	2.9441	2.9979
2-2	3	2.95665	0.01269	2.9298	2.9835
3-1	3	2.76289	0.01269	2.7360	2.7898
3-2	3	2.92794	0.01269	2.9011	2.9548
4-1	3	2.96383	0.01269	2.9369	2.9907
4-2	3	2.94230	0.01269	2.9154	2.9692

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=MgO (wt%), Prep Method=AR, Targeted=1.21**



Oneway **Anova**
Summary of Fit

Rsquare	0.94826
Adj Rsquare	0.925623
Root Mean Square Error	0.011929
Mean of Response	1.19059
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.04173051	0.005962	41.8908	<.0001
Error	16	0.00227697	0.000142		
C. Total	23	0.04400748			

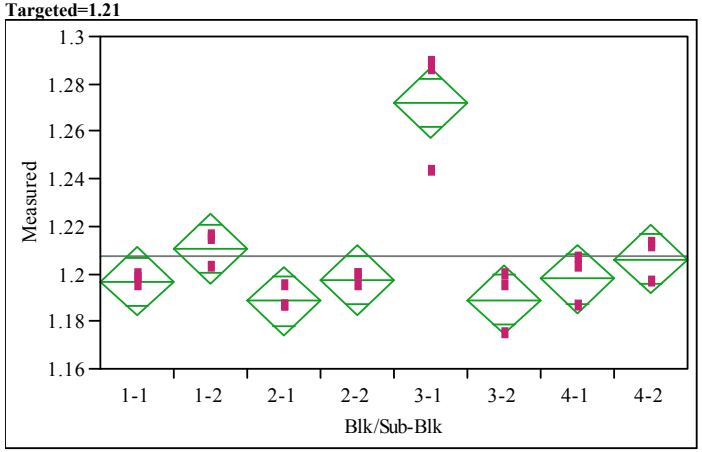
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	1.14865	0.00689	1.1340	1.1632
1-2	3	1.15031	0.00689	1.1357	1.1649
2-1	3	1.15860	0.00689	1.1440	1.1732
2-2	3	1.14312	0.00689	1.1285	1.1577
3-1	3	1.24538	0.00689	1.2308	1.2600
3-2	3	1.24317	0.00689	1.2286	1.2578
4-1	3	1.21553	0.00689	1.2009	1.2301
4-2	3	1.21996	0.00689	1.2054	1.2346

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=MgO (wt%), Prep Method=PF, Targeted=1.21**



Oneway **Anova**
Summary of Fit

Rsquare	0.872888
Adj Rsquare	0.817277
Root Mean Square Error	0.011891
Mean of Response	1.207242
Observations (or Sum Wgts)	24

Analysis of Variance

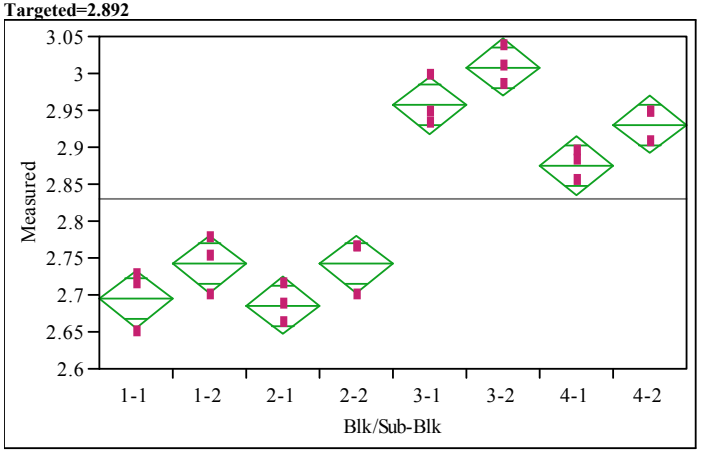
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.01553543	0.002219	15.6962	<.0001
Error	16	0.00226230	0.000141		
C. Total	23	0.01779773			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	1.19674	0.00687	1.1822	1.2113
1-2	3	1.21056	0.00687	1.1960	1.2251
2-1	3	1.18845	0.00687	1.1739	1.2030
2-2	3	1.19729	0.00687	1.1827	1.2118
3-1	3	1.27192	0.00687	1.2574	1.2865
3-2	3	1.18900	0.00687	1.1744	1.2036
4-1	3	1.19785	0.00687	1.1833	1.2124
4-2	3	1.20614	0.00687	1.1916	1.2207

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=MnO (wt%), Prep Method=AR, Targeted=2.892**



Oneway **Anova**
Summary of Fit

Rsquare	0.955384
Adj Rsquare	0.935864
Root Mean Square Error	0.031737
Mean of Response	2.829342
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.34510292	0.049300	48.9448	<.0001
Error	16	0.01611624	0.001007		
C. Total	23	0.36121917			

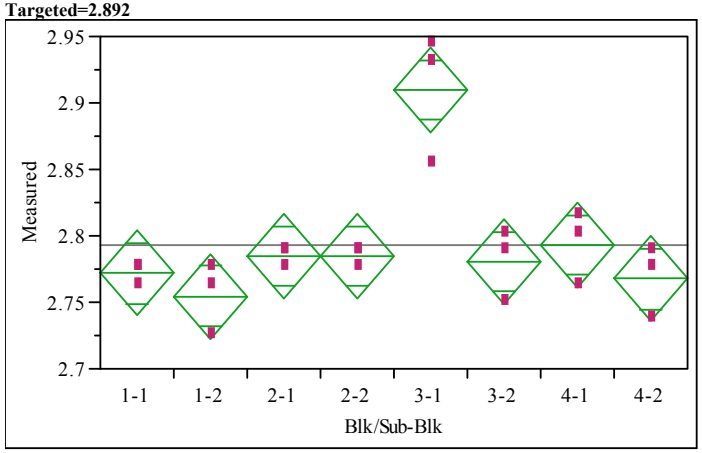
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	2.69430	0.01832	2.6555	2.7331
1-2	3	2.74165	0.01832	2.7028	2.7805
2-1	3	2.68570	0.01832	2.6469	2.7245
2-2	3	2.74165	0.01832	2.7028	2.7805
3-1	3	2.95685	0.01832	2.9180	2.9957
3-2	3	3.00850	0.01832	2.9697	3.0473
4-1	3	2.87507	0.01832	2.8362	2.9139
4-2	3	2.93102	0.01832	2.8922	2.9699

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=MnO (wt%), Prep Method=PF, Targeted=2.892**



Oneway **Anova**
Summary of Fit

Rsquare	0.819188
Adj Rsquare	0.740083
Root Mean Square Error	0.026092
Mean of Response	2.793296
Observations (or Sum Wgts)	24

Analysis of Variance

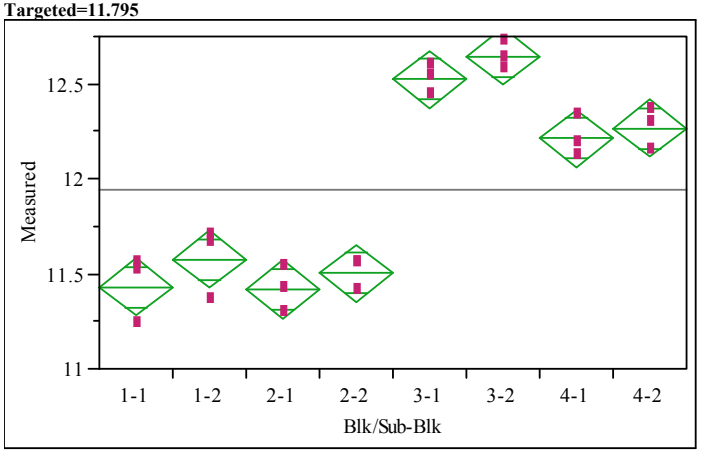
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.04934904	0.007050	10.3557	<.0001
Error	16	0.01089236	0.000681		
C. Total	23	0.06024140			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	2.77178	0.01506	2.7398	2.8037
1-2	3	2.75456	0.01506	2.7226	2.7865
2-1	3	2.78469	0.01506	2.7528	2.8166
2-2	3	2.78469	0.01506	2.7528	2.8166
3-1	3	2.90950	0.01506	2.8776	2.9414
3-2	3	2.78038	0.01506	2.7484	2.8123
4-1	3	2.79330	0.01506	2.7614	2.8252
4-2	3	2.76747	0.01506	2.7355	2.7994

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=Na2O (wt%), Prep Method=AR, Targeted=11.795**



Oneway **Anova**
Summary of Fit

Rsquare	0.958189
Adj Rsquare	0.939897
Root Mean Square Error	0.123791
Mean of Response	11.94665
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	5.6190610	0.802723	52.3826	<.0001
Error	16	0.2451879	0.015324		
C. Total	23	5.8642489			

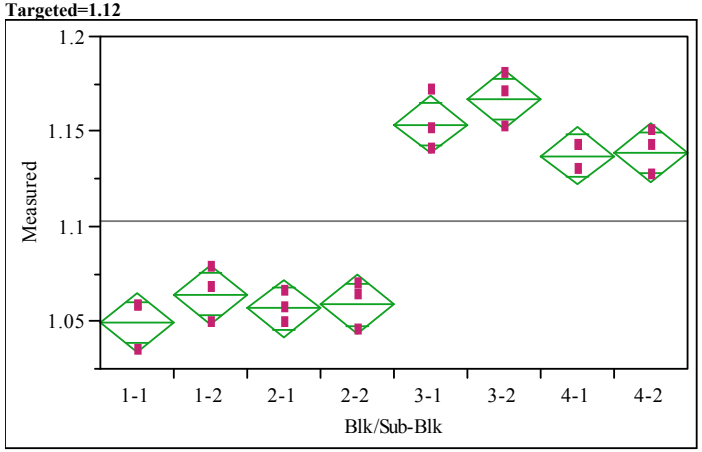
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	11.4310	0.07147	11.280	11.583
1-2	3	11.5748	0.07147	11.423	11.726
2-1	3	11.4176	0.07147	11.266	11.569
2-2	3	11.5029	0.07147	11.351	11.654
3-1	3	12.5229	0.07147	12.371	12.674
3-2	3	12.6442	0.07147	12.493	12.796
4-1	3	12.2129	0.07147	12.061	12.364
4-2	3	12.2668	0.07147	12.115	12.418

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=NiO (wt%), Prep Method=AR, Targeted=1.12**



Oneway **Anova**
Summary of Fit

Rsquare	0.954087
Adj Rsquare	0.934001
Root Mean Square Error	0.012602
Mean of Response	1.103204
Observations (or Sum Wgts)	24

Analysis of Variance

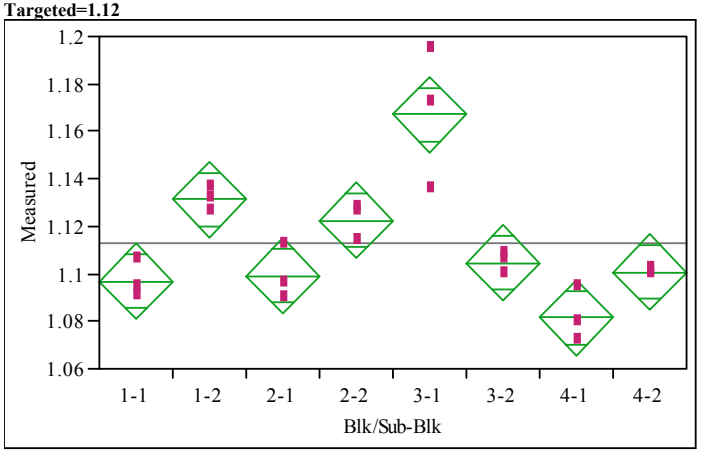
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.05280658	0.007544	47.4984	<.0001
Error	16	0.00254115	0.000159		
C. Total	23	0.05534773			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	1.04939	0.00728	1.0340	1.0648
1-2	3	1.06423	0.00728	1.0488	1.0797
2-1	3	1.05660	0.00728	1.0412	1.0720
2-2	3	1.05872	0.00728	1.0433	1.0741
3-1	3	1.15373	0.00728	1.1383	1.1692
3-2	3	1.16688	0.00728	1.1515	1.1823
4-1	3	1.13719	0.00728	1.1218	1.1526
4-2	3	1.13889	0.00728	1.1235	1.1543

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=NiO (wt%), Prep Method=PF, Targeted=1.12**



Oneway **Anova**
Summary of Fit

Rsquare	0.84751
Adj Rsquare	0.780796
Root Mean Square Error	0.013029
Mean of Response	1.11296
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.01509518	0.002156	12.7036	<.0001
Error	16	0.00271603	0.000170		
C. Total	23	0.01781121			

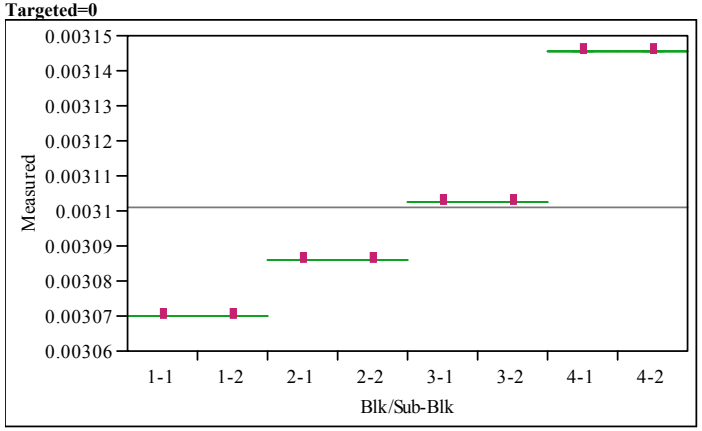
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	1.09690	0.00752	1.0809	1.1128
1-2	3	1.13125	0.00752	1.1153	1.1472
2-1	3	1.09902	0.00752	1.0831	1.1150
2-2	3	1.12235	0.00752	1.1064	1.1383
3-1	3	1.16731	0.00752	1.1514	1.1833
3-2	3	1.10453	0.00752	1.0886	1.1205
4-1	3	1.08163	0.00752	1.0657	1.0976
4-2	3	1.10071	0.00752	1.0848	1.1167

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=PbO (wt%), Prep Method=AR, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	3.8e-12
Mean of Response	0.003101
Observations (or Sum Wgts)	24

Analysis of Variance

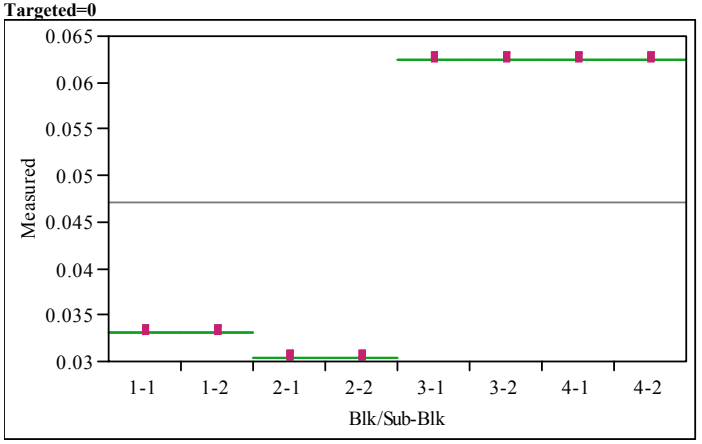
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	1.89284e-8	2.7041e-9	1.87e+14	<.0001
Error	16	2.3161e-22	1.448e-23		
C. Total	23	1.89284e-8			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.003070	2.197e-12	0.00307	0.00307
1-2	3	0.003070	2.197e-12	0.00307	0.00307
2-1	3	0.003086	2.197e-12	0.00309	0.00309
2-2	3	0.003086	2.197e-12	0.00309	0.00309
3-1	3	0.003102	2.197e-12	0.00310	0.00310
3-2	3	0.003102	2.197e-12	0.00310	0.00310
4-1	3	0.003145	2.197e-12	0.00315	0.00315
4-2	3	0.003145	2.197e-12	0.00315	0.00315

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=PbO (wt%), Prep Method=PF, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	0
Mean of Response	0.047114
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00568416	0.000812	.	.
Error	16	0.00000000	0.000000		
C. Total	23	0.00568416			

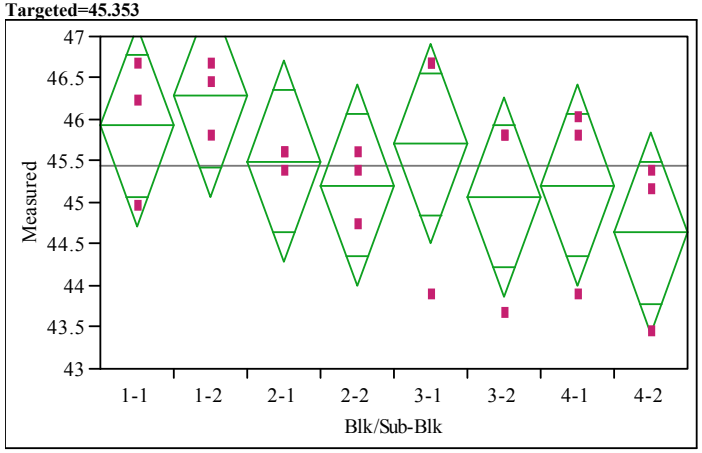
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.033016	0	0.03302	0.03302
1-2	3	0.033016	0	0.03302	0.03302
2-1	3	0.030485	0	0.03048	0.03048
2-2	3	0.030485	0	0.03048	0.03048
3-1	3	0.062478	0	0.06248	0.06248
3-2	3	0.062478	0	0.06248	0.06248
4-1	3	0.062478	0	0.06248	0.06248
4-2	3	0.062478	0	0.06248	0.06248

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=SiO2 (wt%), Prep Method=PF, Targeted=45.353**



Oneway **Anova**
Summary of Fit

Rsquare	0.267263
Adj Rsquare	-0.05331
Root Mean Square Error	0.9881
Mean of Response	45.4423
Observations (or Sum Wgts)	24

Analysis of Variance

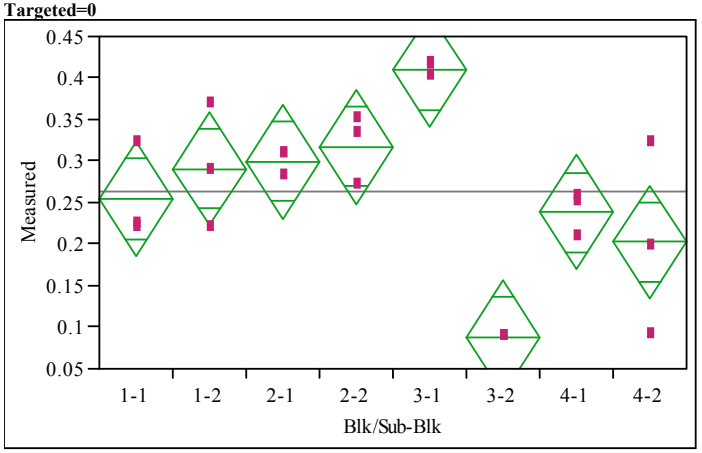
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	5.697873	0.813982	0.8337	0.5751
Error	16	15.621477	0.976342		
C. Total	23	21.319349			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	45.9236	0.57048	44.714	47.133
1-2	3	46.2802	0.57048	45.071	47.490
2-1	3	45.4958	0.57048	44.286	46.705
2-2	3	45.2105	0.57048	44.001	46.420
3-1	3	45.7097	0.57048	44.500	46.919
3-2	3	45.0679	0.57048	43.859	46.277
4-1	3	45.2105	0.57048	44.001	46.420
4-2	3	44.6401	0.57048	43.431	45.849

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=SO4 (wt%), Prep Method=AR, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	0.786122
Adj Rsquare	0.69255
Root Mean Square Error	0.056074
Mean of Response	0.262728
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.18491248	0.026416	8.4013	0.0002
Error	16	0.05030860	0.003144		
C. Total	23	0.23522108			

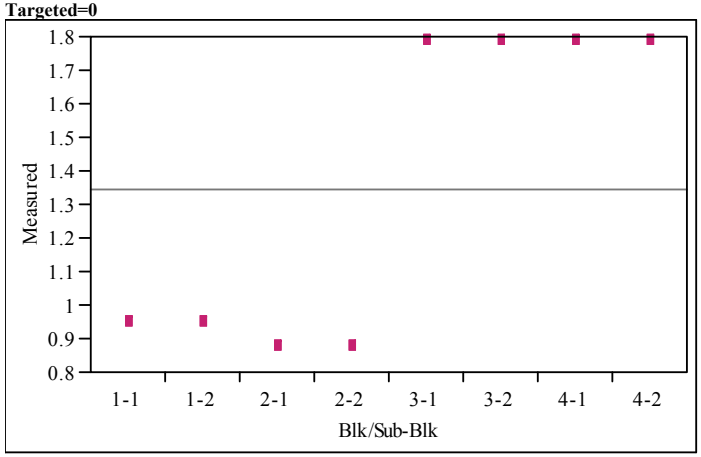
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.254152	0.03237	0.18552	0.32278
1-2	3	0.291002	0.03237	0.22237	0.35963
2-1	3	0.299690	0.03237	0.23106	0.36832
2-2	3	0.317466	0.03237	0.24884	0.38610
3-1	3	0.410438	0.03237	0.34181	0.47907
3-2	3	0.088529	0.03237	0.01990	0.15716
4-1	3	0.238074	0.03237	0.16944	0.30670
4-2	3	0.202473	0.03237	0.13384	0.27110

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=SO4 (wt%), Prep Method=PF, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	.
Mean of Response	1.34441
Observations (or Sum Wgts)	24

Analysis of Variance

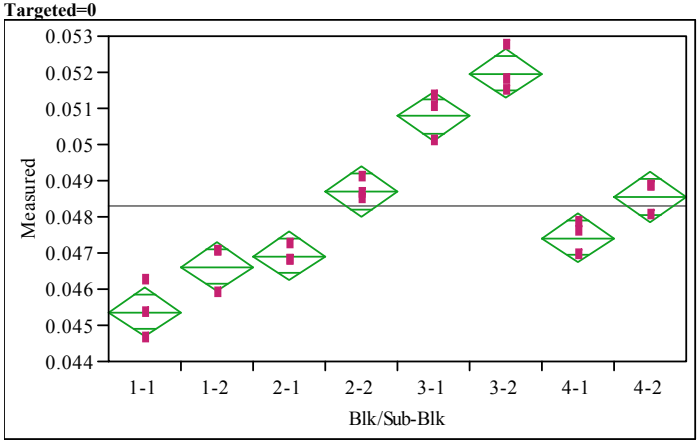
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	4.622928	0.66042	-1.2e+16	0.0000
Error	16	-8.882e-16	-5.6e-17		
C. Total	23	4.622928			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.94221	.	.	.
1-2	3	0.94221	.	.	.
2-1	3	0.87031	.	.	.
2-2	3	0.87031	.	.	.
3-1	3	1.78256	.	.	.
3-2	3	1.78256	.	.	.
4-1	3	1.78256	.	.	.
4-2	3	1.78256	.	.	.

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=ThO2 (wt%), Prep Method=AR, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	0.953197
Adj Rsquare	0.932721
Root Mean Square Error	0.000559
Mean of Response	0.04829
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00010197	0.000015	46.5515	<.0001
Error	16	0.00000501	3.129e-7		
C. Total	23	0.00010697			

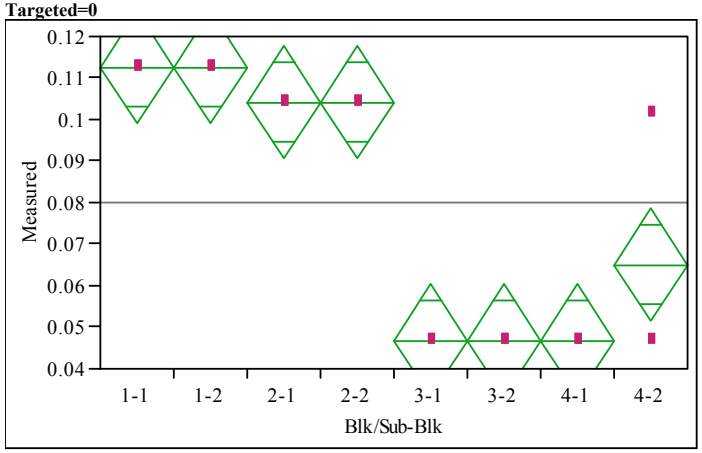
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.045364	0.00032	0.04468	0.04605
1-2	3	0.046616	0.00032	0.04593	0.04730
2-1	3	0.046919	0.00032	0.04623	0.04760
2-2	3	0.048702	0.00032	0.04802	0.04939
3-1	3	0.050788	0.00032	0.05010	0.05147
3-2	3	0.051964	0.00032	0.05128	0.05265
4-1	3	0.047413	0.00032	0.04673	0.04810
4-2	3	0.048550	0.00032	0.04787	0.04924

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=ThO2 (wt%), Prep Method=PF, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	0.911598
Adj Rsquare	0.872922
Root Mean Square Error	0.011137
Mean of Response	0.079878
Observations (or Sum Wgts)	24

Analysis of Variance

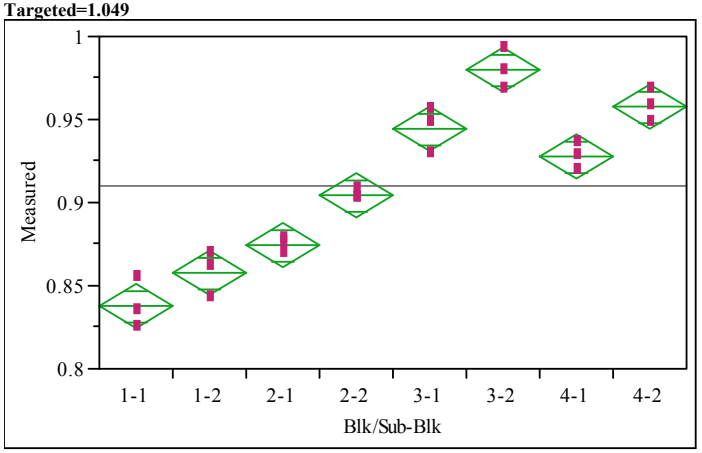
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.02046602	0.002924	23.5701	<.0001
Error	16	0.00198470	0.000124		
C. Total	23	0.02245071			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.112652	0.00643	0.09902	0.12628
1-2	3	0.112652	0.00643	0.09902	0.12628
2-1	3	0.104118	0.00643	0.09049	0.11775
2-2	3	0.104118	0.00643	0.09049	0.11775
3-1	3	0.046825	0.00643	0.03319	0.06046
3-2	3	0.046825	0.00643	0.03319	0.06046
4-1	3	0.046825	0.00643	0.03319	0.06046
4-2	3	0.065012	0.00643	0.05138	0.07864

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=TiO2 (wt%), Prep Method=AR, Targeted=1.049**



Oneway **Anova**
Summary of Fit

Rsquare	0.965545
Adj Rsquare	0.950471
Root Mean Square Error	0.010959
Mean of Response	0.910172
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.05384902	0.007693	64.0530	<.0001
Error	16	0.00192159	0.000120		
C. Total	23	0.05577061			

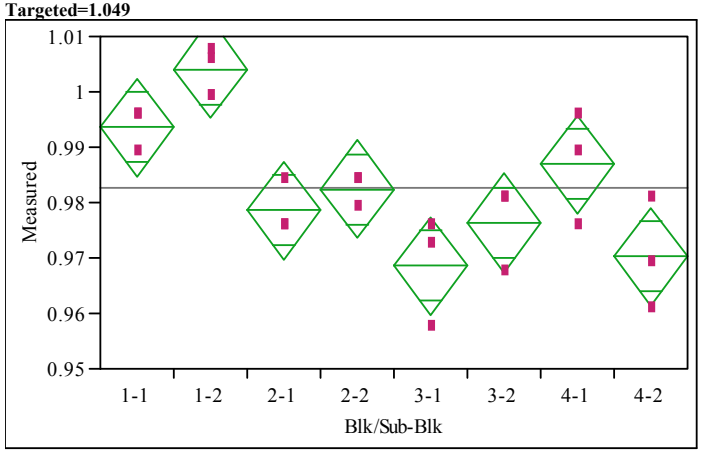
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.837336	0.00633	0.82392	0.85075
1-2	3	0.857352	0.00633	0.84394	0.87077
2-1	3	0.874032	0.00633	0.86062	0.88745
2-2	3	0.904056	0.00633	0.89064	0.91747
3-1	3	0.944088	0.00633	0.93067	0.95750
3-2	3	0.979672	0.00633	0.96626	0.99309
4-1	3	0.927408	0.00633	0.91399	0.94082
4-2	3	0.957432	0.00633	0.94402	0.97085

