SRNL-STI-2011-00178
Revision 0

Keywords: *SCIX, DWPF, Titanium, Glass, Durability*

Retention: *Permanent*

Impacts of Small Column Ion Exchange Streams on DWPF Glass Formulation: KT08, KT09, and KT10-Series Glass Compositions

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April 2011

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

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U.S. Department of Energy

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ACKNOWLEDGEMENTS

The authors would like to thank Irene Reamer, Phyllis Workman, Pat Simmons, Whitney Riley, David Best, Debbie Marsh, Myra Pettis, David Missimer, Beverly Wall, Mark Jones, Damon Click, and Boyd Wiedenman for their assistance with the fabrication and characterization of the glasses in this study. The authors would also like to thank Dr. David Peeler for his suggestions and helpful discussions.

EXECUTIVE SUMMARY

This report is the fourth in a series of studies of the impacts of the addition of Crystalline Silicotitanate (CST) and Monosodium Titanate (MST) from the Small Column Ion Exchange (SCIX) process on the Defense Waste Processing Facility (DWPF) glass waste form and the applicability of the DWPF process control models. MST from the Salt Waste Processing Facility (SWPF) is also considered in the study. The KT08-series of glasses was designed to evaluate any impacts of the inclusion of uranium and thorium in glasses containing the SCIX components. The KT09-series of glasses was designed to study the effect of increasing Al_2O_3 and K_2O concentrations on the propensity for crystallization of titanium containing phases in high TiO_2 concentration glasses. Earlier work on the KT05-series glasses recommended that the impact of these two components be studied further. Increased Al_2O_3 concentrations have been shown to improve the properties and performance of high waste loading glasses, and K_2O has been reported to improve the retention of TiO_2 in silicate glasses. The KT10-series of compositions was designed to evaluate any impacts of the SCIX components at concentrations 50% higher than currently projected.[a] The glasses were fabricated in the laboratory and characterized to identify crystallization, to verify chemical compositions, to measure viscosity, and to measure durability. Liquidus temperature measurements for the KT10-series glasses are underway and will be reported separately.

All but one of the KT08-series glasses were found to be amorphous by X-ray diffraction (XRD). One of the slowly cooled glasses contained a small amount of trevorite, which had no practical impact on the durability of the glass and is typically found in DWPF-type glasses. The measured Product Consistency Test (PCT) responses for the KT08-series glasses are well predicted by the DWPF models. The viscosities of the KT08-series glasses were generally well predicted by the DWPF model. No unexpected issues were encountered when uranium and thorium were added to the glasses with SCIX components.

Increased Al_2O_3 concentrations were not successful in preventing the formation of iron titanate crystals in the KT09-series glasses. Increased K_2O concentrations were successful in hindering the formation of iron titanates in some of the glasses after the canister centerline cooled (CCC) heat treatment. However, this result did not apply to all of the CCC versions of the glasses, indicating a compositional dependence of this effect. In addition, high concentrations of K_2O have been shown to hinder the ability of the DWPF durability and viscosity models to predict the performance of these glasses. The usefulness of increased K_2O concentrations in preventing the formation of iron titanates may therefore be limited. Further characterization was not performed for the KT09-series glasses since the type of crystallization formed was the characteristic of interest for these compositions.

All of the KT10-series glasses were XRD amorphous, regardless of heat treatment. Chemical composition measurements showed that the glasses met the targeted concentrations for each oxide. In general, the measured PCT responses of the KT10-series glasses were well predicted by the DWPF models. The measured, normalized release values for silicon for some of the glasses fell above the 95% confidence interval for the predicted values; however, the PCT responses for these glasses remain considerably lower than that of the benchmark Environmental Assessment (EA) glass. The viscosities of the KT10-series glasses were generally well predicted by the DWPF model.

[a] The earlier KT04-series glasses were designed using the projected SCIX component concentrations.

The next step in this study will be to compile all of the data developed and further compare the measured properties and performance with those predicted by the current DWPF Product Composition Control System (PCCS) models. Recommendations will then be made as to which models, if any, may need to be modified in order to accommodate the material from SCIX into DWPF glass production.

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
ARM	Approved Reference Material
BSE	Back Scattered Electron
CCC	Canister Centerline Cooled
CH	Cesium Hydroxide
CST	Crystalline Silicotitanate
DWPF	Defense Waste Processing Facility
EA	Environmental Assessment
EDS	Energy Dispersive Spectroscopy
HLW	High Level Waste
ICP-AES	Inductively Coupled Plasma – Atomic Emission Spectroscopy
LM	Lithium Metaborate
MAR	Measurement Acceptability Region
MST	Mono Sodium Titanate
PCCS	Product Composition Control System
PCT	Product Consistency Test
PF	Peroxide Fusion
RMF	Rotary Micro Filter
SCIX	Small Column Ion Exchange
SEM	Scanning Electron Microscopy
SRAT	Sludge Receipt and Adjustment Tank
SRNL	Savannah River National Laboratory
SRS	Savannah River Site
SWPF	Salt Waste Processing Facility
Ustd	Uranium Standard Glass
XRD	X-ray Diffraction

1.0 Introduction

1.1 Background

The Savannah River Site (SRS) Liquid Waste contractor will begin a process referred to as Small Column Ion Exchange (SCIX) to disposition salt solution in fiscal year 2014. In the first step of the process, salt solution retrieved from various waste tanks will be struck with Monosodium Titanate (MST) to remove key actinides and Sr. The salt solution will then be processed using Rotary Micro Filtration (RMF) to remove the MST and any insoluble solids. The MST and insoluble solids will accumulate on the bottom of Tank 41. The filtrate from RMF will be fed to ion exchange columns, also in Tank 41, to remove the ^{137}Cs using Crystalline Silicotitanate (CST) resin. The decontaminated salt solution from SCIX will be sent to the Saltstone Facility for immobilization in grout. The ^{137}Cs-laden CST resin will be sluiced and ground for particle size reduction, then sent to the Defense Waste Processing Facility (DWPF) for immobilization in glass. These processes mirror the current disposition paths for streams associated with the Salt Waste Processing Facility (SWPF), which is under construction and will run concurrently with SCIX.

The MST and insoluble solids from Tank 41 will periodically be transferred to a sludge batch preparation tank (e.g., Tank 42 or Tank 51) as part of the High Level Waste (HLW) sludge batch preparation process for DWPF. The ground, ^{137}Cs-laden CST material (hereafter referred to simply as CST) from SCIX will be periodically transferred to Tank 40 prior to being processed at DWPF. Periodic additions of CST to Tank 40 would result in a changing composition of each sludge batch as it is processed since Tank 40 serves as the feed tank for the DWPF. Work is currently in progress to determine the feasibility of dropping the ground CST into Tank 41. If ground CST can be dropped into Tank 41 (depending on heat loading issues, among others), the CST would be sent to Tank 42 or Tank 51 using an existing transfer line. Therefore, the studies of SCIX impacts on DWPF glass formulation will encompass scenarios where the CST is sent to either Tank 40 or a sludge batch preparation tank. MST from the SWPF is also considered in the study.

This work was initiated by a DWPF Technical Task Request[1] and was performed following a Task Technical and Quality Assurance Plan.[2]

1.2 Potential Impacts of SCIX on DWPF Glass Formulation

The MST and CST from the SCIX process will significantly increase the concentrations of Nb_2O_5, TiO_2, and ZrO_2 in the DWPF feed. Other constituents of MST and CST – Na_2O and SiO_2 – are already present in high concentrations in DWPF glass; thus their influences are well understood. The increased concentrations of Nb_2O_5, TiO_2, and ZrO_2 will likely have some impact on the properties and performance of the DWPF glass product. Properties such as the liquidus temperature, viscosity, and rate of melting of the glass may be impacted. The performance of the glass, particularly its chemical durability as it pertains to repository acceptance requirements, may also be impacted. The DWPF uses a set of semi-empirical and first-principles models referred to as the Product Composition Control System (PCCS)[3] to predict the properties and performance of a glass based on its composition since it is not possible to measure these attributes during processing. The objective of this study is to evaluate the impacts of the SCIX streams on the properties and performance of the DWPF glass product and on the applicability of the current process control models.

This report is part of a series of studies on the potential impacts of SCIX on DWPF glass. Fox and Edwards performed a paper study evaluation using updated projections for sludge batch compositions and SCIX CST and MST addition rates.[4] This study found that, as a result of the updated composition projections, several viable options were predicted to be available for incorporation of the SCIX streams into either Tank 40 or a sludge batch preparation tank. Transfer of the CST to a sludge batch preparation tank was the preferred option since it allowed more compositional flexibility for frit optimization while maintaining sufficient projected operating windows. The report again identified several assumptions and limitations associated with the current PCCS models, and recommended that these be further evaluated.

The first report on experimental results in this series covered glass compositions identified as the KT01, KT02, KT03, and KT04-series.[5] The results presented in that report showed a reasonable ability to incorporate the anticipated SCIX streams into the DWPF-type glass compositions studied, with TiO_2 concentrations of 4-5 wt % in glass. The durability and viscosity models satisfactorily predicted the measured values for the study glasses with the exception of a small number of extreme compositions. It was shown that the liquidus temperature model may need to be adjusted to correctly predict the liquidus temperatures of glasses including the SCIX streams based on the data measured.

The second report on experimental results in this series covered compositions identified as the KT05 and KT06-series.[6] The KT05-series glasses were selected, fabricated, and characterized as a more fundamental study of glass compositions where iron titanate crystals had been previously found to form during a study of high waste loading glasses for future DWPF processing.[7] These glasses contained high TiO_2 concentrations, but may be outside the compositional region that is directly of interest to DWPF. Formation of these crystalline phases in these glasses was confirmed. However, the glass compositions from which these phases formed are different from the current projections for SCIX incorporation into DWPF sludge batches. Increased Na_2O concentrations had little if any impact on reducing the propensity for the formation of the iron titanate crystalline phases. The KT06-series glasses were selected, fabricated, and characterized to further study glass compositions that, while broader than the current projections for DWPF feeds with SCIX material, are potential candidates for future processing (i.e., the compositions are acceptable for processing by the PCCS with the exception of the current TiO_2 concentration constraint). Several of the KT06-series compositions had durability values that, while acceptable, were not well predicted by the current durability models. It was shown that for these high TiO_2 concentration glasses, relatively high Fe_2O_3 concentrations combined with relatively high Al_2O_3 concentrations led to durabilities that were unpredictable. Similar Product Consistency Test (PCT) responses (e.g., durability values that are acceptable but not predictable) have been observed in other DWPF studies.[8-10] Several of the KT06-series glasses also had measured viscosity values that were not well predicted by the current model. A statistical partitioning routine showed that the measured viscosities became unpredictable by the current model when the Fe_2O_3 concentration in the glasses was less than about 8.2 wt % and TiO_2 concentrations were high. The current durability and viscosity models will have to be further evaluated should compositions in these regions become necessary for DWPF processing. Overall, the results for the KT05 and KT06-series glasses continued to show a reasonable ability to incorporate the anticipated SCIX streams into the DWPF-type glass compositions studied, with TiO_2 concentrations of approximately 6 wt % in glass.

The third report on experimental results in this series covered compositions identified as the KT07-series, which were selected to evaluate any potential impacts of the addition of noble metals.[11] Noble metals can act as nucleation sites in glass melts, leading to enhanced crystallization. This crystallization can potentially influence the properties and performance of the glass, such as chemical durability, viscosity, and liquidus temperature. All of the KT07-series glasses, both quenched and slowly cooled, were found to be amorphous by X-ray diffraction

(XRD). Chemical composition measurements showed that all of the glasses met their targeted compositions. The PCT results showed that all of the glasses had chemical durabilities that were far better than that of the Environmental Assessment (EA) benchmark glass. The measured PCT responses were well predicted by the current DWPF PCCS durability models. The measured viscosity values for each KT07-series glass were acceptable for DWPF processing and were well predicted by the current PCCS model. Overall, the results showed that the inclusion of relatively high concentrations of noble metals (in terms of expected values for a DWPF sludge batch) had no significant impact on the properties and performance of these glass compositions. Liquidus temperature measurements are still underway for these glasses and there may be an impact of the noble metals on those measurements. However, no adverse effects were noted in terms of crystallization after slow cooling.

The present report discusses the fabrication and characterization of the KT08, KT09, and KT10-series glass compositions. As will be described below, these glasses were selected to evaluate the potential impacts of incorporating uranium and thorium (KT08-series), the influence of compositional modifications on glasses known to crystallize titanium-containing phases (KT09-series), and the impacts of higher than projected concentrations of the SCIX streams on glass properties and performance (KT10-series).

2.0 Experimental Procedure

2.1 Selection of Glass Compositions

2.1.1 *KT08-Series*

The KT08-series of compositions was selected to evaluate any impacts of the inclusion of uranium and thorium in glasses with the SCIX components. While the composition projections for the sludge batches with SCIX additions included uranium and thorium,[4] these components have been removed from the glasses fabricated for the experimental studies completed to date[5,6,11] in order to minimize exposure to radioactivity. Several variability studies performed at the Savannah River National Laboratory (SRNL) in support of frit optimization for DWPF processing have shown that the properties of glasses fabricated with uranium and thorium are unlikely to differ significantly from those of their non-radioactive counterparts.[10,12-14] The KT08-series glasses were selected to further confirm these findings when the SCIX components are included, as well as to determine whether changes in the amounts of the non-radioactive components in the glass (as a function of the total glass composition) have any significant impacts on the properties or performance of the glass.

The basis for the KT08-series compositions was a series of projections of individual sludge batches incorporating the SCIX streams. These projections were very similar to those provided in the earlier paper study report,[4] with minor refinements.[a] Composition projections for sludge batches 8 through 17 were used,[15] and CST additions to Tank 40 were projected at the accelerated DWPF processing rate of 75 Sludge Receipt and Adjustment Tank (SRAT) batches per year (including MST) with the SWPF streams added. The final SRAT batch composition for each sludge batch was used, since these cases represent the maximum concentrations of CST in the sludge. The resulting ten sludge composition projections are given in Table 2-1. Each projection is identified by the relevant sludge batch and SRAT batch number.

[a] The projected number of SRAT batches required to process each sludge batch was used for all composition calculations rather than using a fixed value of 75 SRAT batches in some instances, which resulted in minor changes to the projected compositions.

Table 2-1. Projected Compositions (wt %) of the Final SRAT Batches of Sludge Batches 8 through 17, Including SCIX Streams, Used to Develop the KT08 Glass Compositions.

Oxide	SB08-69	SB09-79	SB10-80	SB11-70	SB12-71	SB13-66	SB14-74	SB15-91	SB16-38	SB17-35
Al_2O_3	14.25	12.68	10.85	12.29	17.00	17.86	12.51	10.96	12.14	12.51
BaO	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
CaO	2.30	2.31	2.32	2.12	2.32	2.43	1.98	1.76	2.11	2.16
Ce_2O_3	0.70	0.70	0.62	0.53	0.35	0.27	0.17	0.17	0.44	0.54
Cr_2O_3	0.22	0.22	0.22	0.22	0.33	0.33	0.33	0.22	0.22	0.23
CuO	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.10
Fe_2O_3	29.72	28.22	27.86	30.08	23.87	22.28	20.88	19.97	27.31	30.27
K_2O	0.09	0.09	0.09	0.09	0.18	0.27	0.18	0.18	0.18	0.09
La_2O_3	0.26	0.18	0.18	0.18	0.18	0.09	0.09	0.09	0.18	0.18
MgO	0.37	0.37	0.37	0.38	0.38	0.25	0.25	0.25	0.25	0.26
MnO	4.73	4.17	4.37	2.64	2.54	2.93	1.64	2.10	1.27	0.90
Na_2O	25.08	27.05	27.47	26.69	26.56	26.30	25.62	27.15	24.50	23.42
Nb_2O_5	2.54	2.68	2.66	2.61	2.67	2.53	2.66	2.83	1.88	1.75
NiO	0.86	0.48	0.77	0.39	0.29	0.39	1.42	1.32	1.15	1.08
PbO	0.40	0.32	0.32	0.24	0.16	0.16	0.16	0.16	0.33	0.33
SiO_2	3.43	4.68	5.15	6.74	8.08	7.96	6.55	5.72	3.04	2.31
ThO_2	0.43	1.54	2.14	0.60	0.00	0.00	0.00	0.00	0.00	0.00
TiO_2	10.67	10.69	10.64	10.91	11.03	10.80	10.79	10.79	10.72	10.04
U_3O_8	1.41	0.80	1.16	0.54	1.25	2.32	11.97	13.54	12.13	11.87
ZnO	0.00	0.09	0.09	0.19	0.09	0.19	0.19	0.09	0.09	0.10
ZrO_2	2.27	2.47	2.46	2.32	2.46	2.36	2.35	2.47	1.78	1.70

Note that the sludge projections did not include sulfate concentrations; therefore, a SO_4^{2-} concentration of 1.0 wt % was assumed for each sludge batch. Noble metals are not typically tracked in sludge batch projections, although they may play some role in determining the properties and performance of the glass. Therefore, the noble metals Ag, Pd, Rh, and Ru, along with SO_4^{2-}, were added to the sludge compositions, followed by a normalization of the remaining components to 100 wt %.[a] The concentrations of the noble metals were obtained from recent measurements of Sludge Batch 6 (on a total solids basis), which was considered to contain a high concentration of noble metals.[16] The targeted concentrations for these metals as oxides in sludge are given in Table 2-2.

Table 2-2. Targeted Noble Metals Concentrations (in Sludge) for the KT08-Series Glasses.

Metal	(wt %)
Ag_2O	0.016
PdO	0.008
Rh_2O_3	0.02
RuO_2	0.14

A single frit composition was identified that produced a PCCS Measurement Acceptability Region (MAR) acceptable glass at a targeted waste loading of 40 wt % with each of the sludge composition projections given in Table 2-1. The composition of this frit, which was labeled Frit 0607, is given in Table 2-3. Each of the sludge compositions with SO_4^{2-} and noble metal oxides added was then combined with Frit 0607 at a waste loading of 40 wt % to give the targeted glass compositions for the KT08-series shown in Table 2-4.

Table 2-3. Composition of Frit 0607 (wt %).

B_2O_3	Li_2O	Na_2O	SiO_2
10	6	5	79

[a] Note that this method of including the noble metals does not account for the portion of the sludge volume that consists of MST and CST from SCIX. In other words, this method does not account for dilution of the concentrations of noble metals by the addition of the SCIX streams; therefore, additional conservatism is included.

Table 2-4. Targeted Compositions (wt %) for the KT08-Series Glasses.

Oxide	KT08-01	KT08-02	KT08-03	KT08-04	KT08-05	KT08-06	KT08-07	KT08-08	KT08-09	KT08-10
Ag_2O	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Al_2O_3	5.632	5.011	4.289	4.858	6.720	7.060	4.947	4.333	4.798	4.944
B_2O_3	5.999	5.999	5.999	5.999	5.999	5.999	5.999	5.999	5.999	5.999
BaO	0.066	0.066	0.066	0.067	0.067	0.067	0.066	0.065	0.067	0.068
CaO	0.910	0.913	0.916	0.837	0.919	0.962	0.783	0.695	0.835	0.855
Ce_2O_3	0.277	0.278	0.244	0.210	0.140	0.105	0.069	0.068	0.175	0.215
Cr_2O_3	0.086	0.087	0.087	0.087	0.131	0.131	0.129	0.085	0.087	0.089
CuO	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.038
Fe_2O_3	11.751	11.156	11.015	11.890	9.435	8.808	8.255	7.895	10.798	11.965
K_2O	0.036	0.036	0.036	0.036	0.072	0.108	0.071	0.070	0.072	0.037
La_2O_3	0.104	0.070	0.070	0.070	0.070	0.035	0.035	0.034	0.070	0.072
Li_2O	3.599	3.599	3.599	3.599	3.599	3.599	3.599	3.599	3.599	3.599
MgO	0.147	0.148	0.148	0.149	0.149	0.099	0.098	0.097	0.099	0.101
MnO	1.871	1.648	1.729	1.043	1.003	1.159	0.647	0.830	0.501	0.355
Na_2O	12.915	13.695	13.859	13.549	13.498	13.398	13.130	13.731	12.685	12.259
Nb_2O_5	1.006	1.059	1.052	1.031	1.055	0.999	1.050	1.119	0.742	0.692
NiO	0.339	0.189	0.303	0.152	0.114	0.152	0.562	0.521	0.456	0.428
PbO	0.159	0.128	0.128	0.097	0.064	0.064	0.063	0.063	0.129	0.132
PdO	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Rh_2O_3	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
RuO_2	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058
SiO_2	48.749	49.241	49.428	50.057	50.585	50.541	49.982	49.652	48.595	48.305
SO_4^{2-}	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400
ThO_2	0.168	0.608	0.846	0.238	0.000	0.000	0.000	0.000	0.000	0.000
TiO_2	4.217	4.228	4.207	4.312	4.361	4.271	4.266	4.264	4.239	3.970
U_3O_8	0.559	0.315	0.457	0.212	0.494	0.919	4.734	5.351	4.797	4.691
ZnO	0.000	0.037	0.037	0.074	0.037	0.074	0.073	0.036	0.037	0.038
ZrO_2	0.896	0.976	0.971	0.917	0.974	0.933	0.928	0.977	0.705	0.672

2.1.2 *KT09-Series*

A recent study of high waste loading glasses for enhanced melter throughput identified glass compositions with relatively high TiO_2 concentrations (5.7-6.0 wt %) that formed iron titanate crystalline phases during liquidus temperature determinations.[7] These compositions are of interest since none of the glasses fabricated to date for the SCIX project based on projected SRS sludge compositions have formed crystalline phases containing titanium. Earlier, the KT05-series of glasses was developed with the hypothesis that an increase in the concentration of Na_2O in the original FY09EM21 compositions[7] could avoid the formation of an iron titanate phase.[6] This hypothesis was based on the results of studies of the KT02-series compositions.[5] Characterization of the KT05-series glasses confirmed that titanium-containing crystalline phases were forming, although increased Na_2O concentrations had little if any impact on reducing the propensity for the formation of iron titanate crystalline phases in those glasses. A recommendation was made to study additions of Al_2O_3 and K_2O,[6] keeping in mind that extreme levels of K_2O had been shown to be detrimental to the glass (in terms of the predictability of viscosity and durability) in earlier SCIX studies.[5]

The KT09-series of glasses was designed based on those recommendations. Increased Al_2O_3 concentrations were identified as a potential method of improving the properties and performance of the high waste loading glasses through a detailed characterization study performed at SIA Radon in Russia.[17] Increased K_2O concentrations have been previously reported to improve the retention of TiO_2 in glass.[18] Two of the glasses that formed iron titanate crystals, labeled FY09EM21-14, and -23 in the original study, were used as the basis for the KT09-series glasses. The targeted compositions of these two glasses were taken from the targeted values provided in the report, which did not differ significantly from the measured values.[7] These compositions were then modified as described in Table 2-5 to increase their concentrations of Al_2O_3 and K_2O, resulting in the targeted compositions shown in Table 2-6. Note that smaller increases in the Al_2O_3 concentration were made to composition FY09EM21-23 since this glass already had a significantly higher Al_2O_3 concentration than composition FY09EM21-14.

As will be described below, the KT09-series glasses were fabricated, heat treated, and characterized via XRD only, since the type of crystallization formed, if any, was the characteristic of interest for these compositions. Chemical composition, durability, viscosity, and liquidus temperature of these glasses were not determined.

Table 2-5. Glass Selection Strategy for the KT09-Series.

Glass ID	Base Composition	Modification from Base Composition
KT09-01	FY09EM21-14	Add 2 wt % K_2O
KT09-02	FY09EM21-14	Add 4 wt % K_2O
KT09-03	FY09EM21-14	Add 8 wt % K_2O
KT09-04	FY09EM21-23	Add 2 wt % K_2O
KT09-05	FY09EM21-23	Add 4 wt % K_2O
KT09-06	FY09EM21-23	Add 8 wt % K_2O
KT09-07	FY09EM21-14	Increase [Al_2O_3] by 1.5x (wt % basis)
KT09-08	FY09EM21-14	Increase [Al_2O_3] by 2x (wt % basis)
KT09-09	FY09EM21-23	Increase [Al_2O_3] by 1.25x (wt % basis)
KT09-10	FY09EM21-23	Increase [Al_2O_3] by 1.5x (wt % basis)

Table 2-6. Targeted Compositions for the KT09-Series Glasses.

Oxide	KT09-01	KT09-02	KT09-03	KT09-04	KT09-05	KT09-06	KT09-07	KT09-08	KT09-09	KT09-10
Al_2O_3	3.185	3.120	2.990	13.680	13.400	12.842	4.875	6.500	17.449	20.938
B_2O_3	13.374	13.101	12.555	5.665	5.549	5.318	13.417	13.188	5.546	5.312
BaO	0.078	0.077	0.074	0.078	0.077	0.074	0.079	0.077	0.077	0.074
CaO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CdO	0.291	0.285	0.273	0.291	0.285	0.273	0.292	0.287	0.284	0.272
Ce_2O_3	0.353	0.346	0.332	0.353	0.346	0.332	0.355	0.348	0.346	0.331
Cr_2O_3	0.196	0.192	0.184	0.000	0.000	0.000	0.197	0.193	0.000	0.000
CuO	0.126	0.123	0.118	0.126	0.123	0.118	0.126	0.124	0.123	0.118
Fe_2O_3	20.133	19.722	18.900	11.867	11.625	11.140	20.199	19.854	11.618	11.127
K_2O	2.000	4.000	8.000	2.000	4.000	8.000	0.000	0.000	0.000	0.000
La_2O_3	0.096	0.094	0.090	0.096	0.094	0.090	0.096	0.095	0.094	0.090
Li_2O	3.920	3.840	3.680	3.920	3.840	3.680	3.933	3.866	3.838	3.676
MgO	0.000	0.000	0.000	1.470	1.440	1.380	0.000	0.000	1.439	1.378
MnO	0.294	0.288	0.276	0.294	0.288	0.276	0.295	0.290	0.288	0.276
Na_2O	9.800	9.600	9.200	9.800	9.600	9.200	9.832	9.664	9.594	9.189
NiO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PbO	0.212	0.208	0.199	0.212	0.208	0.199	0.213	0.209	0.208	0.199
SiO_2	39.546	38.739	37.125	43.465	42.578	40.804	39.676	38.998	42.553	40.754
SO_4^{2-}	0.471	0.462	0.442	0.471	0.462	0.442	0.473	0.465	0.461	0.442
TiO_2	5.592	5.478	5.250	5.880	5.760	5.520	5.610	5.515	5.757	5.513
ZnO	0.132	0.129	0.124	0.132	0.129	0.124	0.132	0.130	0.129	0.124
ZrO_2	0.201	0.197	0.189	0.201	0.197	0.189	0.202	0.198	0.197	0.188

2.1.3 *KT10-Series*

The KT10-series of compositions was selected to evaluate any impacts of the SCIX components at concentrations significantly higher than currently projected. Should further studies or operational experience show that higher concentrations of MST or CST are necessary for the SCIX process, it would then be necessary to incorporate higher concentrations of these components in glass. Therefore, the concentrations of Nb_2O_3, TiO_2, and ZrO_2 projected in the sludge compositions given in Table 2-1 were increased to 150% of those values to develop the KT10-series glasses. Sulfate and the noble metals were added to the sludge compositions in the same manor as the KT08-series glasses. The thorium and uranium were removed from the compositions to allow for fabrication and characterization in non-radiological laboratories.

A single frit composition was identified that produced a PCCS MAR acceptable glass at a targeted waste loading of 40 wt % with each of the sludge composition projections after increasing the concentrations of the SCIX components. The composition of this frit, which was labeled Frit 1202, is given in Table 2-7. The use of a different frit composition for these glasses will also serve to expand the compositional region of glasses fabricated and characterized for the SCIX task, which will aid future model development efforts. Each of the sludge compositions with increased SCIX components was then combined with Frit 1202 at a waste loading of 40 wt % to give the targeted glass compositions for the KT08-series shown in Table 2-8.

Table 2-7. Composition of Frit 1202 (wt %).

B_2O_3	Li_2O	Na_2O	SiO_2
8	9	3	80

Table 2-8. Targeted Compositions of the KT10-Series Glasses.

Oxide	KT10-01	KT10-02	KT10-03	KT10-04	KT10-05	KT10-06	KT10-07	KT10-08	KT10-09	KT10-10
Ag_2O	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Al_2O_3	5.32	4.75	4.10	4.55	6.29	6.69	5.15	4.58	5.04	5.21
B_2O_3	4.80	4.80	4.80	4.80	4.80	4.80	4.80	4.80	4.80	4.80
BaO	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07
CaO	0.86	0.87	0.88	0.78	0.86	0.91	0.82	0.73	0.88	0.90
Ce_2O_3	0.26	0.26	0.23	0.20	0.13	0.10	0.07	0.07	0.18	0.23
Cr_2O_3	0.08	0.08	0.08	0.08	0.12	0.12	0.13	0.09	0.09	0.09
CuO	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Fe_2O_3	11.10	10.57	10.54	11.14	8.84	8.35	8.60	8.35	11.35	12.60
K_2O	0.03	0.03	0.03	0.03	0.07	0.10	0.07	0.07	0.08	0.04
La_2O_3	0.10	0.07	0.07	0.07	0.07	0.03	0.04	0.04	0.07	0.08
Li_2O	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40
MgO	0.14	0.14	0.14	0.14	0.14	0.09	0.10	0.10	0.10	0.11
MnO	1.77	1.56	1.65	0.98	0.94	1.10	0.67	0.88	0.53	0.37
Na_2O	11.17	11.93	12.19	11.69	11.63	11.66	12.35	13.15	11.98	11.55
Nb_2O_5	1.43	1.51	1.51	1.45	1.48	1.42	1.64	1.77	1.17	1.09
NiO	0.32	0.18	0.29	0.14	0.11	0.14	0.59	0.55	0.48	0.45
PbO	0.15	0.12	0.12	0.09	0.06	0.06	0.07	0.07	0.14	0.14
PdO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rh_2O_3	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
RuO_2	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06
SO_4^{2-}	0.37	0.37	0.38	0.37	0.37	0.37	0.41	0.42	0.42	0.42
SiO_2	49.28	49.75	49.95	50.50	50.99	50.99	50.70	50.39	49.26	48.96
TiO_2	5.98	6.01	6.04	6.06	6.13	6.07	6.67	6.76	6.68	6.27
ZnO	0.00	0.03	0.04	0.07	0.03	0.07	0.08	0.04	0.04	0.04
ZrO_2	1.27	1.39	1.39	1.29	1.37	1.33	1.45	1.55	1.11	1.06

2.2 Glass Fabrication

Each of the study glasses was prepared from the proper proportions of reagent-grade metal oxides, carbonates, and boric acid in 200 g batches. The raw materials were thoroughly mixed and placed into platinum/gold, 250 ml crucibles. The batch was placed into a high-temperature furnace at the melt temperature of 1150 °C. The crucible was removed from the furnace after an isothermal hold for 1 hour. The glass was poured onto a clean, stainless steel plate and allowed to air cool (quench). The glass pour patty was used as a sampling stock for the various property measurements described below.

Approximately 25 g of each glass was heat-treated to simulate cooling along the centerline of a DWPF-type canister[19] to gauge the effects of thermal history on the product performance. This cooling schedule is referred to as the canister centerline cooled (CCC) heat treatment. Visual observations of both quenched and CCC glasses were documented.[a]

2.3 Compositional Analysis

Chemical analysis was performed under the auspices of analytical plans[20,21] on a representative sample from each quenched glass in the KT08 and KT10-series to confirm that the as-fabricated glasses met the targeted compositions. The KT09-series glasses were not measured. Two dissolution techniques, sodium peroxide fusion (PF) and cesium hydroxide fusion (CH), were used to prepare the KT08-series glass samples, in duplicate, for analysis. PF and lithium-metaborate fusion (LM) were used to prepare the KT10-series glass samples, in duplicate, for analysis. Each of the samples was analyzed, twice for each element of interest, by Inductively Coupled Plasma – Atomic Emission Spectroscopy (ICP-AES). Glass standards were also intermittently measured to assess the performance of the ICP-AES instrument over the course of these analyses. The uranium standard glass (Ustd) was included with the KT08-series glasses. An additional reference glass composition, labeled KT7Ref and thoroughly characterized under a separate analytical plan,[22] was also included with the KT08-series glasses. The Batch 1 standard was included with the KT10-series glasses.

2.4 Crystallization

Representative samples of each quenched and CCC glass were analyzed by XRD. 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 product is free of crystallization, suggesting either a completely amorphous product or that the degree of crystallization is below the detection limit.

Scanning Electron Microscopy (SEM) and Energy Dispersive Spectroscopy (EDS) were used to provide qualitative information on the types of crystallization present in select glasses in the KT09-series. Samples of crushed glass were prepared by adhering particles to carbon tape on aluminum specimen holders. A conductive carbon coating was deposited on the samples via evaporation.

[a] See notebook SRNL-NB-2010-00137.

2.5 Product Consistency Test

The PCT Method-A[23] was performed in triplicate on each KT08 and KT10-series quenched and CCC glass to assess chemical durability. Also included in the experimental test matrix was the EA benchmark glass,[24] the Approved Reference Material (ARM) glass,[25] and blanks from the sample cleaning batch. Samples were ground, washed, and prepared according to the standard procedure.[23] Fifteen milliliters of Type-I ASTM water were added to 1.5 g of glass in stainless steel vessels. The vessels were closed, sealed, and placed in an oven at 90 ± 2 °C where the samples were maintained at temperature for 7 days. Once cooled, the resulting solutions were sampled (filtered and acidified), then labeled and analyzed by ICP-AES under the auspices of analytical plans.[26,27] Samples of a multi-element, standard solution were also included in the analytical plans as a check on the accuracy of the ICP-AES instruments used for these measurements. Normalized release rates were calculated based on the targeted and measured compositions using the average of the common logarithms of the leachate concentrations.

2.6 Viscosity

The viscosity of the KT08 and the KT10-series glasses was measured following Procedure A of the ASTM C 965 standard.[28] Harrop and Orton high temperature rotating spindle viscometers were used with platinum crucibles and spindles. The viscometers were specially designed to operate with small quantities of glass to support measurements of radioactive glasses when necessary.[29,30] A well characterized standard glass was used to determine the appropriate spindle constants.[30,31] Measurements were taken over a range of temperatures from 1050 to 1250 °C in 50 °C intervals. Measurements at 1150 °C were taken at three different times during the procedure to provide an opportunity to identify the effects of any crystallization or volatilization that may have occurred during the test. The data were fit to a Fulcher equation[32,33] to provide a measured viscosity value at the nominal DWPF melt temperature of 1150 °C.

2.7 Liquidus Temperature

Liquidus temperatures were not measured for the KT08-series glasses since they contain uranium and thorium. Liquidus temperatures were not measured for the KT09-series glasses since they were expected to form crystalline phases at or near the melt temperature. Liquidus temperature estimates for the KT10-series glasses are not yet complete. The results will be reported in a separate technical report.[34]

3.0 Results and Discussion

3.1 Crystallization

Crystallization within each glass sample was assessed via visual observations and XRD. The results will be discussed below for each series of glasses. The potential impacts of any crystallization that was identified will be discussed during the later description of the measured properties of the glasses (i.e., durability, viscosity, etc.).

3.1.1 *KT08-Series*

Visual observations of the quenched versions of the KT08-series glasses identified no visible crystallization. All of the quenched glasses were found to be amorphous by XRD. For the CCC versions of the KT08-series glasses, visual observations identified a small amount of surface crystallization on compositions KT08-01, -02, and -03. All of the CCC glasses were found to be amorphous by XRD with the exception of glass KT08-07. This indicates that the volume of surface crystallization in compositions KT08-01, -02, and -03 was below the XRD detection limit. Glass KT08-07 contained a small amount of trevorite, which may have been difficult to identify visually in the bulk of the glass. Spinels, including trevorite, are the crystalline phase typically found in DWPF-type glasses and have been shown to have no practical impact on durability.[35]

3.1.2 *KT09-Series*

Visual observations of the quenched versions of the KT09-series glasses identified visible crystallization in compositions KT09-04, -07, -08, -09, and -10. Note that the melting temperature for compositions KT09-09 and -10 had to be increased to 1300 °C as these compositions were found to be more refractory during fabrication. The XRD results for the quenched KT09-series glasses are detailed in Table 3-1, and are in general agreement with the visual observations. The volume fraction of the crystals visually observed in composition KT09-07 was below the XRD detection limit. The crystalline phases that formed in the quenched glasses could not be identified by matching the XRD data to the crystallographic database and the volume of these phases was small. In addition, the diffraction patterns for hematite (Fe_2O_3) and Fe_9TiO_{15} are the same; therefore, they cannot be differentiated by XRD alone. As will be described below, SEM and EDS analyses were used for further characterization of these phases.

Visual observations of the CCC versions of the KT09-series glasses identified visual crystallization in all of the compositions except for KT09-03. The XRD results for the CCC glasses, also detailed in Table 3-1, are in agreement with these observations. The volume fraction of the crystalline phases was higher in the CCC versions of the KT09-series glasses, which may have aided in their identification as shown in the table. Several of the KT09-series CCC glasses were also analyzed by SEM and EDS, as will be described below.

Table 3-1. XRD Results for the KT09-Series Glasses.

Glass ID	Heat Treatment	XRD Results
KT09-01	Quenched	amorphous
	CCC	hematite (Fe_2O_3) or Fe_9TiO_{15}
KT09-02	Quenched	amorphous
	CCC	hematite (Fe_2O_3) or Fe_9TiO_{15}, and unidentified phase
KT09-03	Quenched	amorphous
	CCC	amorphous
KT09-04	Quenched	Unidentified crystalline phase
	CCC	hematite (Fe_2O_3) or Fe_9TiO_{15}, pseudobrookite (Fe_2TiO_5), and nepheline ($NaAlSiO_4$)
KT09-05	Quenched	amorphous
	CCC	$LiFeTiO_4$, pseudobrookite (Fe_2TiO_5), nepheline ($NaAlSiO_4$), and Fe_9TiO_{15}
KT09-06	Quenched	amorphous
	CCC	$LiFeTiO_4$ and nepheline ($K(Na,K)_3Al_4Si_4O_{16}$)
KT09-07	Quenched	amorphous
	CCC	hematite (Fe_2O_3) or Fe_9TiO_{15}
KT09-08	Quenched	Unidentified crystalline phase
	CCC	hematite (Fe_2O_3) or Fe_9TiO_{15}
KT09-09	Quenched	Unidentified crystalline phase
	CCC	pseudobrookite (Fe_2TiO_5) and nepheline ($NaAlSiO_4$)
KT09-10	Quenched	Unidentified crystalline phase
	CCC	$Li_2Al_2Si_3O_{10}$, nepheline ($NaAlSiO_4$), pseudobrookite (Fe_2TiO_5), and hematite (Fe_2O_3) or Fe_9TiO_{15}

The quenched version of composition KT09-04 was viewed in the SEM with the intent of qualitatively determining the composition of the crystalline phase via EDS. However, as shown in Figure 3-1, it was not possible to locate any crystalline phases in this sample. This likely indicates that the crystalline material detected in this glass via XRD was not well distributed throughout the glass, and that this phase likely occupied only a small volume of the melt. Note that some surface features are visible in the micrographs of Figure 3-1, including fracture lines and small particles of glass, although these do not indicate crystallization.

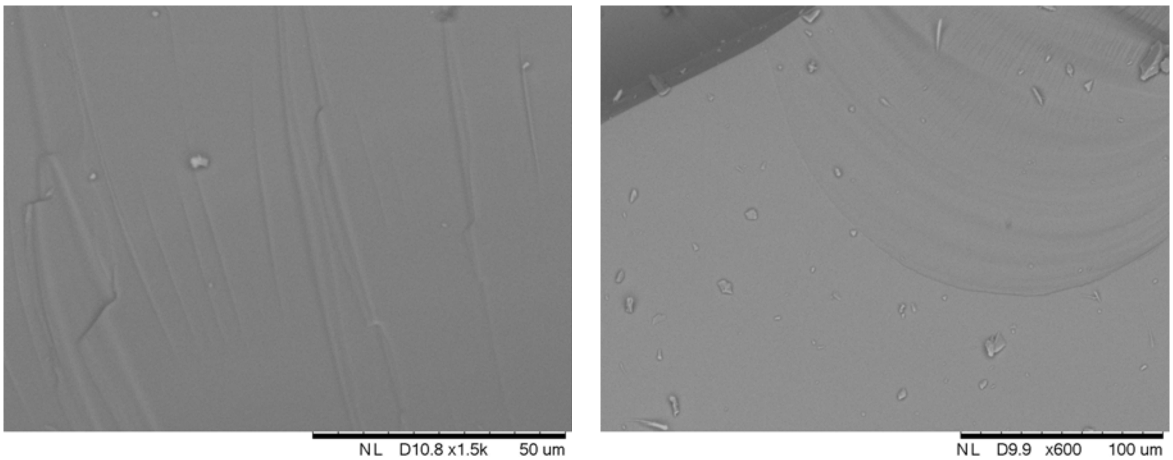
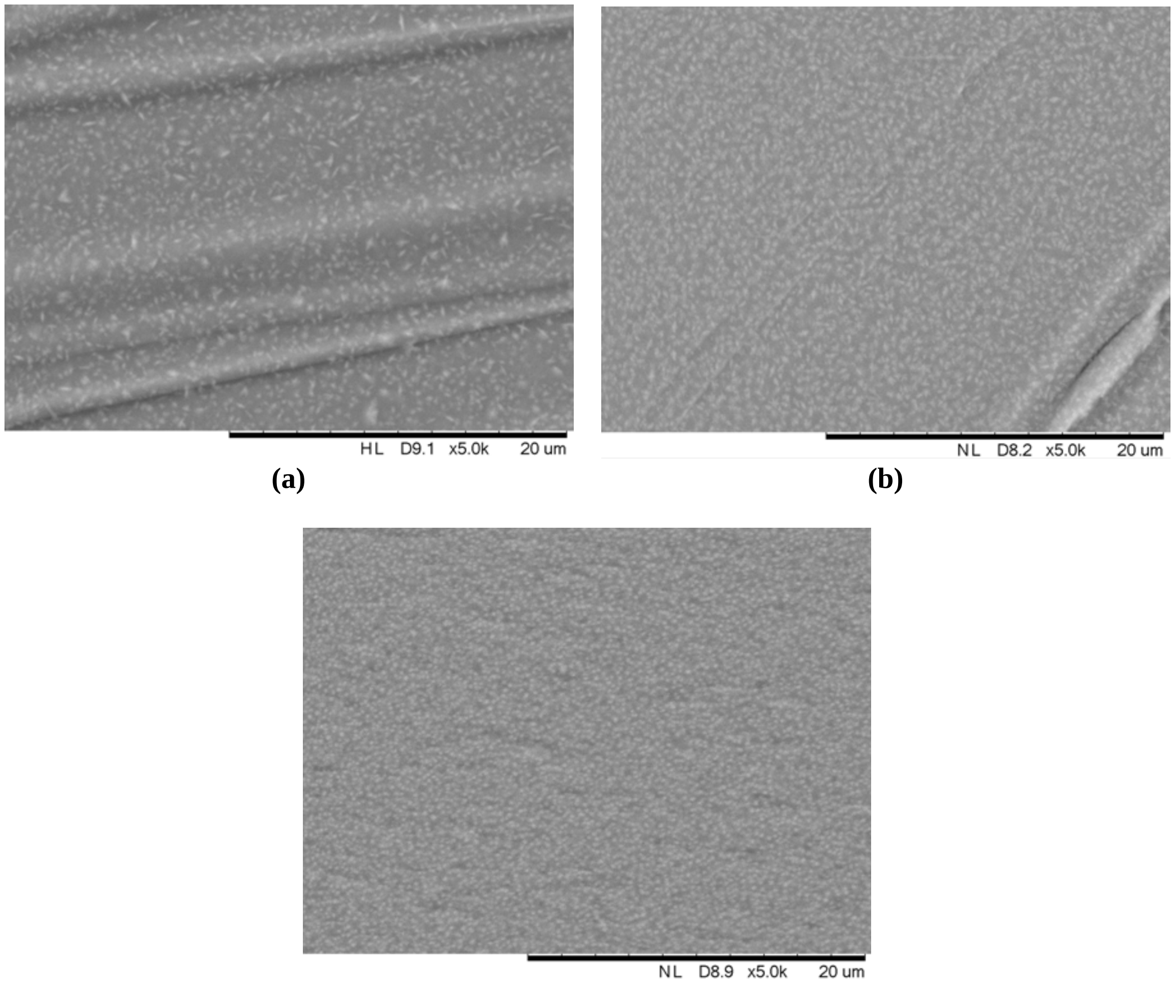


Figure 3-1. SEM Micrographs of the Quenched Version of Composition KT09-04.

SEM micrographs of the quenched versions of compositions KT09-08, -09, and -10 are shown in Figure 3-2. Each of these micrographs shows a large number of small crystallites (white areas) distributed throughout the glass matrix (grey area). The crystallites are quite small (generally less than 1 μm in length); therefore, EDS analysis was not possible on the instrument used. Based on microscopy observations from the on-going liquidus temperature measurements for the SCIX glasses, the morphology of these crystallites indicates that they are likely a mixture of iron titanates and other transition metal spinels. Composition KT09-08 appears to have the highest concentration of iron titanates (Figure 3-2a), followed by KT09-09 (Figure 3-2b). Composition KT09-10 appears to contain mostly spinels of transition metals other than titanium (Figure 3-2c). These results indicate that increasing concentrations of Al_2O_3 may have been somewhat beneficial in reducing the amount of iron titanate crystals formed, although they lead to significant crystallization of other spinels.



(a) **(b)**

(c)

Figure 3-2. SEM Micrographs of the Quenched Versions of Compositions KT09-08 (a), KT09-09 (b), and KT09-10 (c).

SEM micrographs of the CCC version of composition KT09-02 are shown in Figure 3-3. The crystals in this glass were much larger than those observed in the quenched glasses. EDS mapping, shown in Figure 3-4, indicates that the crystals contain Fe and Ti, while Na, Al, and Si are present in the surrounding glass. A backscattered electron (BSE) micrograph of the area mapped is included in the figure. The crystals appear brighter in the BSE micrograph, and their location corresponds with the higher Fe and Ti concentrations (i.e., the brighter color intensities in the maps).

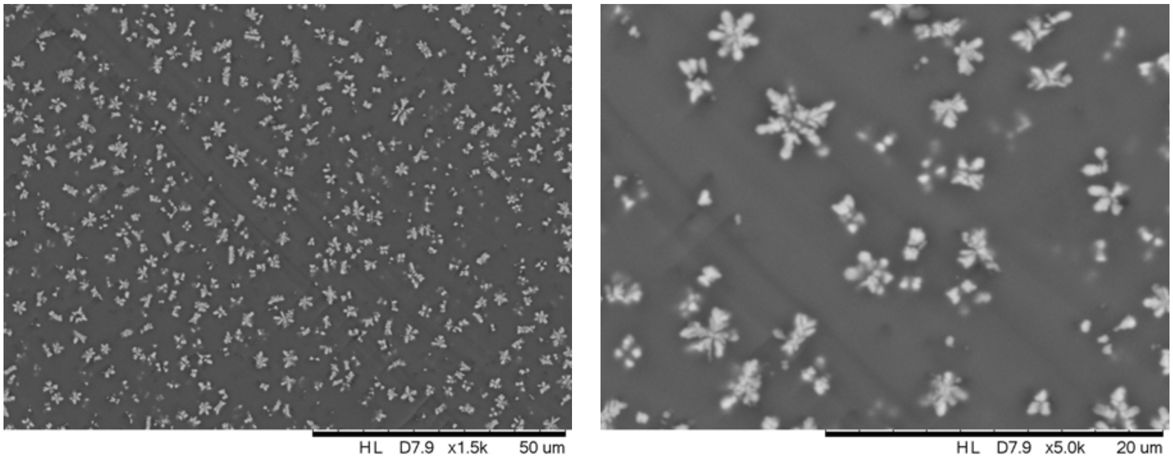


Figure 3-3. SEM Micrographs of the CCC Version of Composition KT09-02, Including an Overview of Crystals (a) and a Higher Magnification Image (b).

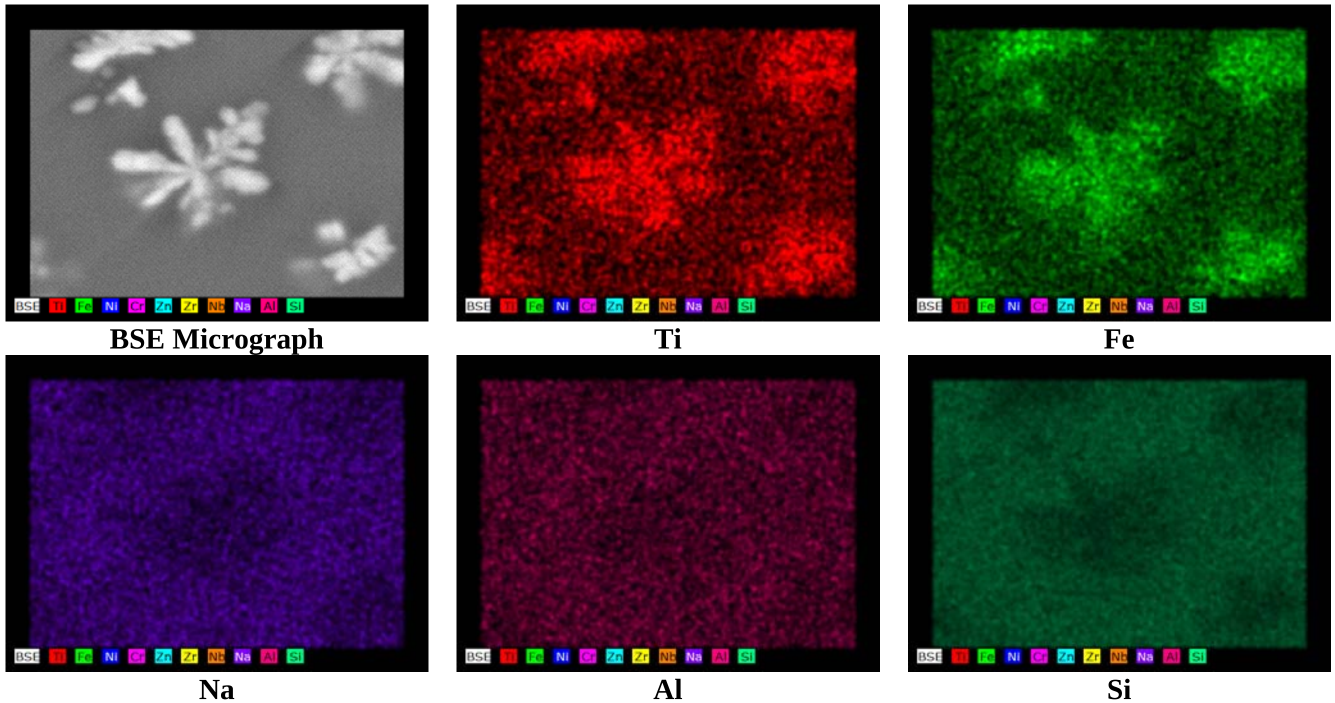


Figure 3-4. EDS Mapping of the CCC Version of Composition KT09-02.

Electron micrographs of the CCC version of composition KT09-05 are shown in Figure 3-5. Several different crystal morphologies were observed, including block-like crystals (Figure 3-5a), elongated crystals (Figure 3-5b), and grouped pillar-like crystals (Figure 3-5c). EDS mapping of each of these three morphologies is shown in Figure 3-6, Figure 3-7, and Figure 3-8. In all cases, the crystals contain Fe and Ti, while the surrounding glass contains Na, Al, and Si. This indicates that while the morphologies are different, the crystals all consist of iron titanates. The differences in morphology may represent different stages of crystal growth in this composition.

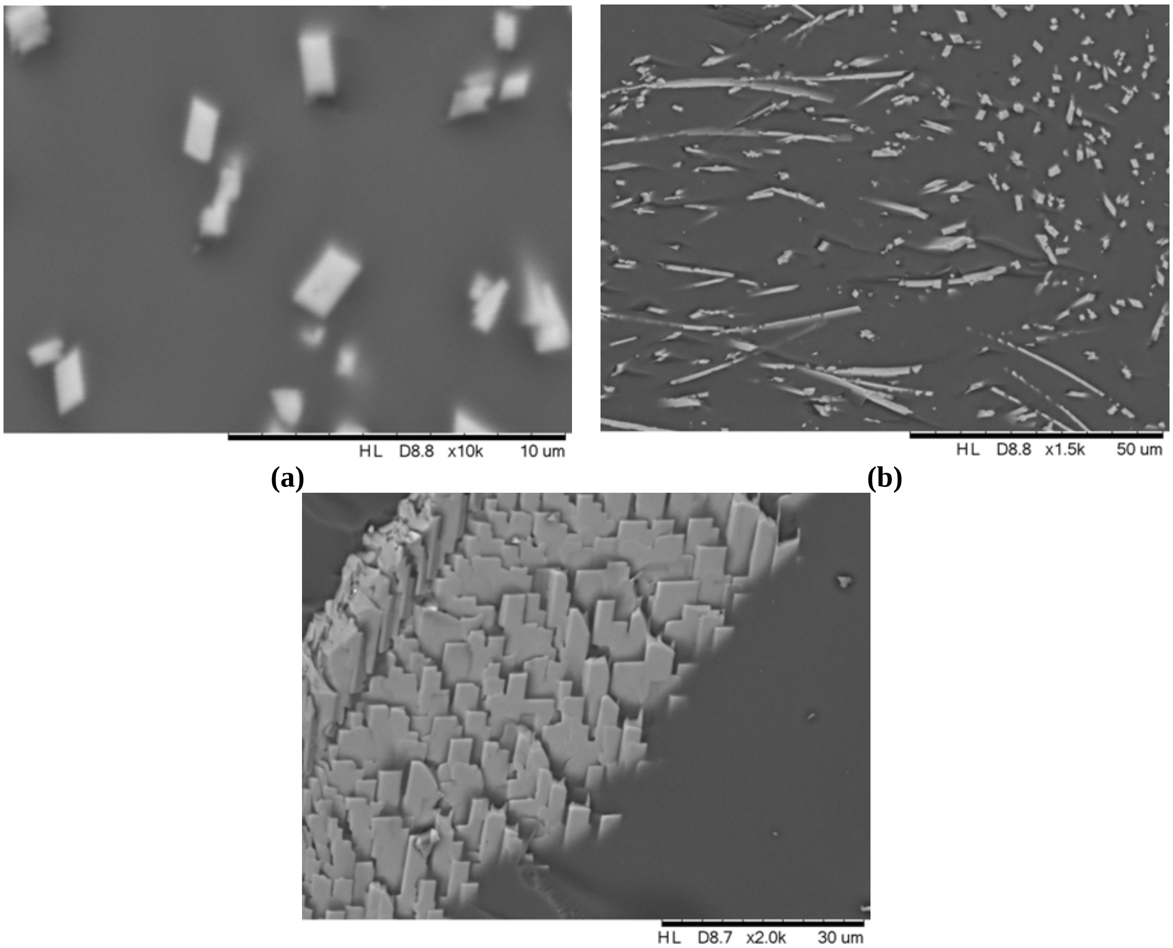


Figure 3-5. Electron Micrographs of the CCC Version of Composition KT09-05. Several Crystal Morphologies were Observed, Including Block-Like (a), Elongated (b), and Grouped Pillars (c).