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=TiO2 (wt%), Prep Method=PF, Targeted=1.049**



Oneway **Anova**
Summary of Fit

Rsquare	0.780462
Adj Rsquare	0.684413
Root Mean Square Error	0.007295
Mean of Response	0.982591
Observations (or Sum Wgts)	24

Analysis of Variance

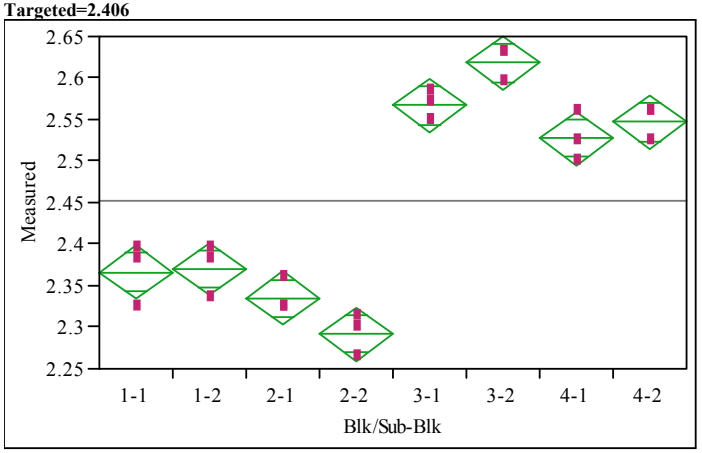
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00302660	0.000432	8.1257	0.0003
Error	16	0.00085136	0.000053		
C. Total	23	0.00387796			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.99357	0.00421	0.98464	1.0025
1-2	3	1.00414	0.00421	0.99521	1.0131
2-1	3	0.97856	0.00421	0.96963	0.9875
2-2	3	0.98245	0.00421	0.97352	0.9914
3-1	3	0.96855	0.00421	0.95962	0.9775
3-2	3	0.97634	0.00421	0.96741	0.9853
4-1	3	0.98690	0.00421	0.97797	0.9958
4-2	3	0.97022	0.00421	0.96129	0.9791

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=U3O8 (wt%), Prep Method=AR, Targeted=2.406**



Oneway **Anova**
Summary of Fit

Rsquare	0.9676
Adj Rsquare	0.953425
Root Mean Square Error	0.026147
Mean of Response	2.452736
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.32667777	0.046668	68.2615	<.0001
Error	16	0.01093870	0.000684		
C. Total	23	0.33761647			

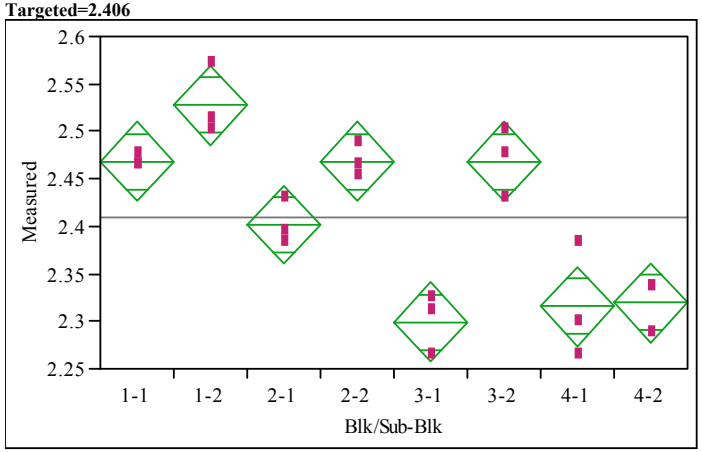
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	2.36626	0.01510	2.3343	2.3983
1-2	3	2.37019	0.01510	2.3382	2.4022
2-1	3	2.33482	0.01510	2.3028	2.3668
2-2	3	2.29158	0.01510	2.2596	2.3236
3-1	3	2.56673	0.01510	2.5347	2.5987
3-2	3	2.61782	0.01510	2.5858	2.6498
4-1	3	2.52742	0.01510	2.4954	2.5594
4-2	3	2.54707	0.01510	2.5151	2.5791

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=U3O8 (wt%), Prep Method=PF, Targeted=2.406**



Oneway **Anova**
Summary of Fit

Rsquare	0.898432
Adj Rsquare	0.853997
Root Mean Square Error	0.033698
Mean of Response	2.408516
Observations (or Sum Wgts)	24

Analysis of Variance

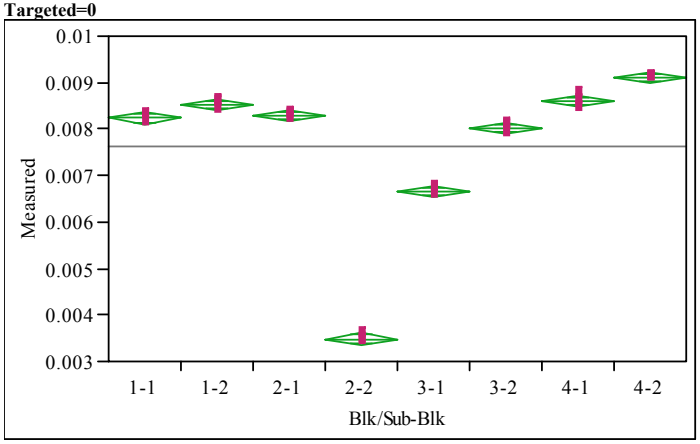
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.16072009	0.022960	20.2187	<.0001
Error	16	0.01816937	0.001136		
C. Total	23	0.17888945			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	2.46846	0.01946	2.4272	2.5097
1-2	3	2.52742	0.01946	2.4862	2.5687
2-1	3	2.40164	0.01946	2.3604	2.4429
2-2	3	2.46846	0.01946	2.4272	2.5097
3-1	3	2.29944	0.01946	2.2582	2.3407
3-2	3	2.46846	0.01946	2.4272	2.5097
4-1	3	2.31516	0.01946	2.2739	2.3564
4-2	3	2.31909	0.01946	2.2778	2.3603

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=ZnO (wt%), Prep Method=AR, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	0.997813
Adj Rsquare	0.996857
Root Mean Square Error	0.000097
Mean of Response	0.007611
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00006873	9.8188e-6	1043.071	<.0001
Error	16	0.00000015	9.4134e-9		
C. Total	23	0.00006888			

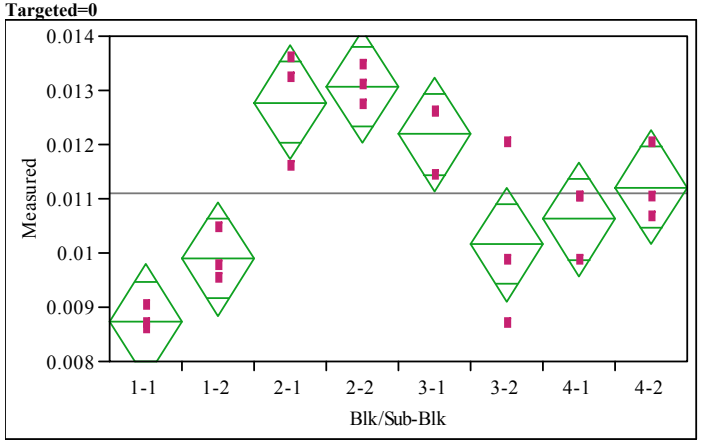
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.008232	5.6e-5	0.00811	0.00835
1-2	3	0.008527	5.6e-5	0.00841	0.00865
2-1	3	0.008282	5.6e-5	0.00816	0.00840
2-2	3	0.003485	5.6e-5	0.00337	0.00360
3-1	3	0.006668	5.6e-5	0.00655	0.00679
3-2	3	0.008008	5.6e-5	0.00789	0.00813
4-1	3	0.008593	5.6e-5	0.00847	0.00871
4-2	3	0.009095	5.6e-5	0.00898	0.00921

Std Error uses a pooled estimate of error variance

Exhibit A5. Measurements by Block and Sub-Block for Samples of the Sb7aref Glass and the Ustd Standard Glass by Oxide by Prep

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=ZnO (wt%), Prep Method=PF, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	0.804212
Adj Rsquare	0.718554
Root Mean Square Error	0.000855
Mean of Response	0.011083
Observations (or Sum Wgts)	24

Analysis of Variance

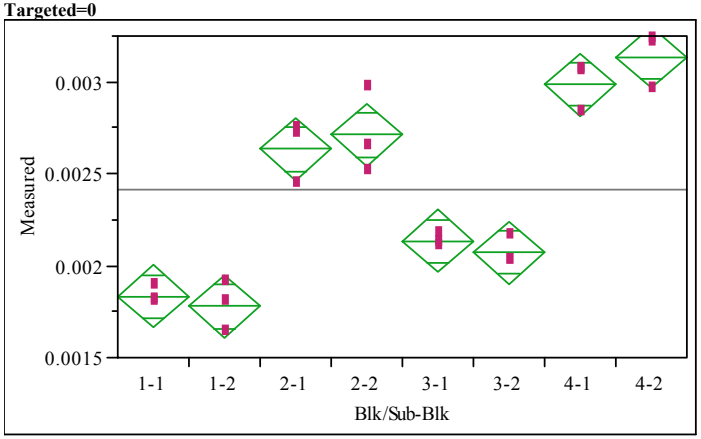
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	0.00004806	6.8659e-6	9.3887	0.0001
Error	16	0.00001170	7.313e-7		
C. Total	23	0.00005976			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.008743	0.00049	0.00770	0.00979
1-2	3	0.009892	0.00049	0.00885	0.01094
2-1	3	0.012780	0.00049	0.01173	0.01383
2-2	3	0.013070	0.00049	0.01202	0.01412
3-1	3	0.012187	0.00049	0.01114	0.01323
3-2	3	0.010162	0.00049	0.00912	0.01121
4-1	3	0.010622	0.00049	0.00958	0.01167
4-2	3	0.011211	0.00049	0.01016	0.01226

Std Error uses a pooled estimate of error variance

Oneway **Analysis of Measured By Blk/Sub-Blk Glass ID=Ustd, Oxide=ZrO2 (wt%), Prep Method=AR, Targeted=0**



Oneway **Anova**
Summary of Fit

Rsquare	0.950154
Adj Rsquare	0.928347
Root Mean Square Error	0.000137
Mean of Response	0.00241
Observations (or Sum Wgts)	24

Analysis of Variance

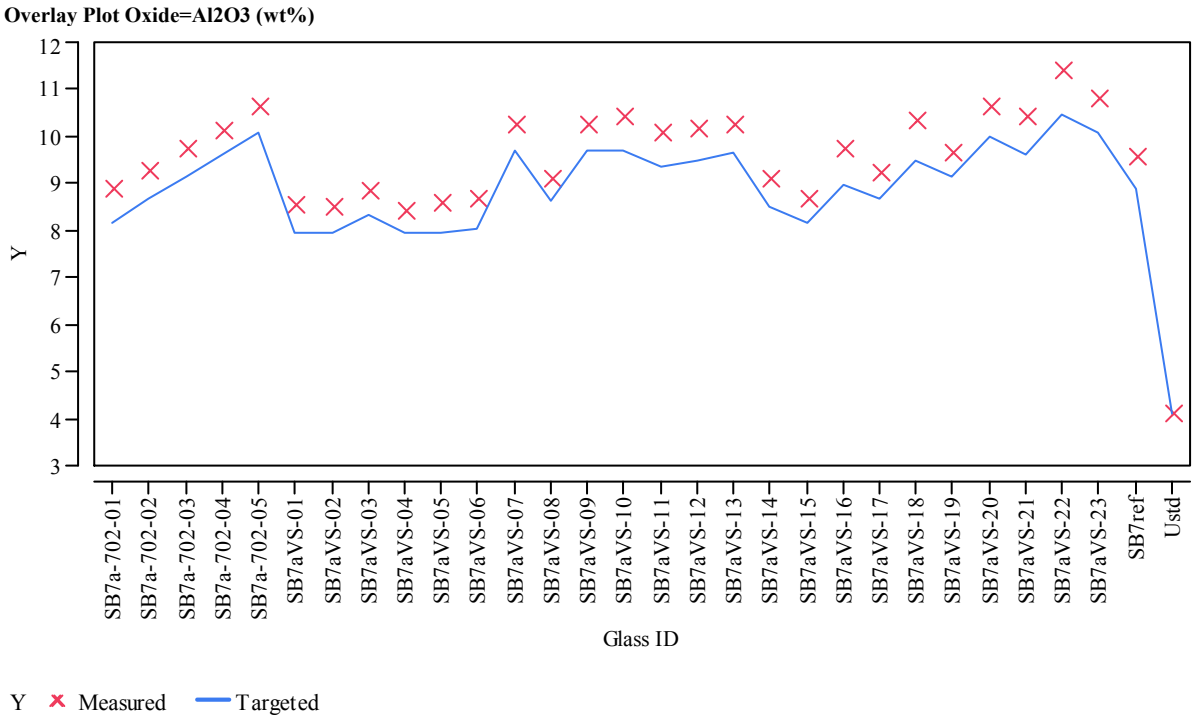
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Blk/Sub-Blk	7	5.75519e-6	8.2217e-7	43.5702	<.0001
Error	16	3.01921e-7	1.887e-8		
C. Total	23	6.05711e-6			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-1	3	0.001833	0.00008	0.00166	0.00200
1-2	3	0.001779	0.00008	0.00161	0.00195
2-1	3	0.002634	0.00008	0.00247	0.00280
2-2	3	0.002711	0.00008	0.00254	0.00288
3-1	3	0.002134	0.00008	0.00197	0.00230
3-2	3	0.002071	0.00008	0.00190	0.00224
4-1	3	0.002985	0.00008	0.00282	0.00315
4-2	3	0.003134	0.00008	0.00297	0.00330

Std Error uses a pooled estimate of error variance

Exhibit A6. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the SB7a VS Glasses



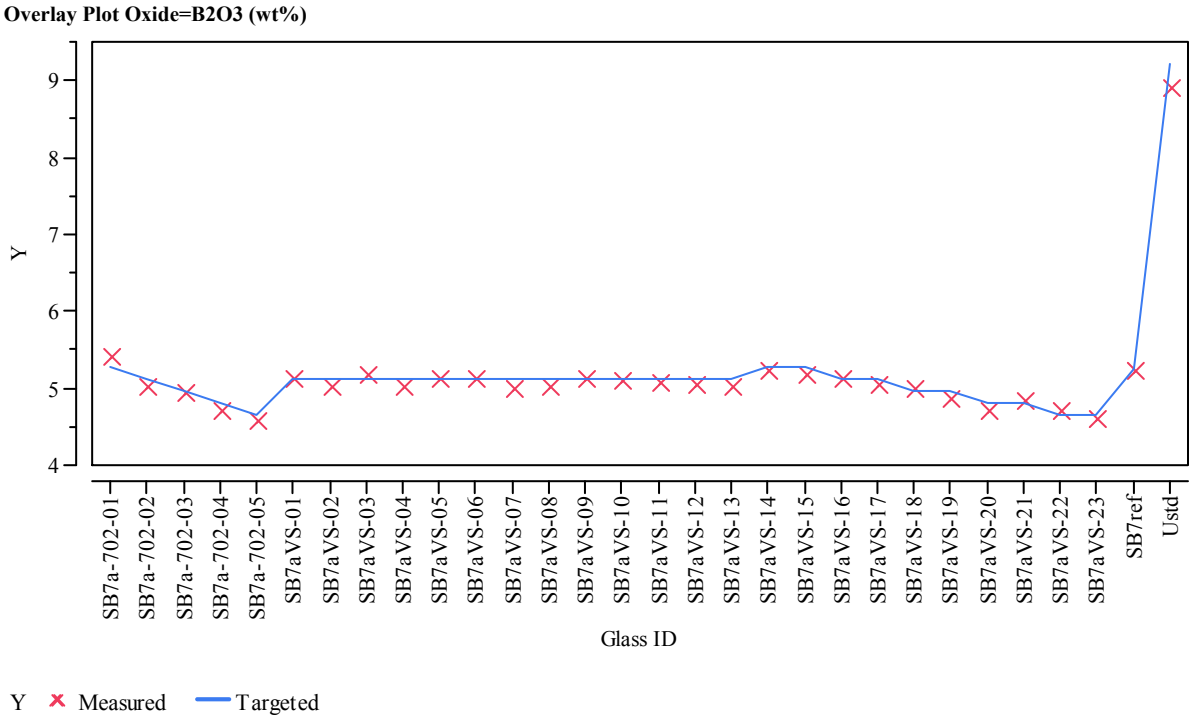
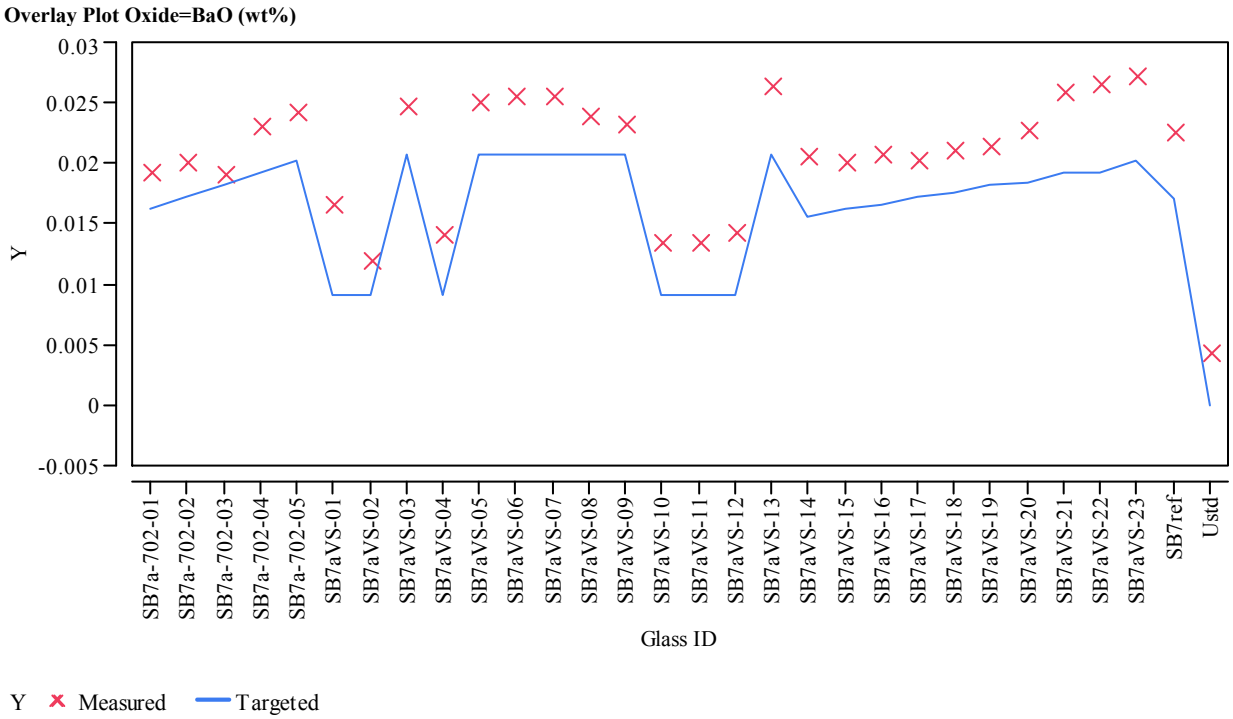


Exhibit A6. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the SB7a VS Glasses



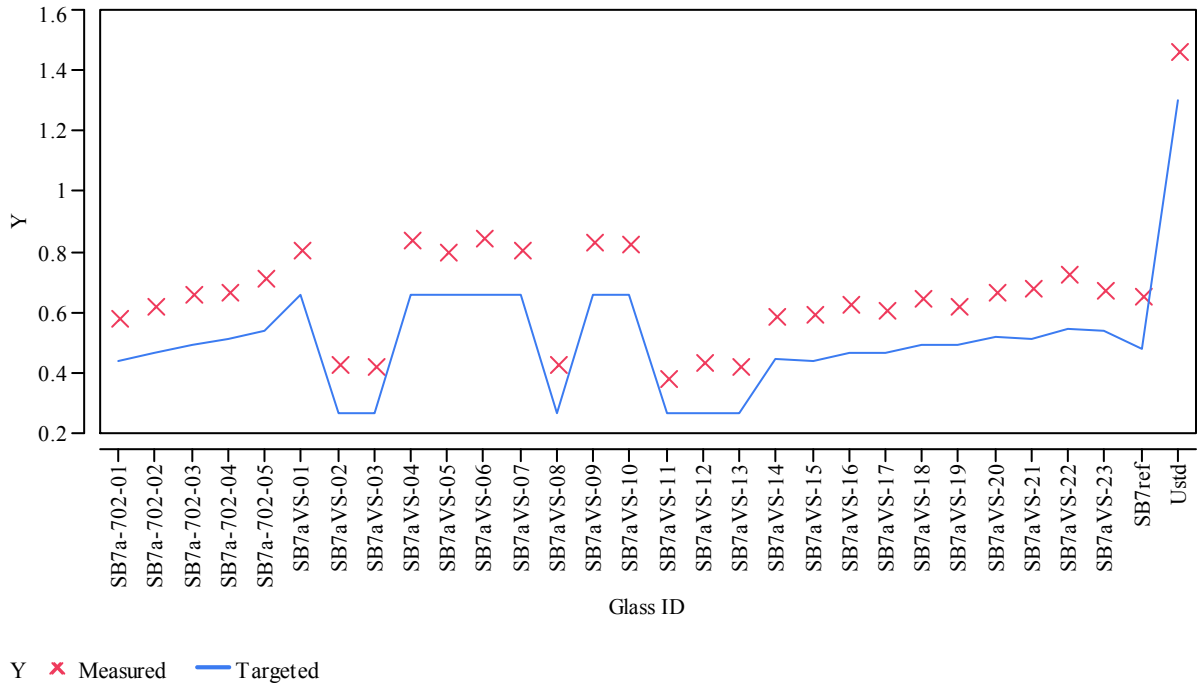
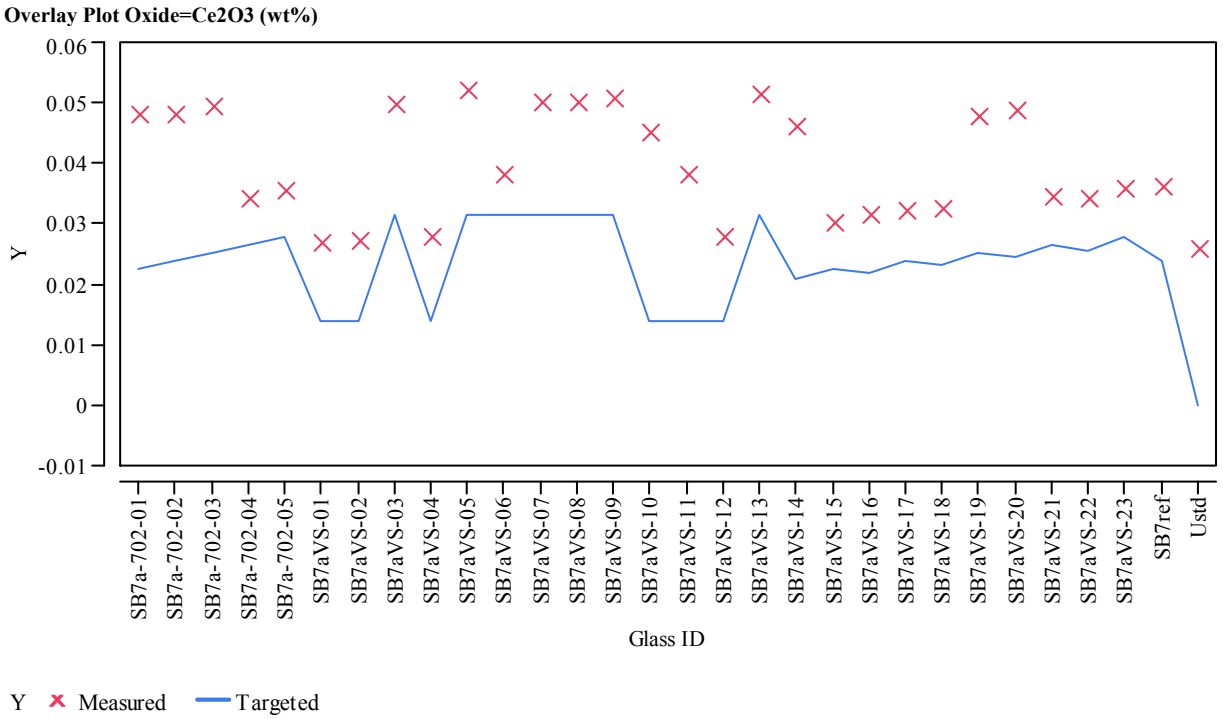


Exhibit A6. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the SB7a VS Glasses