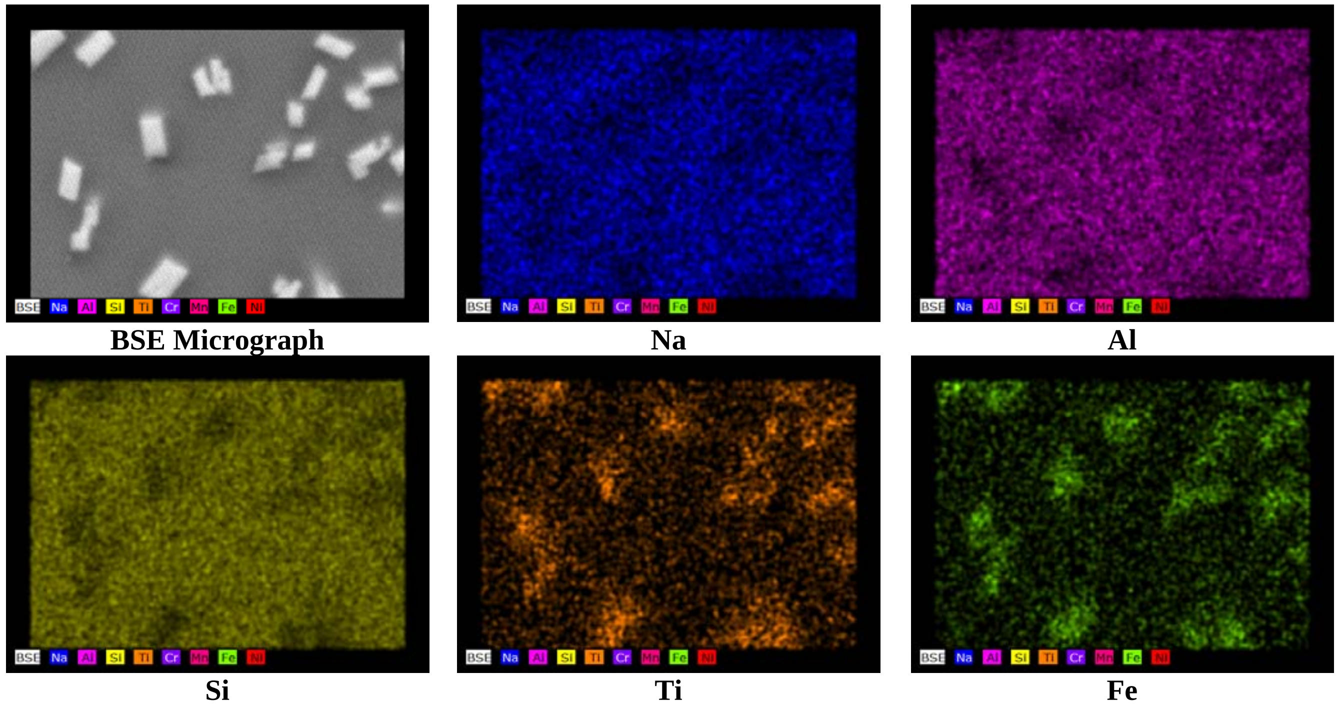


Figure 3-6. EDS Mapping of the CCC Version of Composition KT09-05, in a Region with Block-Like Crystals.

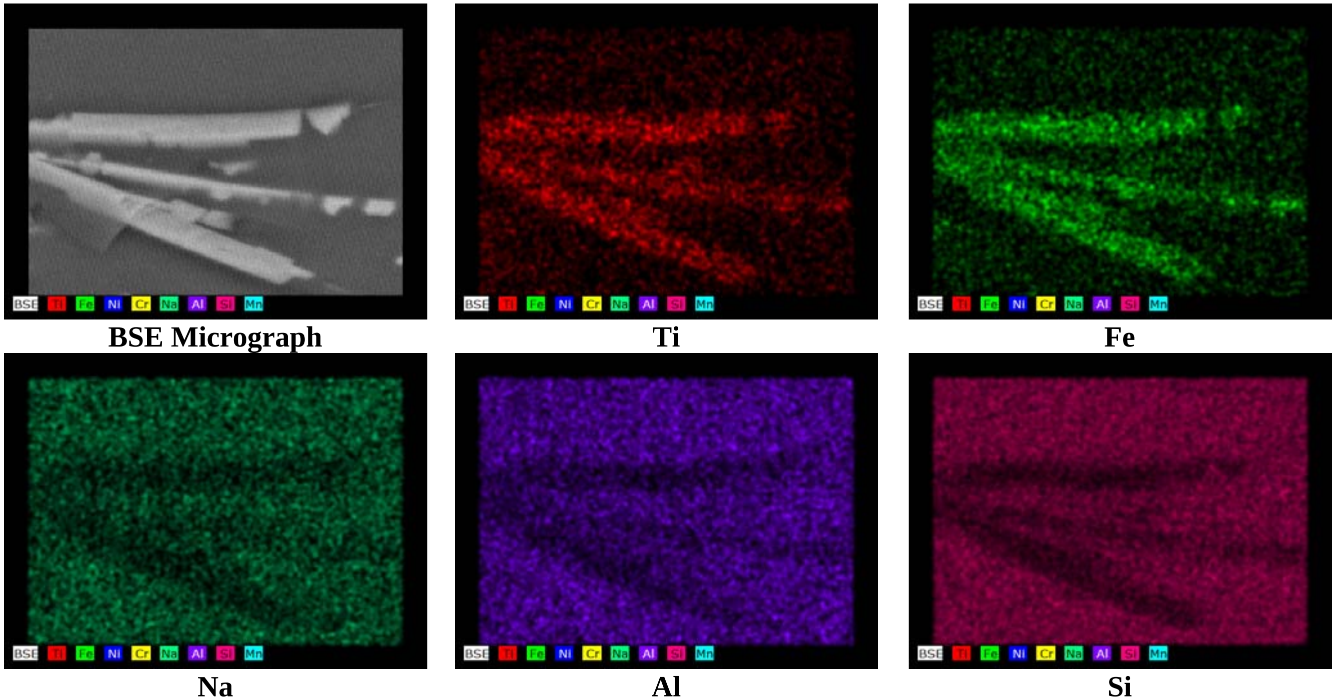


Figure 3-7. EDS Mapping of the CCC Version of Composition KT09-05, in a Region with Elongated Crystals.

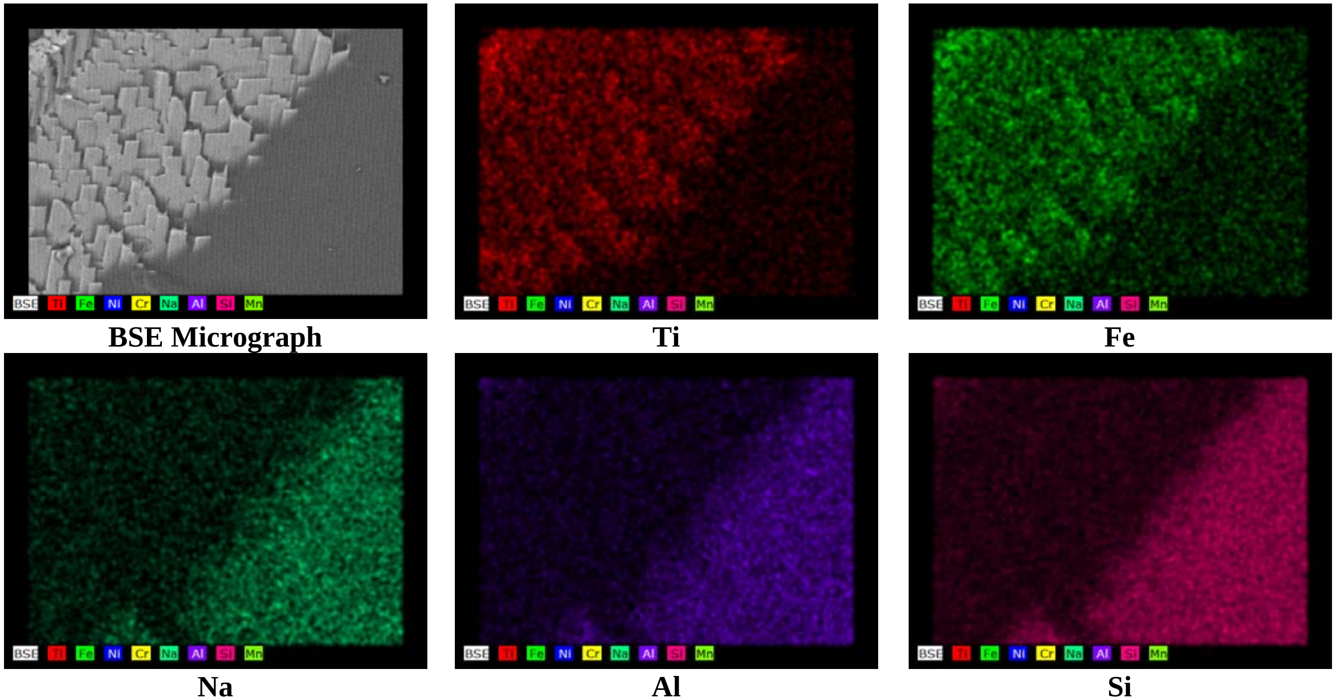


Figure 3-8. EDS Mapping of the CCC Version of Composition KT09-05, in a Region with Pillars of Crystals.

In summary, increased Al_2O_3 concentrations were not successful in preventing the formation of iron titanate crystals in the KT09-series glasses. Increased K_2O concentrations were successful in hindering the formation of iron titanates in the glasses based on composition FY09EM21-14 (i.e., glasses KT09-01, -02, and -03; see Table 2-5) after the CCC heat treatment. However, this result did not apply to the CCC versions of the glasses based on composition FY09EM21-23 (i.e., glasses KT09-04, -05, and -06; see Table 2-5), indicating a compositional dependence of this effect. In addition, high concentrations of K_2O have been shown to be detrimental to some glass properties other than crystallization.[5] The usefulness of increased K_2O concentrations in preventing the formation of iron titanates may therefore be limited.

3.1.3 *KT10-Series*

Visual observations of the quenched versions of the KT10-series glasses identified no visible crystallization. All of the quenched glasses were found to be amorphous by XRD. For the CCC versions of the KT10-series glasses, visual observations identified a small amount of surface crystallization on compositions KT10-07, -09, and -10, and a slight haze on the surface of the other glasses. All of the CCC glasses were found to be amorphous by XRD, indicating that the volume of crystallization on the surface of the glasses was insignificant.

3.2 Chemical Composition

In this section, the measured versus targeted compositions of the study glasses are presented and compared. Measurements for samples of the Batch 1 standard glass that were included in the analytical plans along with the study glasses are also discussed. The elemental concentrations were converted to oxide concentrations by multiplying the values for each element by the gravimetric factor for the corresponding oxide. During this process, an elemental concentration that was determined to be below the detection limit of the analytical procedures used was reduced to half of that detection limit as the oxide concentration was determined.[36] In the sections that follow, the analytical sequences of the measurements are explored, the measurements of the standard are investigated, and the measurements for each glass are reviewed. In addition, the average chemical compositions for each glass are determined, and comparisons are made between the measurements and the targeted compositions of the glasses.

3.2.1 *KT08-Series*

Table A-1 and Table A-2 in Appendix A provide the elemental concentration measurements from the KT08-series glasses that were digested using CH. Table A-3 and Table A-4 in Appendix A provide the measurements from the samples of these glasses digested using PF. Measurements for samples of the Ustd glass and the KT7ref glass that were included in the analytical plan along with the study glasses are also provided in these tables. Exhibit A-1 in Appendix A provides plots of the sample measurements for each oxide over both preparation methods. The plots are in analytical sequence with different symbols and colors being used to represent each of the study glasses and the standard and reference glasses. There are obvious issues with Nb_2O_5 and SiO_2 for the CH prepared glasses in Block 2 of the measurements. Glasses KT08-01, -02, and -07 each have one measured value for SiO_2 prepared by PF that is an outlier. There is a detection limit issue for PbO prepared by PF in Block 2, Sub Block 2 of the measurements. There is one outlier in the SO_4^{2-} measurements prepared by PF. There is an issue with the ThO_2 measurements prepared by PF; the measurements indicate the presence of ThO_2 in glasses that did not contain ThO_2. Further opportunity for a review of the measurements for each glass is provided in the discussions that follow.

Exhibit A-2 in Appendix A provides plots of the oxide concentration measurements by Glass ID (including Ustd and KT7ref) by analytical solution or Lab ID for both preparation methods for the KT08-series. The different symbols and colors being used to represent the glasses are discernable in this exhibit. These plots show the individual measurements across the duplicates of each preparation method and the two ICP-AES calibrations for each glass for each oxide. The results are grouped by analytical block and arranged by targeted concentration to facilitate the interpretation of the measurements. A review of the plots presented in this exhibit reveals the repeatability of the four individual values for each oxide for each glass. A comparison of the targeted and measured values for Al_2O_3, Ce_2O_3, Cr_2O_3, Fe_2O_3, and ThO_2 in the first PF preparation for glasses KT08-04 and -05 indicates that these two compositions were inadvertently swapped during the chemical composition measurements. This error was corrected during further analyses of these data. There was likely a minor batching error for CuO in composition KT08-01. The same issues identified above with Exhibit A-1 are again apparent here. Although the data do suggest some issues with the measurement process, there is no indication of any significant issues in the batching of the KT08 glasses. The measurement issues will be discussed further below.

Exhibit A-3 in Appendix A provides statistical analyses of the results for the KT7ref reference glass composition that was included with the KT08 glasses by analytical block/sub-block for each oxide of interest over both preparation methods. The results include analysis of variance (ANOVA) investigations looking for statistically significant differences among the means of these groups for each of the oxides. The reference values for the oxide concentrations of the KT7ref glass are given in the header for each set of measurements in the exhibit. The results from the statistical tests for the KT7ref glass included with the KT08 glasses may be summarized as follows for the CH preparation: Al_2O_3, BaO, CaO, Ce_2O_3, Cr_2O_3, CuO, Fe_2O_3, La_2O_3, Li_2O, MgO, Nb_2O_5, PbO, SiO_2, ZnO, and ZrO_2 have measurements that indicate an ICP-AES calibration effect on the block averages at the 5% significance level. For the PF preparation: Al_2O_3, B_2O_3, BaO, Ce_2O_3, Fe_2O_3, Li_2O, MgO, Nb_2O_5, PbO, SO_4^{2-}, ThO_2, TiO_2, and ZnO have measurements that indicate an ICP-AES calibration effect on the block averages at the 5% significance level. While statistically significant, the practical impact of these calibration effects is minimal.

Exhibit A-4 in Appendix A provides statistical analyses of the results for the Ustd glass that was included with the KT08 glasses by analytical block/sub-block for each oxide of interest over both preparation methods. The results include ANOVA investigations looking for statistically significant differences among the means of these groups for each of the oxides. The reference values for the oxide concentrations of the Ustd glass are given in the header for each set of measurements in the exhibit. The results from the statistical tests for the Ustd glass included with the KT08 glasses may be summarized as follows for the CH preparation: BaO, La_2O_3, PbO, ThO_2, U_3O_8, and ZrO_2 have measurements that indicate an ICP-AES calibration effect on the block averages at the 5% significance level. For the PF preparation: Al_2O_3, B_2O_3, Fe_2O_3, K_2O, La_2O_3, Li_2O, MgO, NiO, PbO, SiO_2, ThO_2, U_3O_8, and ZnO have measurements that indicate an ICP-AES calibration effect on the block averages at the 5% significance level. While statistically significant, the practical impact of these calibration effects is minimal.

Based on the evaluations described above and the issues identified with some of the measurements, decisions were made regarding which preparation method would be used for each oxide in determining the average measured composition. These decisions are summarized in Table 3-2.

Table 3-2. Preparation Methods Used in Determining the Concentration of Individual Oxides in the KT08-Series Glasses.

Oxide	Preparation Method(s)		Oxide	Preparation Method(s)
Al_2O_3	CH and PF		MnO	CH and PF
B_2O_3	CH		Na_2O	CH
BaO	CH and PF		Nb_2O_5	PF
CaO	CH		NiO	PF
Ce_2O_3	CH		PbO	CH
Cr_2O_3	CH		SO_4^{2-}	CH
CuO	CH and PF		SiO_2	PF
Fe_2O_3	CH		ThO_2	CH
K_2O	CH		TiO_2	CH
La_2O_3	CH and PF		U_3O_8	CH
Li_2O	CH and PF		ZnO	CH and PF
MgO	CH and PF		ZrO_2	CH

The data resulting from the preparation methods listed for each oxide in Table 3-2 were averaged to determine a representative chemical composition for each glass. A sum of oxides was also computed for each glass based upon the measured values. Glasses KT08-01, -02, and -07 each had one measured value for SiO_2 that was an outlier. These values were omitted as the average SiO_2 concentrations were determined for these glasses. Exhibit A-5 in Appendix A provides plots showing the results for each glass for each oxide to help highlight the comparisons among the measured and targeted values. Some observations from the plots of Exhibit A-5 are offered: The Al_2O_3 concentrations are high for the study glasses. The CaO and Na_2O concentrations are high for all of the glasses. The CuO concentration is high for composition KT08-01. The concentrations of Li_2O and SO_4^{2-} are low for all of the glasses. The Nb_2O_5 and ZrO_2 concentrations are low for most of the study glasses. There are some issues with the PbO values, which are likely due to detection limits. There is some scatter in the SiO_2 values. The U_3O_8 concentration is low for composition KT08-07.

Table A-5 in Appendix A provides a summary of the average measured compositions as well as the targeted compositions and the associated differences and relative differences. Note that the targeted sums of oxides for the KT7ref and Ustd glasses do not sum to 100% due to an incomplete coverage of the oxides in these glass. All of the sums of oxides for the KT08 glasses fall within the PCCS acceptable interval of 95 to 105 wt%. Entries in Table A-5 show the relative differences between the measured values and the targeted values. These differences are shaded when they are greater than or equal to 5%. Overall, these comparisons between the measured and targeted compositions again suggest only minor difficulties in meeting the targeted compositions for the KT08-series glasses, none of which should impact the outcome of the study.

3.2.2 *KT10-Series*

Table B-1 and Table B-2 in Appendix B provide the elemental concentration measurements from the KT10 glasses that were digested using LM, and Table B-3 in Appendix B provides the measurements from the samples of these glasses digested using PF. Measurements for samples of the standard Batch 1 glass that were included in the analytical plan along with the study glasses are also provided in these tables. Note that sulfur was inadvertently omitted from the analytical plan for the KT10-series glasses;[21] therefore, sulfur does not appear in these tables. This omission will have no practical impact on the outcome of this study since the targeted sulfur concentrations for these glasses were well below the DWPF limit. Exhibit B-1 in Appendix B provides plots of the sample measurements for each oxide over both preparation methods. The plots are in analytical sequence with different symbols and colors being used to represent each of the study glasses and the standard glass. In general, there does not appear to be any gross patterns or trends due to the analytical sequence. Further opportunity for a review of the measurements for each glass is provided in the discussions that follow.

Exhibit B-2 in Appendix B provides plots of the oxide concentration measurements by Glass ID (including the Batch 1 standard) by analytical solution or Lab ID for both preparation methods for the KT10-series. The different symbols and colors being used to represent the glasses are discernable in this exhibit. These plots show the individual measurements across the duplicates of each preparation method and the two ICP-AES calibrations for each glass for each oxide. The results are grouped by analytical block and arranged by targeted concentration to facilitate the interpretation of the measurements. A review of the plots presented in this exhibit reveals the repeatability of the four individual values for each oxide for each glass. There appears to be good repeatability of these measurements for each of the oxides for each of the glasses. There is a minor preparation issue for Nb_2O_5 and ZrO_2 for glass KT10-02. There is some scatter in the SiO_2 values. The data suggest no other significant issues in the batching of the KT10 glasses or in the analytical process used to provide representative measurements of their compositions.

Exhibit B-3 in Appendix B provides statistical analyses of the results for the Batch 1 standard that was included with the KT10 glasses by analytical block/sub-block for each oxide of interest over both preparation methods. The results include ANOVA investigations looking for statistically significant differences among the means of these groups for each of the oxides. The reference values for the oxide concentrations of the standard are given in the header for each set of measurements in the exhibit. The results from the statistical tests for the Batch 1 standard included with the KT10 glasses may be summarized as follows: B_2O_3, CaO, Cr_2O_3, CuO, K_2O, MgO, NiO, and SiO_2 have measurements that indicate an ICP-AES calibration effect on the block averages at the 5% significance level. While statistically significant, the practical impact of these calibration effects is minimal.

All of the measurements for each oxide for each KT10 glass (i.e., all of the measurements in Appendix B Table B-1, Table B-2, and Table B-3) were averaged to determine a representative chemical composition for each glass. A sum of oxides was also computed for each glass based upon the measured values. Exhibit B-4 in Appendix B provides plots showing results for each glass for each oxide to help highlight the comparisons among the measured and targeted values. Some observations from the plots of Exhibit B-4 are offered: The Al_2O_3 and Cr_2O_3 concentrations are slightly high for some of the KT10 glasses. The Fe_2O_3, La_2O_3, Li_2O, and ZrO_2 concentrations are low for some of the KT10 glasses. In particular, glass KT10-02 has low Nb_2O_5 and ZrO_2 values, which are likely due to the minor preparation issue mentioned above. There is some scatter in the SiO_2 values. The sums of oxides are low for most of the glasses. In general, there appear to have been only minor difficulties in meeting the targeted concentrations for the KT10 glasses.

Table B-4 in Appendix B provides a summary of the average measured compositions as well as the targeted compositions and the associated differences and relative differences. Note that the targeted sum of oxides for the Batch 1 standard does not sum to 100% due to an incomplete coverage of the oxides in this glass. All of the sums of oxides for the KT10 glasses fall within the PCCS acceptable interval of 95 to 105 wt%. Entries in Table B-4 show the relative differences between the measured values and the targeted values. These differences are shaded when they are greater than or equal to 5%. Overall, these comparisons between the measured and targeted compositions again suggest only minor difficulties in meeting the targeted compositions for the KT10 glasses.

3.3 Durability

The measurements generated by the PCTs for the KT08 and KT10-series glasses are presented and reviewed in the following sections. For each series of glasses, the analytical sequence of the measurements is explored, the measurements of the standards are investigated and used to assess the overall accuracy of the ICP-AES measurement process, the measurements for each glass are reviewed, plots are provided that explore the effects of heat treatment on the PCTs for these glasses, the PCTs are normalized using the compositions (targeted and measured) discussed in Section 3.2, and the normalized PCTs are compared to durability predictions for these compositions generated from the current DWPF models.[3]

3.3.1 *KT08-Series*

One of the quality control checkpoints for the PCT procedure is solution mass loss over the course of the seven day test. Water loss was in the acceptable range for all of the KT08 PCT vessels. One of the vessels, the first replicate of the quenched version of glass KT08-04, had an insufficient amount of glass to meet the required ratio of leachant volume to mass of ground glass. Data for this vessel were omitted from further analyses. This omission will not impact the outcome of the study since each glass was tested in triplicate. All of the measurements of the ARM glass fell within the control ranges.[25]

Table C-1 in Appendix C provides the elemental leachate concentration measurements for the solution samples generated by the PCTs for the KT08 glasses. The values were adjusted for the dilution factors: the values for the study glasses, the blanks, and the ARM glass in Table C-1 were multiplied by 1.6667 to determine the values in parts per million and the values for EA were multiplied by 16.6667. Table C-1 also provides the resulting ppm measurements. Exhibit C-1 in Appendix C provides plots of the leachate concentrations (ppm) in analytical sequence for all of the data from the KT08 PCTs. Different colors and symbols are used for each of the study glasses and standards. No issues are seen in these plots. Exhibit C-2 in Appendix C provides analyses of the measurements of the samples of the multi-element standard solution by analytical set and ICP-AES calibration block for the KT08-series. An ANOVA investigating for statistically significant differences among the block averages for these samples for each element of interest is included in the exhibit. A statistically significant (at a 5% level) difference among the averages of these measurements was indicated for Li and Na. However, no attempt was made to bias correct for these effects since averaging the measured concentrations for each set of triplicates in the PCT helps to minimize the impact of any potential ICP-AES bias effects. Exhibit C-3 in Appendix C provides plots of the leachate concentrations for each type of submitted sample: the study glasses by heat treatment and the standards (EA, ARM, the multi-element solution standard, and blanks). The common logarithm plots allow for the assessment of the repeatability of the measurements, which suggest only minor scatter in the triplicate values for some analytes for some of the glasses.

The PCT leachate concentrations were normalized using the targeted and measured cation compositions of the glasses to obtain g/L leachate concentrations following the procedure.[23] Exhibit C-4 in Appendix C provides scatter plots for these results and offers an opportunity to investigate the consistency in the leaching across the elements for the KT08 glasses. All combinations of the normalizations of the PCTs (i.e., those generated using the targeted and measured compositional views) and both heat treatments are represented in the series of scatter plots. 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 that for Na and Si with a value of approximately 97%, indicating highly linear correlations for all of the element pairs. Table C-2 in Appendix C summarizes the normalized PCT results for the KT08-series glasses. The PCT results are listed by heat treatment and compositional view for each glass. The KT08-series glasses all had normalized release for boron (NL [B]) values that were well below the 16.695 g/L value of the benchmark EA glass. The highest NL [B] value based on measured compositions was for glass KT08-03, with values of 0.65 g/L and 0.60 g/L for the quenched and CCC versions of this glass, respectively. Exhibit C-5 in Appendix C provides plots showing comparisons of the normalized PCT responses for the two heat treatments for each glass. A review of these plots shows only minor differences in normalized release for the KT08-series glasses as a function of heat treatment.

The predictability of the KT08 PCT responses was evaluated using the DWPF durability models. The predicted PCT values, determined using the targeted and measured compositions of the KT08 glasses, were compared with the normalized PCT responses. Exhibit C-6 in Appendix C provides plots of the DWPF models for B, Li, Na, and Si that relate the logarithm of the normalized PCT value (for each element of interest) to a linear function of a free energy of hydration term (ΔG_p, in kcal/100 g glass) derived from all of the compositional views and heat treatments of the KT08-series glasses. Prediction limits at a 95% confidence for an individual PCT result are also plotted along with the linear fit. The EA and ARM results are indicated on these plots as well. The measured PCT responses for the KT08-series glasses are well predicted by the DWPF models.

3.3.2 *KT10-Series*

One of the vessels used in the KT10-series PCT, which corresponded to the second replicate of the CCC version of glass KT10-09, had a water loss issue. Data for this vessel were omitted from further analyses. This omission will not impact the outcome of the study since each glass was tested in triplicate. The ratio of leachant volume to the mass of ground glass was confirmed to be correct for each vessel. Some of the measurements of the ARM glass fell outside the control ranges,[25] although this will have no practical impact as the measurements are outside of the ranges by less than one ppm.

Table D-1 in Appendix D provides the elemental leachate concentration measurements for the solution samples generated by the PCTs for the KT10 glasses. The values were adjusted for the dilution factors: the values for the study glasses, the blanks, and the ARM glass in Table D-1 were multiplied by 1.6667 to determine the values in parts per million and the values for EA were multiplied by 16.6667. Table D-1 also provides the resulting ppm measurements. Exhibit D-1 in Appendix D provides plots of the leachate concentrations (ppm) in analytical sequence for all of the data from the KT10 PCTs. Different colors and symbols are used for each of the study glasses and standards. No issues are seen in these plots. Exhibit D-2 in Appendix D provides analyses of the measurements of the samples of the multi-element standard solution by analytical set and ICP-AES calibration block for the KT10-series. An ANOVA investigating for statistically significant differences among the block averages for these samples for each element of interest is included in the exhibit. No statistically significant differences are seen among the averages of these measurements. Exhibit D-3 in Appendix D provides plots of the leachate concentrations for each type of submitted sample: the study glasses by heat treatment and the standards (EA, ARM, the multi-element solution standard, and blanks). The common logarithm plots allow for the assessment of the repeatability of the measurements, which suggest only minor scatter in the triplicate values for some analytes for some of the glasses.

The PCT leachate concentrations were normalized using the targeted and measured cation compositions of the glasses to obtain g/L leachate concentrations following the procedure.[23]

Exhibit D-4 in Appendix D provides scatter plots for these results and offers an opportunity to investigate the consistency in the leaching across the elements for the KT10 glasses. All combinations of the normalizations of the PCTs (i.e., those generated using the targeted and measured compositional views) and both heat treatments are represented in the series of scatter plots. 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 that for B and Si with a value of approximately 96%, indicating highly linear correlations for all of the element pairs. Table D-2 in Appendix D summarizes the normalized PCT results for the KT10-series glasses. The PCT results are listed by heat treatment and compositional view for each glass. The KT10-series glasses all had normalized release for boron (NL [B]) values that were well below the 16.695 g/L value of the benchmark EA glass. The highest NL [B] value based on measured compositions was for glass KT10-03, with values of 0.70 g/L and 0.75 g/L for the quenched and CCC versions of this glass, respectively. Exhibit D-5 in Appendix D provides plots showing comparisons of the normalized PCT responses for the two heat treatments for each glass. A review of these plots shows only minor differences in normalized release for the KT10-series glasses as a function of heat treatment.

The predictability of the KT10 PCT responses was evaluated using the DWPF durability models. The predicted PCT values, determined using the targeted and measured compositions of the KT10 glasses, were compared with the normalized PCT responses. Exhibit D-6 in Appendix D provides plots of the DWPF models for B, Li, Na, and Si that relate the logarithm of the normalized PCT value (for each element of interest) to a linear function of a free energy of hydration term (ΔG_p, in kcal/100 g glass) derived from all of the compositional views and heat treatments of the KT10-series glasses. Prediction limits at a 95% confidence for an individual PCT result are also plotted along with the linear fit. The EA and ARM results are indicated on these plots as well. In general, the measured PCT responses are well predicted by the DWPF models. The measured, normalized release values for silicon for some of the KT10-series glasses fall above the 95% confidence interval for the predicted values; however, the PCT responses for these glasses remain considerably lower than that of the benchmark EA glass.

3.4 Viscosity

Viscosity data were collected for all of the glasses in the KT08 and KT10-series. The measured viscosity at 1150 °C was determined by fitting the data for each glass to the Fulcher equation.[32,33]

3.4.1 *KT08-Series*

Complete data from the fitting of Fulcher equations are given in Exhibit E-1 in Appendix E for the KT08-series glasses. The results of the Fulcher fits were used to calculate a measured viscosity value for each glass at 1150 °C. These values are given in Table E-1 of Appendix E. The measured values are displayed graphically versus the model predicted values in Figure 3-9.

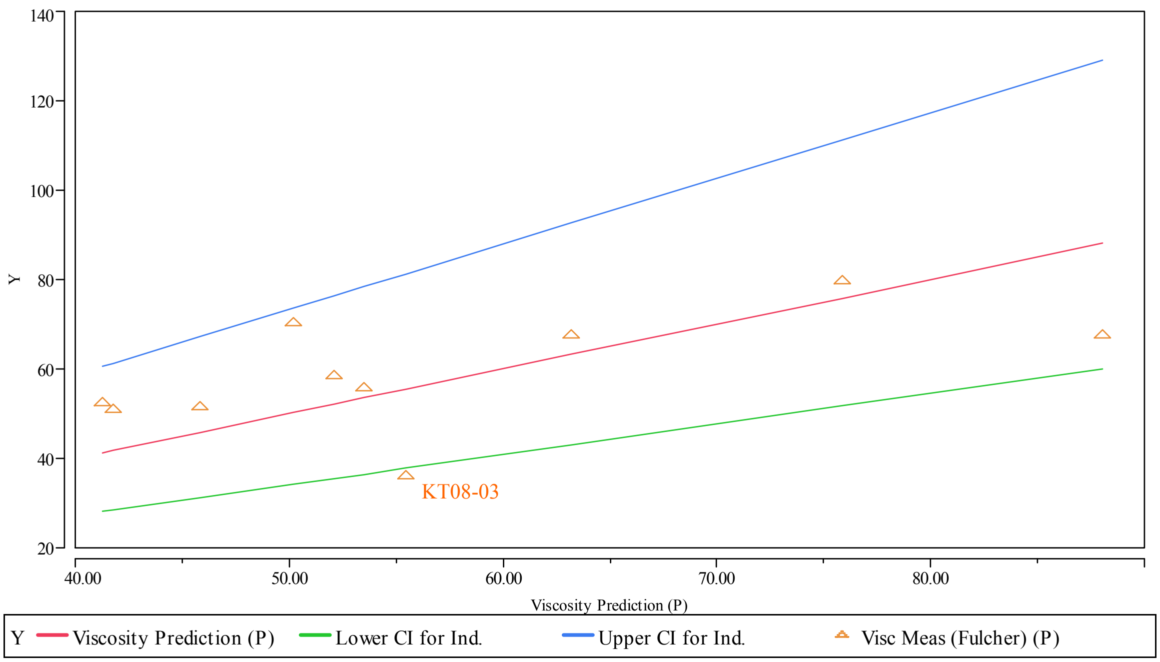


Figure 3-9. Predictability of the Viscosity Values at 1150 °C for the KT08-Series Glasses.

Figure 3-9 shows that all but one of the KT08-series glasses had measured viscosities that were predictable using the current DWPF viscosity model, based on both the targeted and measured compositions. Composition KT08-03 had a measured viscosity that fell below the lower confidence interval for the model prediction based on the measured composition. However, the difference between the lower confidence interval value and the measured value for this glass is only 2 poise (see Table E-1), which represents a difference with no practical impact. Overall, the measured viscosity values of the KT08-series glasses are well predicted by the current DWPF viscosity model.

3.4.2 *KT10-Series*

Complete data from the fitting of Fulcher equations are given in Exhibit F-1 in Appendix F for the KT10-series glasses. The results of the Fulcher fits were used to calculate a measured viscosity value for each glass at 1150 °C. These values are given in Table F-1 of Appendix F. The measured values are displayed graphically versus the model predicted values in Figure 3-10.

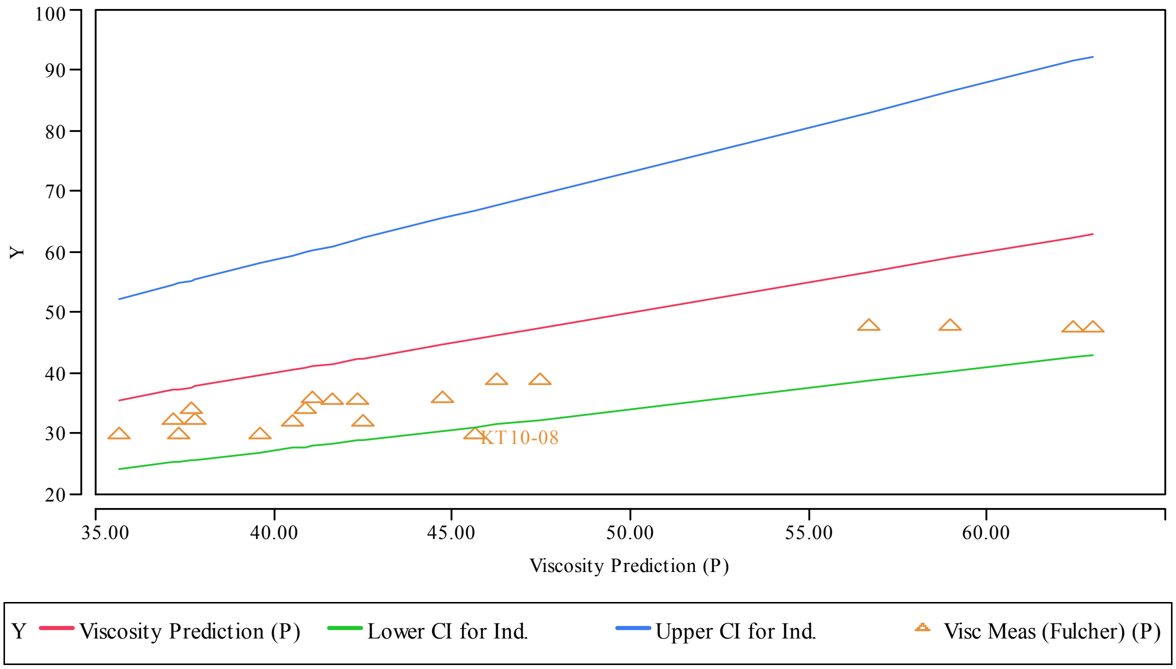


Figure 3-10. Predictability of the Viscosity Values at 1150 °C for the KT10-Series Glasses.

Figure 3-10 shows that all but one of the KT10-series glasses had measured viscosities that were predictable using the current DWPF viscosity model, based on both the targeted and measured compositions. Composition KT10-08 had a measured viscosity that fell below the lower confidence interval for the model prediction based on the measured composition. However, the difference between the lower confidence interval value and the measured value for this glass is only 1 poise (see Table F-1), which represents a difference with no practical impact. Overall, the measured viscosity values of the KT10-series glasses are well predicted by the current DWPF viscosity model.

4.0 Summary

Three series of glass compositions were selected, fabricated, and characterized for this part of the study to determine the impacts of the addition of CST and MST from the SCIX process on the DWPF glass waste form and the applicability of the DWPF process control models. The KT08-series of glasses was designed to evaluate any impacts of the inclusion of uranium and thorium in glasses containing the SCIX components. The KT09-series of glasses was designed to study the effect of increasing Al_2O_3 and K_2O concentrations on the propensity for crystallization of titanium containing phases in high TiO_2 concentration glasses. Earlier work on the KT05-series glasses recommended that the impact of these two components be studied further. Increased Al_2O_3 concentrations have been shown to improve the properties and performance of high waste loading glasses, and K_2O has been reported to improve the retention of TiO_2 in silicate glasses. The KT10-series of compositions was designed to evaluate any impacts of the SCIX components at concentrations 50% higher than currently projected. The glasses were fabricated in the laboratory and characterized using XRD to identify crystallization, ICP-AES to verify chemical compositions, and the PCT to measure durability. The viscosities of several of the glasses were also measured. Liquidus temperature measurements for the KT10-series glasses are underway and will be reported separately.

All but one of the KT08-series glasses were found to be amorphous by XRD. One of the slowly cooled glasses contained a small amount of trevorite, which had no practical impact on the durability of the glass and is typically found in DWPF-type glasses. The measured PCT responses for the KT08-series glasses are well predicted by the DWPF models. The viscosities of the KT08-series glasses were generally well predicted by the DWPF model. No unexpected issues were encountered when uranium and thorium were added to the glasses with SCIX components.

The KT09-series glasses were fabricated, heat treated, and characterized via XRD only, since the type of crystallization formed, if any, was the characteristic of interest for these compositions. Chemical composition, durability, viscosity, and liquidus temperature of these glasses were not determined. Increased Al_2O_3 concentrations were not successful in preventing the formation of iron titanate crystals in the KT09-series glasses. Increased K_2O concentrations were successful in hindering the formation of iron titanates in some of the glasses after the CCC heat treatment. However, this result did not apply to all of the CCC versions of the glasses, indicating a compositional dependence of this effect. In addition, high concentrations of K_2O have been shown to hinder the ability of the DWPF durability and viscosity models to predict the performance of these glasses.[5] The usefulness of increased K_2O concentrations in preventing the formation of iron titanates may therefore be limited.

All of the KT10-series glasses were XRD amorphous, regardless of heat treatment. Chemical composition measurements showed that the glasses met the targeted concentrations for each oxide. In general, the measured PCT responses of the KT10-series glasses were well predicted by the DWPF models. The measured, normalized release values for silicon for some of the glasses fell above the 95% confidence interval for the predicted values; however, the PCT responses for these glasses remain considerably lower than that of the benchmark EA glass. The viscosities of the KT10-series glasses were generally well predicted by the DWPF model.

5.0 Recommendations and Path Forward

Ten sets of experimental glasses have now been fabricated and characterized to better understand the impacts of the SCIX streams on DWPF glass formulation. The next step will be to compile all of the data developed and further compare the measured properties and performance with those predicted by the current DWPF PCCS models. Recommendations will then be made as to which models, if any, may need to be modified in order to accommodate the material from SCIX into DWPF glass production. Liquidus temperature data for the glasses will also be reported with these recommendations. An additional report on the potential impacts of the SCIX material on the melt rate of DWPF glass is also forthcoming.

6.0 References

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Appendix A. Data Supporting the Chemical Composition Measurements of the KT08-Series Glasses

Table A-1. Chemical Composition Measurements of the KT08-Series of Glasses Using CH Preparation Method (part 1).

Glass ID	Block	Sub-Blk	Sequence	Lab ID	Ag (ug/g)	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)
KT7ref	1	1	1	KT7REFCH11	< 50.2	30500	18400	691	7420	1830	677	429	86100	2050	658	16100
Ustd	1	1	2	USTDCH11	< 50.1	21600	28300	38.4	9720	< 155	1750	< 33.3	95500	26200	77.1	13800
KT08-08	1	1	3	J08CH2	< 50.6	24500	18300	572	5290	906	587	352	55600	2030	285	15900
KT08-01	1	1	4	J03CH2	< 50.3	31900	18600	592	6960	2510	596	650	82900	1680	795	15900
KT08-01	1	1	5	J03CH1	< 49.8	32000	18900	582	7140	2510	604	653	83600	1650	794	15800
KT08-06	1	1	6	J09CH1	< 51.1	41200	18900	620	7690	1130	916	433	63300	2290	307	15900
KT08-10	1	1	7	J05CH2	< 50.8	28400	18900	643	6760	2000	624	339	85900	1780	575	16100
KT7ref	1	1	8	KT7REFCH12	< 50.2	30800	18800	701	7490	1830	690	433	88000	1980	657	16000
Ustd	1	1	9	USTDCH12	< 50.1	21400	28000	37.7	9580	< 155	1740	< 33.3	94800	25600	72.6	13500
KT08-08	1	1	10	J08CH1	< 50.4	24700	18600	598	5320	888	617	367	56200	1900	282	15900
KT08-05	1	1	11	J02CH2	< 49.5	39400	19400	649	7310	1480	916	433	70200	1950	583	16700
KT08-06	1	1	12	J09CH2	< 49.8	39500	18600	610	7290	1100	872	395	62600	2120	309	15800
KT08-05	1	1	13	J02CH1	< 50.7	37700	18500	622	6980	1420	881	420	67100	1990	557	15900
KT08-10	1	1	14	J05CH1	< 51.2	28000	18700	633	6580	1990	624	330	85800	1670	573	16000
Blank	1	1	15	BLANKCH1	< 51.4	< 226	728	< 28.3	67	< 158	< 33.4	< 34.1	84	1210	< 15.4	< 181
KT7ref	1	1	16	KT7REFCH13	< 50.2	30700	18600	700	7440	1860	690	433	87600	2140	653	15900
Ustd	1	1	17	USTDCH13	< 50.1	21700	28600	40.8	9770	< 155	1780	< 33.3	96800	26100	74.7	13700
KT7ref	1	2	1	KT7REFCH11	< 50.2	30100	18200	668	7290	1810	653	430	84100	2200	638	16100
Ustd	1	2	2	USTDCH11	< 50.1	21400	27800	32.8	9560	< 155	1700	< 33.3	93200	26100	63.5	14000
KT08-10	1	2	3	J05CH1	< 51.2	27700	18200	612	6460	1970	598	340	83200	1940	560	16200
KT08-06	1	2	4	J09CH1	< 51.1	40700	18500	601	7570	1090	884	438	61900	2400	303	16100
KT08-08	1	2	5	J08CH2	< 50.6	24300	18000	554	5210	864	570	372	54700	2190	278	16000
KT08-01	1	2	6	J03CH1	< 49.8	31900	18700	569	7090	2500	589	681	82200	1770	789	16200
KT08-10	1	2	7	J05CH2	< 50.8	28000	18500	625	6650	1970	606	350	84000	1910	561	16100
KT7ref	1	2	8	KT7REFCH12	< 50.2	30600	18500	685	7380	1840	671	434	86200	2280	645	16200
Ustd	1	2	9	USTDCH12	< 50.1	21100	27500	35.6	9420	< 155	1680	< 33.3	92500	25800	59	13600
KT08-01	1	2	10	J03CH2	< 50.3	31700	18500	581	6890	2510	583	660	82100	1830	783	16100
KT08-05	1	2	11	J02CH1	< 50.7	37500	18300	611	6910	1400	861	421	66100	2110	548	16000
KT08-08	1	2	12	J08CH1	< 50.4	24500	18300	587	5290	893	606	381	55600	2060	277	16100
KT08-06	1	2	13	J09CH2	< 49.8	39700	18600	601	7270	1100	864	400	62200	2250	301	16200
KT08-05	1	2	14	J02CH2	< 49.5	37800	18400	609	6950	1420	862	419	66700	1990	552	16200
Blank	1	2	15	BLANKCH1	< 51.4	< 226	721	< 28.3	57.5	< 158	< 33.4	< 34.1	73.5	1280	< 15.4	< 181
KT7ref	1	2	16	KT7REFCH13	< 50.2	30800	18600	694	7430	1850	680	433	87400	2140	648	16100
Ustd	1	2	17	USTDCH13	< 50.1	21800	28400	36.8	9700	< 155	1750	< 33.3	96200	26400	65.6	13900
KT7ref	2	1	1	KT7REFCH21	< 50.3	30300	18400	665	7220	1960	675	331	83600	2350	665	16300
Ustd	2	1	2	USTDCH21	< 50.7	20800	26900	36.2	9420	164	1630	< 33.6	88500	25400	81	13600
KT08-02	2	1	3	J10CH1	< 49.9	27800	18400	564	6910	2630	580	371	75600	2260	541	16100
KT08-09	2	1	4	J06CH1	< 51.1	27400	18800	591	6520	1770	620	281	73900	2620	579	16300
KT08-09	2	1	5	J06CH2	< 49.7	27800	18200	562	6500	1740	605	274	73500	2430	580	16200
KT08-02	2	1	6	J10CH2	< 50.3	28100	18400	575	7050	2600	578	381	75700	2150	544	16200
KT08-07	2	1	7	J01CH2	< 50.2	28000	18800	590	6000	953	886	271	57100	2410	299	16500
KT7ref	2	1	8	KT7REFCH22	< 50.3	30400	18300	661	7200	1930	671	340	83400	2460	672	16300
Ustd	2	1	9	USTDCH222	< 50.7	21700	27800	38.8	9780	< 156	1680	< 33.6	91900	26700	82.9	14100
KT08-07	2	1	10	J01CH1	< 50.8	28000	18400	585	5980	949	885	271	57000	2440	296	16500

Table A-1. Chemical Composition Measurements of the KT08-Series of Glasses Using CH Preparation Method (part 1). (continued)

Glass ID	Block	Sub-Blk	Sequence	Lab ID	Ag (ug/g)	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)
KT08-03	2	1	11	J07CH2	< 50.5	24000	18500	571	6860	2320	567	338	74400	2050	532	16300
KT08-04	2	1	12	J04CH2	< 50.2	27500	18400	575	6720	2060	588	363	81400	2090	579	16300
KT08-03	2	1	13	J07CH1	< 50.3	24000	18400	562	6820	2360	570	348	74600	2250	530	16300
KT08-04	2	1	14	J04CH1	< 50.3	27200	18400	587	6420	2040	572	360	80700	2040	571	16200
Blank	2	1	15	BLANKCH2	< 51.4	< 226	< 90	< 28.3	132	< 158	< 33.4	< 34.1	171	1570	< 15.4	< 181
KT7ref	2	1	16	KT7REFCH23	< 50.3	30800	18500	666	7250	1910	677	359	84400	2410	674	16300
Ustd	2	1	17	USTDCH23	< 50.7	21900	27900	36	9770	< 156	1700	< 33.6	92400	26700	81.9	14000
KT7ref	2	2	1	KT7REFCH21	< 50.3	30900	18500	681	7260	1950	684	348	85800	2360	671	16200
Ustd	2	2	2	USTDCH21	< 50.7	21400	27300	38.4	9550	< 156	1690	< 33.6	91900	26200	78.4	13600
KT08-03	2	2	3	J07CH2	< 50.5	24400	18800	591	6910	2320	590	363	77000	1990	528	16200
KT08-04	2	2	4	J04CH1	< 50.3	27600	18700	606	6450	2030	584	366	83400	1780	579	16100
KT08-09	2	2	5	J06CH1	< 51.1	28100	19200	613	6580	1710	641	287	76500	2310	579	16300
KT08-07	2	2	6	J01CH2	< 50.2	28600	19100	613	6060	904	911	270	59100	2300	304	16400
KT08-02	2	2	7	J10CH1	< 49.9	28700	18700	584	6940	2590	596	378	78400	1760	548	16100
KT7ref	2	2	8	KT7REFCH22	< 50.3	31200	18700	687	7270	1880	695	352	86600	2120	674	16200
Ustd	2	2	9	USTDCH222	< 50.7	22300	28500	39.8	9860	< 156	1750	< 33.6	95700	27100	86.7	14100
KT08-02	2	2	10	J10CH2	< 50.3	28900	18800	598	7100	2560	595	396	78800	1590	536	16100
KT08-03	2	2	11	J07CH1	< 50.3	24700	18900	584	6880	2310	590	364	77600	1460	525	16200
KT08-07	2	2	12	J01CH1	< 50.8	28900	19000	609	6040	867	920	284	59700	1930	308	16400
KT08-04	2	2	13	J04CH2	< 50.2	28200	18800	596	6770	1990	605	368	84400	1530	580	16200
KT08-09	2	2	14	J06CH2	< 49.7	28700	18600	585	6570	1660	623	285	76400	1860	574	16200
Blank	2	2	15	BLANKCH2	< 51.4	< 226	< 90	< 28.3	129	< 158	< 33.4	< 34.1	175	1380	< 15.4	< 181
KT7ref	2	2	16	KT7REFCH23	< 50.3	31500	18800	691	7290	1890	693	348	87200	1790	677	16300
Ustd	2	2	17	USTDCH23	< 50.7	22400	28300	39.3	9870	< 156	1760	< 33.6	95500	26800	89.5	14100

Table A-2. Chemical Composition Measurements of the KT08-Series of Glasses Using CH Preparation Method (part 2).

Glass ID	Block	Sub-Blk	Sequence	Lab ID	Mg (ug/g)	Mn (ug/g)	Na (ug/g)	Nb (ug/g)	Pb (ug/g)	S (ug/g)	Si (ug/g)	Th (ug/g)	Ti (ug/g)	U (ug/g)	Zn (ug/g)	Zr (ug/g)
KT7ref	1	1	1	KT7REFCH11	736	4420	112000	6230	1810	< 1760	228000	< 298	28200	< 1040	378	5440
Ustd	1	1	2	USTDCH11	7440	21900	91800	< 26.9	< 171	< 1760	227000	< 298	5960	19200	71.2	73.3
KT08-08	1	1	3	J08CH2	615	6430	105000	8210	1270	< 1770	242000	< 301	25000	44500	322	6640
KT08-01	1	1	4	J03CH2	928	14800	100000	7140	2020	< 1760	232000	1520	24700	5130	92.6	6140
KT08-01	1	1	5	J03CH1	934	14900	99100	7170	2060	< 1740	234000	1370	24700	5270	91.6	6020
KT08-06	1	1	6	J09CH1	671	9200	103000	6910	1180	< 1790	236000	< 304	25300	6760	673	6330
KT08-10	1	1	7	J05CH2	668	2830	94300	4950	1580	< 1780	236000	< 302	23700	38700	374	4650
KT7ref	1	1	8	KT7REFCH12	754	4540	108000	6260	1860	< 1760	237000	< 298	28500	< 1040	392	5560
Ustd	1	1	9	USTDCH12	7390	21800	89100	45.5	< 171	< 1760	225000	< 298	5860	18600	59.3	60.2
KT08-08	1	1	10	J08CH1	627	6530	104000	8250	1260	< 1770	245000	< 300	25100	44000	330	6700
KT08-05	1	1	11	J02CH2	1010	8280	108000	7900	1260	< 1730	256000	< 294	26900	4440	357	6970
KT08-06	1	1	12	J09CH2	674	9090	101000	7030	1210	< 1740	240000	< 296	25100	6630	639	6410
KT08-05	1	1	13	J02CH1	966	7900	102000	7560	1200	< 1780	245000	< 301	25700	4330	339	6630
KT08-10	1	1	14	J05CH1	669	2840	93700	4950	1550	< 1790	236000	< 304	23600	38400	367	4600
Blank	1	1	15	BLANKCH1	11.4	< 26.4	976	74.9	< 175	< 1800	477	< 305	< 26.4	< 1070	< 36.2	33.5
KT7ref	1	1	16	KT7REFCH13	751	4530	106000	6140	1800	< 1760	235000	< 298	28300	< 1040	392	5490
Ustd	1	1	17	USTDCH13	7560	22300	90300	< 26.9	< 171	< 1760	229000	< 298	5980	19200	61.6	60.6
KT7ref	1	2	1	KT7REFCH11	721	4330	105000	5790	1600	< 1760	214000	< 298	28100	< 1040	369	5370
Ustd	1	2	2	USTDCH11	7260	21400	89500	61.1	< 171	< 1760	217000	< 298	5930	18900	59	53.3
KT08-10	1	2	3	J05CH1	649	2740	92900	4760	1400	< 1790	222000	< 304	23500	38600	351	4520
KT08-06	1	2	4	J09CH1	655	8940	102000	6630	985	< 1790	220000	< 304	25200	6530	656	6230
KT08-08	1	2	5	J08CH2	606	6330	103000	8240	1050	< 1770	234000	< 301	24900	44200	318	6620
KT08-01	1	2	6	J03CH1	918	14600	98300	6810	1850	< 1740	216000	1430	24800	4900	96.5	5980
KT08-10	1	2	7	J05CH2	654	2770	93000	4740	1430	< 1780	221000	< 302	23500	38300	365	4600
KT7ref	1	2	8	KT7REFCH12	738	4440	107000	5930	1630	< 1760	222000	< 298	28400	< 1040	385	5490
Ustd	1	2	9	USTDCH12	7200	21300	87700	43.8	< 171	< 1760	217000	< 298	5820	18600	59.3	59.7
KT08-01	1	2	10	J03CH2	916	14500	97800	6810	1820	< 1760	217000	1540	24700	4950	95.9	6060
KT08-05	1	2	11	J02CH1	948	7760	102000	7170	1070	< 1780	227000	< 301	25700	3960	342	6570
KT08-08	1	2	12	J08CH1	619	6430	104000	8350	1060	< 1770	237000	< 300	25200	44200	330	6730
KT08-06	1	2	13	J09CH2	670	8990	102000	6710	1020	< 1740	223000	< 296	25300	6350	633	6380
KT08-05	1	2	14	J02CH2	955	7830	103000	7260	1010	< 1730	229000	< 294	25900	4060	339	6650
Blank	1	2	15	BLANKCH1	13.2	< 26.4	877	85.9	< 175	< 1800	419	< 305	< 26.4	< 1070	< 36.2	43
KT7ref	1	2	16	KT7REFCH13	746	4490	107000	5880	1680	< 1760	222000	< 298	28500	< 1040	396	5470
Ustd	1	2	17	USTDCH13	7470	22100	90600	< 26.9	< 171	< 1760	225000	< 298	5990	18900	62.6	61.6
KT7ref	2	1	1	KT7REFCH21	719	4340	104000	1130	1170	< 1760	32900	< 299	28500	< 1040	354	4770
Ustd	2	1	2	USTDCH21	6900	20500	84900	39.8	< 173	< 1780	210000	< 301	5760	19700	62.5	36.7
KT08-02	2	1	3	J10CH1	904	12400	101000	2060	1110	< 1750	57000	5340	24800	3590	314	5940
KT08-09	2	1	4	J06CH1	635	3840	95100	2580	1200	< 1790	110000	< 304	25100	42300	339	4410
KT08-09	2	1	5	J06CH2	642	3830	94500	1710	1170	< 1740	69000	< 295	25000	41700	354	4010
KT08-02	2	1	6	J10CH2	910	12400	102000	2030	1080	< 1760	54900	5480	24900	3820	325	5990
KT08-07	2	1	7	J01CH2	633	4990	98900	1830	565	< 1760	56000	< 298	25600	32000	594	5600
KT7ref	2	1	8	KT7REFCH22	720	4340	105000	1320	1220	< 1760	40300	< 299	28500	< 1040	356	4870
Ustd	2	1	9	USTDCH222	7160	21300	88900	46.9	< 173	< 1780	219000	< 301	5960	20300	64.6	51.2
KT08-07	2	1	10	J01CH1	623	4970	99200	1840	508	< 1780	52300	< 302	25400	32200	594	5640

Table A-2. Chemical Composition Measurements of the KT08-Series of Glasses Using CH Preparation Method (part 2). (continued)

Glass ID	Block	Sub-Blk	Sequence	Lab ID	Mg (ug/g)	Mn (ug/g)	Na (ug/g)	Nb (ug/g)	Pb (ug/g)	S (ug/g)	Si (ug/g)	Th (ug/g)	Ti (ug/g)	U (ug/g)	Zn (ug/g)	Zr (ug/g)
KT08-03	2	1	11	J07CH2	909	13000	104000	1880	1050	< 1770	47200	7880	24700	5390	296	5800
KT08-04	2	1	12	J04CH2	893	7930	102000	1840	790	< 1760	47500	2010	25600	1910	622	5260
KT08-03	2	1	13	J07CH1	912	13100	104000	2600	1160	< 1760	73900	7780	24700	5260	295	6240
KT08-04	2	1	14	J04CH1	892	7870	102000	2870	887	< 1760	83400	2220	25400	2110	611	5500
Blank	2	1	15	BLANKCH2	17.4	< 26.4	1080	104	< 175	< 1800	307	< 305	< 26.4	< 1070	< 36.2	50.2
KT7ref	2	1	16	KT7REFCH23	727	4380	106000	2050	1300	< 1760	65900	< 299	28600	< 1040	364	4890
Ustd	2	1	17	USTDCH23	7210	21400	89800	< 27.2	< 173	< 1780	222000	< 301	5940	20400	64.2	44.3
KT7ref	2	2	1	KT7REFCH21	734	4450	107000	1310	1280	< 1760	37200	< 299	28600	< 1040	369	4950
Ustd	2	2	2	USTDCH21	7140	21200	87800	< 27.2	< 173	< 1780	214000	< 301	5810	19200	60.4	33.6
KT08-03	2	2	3	J07CH2	933	13400	106000	2170	1150	< 1770	53200	7980	24800	5190	314	6020
KT08-04	2	2	4	J04CH1	915	8090	103000	3150	975	< 1760	91000	2180	25500	1960	639	5670
KT08-09	2	2	5	J06CH1	652	3960	98200	2800	1320	< 1790	121000	< 304	25300	40700	357	4520
KT08-07	2	2	6	J01CH2	648	5130	102000	1290	518	< 1760	35600	< 298	25600	31400	632	5760
KT08-02	2	2	7	J10CH1	930	12800	105000	1760	1160	< 1750	45500	5370	25000	3610	333	6060
KT7ref	2	2	8	KT7REFCH22	743	4480	108000	1190	1270	< 1760	33000	< 299	28600	< 1040	381	4990
Ustd	2	2	9	USTDCH222	7420	22100	91700	32	< 173	< 1780	224000	< 301	6000	19700	65.1	41.9
KT08-02	2	2	10	J10CH2	939	12900	105000	2330	1250	< 1760	63400	5500	25000	3750	352	6120
KT08-03	2	2	11	J07CH1	940	13500	107000	2660	1260	< 1760	76300	7800	24900	5430	316	6340
KT08-07	2	2	12	J01CH1	647	5170	103000	1820	586	< 1780	49700	< 302	25700	31000	646	5780
KT08-04	2	2	13	J04CH2	921	8190	105000	1820	869	< 1760	44400	2030	25700	2100	671	5390
KT08-09	2	2	14	J06CH2	662	3960	98200	1580	1200	< 1740	62300	< 295	25200	40300	379	4070
Blank	2	2	15	BLANKCH2	17.2	< 26.4	1270	95.5	< 175	< 1800	296	< 305	< 26.4	< 1070	< 36.2	33
KT7ref	2	2	16	KT7REFCH23	747	4500	109000	1580	1320	< 1760	44900	< 299	28800	< 1040	381	4980
Ustd	2	2	17	USTDCH23	7420	22000	92100	< 27.2	< 173	< 1780	224000	< 301	5990	19600	65.1	37.9

Table A-3. Chemical Composition Measurements of the KT08-Series of Glasses Using PF Preparation Method (part 1).

Glass ID	Block	Sub-Blk	Sequence	Lab ID	Ag (ug/g)	Al (ug/g)	B (ug/g)	Ba (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)
KT7ref	1	1	1	KT7REFPF11	< 170	30700	18400	683	1720	647	428	83600	< 2770	697	16000	699
Ustd	1	1	2	USTDPF11	< 169	21700	28400	< 93.4	< 523	1720	< 112	92900	25200	127	13600	7190
KT08-04	1	1	3	J04PF1	< 171	38300	18800	631	1480	876	394	65900	< 2780	596	16000	913
KT08-05	1	1	4	J02PF1	< 169	27900	18500	632	1990	577	385	82200	< 2760	587	15600	862
KT08-03	1	1	5	J07PF1	< 168	24800	18800	596	2340	570	420	76500	< 2740	559	15900	901
KT08-10	1	1	6	J05PF1	< 169	28400	18800	632	2130	617	301	83400	< 2760	601	16000	623
KT08-06	1	1	7	J09PF2	< 170	39400	18400	606	935	876	369	60500	3460	369	15700	615
KT7ref	1	1	8	KT7REFPF12	< 170	31100	18700	701	2020	683	398	85500	3320	690	15900	695
Ustd	1	1	9	USTDPF12	< 169	21800	28400	< 93.4	< 523	1730	< 112	93300	26400	123	13600	7200
KT08-10	1	1	10	J05PF2	< 166	27900	18500	629	2010	601	271	82300	< 2710	613	15800	594
KT08-06	1	1	11	J09PF1	< 166	39700	18600	613	1070	873	387	61100	2800	346	15800	623
KT08-03	1	1	12	J07PF2	< 170	24700	18600	601	2100	546	428	76400	< 2770	545	15800	880
KT08-04	1	1	13	J04PF2	< 168	27900	18600	633	1880	571	393	81900	3850	562	15700	785
KT08-05	1	1	14	J02PF2	< 169	37600	18400	614	1480	868	395	64600	< 2760	598	15700	878
Blank	1	1	15	BLANKPF1	< 171	1330	< 300	< 94.4	< 528	< 111	< 114	180	2940	63.2	< 605	21.6
KT7ref	1	1	16	KT7REFPF13	< 170	31100	18600	699	1950	679	425	85500	3020	690	15900	698
Ustd	1	1	17	USTDPF13	< 169	21800	28500	< 93.4	< 523	1750	< 112	93500	26500	123	13500	7200
KT7ref	1	2	1	KT7REFPF11	< 170	30800	18300	667	1740	654	425	83600	< 2770	670	16000	692
Ustd	1	2	2	USTDPF11	< 169	22100	28300	< 93.4	< 523	1700	< 112	92900	24100	85.5	13700	7180
KT08-04	1	2	3	J04PF2	< 168	28900	18800	633	2120	597	403	83600	< 2740	591	15900	790
KT08-03	1	2	4	J07PF1	< 168	25600	19000	609	2280	584	449	77800	< 2740	564	16000	912
KT08-05	1	2	5	J02PF2	< 169	38600	18500	625	1270	873	451	65400	< 2760	588	15900	882
KT08-10	1	2	6	J05PF1	< 169	29100	19000	639	1990	598	316	84600	< 2760	598	16100	628
KT08-06	1	2	7	J09PF1	< 166	41100	18900	626	1050	868	415	62200	< 2700	352	16100	629
KT7ref	1	2	8	KT7REFPF12	< 170	32200	18900	705	2090	694	455	87100	< 2770	699	16000	698
Ustd	1	2	9	USTDPF12	< 169	23100	28800	< 93.4	< 523	1780	< 112	95500	21400	113	13800	7280
KT08-06	1	2	10	J09PF2	< 170	40200	18600	616	1230	854	430	61200	< 2770	389	15900	618
KT08-04	1	2	11	J04PF1	< 171	38900	19000	643	1560	890	434	67100	< 2780	602	16100	918
KT08-03	1	2	12	J07PF2	< 170	25300	18800	605	2230	579	477	77300	< 2770	564	16100	884
KT08-10	1	2	13	J05PF2	< 166	28600	18700	628	2220	596	316	83400	< 2710	594	15900	597
KT08-05	1	2	14	J02PF1	< 169	28200	18600	623	2060	559	393	82900	< 2760	589	15700	866
Blank	1	2	15	BLANKPF1	< 171	1170	< 300	< 94.4	< 528	< 111	< 114	198	< 2790	68.8	< 605	22.4
KT7ref	1	2	16	KT7REFPF13	< 170	32100	18800	712	2060	681	443	87200	< 2770	686	16000	703
Ustd	1	2	17	USTDPF13	< 169	22700	28800	< 93.4	< 523	1750	< 112	95400	23200	120	13700	7290
KT7ref	2	1	1	KT7REFPF21	< 167	30800	18200	684	1540	668	426	85500	< 2730	662	16100	617
Ustd	2	1	2	USTDPF21	< 170	21600	27800	< 94	< 526	1720	< 113	94000	26700	130	13900	7310
KT08-07	2	1	3	J01PF2	< 170	28400	17900	588	578	862	364	56500	2840	317	16100	479
KT08-02	2	1	4	J10PF2	< 170	28200	17500	585	2140	551	468	75100	< 2780	494	15900	711
KT08-08	2	1	5	J08PF2	< 167	23600	16800	548	585	538	372	51200	< 2720	302	15500	465
KT08-07	2	1	6	J01PF1	< 169	28200	17500	578	627	831	376	56100	< 2760	327	16300	534
KT08-09	2	1	7	J06PF1	< 170	27200	17100	575	1330	566	298	71200	< 2770	552	16000	505
KT7ref	2	1	8	KT7REFPF22	< 167	30600	17300	653	1720	631	415	82000	< 2730	660	16200	591
Ustd	2	1	9	USTDPF22	< 170	21500	26700	< 94	< 526	1670	< 113	91200	26700	135	14000	7140
KT08-02	2	1	10	J10PF1	< 169	28600	17500	585	2330	545	451	75600	< 2750	580	16400	830

Table A-3. Chemical Composition Measurements of the KT08-Series of Glasses Using PF Preparation Method (part 1). (continued)

Glass ID	Block	Sub-Blk	Sequence	Lab ID	Ag (ug/g)	Al (ug/g)	B (ug/g)	Ba (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)
KT08-01	2	1	11	J03PF2	< 169	32200	17500	558	2410	561	641	78600	< 2760	802	16400	771
KT08-09	2	1	12	J06PF2	< 166	27200	17300	577	1410	574	290	71300	< 2700	562	16200	511
KT08-01	2	1	13	J03PF1	< 168	32500	17700	572	2410	557	644	80000	< 2740	825	16700	809
KT08-08	2	1	14	J08PF1	< 168	24400	17300	562	552	561	368	53100	< 2740	319	16600	499
Blank	2	1	15	BLANKPF2	< 171	797	< 300	< 94.4	< 528	< 111	< 114	157	< 2790	58.4	< 605	< 20
KT7ref	2	1	16	KT7REFPF23	< 167	30500	17400	662	1600	629	412	82600	< 2730	672	16500	590
Ustd	2	1	17	USTDPF23	< 170	21000	26300	< 94	< 526	1630	< 113	89700	25800	133	14000	6990
KT7ref	2	2	1	KT7REFPF21	< 167	30800	18700	718	1770	685	423	87800	2880	688	16500	664
Ustd	2	2	2	USTDPF21	< 170	21600	28500	< 94	< 526	1790	< 113	96700	27300	136	14300	7480
KT08-08	2	2	3	J08PF1	< 168	24500	18500	613	585	595	358	56300	< 2740	330	16800	554
KT08-02	2	2	4	J10PF1	< 169	28700	18700	640	2390	593	467	80300	2770	593	17000	897
KT08-08	2	2	5	J08PF2	< 167	23700	17900	594	613	591	351	54400	3150	305	16200	515
KT08-01	2	2	6	J03PF1	< 168	32400	19000	632	2370	618	611	85200	< 2740	829	17200	879
KT08-07	2	2	7	J01PF1	< 169	28400	18900	635	725	903	356	60100	< 2760	333	17100	592
KT7ref	2	2	8	KT7REFPF22	< 167	30700	18800	723	1690	688	416	88400	< 2730	661	17000	658
Ustd	2	2	9	USTDPF22	< 170	21500	28800	< 94	< 526	1790	< 113	97500	27900	134	14600	7500
KT08-02	2	2	10	J10PF2	< 170	28100	18600	632	2170	608	402	79600	< 2780	509	16700	774
KT08-09	2	2	11	J06PF2	< 166	27000	18500	631	1350	647	290	76300	< 2700	574	16600	570
KT08-01	2	2	12	J03PF2	< 169	32100	18800	614	2420	615	634	83900	< 2760	791	16700	846
KT08-09	2	2	13	J06PF1	< 170	27300	18500	632	1320	621	282	76600	< 2770	556	16500	565
KT08-07	2	2	14	J01PF2	< 170	28100	18700	634	718	917	337	59200	< 2770	324	16700	531
Blank	2	2	15	BLANKPF2	< 171	942	< 300	< 94.4	< 528	< 111	< 114	165	< 2790	63.2	< 605	< 20
KT7ref	2	2	16	KT7REFPF23	< 167	30300	18500	706	1650	699	398	87000	< 2730	657	16600	650
Ustd	2	2	17	USTDPF23	< 170	21000	28000	< 94	< 526	1730	< 113	95200	26600	139	14000	7350

Table A-4. Chemical Composition Measurements of the KT08-Series of Glasses Using PF Preparation Method (part 2).

Glass ID	Block	Sub-Blk	Sequence	Lab ID	Mn (ug/g)	Nb (ug/g)	Ni (ug/g)	Pb (ug/g)	S (ug/g)	Si (ug/g)	Th (ug/g)	Ti (ug/g)	U (ug/g)	Zn (ug/g)
KT7ref	1	1	1	KT7REFPF11	4370	5840	4020	1580	< 5940	217000	7700	28600	< 3520	393
Ustd	1	1	2	USTDPF11	21500	< 91.1	8660	< 579	< 5940	218000	4640	5820	21600	< 120
KT08-04	1	1	3	J04PF1	7890	6740	1090	904	< 5980	240000	3710	26000	6730	355
KT08-05	1	1	4	J02PF1	8100	6420	1380	1250	< 5930	235000	5950	25200	5610	671
KT08-03	1	1	5	J07PF1	13600	6810	2390	1540	< 5890	241000	10800	24900	7470	344
KT08-10	1	1	6	J05PF1	2800	4560	3680	1570	< 5930	238000	3840	23600	40100	361
KT08-06	1	1	7	J09PF2	8970	6460	1340	1140	< 5950	243000	1920	25100	9180	641
KT7ref	1	1	8	KT7REFPF12	4430	5810	4230	1660	< 5940	241000	7410	28600	< 3520	398
Ustd	1	1	9	USTDPF12	21700	< 91.1	8740	< 579	< 5940	222000	4680	5790	22500	< 120
KT08-10	1	1	10	J05PF2	2780	4410	3470	1370	< 5830	235000	1460	23300	40300	354
KT08-06	1	1	11	J09PF1	9060	6550	1330	1020	< 5810	245000	2480	25300	8090	647
KT08-03	1	1	12	J07PF2	13600	6710	2440	1560	< 5940	244000	9350	24700	7590	326
KT08-04	1	1	13	J04PF2	7920	6430	1470	1410	< 5880	240000	4900	25500	< 3490	640
KT08-05	1	1	14	J02PF2	7780	6970	1010	1040	< 5930	247000	5320	25400	5660	332
Blank	1	1	15	BLANKPF1	32	145	< 744	< 585	< 6000	1250	6820	< 88	< 3560	< 121
KT7ref	1	1	16	KT7REFPF13	4450	5810	4260	1740	< 5940	238000	7590	28500	< 3520	389
Ustd	1	1	17	USTDPF13	21700	< 91.1	8730	< 579	< 5940	221000	5080	5770	19900	< 120
KT7ref	1	2	1	KT7REFPF11	4350	5720	3950	< 4800	< 5940	217000	8060	28700	< 3520	401
Ustd	1	2	2	USTDPF11	21400	< 91.1	8660	< 4800	< 5940	215000	5090	5840	19700	88.7
KT08-04	1	2	3	J04PF2	7950	6490	1600	< 4750	< 5880	244000	5100	25600	6590	658
KT08-03	1	2	4	J07PF1	13700	6880	2620	< 4760	< 5890	244000	11100	25000	9370	337
KT08-05	1	2	5	J02PF2	7770	7110	1130	< 4790	6650	249000	5750	25700	7590	328
KT08-10	1	2	6	J05PF1	2810	4570	3740	< 4790	< 5930	242000	4010	23700	41600	377
KT08-06	1	2	7	J09PF1	9120	6680	1440	< 4690	< 5810	250000	2590	25400	10600	653
KT7ref	1	2	8	KT7REFPF12	4460	5980	4460	< 4800	< 5940	247000	7730	28700	4040	405
Ustd	1	2	9	USTDPF12	21900	< 91.1	9170	< 4800	< 5940	227000	5340	5820	23300	84.7
KT08-06	1	2	10	J09PF2	9010	6570	1390	< 4810	< 5950	244000	2180	25300	9500	648
KT08-04	1	2	11	J04PF1	7950	6590	1070	< 4830	< 5980	235000	3820	26100	7460	339
KT08-03	1	2	12	J07PF2	13600	6780	2540	< 4800	< 5940	245000	9710	24900	7800	315
KT08-10	1	2	13	J05PF2	2790	4350	3600	< 4710	< 5830	233000	1630	23500	39500	357
KT08-05	1	2	14	J02PF1	8110	6370	1470	< 4790	< 5930	231000	6310	25400	4110	666
Blank	1	2	15	BLANKPF1	16.8	150	< 744	< 4850	< 6000	938	7210	< 88	3640	< 17.6
KT7ref	1	2	16	KT7REFPF13	4460	5960	4420	< 4800	< 5940	242000	8080	28800	3680	400
Ustd	1	2	17	USTDPF13	21800	< 91.1	9050	< 4800	< 5940	224000	5380	5830	21400	83.1
KT7ref	2	1	1	KT7REFPF21	4450	5620	4060	1720	< 5870	223000	4680	28600	< 3480	318
Ustd	2	1	2	USTDPF21	21800	< 91.6	8620	< 582	< 5970	208000	3300	5910	18900	< 120
KT08-07	2	1	3	J01PF2	4950	6280	4330	919	< 5950	215000	2740	25200	29100	549
KT08-02	2	1	4	J10PF2	12300	7370	1510	1700	< 5970	237000	9000	24800	< 3540	246
KT08-08	2	1	5	J08PF2	6060	7440	3730	1010	< 5850	219000	3030	24200	40800	227
KT08-07	2	1	6	J01PF1	4930	6710	4300	951	< 5930	220000	3140	25500	30100	531
KT08-09	2	1	7	J06PF1	3710	4430	3370	1390	< 5950	204000	3630	24700	38000	256
KT7ref	2	1	8	KT7REFPF22	4280	5530	3870	1660	< 5870	217000	4550	28300	< 3480	285
Ustd	2	1	9	USTDPF22	21100	< 91.6	8230	< 582	< 5970	211000	3310	5870	19200	< 120
KT08-02	2	1	10	J10PF1	12400	6850	1500	1640	< 5910	218000	10100	25000	< 3500	249

Table A-4. Chemical Composition Measurements of the KT08-Series of Glasses Using PF Preparation Method (part 2). (continued)

Glass ID	Block	Sub-Blk	Sequence	Lab ID	Mn (ug/g)	Nb (ug/g)	Ni (ug/g)	Pb (ug/g)	S (ug/g)	Si (ug/g)	Th (ug/g)	Ti (ug/g)	U (ug/g)	Zn (ug/g)
KT08-01	2	1	11	J03PF2	14100	6520	2560	1870	< 5930	215000	9250	24700	5040	< 119
KT08-09	2	1	12	J06PF2	3690	4600	3390	1350	< 5810	217000	4040	24500	38000	263
KT08-01	2	1	13	J03PF1	14300	6440	2660	1860	< 5880	211000	7220	25000	5160	< 118
KT08-08	2	1	14	J08PF1	6240	7690	3970	987	< 5890	227000	2860	25000	43000	244
Blank	2	1	15	BLANKPF2	< 16	235	< 744	< 585	< 6000	< 763	4350	< 88	< 3560	< 121
KT7ref	2	1	16	KT7REFPF23	4250	5480	3890	1590	< 5870	218000	4470	28100	< 3480	297
Ustd	2	1	17	USTDPF23	20600	< 91.6	8210	< 582	< 5970	209000	3200	5740	19000	< 120
KT7ref	2	2	1	KT7REFPF21	4410	5500	4170	1910	< 5870	218000	4720	29000	< 3480	378
Ustd	2	2	2	USTDPF21	21700	< 91.6	8970	< 582	< 5970	211000	3300	6010	18900	< 120
KT08-08	2	2	3	J08PF1	6420	7980	4240	1330	< 5890	234000	2780	25500	42000	311
KT08-02	2	2	4	J10PF1	12700	6940	1550	1920	< 5910	225000	10300	25500	3790	313
KT08-08	2	2	5	J08PF2	6180	7820	4110	1360	< 5850	230000	3110	24500	39400	298
KT08-01	2	2	6	J03PF1	14800	4570	2800	1940	< 5880	140000	7000	25400	5120	< 118
KT08-07	2	2	7	J01PF1	5100	6700	4710	1250	< 5930	227000	3260	25800	29200	645
KT7ref	2	2	8	KT7REFPF22	4450	5610	4260	1850	< 5870	225000	4640	28900	< 3480	368
Ustd	2	2	9	USTDPF22	21800	< 91.6	9060	< 582	< 5970	223000	3240	5990	18700	< 120
KT08-02	2	2	10	J10PF2	12600	4570	1570	1620	< 5970	137000	8910	25200	< 3540	310
KT08-09	2	2	11	J06PF2	3840	4690	3690	1740	< 5810	226000	4120	25000	37500	333
KT08-01	2	2	12	J03PF2	14600	6450	2770	2130	< 5930	218000	9340	25100	5080	< 119
KT08-09	2	2	13	J06PF1	3850	4380	3780	1520	< 5950	207000	3640	25100	36600	326
KT08-07	2	2	14	J01PF2	5000	5160	4540	1030	< 5950	177000	2620	25500	27600	621
Blank	2	2	15	BLANKPF2	< 16	298	< 744	< 585	< 6000	< 763	4350	< 88	< 3560	< 121
KT7ref	2	2	16	KT7REFPF23	4370	5450	4160	1830	< 5870	221000	4390	28600	< 3480	352
Ustd	2	2	17	USTDPF23	21400	< 91.6	8690	< 582	< 5970	216000	3190	5860	18500	< 120

Table A-5. Comparison of Measured versus Targeted Compositions for the KT08-Series of Glasses.

Glass ID	Oxide	Measured (wt %)	Targeted (wt %)	Difference of Measured (wt %)	% Difference of Measured
KT08-01	Al_2O_3	6.0629	5.6320	0.4309	7.7%
KT08-01	B_2O_3	6.0132	5.9990	0.0142	0.2%
KT08-01	BaO	0.0656	0.0660	-0.0004	-0.6%
KT08-01	CaO	0.9822	0.9100	0.0722	7.9%
KT08-01	Ce_2O_3	0.2937	0.2770	0.0167	6.0%
KT08-01	Cr_2O_3	0.0867	0.0860	0.0007	0.8%
KT08-01	CuO	0.0810	0.0370	0.0440	118.8%
KT08-01	Fe_2O_3	11.8236	11.7510	0.0726	0.6%
KT08-01	K_2O	0.2087	0.0360	0.1727	479.7%
KT08-01	La_2O_3	0.0939	0.1040	-0.0101	-9.7%
KT08-01	Li_2O	3.5254	3.5990	-0.0736	-2.0%
KT08-01	MgO	0.1451	0.1470	-0.0019	-1.3%
KT08-01	MnO	1.8819	1.8710	0.0109	0.6%
KT08-01	Na_2O	13.3182	12.9150	0.4032	3.1%
KT08-01	Nb_2O_5	0.8576	1.0060	-0.1484	-14.8%
KT08-01	NiO	0.3433	0.3390	0.0043	1.3%
KT08-01	PbO	0.2087	0.1590	0.0497	31.3%
KT08-01	SiO_2	45.9236	48.7490	-2.8254	-5.8%
KT08-01	SO_4	0.2621	0.4000	-0.1379	-34.5%
KT08-01	ThO_2	0.1667	0.1680	-0.0013	-0.8%
KT08-01	TiO_2	4.1241	4.2170	-0.0929	-2.2%
KT08-01	U_3O_8	0.5970	0.5590	0.0380	6.8%
KT08-01	ZnO	0.0095	0.0000	0.0095	
KT08-01	ZrO_2	0.8172	0.8960	-0.0788	-8.8%
KT08-01	Sum	97.8921	99.9230	-2.0309	-2.0%
KT08-02	Al_2O_3	5.3638	5.0110	0.3528	7.0%
KT08-02	B_2O_3	5.9810	5.9990	-0.0180	-0.3%
KT08-02	BaO	0.0665	0.0660	0.0005	0.7%
KT08-02	CaO	0.9794	0.9130	0.0664	7.3%
KT08-02	Ce_2O_3	0.3040	0.2780	0.0260	9.3%
KT08-02	Cr_2O_3	0.0858	0.0870	-0.0012	-1.3%
KT08-02	CuO	0.0519	0.0370	0.0149	40.2%
KT08-02	Fe_2O_3	11.0266	11.1560	-0.1294	-1.2%
KT08-02	K_2O	0.2337	0.0360	0.1977	549.1%
KT08-02	La_2O_3	0.0637	0.0700	-0.0063	-9.0%
KT08-02	Li_2O	3.5119	3.5990	-0.0871	-2.4%
KT08-02	MgO	0.1429	0.1480	-0.0051	-3.4%
KT08-02	MnO	1.6221	1.6480	-0.0259	-1.6%
KT08-02	Na_2O	13.9181	13.6950	0.2231	1.6%
KT08-02	Nb_2O_5	0.9202	1.0590	-0.1388	-13.1%
KT08-02	NiO	0.1950	0.1890	0.0060	3.2%
KT08-02	PbO	0.1239	0.1280	-0.0041	-3.2%
KT08-02	SiO_2	48.4908	49.2410	-0.7502	-1.5%
KT08-02	SO_4	0.2629	0.4000	-0.1371	-34.3%
KT08-02	ThO_2	0.6170	0.6080	0.0090	1.5%
KT08-02	TiO_2	4.1575	4.2280	-0.0705	-1.7%
KT08-02	U_3O_8	0.4354	0.3150	0.1204	38.2%
KT08-02	ZnO	0.0380	0.0370	0.0010	2.7%
KT08-02	ZrO_2	0.8142	0.9760	-0.1618	-16.6%
KT08-02	Sum	99.4062	99.9240	-0.5178	-0.5%
KT08-03	Al_2O_3	4.6647	4.2890	0.3757	8.8%
KT08-03	B_2O_3	6.0051	5.9990	0.0061	0.1%
KT08-03	BaO	0.0659	0.0660	-0.0001	-0.2%
KT08-03	CaO	0.9609	0.9160	0.0449	4.9%
KT08-03	Ce_2O_3	0.2726	0.2440	0.0286	11.7%
KT08-03	Cr_2O_3	0.0847	0.0870	-0.0023	-2.7%
KT08-03	CuO	0.0499	0.0370	0.0129	34.8%
KT08-03	Fe_2O_3	10.8514	11.0150	-0.1636	-1.5%
KT08-03	K_2O	0.2334	0.0360	0.1974	548.3%

Table A-5. Comparison of Measured versus Targeted Compositions for the KT08-Series of Glasses. (continued)

Glass ID	Oxide	Measured (wt %)	Targeted (wt %)	Difference of Measured (wt %)	% Difference of Measured
KT08-03	La_2O_3	0.0637	0.0700	-0.0063	-9.0%
KT08-03	Li_2O	3.4662	3.5990	-0.1328	-3.7%
KT08-03	MgO	0.1507	0.1480	0.0027	1.8%
KT08-03	MnO	1.7351	1.7290	0.0060	0.3%
KT08-03	Na_2O	14.1877	13.8590	0.3287	2.4%
KT08-03	Nb_2O_5	0.9720	1.0520	-0.0800	-7.6%
KT08-03	NiO	0.3178	0.3030	0.0148	4.9%
KT08-03	PbO	0.1244	0.1280	-0.0036	-2.8%
KT08-03	SiO_2	52.0920	49.4280	2.6640	5.4%
KT08-03	SO_4	0.2644	0.4000	-0.1356	-33.9%
KT08-03	ThO_2	0.8944	0.8460	0.0484	5.7%
KT08-03	TiO_2	4.1325	4.2070	-0.0745	-1.8%
KT08-03	U_3O_8	0.6270	0.4570	0.1700	37.2%
KT08-03	ZnO	0.0396	0.0370	0.0026	6.9%
KT08-03	ZrO_2	0.8240	0.9710	-0.1470	-15.1%
KT08-03	Sum	103.0800	99.9230	3.1570	3.2%
KT08-04	Al_2O_3	5.2764	4.8580	0.4184	8.6%
KT08-04	B_2O_3	5.9810	5.9990	-0.0180	-0.3%
KT08-04	BaO	0.0682	0.0670	0.0012	1.8%
KT08-04	CaO	0.9221	0.8370	0.0851	10.2%
KT08-04	Ce_2O_3	0.2378	0.2100	0.0278	13.2%
KT08-04	Cr_2O_3	0.0858	0.0870	-0.0012	-1.3%
KT08-04	CuO	0.0474	0.0370	0.0104	28.2%
KT08-04	Fe_2O_3	11.7915	11.8900	-0.0985	-0.8%
KT08-04	K_2O	0.2241	0.0360	0.1881	522.4%
KT08-04	La_2O_3	0.0680	0.0700	-0.0020	-2.9%
KT08-04	Li_2O	3.4366	3.5990	-0.1624	-4.5%
KT08-04	MgO	0.1435	0.1490	-0.0055	-3.7%
KT08-04	MnO	1.0355	1.0430	-0.0075	-0.7%
KT08-04	Na_2O	13.8844	13.5490	0.3354	2.5%
KT08-04	Nb_2O_5	0.9195	1.0310	-0.1115	-10.8%
KT08-04	NiO	0.1883	0.1520	0.0363	23.9%
KT08-04	PbO	0.0948	0.0970	-0.0022	-2.2%
KT08-04	SiO_2	50.8084	50.0570	0.7514	1.5%
KT08-04	SO_4	0.2636	0.4000	-0.1364	-34.1%
KT08-04	ThO_2	0.2401	0.2380	0.0021	0.9%
KT08-04	TiO_2	4.2617	4.3120	-0.0503	-1.2%
KT08-04	U_3O_8	0.2382	0.2120	0.0262	12.4%
KT08-04	ZnO	0.0806	0.0740	0.0066	8.9%
KT08-04	ZrO_2	0.7369	0.9170	-0.1801	-19.6%
KT08-04	Sum	101.0343	99.9210	1.1133	1.1%
KT08-05	Al_2O_3	7.2226	6.7200	0.5026	7.5%
KT08-05	B_2O_3	6.0051	5.9990	0.0061	0.1%
KT08-05	BaO	0.0698	0.0670	0.0028	4.2%
KT08-05	CaO	0.9847	0.9190	0.0657	7.1%
KT08-05	Ce_2O_3	0.1675	0.1400	0.0275	19.6%
KT08-05	Cr_2O_3	0.1286	0.1310	-0.0024	-1.8%
KT08-05	CuO	0.0527	0.0370	0.0157	42.4%
KT08-05	Fe_2O_3	9.6540	9.4350	0.2190	2.3%
KT08-05	K_2O	0.2421	0.0720	0.1701	236.3%
KT08-05	La_2O_3	0.0678	0.0700	-0.0022	-3.2%
KT08-05	Li_2O	3.4581	3.5990	-0.1409	-3.9%
KT08-05	MgO	0.1548	0.1490	0.0058	3.9%
KT08-05	MnO	1.0194	1.0030	0.0164	1.6%
KT08-05	Na_2O	13.9855	13.4980	0.4875	3.6%
KT08-05	Nb_2O_5	0.9803	1.0550	-0.0747	-7.1%
KT08-05	NiO	0.1368	0.1140	0.0228	20.0%
KT08-05	PbO	0.1223	0.0640	0.0583	91.0%

Table A-5. Comparison of Measured versus Targeted Compositions for the KT08-Series of Glasses. (continued)

Glass ID	Oxide	Measured (wt %)	Targeted (wt %)	Difference of Measured (wt %)	% Difference of Measured
KT08-05	SiO_2	51.9315	50.5850	1.3465	2.7%
KT08-05	SO_4	0.2629	0.4000	-0.1371	-34.3%
KT08-05	ThO_2	0.0169	0.0000	0.0169	
KT08-05	TiO_2	4.3451	4.3610	-0.0159	-0.4%
KT08-05	U_3O_8	0.4950	0.4940	0.0010	0.2%
KT08-05	ZnO	0.0425	0.0370	0.0055	14.8%
KT08-05	ZrO_2	0.9057	0.9740	-0.0683	-7.0%
KT08-05	Sum	102.4518	99.9230	2.5288	2.5%
KT08-06	Al_2O_3	7.5934	7.0600	0.5334	7.6%
KT08-06	B_2O_3	6.0051	5.9990	0.0061	0.1%
KT08-06	BaO	0.0683	0.0670	0.0013	1.9%
KT08-06	CaO	1.0431	0.9620	0.0811	8.4%
KT08-06	Ce_2O_3	0.1294	0.1050	0.0244	23.3%
KT08-06	Cr_2O_3	0.1292	0.1310	-0.0018	-1.4%
KT08-06	CuO	0.0511	0.0370	0.0141	38.2%
KT08-06	Fe_2O_3	8.9356	8.8080	0.1276	1.4%
KT08-06	K_2O	0.2728	0.1080	0.1648	152.6%
KT08-06	La_2O_3	0.0392	0.0350	0.0042	12.1%
KT08-06	Li_2O	3.4312	3.5990	-0.1678	-4.7%
KT08-06	MgO	0.1069	0.0990	0.0079	7.9%
KT08-06	MnO	1.1682	1.1590	0.0092	0.8%
KT08-06	Na_2O	13.7496	13.3980	0.3516	2.6%
KT08-06	Nb_2O_5	0.9391	0.9990	-0.0599	-6.0%
KT08-06	NiO	0.1750	0.1520	0.0230	15.1%
KT08-06	PbO	0.1184	0.0640	0.0544	84.9%
KT08-06	SiO_2	52.5198	50.5410	1.9788	3.9%
KT08-06	SO_4	0.2644	0.4000	-0.1356	-33.9%
KT08-06	ThO_2	0.0171	0.0000	0.0171	
KT08-06	TiO_2	4.2075	4.2710	-0.0635	-1.5%
KT08-06	U_3O_8	0.7744	0.9190	-0.1446	-15.7%
KT08-06	ZnO	0.0808	0.0740	0.0068	9.1%
KT08-06	ZrO_2	0.8561	0.9330	-0.0769	-8.2%
KT08-06	Sum	102.6758	99.9200	2.7558	2.8%
KT08-07	Al_2O_3	5.3520	4.9470	0.4050	8.2%
KT08-07	B_2O_3	6.0615	5.9990	0.0625	1.0%
KT08-07	BaO	0.0674	0.0660	0.0014	2.2%
KT08-07	CaO	0.8423	0.7830	0.0593	7.6%
KT08-07	Ce_2O_3	0.1076	0.0690	0.0386	55.9%
KT08-07	Cr_2O_3	0.1316	0.1290	0.0026	2.0%
KT08-07	CuO	0.0396	0.0370	0.0026	7.0%
KT08-07	Fe_2O_3	8.3244	8.2550	0.0694	0.8%
KT08-07	K_2O	0.2734	0.0710	0.2024	285.1%
KT08-07	La_2O_3	0.0368	0.0350	0.0018	5.0%
KT08-07	Li_2O	3.5523	3.5990	-0.0467	-1.3%
KT08-07	MgO	0.0972	0.0980	-0.0008	-0.9%
KT08-07	MnO	0.6495	0.6470	0.0025	0.4%
KT08-07	Na_2O	13.5845	13.1300	0.4545	3.5%
KT08-07	Nb_2O_5	0.8887	1.0500	-0.1613	-15.4%
KT08-07	NiO	0.5688	0.5620	0.0068	1.2%
KT08-07	PbO	0.0586	0.0630	-0.0044	-6.9%
KT08-07	SiO_2	47.2072	49.9820	-2.7748	-5.6%
KT08-07	SO_4	0.2651	0.4000	-0.1349	-33.7%
KT08-07	ThO_2	0.0171	0.0000	0.0171	
KT08-07	TiO_2	4.2659	4.2660	-0.0001	0.0%
KT08-07	U_3O_8	3.7322	4.7340	-1.0018	-21.2%
KT08-07	ZnO	0.0749	0.0730	0.0019	2.6%
KT08-07	ZrO_2	0.7693	0.9280	-0.1587	-17.1%
KT08-07	Sum	96.9678	99.9230	-2.9552	-3.0%

Table A-5. Comparison of Measured versus Targeted Compositions for the KT08-Series of Glasses. (continued)

Glass ID	Oxide	Measured (wt %)	Targeted (wt %)	Difference of Measured (wt %)	% Difference of Measured
KT08-08	Al_2O_3	4.5868	4.3330	0.2538	5.9%
KT08-08	B_2O_3	5.8924	5.9990	-0.1066	-1.8%
KT08-08	BaO	0.0646	0.0650	-0.0004	-0.6%
KT08-08	CaO	0.7384	0.6950	0.0434	6.2%
KT08-08	Ce_2O_3	0.1040	0.0680	0.0360	52.9%
KT08-08	Cr_2O_3	0.0870	0.0850	0.0020	2.3%
KT08-08	CuO	0.0457	0.0370	0.0087	23.5%
KT08-08	Fe_2O_3	7.9384	7.8950	0.0434	0.5%
KT08-08	K_2O	0.2463	0.0700	0.1763	251.9%
KT08-08	La_2O_3	0.0349	0.0340	0.0009	2.5%
KT08-08	Li_2O	3.4716	3.5990	-0.1274	-3.5%
KT08-08	MgO	0.0933	0.0970	-0.0037	-3.8%
KT08-08	MnO	0.8170	0.8300	-0.0130	-1.6%
KT08-08	Na_2O	14.0192	13.7310	0.2882	2.1%
KT08-08	Nb_2O_5	1.1061	1.1190	-0.0129	-1.1%
KT08-08	NiO	0.5106	0.5210	-0.0104	-2.0%
KT08-08	PbO	0.1250	0.0630	0.0620	98.3%
KT08-08	SiO_2	48.6691	49.6520	-0.9829	-2.0%
KT08-08	SO_4	0.2651	0.4000	-0.1349	-33.7%
KT08-08	ThO_2	0.0171	0.0000	0.0171	
KT08-08	TiO_2	4.1783	4.2640	-0.0857	-2.0%
KT08-08	U_3O_8	5.2150	5.3510	-0.1360	-2.5%
KT08-08	ZnO	0.0370	0.0360	0.0010	2.9%
KT08-08	ZrO_2	0.9013	0.9770	-0.0757	-7.7%
KT08-08	Sum	99.1642	99.9210	-0.7568	-0.8%
KT08-09	Al_2O_3	5.2127	4.7980	0.4147	8.6%
KT08-09	B_2O_3	6.0212	5.9990	0.0222	0.4%
KT08-09	BaO	0.0665	0.0670	-0.0005	-0.7%
KT08-09	CaO	0.9154	0.8350	0.0804	9.6%
KT08-09	Ce_2O_3	0.2015	0.1750	0.0265	15.1%
KT08-09	Cr_2O_3	0.0909	0.0870	0.0039	4.5%
KT08-09	CuO	0.0358	0.0370	-0.0012	-3.3%
KT08-09	Fe_2O_3	10.7335	10.7980	-0.0645	-0.6%
KT08-09	K_2O	0.2777	0.0720	0.2057	285.6%
KT08-09	La_2O_3	0.0668	0.0700	-0.0032	-4.6%
KT08-09	Li_2O	3.5065	3.5990	-0.0925	-2.6%
KT08-09	MgO	0.0983	0.0990	-0.0007	-0.7%
KT08-09	MnO	0.4952	0.5010	-0.0058	-1.2%
KT08-09	Na_2O	13.0082	12.6850	0.3232	2.5%
KT08-09	Nb_2O_5	0.6473	0.7420	-0.0947	-12.8%
KT08-09	NiO	0.4527	0.4560	-0.0033	-0.7%
KT08-09	PbO	0.1317	0.1290	0.0027	2.1%
KT08-09	SiO_2	45.6741	48.5950	-2.9209	-6.0%
KT08-09	SO_4	0.2644	0.4000	-0.1356	-33.9%
KT08-09	ThO_2	0.0170	0.0000	0.0170	
KT08-09	TiO_2	4.1950	4.2390	-0.0440	-1.0%
KT08-09	U_3O_8	4.8642	4.7970	0.0672	1.4%
KT08-09	ZnO	0.0406	0.0370	0.0036	9.6%
KT08-09	ZrO_2	0.5744	0.7050	-0.1306	-18.5%
KT08-09	Sum	97.5915	99.9220	-2.3305	-2.3%
KT08-10	Al_2O_3	5.3402	4.9440	0.3962	8.0%
KT08-10	B_2O_3	5.9810	5.9990	-0.0180	-0.3%
KT08-10	BaO	0.0704	0.0680	0.0024	3.5%
KT08-10	CaO	0.9252	0.8550	0.0702	8.2%
KT08-10	Ce_2O_3	0.2322	0.2150	0.0172	8.0%
KT08-10	Cr_2O_3	0.0896	0.0890	0.0006	0.7%
KT08-10	CuO	0.0401	0.0380	0.0021	5.5%
KT08-10	Fe_2O_3	12.1131	11.9650	0.1481	1.2%

Table A-5. Comparison of Measured versus Targeted Compositions for the KT08-Series of Glasses. (continued)

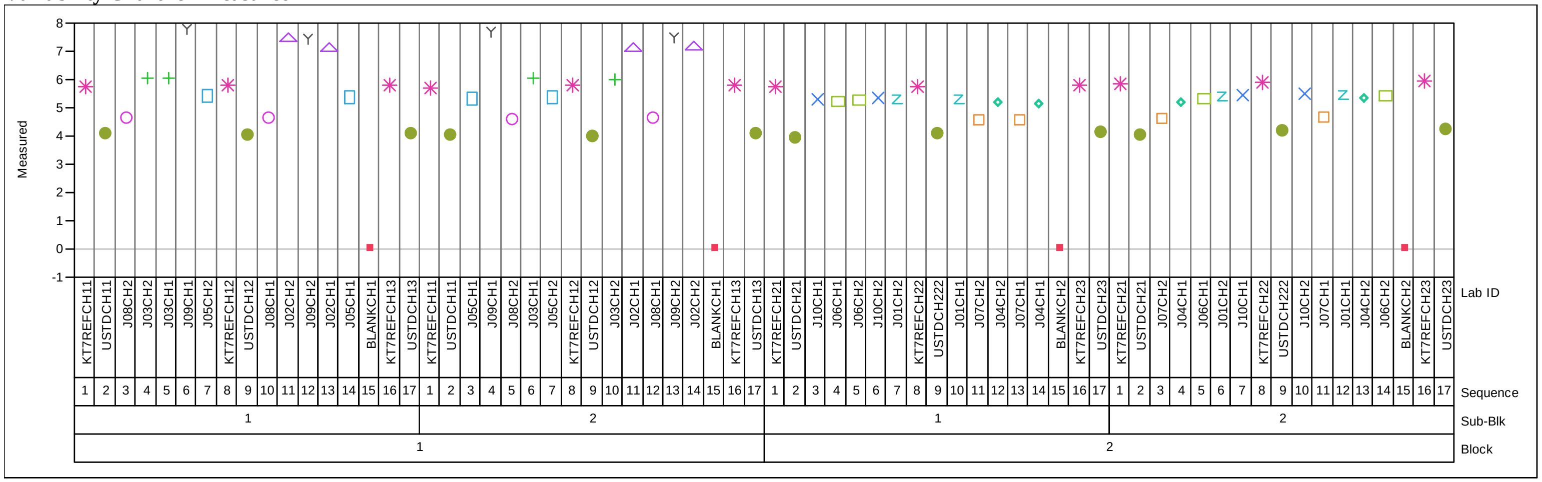
Glass ID	Oxide	Measured (wt %)	Targeted (wt %)	Difference of Measured (wt %)	% Difference of Measured
KT08-10	K_2O	0.2198	0.0370	0.1828	494.2%
KT08-10	La_2O_3	0.0685	0.0720	-0.0035	-4.8%
KT08-10	Li_2O	3.4500	3.5990	-0.1490	-4.1%
KT08-10	MgO	0.1053	0.1010	0.0043	4.3%
KT08-10	MnO	0.3609	0.3550	0.0059	1.7%
KT08-10	Na_2O	12.6004	12.2590	0.3414	2.8%
KT08-10	Nb_2O_5	0.6398	0.6920	-0.0522	-7.5%
KT08-10	NiO	0.4610	0.4280	0.0330	7.7%
KT08-10	PbO	0.1605	0.1320	0.0285	21.6%
KT08-10	SiO_2	50.7014	48.3050	2.3964	5.0%
KT08-10	SO_4	0.2674	0.4000	-0.1326	-33.2%
KT08-10	ThO_2	0.0172	0.0000	0.0172	
KT08-10	TiO_2	3.9323	3.9700	-0.0377	-0.9%
KT08-10	U_3O_8	4.5399	4.6910	-0.1511	-3.2%
KT08-10	ZnO	0.0452	0.0380	0.0072	19.0%
KT08-10	ZrO_2	0.6204	0.6720	-0.0516	-7.7%
KT08-10	Sum	102.9819	99.9240	3.0579	3.1%
KT7ref	Al_2O_3	5.8283	5.4600	0.3683	6.7%
KT7ref	B_2O_3	5.9649	5.9990	-0.0341	-0.6%
KT7ref	BaO	0.0768	0.0760	0.0008	1.0%
KT7ref	CaO	1.0254	0.9510	0.0744	7.8%
KT7ref	Ce_2O_3	0.2200	0.1990	0.0210	10.6%
KT7ref	Cr_2O_3	0.0993	0.0990	0.0003	0.3%
KT7ref	CuO	0.0508	0.0430	0.0078	18.1%
KT7ref	Fe_2O_3	12.2764	12.2890	-0.0126	-0.1%
KT7ref	K_2O	0.2638	0.0820	0.1818	221.7%
KT7ref	La_2O_3	0.0785	0.0800	-0.0015	-1.9%
KT7ref	Li_2O	3.4868	3.5990	-0.1122	-3.1%
KT7ref	MgO	0.1160	0.1130	0.0030	2.7%
KT7ref	MnO	0.5701	0.5700	0.0001	0.0%
KT7ref	Na_2O	14.4236	14.0230	0.4006	2.9%
KT7ref	Nb_2O_5	0.8143	0.8450	-0.0307	-3.6%
KT7ref	NiO	0.5276	0.5190	0.0086	1.6%
KT7ref	PbO	0.1610	0.1460	0.0150	10.3%
KT7ref	SiO_2	48.5621	48.7610	-0.1989	-0.4%
KT7ref	SO_4	0.2636	0.4000	-0.1364	-34.1%
KT7ref	ThO_2	0.0170	0.0000	0.0170	
KT7ref	TiO_2	4.7482	4.8240	-0.0758	-1.6%
KT7ref	U_3O_8	0.0613	0.0000	0.0613	
KT7ref	ZnO	0.0462	0.0420	0.0042	9.9%
KT7ref	ZrO_2	0.7010	0.8020	-0.1010	-12.6%
KT7ref	Sum	100.3830	99.9220	0.4610	0.5%
Ustd	Al_2O_3	4.1010	4.1000	0.0010	0.0%
Ustd	B_2O_3	8.9969	9.2090	-0.2121	-2.3%
Ustd	BaO	0.0047	0.0000	0.0047	
Ustd	CaO	1.3526	1.3010	0.0516	4.0%
Ustd	Ce_2O_3	0.0099	0.0000	0.0099	
Ustd	Cr_2O_3	0.2510	0.0000	0.2510	
Ustd	CuO	0.0046	0.0000	0.0046	
Ustd	Fe_2O_3	13.4022	13.1960	0.2062	1.6%
Ustd	K_2O	3.1631	2.9990	0.1641	5.5%
Ustd	La_2O_3	0.0118	0.0000	0.0118	
Ustd	Li_2O	2.9845	3.0570	-0.0725	-2.4%
Ustd	MgO	1.2070	1.2100	-0.0030	-0.3%
Ustd	MnO	2.7852	2.8920	-0.1068	-3.7%
Ustd	Na_2O	12.0668	11.7950	0.2718	2.3%
Ustd	Nb_2O_5	0.0065	0.0000	0.0065	
Ustd	NiO	1.1112	1.1200	-0.0088	-0.8%

Table A-5. Comparison of Measured versus Targeted Compositions for the KT08-Series of Glasses. (continued)

Glass ID	Oxide	Measured (wt %)	Targeted (wt %)	Difference of Measured (wt %)	% Difference of Measured
Ustd	PbO	0.0093	0.0000	0.0093	
Ustd	SiO_2	46.4406	45.3530	1.0876	2.4%
Ustd	SO_4	0.2651	0.0000	0.2651	
Ustd	ThO_2	0.0170	0.0000	0.0170	
Ustd	TiO_2	0.9869	1.0490	-0.0621	-5.9%
Ustd	U_3O_8	2.2827	2.4060	-0.1233	-5.1%
Ustd	ZnO	0.0080	0.0000	0.0080	
Ustd	ZrO_2	0.0069	0.0000	0.0069	
Ustd	Sum	101.4758	99.6870	1.7888	1.8%

Exhibit A-1. Measurements in Analytical Sequence for the KT08-Series Glasses by Preparation Method by Oxide.