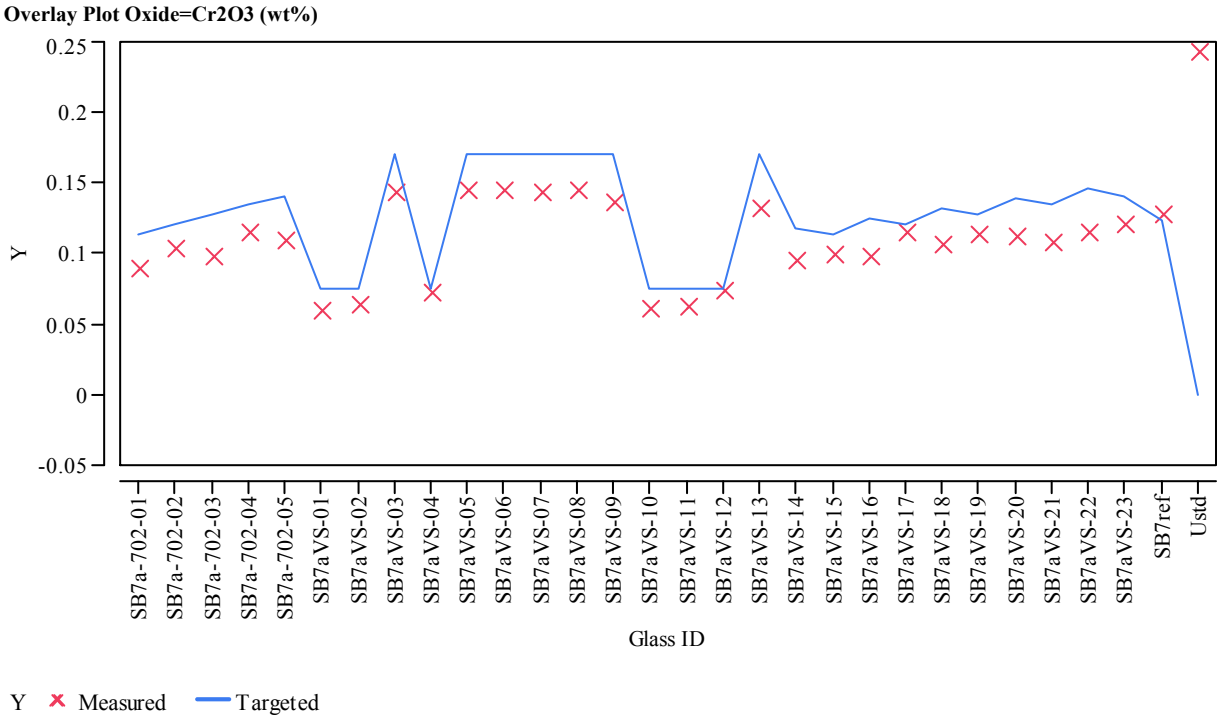
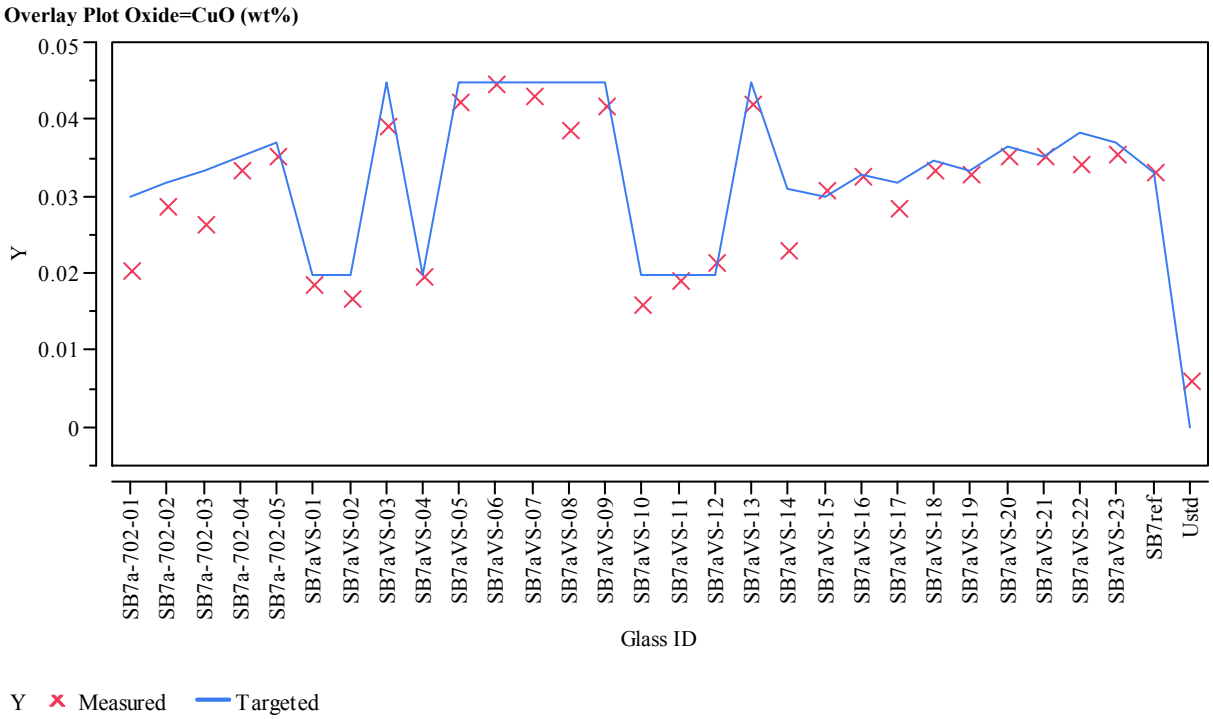


Exhibit A6. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the SB7a VS Glasses



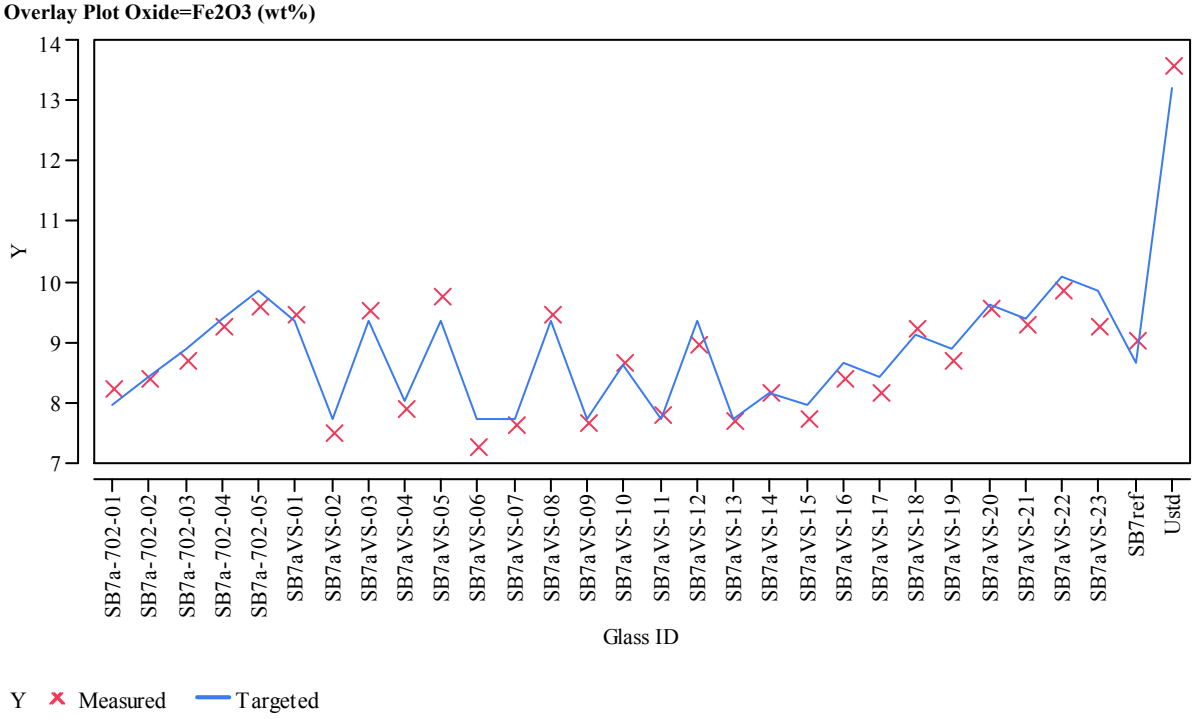
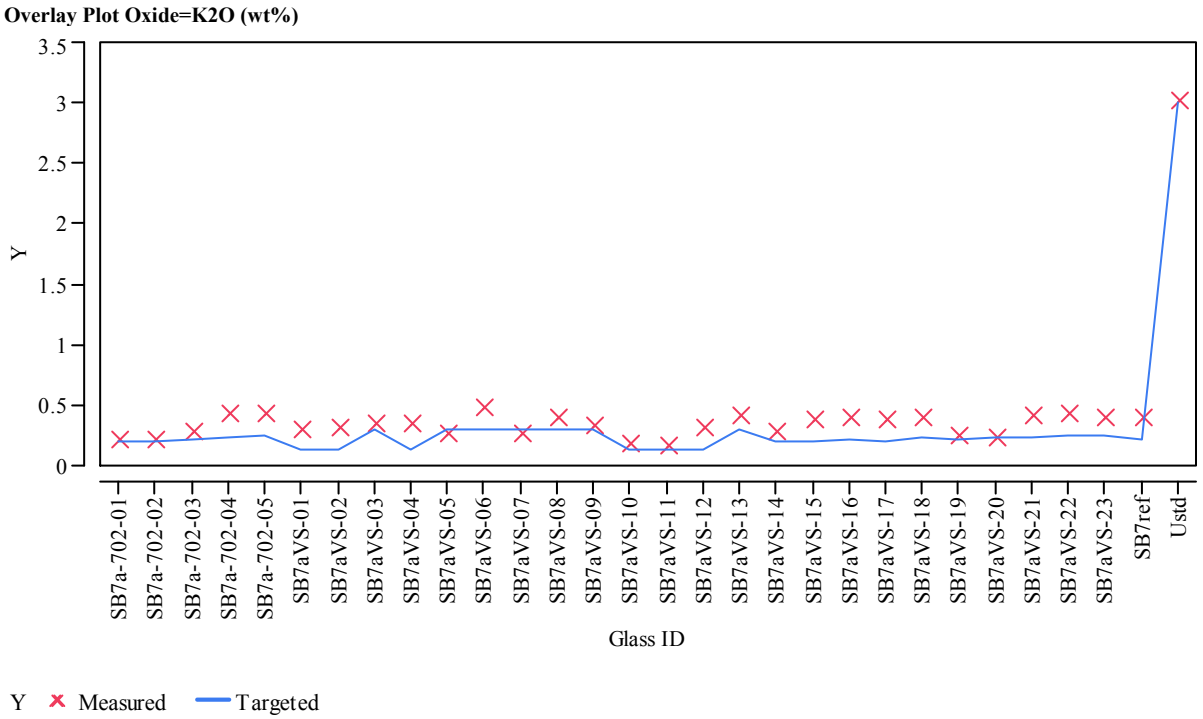


Exhibit A6. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the SB7a VS Glasses



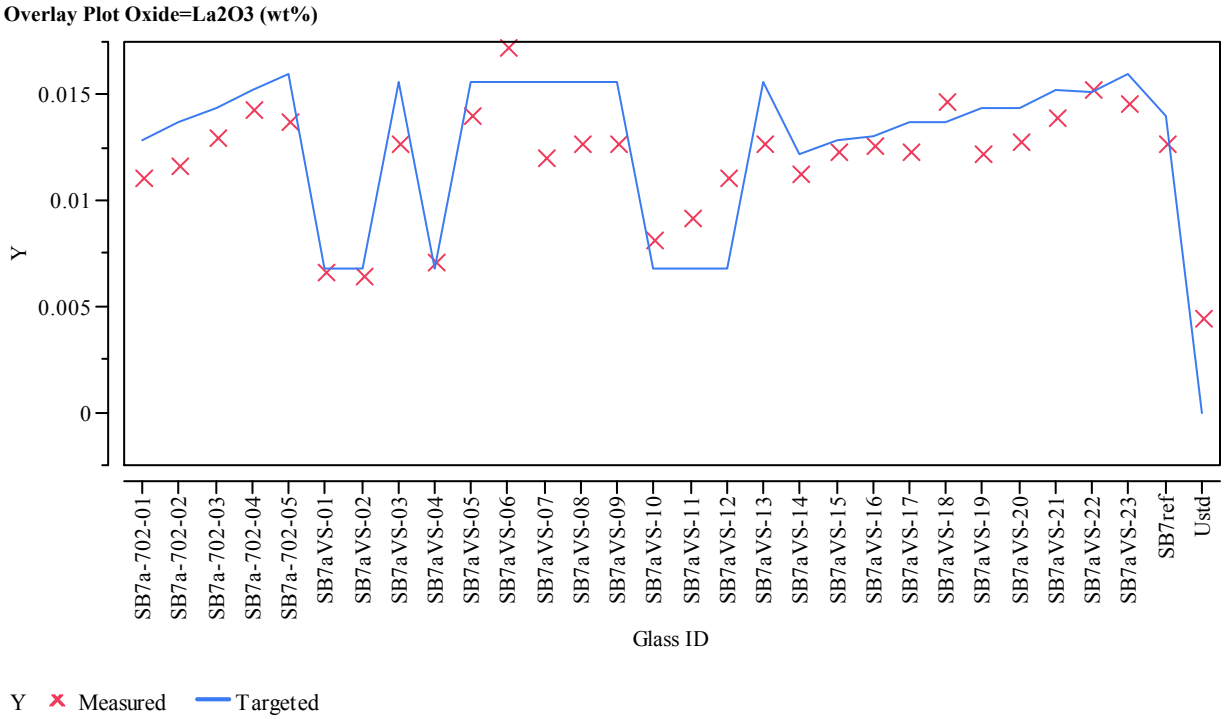
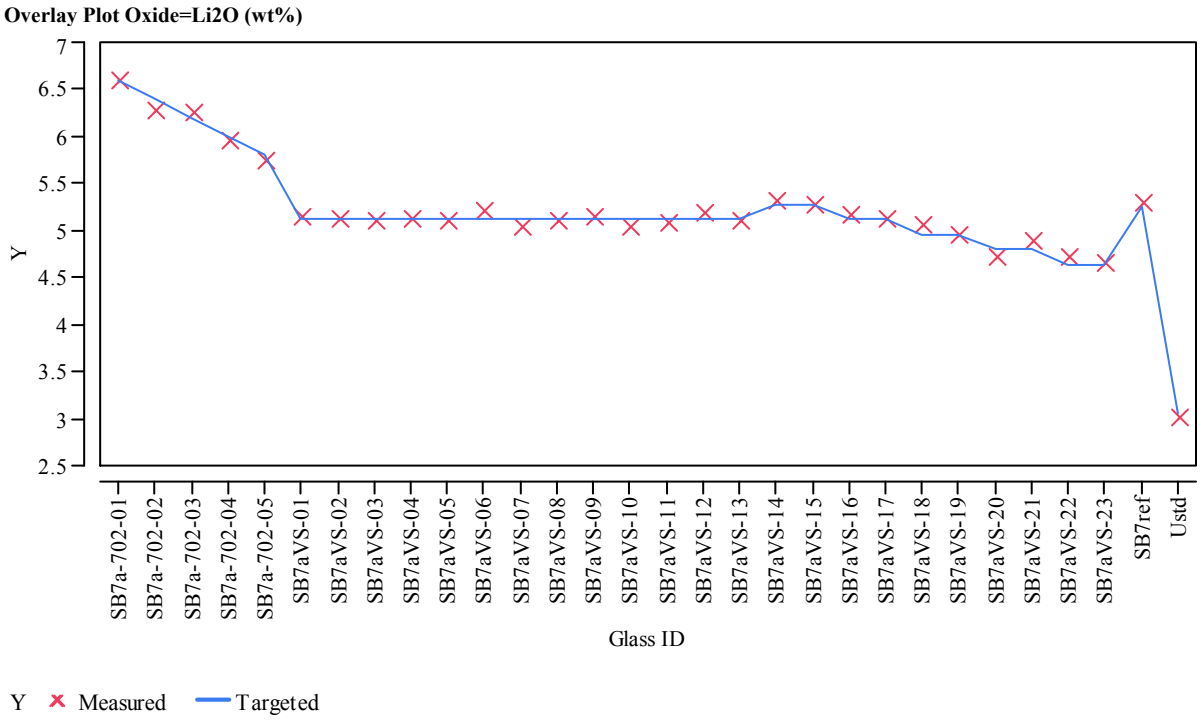


Exhibit A6. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the SB7a VS Glasses



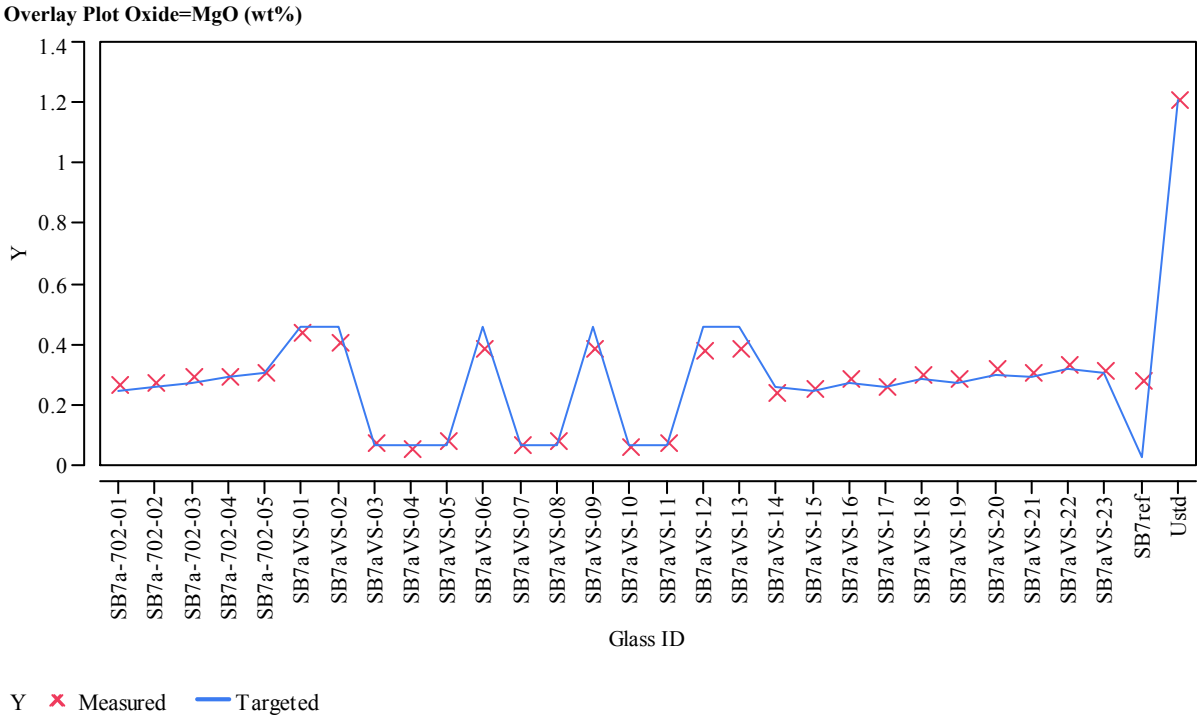
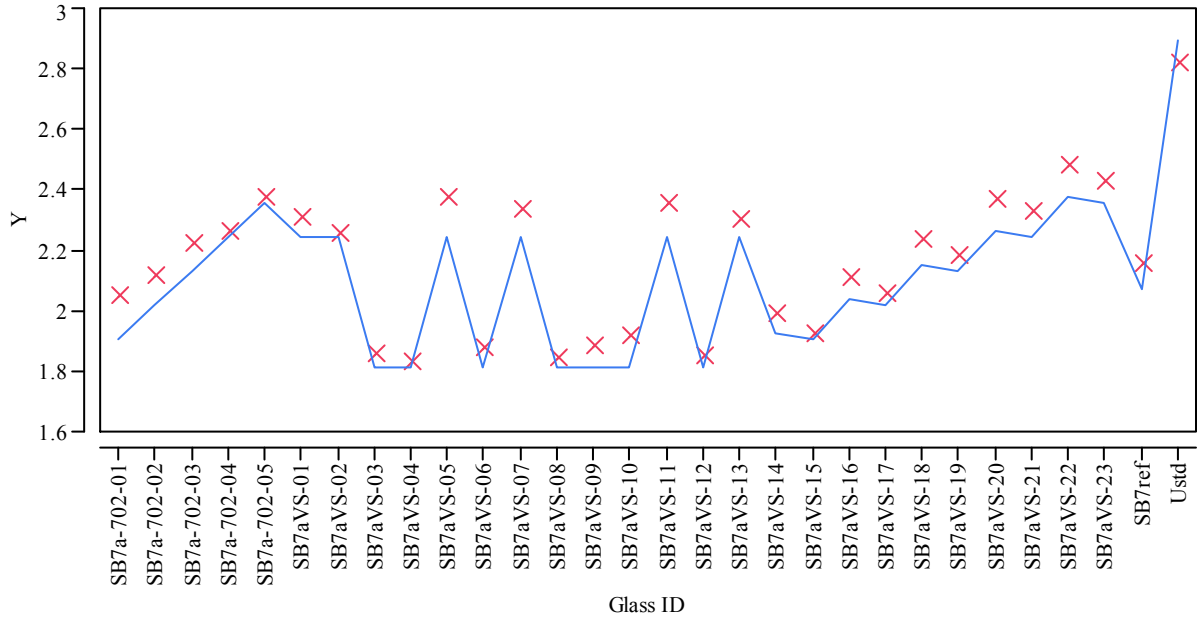


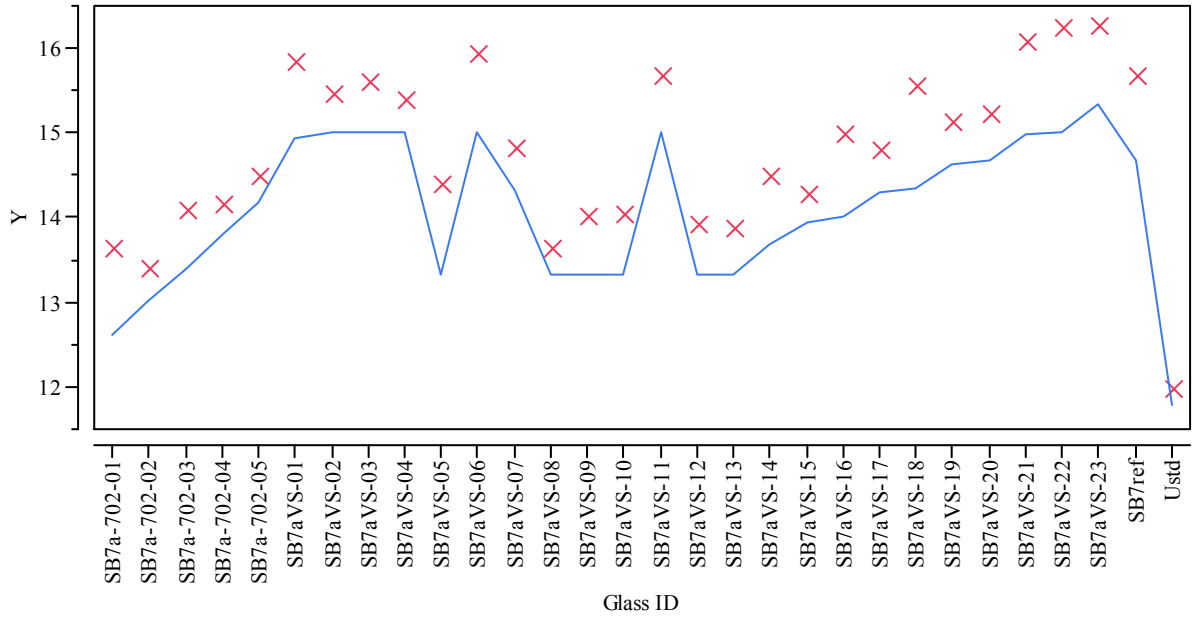
Exhibit A6. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the SB7a VS Glasses

Overlay Plot Oxide=MnO (wt%)



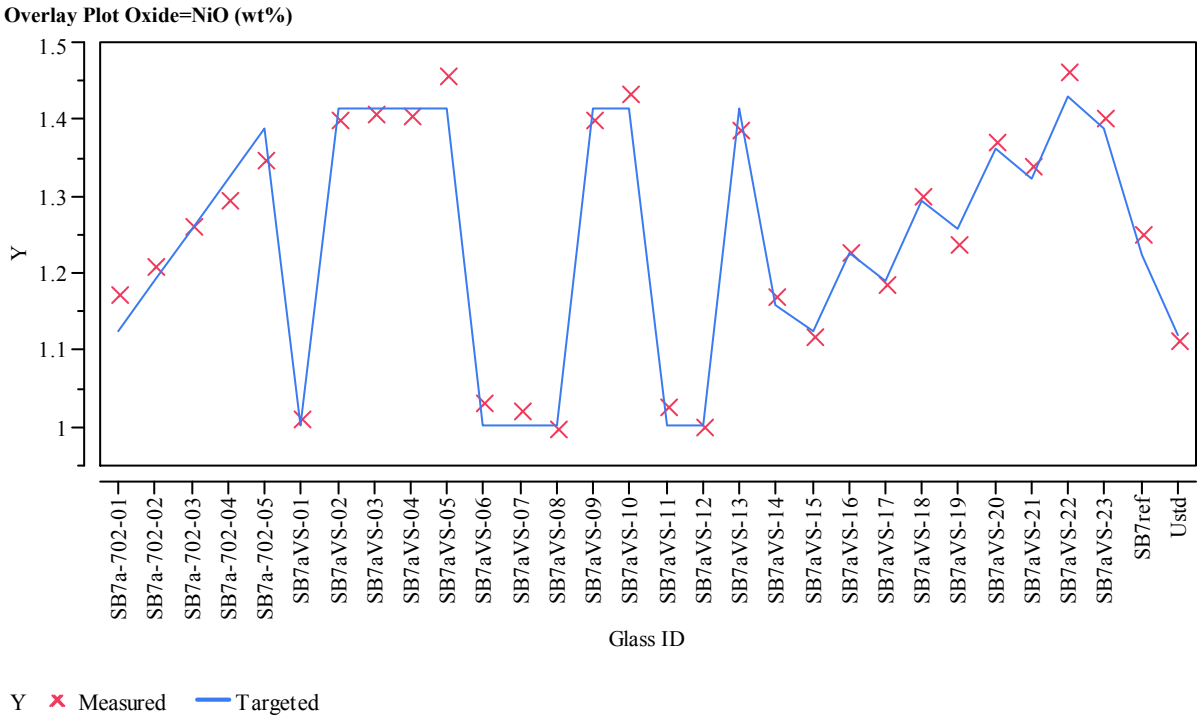
Y × Measured — Targeted

Overlay Plot Oxide=Na2O (wt%)



Y × Measured — Targeted

Exhibit A6. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the SB7a VS Glasses



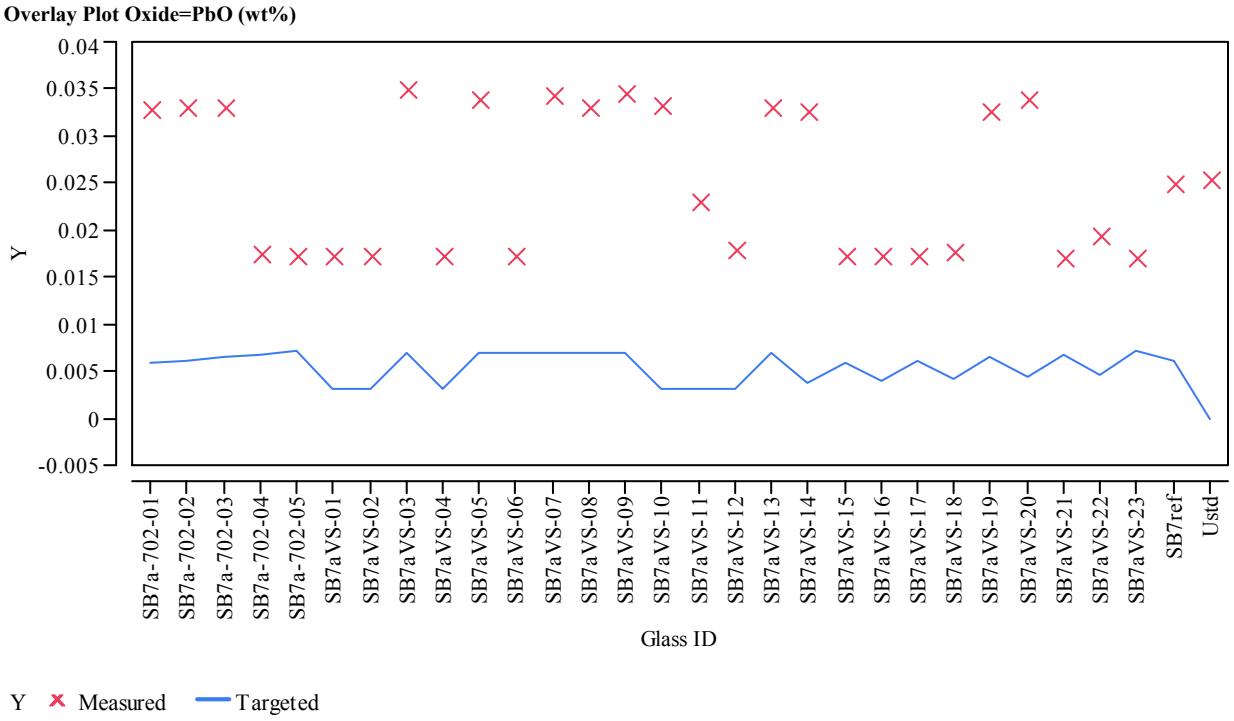
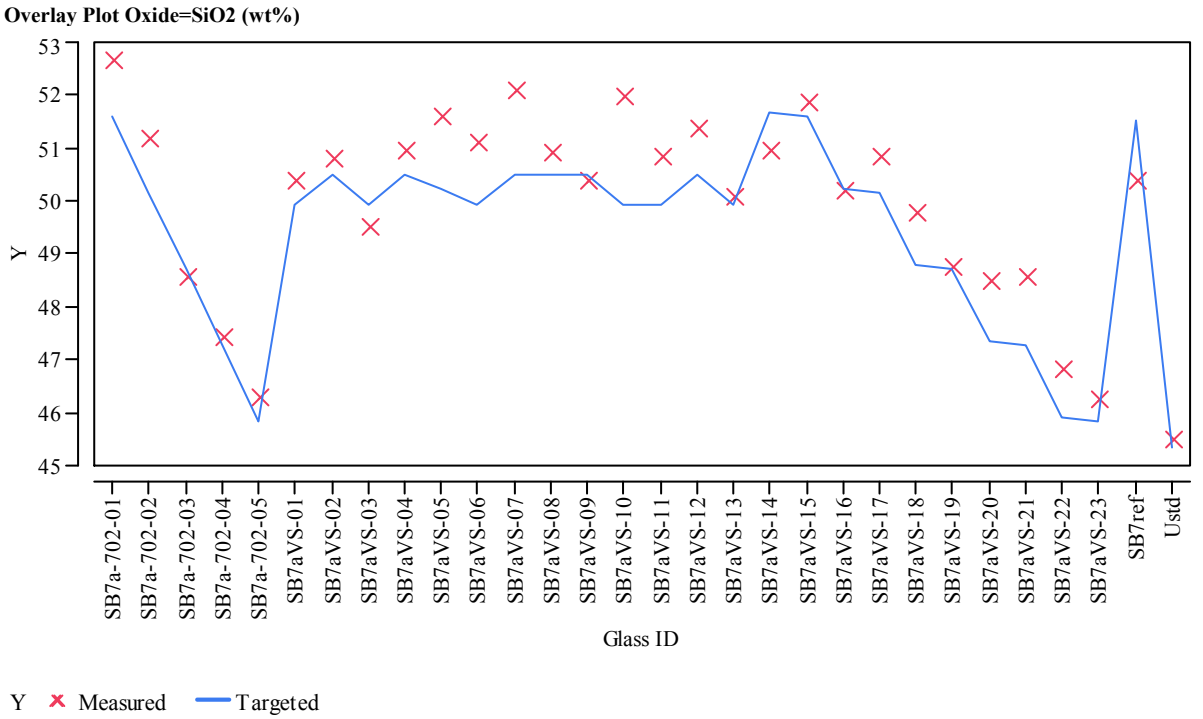


Exhibit A6. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the SB7a VS Glasses



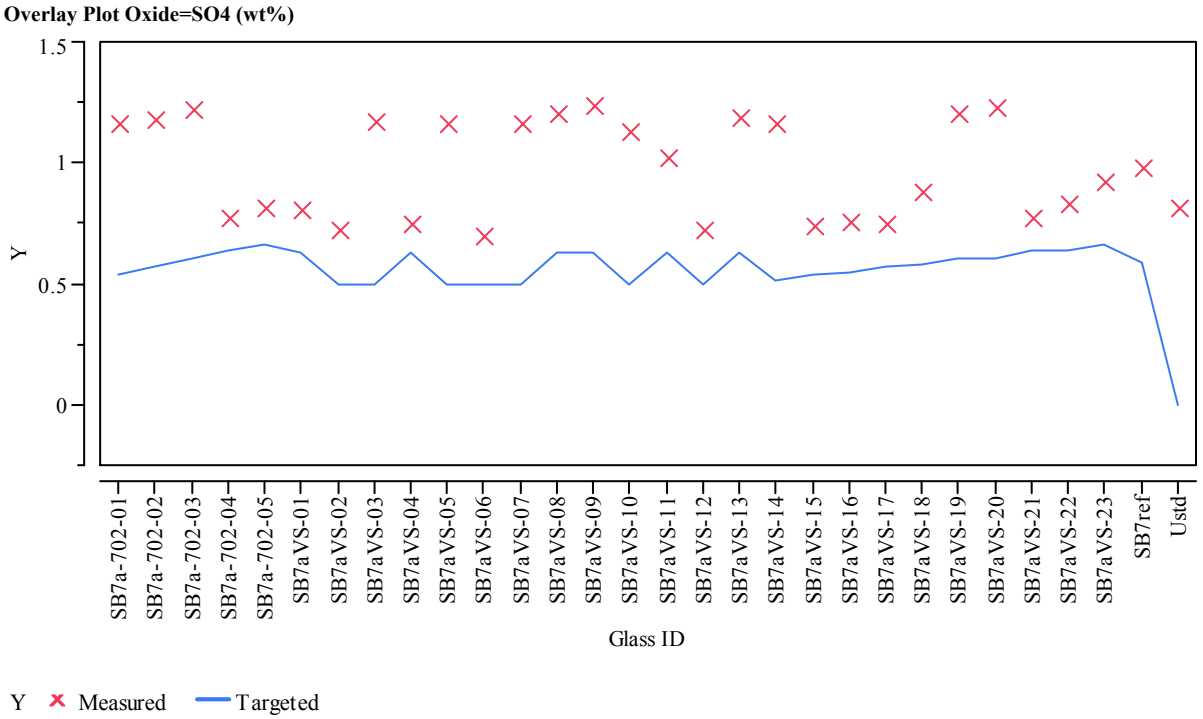
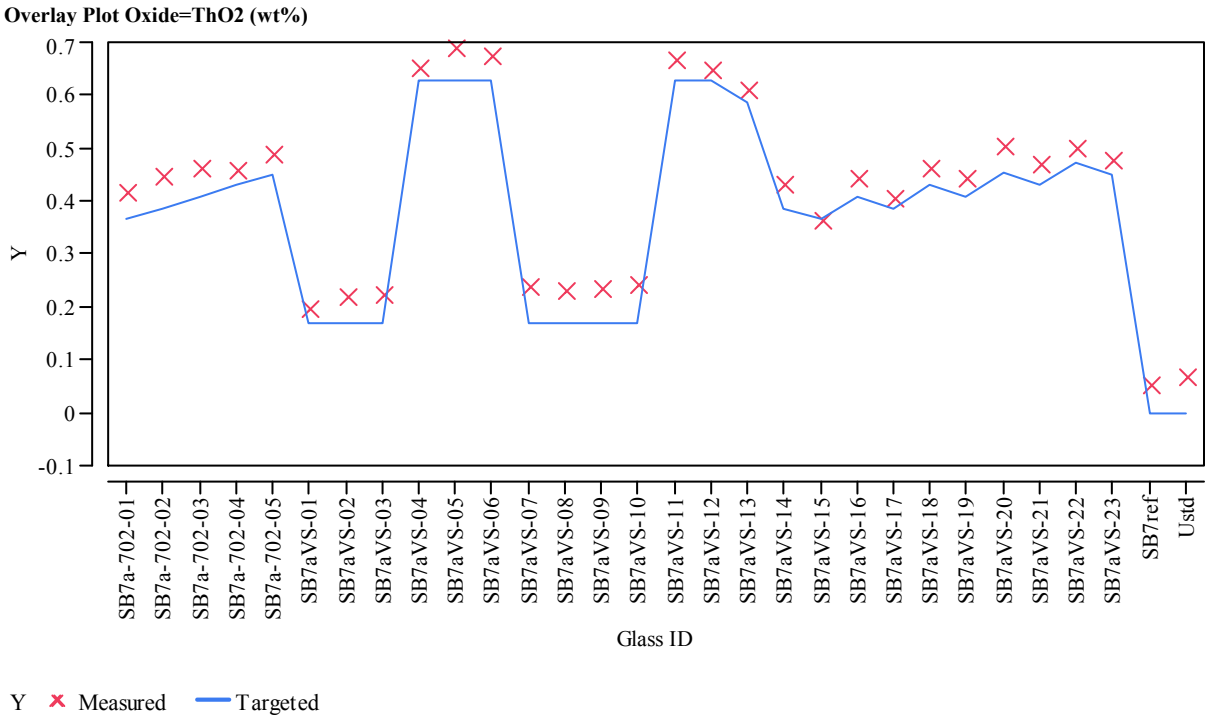


Exhibit A6. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the SB7a VS Glasses



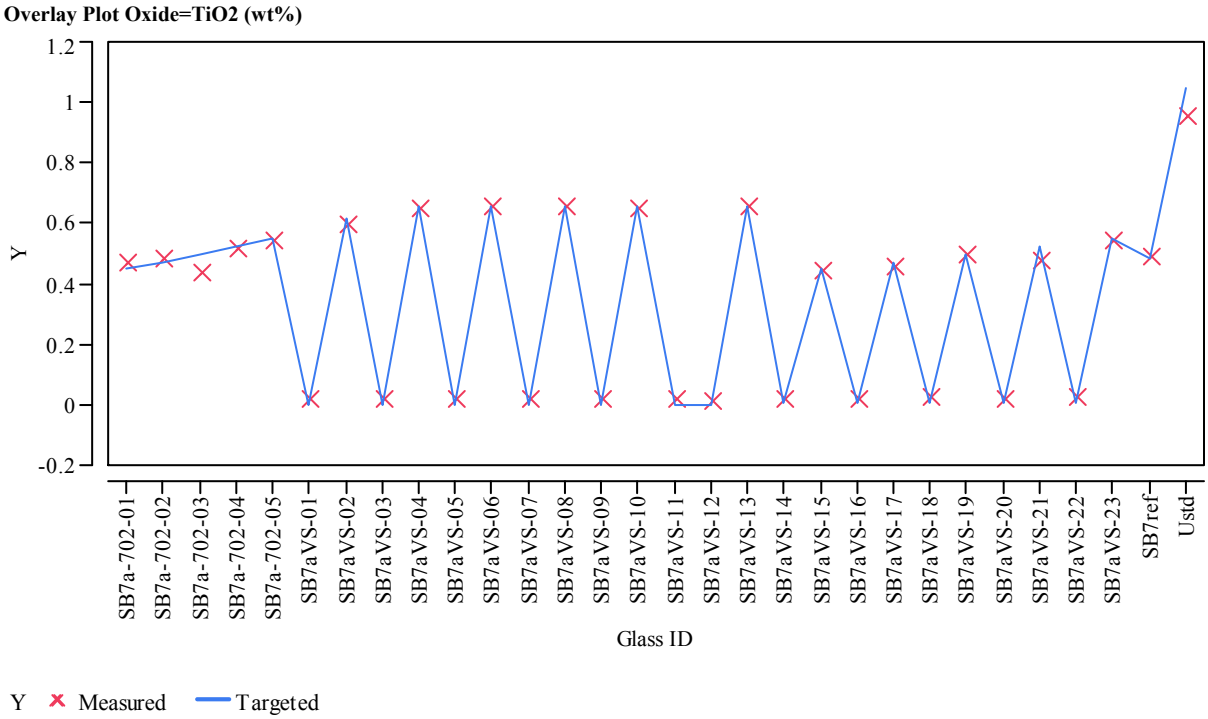
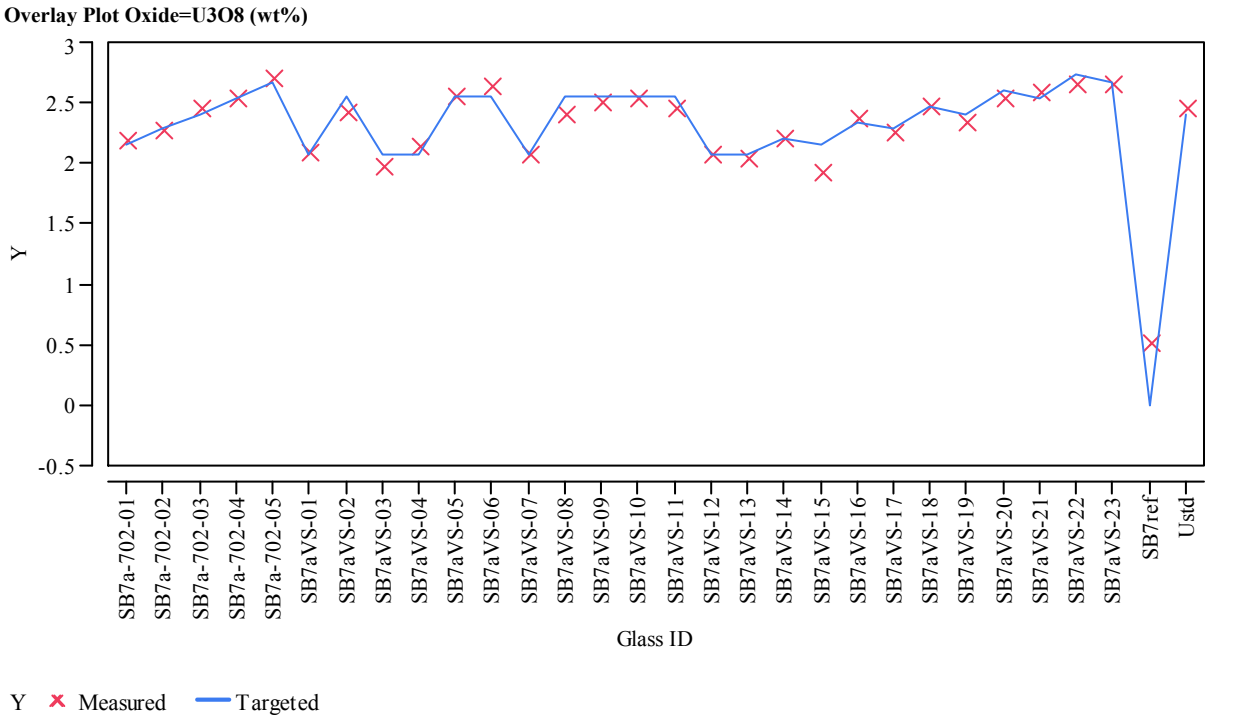


Exhibit A6. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the SB7a VS Glasses



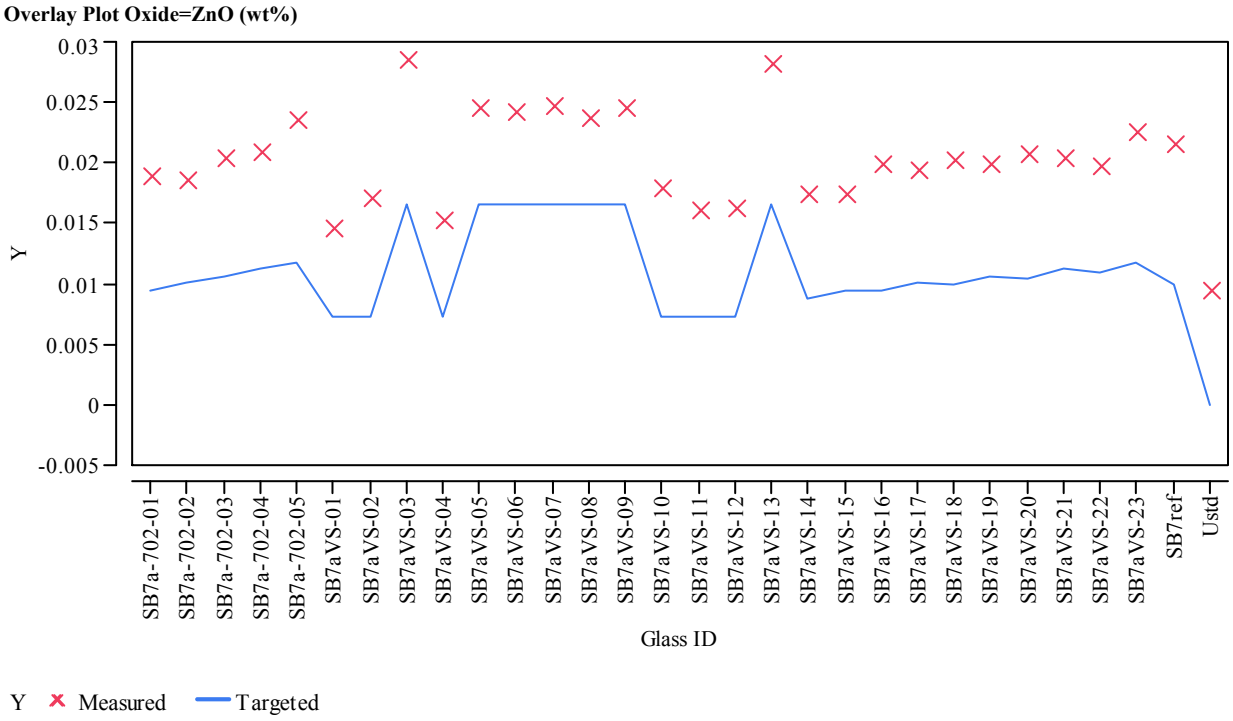
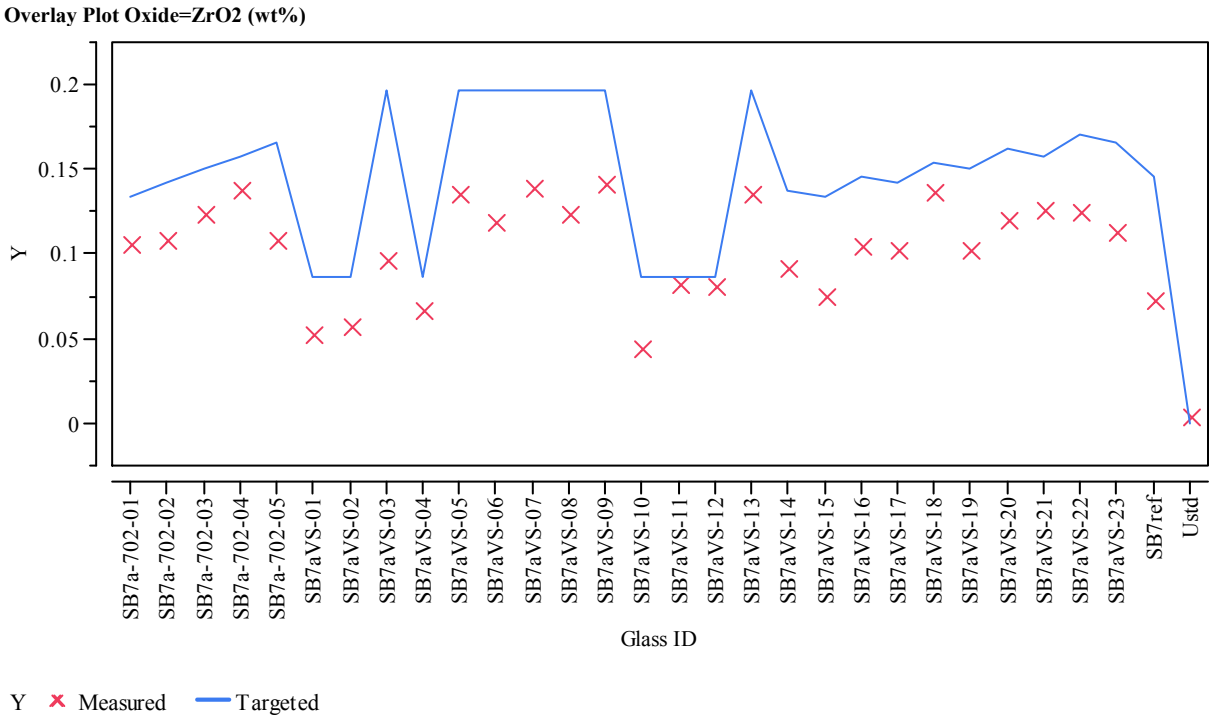
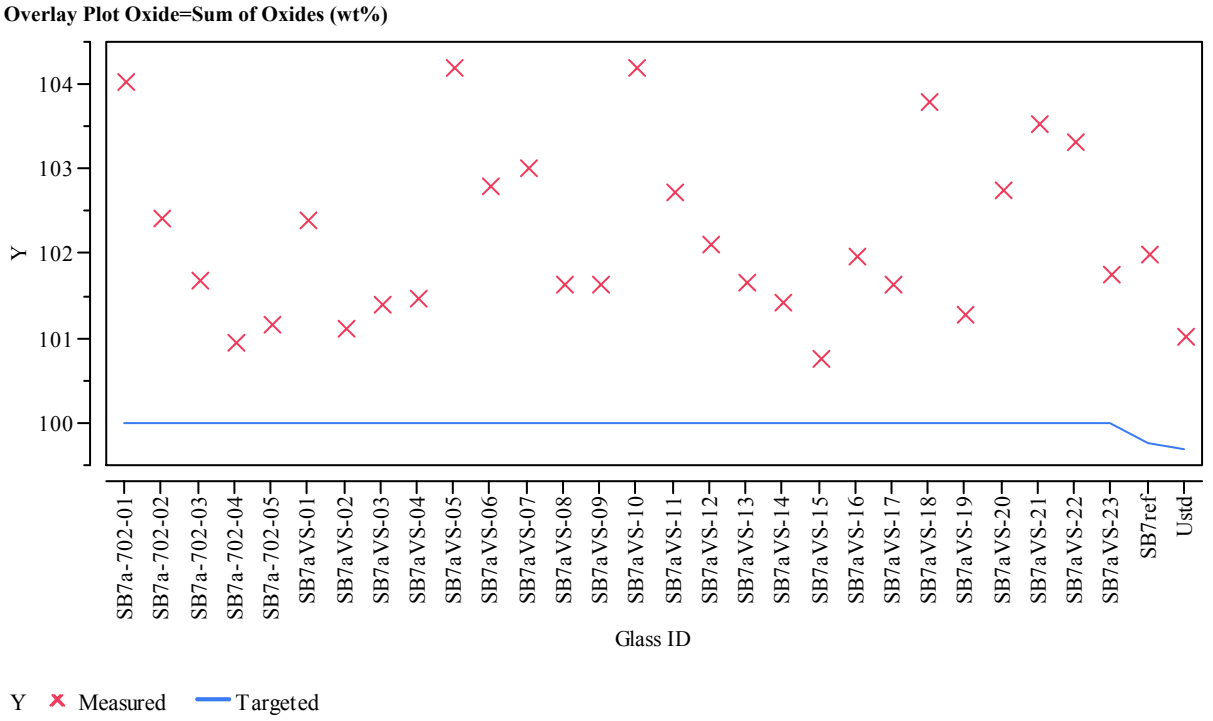


Exhibit A6. Average Measured Versus Targeted Compositions by Glass ID by Oxide for the SB7a VS Glasses





Appendix B:

Tables and Exhibits Supporting the Analysis of the PCT Results for the SB7a Variability 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)

Glass ID (w HT)	Block	Seq	Lab ID	B ar	Li ar	Na ar	Si ar	B (ppm)	Li (ppm)	Na (ppm)	Si (ppm)
Std Soln	A	1	std-A1	20.1	9.97	81.1	52.1	20.100	9.970	81.100	52.100
SB7aVS-05	A	2	p050	6.16	10.5	46.7	70.7	10.267	17.500	77.835	117.836
SB7aVS-05ccc	A	3	p143	5.76	10.1	41.9	66.3	9.600	16.834	69.835	110.502
SB7aVS-12	A	4	p081	5.67	10.2	42.9	72.8	9.450	17.000	71.501	121.336
SB7aVS-12ccc	A	5	p078	5.81	10.5	41.4	72.4	9.684	17.500	69.001	120.669
SB7aVS-13	A	6	p014	5.64	10.1	43.1	69.3	9.400	16.834	71.835	115.502
SB7aVS-13ccc	A	7	p058	5.3	9.39	38.8	64.2	8.834	15.650	64.668	107.002
SB7a-702-02	A	8	p036	7.66	17.2	59	91	12.767	28.667	98.335	151.670
SB7a-702-02ccc	A	9	p083	8.04	19.7	59	96.2	13.400	32.834	98.335	160.337
Std Soln	A	10	std-A2	20.1	9.97	81.2	52	20.100	9.970	81.200	52.000
SB7a-702-03	A	11	p096	7.7	16.4	63.3	86.8	12.834	27.334	105.502	144.670
SB7a-702-03ccc	A	12	p142	7.81	17.5	61	88.1	13.017	29.167	101.669	146.836
SB7a-702-04	A	13	p114	7.74	15.7	66.3	86.2	12.900	26.167	110.502	143.670
SB7a-702-04ccc	A	14	p084	7.73	16.6	63.9	84.8	12.884	27.667	106.502	141.336
SB7a-702-05	A	15	p026	7.52	14.4	69.7	81.3	12.534	24.000	116.169	135.503
SB7a-702-05ccc	A	16	p092	6.99	14.8	63.3	80.2	11.650	24.667	105.502	133.669
ARM-1	A	17	p060	11.5	8.77	23.4	39.1	19.167	14.617	39.001	65.168
Std Soln	A	18	std-A3	20	9.92	82.3	51.8	20.000	9.920	82.300	51.800
Std Soln	B	1	std-B1	19.8	9.81	80.1	51.7	19.800	9.810	80.100	51.700
SB7aVS-05	B	2	p034	5.82	10.2	45.6	68.5	9.700	17.000	76.002	114.169
SB7aVS-05ccc	B	3	p135	5.73	10.3	42.7	67.8	9.550	17.167	71.168	113.002
SB7aVS-12	B	4	p145	5.57	10.1	43.1	71.8	9.284	16.834	71.835	119.669
SB7aVS-12ccc	B	5	p157	5.5	10.3	40.4	71.8	9.167	17.167	67.335	119.669
SB7aVS-13	B	6	p122	5.13	9.25	40.1	64.5	8.550	15.417	66.835	107.502
SB7aVS-13ccc	B	7	p129	5.24	9.75	39.9	66.4	8.734	16.250	66.501	110.669
SB7a-702-02	B	8	p029	7.12	16.3	55.5	87.5	11.867	27.167	92.502	145.836
SB7a-702-02ccc	B	9	p015	7.81	19.7	58.4	94.8	13.017	32.834	97.335	158.003
Std Soln	B	10	std-B2	19.8	9.86	80.1	51.8	19.800	9.860	80.100	51.800
SB7a-702-03	B	11	p054	7.33	16.1	62	85.3	12.217	26.834	103.335	142.170
SB7a-702-03ccc	B	12	p089	7.23	16.6	57.1	84.8	12.050	27.667	95.169	141.336
SB7a-702-04	B	13	p164	7.34	14.9	63.3	80.8	12.234	24.834	105.502	134.669
SB7a-702-04ccc	B	14	p090	7.46	16.5	63.7	84.2	12.434	27.501	106.169	140.336
SB7a-702-05	B	15	p002	6.77	13.7	64.5	77.1	11.284	22.834	107.502	128.503
SB7a-702-05ccc	B	16	p025	6.8	14.6	63	78	11.334	24.334	105.002	130.003
ARM-1	B	17	p112	11.6	8.81	23.3	39.2	19.334	14.684	38.834	65.335
Std Soln	B	18	std-B3	19.9	9.86	80.2	51.6	19.900	9.860	80.200	51.600
Std Soln	C	1	std-C1	19.9	9.93	80.4	51.8	19.900	9.930	80.400	51.800
SB7aVS-05	C	2	p168	5.94	10.3	45.7	67.6	9.900	17.167	76.168	112.669
SB7aVS-05ccc	C	3	p035	5.74	10.4	43	68.7	9.567	17.334	71.668	114.502
SB7aVS-12	C	4	p032	6.39	11.5	49.3	83.7	10.650	19.167	82.168	139.503
SB7aVS-12ccc	C	5	p091	5.65	10.2	41.2	70.8	9.417	17.000	68.668	118.002
SB7aVS-13	C	6	p057	5.36	9.54	41.2	66.4	8.934	15.900	68.668	110.669
SB7aVS-13ccc	C	7	p042	5.39	9.74	40.2	66.9	8.984	16.234	67.001	111.502
SB7a-702-02	C	8	p044	7.43	16.5	57.1	88.3	12.384	27.501	95.169	147.170
SB7a-702-02ccc	C	9	p012	8.09	19.8	59.5	95.6	13.484	33.001	99.169	159.337
Std Soln	C	10	std-C2	20.2	9.86	80.6	52.1	20.200	9.860	80.600	52.100
SB7a-702-03	C	11	p022	7.61	16.4	62.6	87	12.684	27.334	104.335	145.003
SB7a-702-03ccc	C	12	p097	7.41	16.8	58.1	85.2	12.350	28.001	96.835	142.003
SB7a-702-04	C	13	p062	7.24	14.5	62.1	79.8	12.067	24.167	103.502	133.003
SB7a-702-04ccc	C	14	p166	7.79	16.8	64.8	86.1	12.984	28.001	108.002	143.503
SB7a-702-05	C	15	p020	7	13.8	64.8	76.2	11.667	23.000	108.002	127.003
SB7a-702-05ccc	C	16	p080	6.83	14.7	63	77.9	11.384	24.500	105.002	129.836
ARM-1	C	17	p175	12.7	9.37	25.1	40.8	21.167	15.617	41.834	68.001
Std Soln	C	18	std-C3	20.1	9.83	80.3	51.7	20.100	9.830	80.300	51.700
Std Soln	D	1	std-D1	20	9.88	80.3	51.7	20.000	9.880	80.300	51.700
SB7aVS-07	D	2	p148	5.24	9.57	49.2	68.9	8.734	15.950	82.002	114.836
SB7aVS-07ccc	D	3	p159	5.31	10.1	46.9	70.6	8.850	16.834	78.168	117.669
SB7aVS-09	D	4	p048	5.4	9.76	42.8	67.6	9.000	16.267	71.335	112.669
SB7aVS-09ccc	D	5	p065	5.42	9.92	40.8	68.8	9.034	16.534	68.001	114.669
SB7aVS-11	D	6	p010	6.17	11	62.4	78.6	10.284	18.334	104.002	131.003
SB7aVS-11ccc	D	7	p149	5.82	10.7	56.2	74.7	9.700	17.834	93.669	124.502