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



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

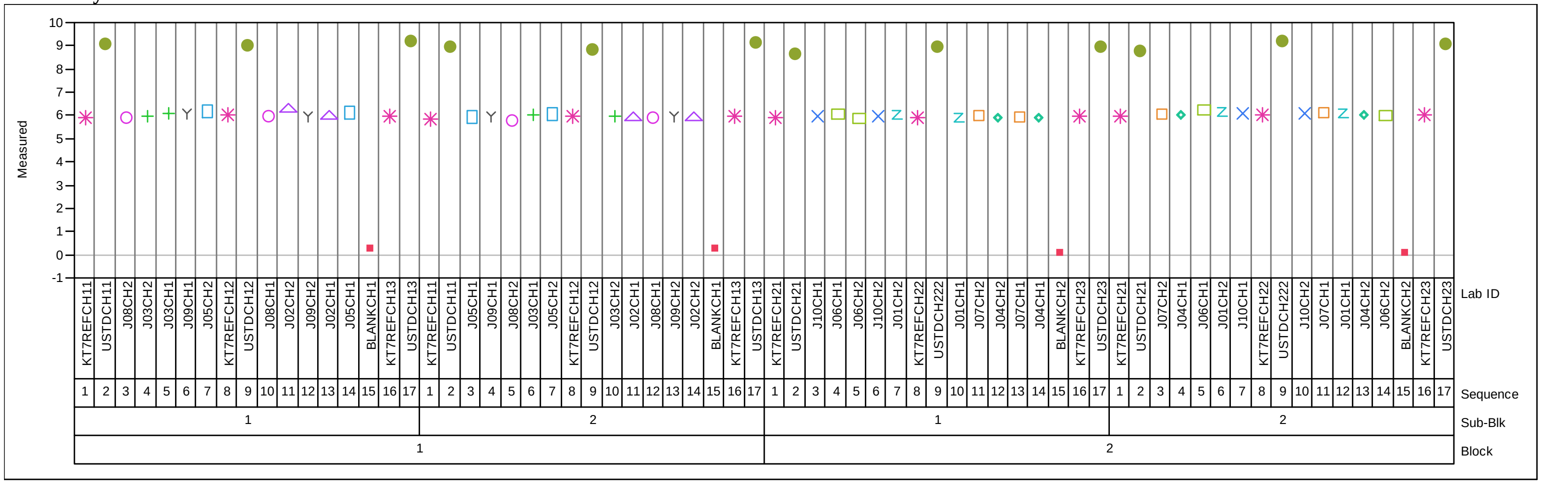
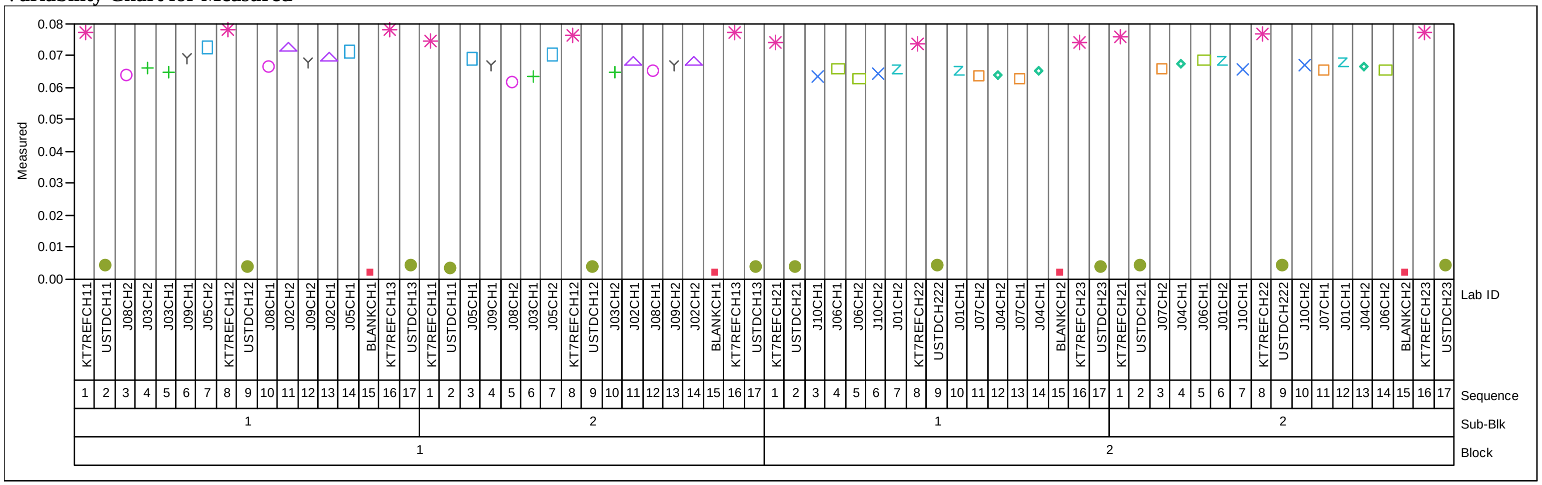


Exhibit A-1. Measurements in Analytical Sequence for the KT08-Series Glasses by Preparation Method by Oxide. (continued)

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



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

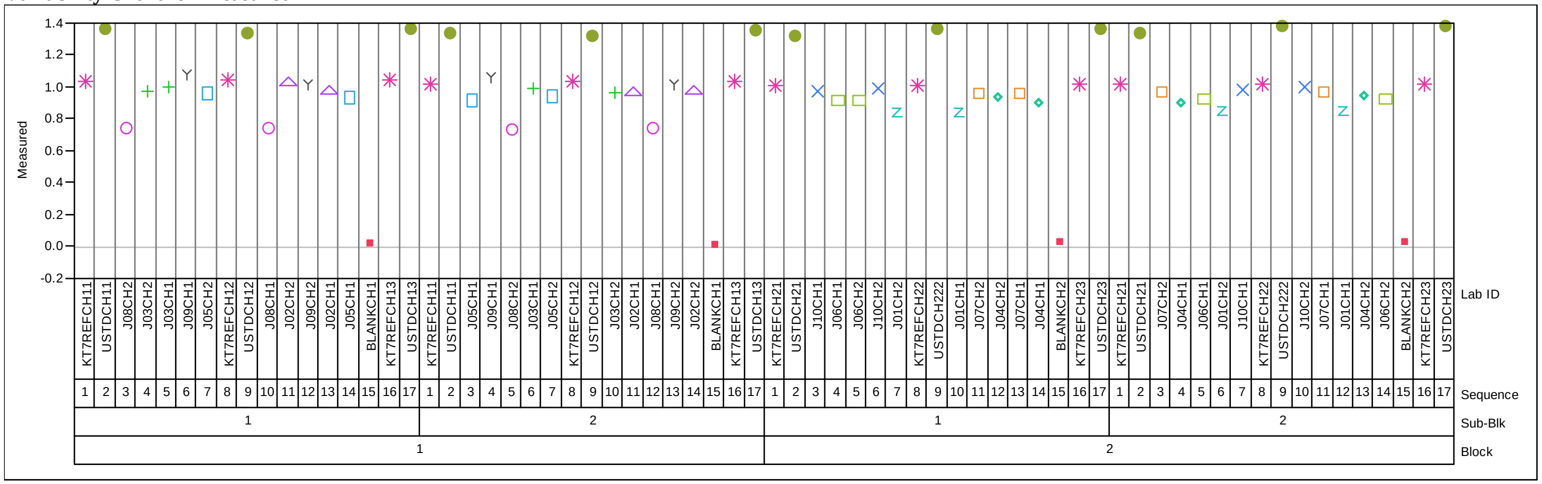
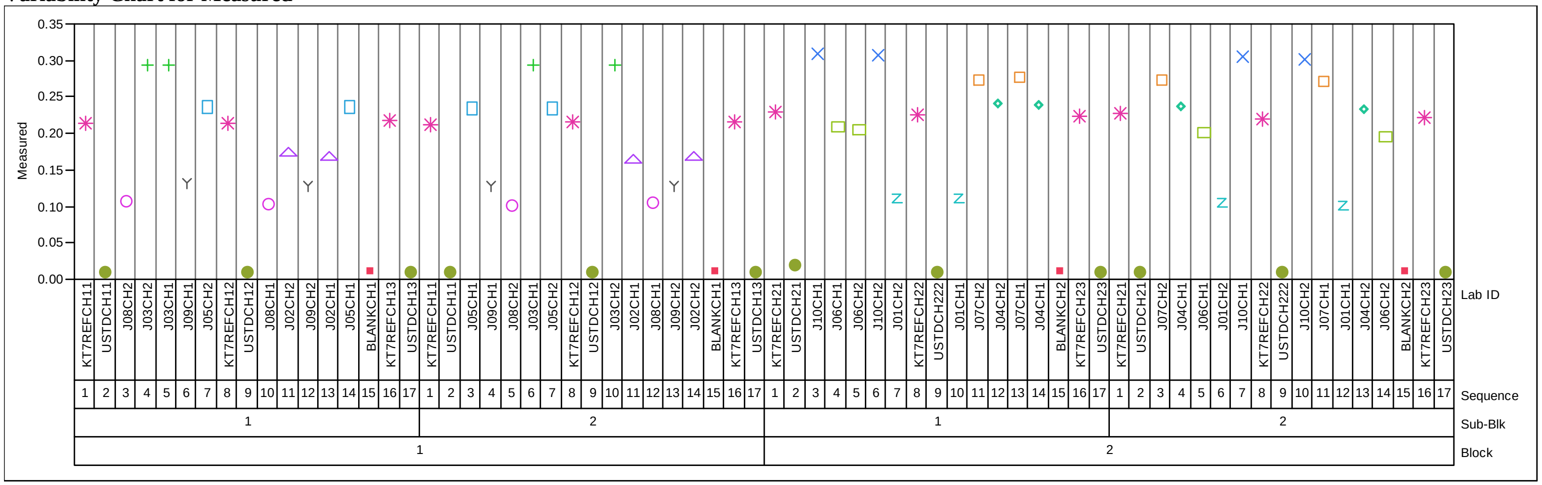


Exhibit A-1. Measurements in Analytical Sequence for the KT08-Series Glasses by Preparation Method by Oxide. (continued)

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



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

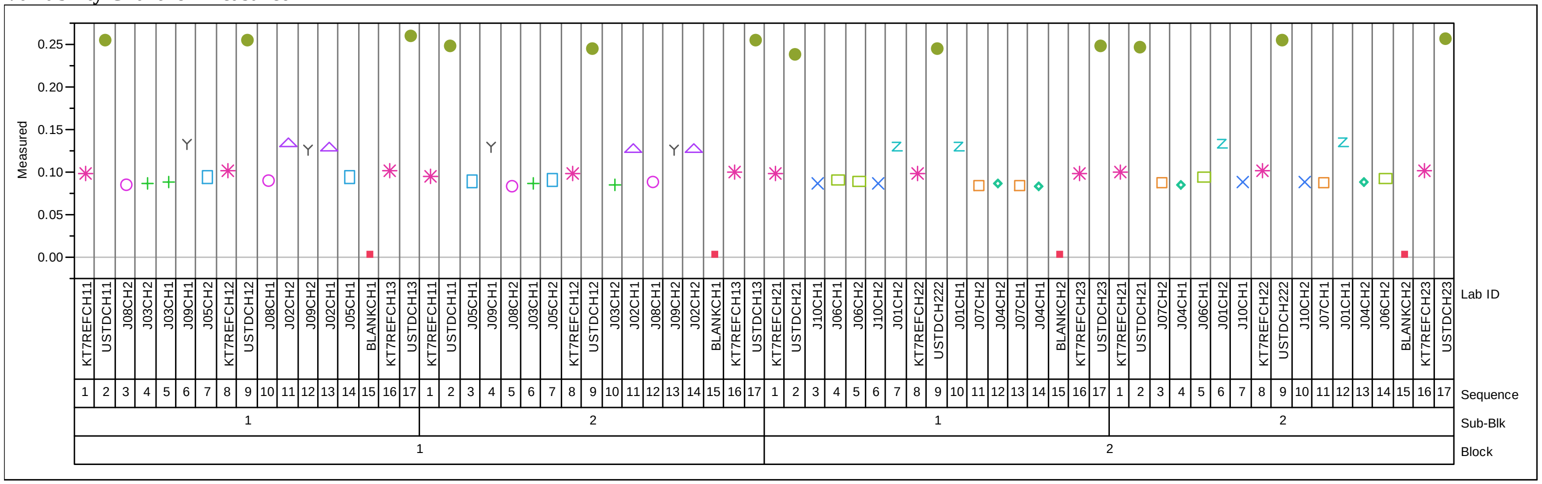
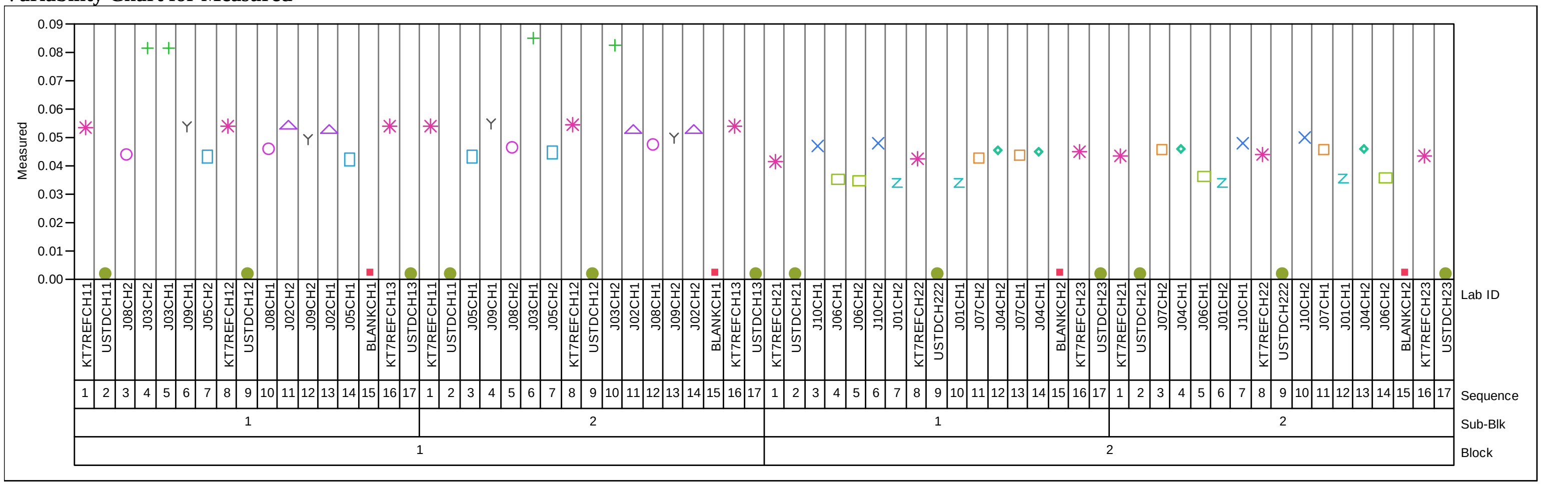


Exhibit A-1. Measurements in Analytical Sequence for the KT08-Series Glasses by Preparation Method by Oxide. (continued)

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



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

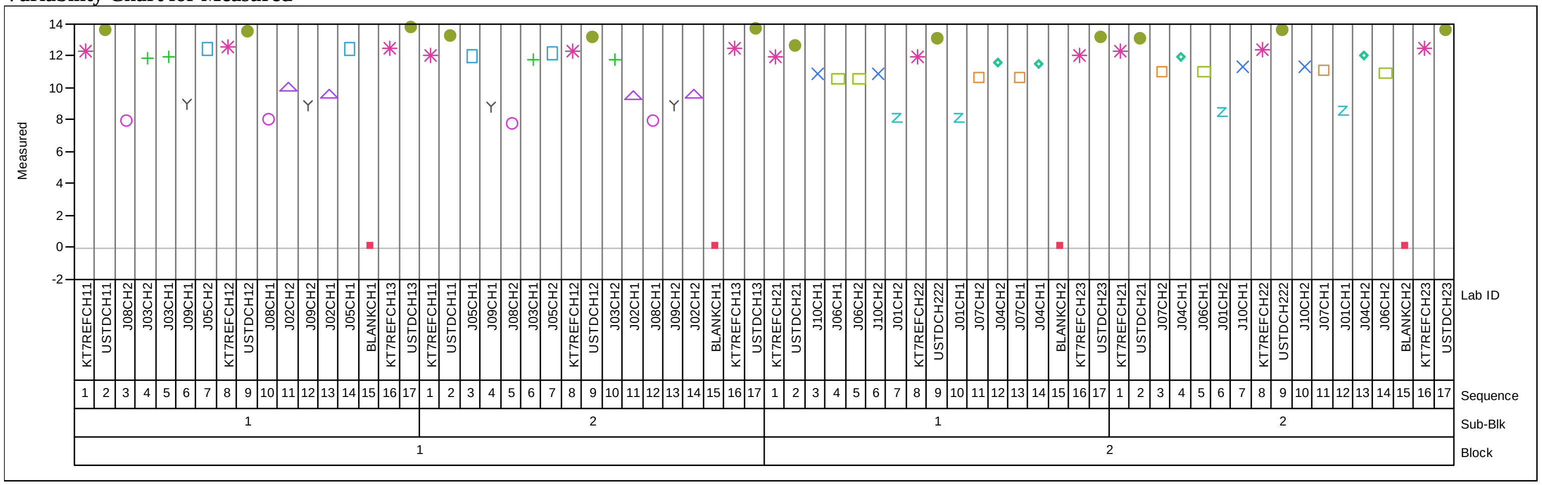
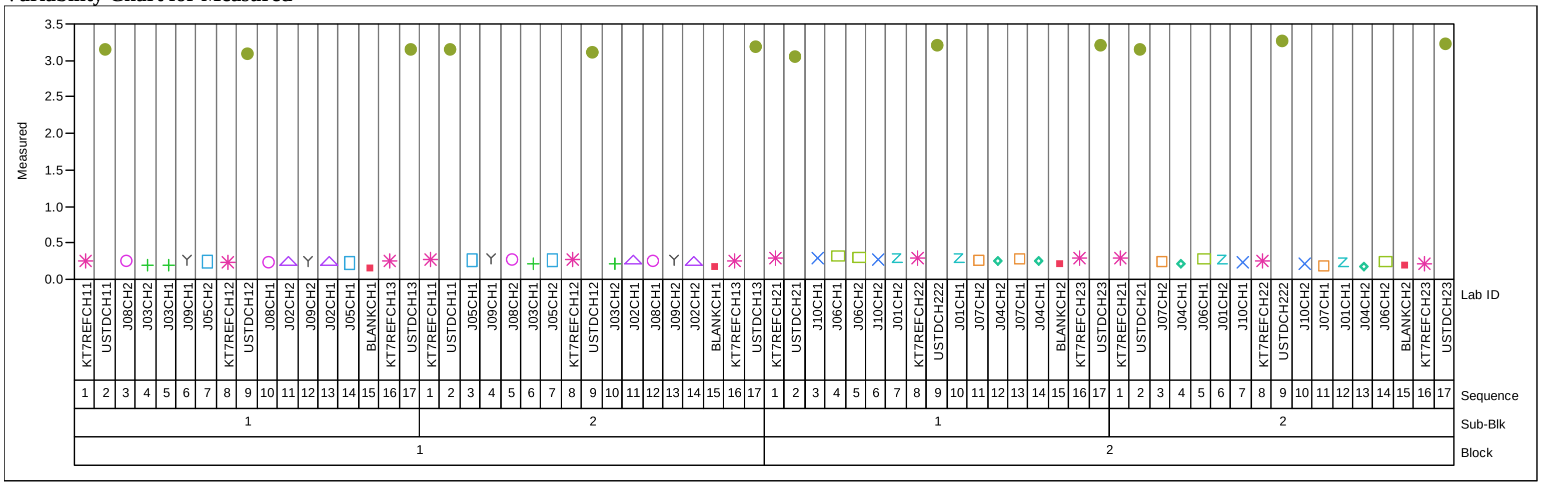


Exhibit A-1. Measurements in Analytical Sequence for the KT08-Series Glasses by Preparation Method by Oxide. (continued)

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



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

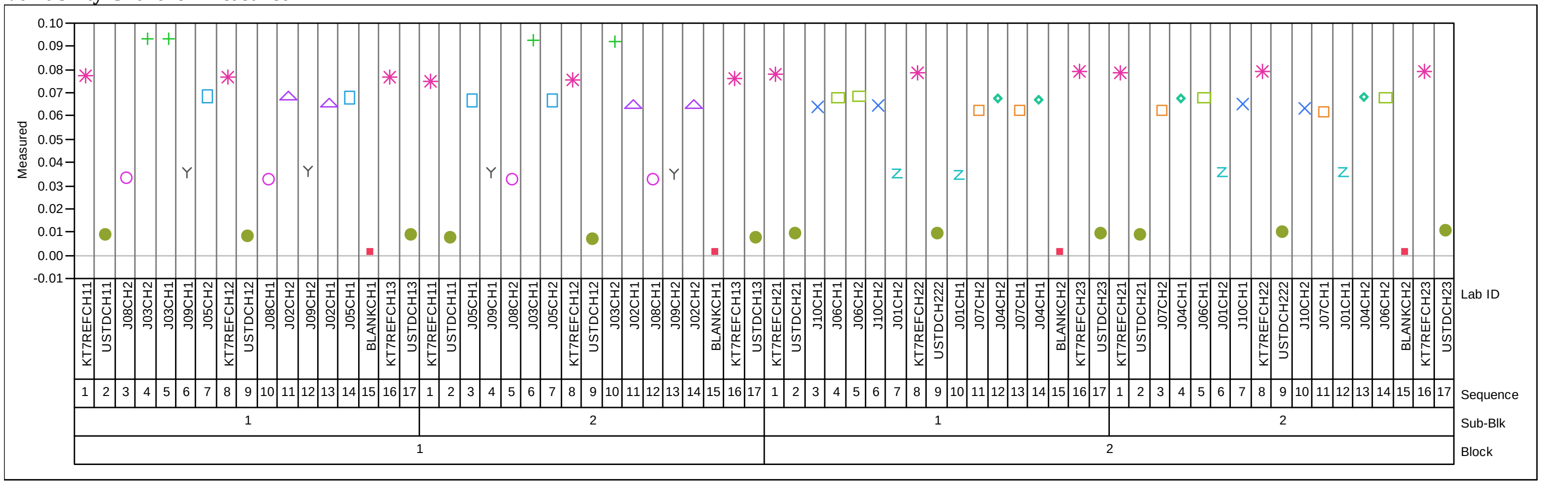
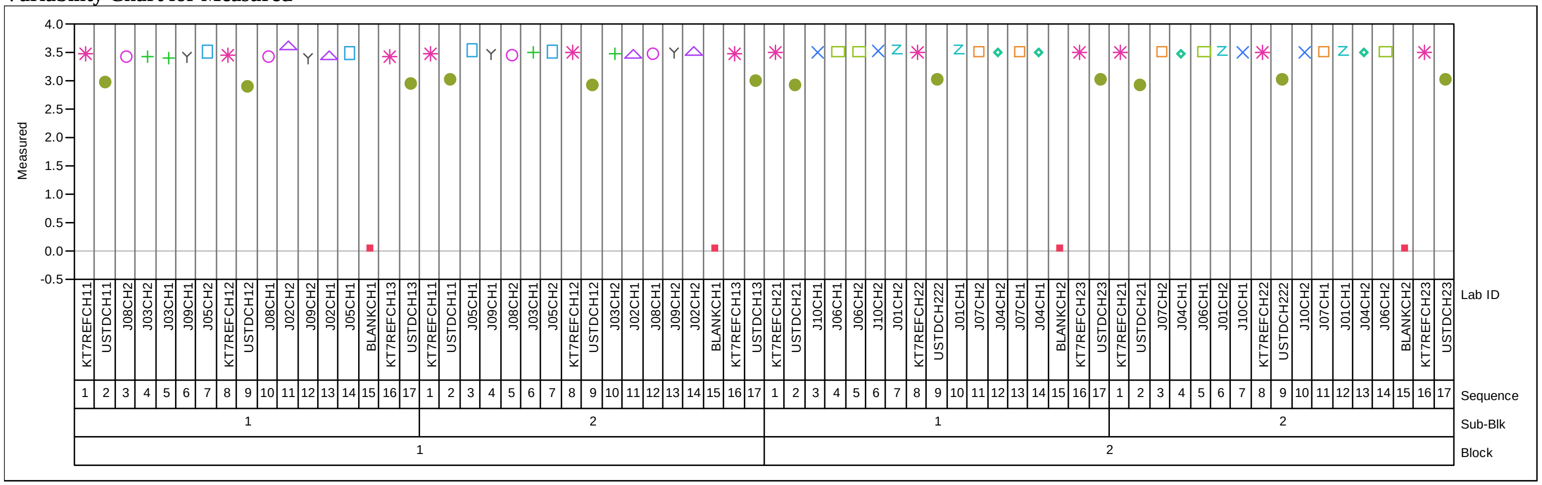


Exhibit A-1. Measurements in Analytical Sequence for the KT08-Series Glasses by Preparation Method by Oxide. (continued)

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



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

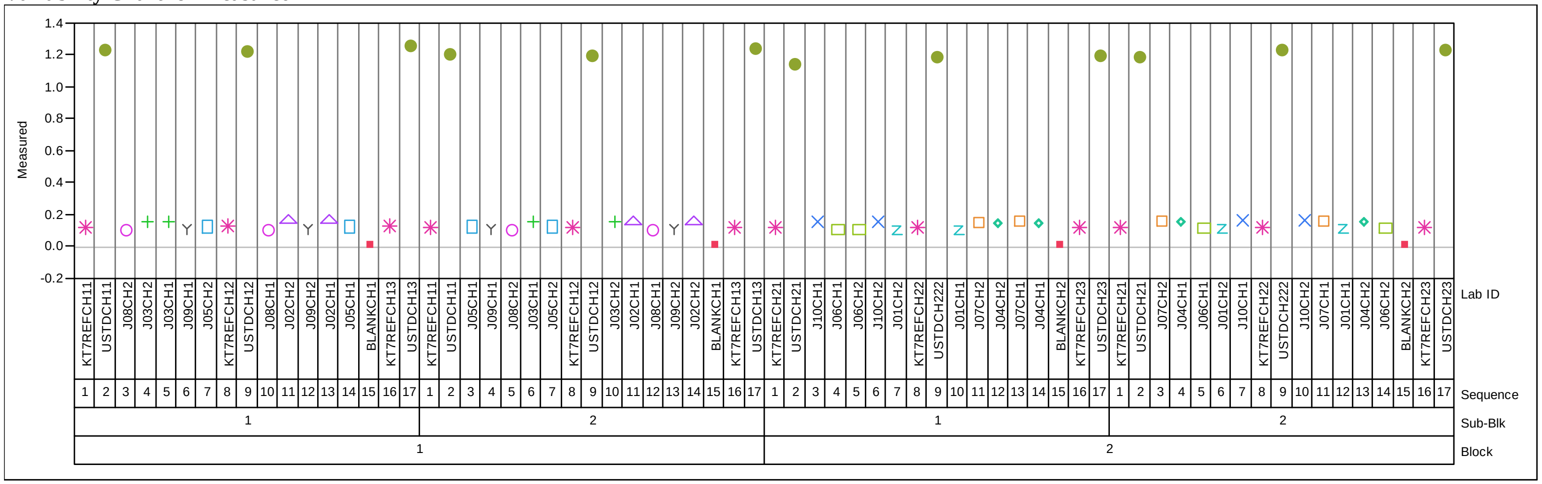
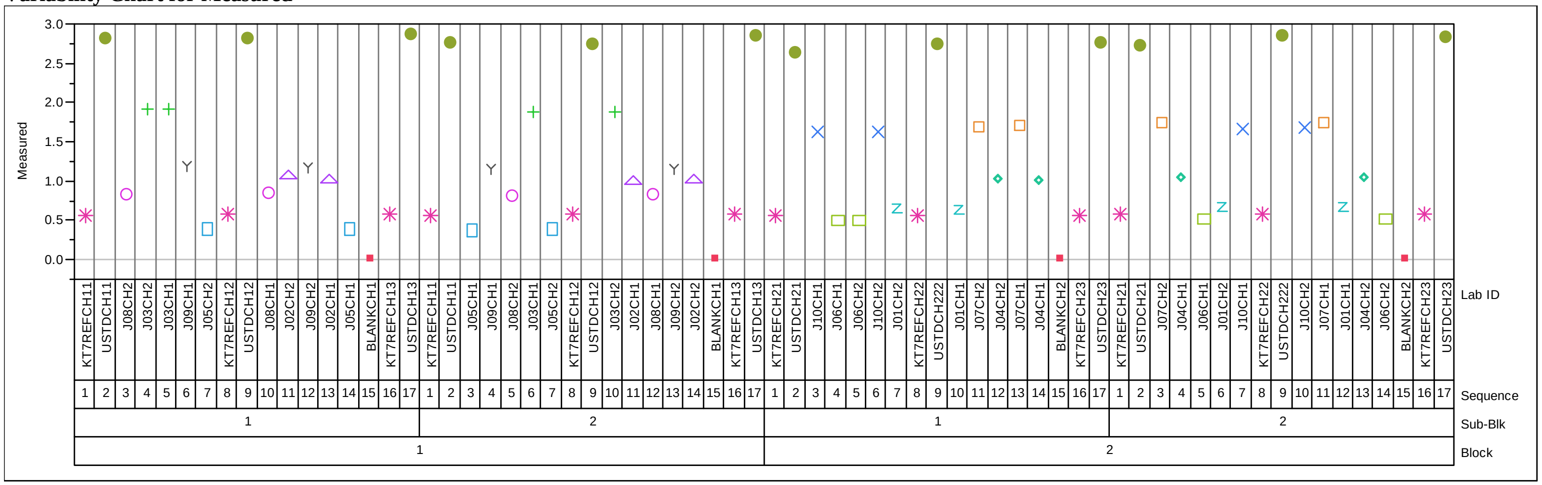


Exhibit A-1. Measurements in Analytical Sequence for the KT08-Series Glasses by Preparation Method by Oxide. (continued)

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



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

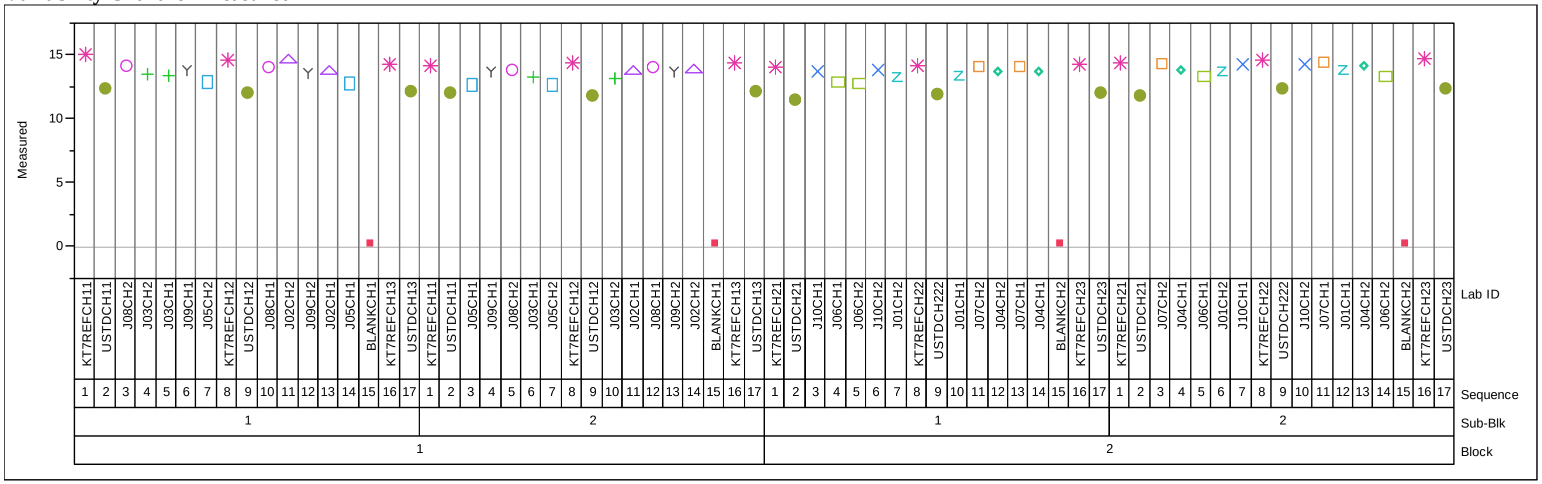
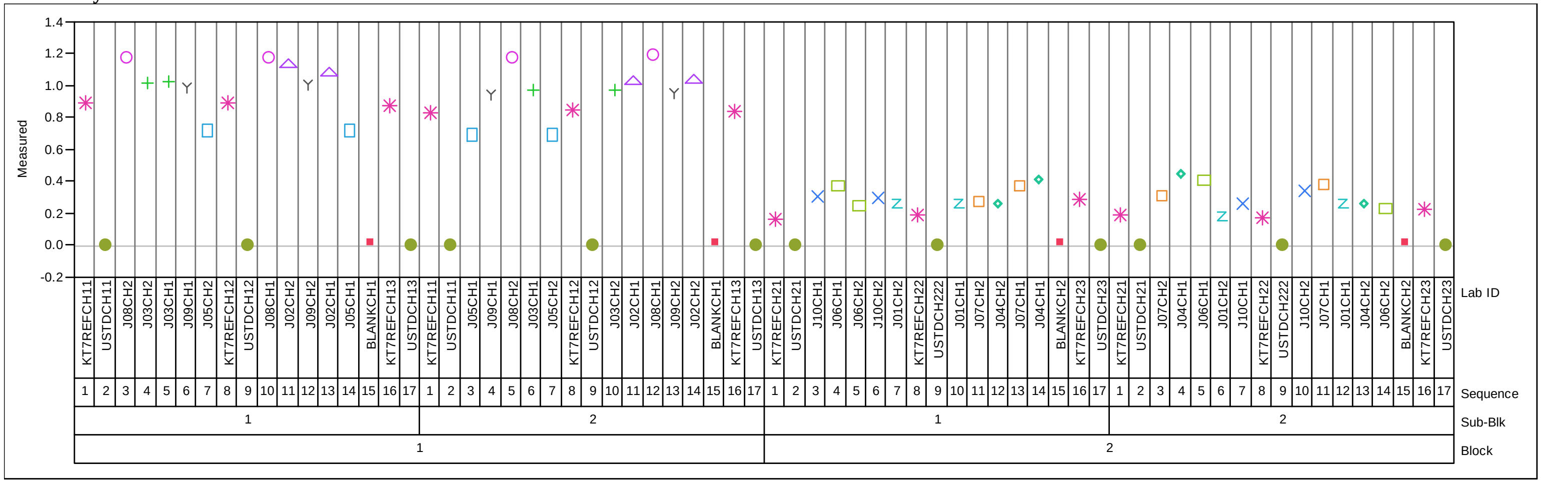


Exhibit A-1. Measurements in Analytical Sequence for the KT08-Series Glasses by Preparation Method by Oxide. (continued)

Prep Method=CH, Oxide=Nb2O5 (wt%)
Variability Chart for Measured



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

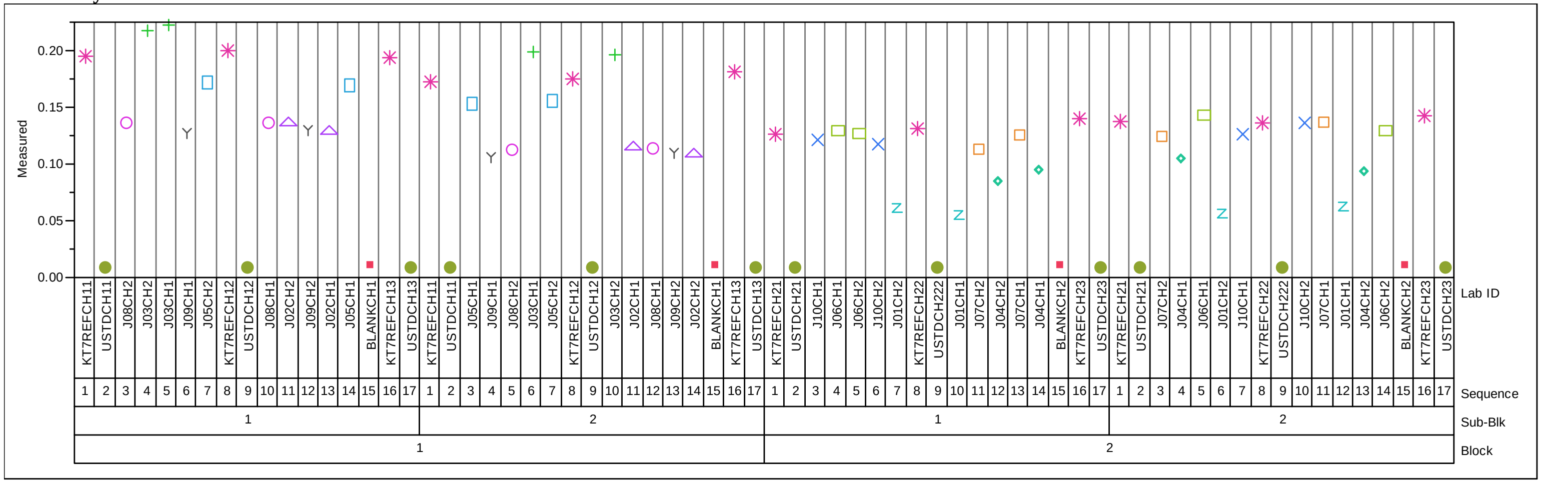
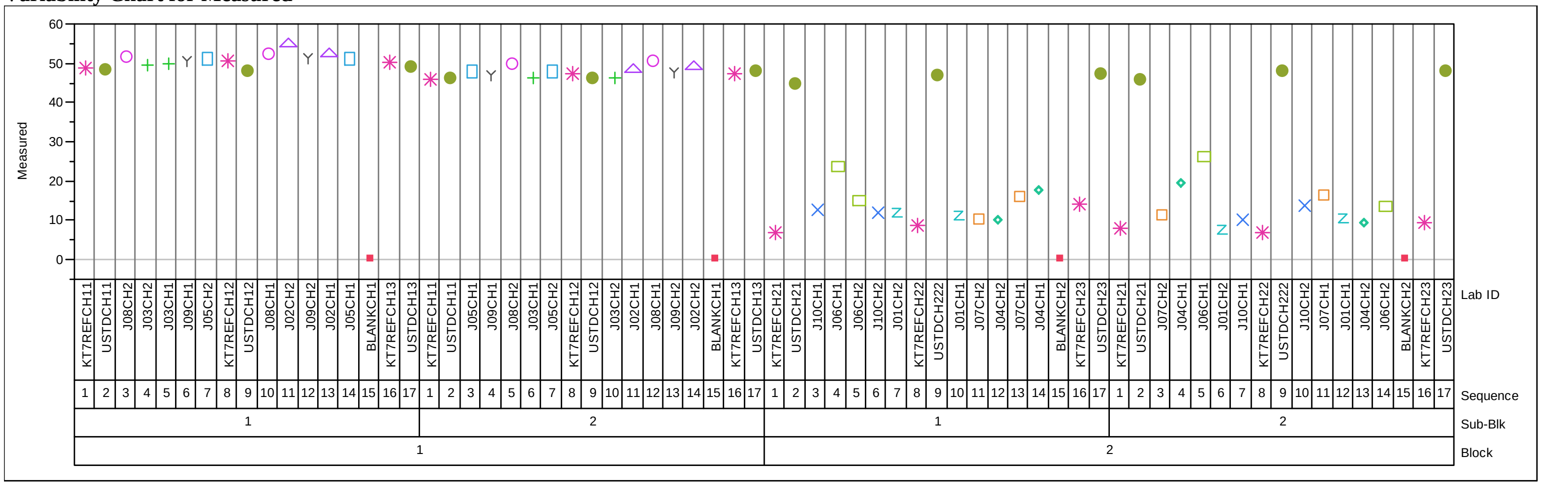


Exhibit A-1. Measurements in Analytical Sequence for the KT08-Series Glasses by Preparation Method by Oxide. (continued)

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



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

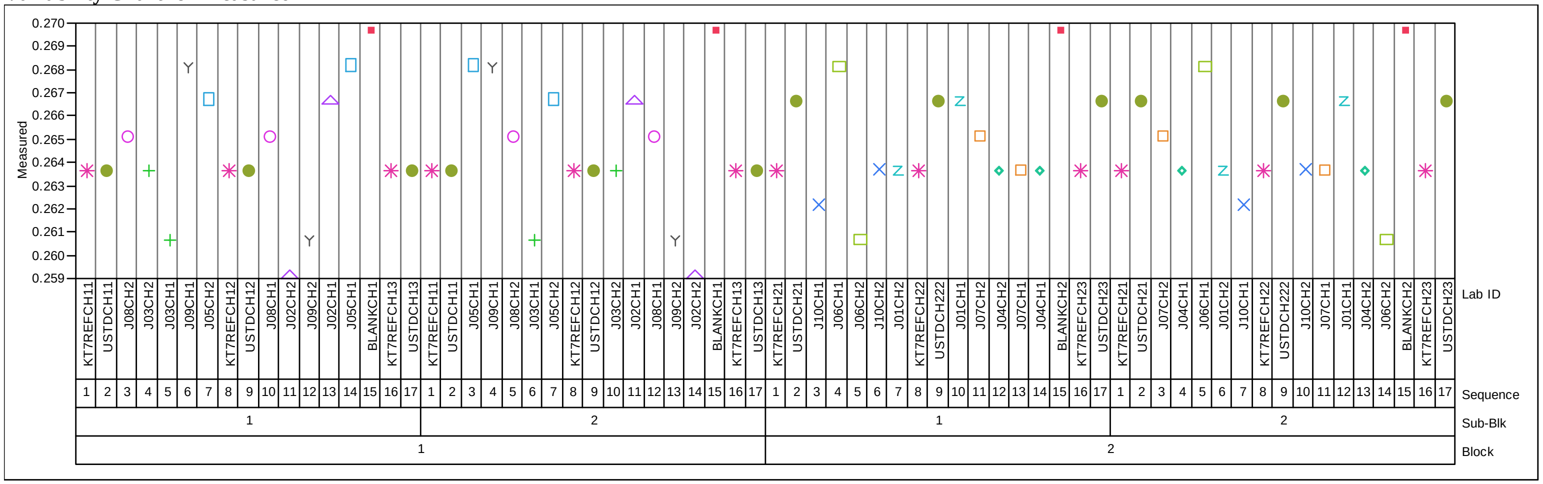
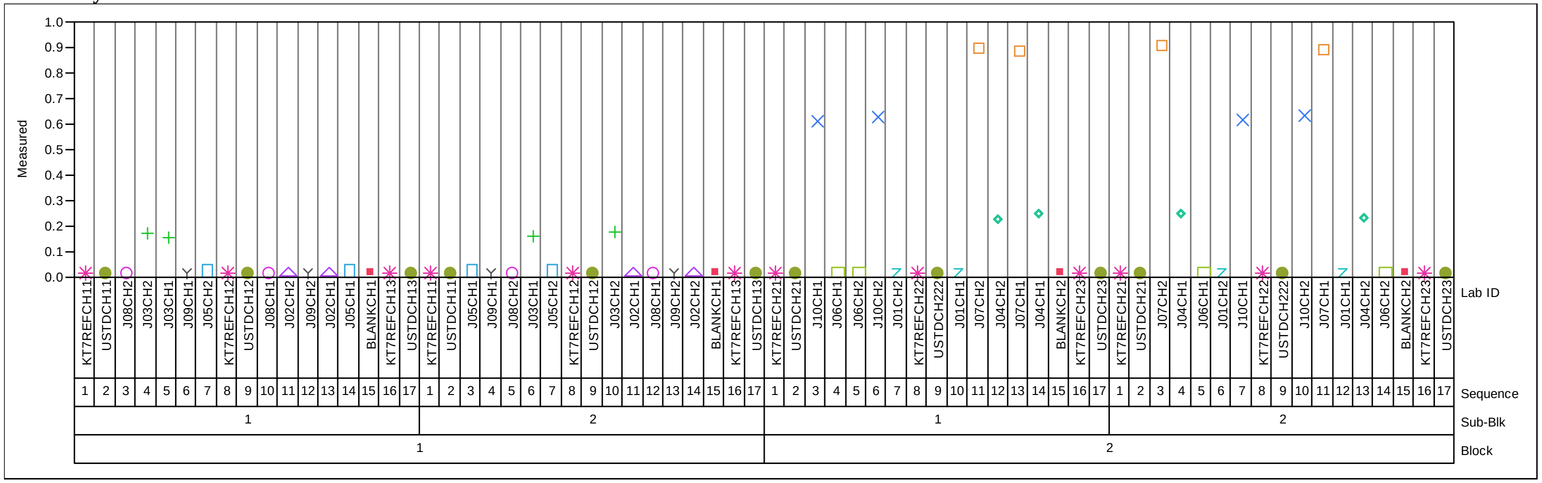


Exhibit A-1. Measurements in Analytical Sequence for the KT08-Series Glasses by Preparation Method by Oxide. (continued)

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



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

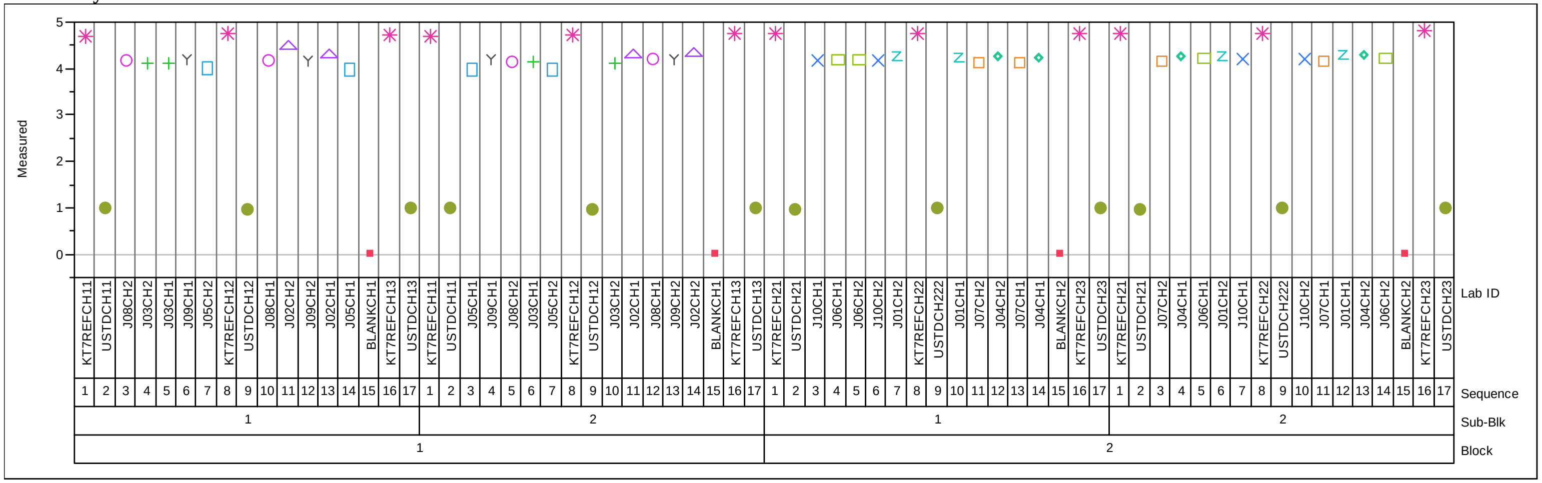
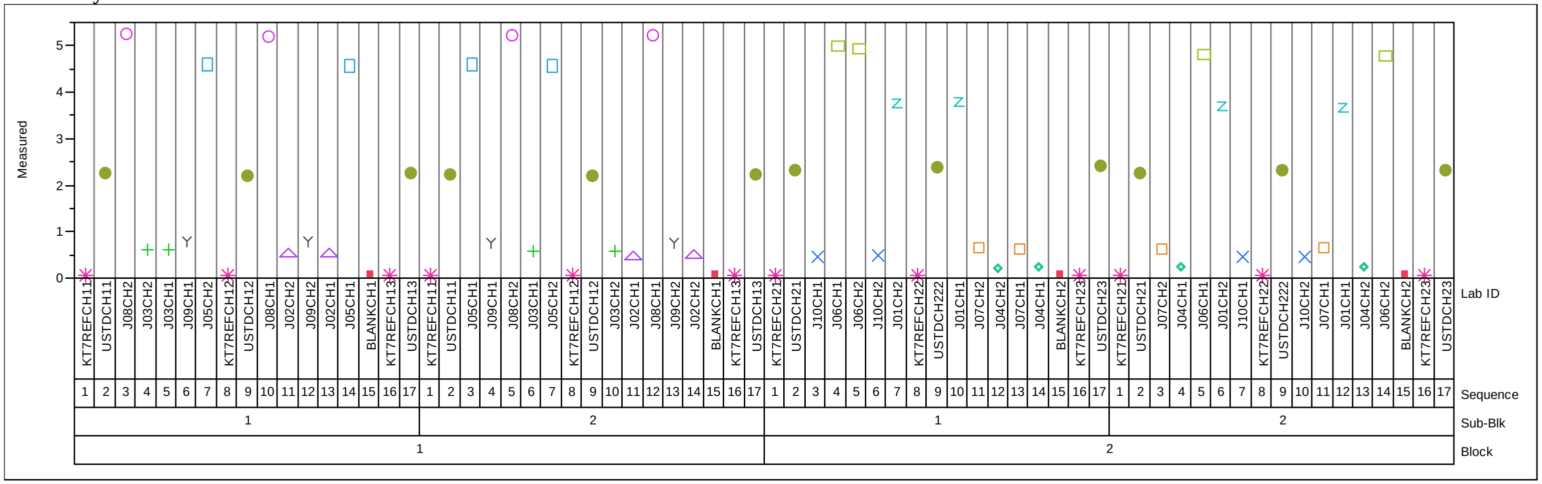


Exhibit A-1. Measurements in Analytical Sequence for the KT08-Series Glasses by Preparation Method by Oxide. (continued)

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



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

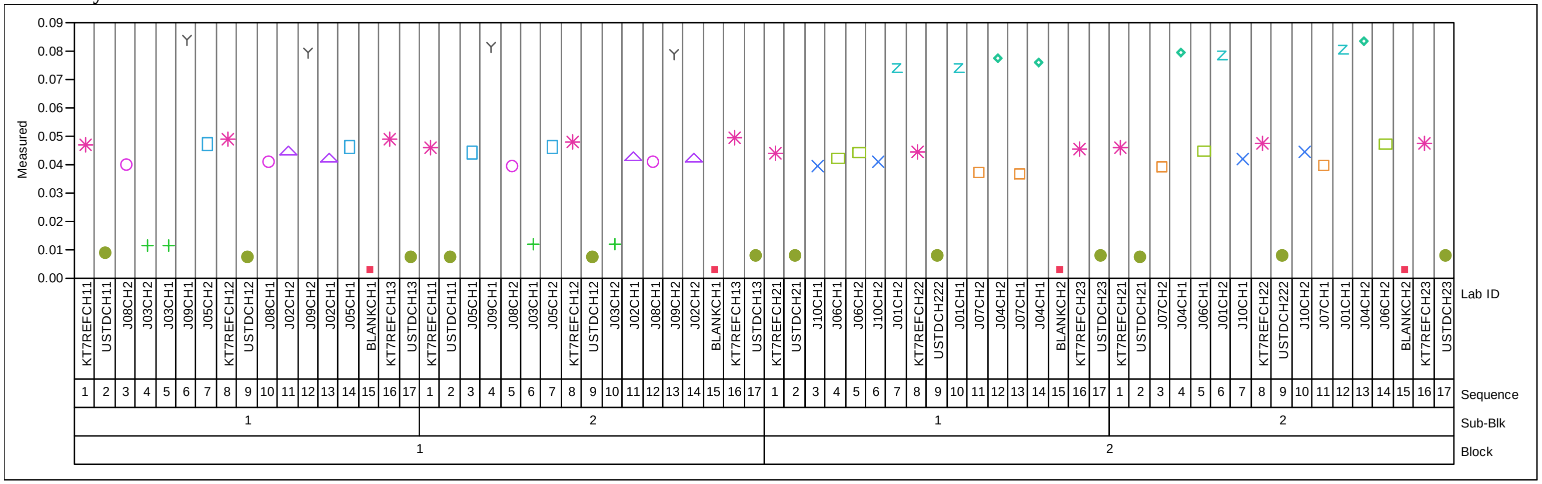
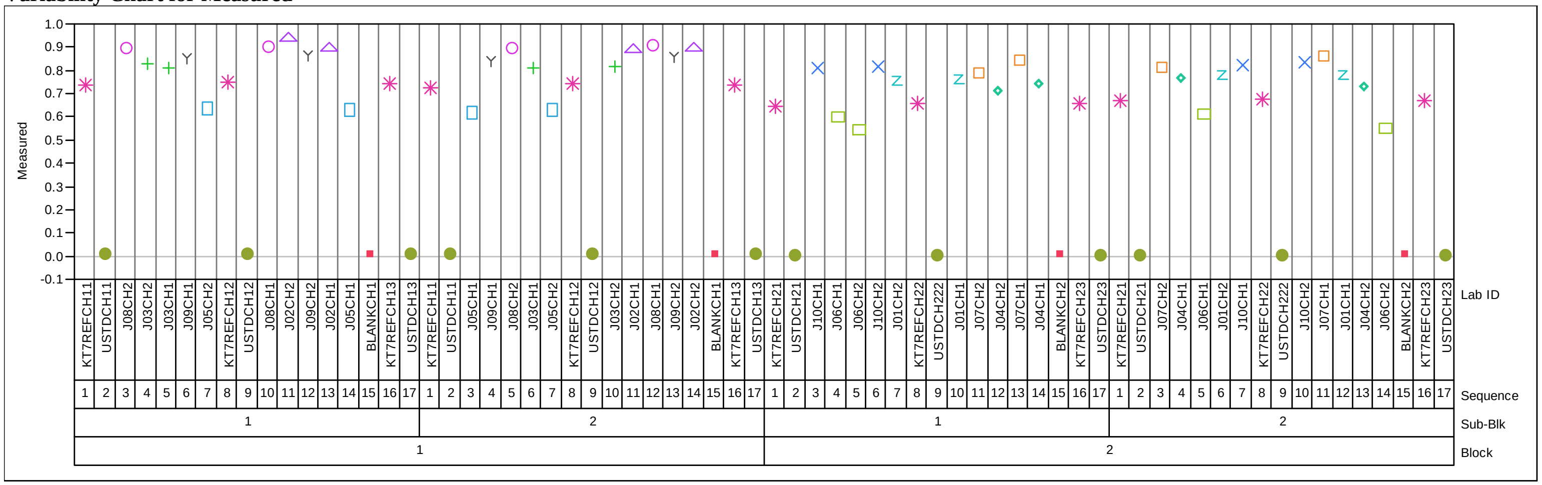


Exhibit A-1. Measurements in Analytical Sequence for the KT08-Series Glasses by Preparation Method by Oxide. (continued)

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



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

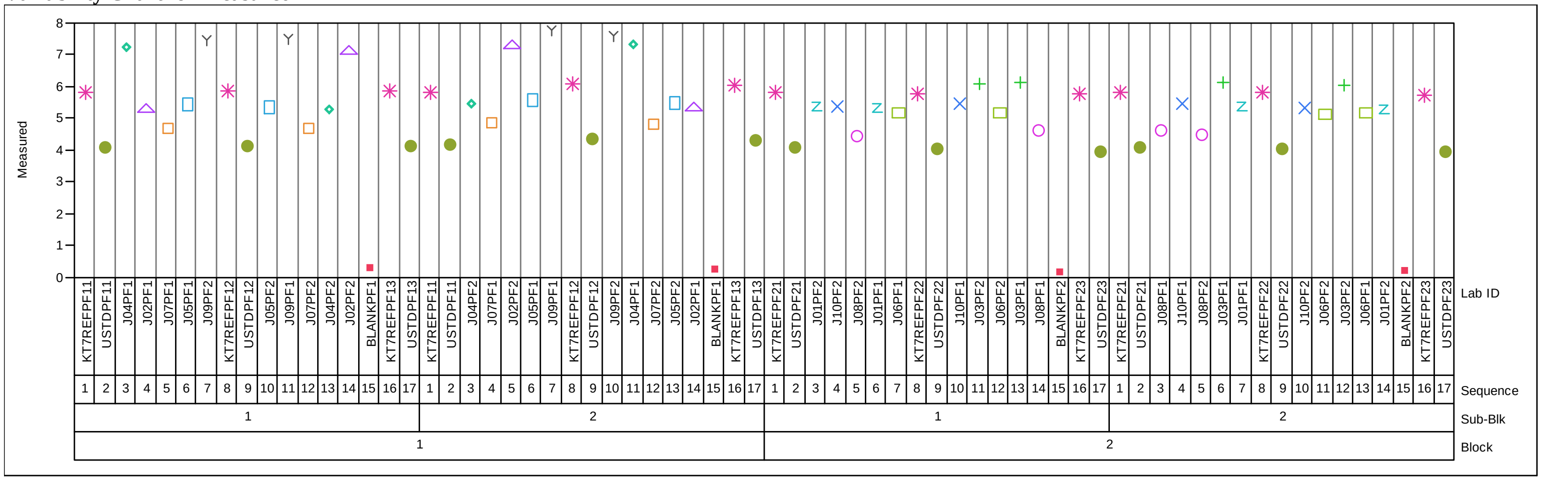
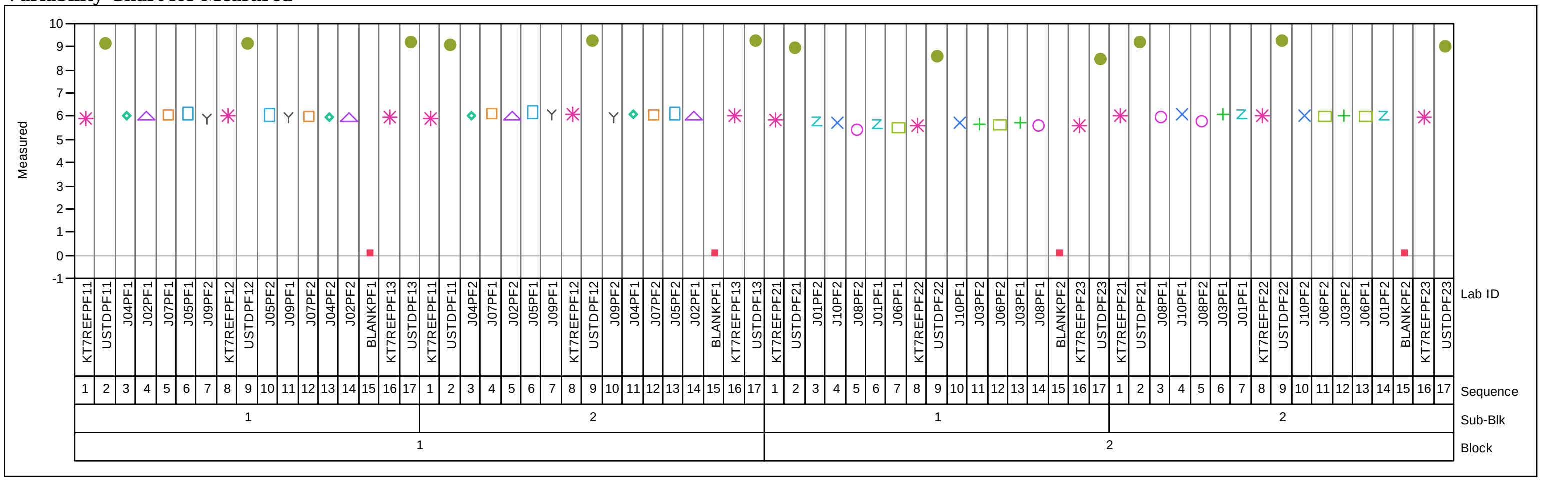


Exhibit A-1. Measurements in Analytical Sequence for the KT08-Series Glasses by Preparation Method by Oxide. (continued)

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



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

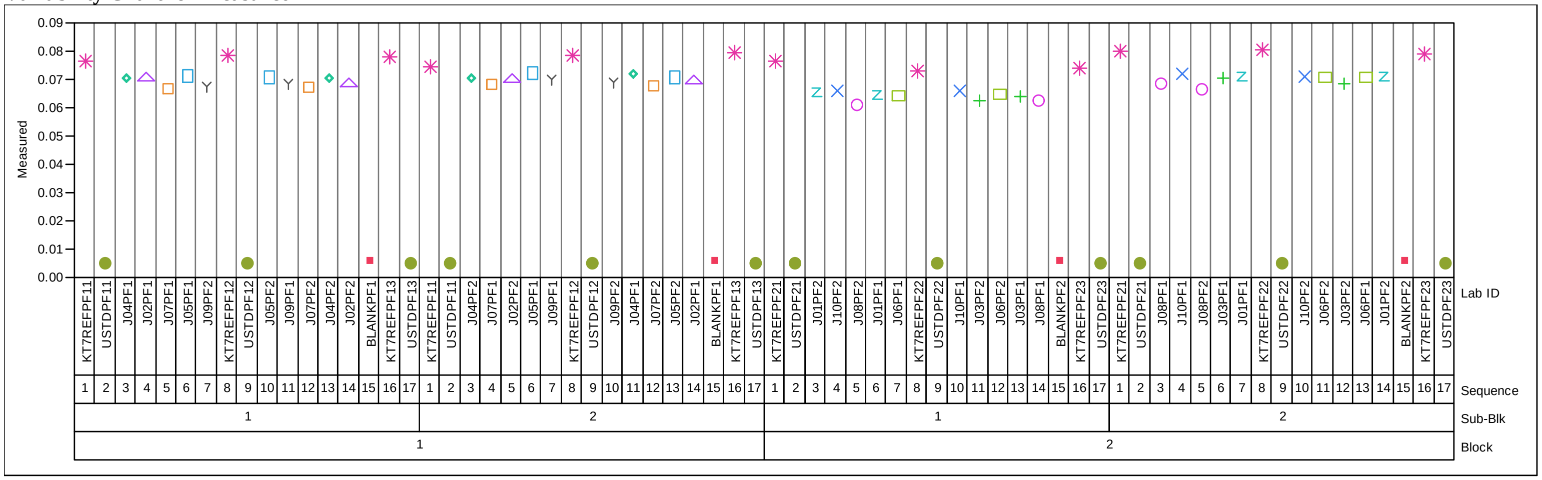
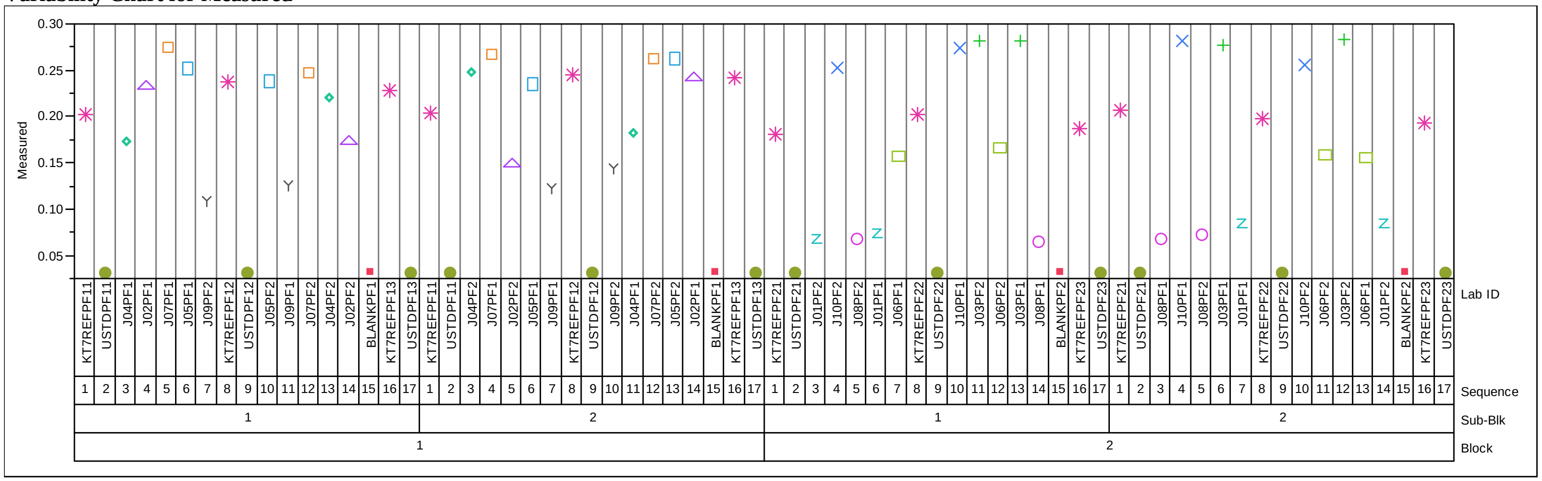