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

Glass ID (w HT)	Block	Seq	Lab ID	B ar	Li ar	Na ar	Si ar	B (ppm)	Li (ppm)	Na (ppm)	Si (ppm)
SB7aVS-18	D	8	p118	6.2	10.4	55.5	73.8	10.334	17.334	92.502	123.002
SB7aVS-18ccc	D	9	p055	6.18	10.8	52.9	73.1	10.300	18.000	88.168	121.836
Std Soln	D	10	std-D2	19.9	9.82	79.9	51.8	19.900	9.820	79.900	51.800
SB7aVS-21	D	11	p053	6.22	10.1	62	73.2	10.367	16.834	103.335	122.002
SB7aVS-21ccc	D	12	p128	6.51	11.2	62	75.5	10.850	18.667	103.335	125.836
SB7aVS-22	D	13	p138	6.14	9.65	61.8	68.7	10.234	16.084	103.002	114.502
SB7aVS-22ccc	D	14	p073	7.22	12.2	71.9	83.3	12.034	20.334	119.836	138.836
SB7a-702-01	D	15	p131	7.67	17.8	55.5	91.3	12.784	29.667	92.502	152.170
SB7a-702-01ccc	D	16	p093	8.86	25.5	60.3	111	14.767	42.501	100.502	185.004
blank	D	17	p144	< 0.443	< 0.302	< 2.78	< 0.382	0.369	0.252	2.317	0.318
Std Soln	D	18	std-D3	19.9	9.88	80	52.1	19.900	9.880	80.000	52.100
Std Soln	E	1	std-E1	20.1	9.88	80.8	51.7	20.100	9.880	80.800	51.700
blank	E	2	p113	< 0.443	< 0.302	< 2.78	< 0.382	0.369	0.252	2.317	0.318
SB7aVS-07ccc	E	3	p074	5.14	9.87	45.9	68.6	8.567	16.450	76.502	114.336
SB7aVS-09	E	4	p037	5.55	9.89	43.6	68.2	9.250	16.484	72.668	113.669
SB7aVS-09ccc	E	5	p049	5.39	9.88	41.3	67.7	8.984	16.467	68.835	112.836
SB7aVS-11	E	6	p173	6.14	11	62.7	78.6	10.234	18.334	104.502	131.003
SB7aVS-11ccc	E	7	p041	6.08	11.2	58.1	78.6	10.134	18.667	96.835	131.003
SB7aVS-18	E	8	p011	6.25	10.4	56.3	72.8	10.417	17.334	93.835	121.336
SB7aVS-18ccc	E	9	p100	6.3	10.9	53.8	73.4	10.500	18.167	89.668	122.336
Std Soln	E	10	std-E2	20.2	9.93	81.4	51.8	20.200	9.930	81.400	51.800
SB7aVS-21	E	11	p066	6.28	10.3	63.3	72.8	10.467	17.167	105.502	121.336
SB7aVS-21ccc	E	12	p063	6.38	10.9	60.6	73.3	10.634	18.167	101.002	122.169
SB7aVS-22	E	13	p021	5.87	9.3	59.5	66.1	9.784	15.500	99.169	110.169
SB7aVS-22ccc	E	14	p039	5.92	10	59.8	68.5	9.867	16.667	99.669	114.169
SB7a-702-01	E	15	p045	7.8	17.9	56.1	92	13.000	29.834	93.502	153.336
SB7a-702-01ccc	E	16	p154	8.85	25.5	60.5	110	14.750	42.501	100.835	183.337
SB7aVS-07	E	17	p177	5.36	9.82	50.8	69.6	8.934	16.367	84.668	116.002
Std Soln	E	18	std-E3	20.1	9.98	81.4	51.8	20.100	9.980	81.400	51.800
Std Soln	F	1	std-F1	20.3	9.9	81.2	52.1	20.300	9.900	81.200	52.100
SB7aVS-07	F	2	p046	5.4	9.75	50.4	70.2	9.000	16.250	84.002	117.002
SB7aVS-07ccc	F	3	p009	5.17	9.83	46	67.4	8.617	16.384	76.668	112.336
SB7aVS-09	F	4	p017	5.53	9.9	43.5	67.6	9.217	16.500	72.501	112.669
SB7aVS-09ccc	F	5	p120	5.5	10.2	41.7	68.2	9.167	17.000	69.501	113.669
SB7aVS-11	F	6	p051	6.2	11.1	63.1	78.2	10.334	18.500	105.169	130.336
SB7aVS-11ccc	F	7	p077	6	11.2	57.1	77.1	10.000	18.667	95.169	128.503
SB7aVS-18	F	8	p028	6.24	10.6	56.5	73.2	10.400	17.667	94.169	122.002
Std Soln	F	9	std-F2	20.2	9.92	81	52	20.200	9.920	81.000	52.000
SB7aVS-18ccc	F	10	p059	6.25	11	53.1	73.9	10.417	18.334	88.502	123.169
SB7aVS-21	F	11	p094	6.5	10.6	64.6	74.1	10.834	17.667	107.669	123.502
SB7aVS-21ccc	F	12	p127	6.38	11	60.4	74	10.634	18.334	100.669	123.336
SB7aVS-22	F	13	p052	5.91	9.38	59.9	67	9.850	15.634	99.835	111.669
SB7aVS-22ccc	F	14	p108	6.06	9.91	59.6	68.4	10.100	16.517	99.335	114.002
SB7a-702-01	F	15	p076	7.75	17.9	55.9	91.2	12.917	29.834	93.169	152.003
SB7a-702-01ccc	F	16	p019	9.01	26.2	61.6	112	15.017	43.668	102.669	186.670
Std Soln	F	17	std-F3	20.1	9.93	81	52	20.100	9.930	81.000	52.000
Std Soln	G	1	std-G1	19.9	9.93	80.9	51.9	19.900	9.930	80.900	51.900
SB7aVS-01	G	2	p123	7.01	12.1	66.3	83.7	11.684	20.167	110.502	139.503
SB7aVS-01ccc	G	3	p068	7.05	12.6	62.6	83.8	11.750	21.000	104.335	139.669
SB7aVS-04	G	4	p086	6.27	10.9	63.3	76.6	10.450	18.167	105.502	127.669
SB7aVS-04ccc	G	5	p001	6.08	10.9	58.4	74.7	10.134	18.167	97.335	124.502
SB7aVS-14	G	6	p064	5.8	10.7	47.8	74.4	9.667	17.834	79.668	124.002
SB7aVS-14ccc	G	7	p106	5.51	10.3	43.4	72.2	9.184	17.167	72.335	120.336
SB7aVS-15	G	8	p171	5.55	10.1	47.5	71.9	9.250	16.834	79.168	119.836
Std Soln	G	9	std-G2	19.6	9.72	79.6	51	19.600	9.720	79.600	51.000
SB7aVS-15ccc	G	10	p133	5.66	10.4	45.3	72.7	9.434	17.334	75.502	121.169
SB7aVS-17	G	11	p079	5.61	9.79	50.5	71	9.350	16.317	84.168	118.336
SB7aVS-17ccc	G	12	p101	5.51	10	46.8	71.9	9.184	16.667	78.002	119.836
SB7aVS-19	G	13	p056	6.3	10.7	60.5	76.7	10.500	17.834	100.835	127.836
SB7aVS-19ccc	G	14	p013	6.2	11	56.7	75	10.334	18.334	94.502	125.003
SB7aVS-23	G	15	p137	6	9.2	64.1	68.4	10.000	15.334	106.835	114.002

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

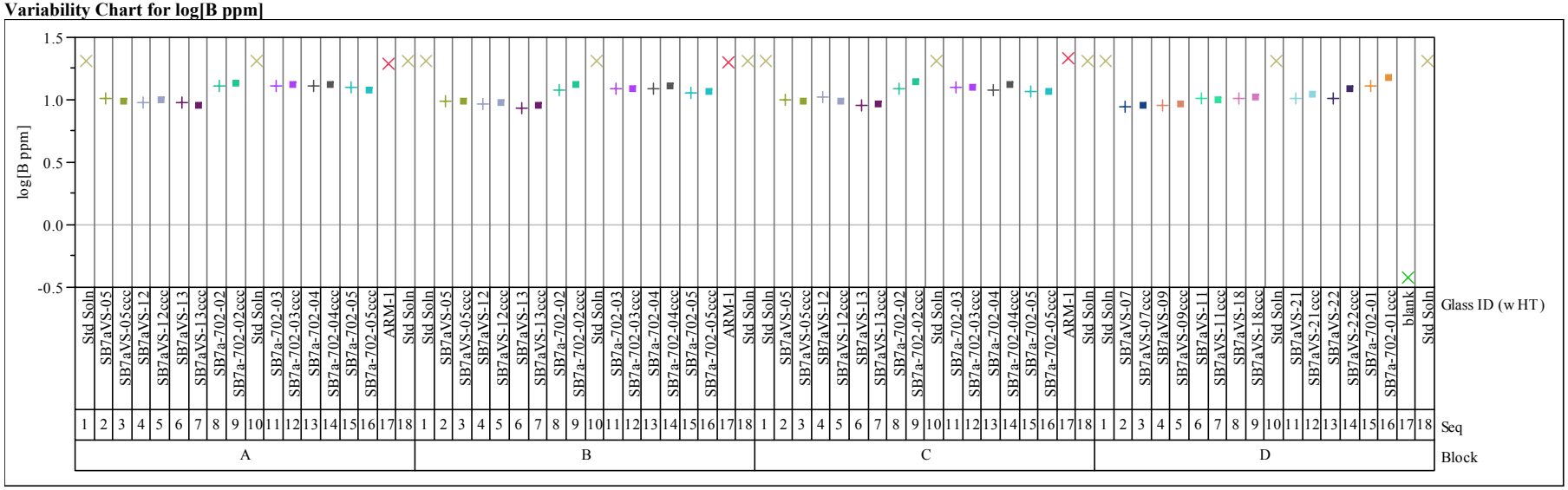
Glass ID (w HT)	Block	Seq	Lab ID	B ar	Li ar	Na ar	Si ar	B (ppm)	Li (ppm)	Na (ppm)	Si (ppm)
SB7aVS-23ccc	G	16	p132	5.98	9.78	60.6	69.1	9.967	16.300	101.002	115.169
Std Soln	G	17	std-G3	19.5	9.67	79.2	51.1	19.500	9.670	79.200	51.100
Std Soln	H	1	std-H1	20	9.84	81.5	52	20.000	9.840	81.500	52.000
SB7aVS-01	H	2	p067	6.77	11.4	65.1	80.3	11.284	19.000	108.502	133.836
SB7aVS-01ccc	H	3	p061	7.08	12.5	63.4	82.2	11.800	20.834	105.669	137.003
SB7aVS-04	H	4	p160	6.29	10.9	64	79.6	10.484	18.167	106.669	132.669
blank	H	5	p165	< 0.443	< 0.302	< 2.78	< 0.382	0.369	0.252	2.317	0.318
SB7aVS-14	H	6	p003	5.84	10.7	48.6	75	9.734	17.834	81.002	125.003
SB7aVS-14ccc	H	7	p161	5.29	9.98	42.4	68	8.817	16.634	70.668	113.336
SB7aVS-15	H	8	p152	5.54	10.2	48.1	71.1	9.234	17.000	80.168	118.502
SB7aVS-15ccc	H	9	p088	5.58	10.5	45.5	73.3	9.300	17.500	75.835	122.169
Std Soln	H	10	std-H2	19.9	9.84	81	51.9	19.900	9.840	81.000	51.900
SB7aVS-17	H	11	p115	5.66	9.9	51	71.6	9.434	16.500	85.002	119.336
SB7aVS-17ccc	H	12	p024	6.11	11.3	52.9	79.4	10.184	18.834	88.168	132.336
SB7aVS-19	H	13	p116	6	10.1	58.1	72.9	10.000	16.834	96.835	121.502
SB7aVS-19ccc	H	14	p141	6.4	11.6	59.3	77.5	10.667	19.334	98.835	129.169
SB7aVS-23	H	15	p121	5.92	9.34	64.3	68.5	9.867	15.567	107.169	114.169
SB7aVS-23ccc	H	16	p134	5.81	9.87	59.7	67.9	9.684	16.450	99.502	113.169
SB7aVS-04ccc	H	17	p178	6.33	11.4	60.7	78.6	10.550	19.000	101.169	131.003
Std Soln	H	18	std-H3	19.9	9.89	81.4	52	19.900	9.890	81.400	52.000
Std Soln	I	1	std-I1	20	9.87	79.4	51.5	20.000	9.870	79.400	51.500
SB7aVS-01	I	2	p140	7.2	12.2	66.9	84.4	12.000	20.334	111.502	140.669
SB7aVS-01ccc	I	3	p156	7.12	12.6	62.3	82.6	11.867	21.000	103.835	137.669
SB7aVS-04	I	4	p027	6.39	11	63.8	78.1	10.650	18.334	106.335	130.169
SB7aVS-04ccc	I	5	p153	6.32	11.1	58.6	76.4	10.534	18.500	97.669	127.336
SB7aVS-14	I	6	p018	5.86	10.8	48	74.8	9.767	18.000	80.002	124.669
SB7aVS-14ccc	I	7	p007	5.43	10.1	42	71.8	9.050	16.834	70.001	119.669
SB7aVS-15	I	8	p004	5.83	10.4	48.6	73.4	9.717	17.334	81.002	122.336
SB7aVS-15ccc	I	9	p043	5.86	10.9	46.3	75.6	9.767	18.167	77.168	126.003
Std Soln	I	10	std-I2	20.1	9.84	79.6	51.7	20.100	9.840	79.600	51.700
SB7aVS-17	I	11	p071	5.76	10	51.1	71.7	9.600	16.667	85.168	119.502
SB7aVS-17ccc	I	12	p124	6.18	11.1	52.2	80.4	10.300	18.500	87.002	134.003
SB7aVS-19	I	13	p087	6.44	11.3	58.1	76.4	10.734	18.834	96.835	127.336
SB7aVS-19ccc	I	14	p031	6.22	10.5	58.9	75.5	10.367	17.500	98.169	125.836
SB7aVS-23	I	15	p111	5.95	9.15	62.3	66.7	9.917	15.250	103.835	111.169
SB7aVS-23ccc	I	16	p176	5.95	9.82	58.6	67.6	9.917	16.367	97.669	112.669
blank	I	17	p070	< 0.443	< 0.302	< 2.78	< 0.382	0.369	0.252	2.317	0.318
Std Soln	I	18	std-I3	20.2	9.8	79.8	51.6	20.200	9.800	79.800	51.600
Std Soln	J	1	std-J1	19.9	9.93	79.2	51.7	19.900	9.930	79.200	51.700
SB7aVS-02	J	2	p136	6.98	12.4	66.7	84.1	11.634	20.667	111.169	140.169
SB7aVS-02ccc	J	3	p117	6.59	12.2	60.8	80.9	10.984	20.334	101.335	134.836
SB7aVS-03	J	4	p125	6.26	11	61.8	76.5	10.434	18.334	103.002	127.503
SB7aVS-03ccc	J	5	p139	6.19	11.1	57.6	76.3	10.317	18.500	96.002	127.169
SB7aVS-06	J	6	p075	6.6	11.7	65	76.7	11.000	19.500	108.336	127.836
SB7aVS-06ccc	J	7	p008	6.32	11.8	59.4	75.3	10.534	19.667	99.002	125.503
SB7aVS-08	J	8	p040	5.23	9.9	41	68.8	8.717	16.500	68.335	114.669
SB7aVS-08ccc	J	9	p119	5.22	10.1	39.8	69.4	8.700	16.834	66.335	115.669
Std Soln	J	10	std-J2	19.7	9.94	78.7	51.4	19.700	9.940	78.700	51.400
SB7aVS-10	J	11	p006	5.38	9.94	41.9	68.8	8.967	16.567	69.835	114.669
SB7aVS-10ccc	J	12	p169	5.47	10.3	40.7	70.9	9.117	17.167	67.835	118.169
SB7aVS-16	J	13	p155	5.47	10	47	69.6	9.117	16.667	78.335	116.002
SB7aVS-16ccc	J	14	p072	5.28	10	43.7	68.3	8.800	16.667	72.835	113.836
SB7aVS-20	J	15	p099	6.03	10.1	57.6	69.7	10.050	16.834	96.002	116.169
SB7aVS-20ccc	J	16	p102	6.1	10.6	56.5	70.7	10.167	17.667	94.169	117.836
EA	J	17	p146	32.5	10.7	87.4	51.7	541.668	178.334	1456.670	861.668
Std Soln	J	18	std-J3	19.8	9.96	78.9	51.3	19.800	9.960	78.900	51.300
Std Soln	K	1	std-K1	20	9.9	80.8	51.5	20.000	9.900	80.800	51.500
SB7aVS-02	K	2	p104	7.02	12.2	67	83.8	11.700	20.334	111.669	139.669
SB7aVS-02ccc	K	3	p105	6.63	11.7	61.1	79.7	11.050	19.500	101.835	132.836
SB7aVS-03	K	4	p030	6.34	10.9	62.6	76.4	10.567	18.167	104.335	127.336
SB7aVS-03ccc	K	5	p110	6.15	10.8	57.1	74.7	10.250	18.000	95.169	124.502

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

Glass ID (w HT)	Block	Seq	Lab ID	B ar	Li ar	Na ar	Si ar	B (ppm)	Li (ppm)	Na (ppm)	Si (ppm)
SB7aVS-06	K	6	p085	6.53	11.5	65.9	75.6	10.884	19.167	109.836	126.003
SB7aVS-06ccc	K	7	p109	6.24	11.5	59.2	73.8	10.400	19.167	98.669	123.002
SB7aVS-08	K	8	p033	5.25	9.83	41.7	68.9	8.750	16.384	69.501	114.836
SB7aVS-08ccc	K	9	p167	5.69	10.7	43.3	73.9	9.484	17.834	72.168	123.169
Std Soln	K	10	std-K2	19.8	9.86	80.3	51.4	19.800	9.860	80.300	51.400
SB7aVS-10	K	11	p038	5.64	10.2	43.4	71.6	9.400	17.000	72.335	119.336
SB7aVS-10ccc	K	12	p095	5.47	10.1	41.1	70	9.117	16.834	68.501	116.669
SB7aVS-16	K	13	p069	5.46	9.97	47.4	69.8	9.100	16.617	79.002	116.336
SB7aVS-16ccc	K	14	p150	5.32	9.88	44.2	68.4	8.867	16.467	73.668	114.002
SB7aVS-20	K	15	p170	6.04	10.1	58.9	69.4	10.067	16.834	98.169	115.669
SB7aVS-20ccc	K	16	p016	6.36	10.7	58.3	72.6	10.600	17.834	97.169	121.002
EA	K	17	p107	28.1	9.56	77.8	48.1	468.334	159.334	1296.669	801.668
Std Soln	K	18	std-K3	20	9.94	80.8	51.6	20.000	9.940	80.800	51.600
Std Soln	L	1	std-L1	19.8	9.83	80.9	51.5	19.800	9.830	80.900	51.500
SB7aVS-02	L	2	p130	6.87	12.1	67.1	85.8	11.450	20.167	111.836	143.003
SB7aVS-02ccc	L	3	p098	6.63	11.9	61.5	80.2	11.050	19.834	102.502	133.669
SB7aVS-03	L	4	p151	6.29	10.8	62.8	76.5	10.484	18.000	104.669	127.503
SB7aVS-03ccc	L	5	p082	6.2	10.9	58.3	76.7	10.334	18.167	97.169	127.836
SB7aVS-06	L	6	p147	6.47	11.3	64.7	75.1	10.784	18.834	107.835	125.169
SB7aVS-06ccc	L	7	p162	6.37	11.6	60.2	74.4	10.617	19.334	100.335	124.002
SB7aVS-08	L	8	p023	5.29	9.89	42.2	69.2	8.817	16.484	70.335	115.336
SB7aVS-08ccc	L	9	p005	5.44	10.4	42.1	71.8	9.067	17.334	70.168	119.669
Std Soln	L	10	std-L2	19.8	9.88	80.5	51.4	19.800	9.880	80.500	51.400
SB7aVS-10	L	11	p172	5.57	10.2	43.1	70.7	9.284	17.000	71.835	117.836
SB7aVS-10ccc	L	12	p126	5.29	9.69	39.8	67.8	8.817	16.150	66.335	113.002
SB7aVS-16	L	13	p163	5.43	9.84	47.5	69.3	9.050	16.400	79.168	115.502
SB7aVS-16ccc	L	14	p158	5.36	9.86	44.4	68.9	8.934	16.434	74.001	114.836
SB7aVS-20	L	15	p174	6.09	10	58.9	69.8	10.150	16.667	98.169	116.336
SB7aVS-20ccc	L	16	p103	5.97	10	55.1	68.7	9.950	16.667	91.835	114.502
EA	L	17	p047	24.3	8.84	68.4	44.4	405.001	147.334	1140.002	740.001
Std Soln	L	18	std-L3	19.8	9.9	80.4	51.3	19.800	9.900	80.400	51.300

Exhibit B1. PCT Measurements (as Common Logarithms) in Analytical Sequence for Blocks A through D

Variability Chart for log[B ppm]



Variability Chart for log[Li ppm]

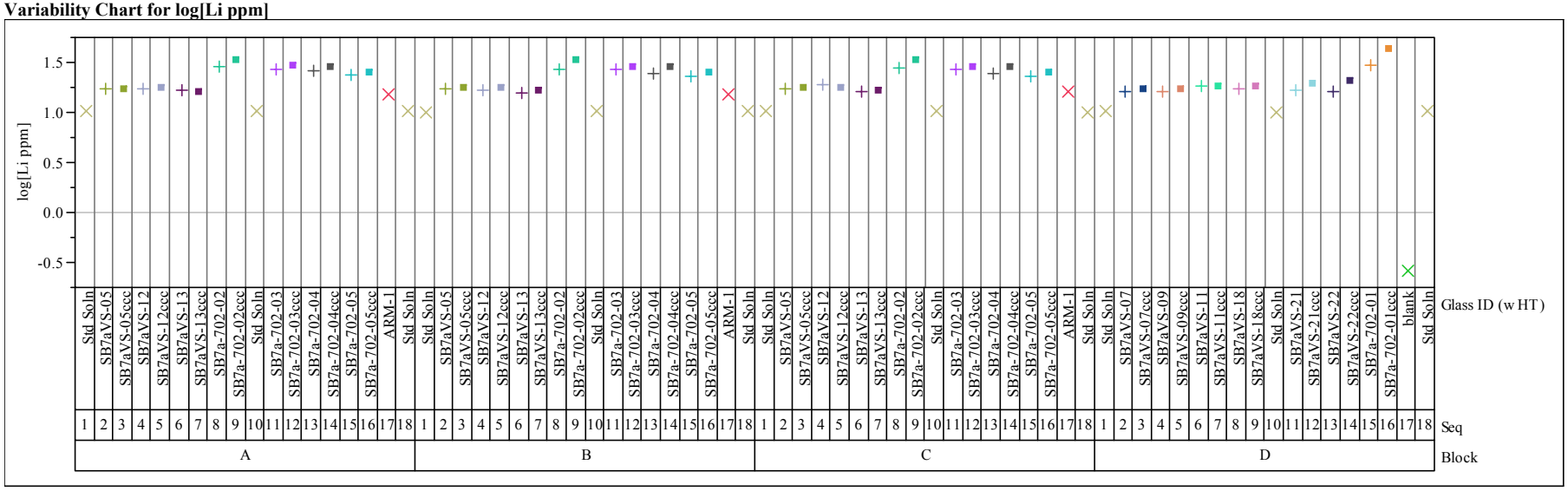
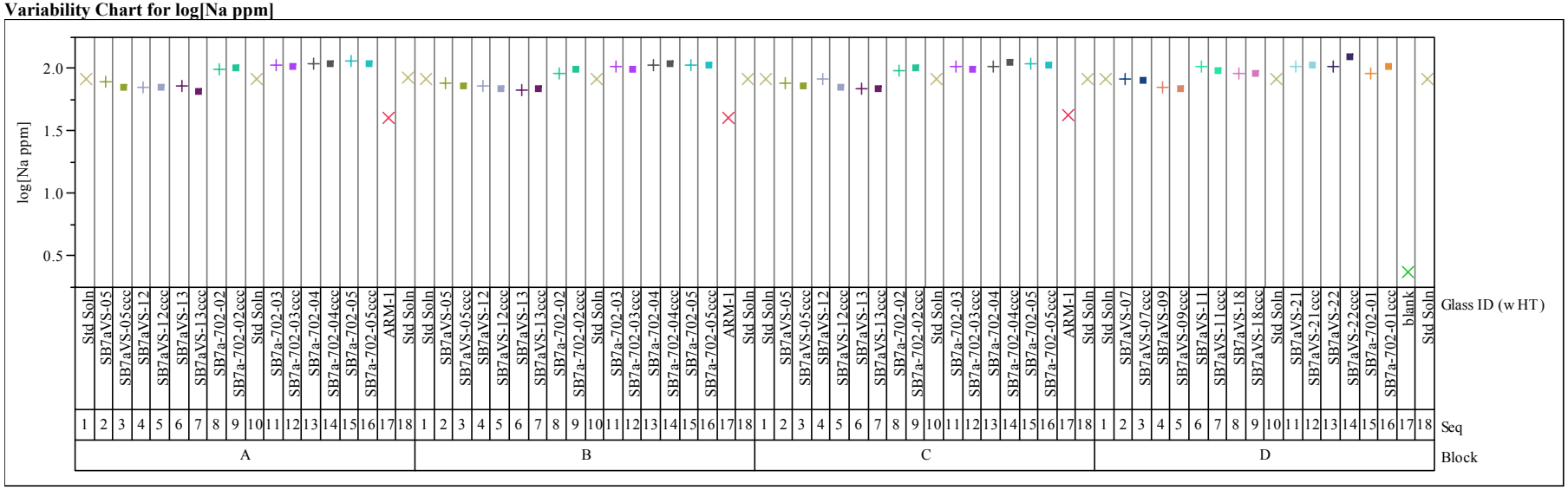


Exhibit B1. PCT Measurements (as Common Logarithms) in Analytical Sequence for Blocks A through D

Variability Chart for log[Na ppm]



Variability Chart for log[Si ppm]

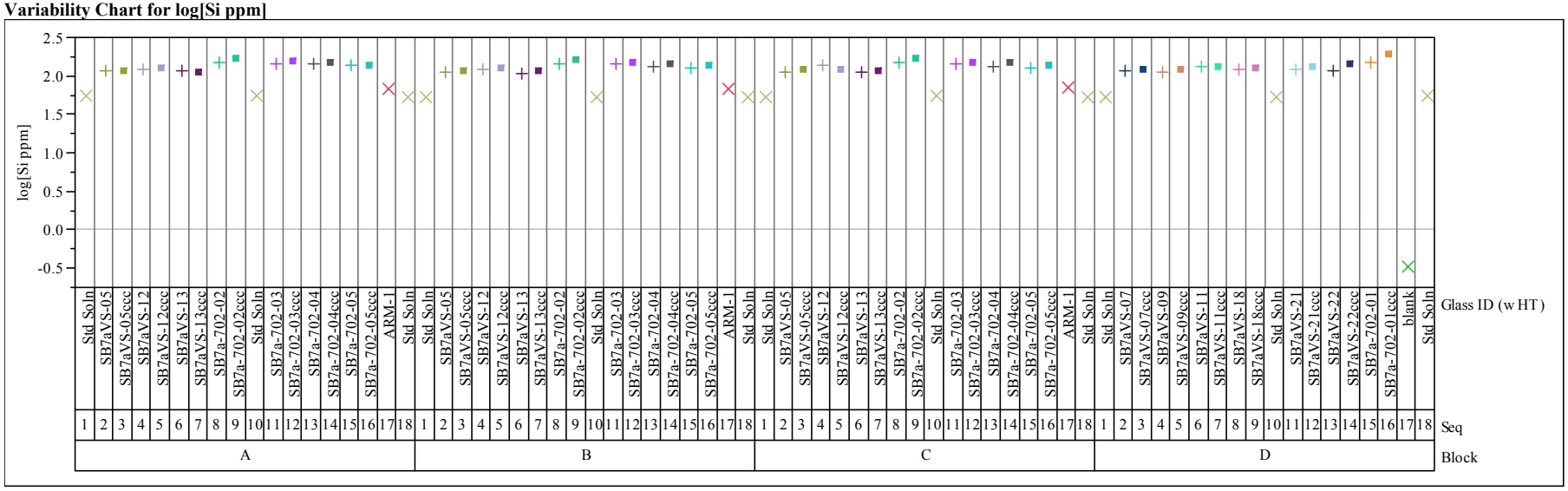
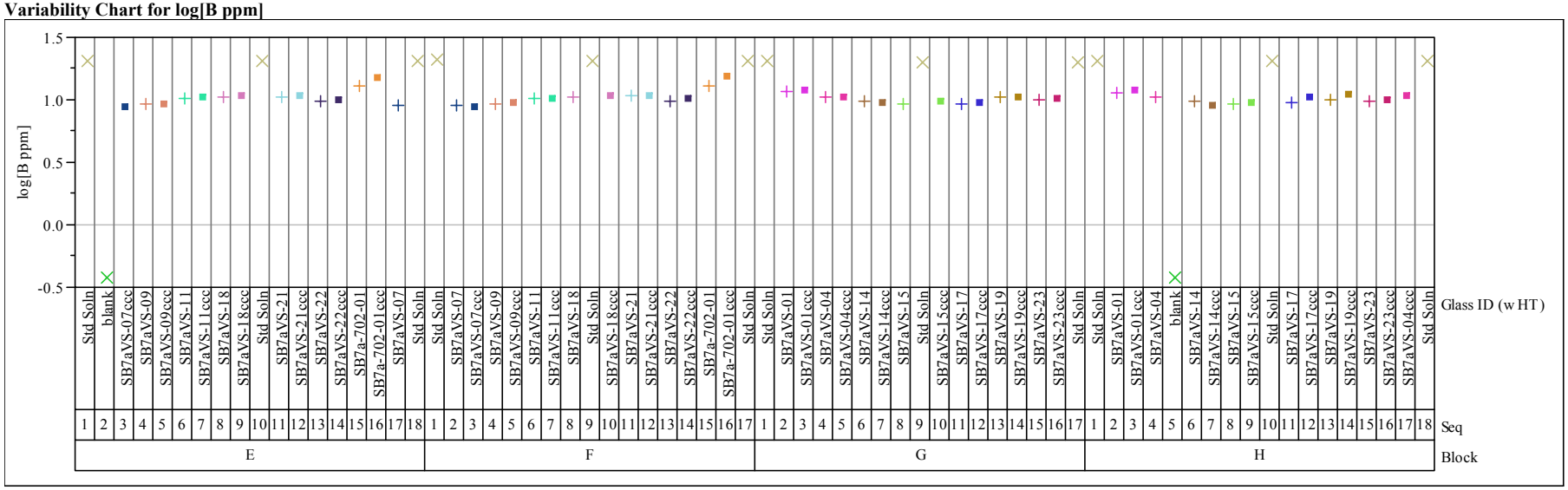


Exhibit B2. PCT Measurements (as Common Logarithms) in Analytical Sequence for Blocks E through H

Variability Chart for log[B ppm]



Variability Chart for log[Li ppm]

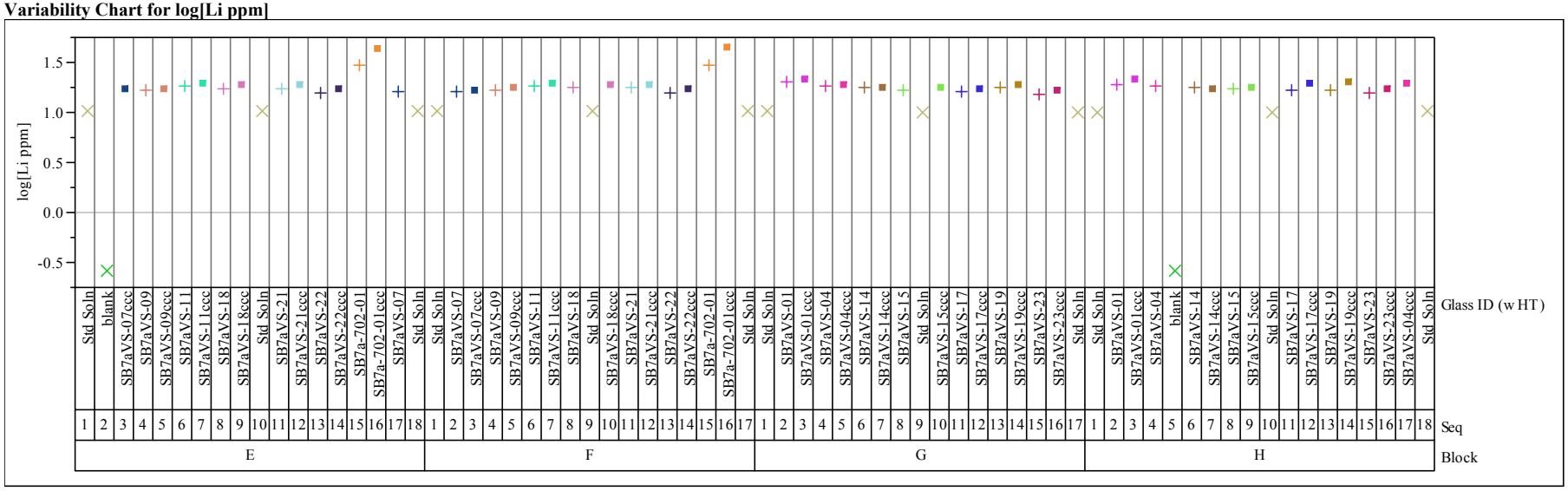
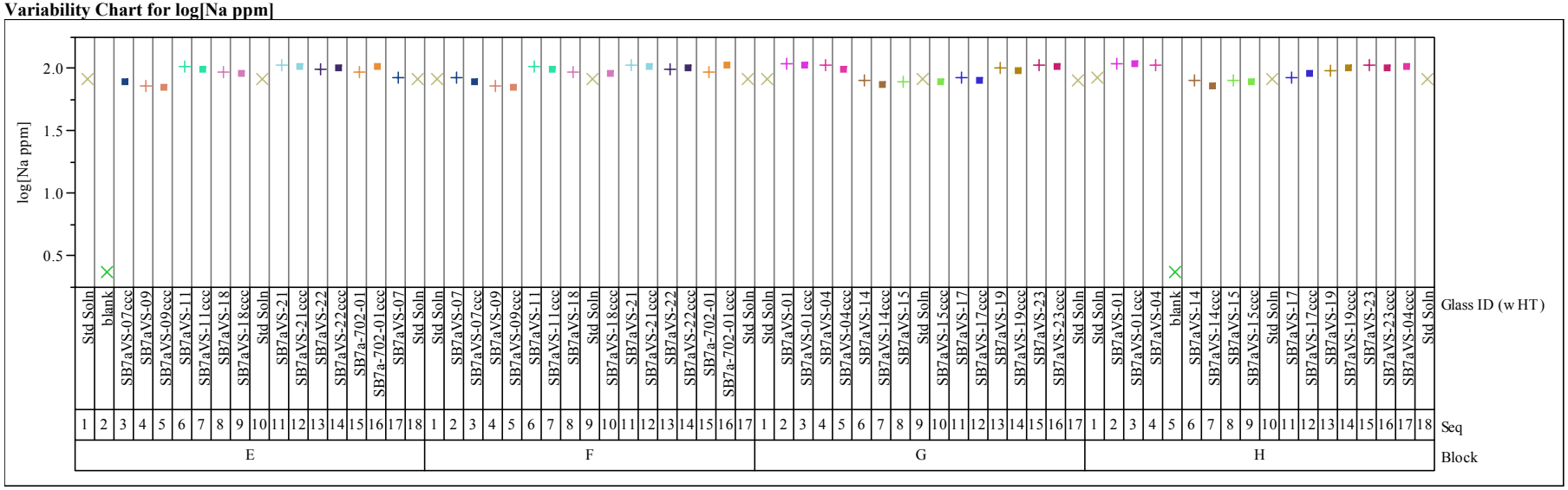


Exhibit B2. PCT Measurements (as Common Logarithms) in Analytical Sequence for Blocks E through H

Variability Chart for log[Na ppm]



Variability Chart for log[Si ppm]

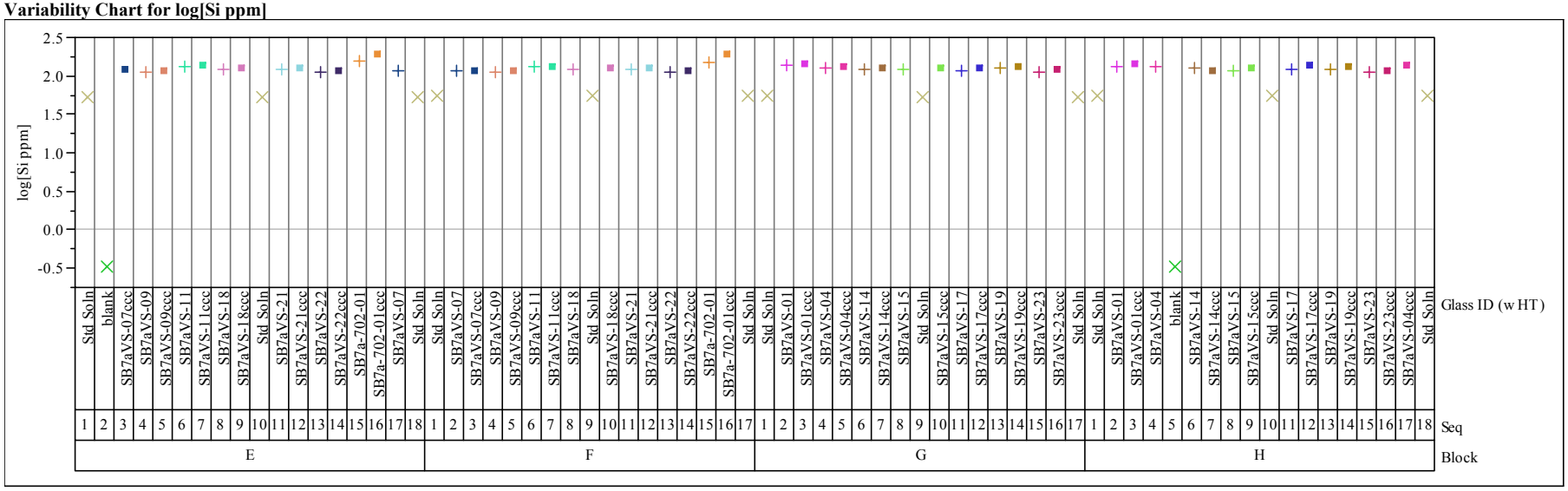
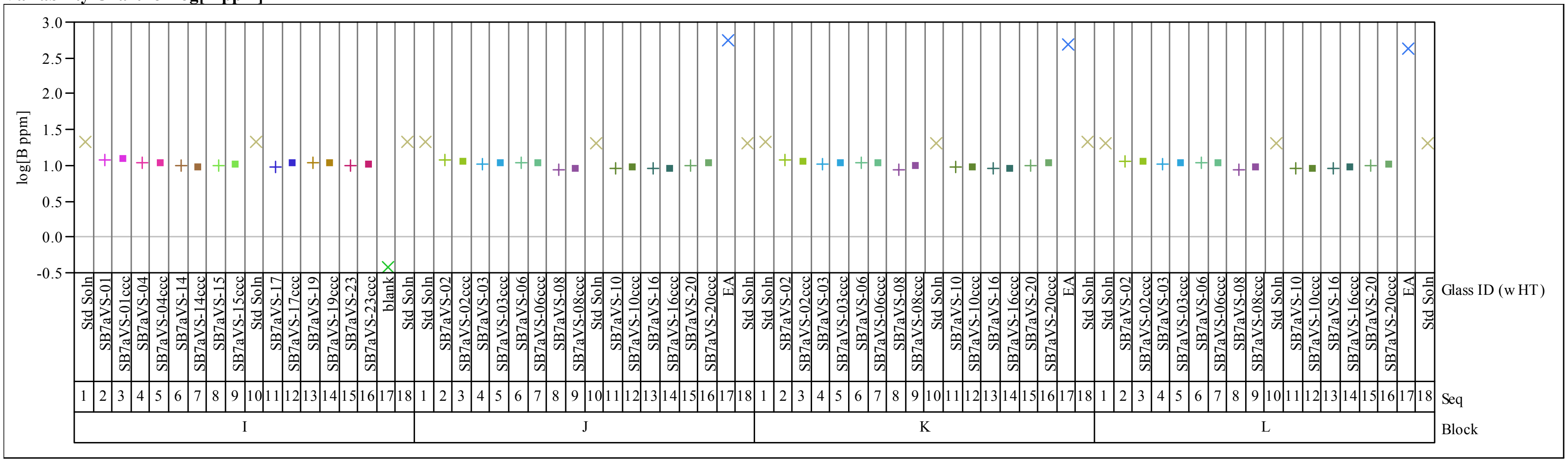


Exhibit B3. PCT Measurements (as Common Logarithms) in Analytical Sequence for Blocks I through L

Variability Chart for log[B ppm]



Variability Chart for log[Li ppm]

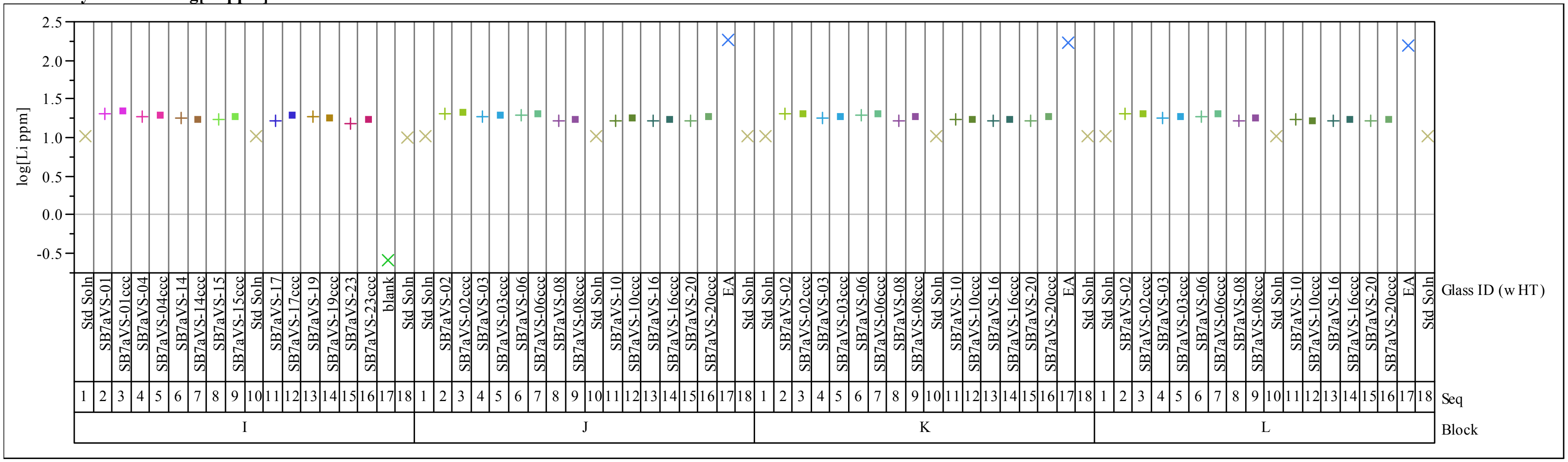
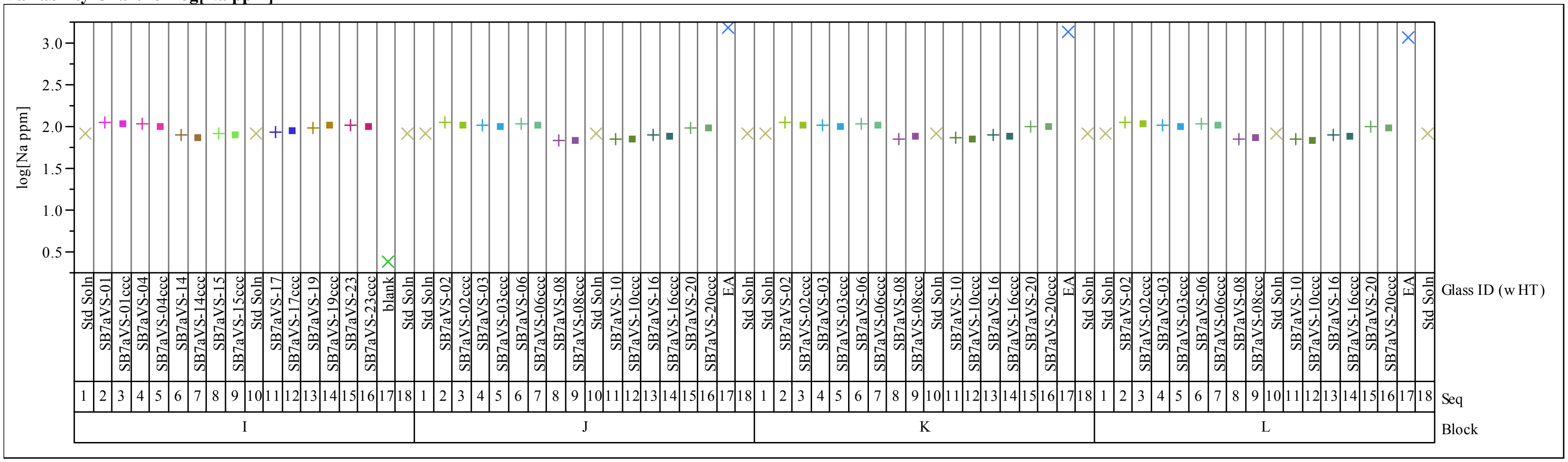


Exhibit B3. PCT Measurements (as Common Logarithms) in Analytical Sequence for Blocks I through L

Variability Chart for log[Na ppm]



Variability Chart for log[Si ppm]

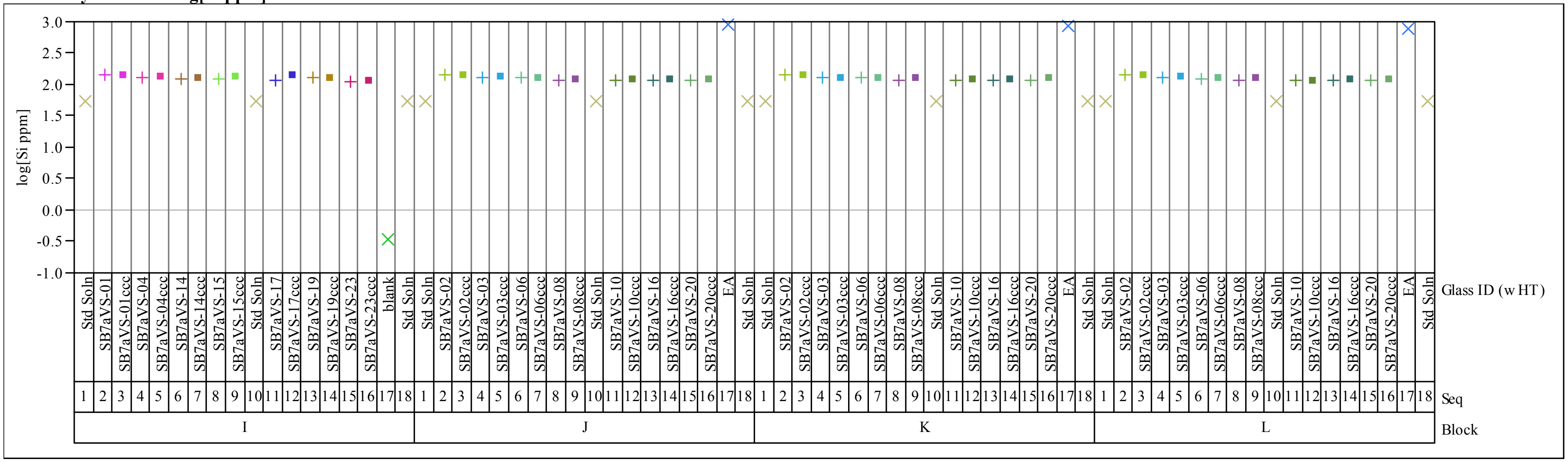
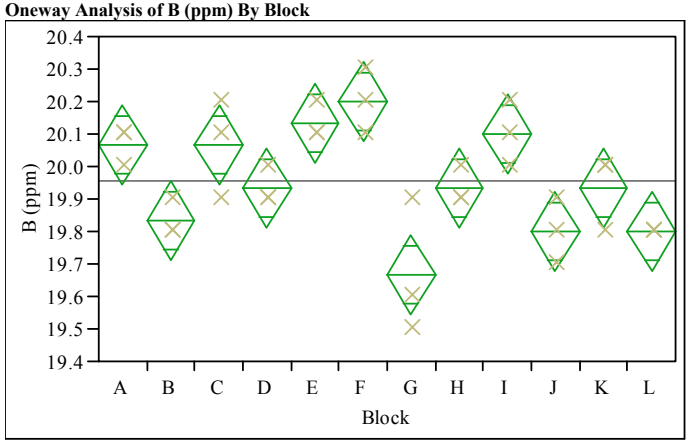


Exhibit B4. Measurements of the Multi-Element Solution Standard by ICP Block

Oneway Analysis of B (ppm) By Block



Oneway Anova
Summary of Fit

Rsquare	0.771543
Adj Rsquare	0.666834
Root Mean Square Error	0.10274
Mean of Response	19.95556
Observations (or Sum Wgts)	36

Analysis of Variance

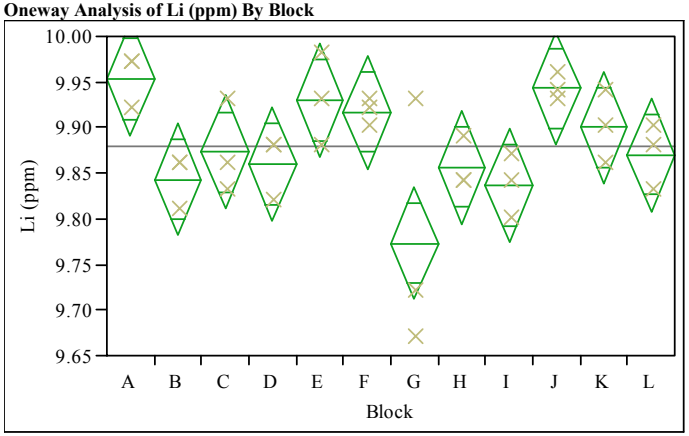
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block	11	0.8555556	0.077778	7.3684	<.0001
Error	24	0.2533333	0.010556		
C. Total	35	1.1088889			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
A	3	20.0667	0.05932	19.944	20.189
B	3	19.8333	0.05932	19.711	19.956
C	3	20.0667	0.05932	19.944	20.189
D	3	19.9333	0.05932	19.811	20.056
E	3	20.1333	0.05932	20.011	20.256
F	3	20.2000	0.05932	20.078	20.322
G	3	19.6667	0.05932	19.544	19.789
H	3	19.9333	0.05932	19.811	20.056
I	3	20.1000	0.05932	19.978	20.222
J	3	19.8000	0.05932	19.678	19.922
K	3	19.9333	0.05932	19.811	20.056
L	3	19.8000	0.05932	19.678	19.922

Std Error uses a pooled estimate of error variance

Oneway Analysis of Li (ppm) By Block



Oneway Anova
Summary of Fit

Rsquare	0.575314
Adj Rsquare	0.380666
Root Mean Square Error	0.052015
Mean of Response	9.879722
Observations (or Sum Wgts)	36

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block	11	0.08796389	0.007997	2.9557	0.0128
Error	24	0.06493333	0.002706		
C. Total	35	0.15289722			

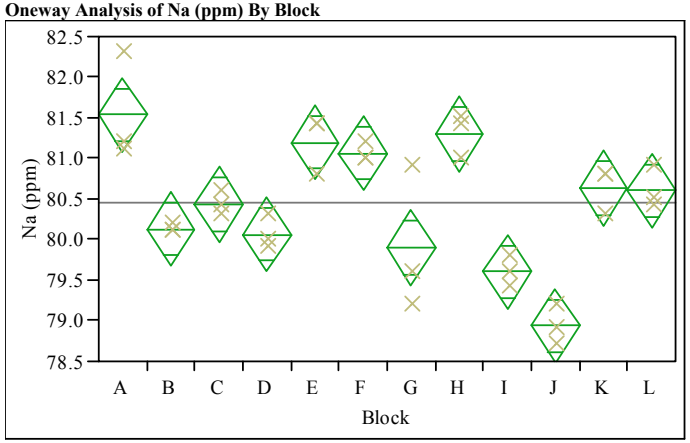
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
A	3	9.95333	0.03003	9.8914	10.015
B	3	9.84333	0.03003	9.7814	9.905
C	3	9.87333	0.03003	9.8114	9.935
D	3	9.86000	0.03003	9.7980	9.922
E	3	9.93000	0.03003	9.8680	9.992
F	3	9.91667	0.03003	9.8547	9.979
G	3	9.77333	0.03003	9.7114	9.835
H	3	9.85667	0.03003	9.7947	9.919
I	3	9.83667	0.03003	9.7747	9.899
J	3	9.94333	0.03003	9.8814	10.005
K	3	9.90000	0.03003	9.8380	9.962
L	3	9.87000	0.03003	9.8080	9.932

Std Error uses a pooled estimate of error variance

Exhibit B4. Measurements of the Multi-Element Solution Standard by ICP Block

Oneway Analysis of Na (ppm) By Block



Oneway Anova
Summary of Fit

Rsquare	0.846199
Adj Rsquare	0.775706
Root Mean Square Error	0.383333
Mean of Response	80.45
Observations (or Sum Wgts)	36

Analysis of Variance

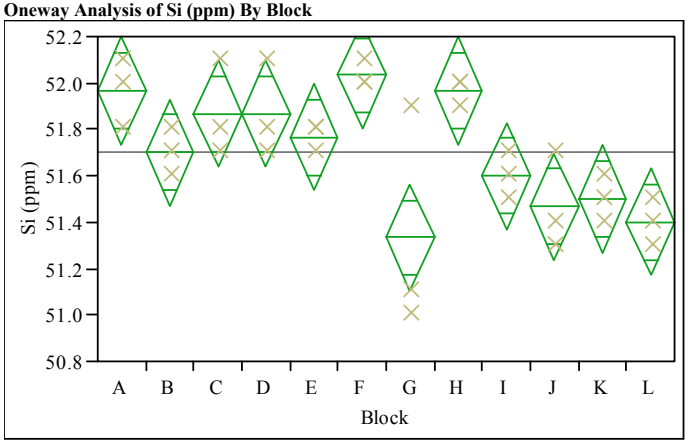
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block	11	19.403333	1.76394	12.0041	<.0001
Error	24	3.526667	0.14694		
C. Total	35	22.930000			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
A	3	81.5333	0.22132	81.077	81.990
B	3	80.1333	0.22132	79.677	80.590
C	3	80.4333	0.22132	79.977	80.890
D	3	80.0667	0.22132	79.610	80.523
E	3	81.2000	0.22132	80.743	81.657
F	3	81.0667	0.22132	80.610	81.523
G	3	79.9000	0.22132	79.443	80.357
H	3	81.3000	0.22132	80.843	81.757
I	3	79.6000	0.22132	79.143	80.057
J	3	78.9333	0.22132	78.477	79.390
K	3	80.6333	0.22132	80.177	81.090
L	3	80.6000	0.22132	80.143	81.057