Exhibit A-1. Measurements in Analytical Sequence for the KT08-Series Glasses by Preparation Method by Oxide. (continued)

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



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

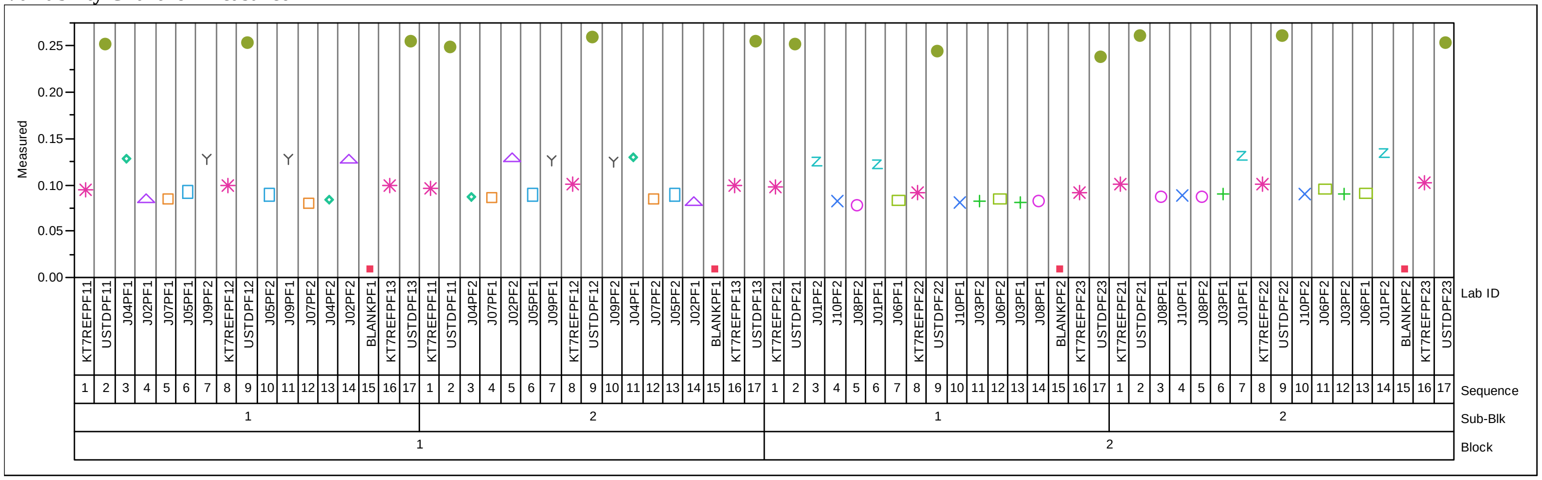
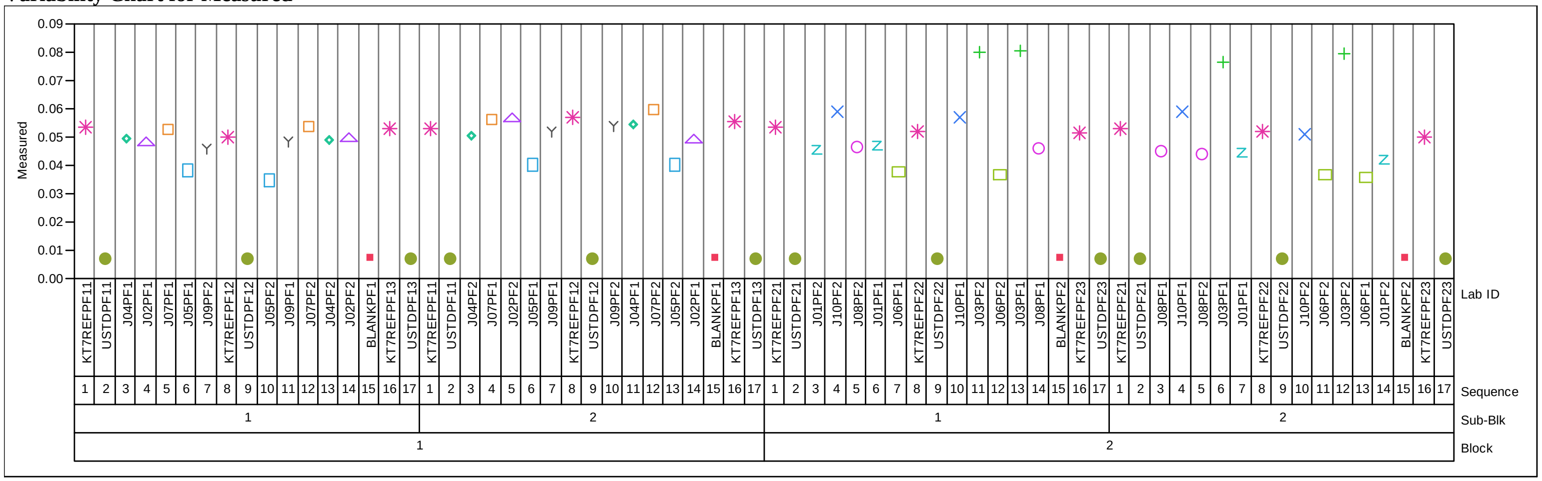


Exhibit A-1. Measurements in Analytical Sequence for the KT08-Series Glasses by Preparation Method by Oxide. (continued)

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



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

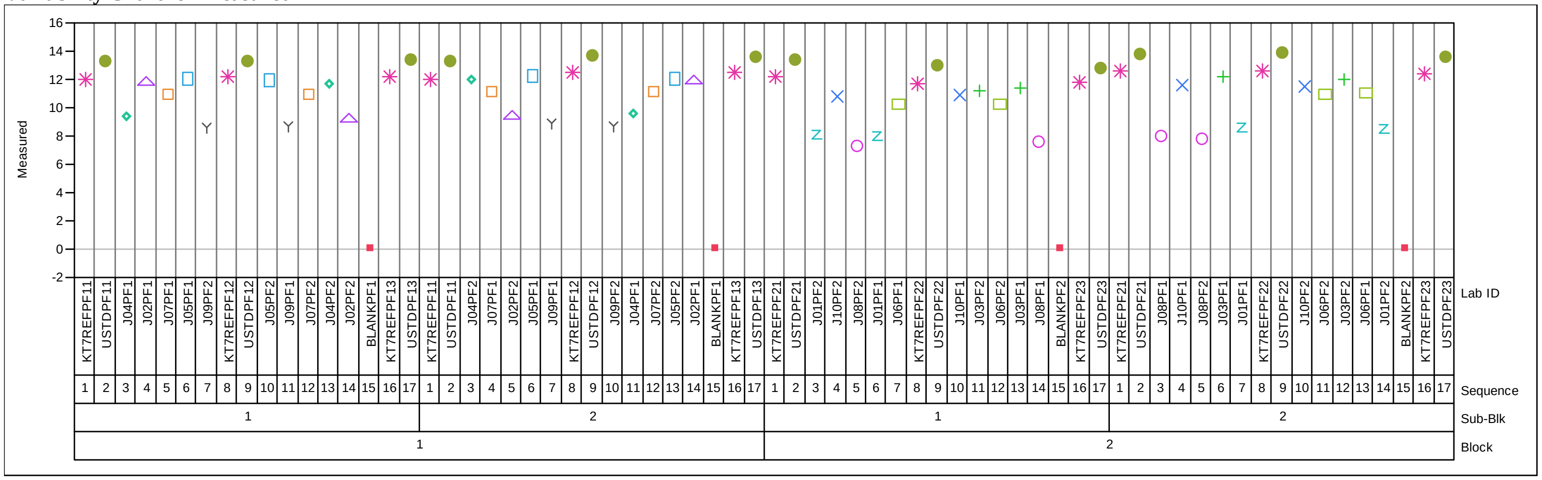
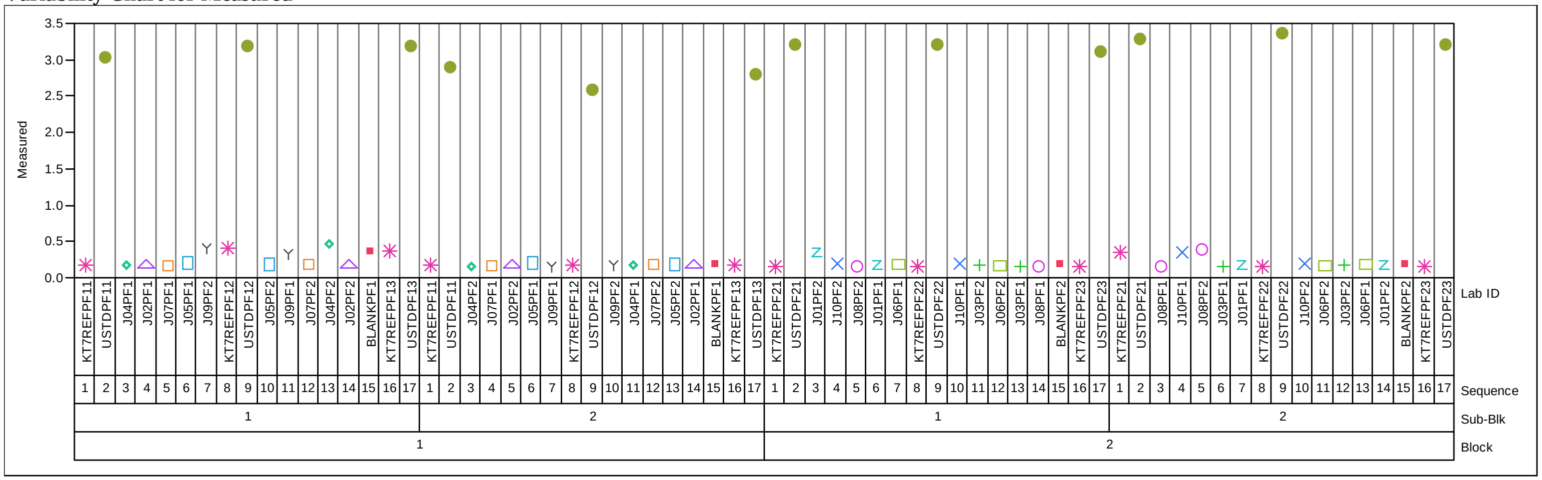


Exhibit A-1. Measurements in Analytical Sequence for the KT08-Series Glasses by Preparation Method by Oxide. (continued)

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



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

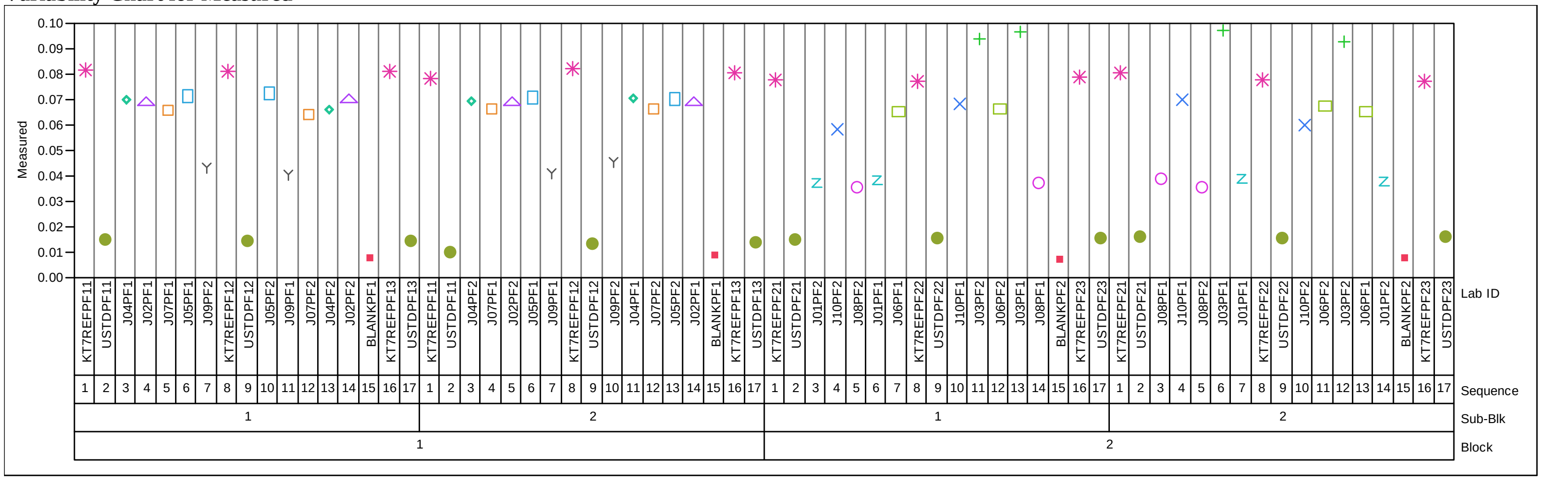
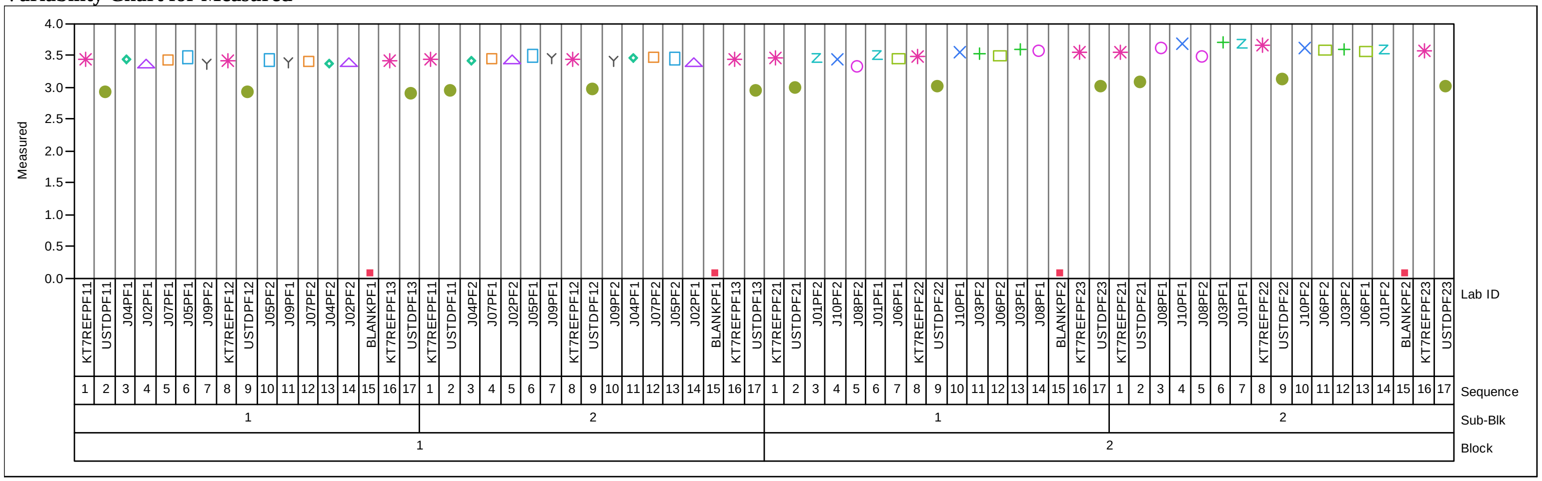


Exhibit A-1. Measurements in Analytical Sequence for the KT08-Series Glasses by Preparation Method by Oxide. (continued)

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



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

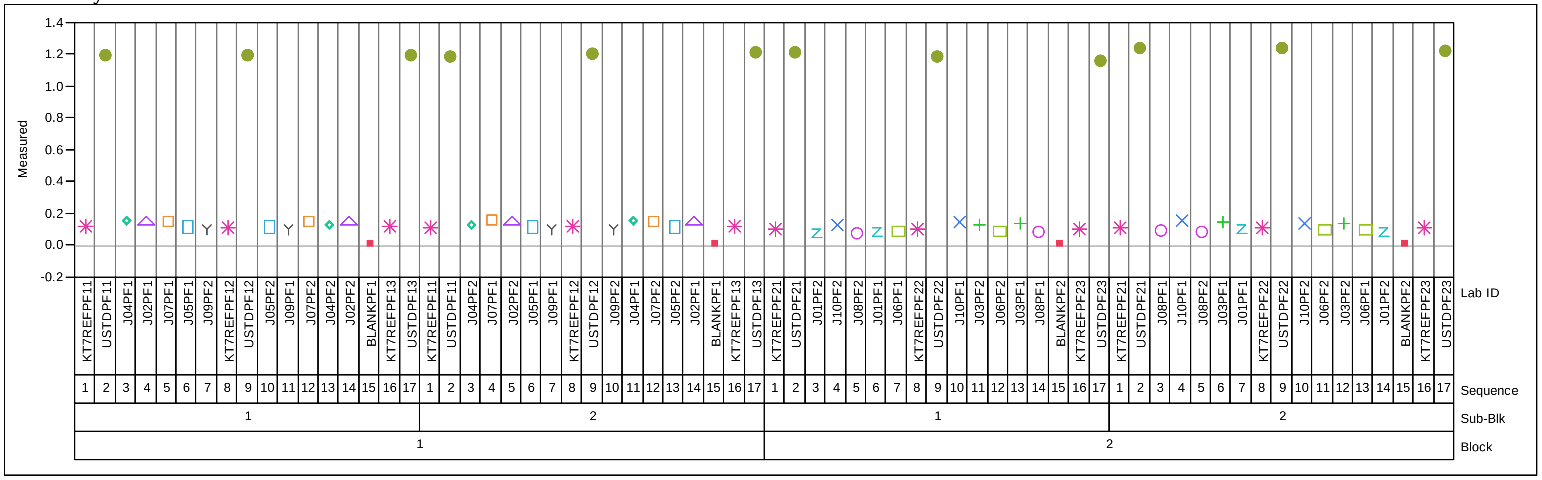
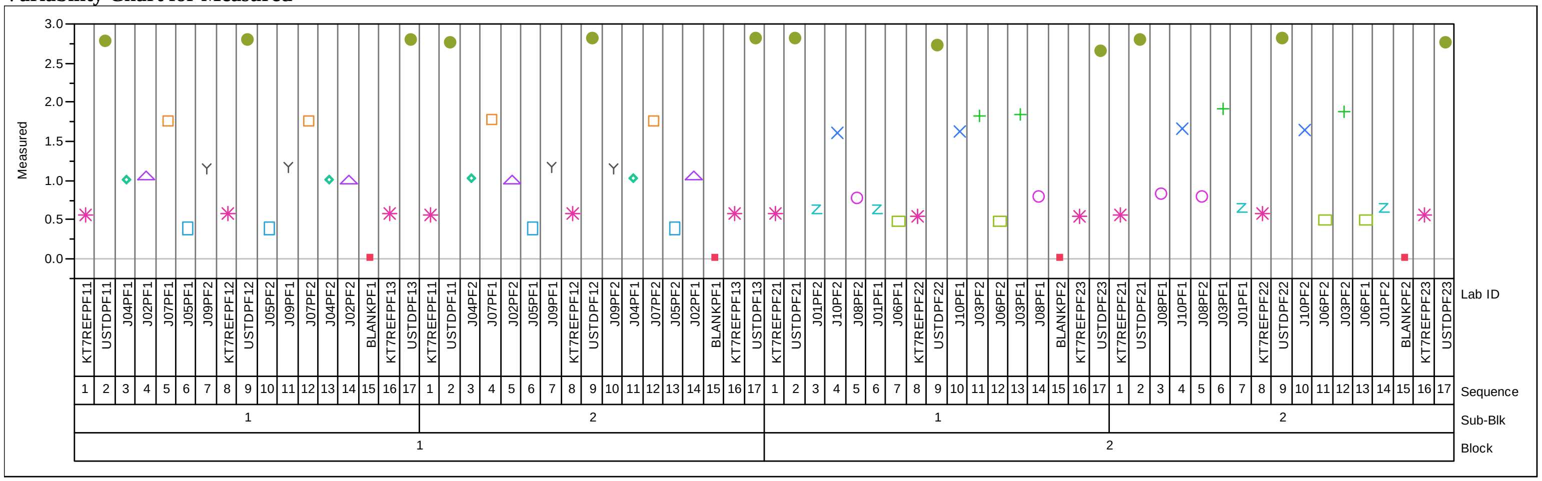


Exhibit A-1. Measurements in Analytical Sequence for the KT08-Series Glasses by Preparation Method by Oxide. (continued)

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



Prep Method=PF, Oxide=Nb2O5 (wt%)
Variability Chart for Measured

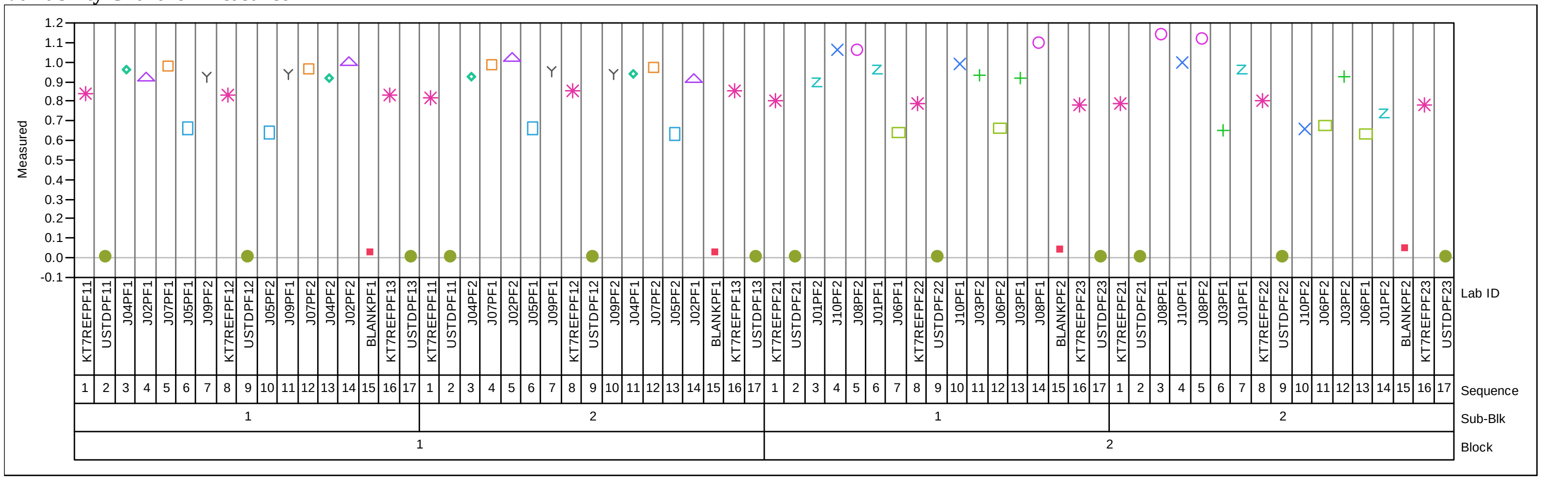
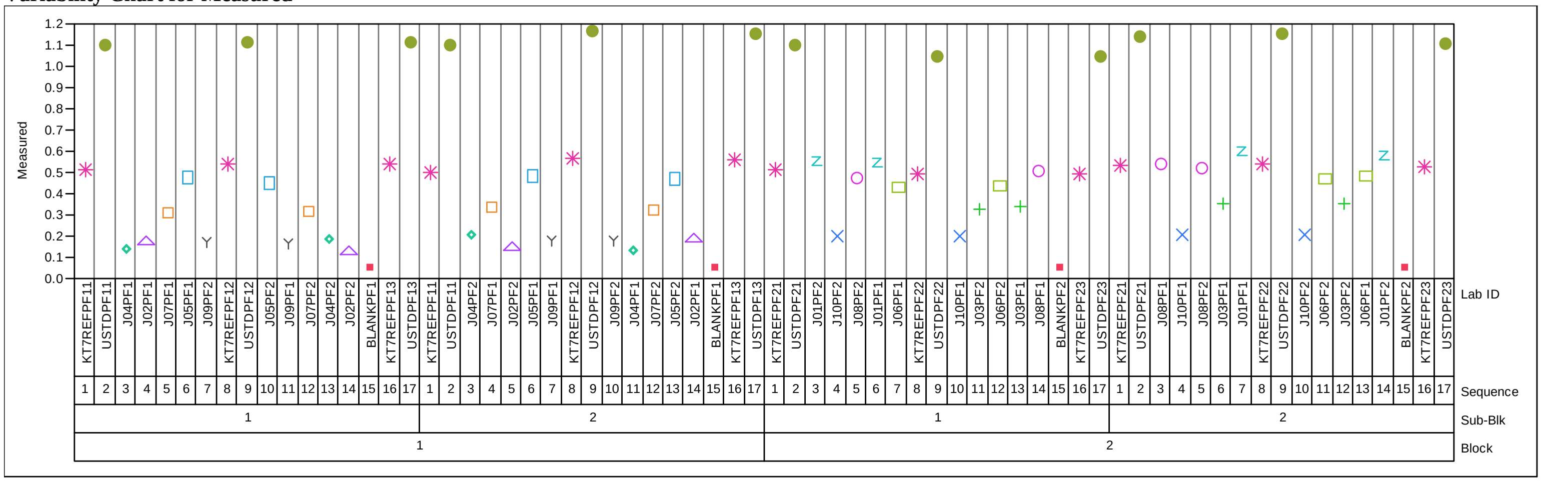


Exhibit A-1. Measurements in Analytical Sequence for the KT08-Series Glasses by Preparation Method by Oxide. (continued)

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



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

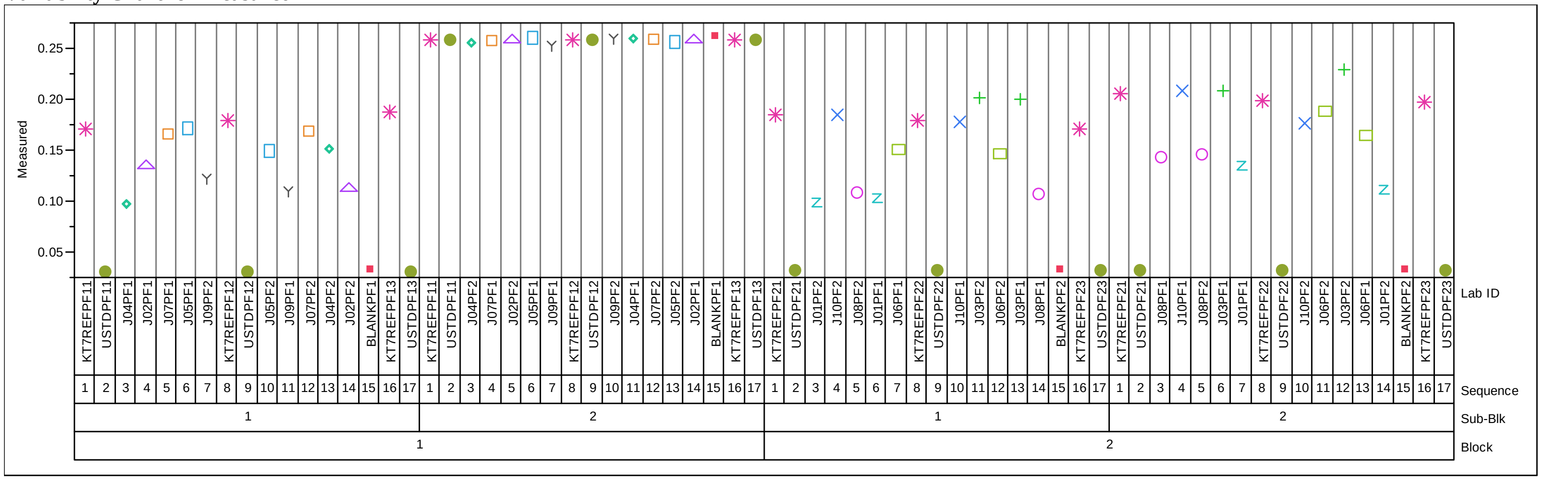
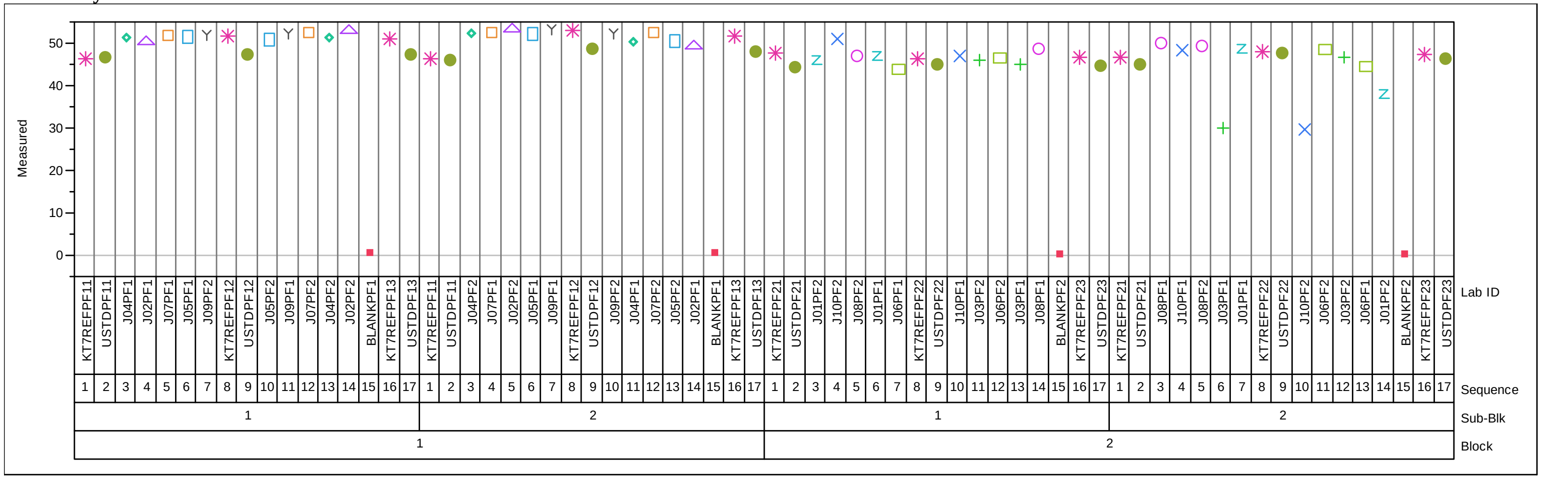


Exhibit A-1. Measurements in Analytical Sequence for the KT08-Series Glasses by Preparation Method by Oxide. (continued)

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



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

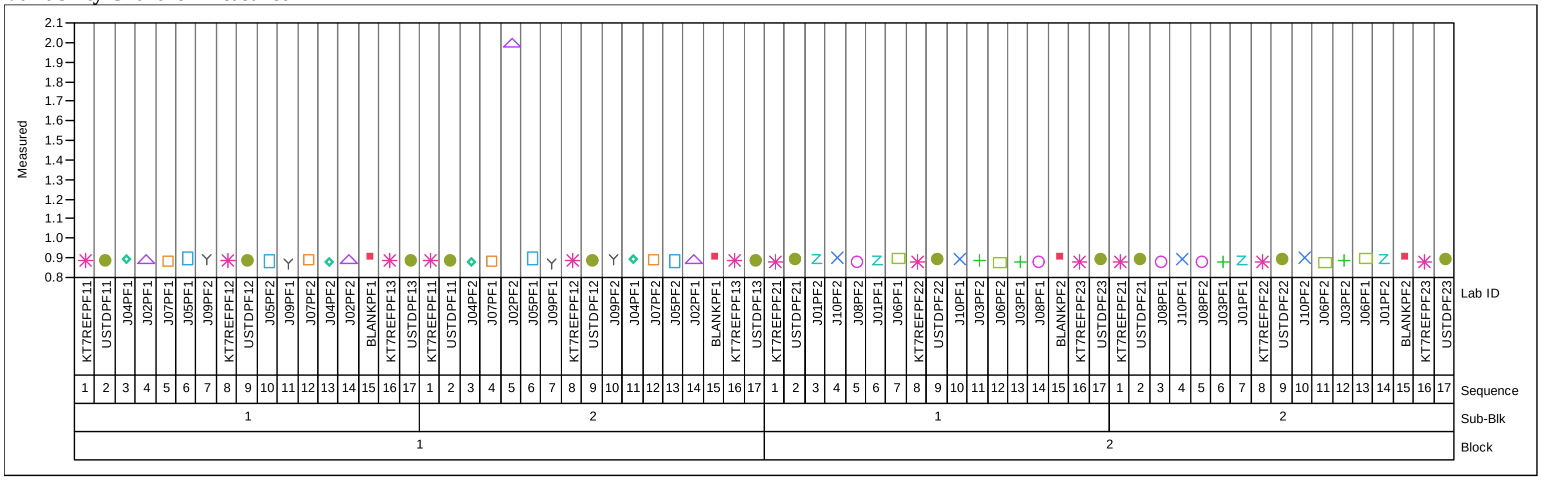
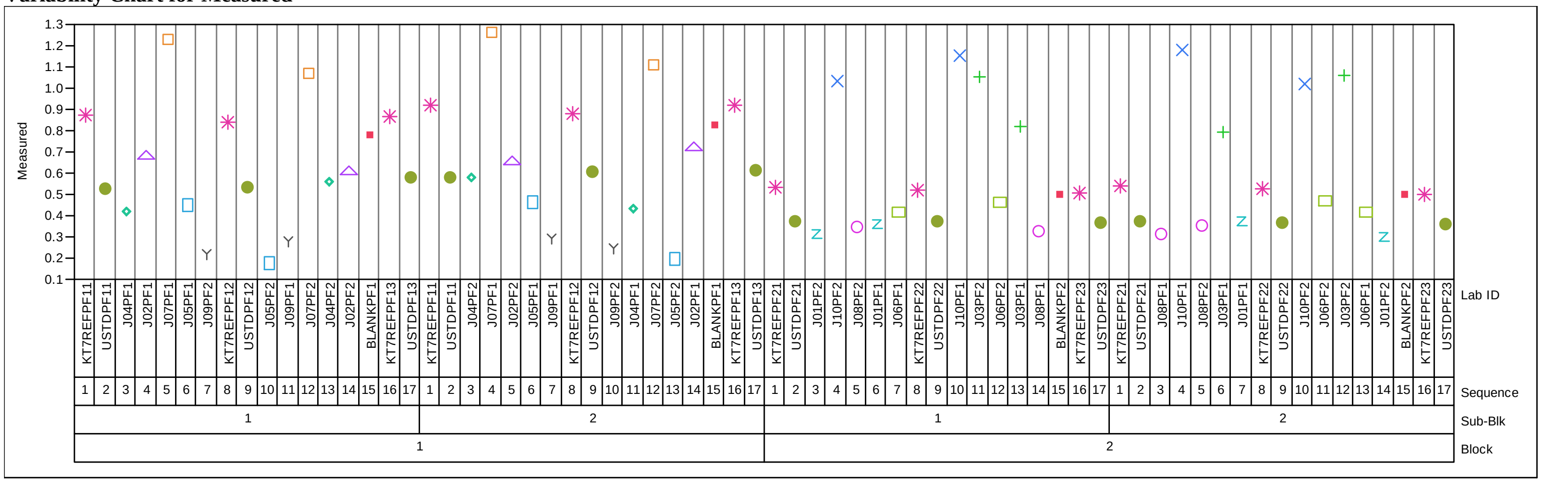


Exhibit A-1. Measurements in Analytical Sequence for the KT08-Series Glasses by Preparation Method by Oxide. (continued)

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



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

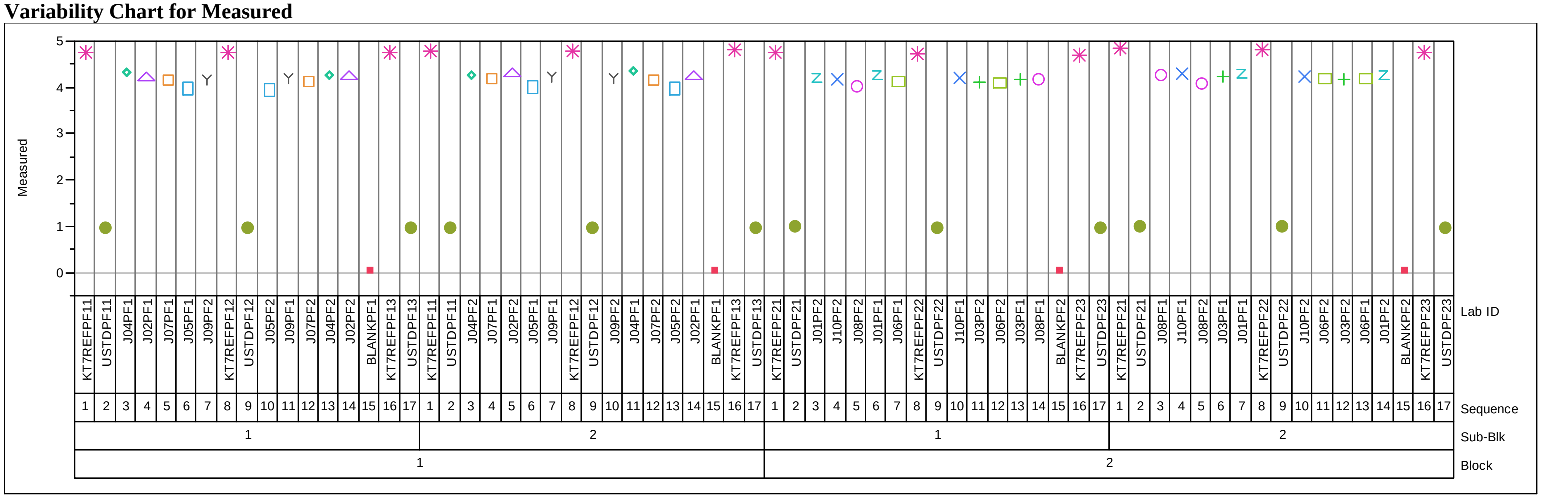
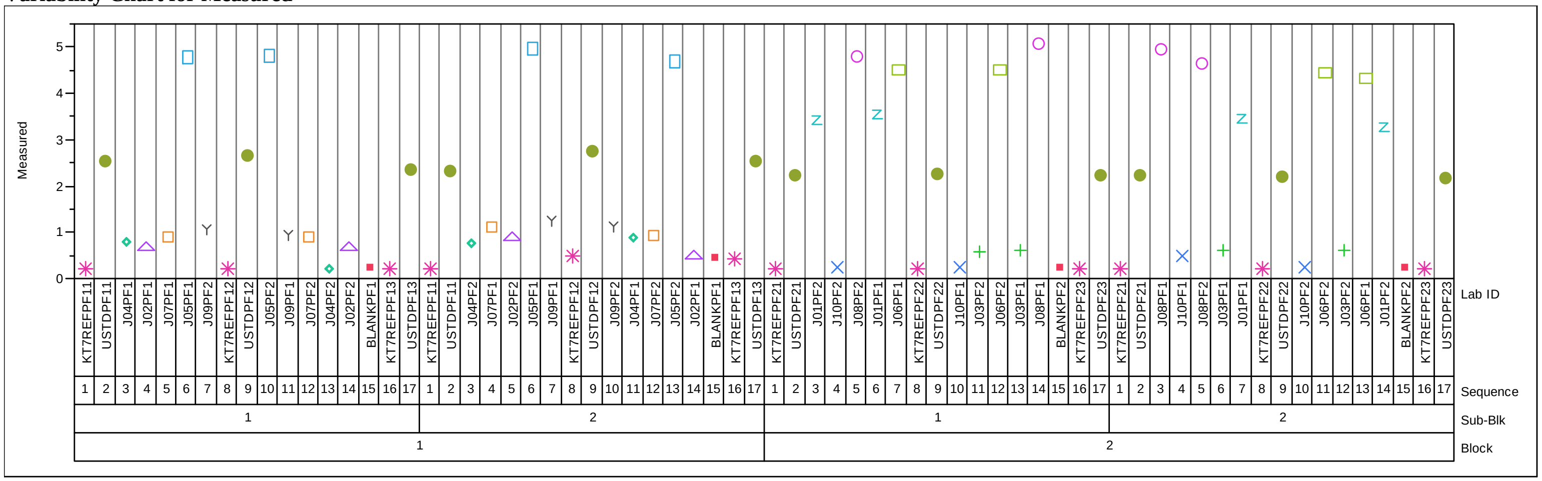


Exhibit A-1. Measurements in Analytical Sequence for the KT08-Series Glasses by Preparation Method by Oxide. (continued)

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



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

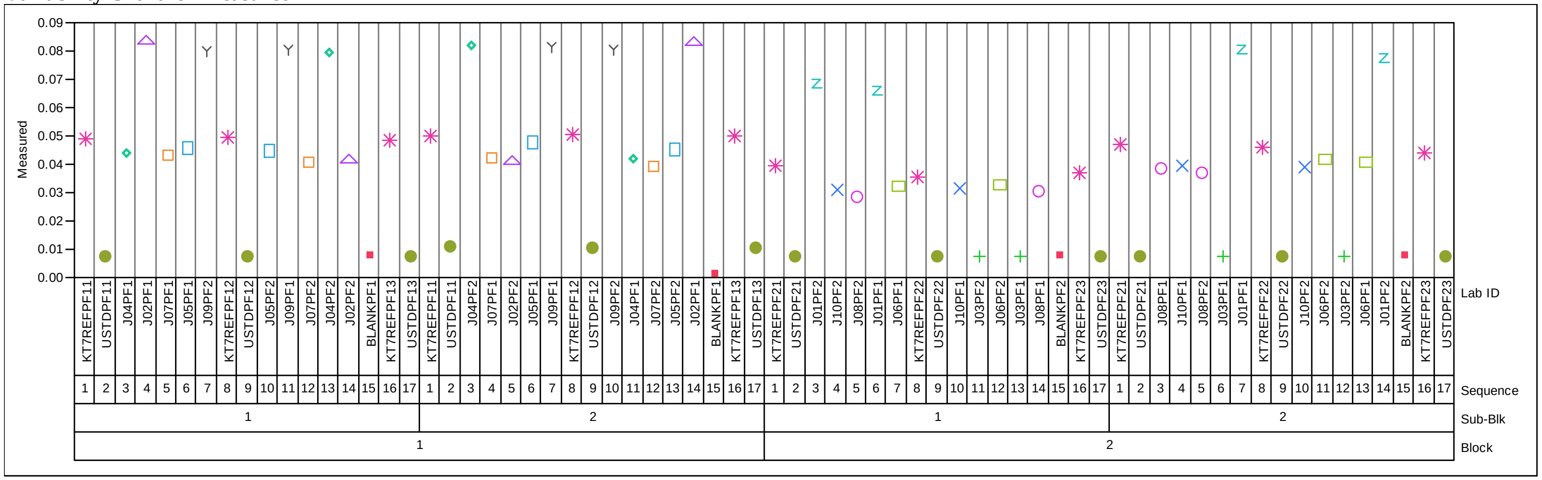
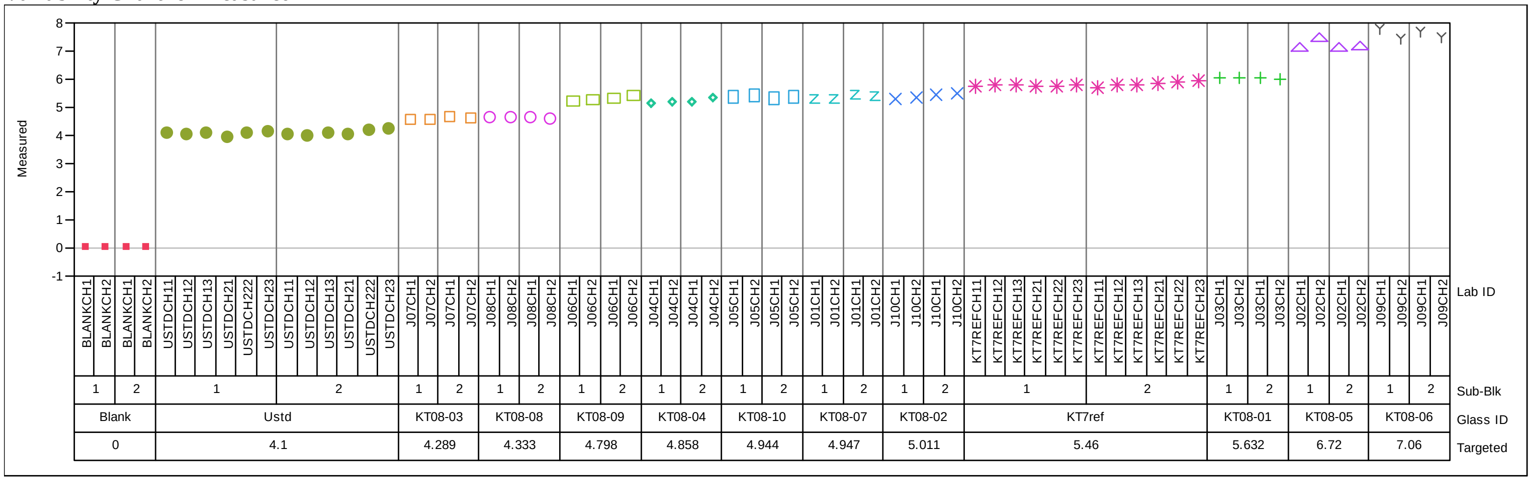


Exhibit A-2. Measurements for Each KT08-Series Glass by Preparation Method by Oxide.

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



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

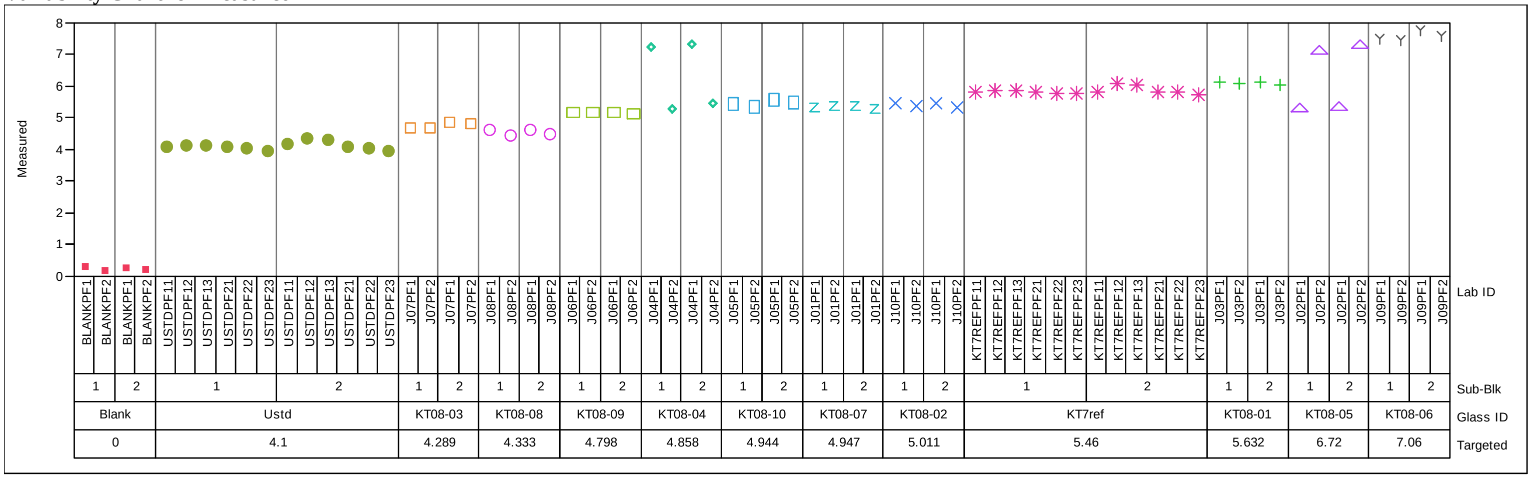
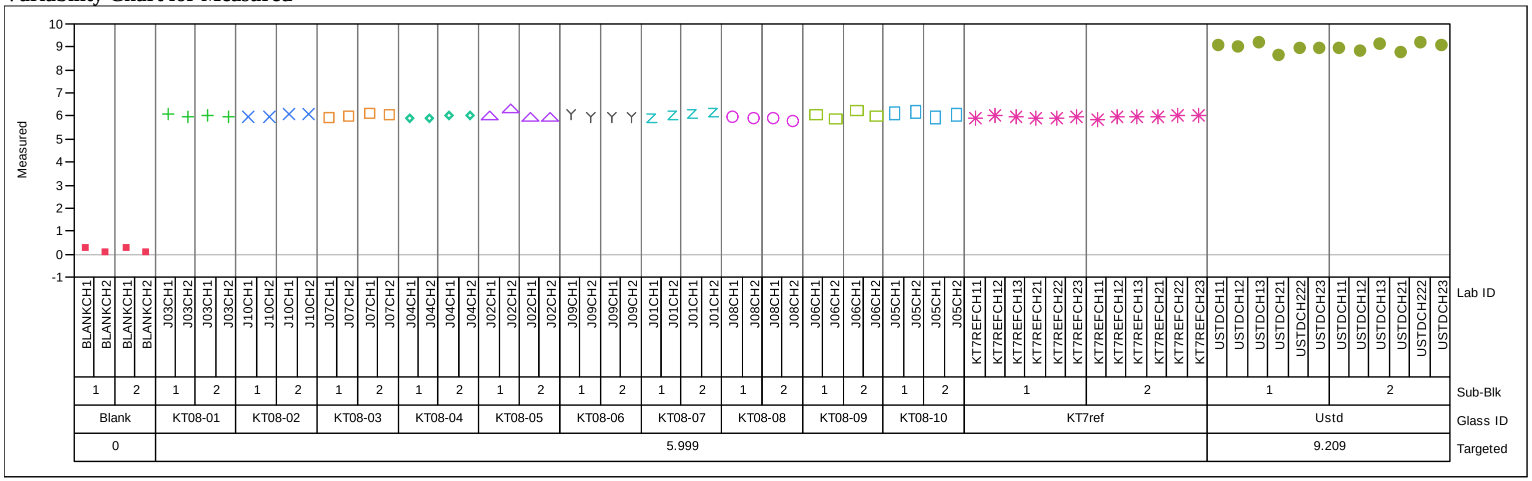


Exhibit A-2. Measurements for Each KT08-Series Glass by Preparation Method by Oxide. (continued)

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



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

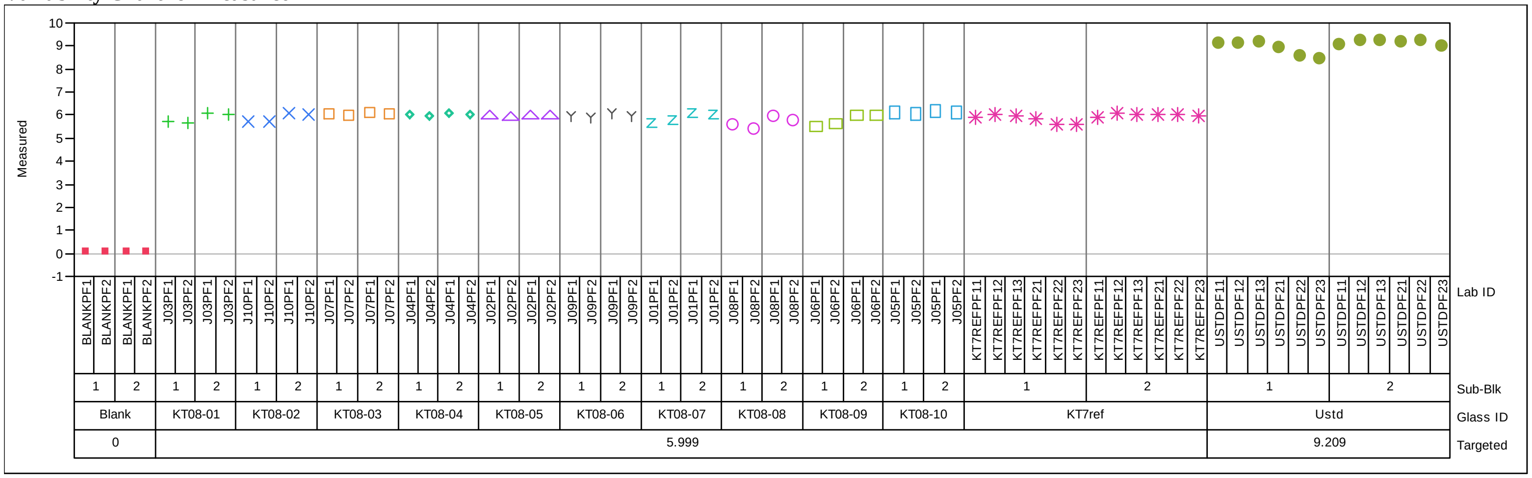
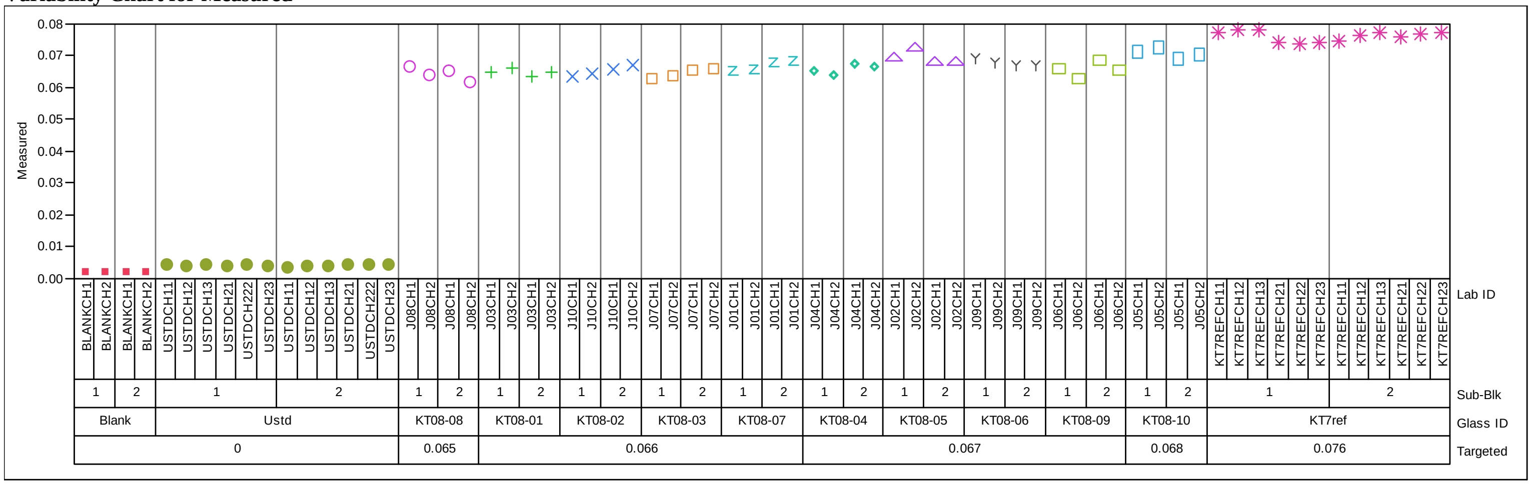


Exhibit A-2. Measurements for Each KT08-Series Glass by Preparation Method by Oxide. (continued)

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



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

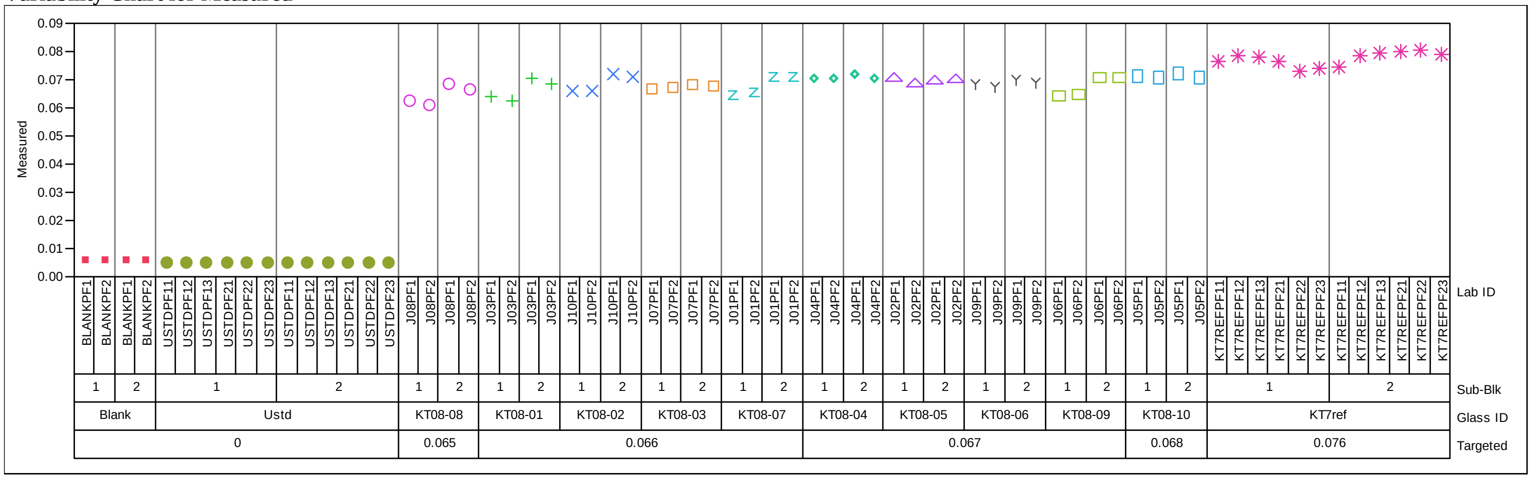
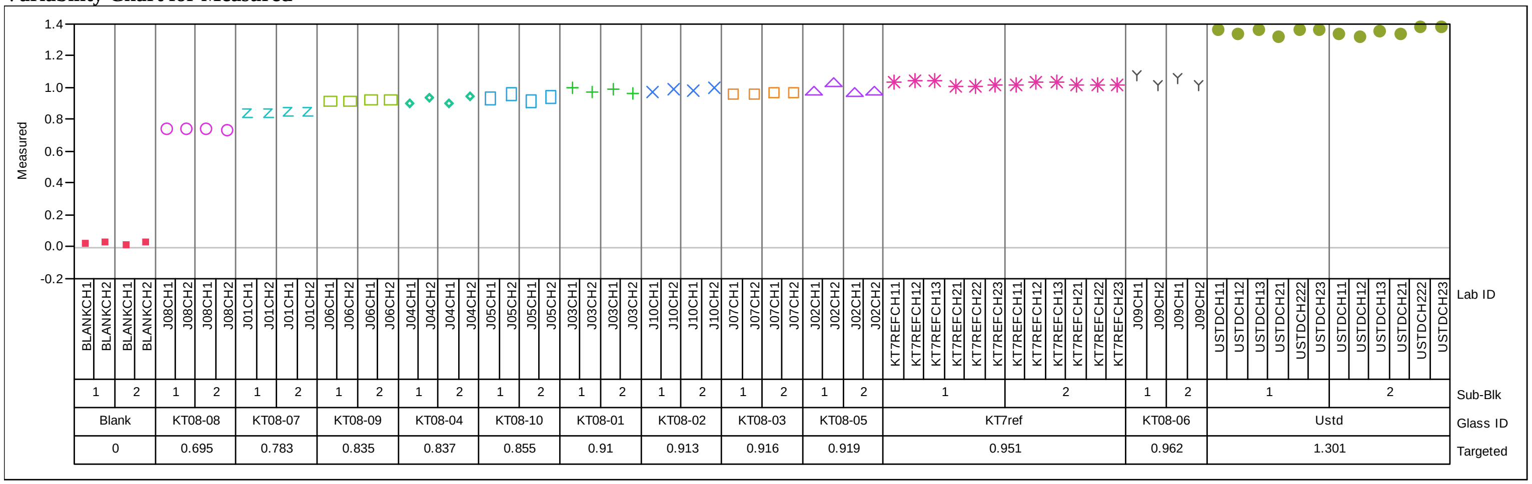


Exhibit A-2. Measurements for Each KT08-Series Glass by Preparation Method by Oxide. (continued)

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



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

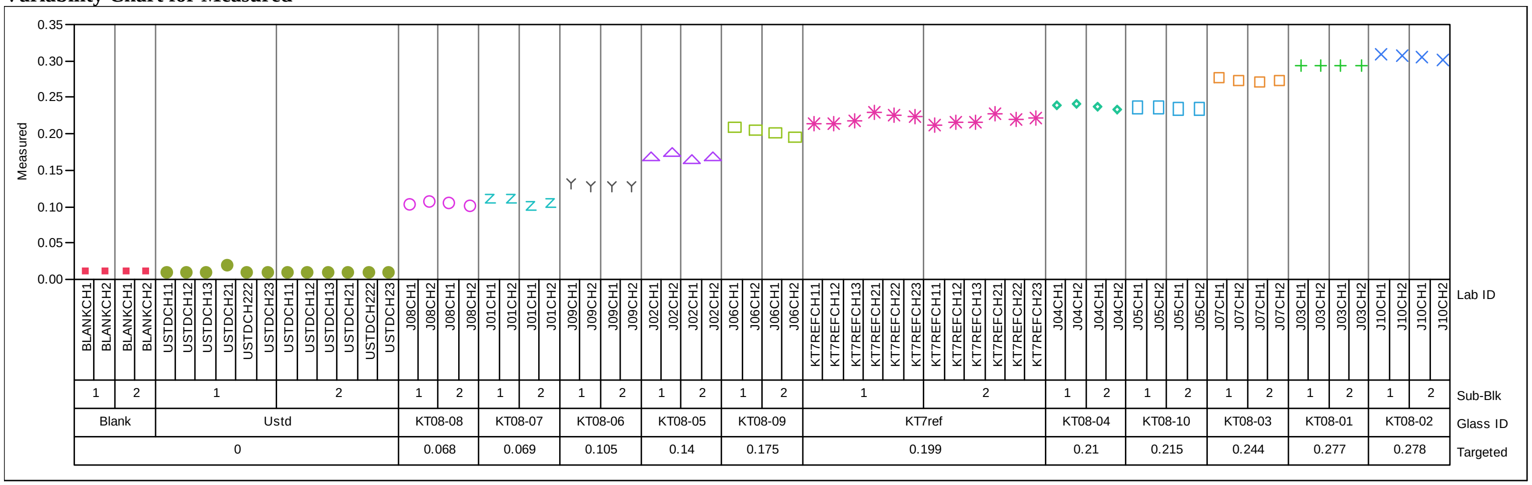
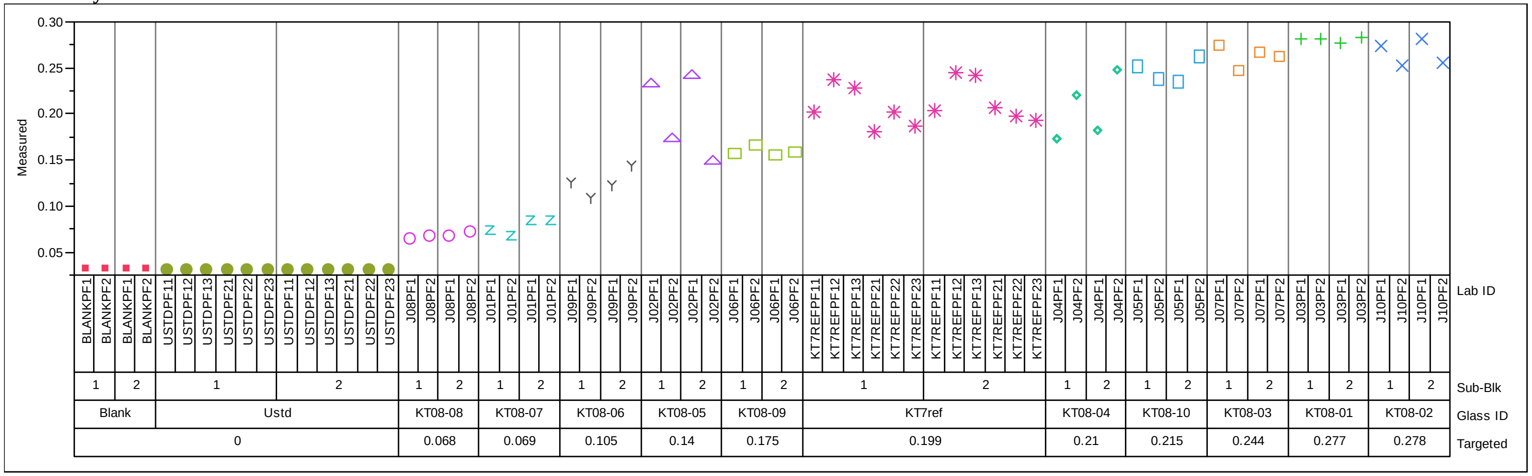


Exhibit A-2. Measurements for Each KT08-Series Glass by Preparation Method by Oxide. (continued)

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



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

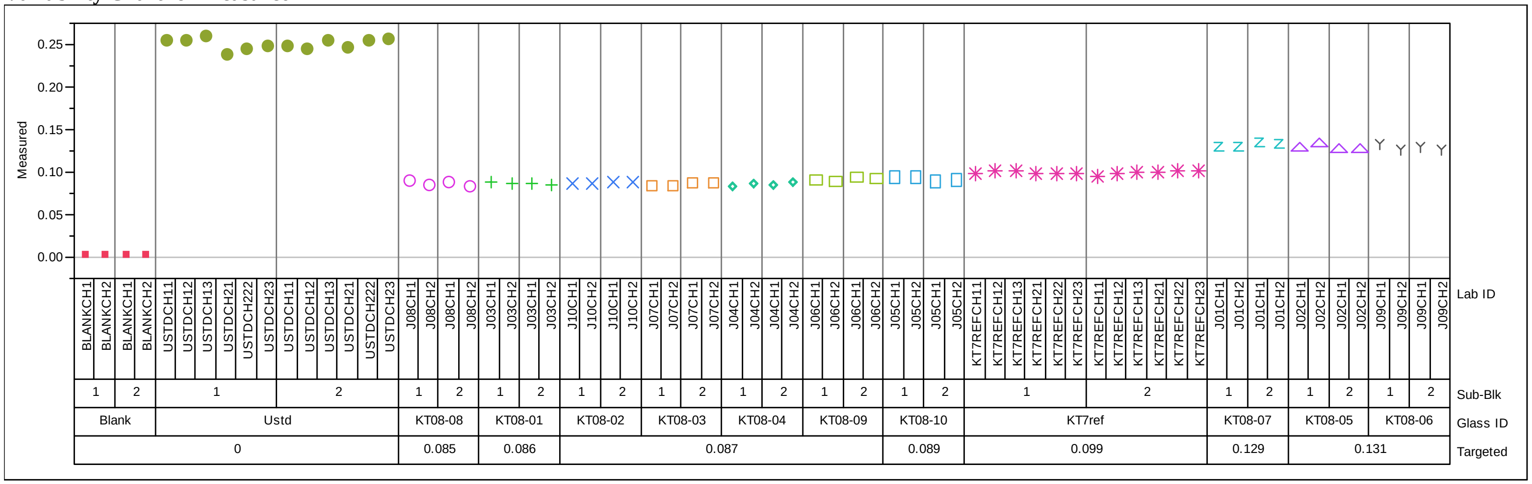
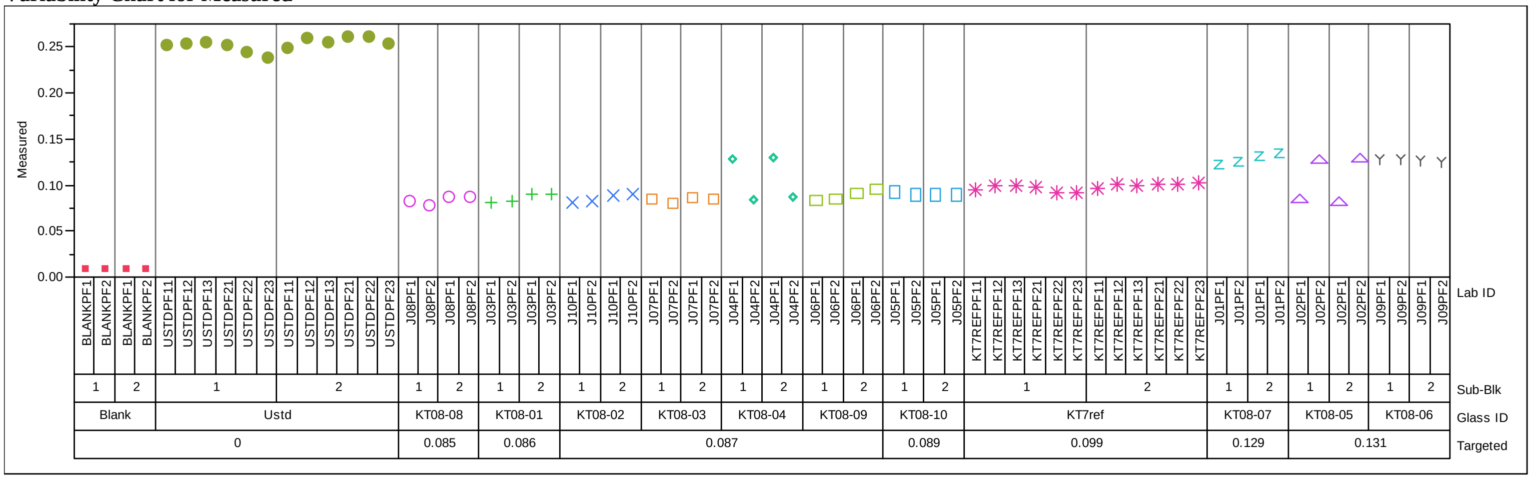


Exhibit A-2. Measurements for Each KT08-Series Glass by Preparation Method by Oxide. (continued)

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



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

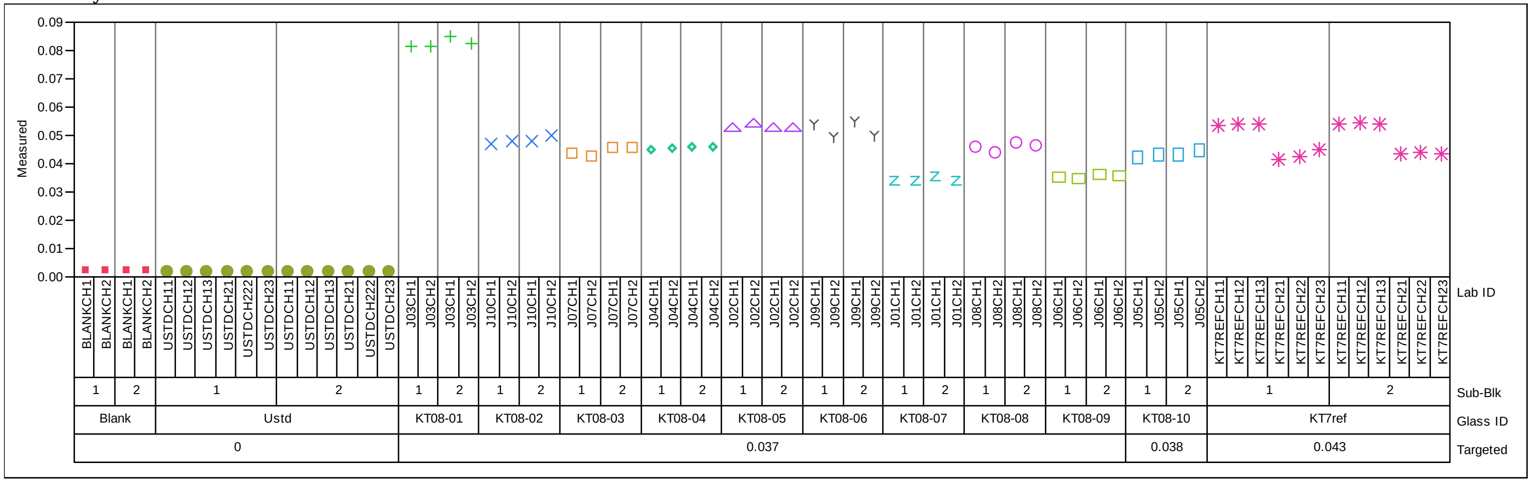
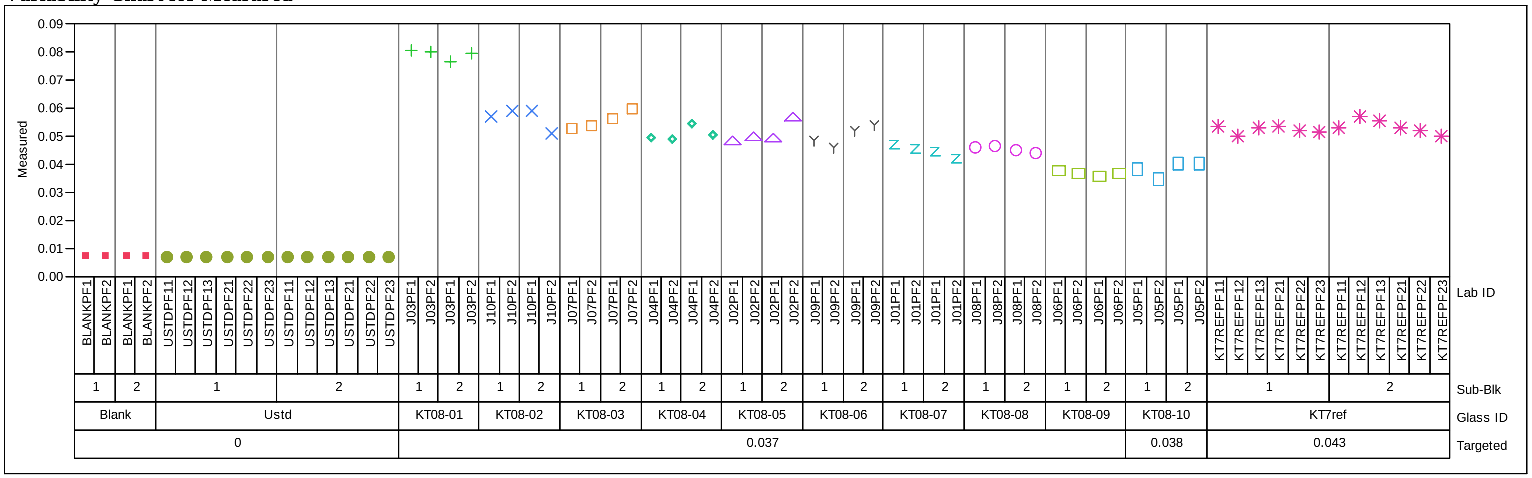


Exhibit A-2. Measurements for Each KT08-Series Glass by Preparation Method by Oxide. (continued)

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



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

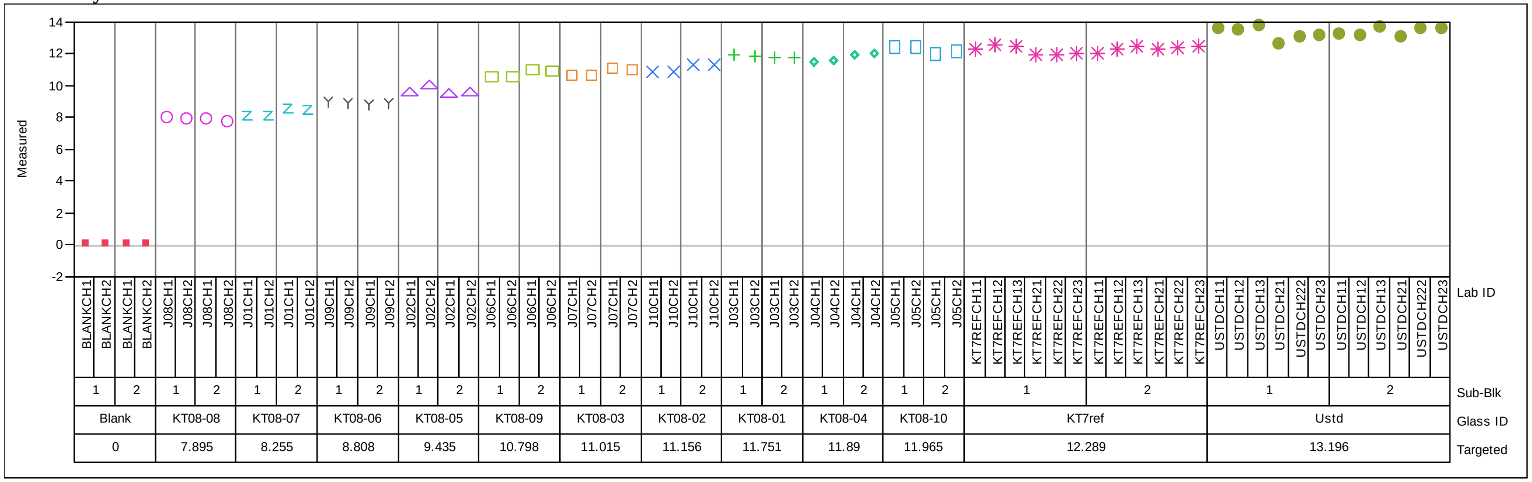
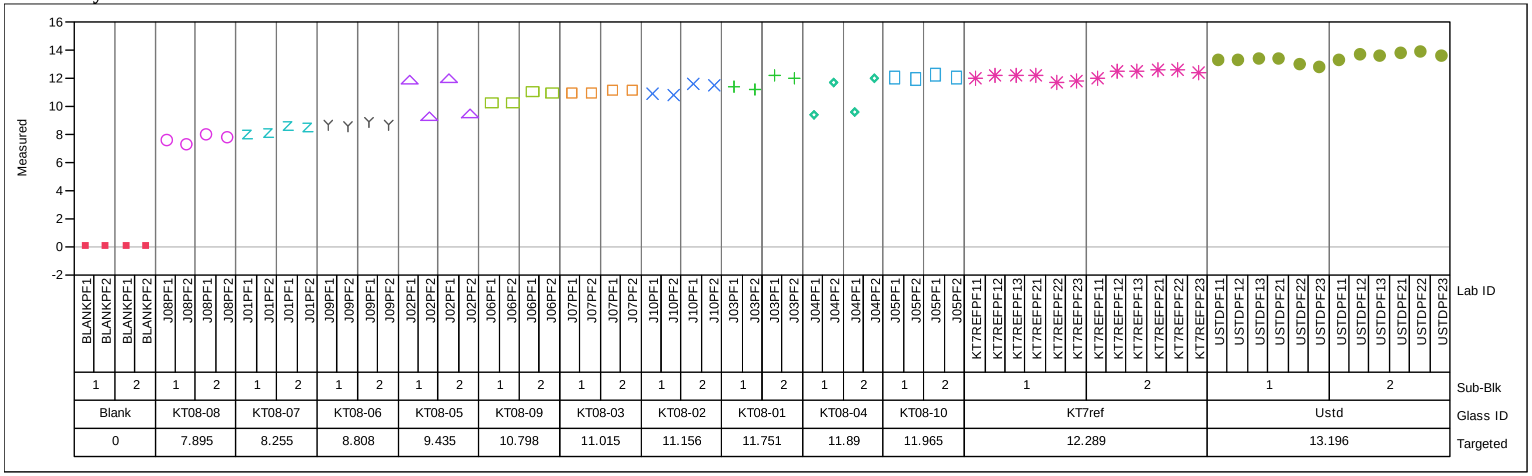


Exhibit A-2. Measurements for Each KT08-Series Glass by Preparation Method by Oxide. (continued)

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



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

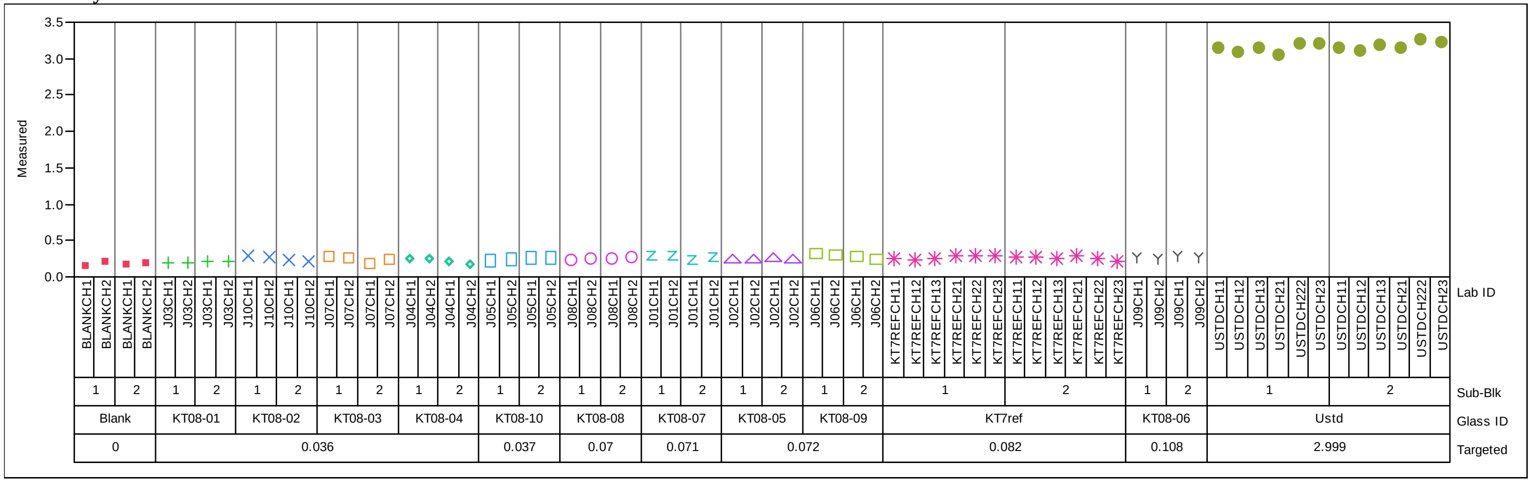
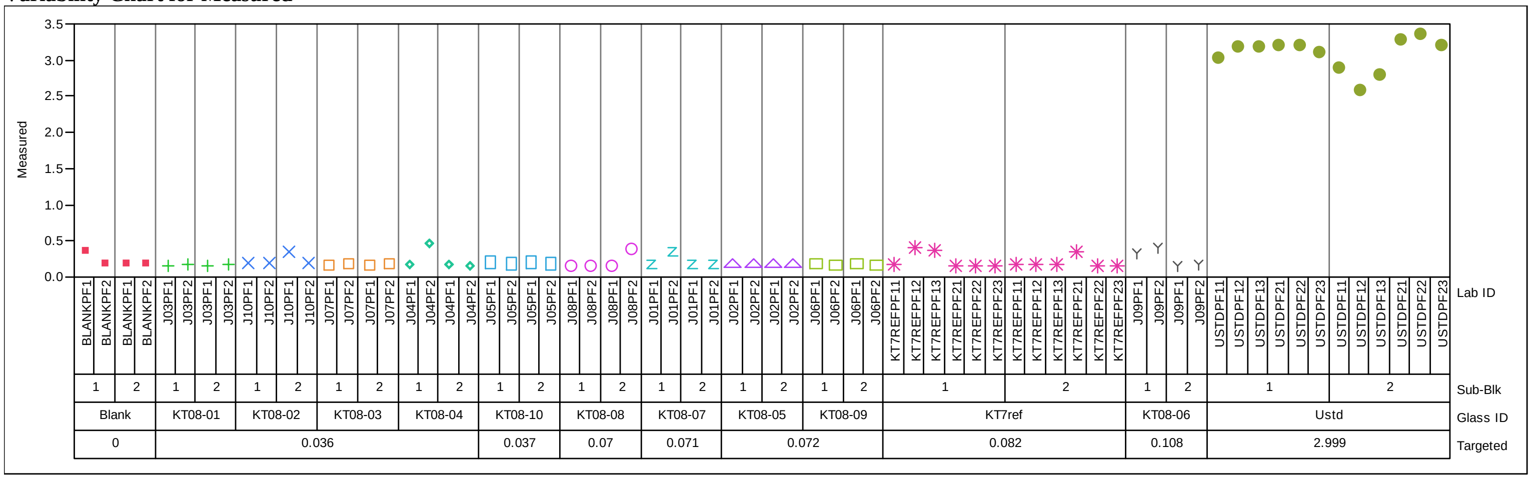


Exhibit A-2. Measurements for Each KT08-Series Glass by Preparation Method by Oxide. (continued)

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



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

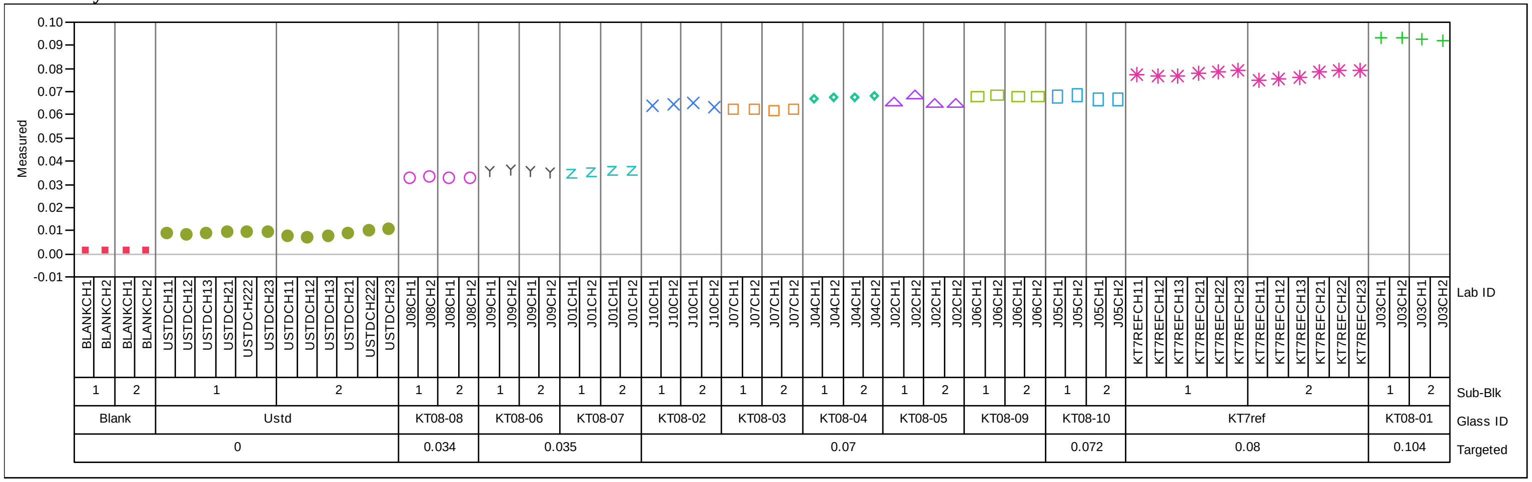
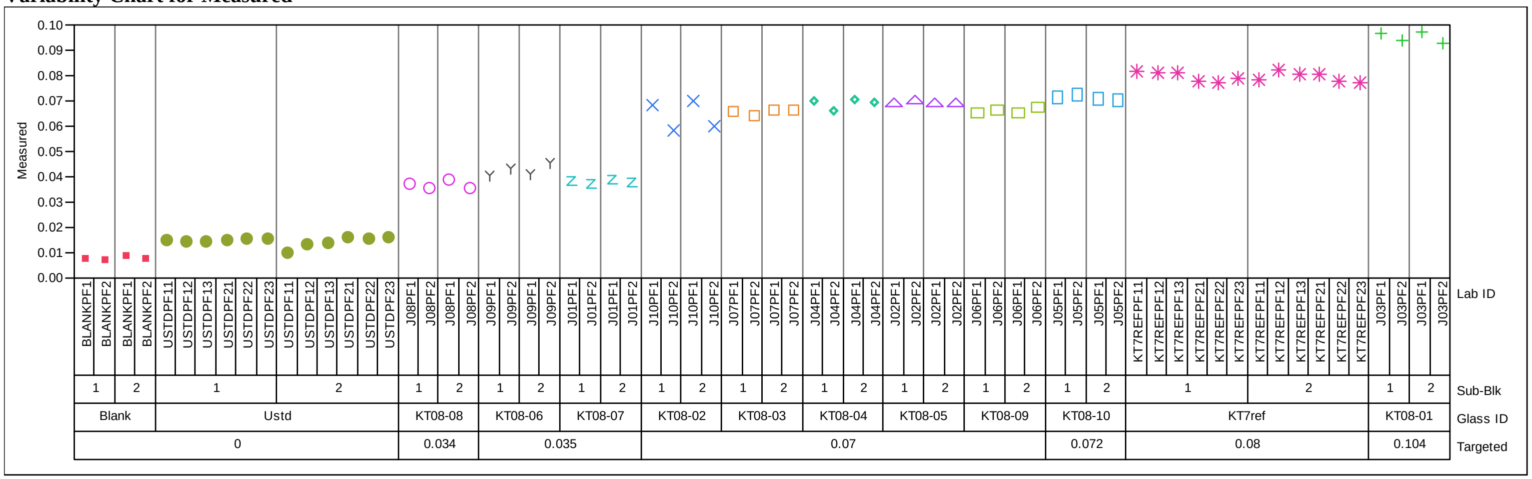


Exhibit A-2. Measurements for Each KT08-Series Glass by Preparation Method by Oxide. (continued)

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



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

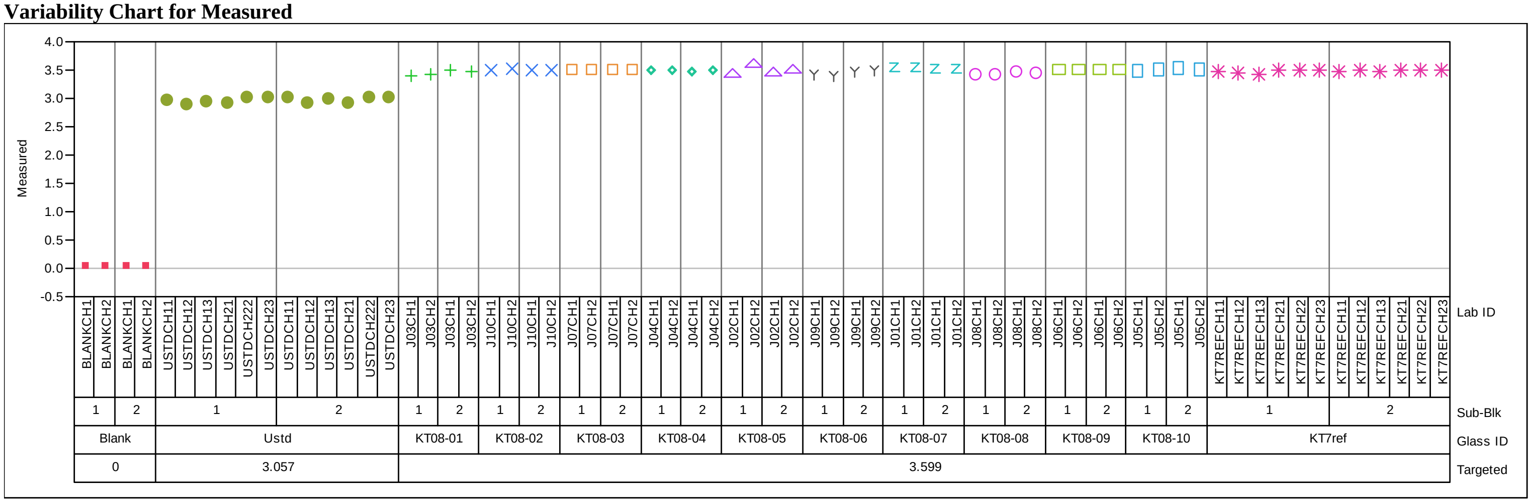
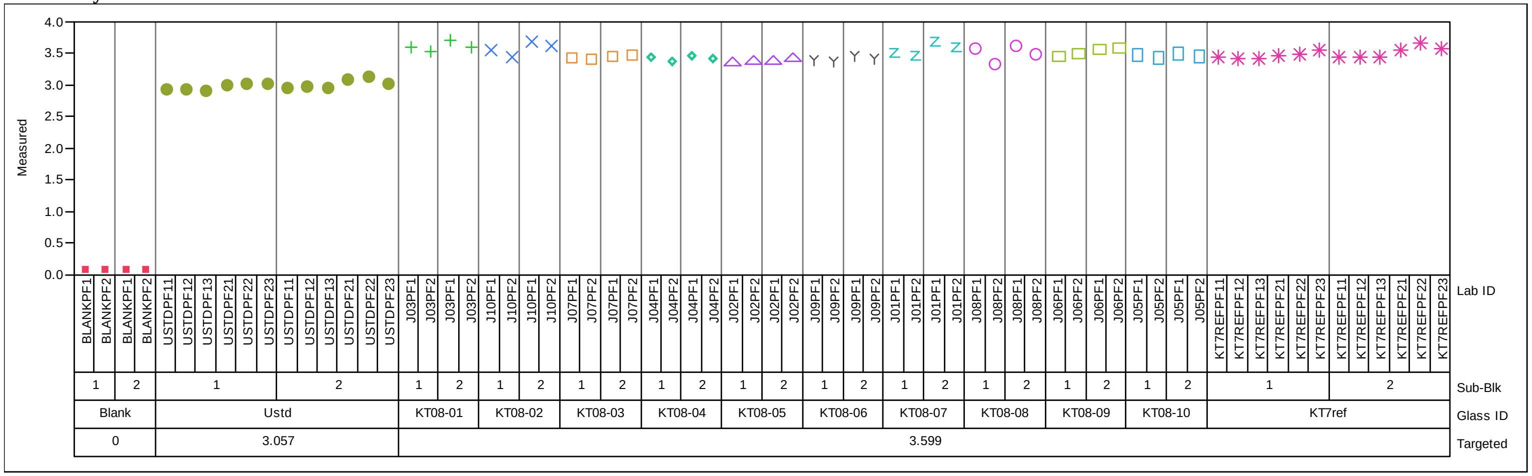


Exhibit A-2. Measurements for Each KT08-Series Glass by Preparation Method by Oxide. (continued)

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



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

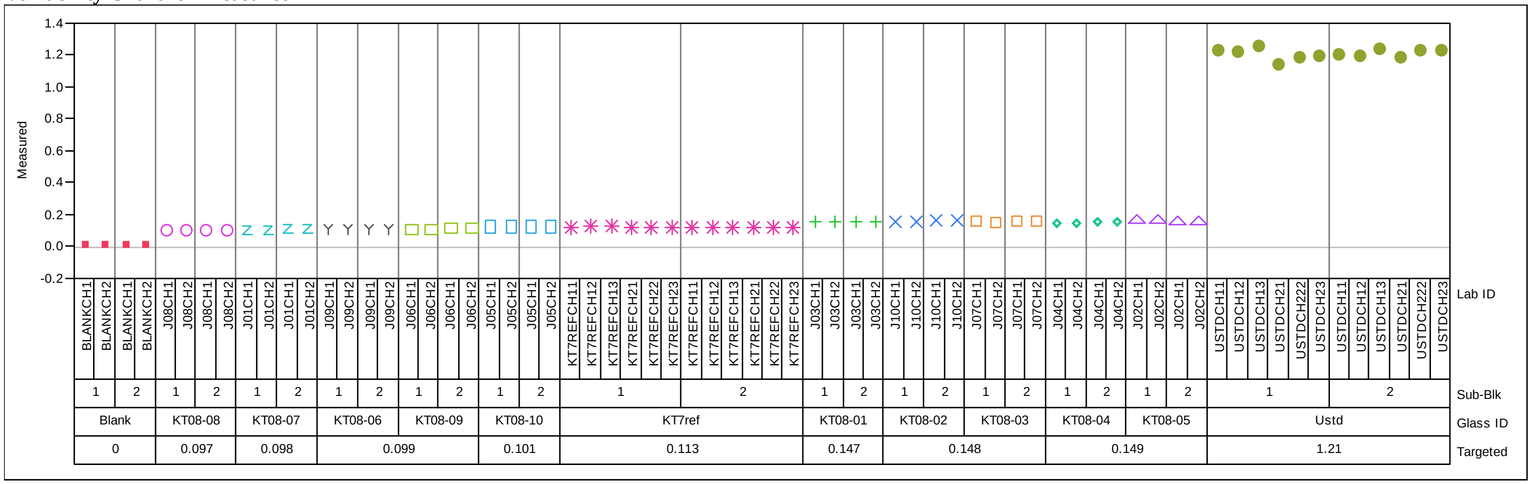
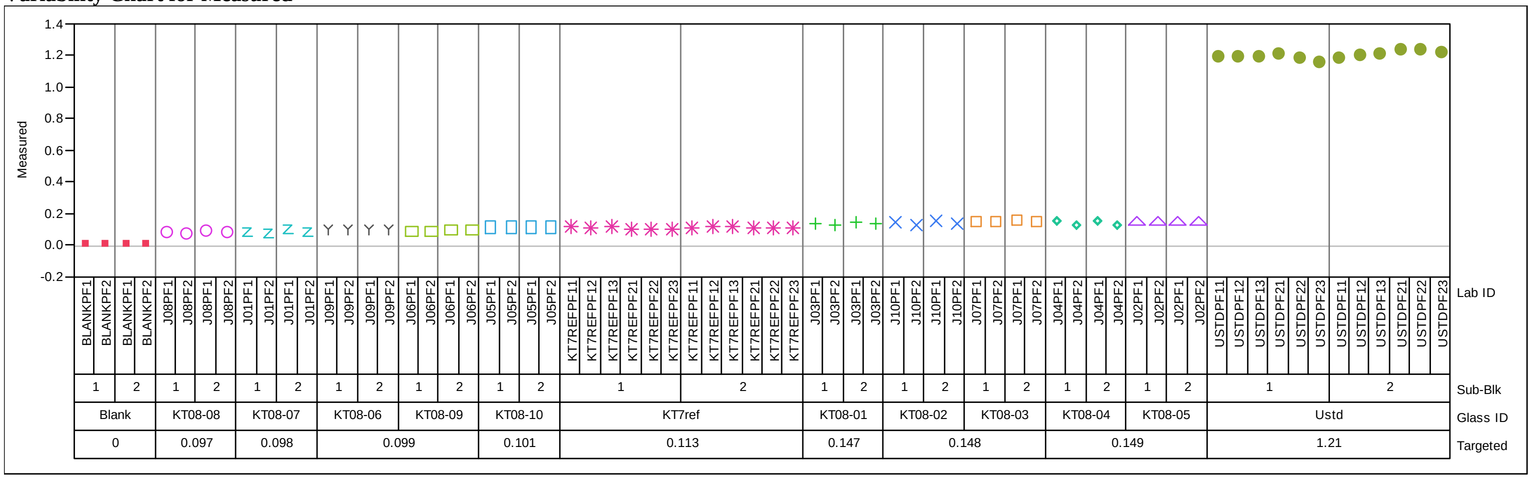


Exhibit A-2. Measurements for Each KT08-Series Glass by Preparation Method by Oxide. (continued)

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



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

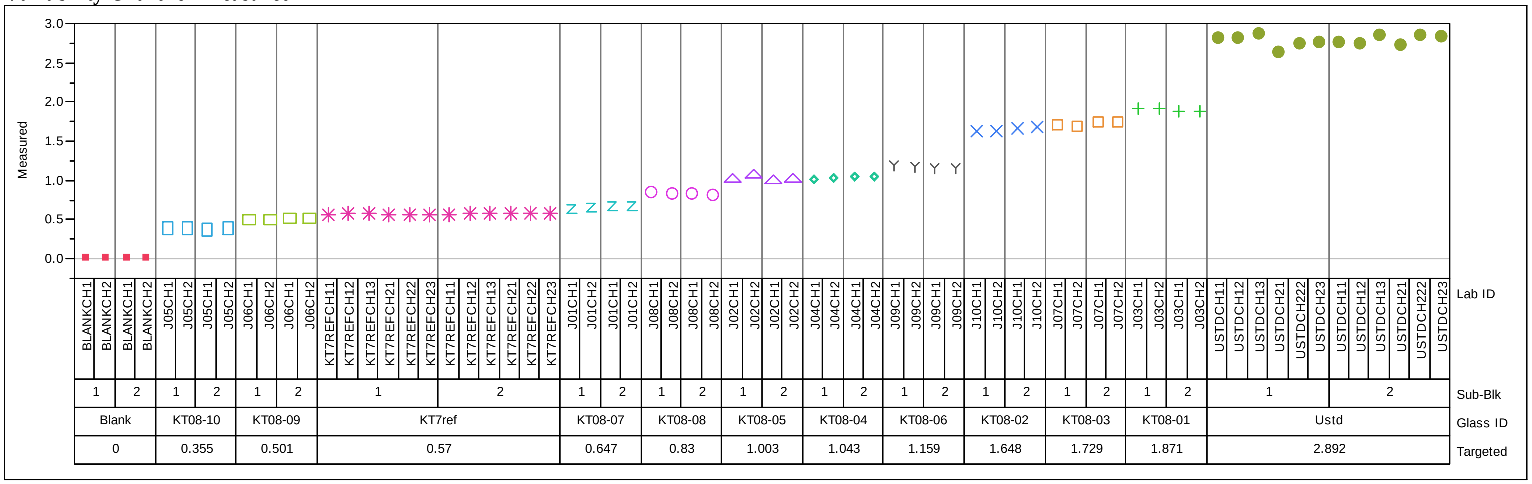
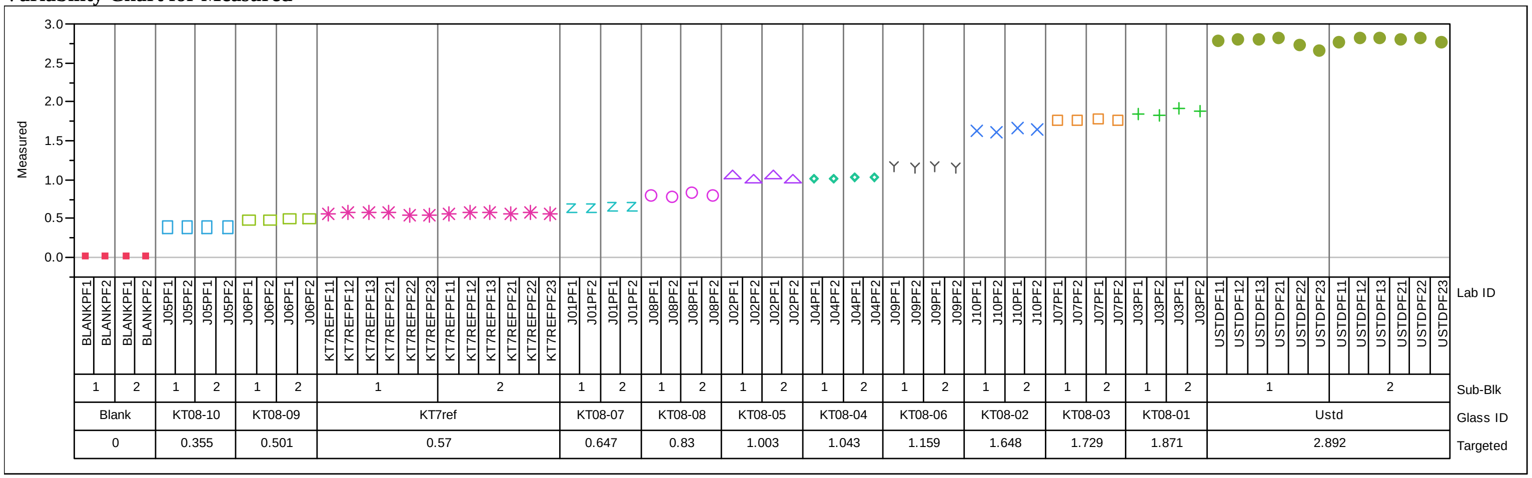


Exhibit A-2. Measurements for Each KT08-Series Glass by Preparation Method by Oxide. (continued)

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



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

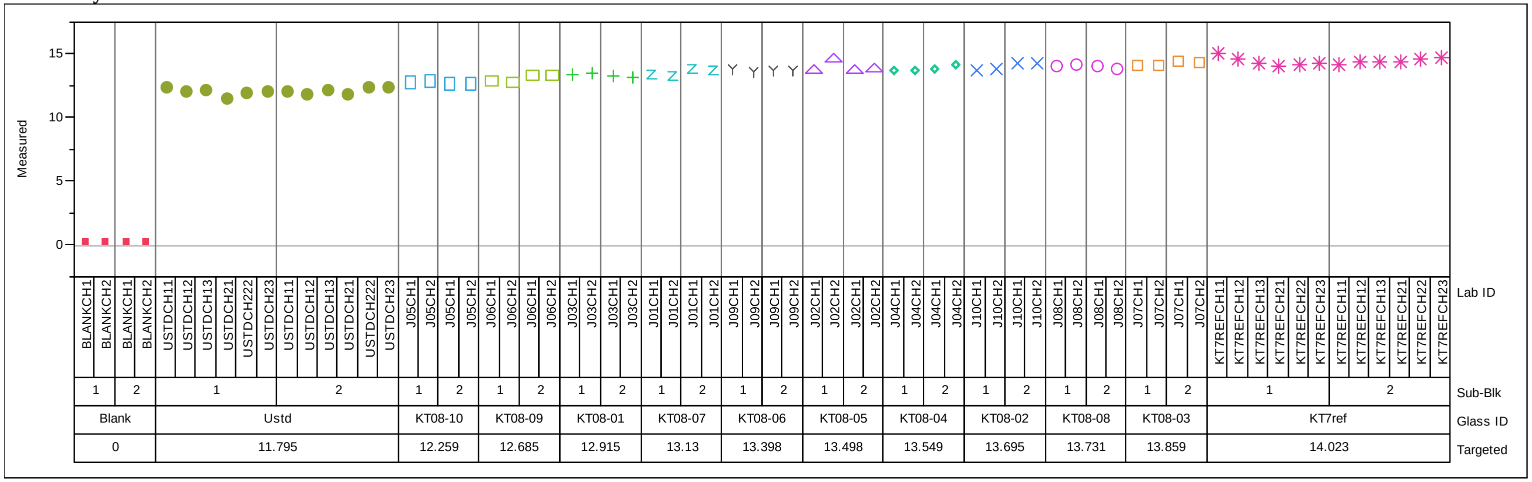
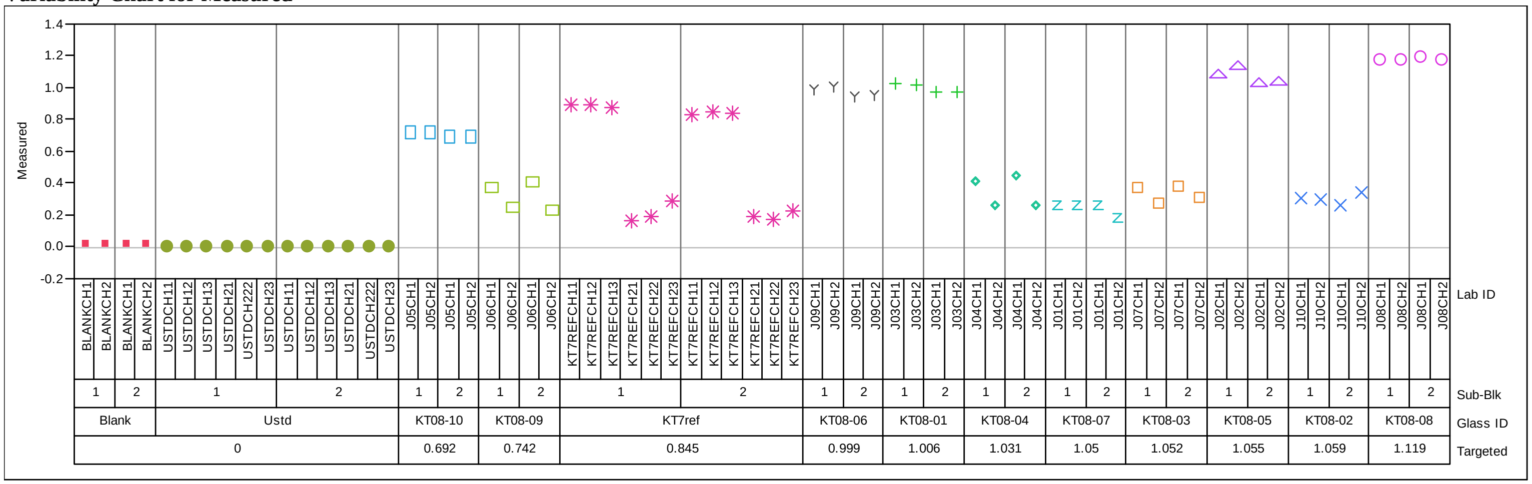


Exhibit A-2. Measurements for Each KT08-Series Glass by Preparation Method by Oxide. (continued)

Oxide=Nb2O5 (wt%), Prep Method=CH
Variability Chart for Measured



Oxide=Nb2O5 (wt%), Prep Method=PF
Variability Chart for Measured

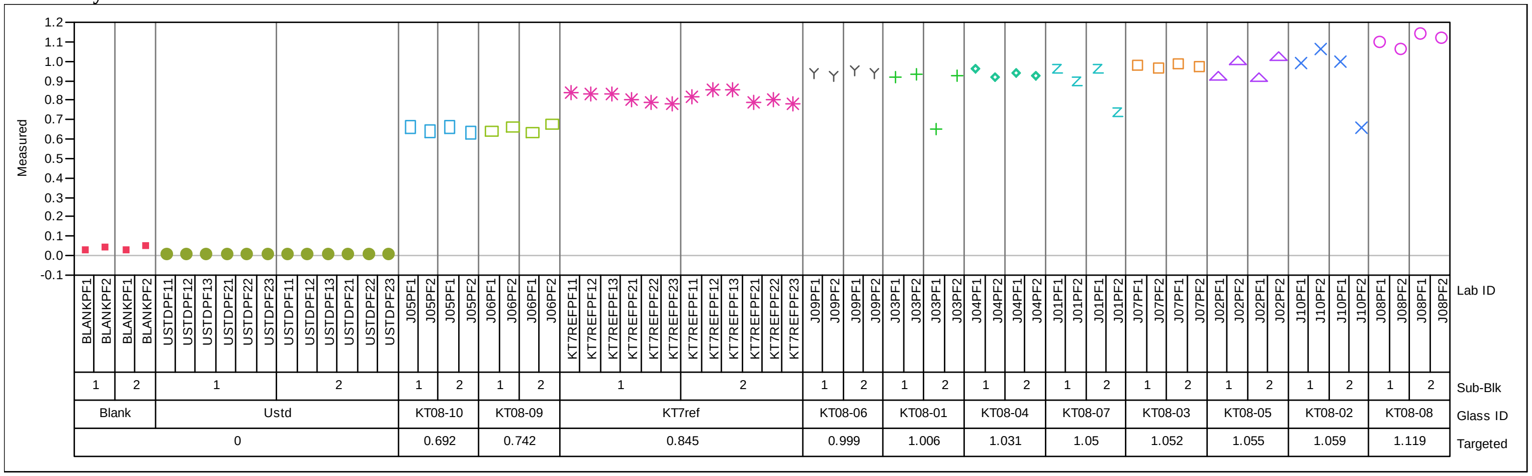
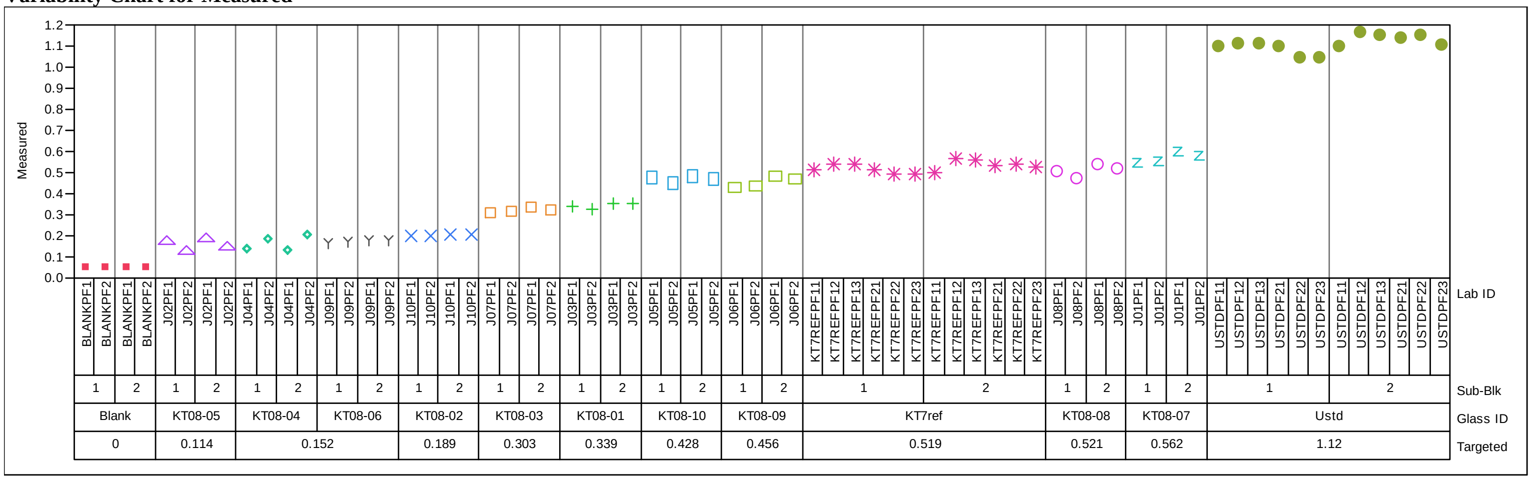