Std Error uses a pooled estimate of error variance

Oneway Analysis of Si (ppm) By Block



Oneway Anova
Summary of Fit

Rsquare	0.68309
Adj Rsquare	0.53784
Root Mean Square Error	0.192931
Mean of Response	51.70556
Observations (or Sum Wgts)	36

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block	11	1.9255556	0.175051	4.7028	0.0007
Error	24	0.8933333	0.037222		
C. Total	35	2.8188889			

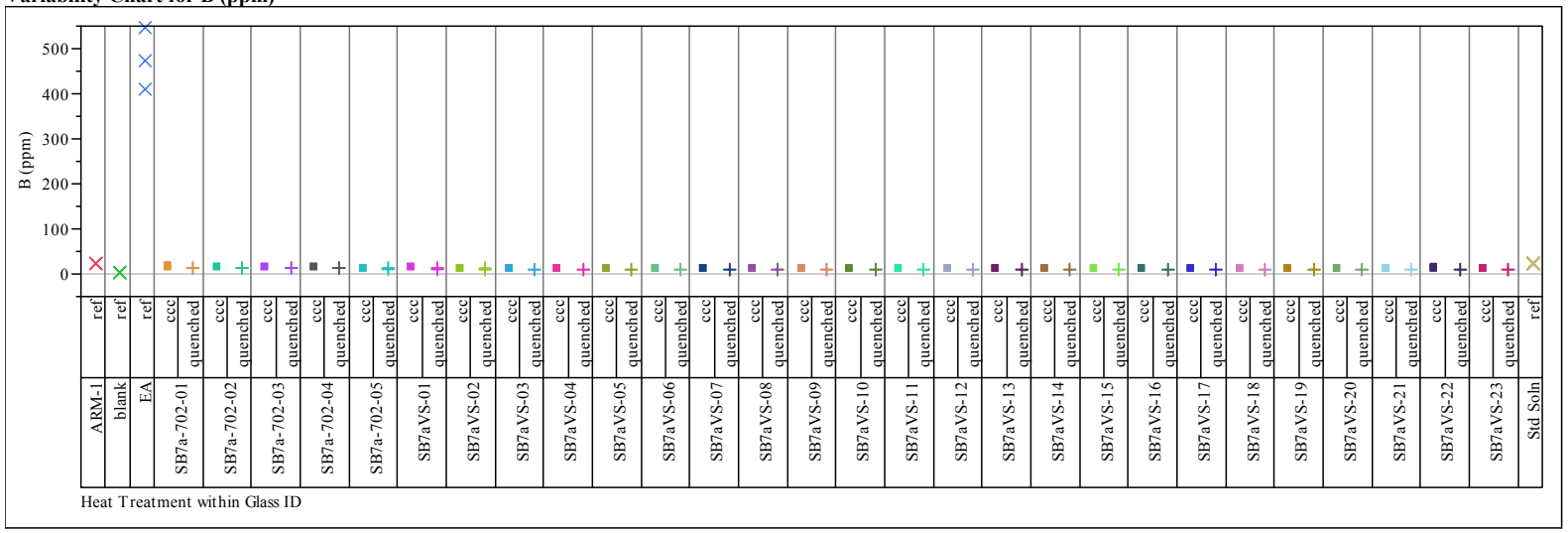
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
A	3	51.9667	0.11139	51.737	52.197
B	3	51.7000	0.11139	51.470	51.930
C	3	51.8667	0.11139	51.637	52.097
D	3	51.8667	0.11139	51.637	52.097
E	3	51.7667	0.11139	51.537	51.997
F	3	52.0333	0.11139	51.803	52.263
G	3	51.3333	0.11139	51.103	51.563
H	3	51.9667	0.11139	51.737	52.197
I	3	51.6000	0.11139	51.370	51.830
J	3	51.4667	0.11139	51.237	51.697
K	3	51.5000	0.11139	51.270	51.730
L	3	51.4000	0.11139	51.170	51.630

Std Error uses a pooled estimate of error variance

Exhibit B5. Laboratory PCT Measurements by Glass Identifier for Study Glasses and Standards

Variability Chart for B (ppm)



Variability Chart for Li (ppm)

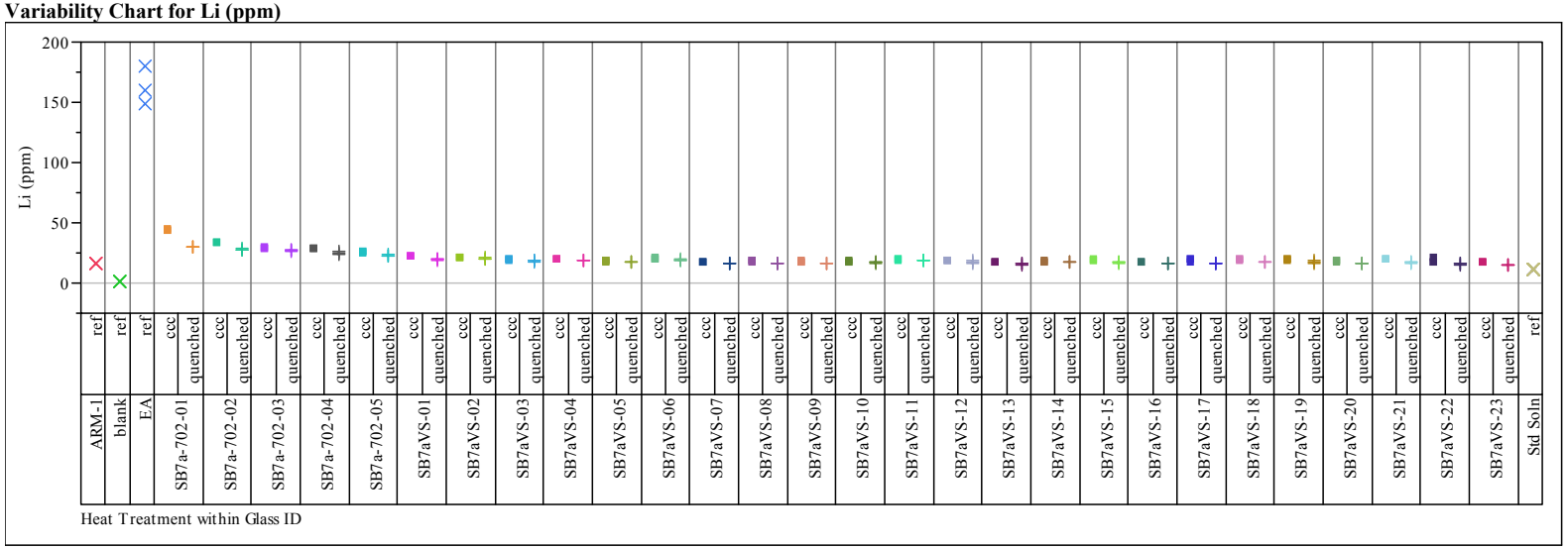
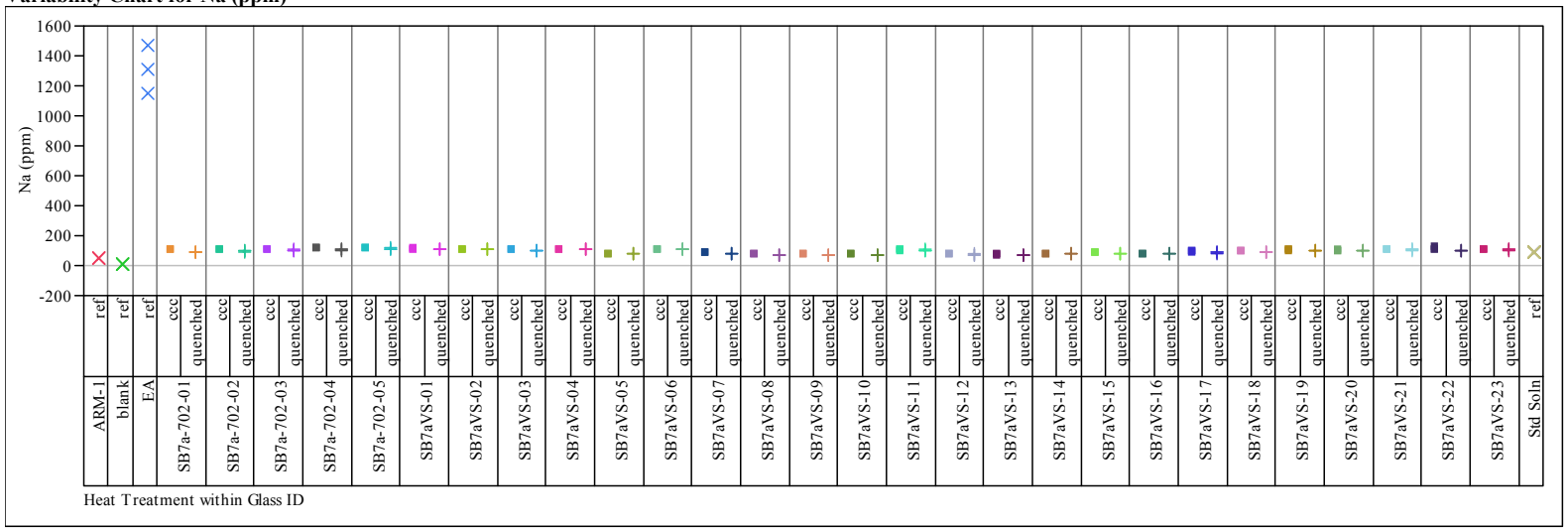


Exhibit B5. Laboratory PCT Measurements by Glass Identifier for Study Glasses and Standards

Variability Chart for Na (ppm)



Variability Chart for Si (ppm)

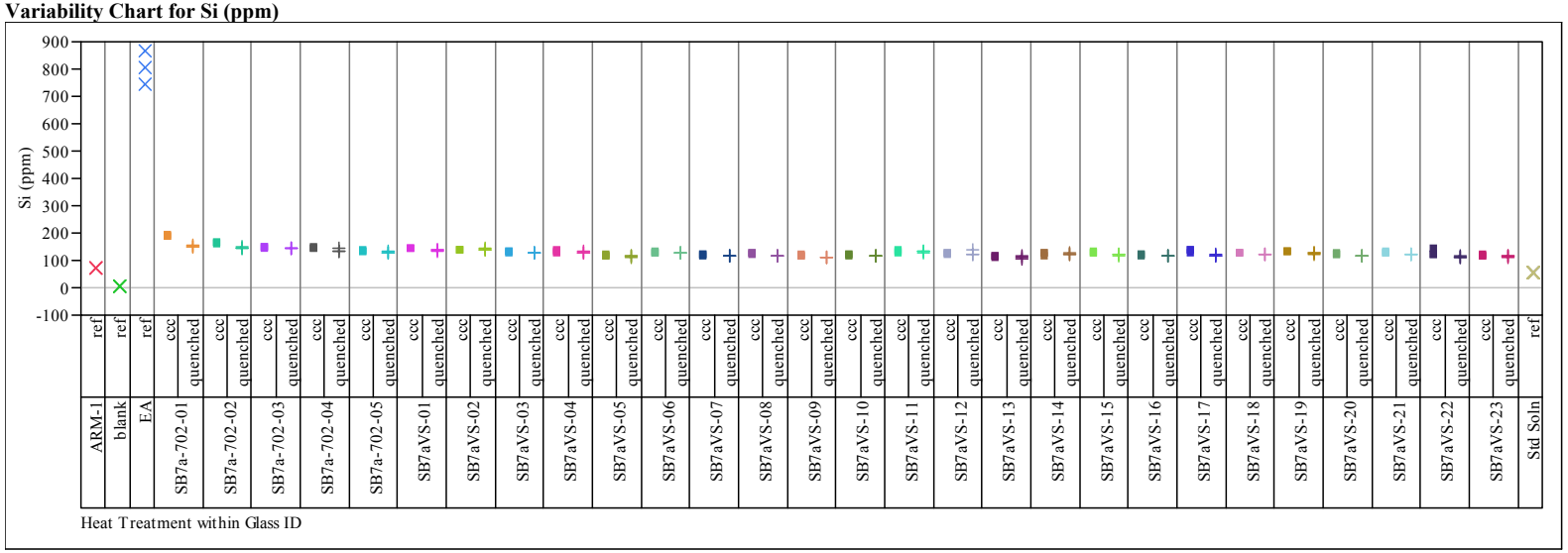
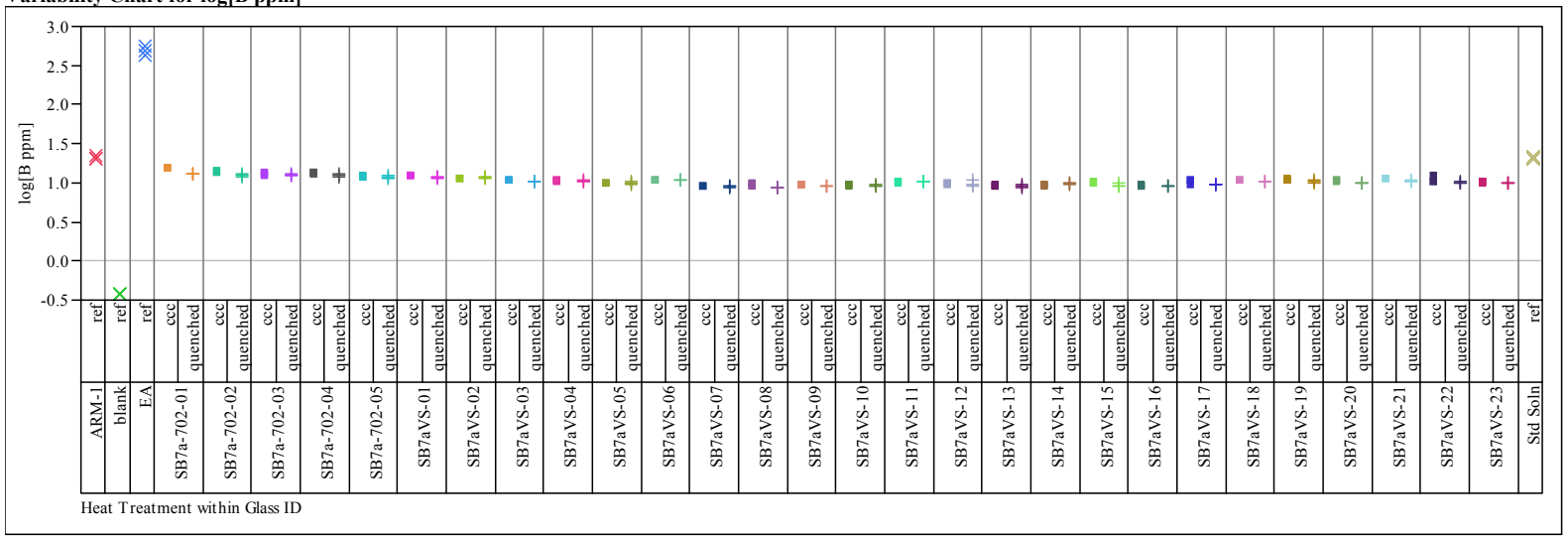


Exhibit B5. Laboratory PCT Measurements by Glass Identifier for Study Glasses and Standards

Variability Chart for log[B ppm]



Variability Chart for log[Li ppm]

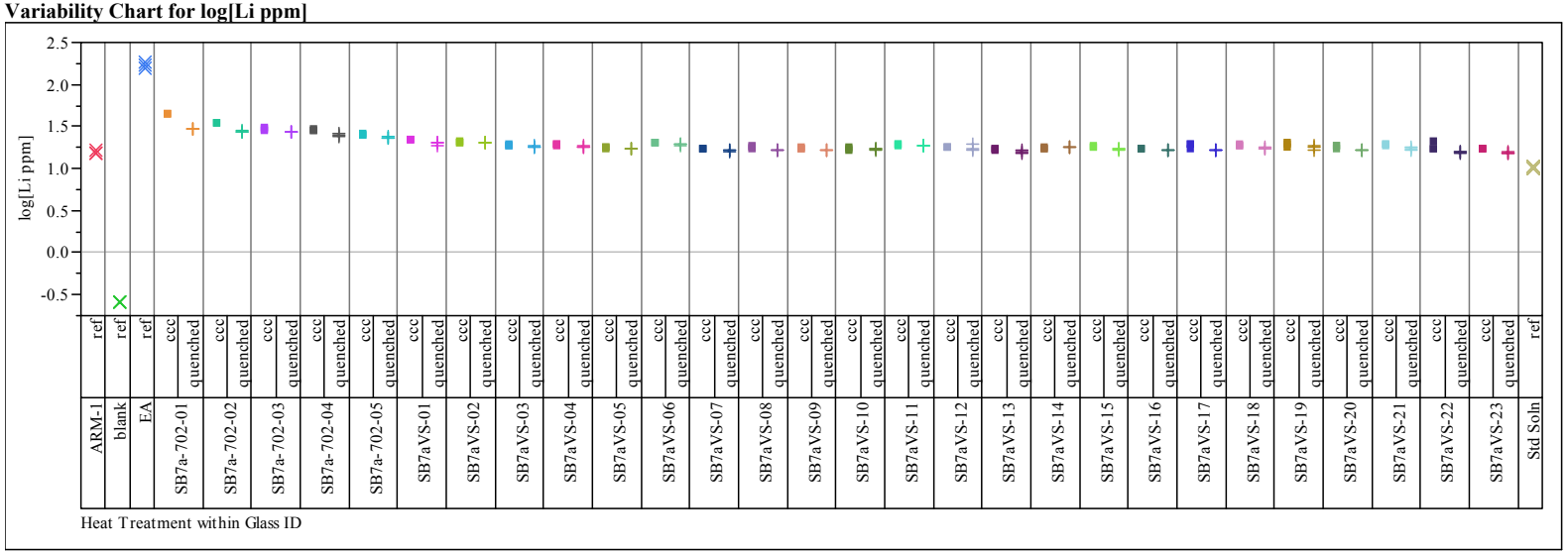
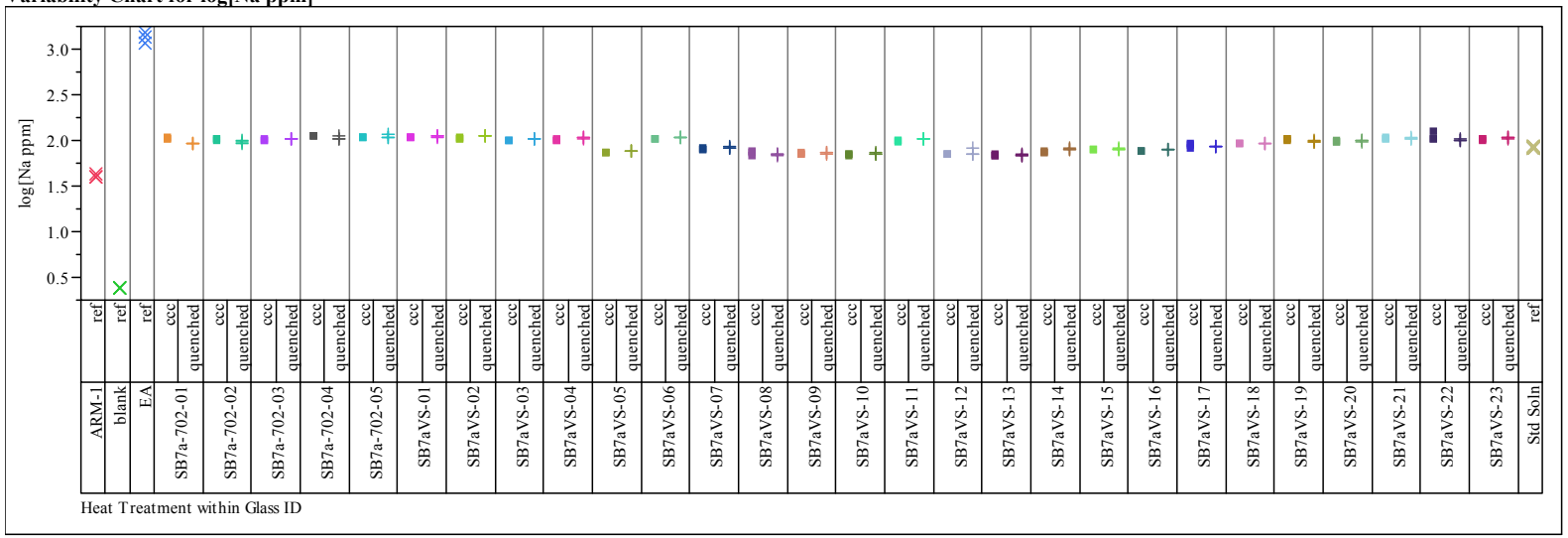


Exhibit B5. Laboratory PCT Measurements by Glass Identifier for Study Glasses and Standards

Variability Chart for log[Na ppm]



Variability Chart for log[Si ppm]

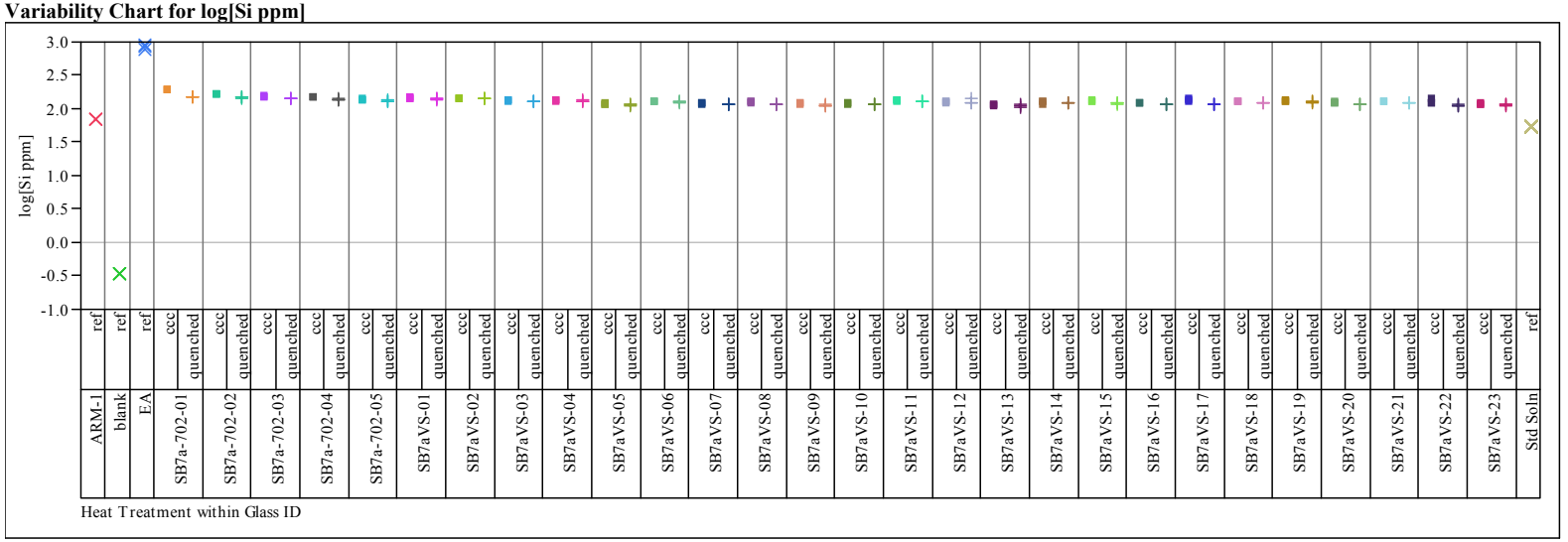


Exhibit B6. Correlations and Scatter Plots of Normalized PCTs Over Both Compositional Views and Heat Treatments for the Study and Standard Glasses

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	0.9687	0.9715	0.9594
log NL[Li(g/L)]	0.9687	1.0000	0.9370	0.9716
log NL[Na (g/L)]	0.9715	0.9370	1.0000	0.9612
log NL[Si (g/L)]	0.9594	0.9716	0.9612	1.0000

Scatterplot Matrix

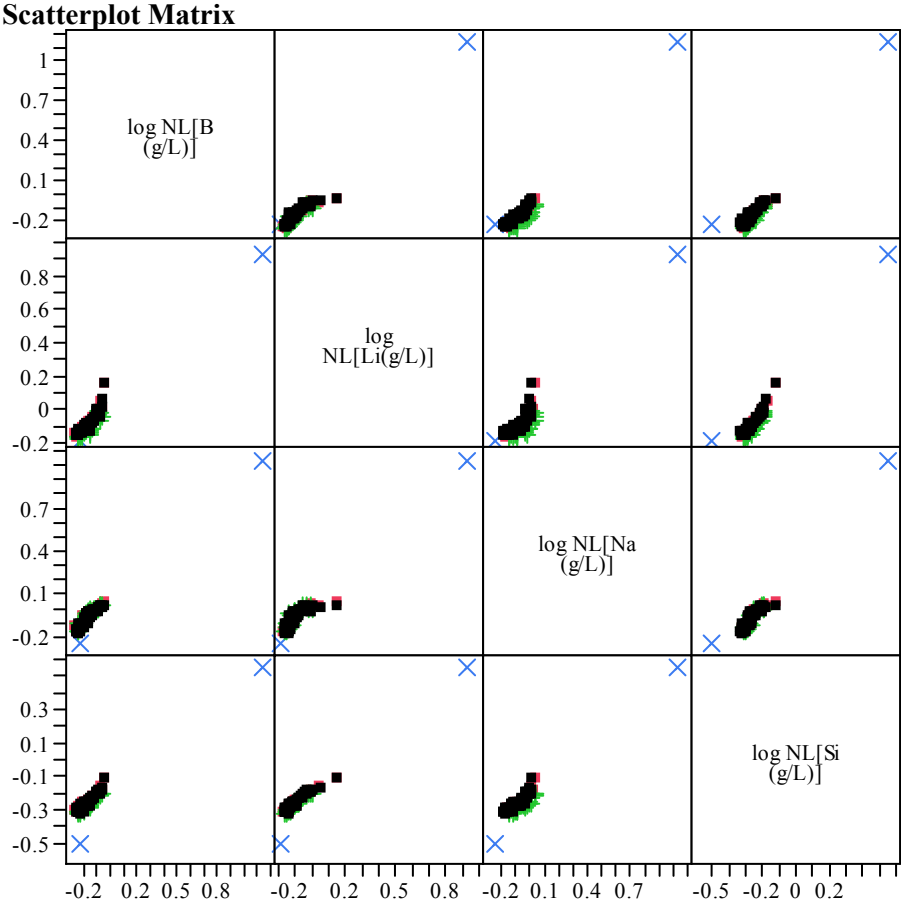
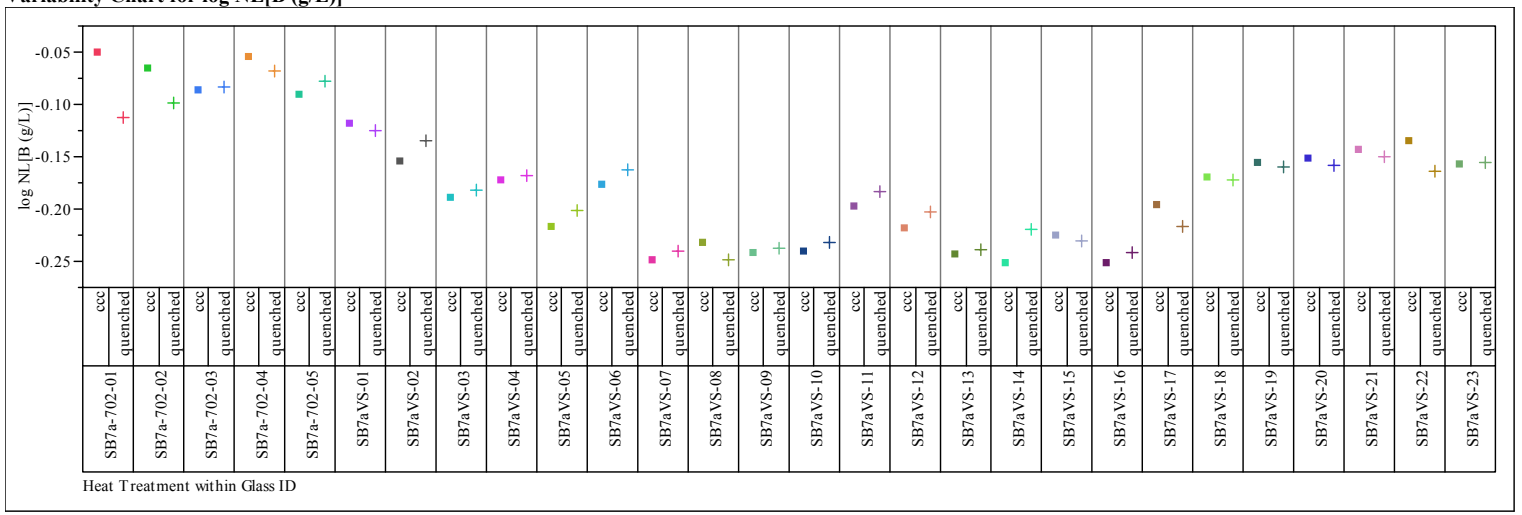