Exhibit A-2. Measurements for Each KT08-Series Glass by Preparation Method by Oxide. (continued)

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



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

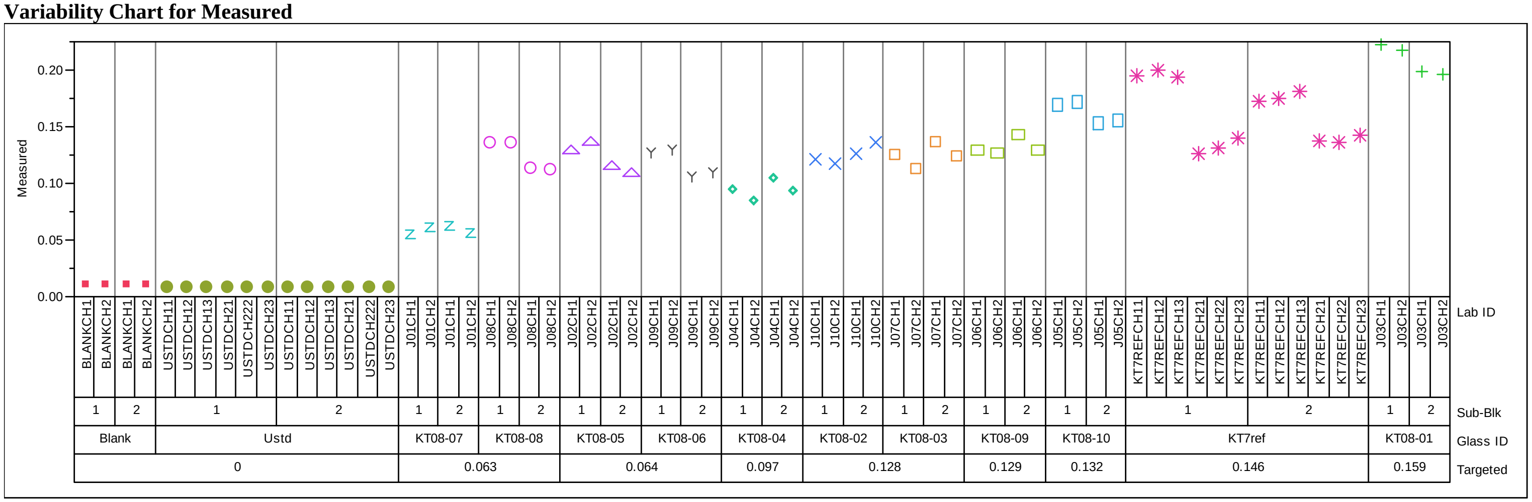
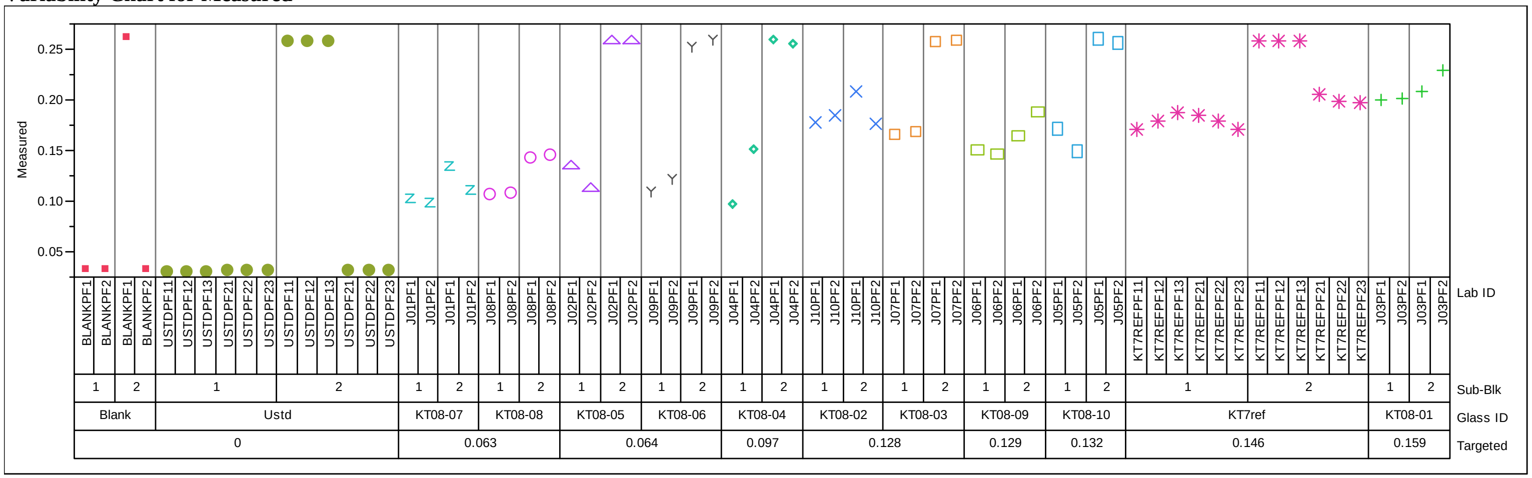


Exhibit A-2. Measurements for Each KT08-Series Glass by Preparation Method by Oxide. (continued)

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



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

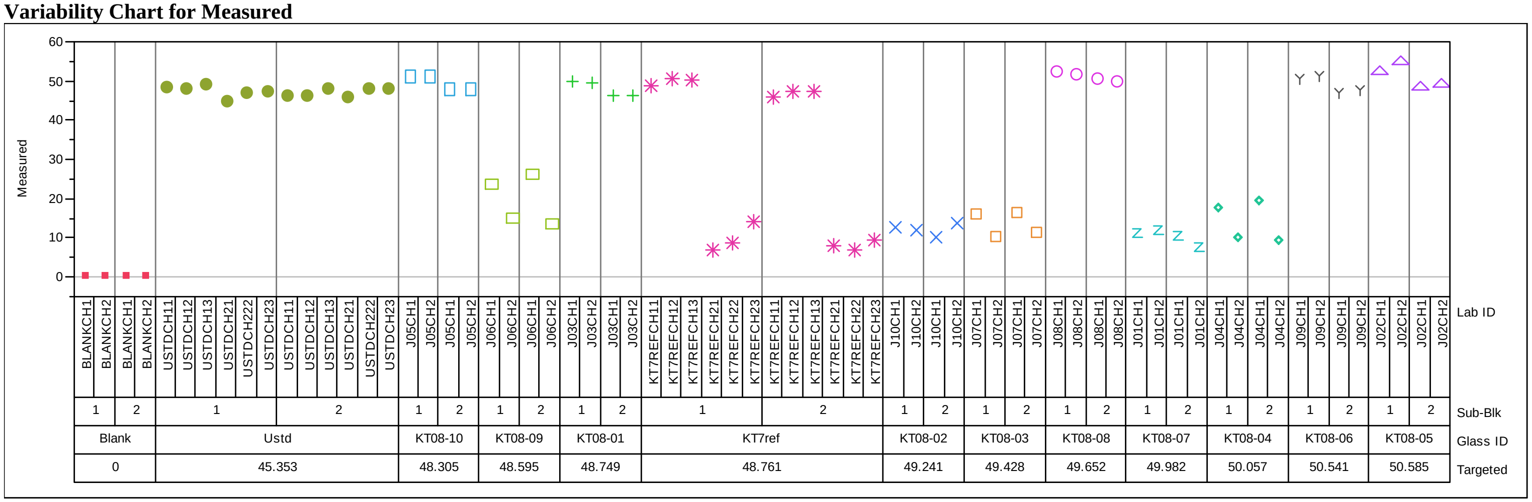
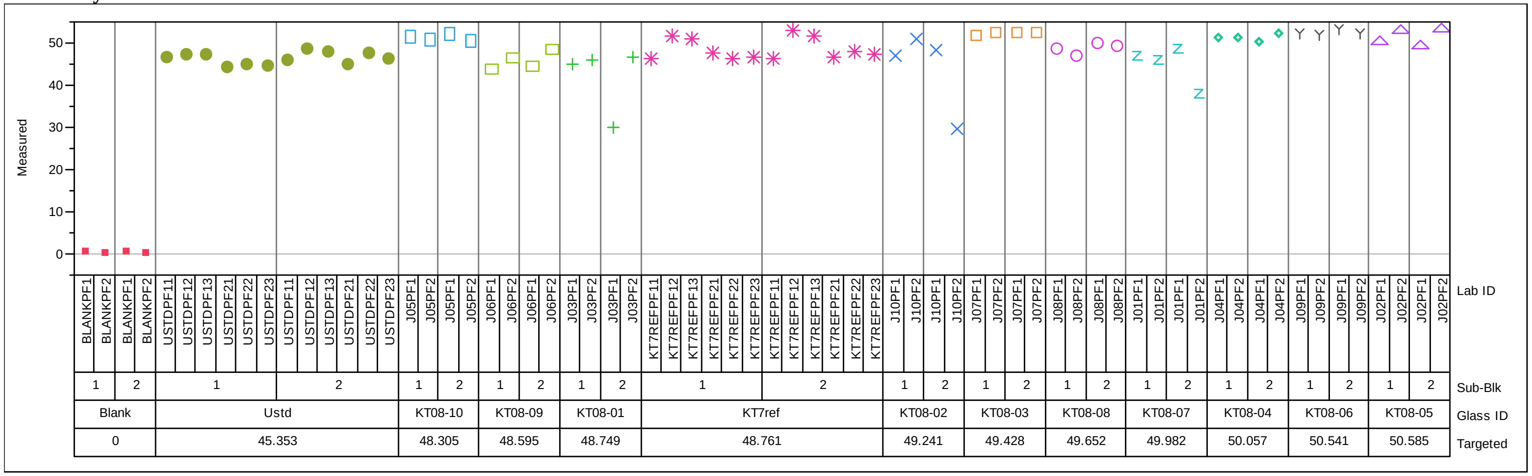


Exhibit A-2. Measurements for Each KT08-Series Glass by Preparation Method by Oxide. (continued)

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



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

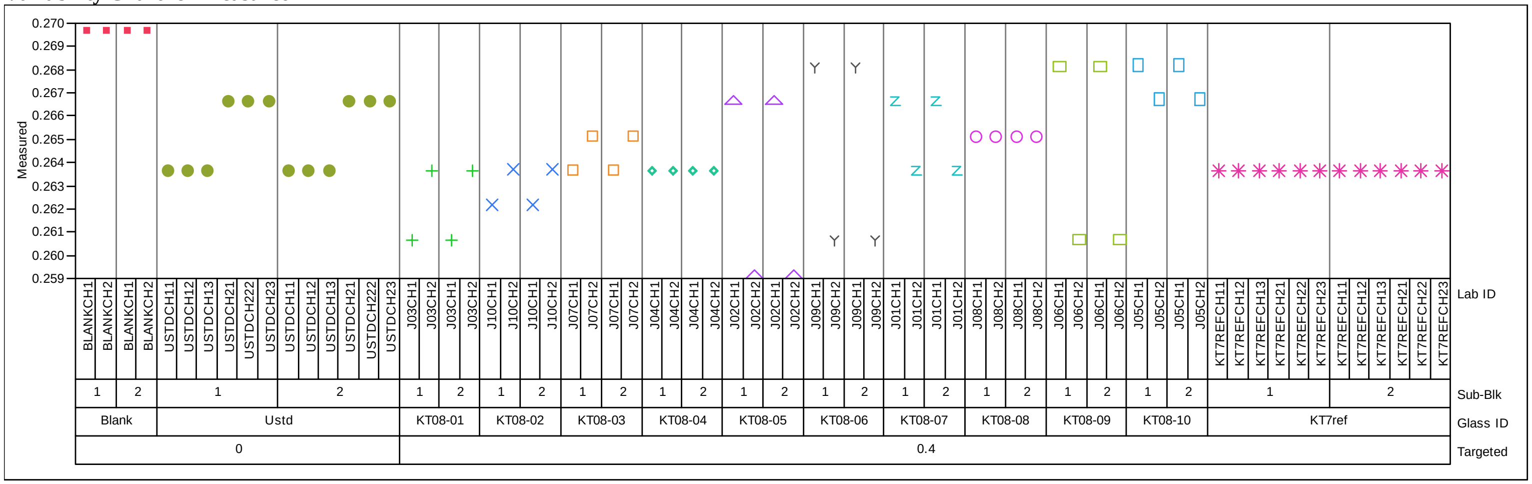
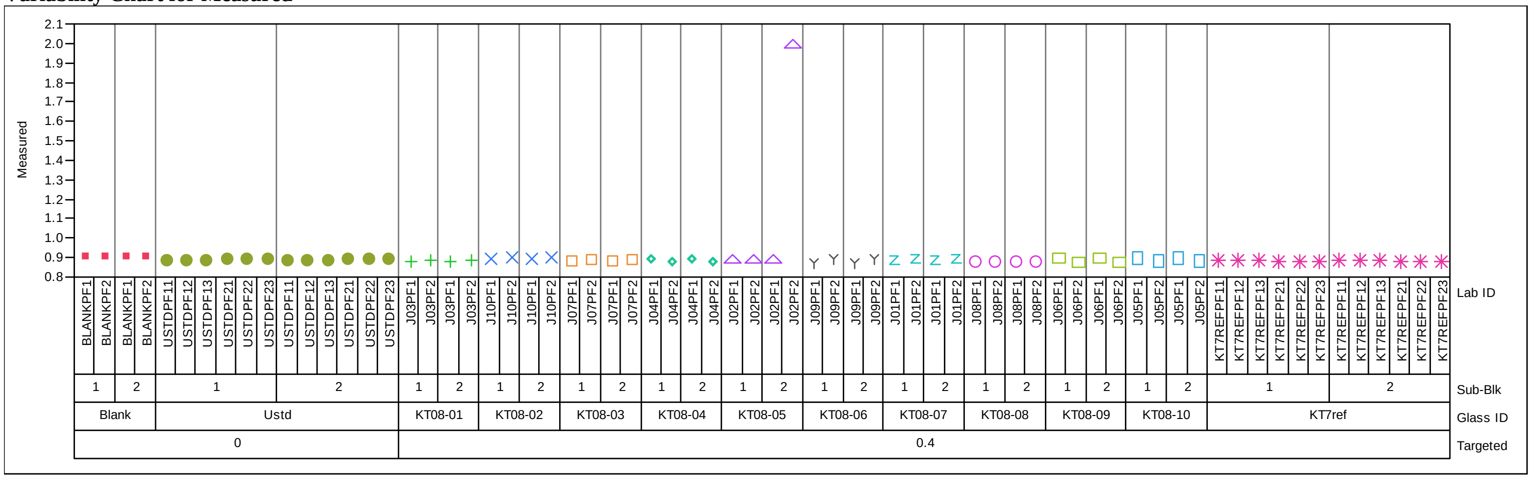


Exhibit A-2. Measurements for Each KT08-Series Glass by Preparation Method by Oxide. (continued)

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



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

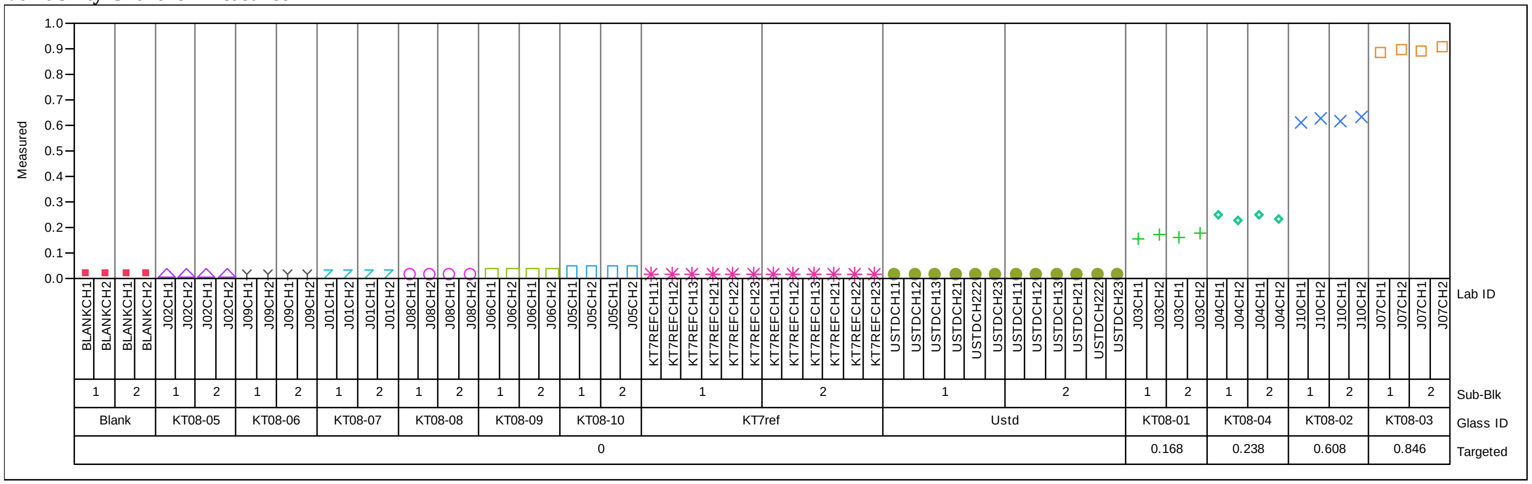
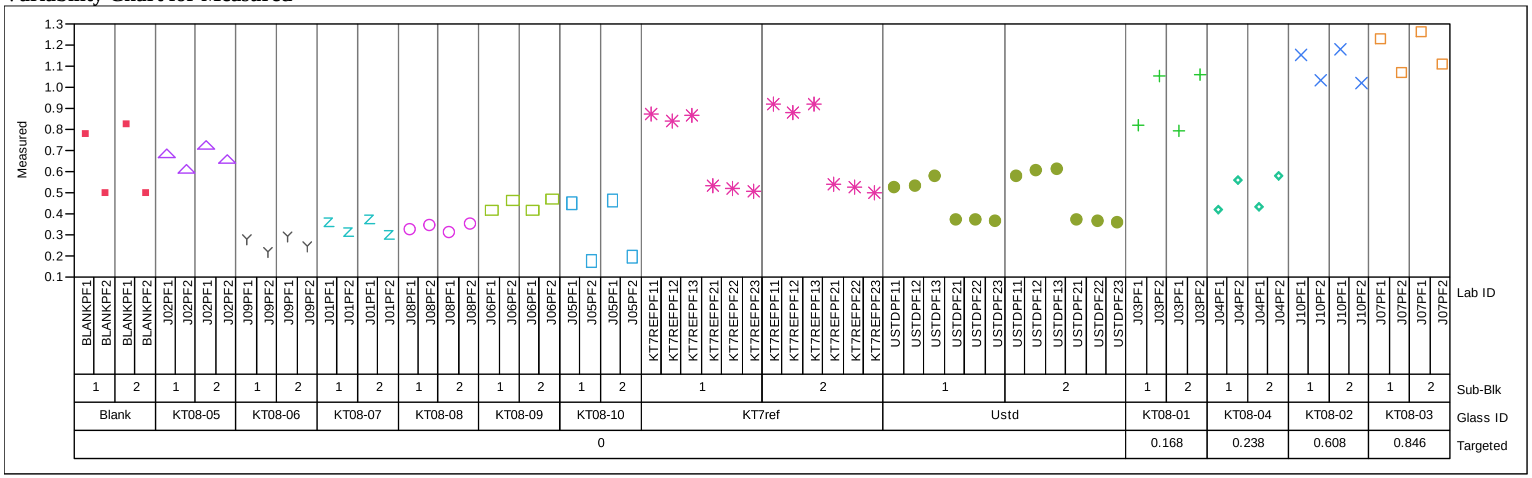


Exhibit A-2. Measurements for Each KT08-Series Glass by Preparation Method by Oxide. (continued)

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



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

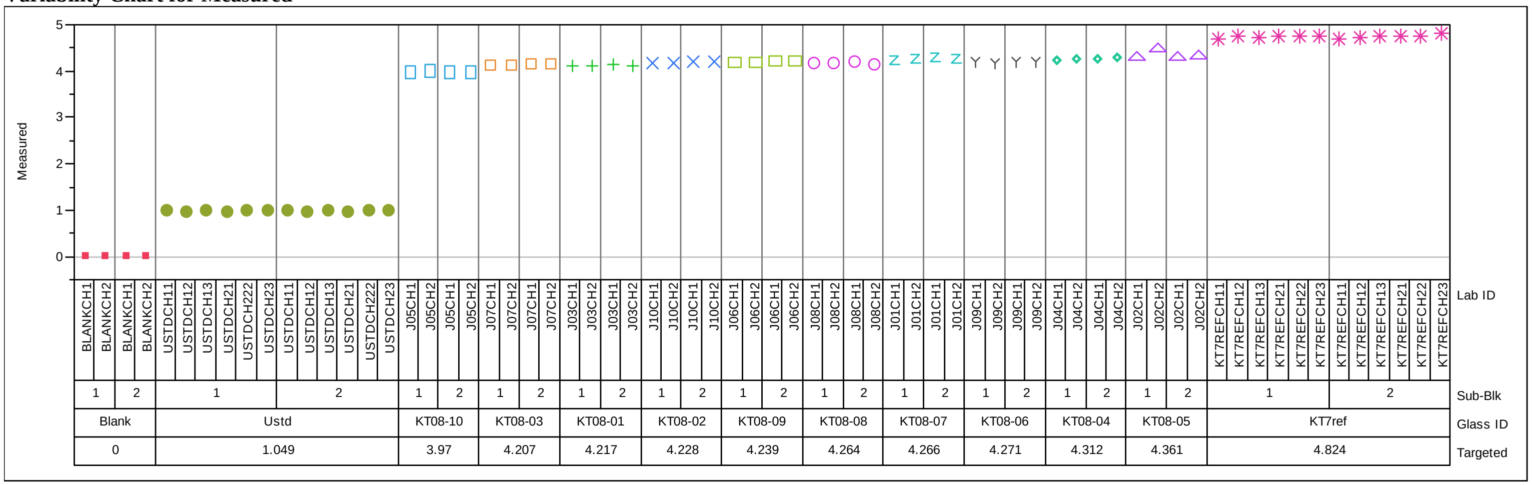
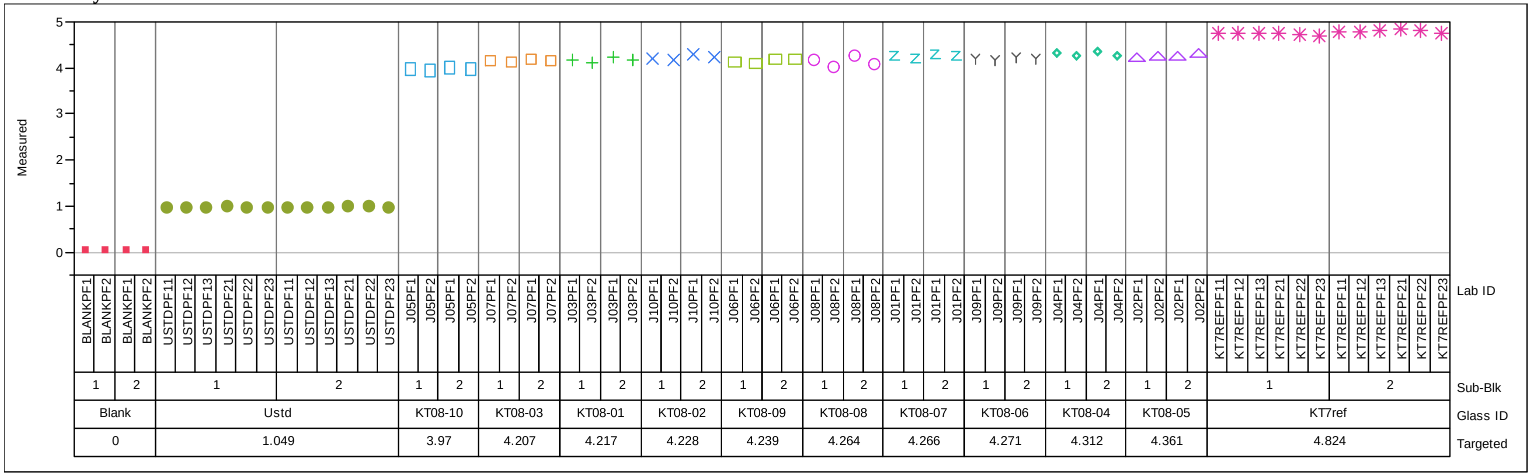


Exhibit A-2. Measurements for Each KT08-Series Glass by Preparation Method by Oxide. (continued)

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



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

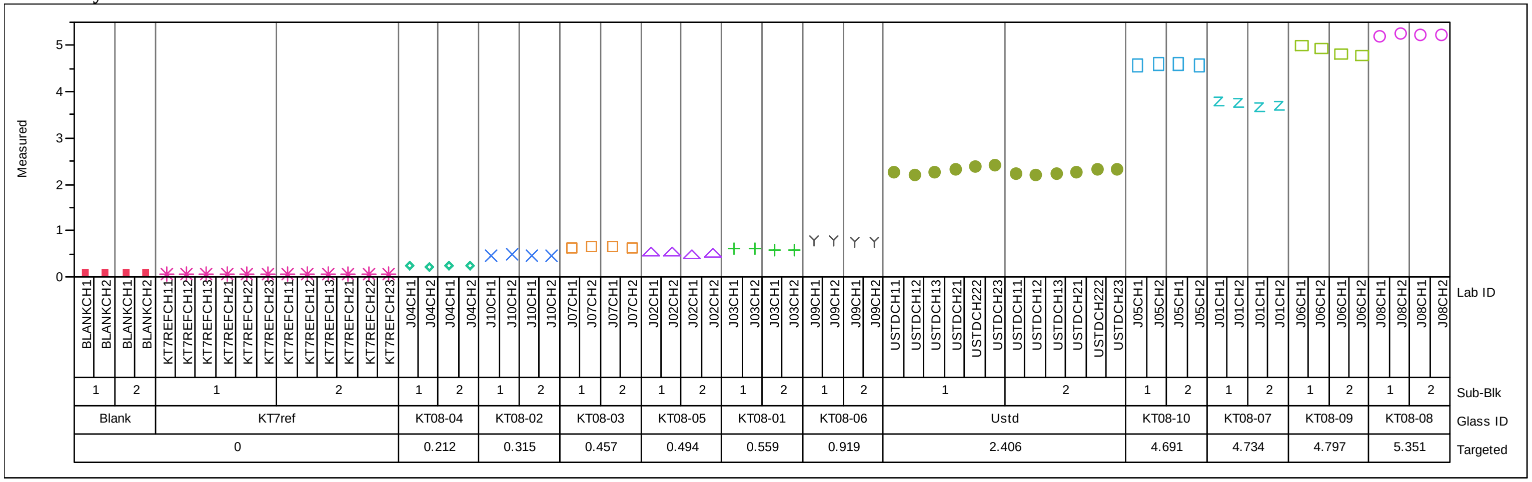
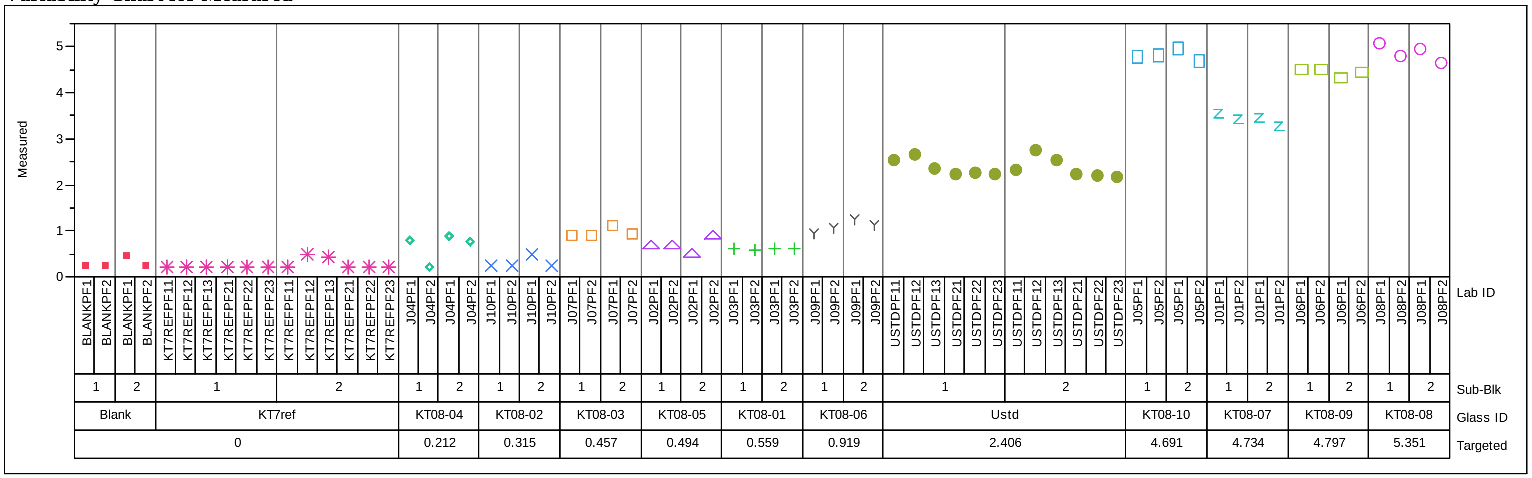


Exhibit A-2. Measurements for Each KT08-Series Glass by Preparation Method by Oxide. (continued)

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



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

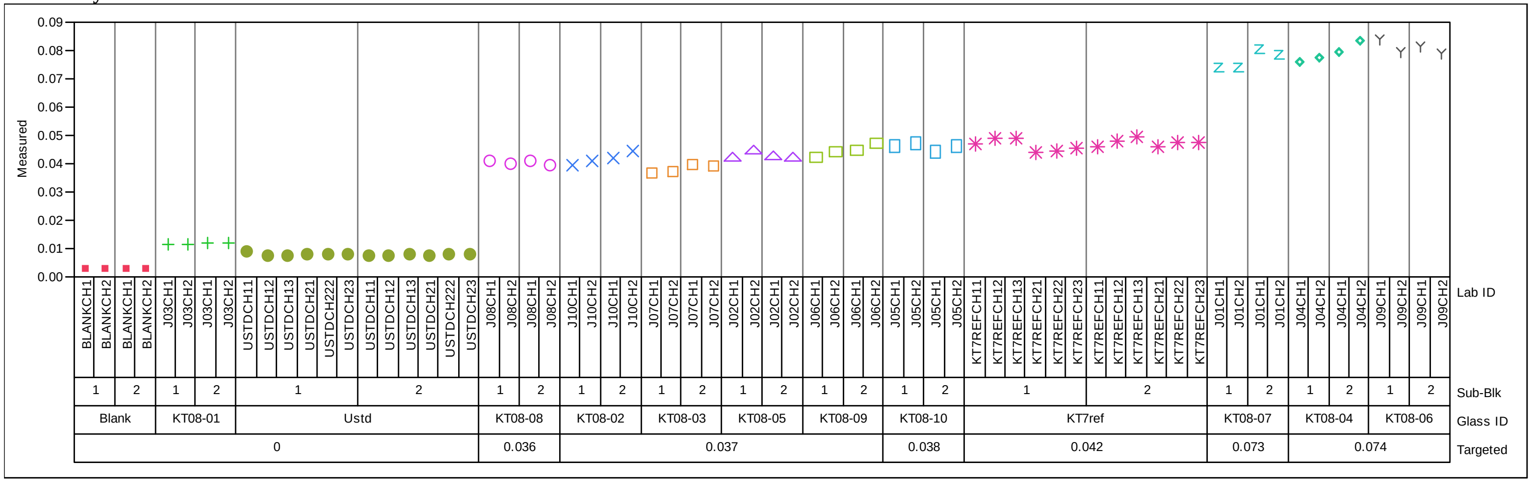
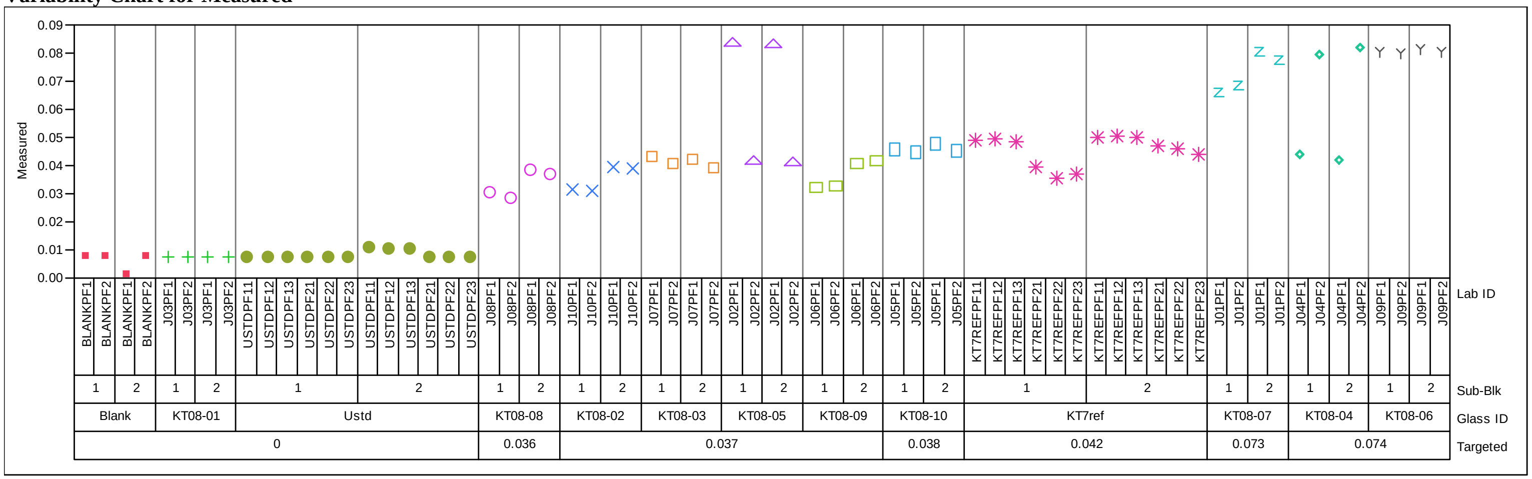


Exhibit A-2. Measurements for Each KT08-Series Glass by Preparation Method by Oxide. (continued)

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



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

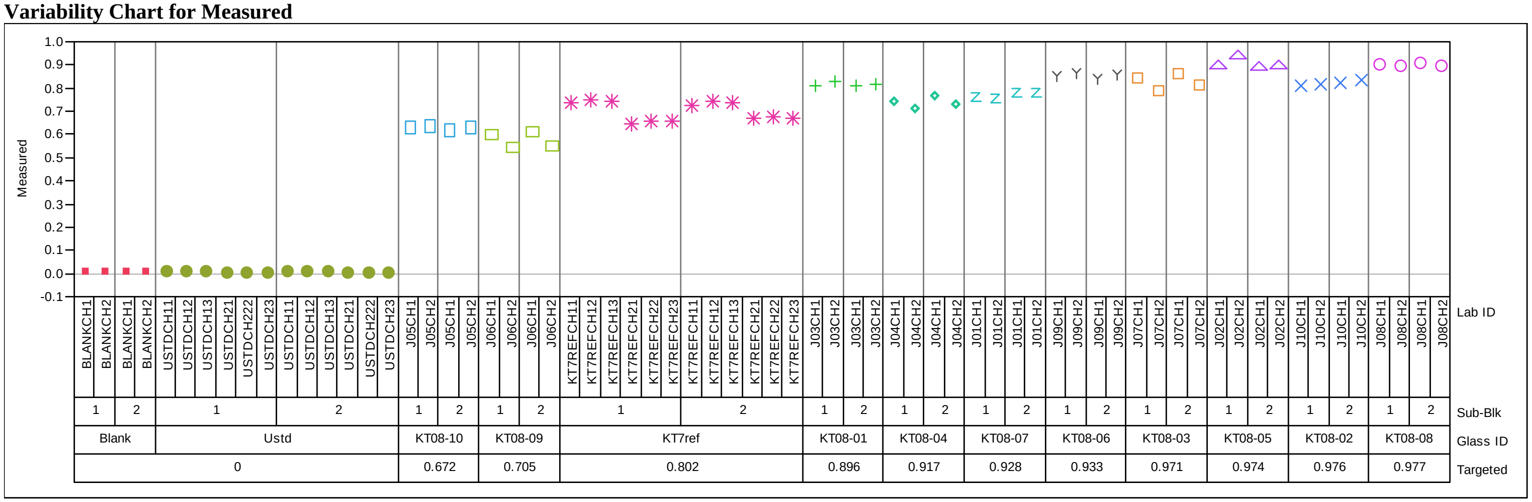
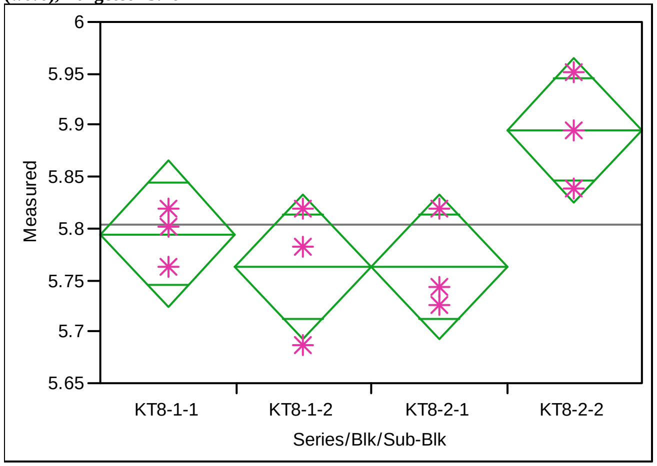


Exhibit A-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series KT7ref Results by Oxide.

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=Al2O3 (wt%), Targeted=5.46



Oneway Anova
Summary of Fit

Rsquare	0.612371
Adj Rsquare	0.46701
Root Mean Square Error	0.052884
Mean of Response	5.803914
Observations (or Sum Wgts)	12

Analysis of Variance

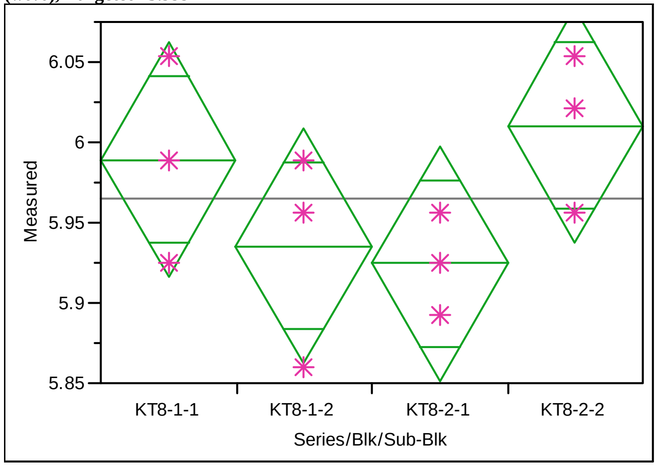
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.03534508	0.011782	4.2128	0.0461
Error	8	0.02237332	0.002797		
C. Total	11	0.05771840			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	5.79447	0.03053	5.7241	5.8649
KT8-1-2	3	5.76298	0.03053	5.6926	5.8334
KT8-2-1	3	5.76298	0.03053	5.6926	5.8334
KT8-2-2	3	5.89524	0.03053	5.8248	5.9656

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=B2O3 (wt%), Targeted=5.999



Oneway Anova
Summary of Fit

Rsquare	0.389978
Adj Rsquare	0.16122
Root Mean Square Error	0.05499
Mean of Response	5.964865
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.01546524	0.005155	1.7048	0.2428
Error	8	0.02419143	0.003024		
C. Total	11	0.03965667			

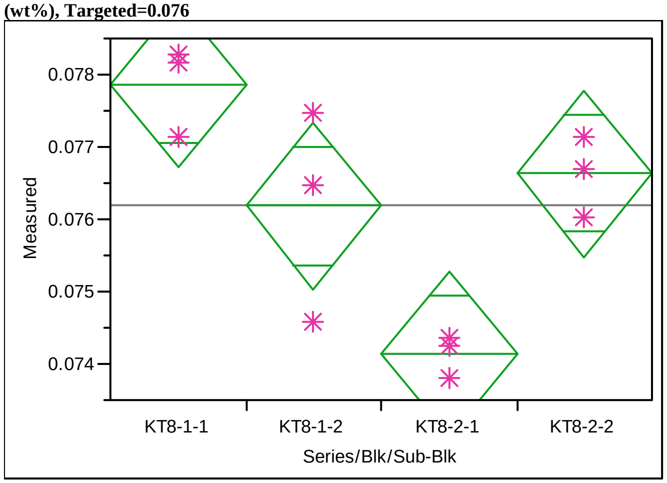
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	5.98901	0.03175	5.9158	6.0622
KT8-1-2	3	5.93535	0.03175	5.8621	6.0086
KT8-2-1	3	5.92462	0.03175	5.8514	5.9978
KT8-2-2	3	6.01048	0.03175	5.9373	6.0837

Std Error uses a pooled estimate of error variance

Exhibit A-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series KT7ref Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=BaO (wt%), Targeted=0.076



Oneway Anova
Summary of Fit

Rsquare	0.785034
Adj Rsquare	0.704422
Root Mean Square Error	0.000859
Mean of Response	0.076201
Observations (or Sum Wgts)	12

Analysis of Variance

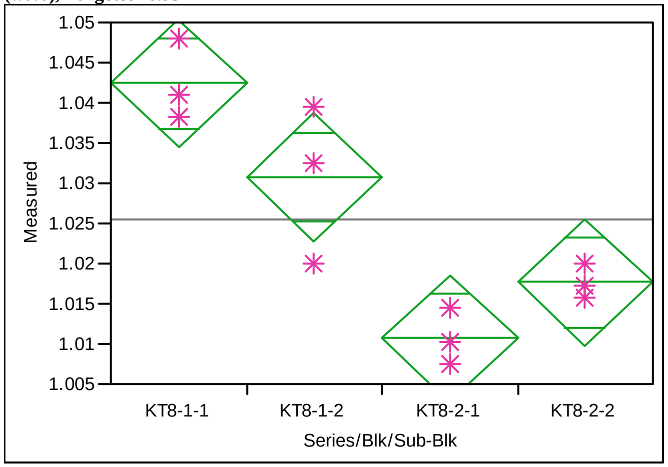
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00002158	7.1927e-6	9.7384	0.0048
Error	8	0.00000591	7.3859e-7		
C. Total	11	0.00002749			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.077857	0.00050	0.07671	0.07900
KT8-1-2	3	0.076183	0.00050	0.07504	0.07733
KT8-2-1	3	0.074136	0.00050	0.07299	0.07528
KT8-2-2	3	0.076629	0.00050	0.07548	0.07777

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=CaO (wt%), Targeted=0.951



Oneway Anova
Summary of Fit

Rsquare	0.863334
Adj Rsquare	0.812085
Root Mean Square Error	0.005936
Mean of Response	1.02538
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00178091	0.000594	16.8457	0.0008
Error	8	0.00028192	0.000035		
C. Total	11	0.00206283			

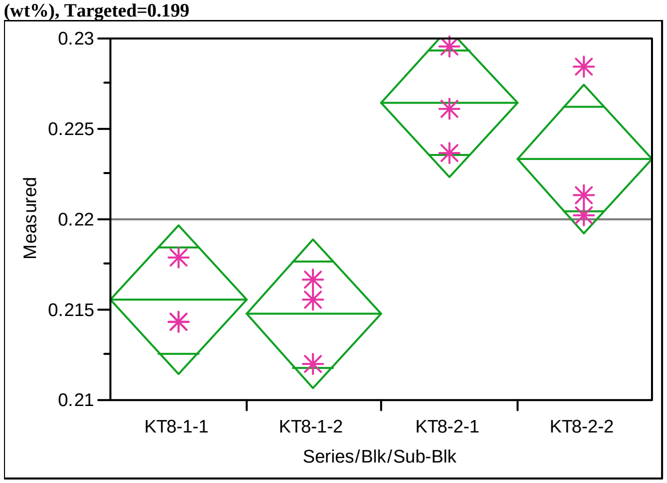
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	1.04240	0.00343	1.0345	1.0503
KT8-1-2	3	1.03074	0.00343	1.0228	1.0386
KT8-2-1	3	1.01069	0.00343	1.0028	1.0186
KT8-2-2	3	1.01768	0.00343	1.0098	1.0256

Std Error uses a pooled estimate of error variance

Exhibit A-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series KT7ref Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=Ce2O3 (wt%), Targeted=0.199



Oneway Anova
Summary of Fit

Rsquare	0.796856
Adj Rsquare	0.720677
Root Mean Square Error	0.003099
Mean of Response	0.220009
Observations (or Sum Wgts)	12

Analysis of Variance

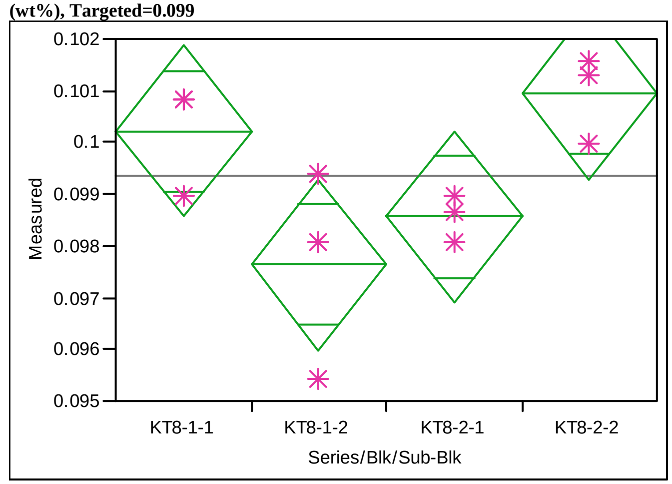
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00030137	0.000100	10.4603	0.0038
Error	8	0.00007683	9.604e-6		
C. Total	11	0.00037820			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.215519	0.00179	0.21139	0.21965
KT8-1-2	3	0.214738	0.00179	0.21061	0.21886
KT8-2-1	3	0.226451	0.00179	0.22233	0.23058
KT8-2-2	3	0.223328	0.00179	0.21920	0.22745

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=Cr2O3 (wt%), Targeted=0.099



Oneway Anova
Summary of Fit

Rsquare	0.625324
Adj Rsquare	0.484821
Root Mean Square Error	0.001242
Mean of Response	0.09934
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00002061	6.8693e-6	4.4506	0.0405
Error	8	0.00001235	1.5435e-6		
C. Total	11	0.00003296			

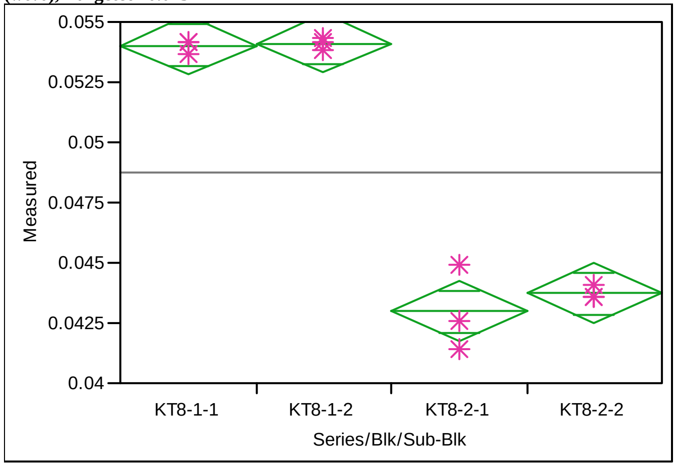
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.100217	0.00072	0.09856	0.10187
KT8-1-2	3	0.097635	0.00072	0.09598	0.09929
KT8-2-1	3	0.098561	0.00072	0.09691	0.10021
KT8-2-2	3	0.100948	0.00072	0.09929	0.10260

Std Error uses a pooled estimate of error variance

Exhibit A-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series KT7ref Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=CuO (wt%), Targeted=0.043



Oneway Anova
Summary of Fit

Rsquare	0.980512
Adj Rsquare	0.973204
Root Mean Square Error	0.000927
Mean of Response	0.048716
Observations (or Sum Wgts)	12

Analysis of Variance

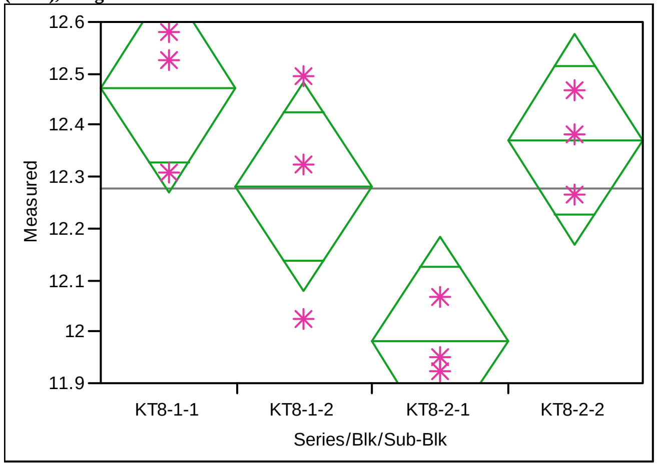
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00034585	0.000115	134.1702	<.0001
Error	8	0.00000687	8.592e-7		
C. Total	11	0.00035273			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.054036	0.00054	0.05280	0.05527
KT8-1-2	3	0.054119	0.00054	0.05289	0.05535
KT8-2-1	3	0.042978	0.00054	0.04174	0.04421
KT8-2-2	3	0.043730	0.00054	0.04250	0.04496

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=Fe2O3 (wt%), Targeted=12.289



Oneway Anova
Summary of Fit

Rsquare	0.683822
Adj Rsquare	0.565255
Root Mean Square Error	0.152762
Mean of Response	12.27636
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.40376645	0.134589	5.7674	0.0212
Error	8	0.18668918	0.023336		
C. Total	11	0.59045563			

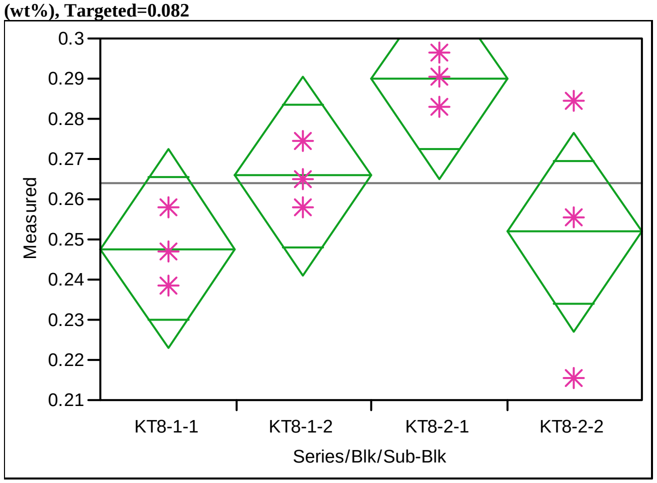
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	12.4717	0.08820	12.268	12.675
KT8-1-2	3	12.2811	0.08820	12.078	12.485
KT8-2-1	3	11.9809	0.08820	11.778	12.184
KT8-2-2	3	12.3717	0.08820	12.168	12.575

Std Error uses a pooled estimate of error variance

Exhibit A-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series KT7ref Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=K2O (wt%), Targeted=0.082



Oneway Anova
Summary of Fit

Rsquare	0.538793
Adj Rsquare	0.365841
Root Mean Square Error	0.018691
Mean of Response	0.263807
Observations (or Sum Wgts)	12

Analysis of Variance

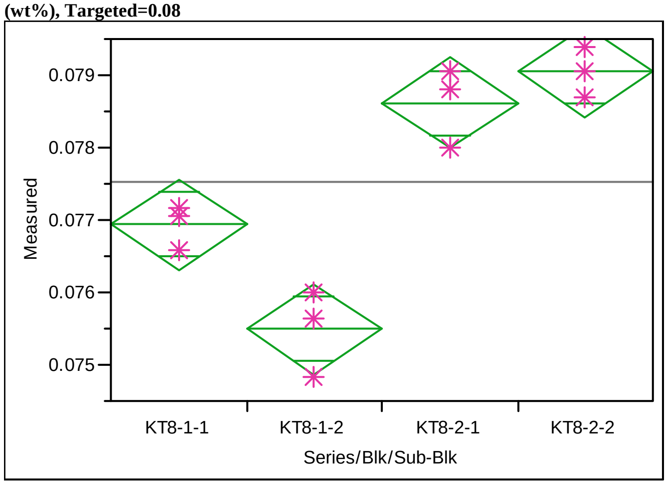
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00326489	0.001088	3.1153	0.0883
Error	8	0.00279474	0.000349		
C. Total	11	0.00605963			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.247746	0.01079	0.22286	0.27263
KT8-1-2	3	0.265815	0.01079	0.24093	0.29070
KT8-2-1	3	0.289907	0.01079	0.26502	0.31479
KT8-2-2	3	0.251761	0.01079	0.22688	0.27665

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=La2O3 (wt%), Targeted=0.08



Oneway Anova
Summary of Fit

Rsquare	0.930985
Adj Rsquare	0.905105
Root Mean Square Error	0.000472
Mean of Response	0.077522
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00002400	0.000008	35.9725	<.0001
Error	8	0.00000178	2.2237e-7		
C. Total	11	0.00002578			

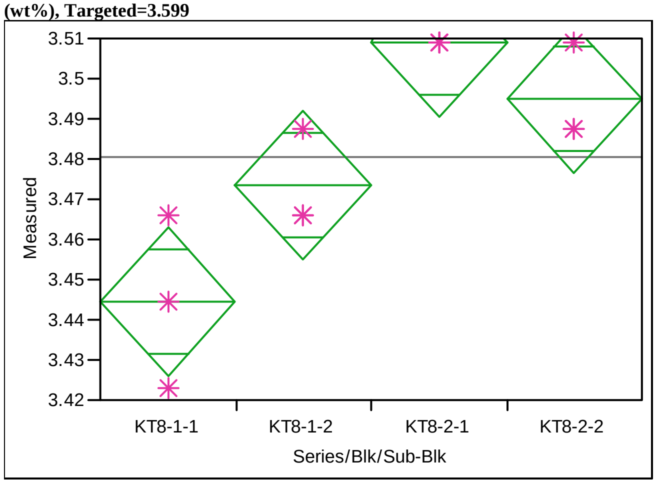
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.076936	0.00027	0.07631	0.07756
KT8-1-2	3	0.075489	0.00027	0.07486	0.07612
KT8-2-1	3	0.078617	0.00027	0.07799	0.07924
KT8-2-2	3	0.079047	0.00027	0.07842	0.07967