Exhibit B7. Effects of Heat Treatment for the Study Glasses by Compositional View

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



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

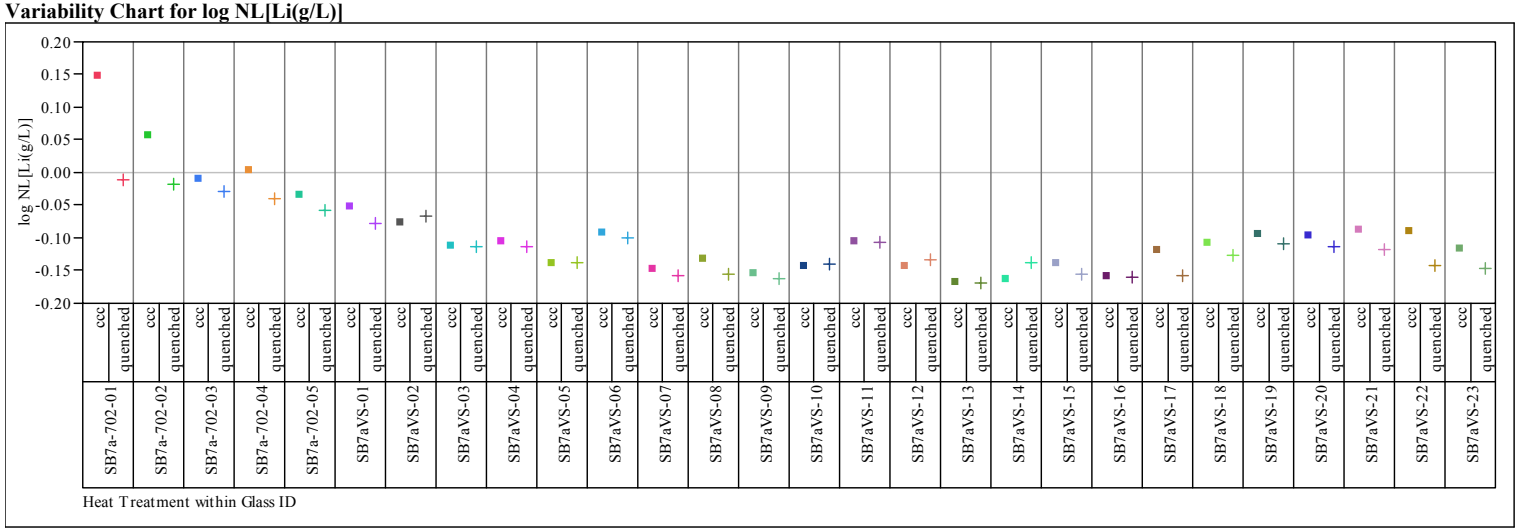
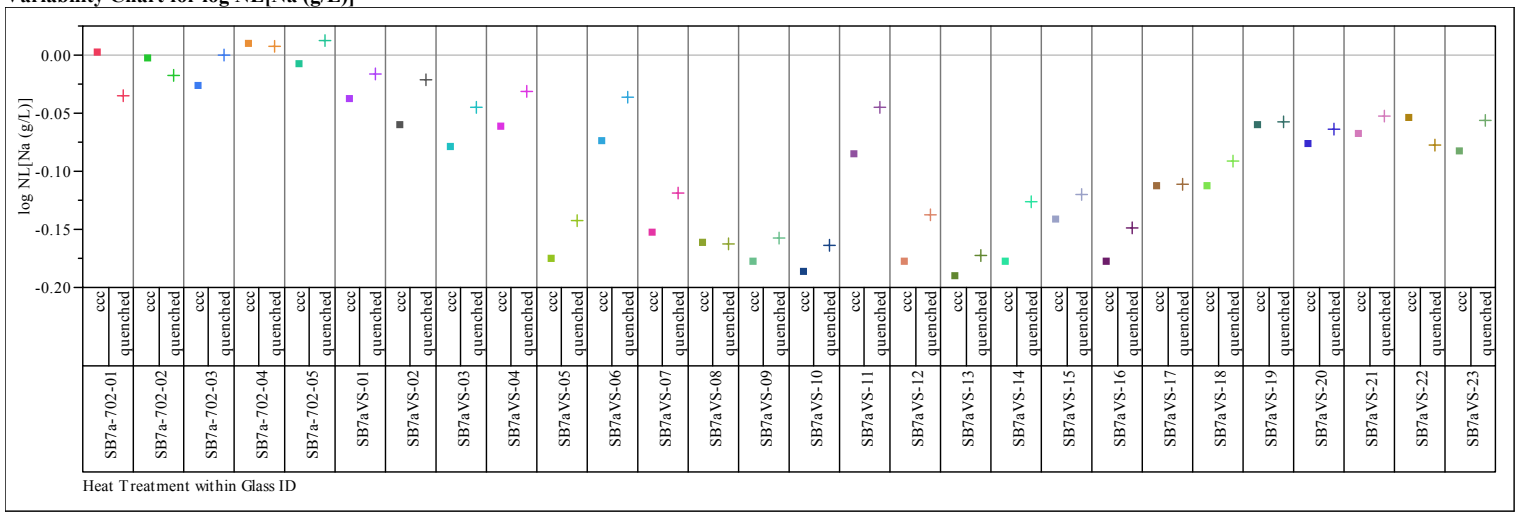


Exhibit B7. Effects of Heat Treatment for the Study Glasses by Compositional View

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



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

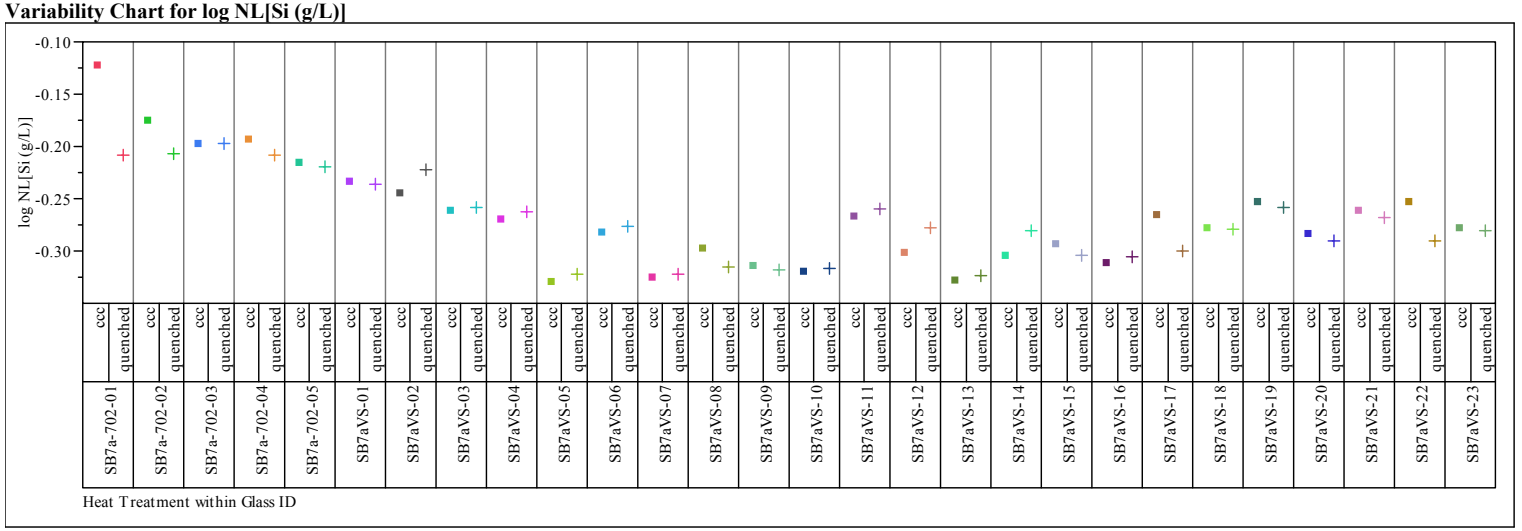
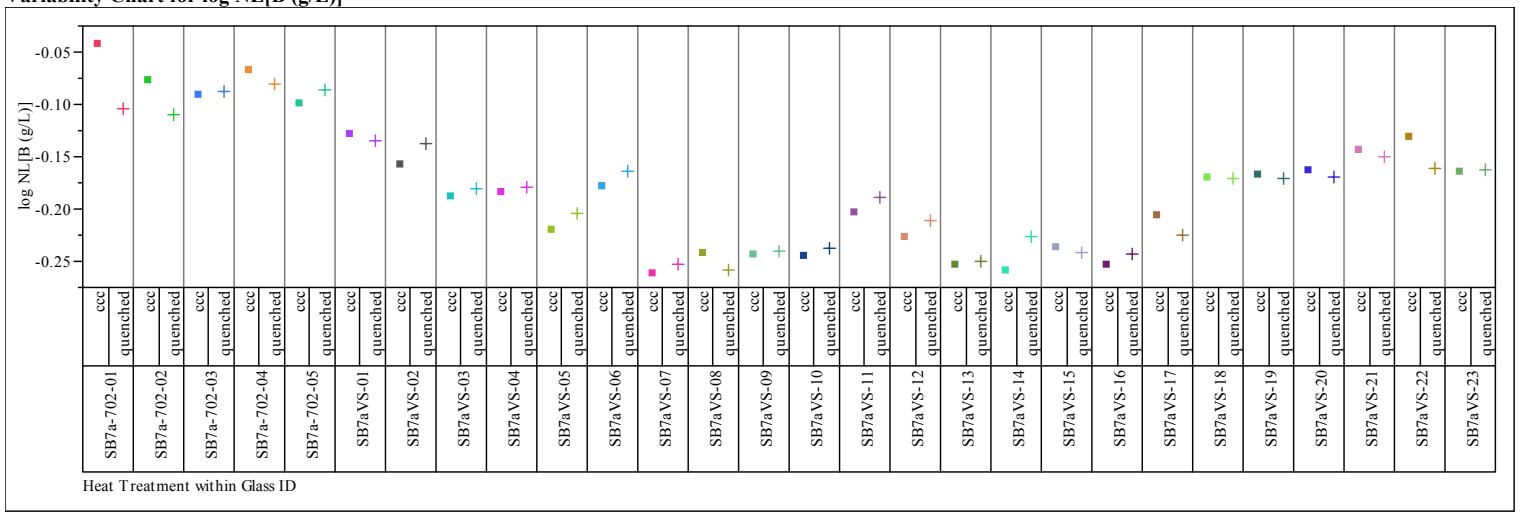


Exhibit B7. Effects of Heat Treatment for the Study Glasses by Compositional View

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



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

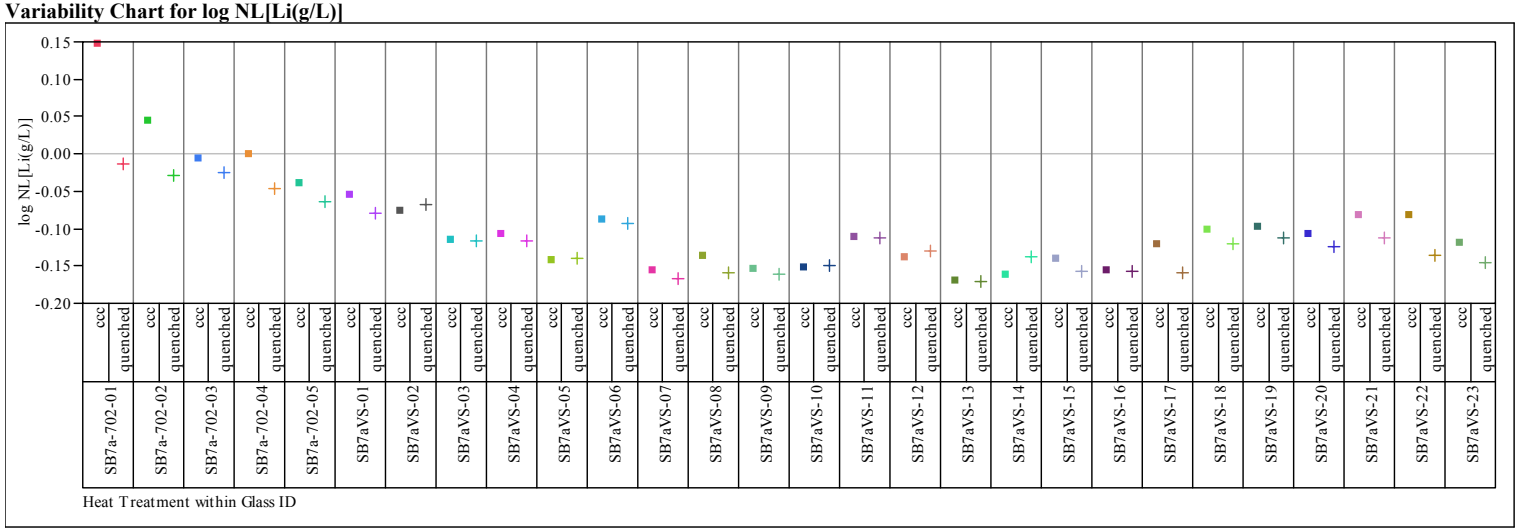
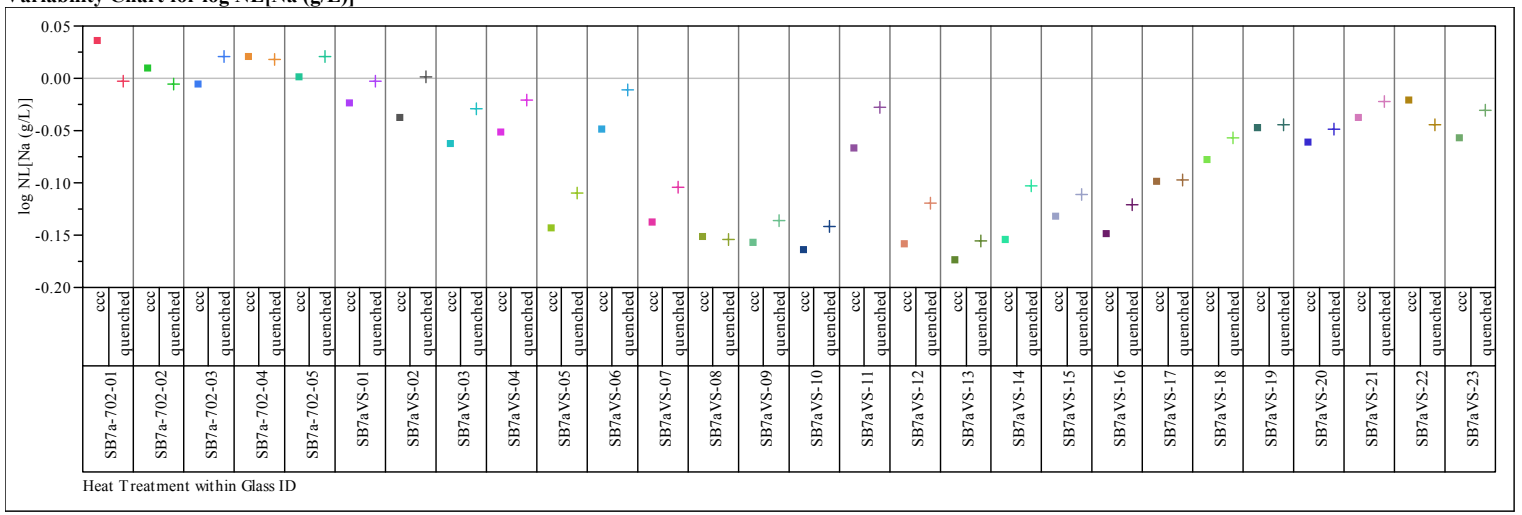


Exhibit B7. Effects of Heat Treatment for the Study Glasses by Compositional View

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



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

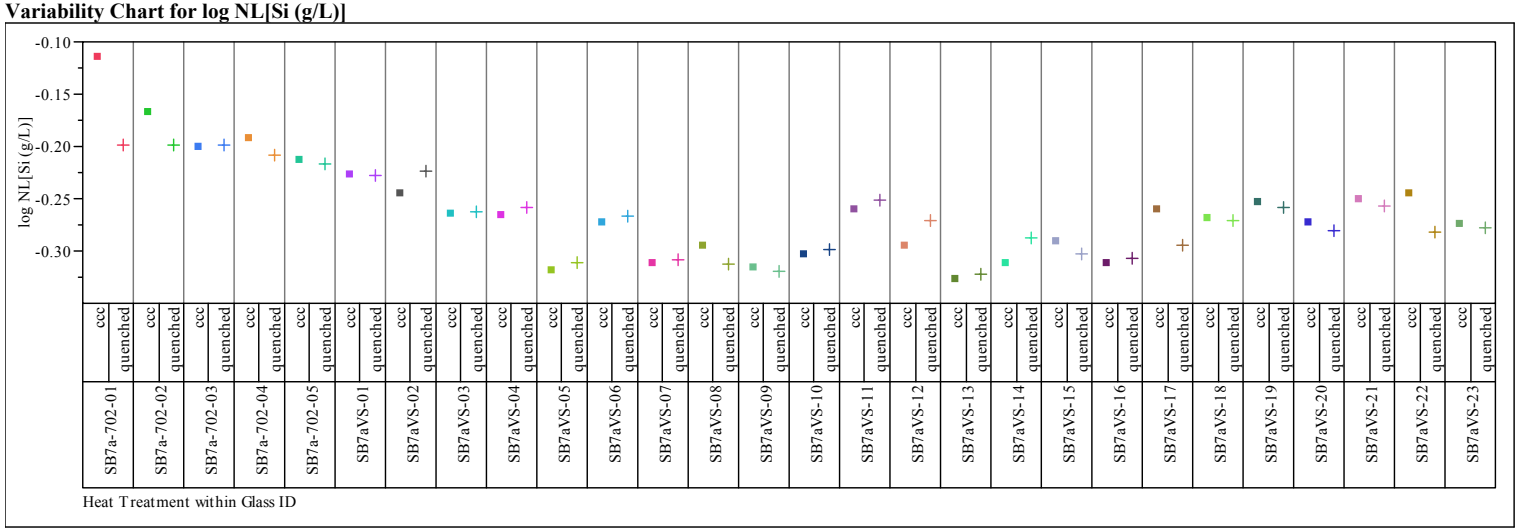


Exhibit B7. Effects of Heat Treatment for the Study Glasses by Compositional View

Exhibit B8. 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 Both Heat Treatments

Legend

Symbol	Standard/ Comp View-Heat Treatment
Z	EA
◊	ARM
▪	Frit 418 GlassesTargeted-ccc
▪	Frit 418 GlassesTargeted-quenched
Y	Frit 702 GlassesTargeted-ccc
Y	Frit 702 GlassesTargeted-quenched

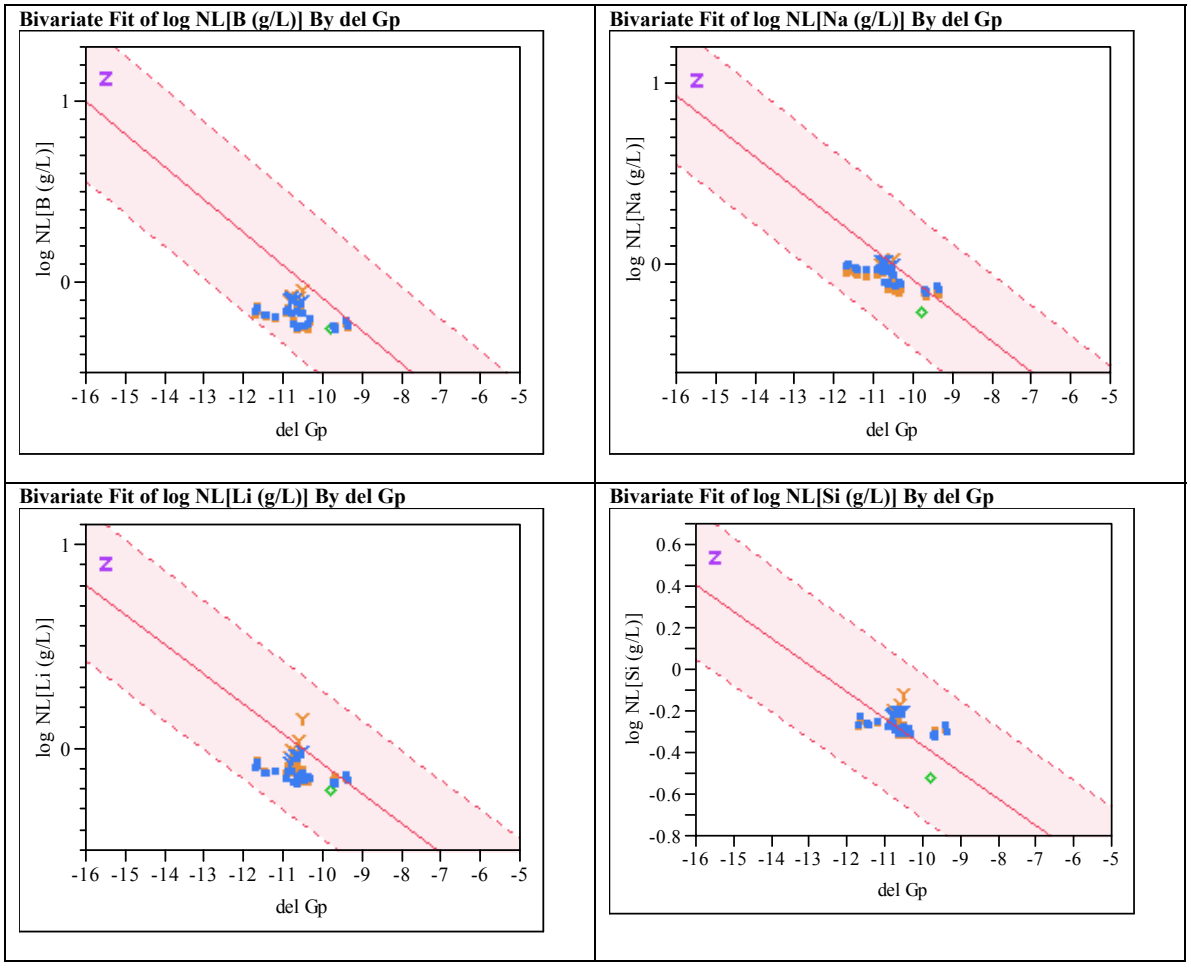
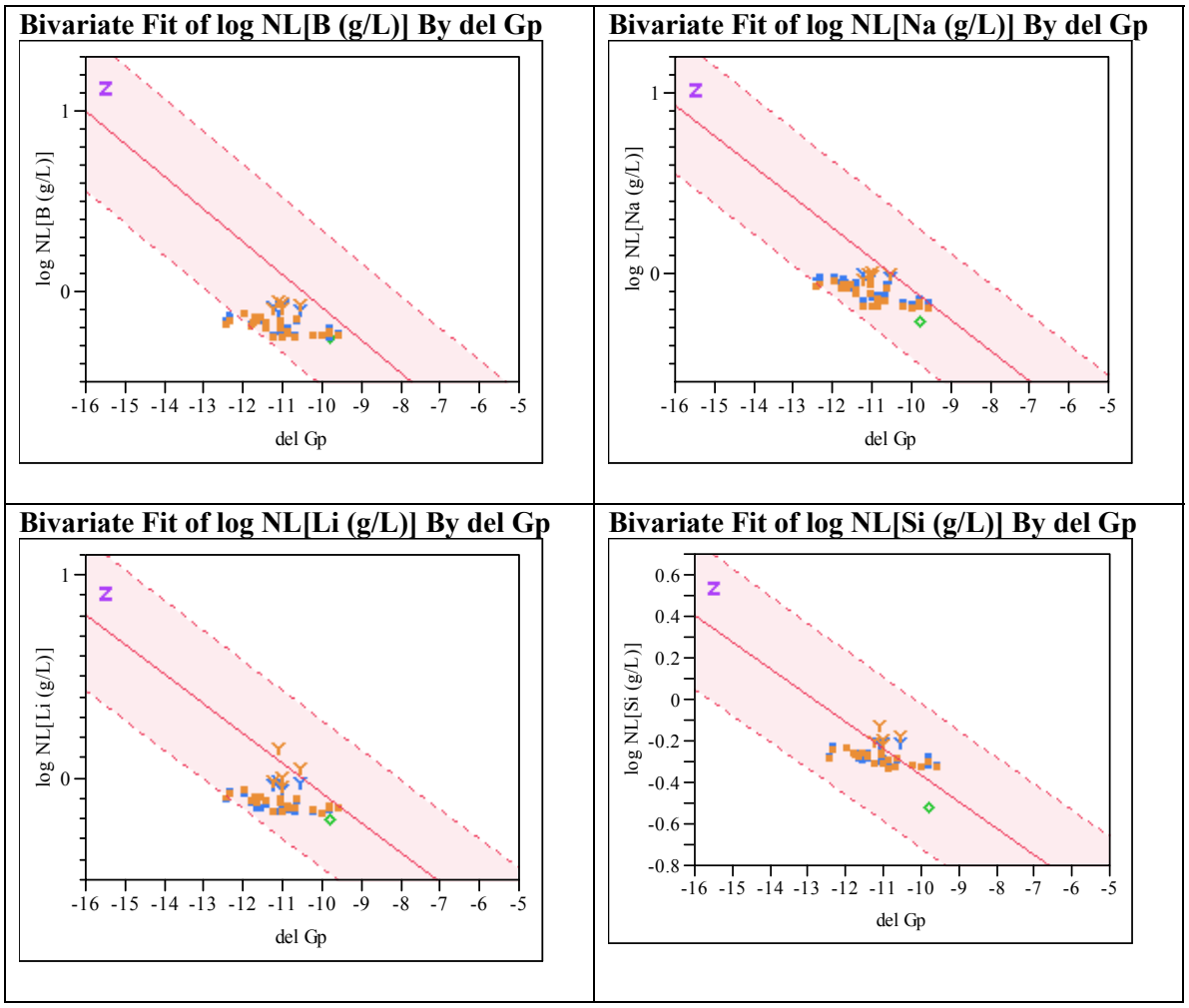


Exhibit B7. Effects of Heat Treatment for the Study Glasses by Compositional View

Exhibit B9. 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 Both Heat Treatments

Legend

Symbol	Standard/ Comp View-Heat Treatment
Z	EA
◊	ARM
▪	Frit 418 Glasses - Measured-ccc
▪	Frit 418 Glasses - Measured-quenched
Y	Frit 702 Glasses - Measured-ccc
Y	Frit 702 Glasses - Measured-quenched



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