Std Error uses a pooled estimate of error variance

Exhibit A-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series KT7ref Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=Li2O (wt%), Targeted=3.599



Oneway Anova
Summary of Fit

Rsquare	0.821429
Adj Rsquare	0.754464
Root Mean Square Error	0.013897
Mean of Response	3.480522
Observations (or Sum Wgts)	12

Analysis of Variance

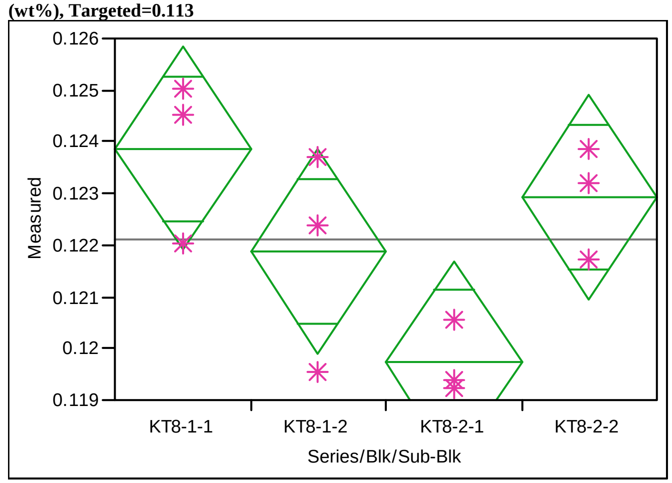
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00710697	0.002369	12.2667	0.0023
Error	8	0.00154499	0.000193		
C. Total	11	0.00865196			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	3.44464	0.00802	3.4261	3.4631
KT8-1-2	3	3.47335	0.00802	3.4548	3.4918
KT8-2-1	3	3.50923	0.00802	3.4907	3.5277
KT8-2-2	3	3.49487	0.00802	3.4764	3.5134

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=MgO (wt%), Targeted=0.113



Oneway Anova
Summary of Fit

Rsquare	0.619085
Adj Rsquare	0.476243
Root Mean Square Error	0.001482
Mean of Response	0.122106
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00002854	9.5149e-6	4.3340	0.0432
Error	8	0.00001756	2.1954e-6		
C. Total	11	0.00004611			

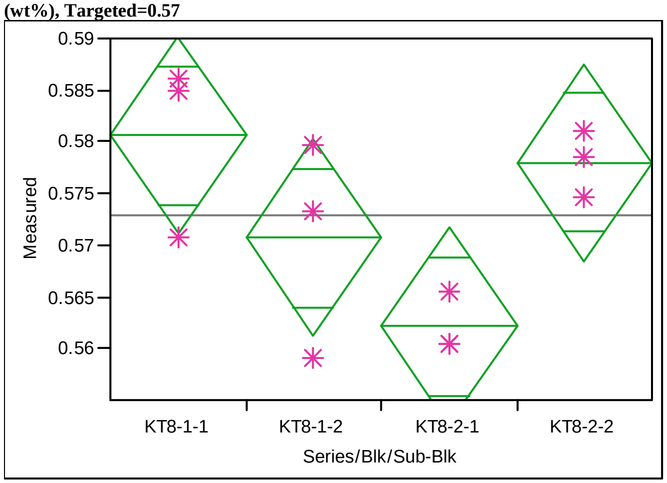
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.123875	0.00086	0.12190	0.12585
KT8-1-2	3	0.121885	0.00086	0.11991	0.12386
KT8-2-1	3	0.119729	0.00086	0.11776	0.12170
KT8-2-2	3	0.122935	0.00086	0.12096	0.12491

Std Error uses a pooled estimate of error variance

Exhibit A-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series KT7ref Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=MnO (wt%), Targeted=0.57



Oneway Anova
Summary of Fit

Rsquare	0.602371
Adj Rsquare	0.45326
Root Mean Square Error	0.00716
Mean of Response	0.572862
Observations (or Sum Wgts)	12

Analysis of Variance

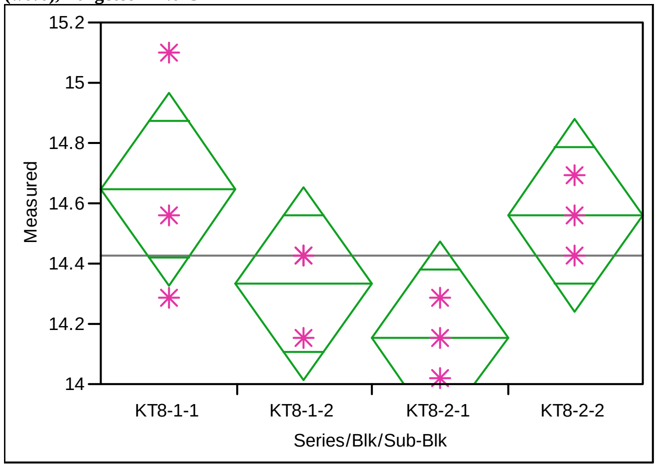
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00062131	0.000207	4.0397	0.0507
Error	8	0.00041013	0.000051		
C. Total	11	0.00103144			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.580610	0.00413	0.57108	0.59014
KT8-1-2	3	0.570710	0.00413	0.56118	0.58024
KT8-2-1	3	0.562102	0.00413	0.55257	0.57164
KT8-2-2	3	0.578027	0.00413	0.56849	0.58756

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=Na2O (wt%), Targeted=14.023



Oneway Anova
Summary of Fit

Rsquare	0.493333
Adj Rsquare	0.303333
Root Mean Square Error	0.239878
Mean of Response	14.4236
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.44821899	0.149406	2.5965	0.1248
Error	8	0.46033301	0.057542		
C. Total	11	0.90855200			

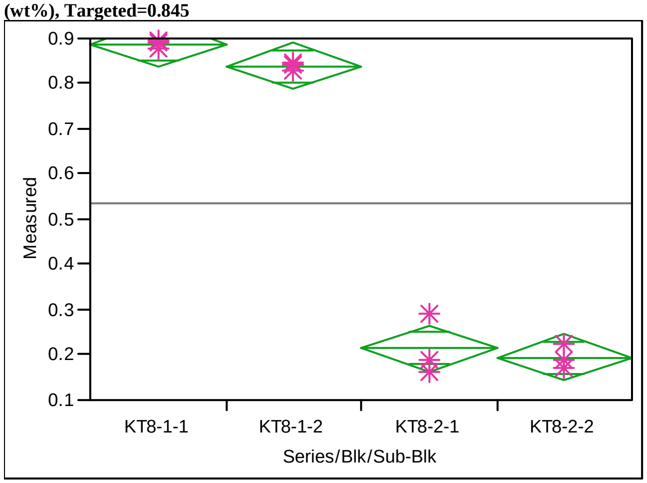
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	14.6483	0.13849	14.329	14.968
KT8-1-2	3	14.3337	0.13849	14.014	14.653
KT8-2-1	3	14.1540	0.13849	13.835	14.473
KT8-2-2	3	14.5584	0.13849	14.239	14.878

Std Error uses a pooled estimate of error variance

Exhibit A-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series KT7ref Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=Nb2O5 (wt%), Targeted=0.845



Oneway Anova
Summary of Fit

Rsquare	0.991169
Adj Rsquare	0.987858
Root Mean Square Error	0.038166
Mean of Response	0.534173
Observations (or Sum Wgts)	12

Analysis of Variance

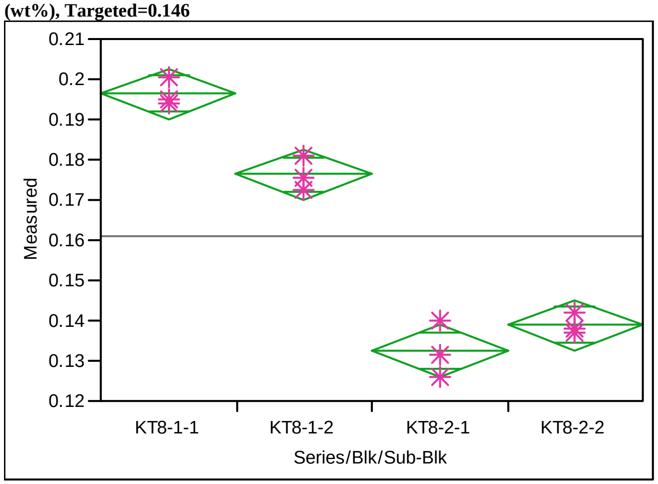
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	1.3079411	0.435980	299.3043	<.0001
Error	8	0.0116532	0.001457		
C. Total	11	1.3195943			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.888341	0.02204	0.83753	0.93915
KT8-1-2	3	0.839227	0.02204	0.78841	0.89004
KT8-2-1	3	0.214575	0.02204	0.16376	0.26539
KT8-2-2	3	0.194548	0.02204	0.14373	0.24536

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=PbO (wt%), Targeted=0.146



Oneway Anova
Summary of Fit

Rsquare	0.979158
Adj Rsquare	0.971342
Root Mean Square Error	0.004716
Mean of Response	0.161041
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00835885	0.002786	125.2812	<.0001
Error	8	0.00017792	0.000022		
C. Total	11	0.00853677			

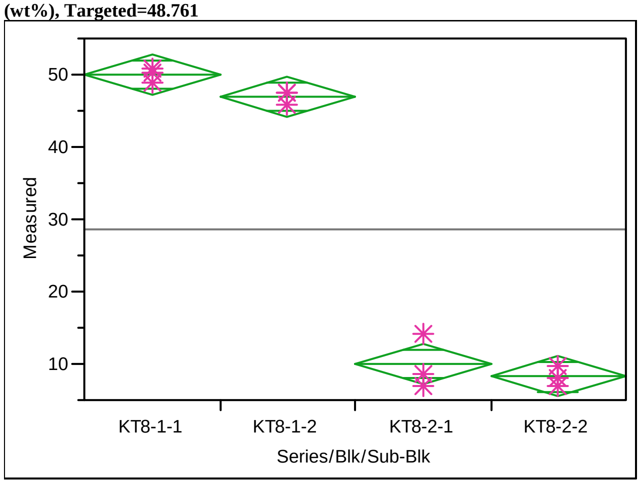
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.196409	0.00272	0.19013	0.20269
KT8-1-2	3	0.176302	0.00272	0.17002	0.18258
KT8-2-1	3	0.132496	0.00272	0.12622	0.13877
KT8-2-2	3	0.138959	0.00272	0.13268	0.14524

Std Error uses a pooled estimate of error variance

Exhibit A-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series KT7ref Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=SiO2 (wt%), Targeted=48.761



Oneway Anova
Summary of Fit

Rsquare	0.9926
Adj Rsquare	0.989824
Root Mean Square Error	2.084976
Mean of Response	28.7415
Observations (or Sum Wgts)	12

Analysis of Variance

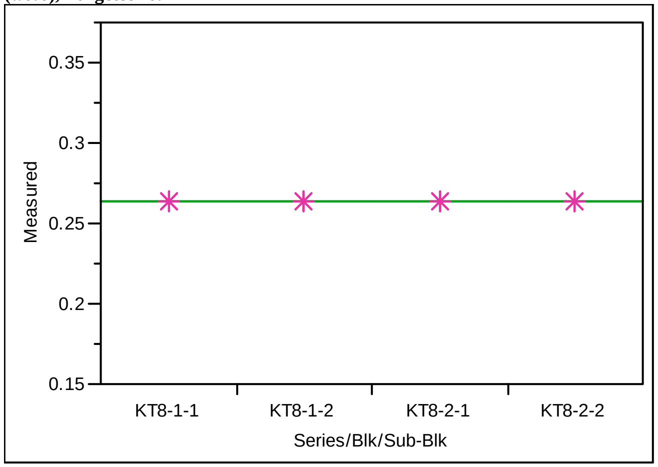
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	4664.5304	1554.84	357.6716	<.0001
Error	8	34.7770	4.35		
C. Total	11	4699.3074			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	49.9170	1.2038	47.141	52.693
KT8-1-2	3	46.9220	1.2038	44.146	49.698
KT8-2-1	3	9.9192	1.2038	7.143	12.695
KT8-2-2	3	8.2078	1.2038	5.432	10.984

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=SO4 (wt%), Targeted=0.4



Oneway Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.263639
Observations (or Sum Wgts)	12

Analysis of Variance

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

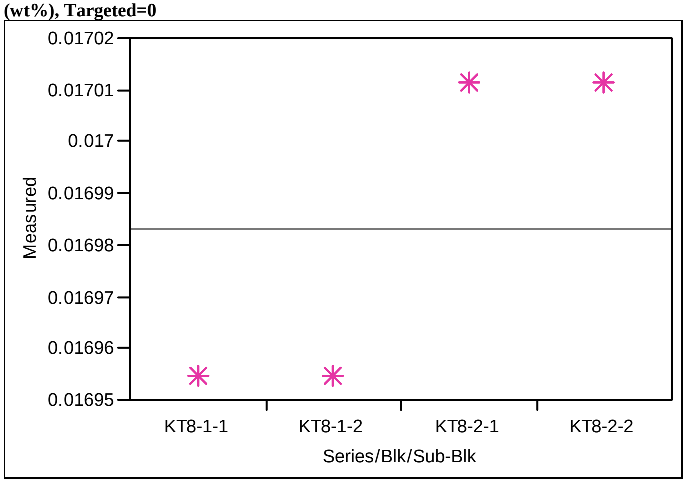
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.263639	0	0.26364	0.26364
KT8-1-2	3	0.263639	0	0.26364	0.26364
KT8-2-1	3	0.263639	0	0.26364	0.26364
KT8-2-2	3	0.263639	0	0.26364	0.26364

Std Error uses a pooled estimate of error variance

Exhibit A-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series KT7ref Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=ThO2 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	.
Mean of Response	0.016983
Observations (or Sum Wgts)	12

Analysis of Variance

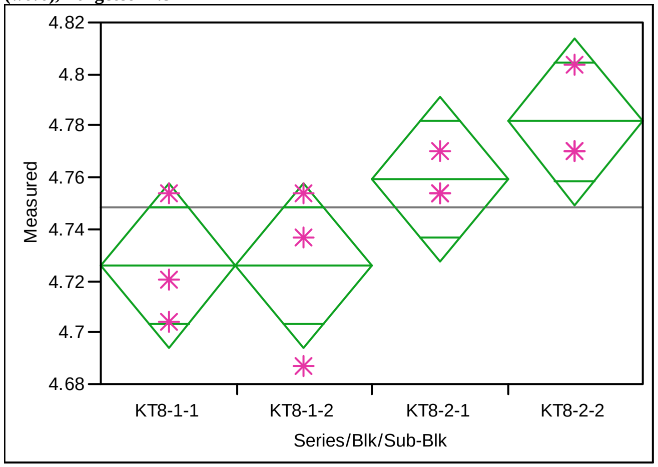
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	9.71112e-9	3.237e-9	-7.8e+15	0.0000
Error	8	-3.309e-24	-4.14e-25		
C. Total	11	9.71112e-9			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.016955	.	.	.
KT8-1-2	3	0.016955	.	.	.
KT8-2-1	3	0.017012	.	.	.
KT8-2-2	3	0.017012	.	.	.

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=TiO2 (wt%), Targeted=4.824



Oneway Anova
Summary of Fit

Rsquare	0.590164
Adj Rsquare	0.436475
Root Mean Square Error	0.024076
Mean of Response	4.74824
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00667734	0.002226	3.8400	0.0569
Error	8	0.00463704	0.000580		
C. Total	11	0.01131438			

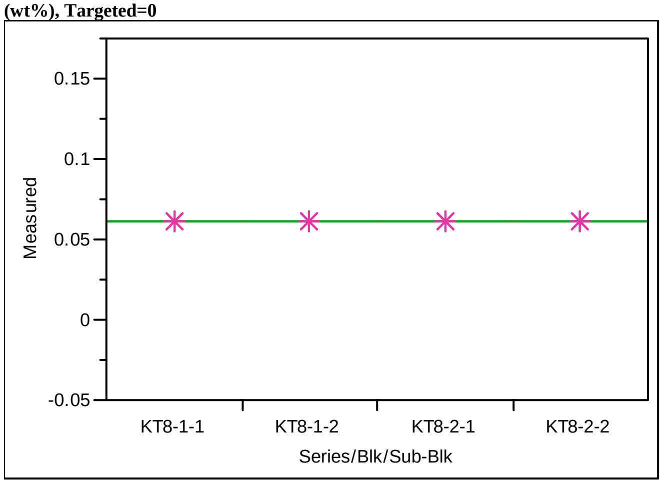
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	4.72600	0.01390	4.6939	4.7581
KT8-1-2	3	4.72600	0.01390	4.6939	4.7581
KT8-2-1	3	4.75936	0.01390	4.7273	4.7914
KT8-2-2	3	4.78160	0.01390	4.7495	4.8137

Std Error uses a pooled estimate of error variance

Exhibit A-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series KT7ref Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=U3O8 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.061318
Observations (or Sum Wgts)	12

Analysis of Variance

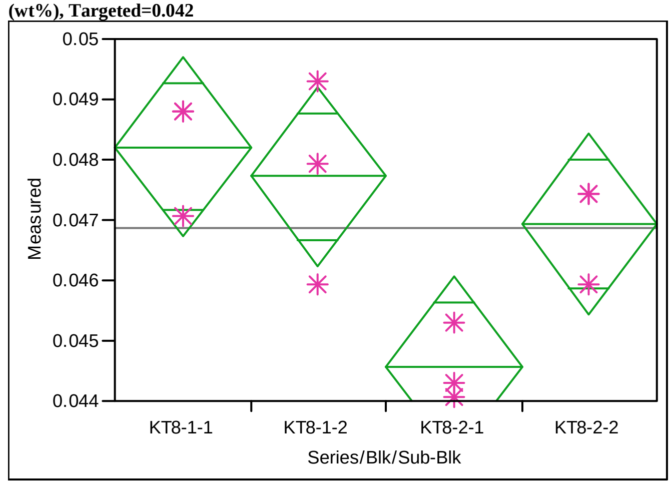
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0	0	.	.
Error	8	0	0		
C. Total	11	0			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.061318	0	0.06132	0.06132
KT8-1-2	3	0.061318	0	0.06132	0.06132
KT8-2-1	3	0.061318	0	0.06132	0.06132
KT8-2-2	3	0.061318	0	0.06132	0.06132

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=ZnO (wt%), Targeted=0.042



Oneway Anova
Summary of Fit

Rsquare	0.699973
Adj Rsquare	0.587463
Root Mean Square Error	0.001123
Mean of Response	0.046856
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00002355	7.8488e-6	6.2214	0.0174
Error	8	0.00001009	1.2616e-6		
C. Total	11	0.00003364			

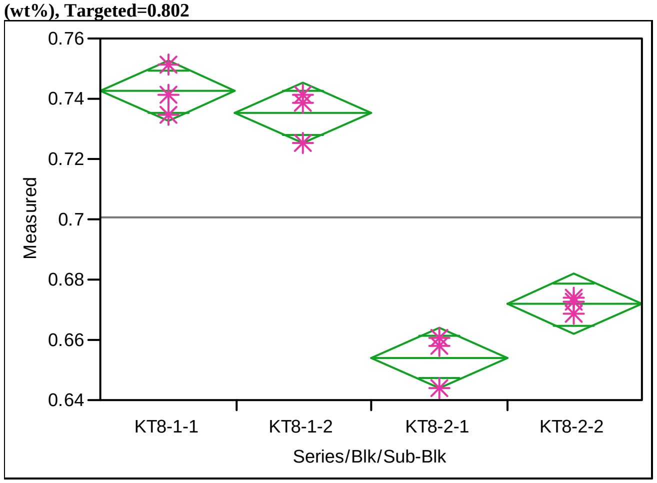
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.048215	0.00065	0.04672	0.04971
KT8-1-2	3	0.047717	0.00065	0.04622	0.04921
KT8-2-1	3	0.044564	0.00065	0.04307	0.04606
KT8-2-2	3	0.046929	0.00065	0.04543	0.04842

Std Error uses a pooled estimate of error variance

Exhibit A-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series KT7ref Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=CH, Oxide=ZrO2 (wt%), Targeted=0.802



Oneway Anova
Summary of Fit

Rsquare	0.97535
Adj Rsquare	0.966107
Root Mean Square Error	0.007501
Mean of Response	0.700953
Observations (or Sum Wgts)	12

Analysis of Variance

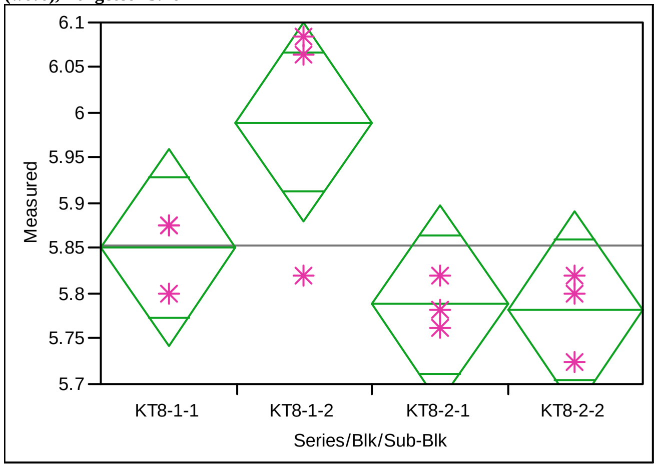
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.01780914	0.005936	105.5162	<.0001
Error	8	0.00045008	0.000056		
C. Total	11	0.01825923			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.742490	0.00433	0.73250	0.75248
KT8-1-2	3	0.735285	0.00433	0.72530	0.74527
KT8-2-1	3	0.654237	0.00433	0.64425	0.66422
KT8-2-2	3	0.671798	0.00433	0.66181	0.68178

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=PF, Oxide=Al2O3 (wt%), Targeted=5.46



Oneway Anova
Summary of Fit

Rsquare	0.608198
Adj Rsquare	0.461273
Root Mean Square Error	0.082181
Mean of Response	5.852726
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.08387019	0.027957	4.1395	0.0480
Error	8	0.05402918	0.006754		
C. Total	11	0.13789937			

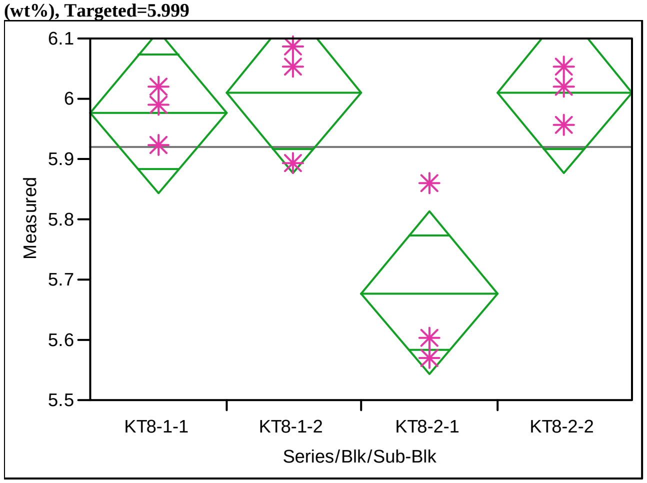
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	5.85115	0.04745	5.7417	5.9606
KT8-1-2	3	5.98972	0.04745	5.8803	6.0991
KT8-2-1	3	5.78817	0.04745	5.6788	5.8976
KT8-2-2	3	5.78187	0.04745	5.6725	5.8913

Std Error uses a pooled estimate of error variance

Exhibit A-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series KT7ref Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=PF, Oxide=B2O3 (wt%), Targeted=5.999



Oneway Anova
Summary of Fit

Rsquare	0.742639
Adj Rsquare	0.646129
Root Mean Square Error	0.10097
Mean of Response	5.91925
Observations (or Sum Wgts)	12

Analysis of Variance

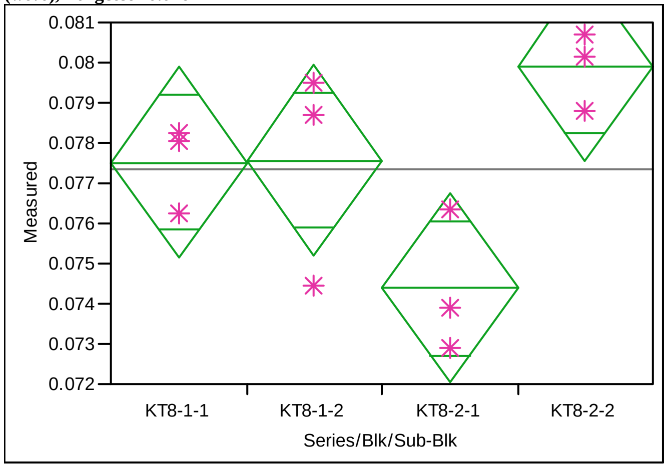
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.23534806	0.078449	7.6949	0.0096
Error	8	0.08155968	0.010195		
C. Total	11	0.31690774			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	5.97828	0.05830	5.8439	6.1127
KT8-1-2	3	6.01048	0.05830	5.8761	6.1449
KT8-2-1	3	5.67776	0.05830	5.5433	5.8122
KT8-2-2	3	6.01048	0.05830	5.8761	6.1449

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=PF, Oxide=BaO (wt%), Targeted=0.076



Oneway Anova
Summary of Fit

Rsquare	0.645105
Adj Rsquare	0.51202
Root Mean Square Error	0.001778
Mean of Response	0.077346
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00004597	0.000015	4.8473	0.0330
Error	8	0.00002529	3.161e-6		
C. Total	11	0.00007126			

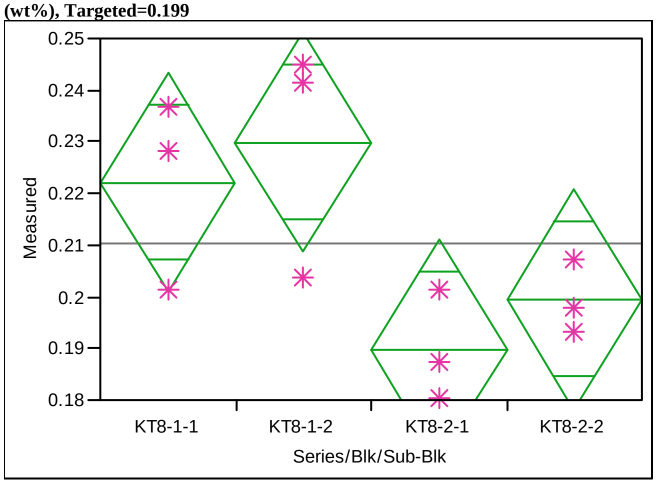
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.077522	0.00103	0.07516	0.07989
KT8-1-2	3	0.077560	0.00103	0.07519	0.07993
KT8-2-1	3	0.074396	0.00103	0.07203	0.07676
KT8-2-2	3	0.079904	0.00103	0.07754	0.08227

Std Error uses a pooled estimate of error variance

Exhibit A-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series KT7ref Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=PF, Oxide=Ce2O3 (wt%), Targeted=0.199



Oneway Anova
Summary of Fit

Rsquare	0.610361
Adj Rsquare	0.464246
Root Mean Square Error	0.015974
Mean of Response	0.210346
Observations (or Sum Wgts)	12

Analysis of Variance

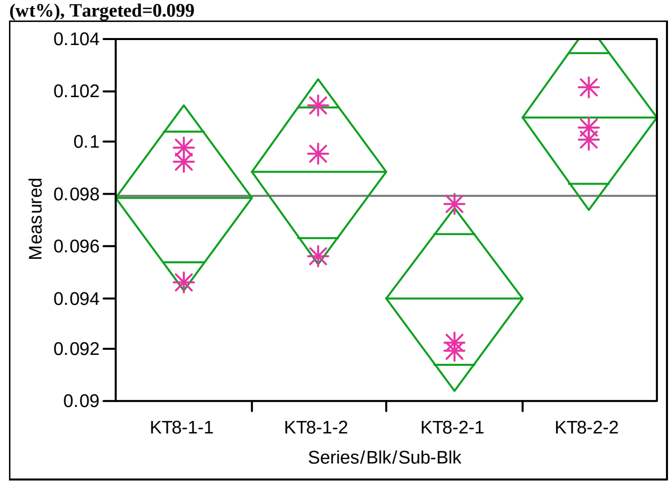
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00319789	0.001066	4.1773	0.0470
Error	8	0.00204145	0.000255		
C. Total	11	0.00523934			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.222157	0.00922	0.20089	0.24342
KT8-1-2	3	0.229965	0.00922	0.20870	0.25123
KT8-2-1	3	0.189751	0.00922	0.16848	0.21102
KT8-2-2	3	0.199511	0.00922	0.17824	0.22078

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=PF, Oxide=Cr2O3 (wt%), Targeted=0.099



Oneway Anova
Summary of Fit

Rsquare	0.575726
Adj Rsquare	0.416623
Root Mean Square Error	0.002677
Mean of Response	0.097903
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00007782	0.000026	3.6186	0.0647
Error	8	0.00005735	7.169e-6		
C. Total	11	0.00013518			

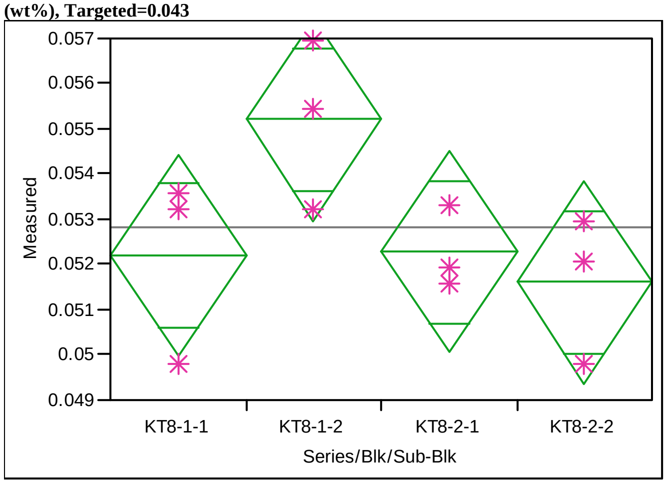
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.097878	0.00155	0.09431	0.10144
KT8-1-2	3	0.098853	0.00155	0.09529	0.10242
KT8-2-1	3	0.093932	0.00155	0.09037	0.09750
KT8-2-2	3	0.100948	0.00155	0.09738	0.10451

Std Error uses a pooled estimate of error variance

Exhibit A-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series KT7ref Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=PF, Oxide=CuO (wt%), Targeted=0.043



Oneway Anova
Summary of Fit

Rsquare	0.508736
Adj Rsquare	0.324512
Root Mean Square Error	0.001681
Mean of Response	0.052826
Observations (or Sum Wgts)	12

Analysis of Variance

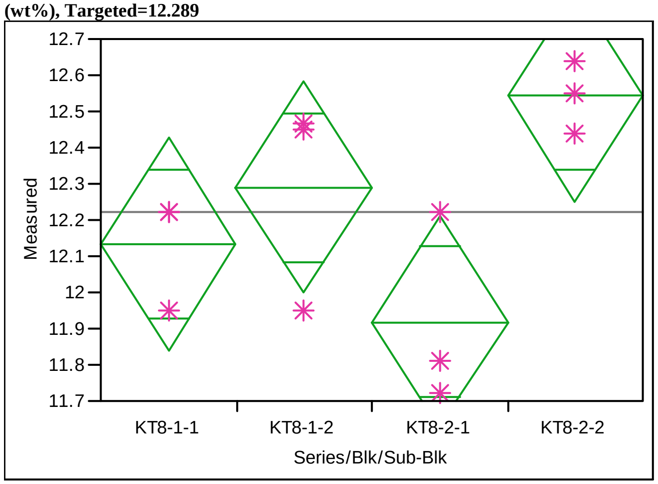
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00002342	7.8072e-6	2.7615	0.1114
Error	8	0.00002262	2.8271e-6		
C. Total	11	0.00004604			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.052200	0.00097	0.04996	0.05444
KT8-1-2	3	0.055204	0.00097	0.05297	0.05744
KT8-2-1	3	0.052284	0.00097	0.05004	0.05452
KT8-2-2	3	0.051616	0.00097	0.04938	0.05385

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=PF, Oxide=Fe2O3 (wt%), Targeted=12.289



Oneway Anova
Summary of Fit

Rsquare	0.618345
Adj Rsquare	0.475225
Root Mean Square Error	0.219208
Mean of Response	12.22155
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.6228196	0.207607	4.3205	0.0435
Error	8	0.3844162	0.048052		
C. Total	11	1.0072358			

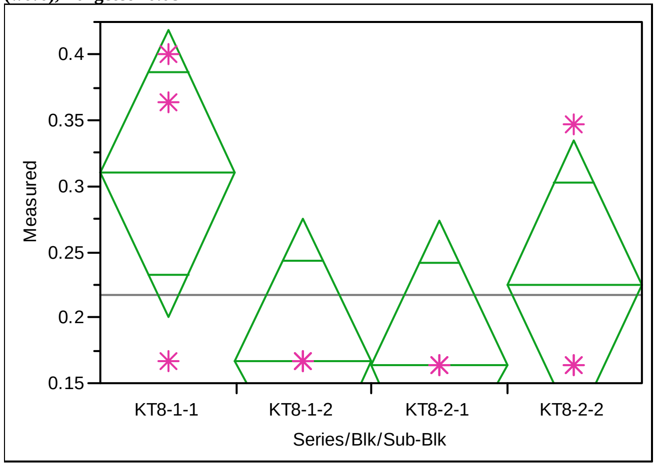
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	12.1334	0.12656	11.842	12.425
KT8-1-2	3	12.2907	0.12656	11.999	12.583
KT8-2-1	3	11.9189	0.12656	11.627	12.211
KT8-2-2	3	12.5432	0.12656	12.251	12.835

Std Error uses a pooled estimate of error variance

Exhibit A-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series KT7ref Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=PF, Oxide=K2O (wt%), Targeted=0.082



Oneway Anova
Summary of Fit

Rsquare	0.439518
Adj Rsquare	0.229337
Root Mean Square Error	0.081914
Mean of Response	0.216677
Observations (or Sum Wgts)	12

Analysis of Variance

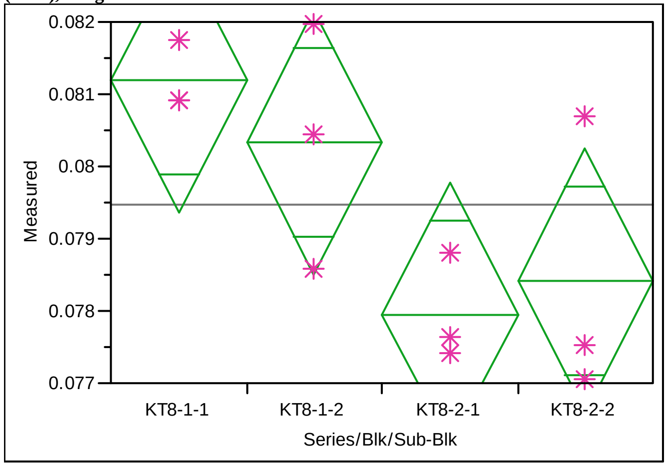
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.04209392	0.014031	2.0911	0.1798
Error	8	0.05367911	0.006710		
C. Total	11	0.09577303			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.310185	0.04729	0.20113	0.41924
KT8-1-2	3	0.166837	0.04729	0.05778	0.27589
KT8-2-1	3	0.164428	0.04729	0.05537	0.27349
KT8-2-2	3	0.225260	0.04729	0.11620	0.33432

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=PF, Oxide=La2O3 (wt%), Targeted=0.08



Oneway Anova
Summary of Fit

Rsquare	0.584627
Adj Rsquare	0.428862
Root Mean Square Error	0.001379
Mean of Response	0.079477
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00002141	7.1371e-6	3.7533	0.0598
Error	8	0.00001521	1.9016e-6		
C. Total	11	0.00003662			

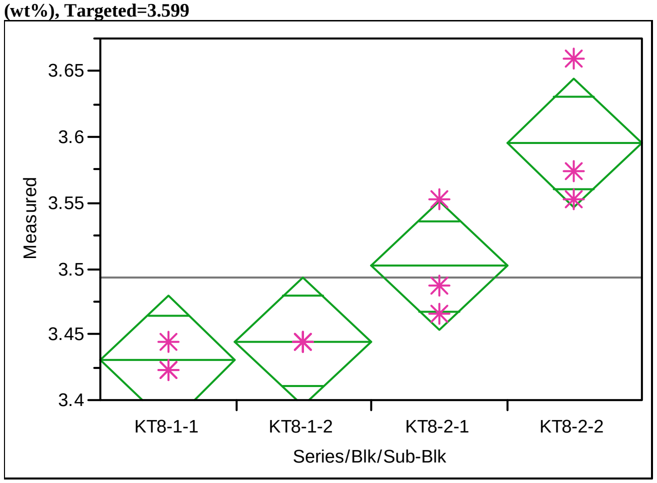
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.081197	0.00080	0.07936	0.08303
KT8-1-2	3	0.080337	0.00080	0.07850	0.08217
KT8-2-1	3	0.077952	0.00080	0.07612	0.07979
KT8-2-2	3	0.078421	0.00080	0.07659	0.08026

Std Error uses a pooled estimate of error variance

Exhibit A-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series KT7ref Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=PF, Oxide=Li2O (wt%), Targeted=3.599



Oneway Anova
Summary of Fit

Rsquare	0.823566
Adj Rsquare	0.757404
Root Mean Square Error	0.036768
Mean of Response	3.49308
Observations (or Sum Wgts)	12

Analysis of Variance

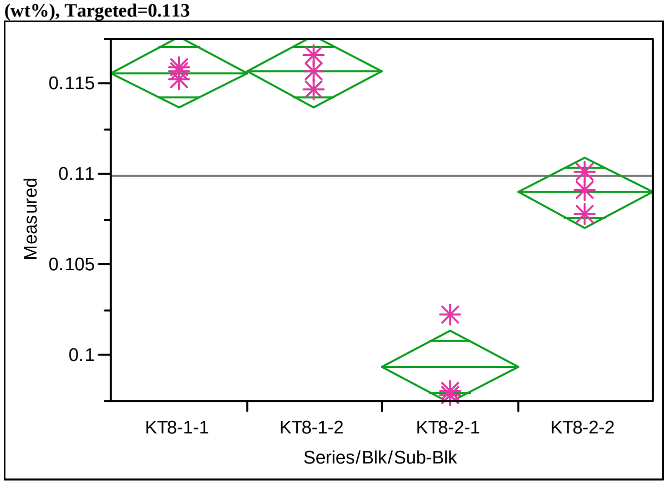
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.05048264	0.016828	12.4476	0.0022
Error	8	0.01081495	0.001352		
C. Total	11	0.06129759			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	3.43029	0.02123	3.3813	3.4792
KT8-1-2	3	3.44464	0.02123	3.3957	3.4936
KT8-2-1	3	3.50205	0.02123	3.4531	3.5510
KT8-2-2	3	3.59534	0.02123	3.5464	3.6443

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=PF, Oxide=MgO (wt%), Targeted=0.113



Oneway Anova
Summary of Fit

Rsquare	0.968222
Adj Rsquare	0.956305
Root Mean Square Error	0.001479
Mean of Response	0.109931
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00053344	0.000178	81.2492	<.0001
Error	8	0.00001751	2.189e-6		
C. Total	11	0.00055095			

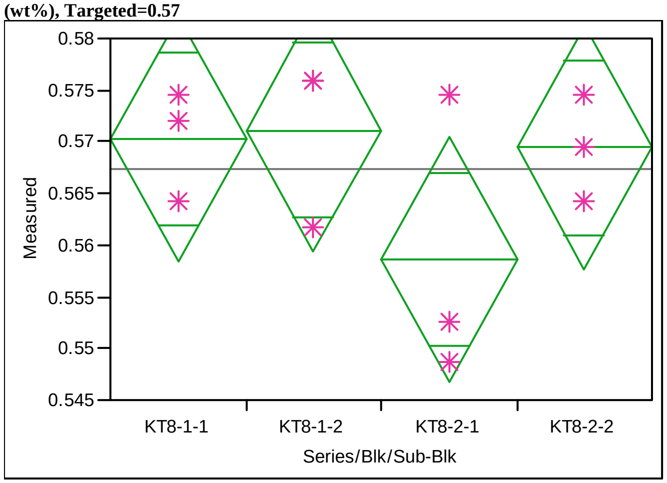
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.115639	0.00085	0.11367	0.11761
KT8-1-2	3	0.115694	0.00085	0.11372	0.11766
KT8-2-1	3	0.099387	0.00085	0.09742	0.10136
KT8-2-2	3	0.109006	0.00085	0.10704	0.11098

Std Error uses a pooled estimate of error variance

Exhibit A-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series KT7ref Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=PF, Oxide=MnO (wt%), Targeted=0.57



Oneway Anova
Summary of Fit

Rsquare	0.327334
Adj Rsquare	0.075085
Root Mean Square Error	0.008899
Mean of Response	0.567375
Observations (or Sum Wgts)	12

Analysis of Variance

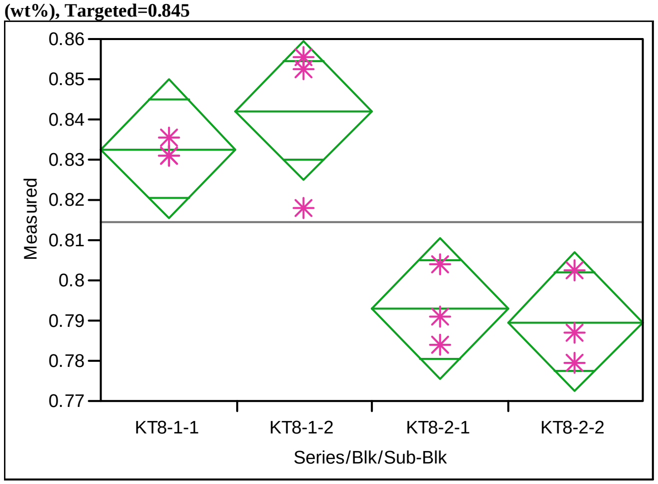
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00030829	0.000103	1.2977	0.3402
Error	8	0.00063354	0.000079		
C. Total	11	0.00094183			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.570280	0.00514	0.55843	0.58213
KT8-1-2	3	0.571141	0.00514	0.55929	0.58299
KT8-2-1	3	0.558659	0.00514	0.54681	0.57051
KT8-2-2	3	0.569419	0.00514	0.55757	0.58127

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=PF, Oxide=Nb2O5 (wt%), Targeted=0.845



Oneway Anova
Summary of Fit

Rsquare	0.82822
Adj Rsquare	0.763803
Root Mean Square Error	0.012987
Mean of Response	0.814312
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00650511	0.002168	12.8571	0.0020
Error	8	0.00134921	0.000169		
C. Total	11	0.00785433			

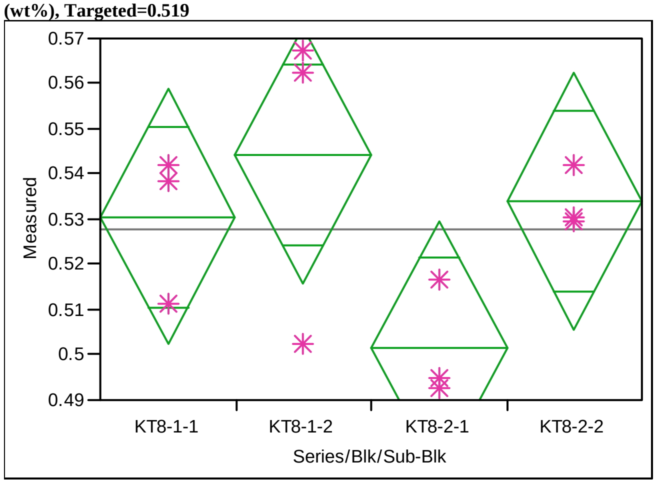
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.832551	0.00750	0.81526	0.84984
KT8-1-2	3	0.842088	0.00750	0.82480	0.85938
KT8-2-1	3	0.792974	0.00750	0.77568	0.81026
KT8-2-2	3	0.789636	0.00750	0.77235	0.80693

Std Error uses a pooled estimate of error variance

Exhibit A-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series KT7ref Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=PF, Oxide=NiO (wt%), Targeted=0.519



Oneway Anova
Summary of Fit

Rsquare	0.45744
Adj Rsquare	0.25398
Root Mean Square Error	0.021242
Mean of Response	0.527557
Observations (or Sum Wgts)	12

Analysis of Variance

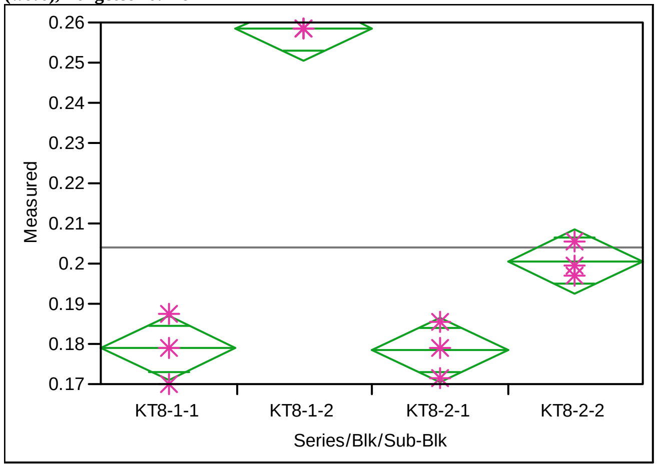
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00304353	0.001015	2.2483	0.1600
Error	8	0.00360986	0.000451		
C. Total	11	0.00665339			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.530633	0.01226	0.50235	0.55891
KT8-1-2	3	0.544206	0.01226	0.51592	0.57249
KT8-2-1	3	0.501365	0.01226	0.47308	0.52965
KT8-2-2	3	0.534026	0.01226	0.50574	0.56231

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=PF, Oxide=PbO (wt%), Targeted=0.146



Oneway Anova
Summary of Fit

Rsquare	0.978091
Adj Rsquare	0.969875
Root Mean Square Error	0.00599
Mean of Response	0.204129
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.01281231	0.004271	119.0476	<.0001
Error	8	0.00028700	0.000036		
C. Total	11	0.01309930			

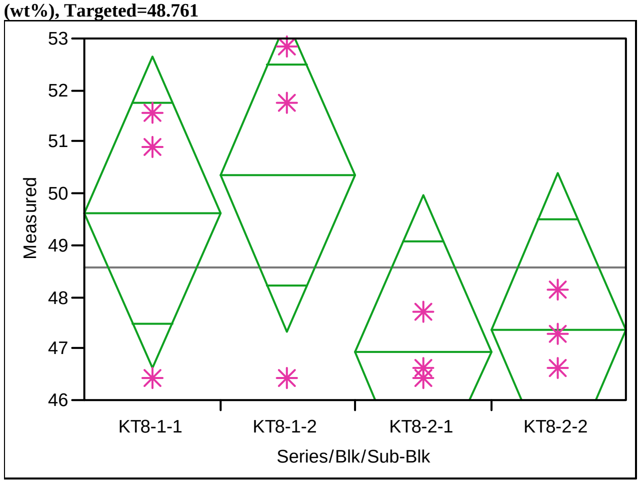
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.178815	0.00346	0.17084	0.18679
KT8-1-2	3	0.258528	0.00346	0.25055	0.26650
KT8-2-1	3	0.178456	0.00346	0.17048	0.18643
KT8-2-2	3	0.200718	0.00346	0.19274	0.20869

Std Error uses a pooled estimate of error variance

Exhibit A-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series KT7ref Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=PF, Oxide=SiO2 (wt%), Targeted=48.761



Oneway Anova
Summary of Fit

Rsquare	0.380822
Adj Rsquare	0.14863
Root Mean Square Error	2.274107
Mean of Response	48.56211
Observations (or Sum Wgts)	12

Analysis of Variance

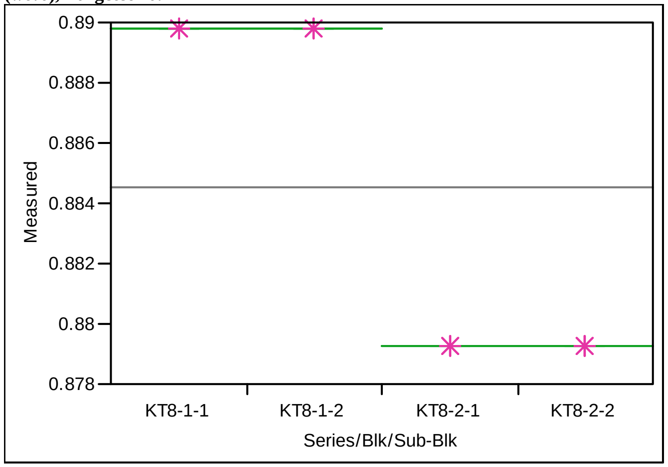
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	25.445921	8.48197	1.6401	0.2558
Error	8	41.372505	5.17156		
C. Total	11	66.818426			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	49.6318	1.3130	46.604	52.659
KT8-1-2	3	50.3449	1.3130	47.317	53.373
KT8-2-1	3	46.9220	1.3130	43.894	49.950
KT8-2-2	3	47.3498	1.3130	44.322	50.378

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=PF, Oxide=SO4 (wt%), Targeted=0.4



Oneway Anova
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	9.31e-10
Mean of Response	0.884539
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00032985	0.000110	1.27e+14	<.0001
Error	8	6.9389e-18	8.67e-19		
C. Total	11	0.00032985			

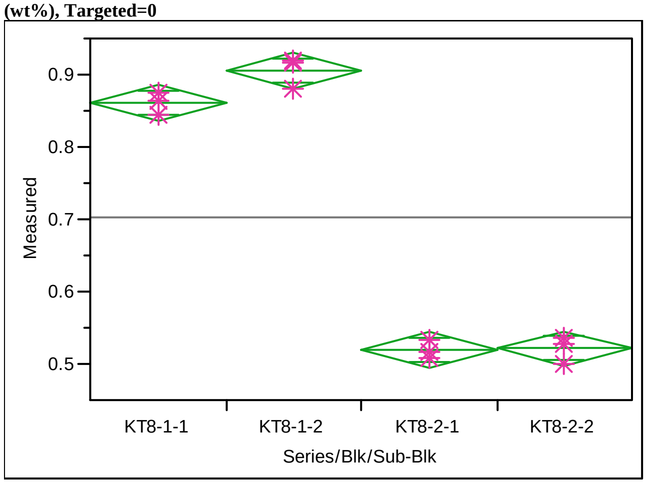
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.889782	5.377e-10	0.88978	0.88978
KT8-1-2	3	0.889782	5.377e-10	0.88978	0.88978
KT8-2-1	3	0.879297	5.377e-10	0.87930	0.87930
KT8-2-2	3	0.879297	5.377e-10	0.87930	0.87930

Std Error uses a pooled estimate of error variance

Exhibit A-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series KT7ref Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=PF, Oxide=ThO2 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0.993466
Adj Rsquare	0.991016
Root Mean Square Error	0.018076
Mean of Response	0.701895
Observations (or Sum Wgts)	12

Analysis of Variance

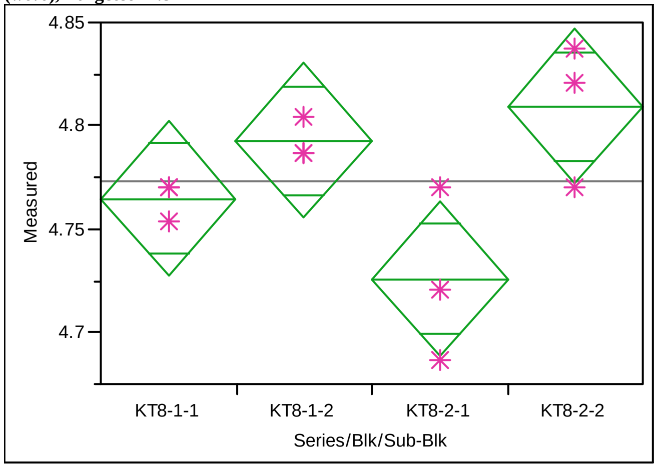
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.39741930	0.132473	405.4571	<.0001
Error	8	0.00261380	0.000327		
C. Total	11	0.40003310			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.861011	0.01044	0.83695	0.88508
KT8-1-2	3	0.905389	0.01044	0.88132	0.92945
KT8-2-1	3	0.519641	0.01044	0.49558	0.54371
KT8-2-2	3	0.521537	0.01044	0.49747	0.54560

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=PF, Oxide=TiO2 (wt%), Targeted=4.824



Oneway Anova
Summary of Fit

Rsquare	0.654822
Adj Rsquare	0.525381
Root Mean Square Error	0.028077
Mean of Response	4.77326
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.01196356	0.003988	5.0588	0.0297
Error	8	0.00630637	0.000788		
C. Total	11	0.01826994			

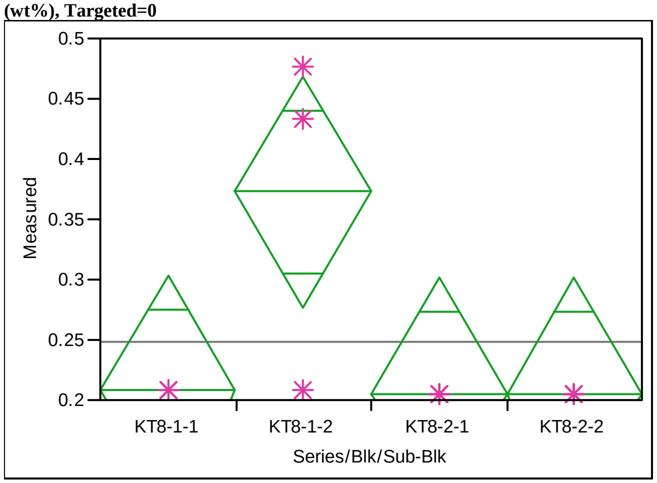
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	4.76492	0.01621	4.7275	4.8023
KT8-1-2	3	4.79272	0.01621	4.7553	4.8301
KT8-2-1	3	4.72600	0.01621	4.6886	4.7634
KT8-2-2	3	4.80940	0.01621	4.7720	4.8468

Std Error uses a pooled estimate of error variance

Exhibit A-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series KT7ref Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=PF, Oxide=U3O8 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0.59936
Adj Rsquare	0.44912
Root Mean Square Error	0.072269
Mean of Response	0.247632
Observations (or Sum Wgts)	12

Analysis of Variance

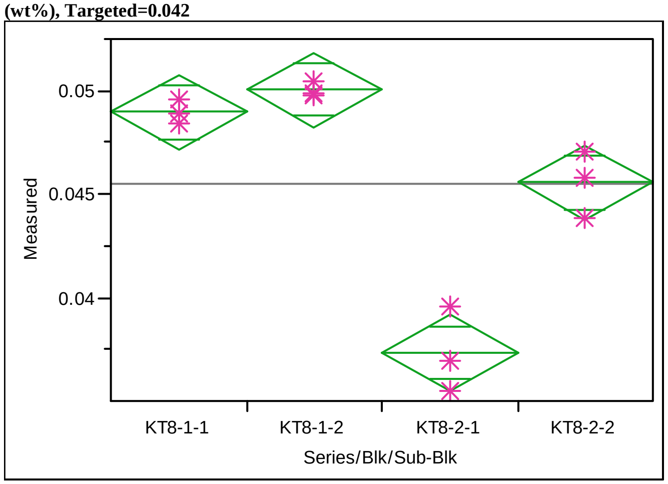
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.06250632	0.020835	3.9894	0.0522
Error	8	0.04178212	0.005223		
C. Total	11	0.10428845			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.207539	0.04172	0.11132	0.30376
KT8-1-2	3	0.372627	0.04172	0.27641	0.46884
KT8-2-1	3	0.205181	0.04172	0.10896	0.30140
KT8-2-2	3	0.205181	0.04172	0.10896	0.30140

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=KT7 ref, Prep Method=PF, Oxide=ZnO (wt%), Targeted=0.042



Oneway Anova
Summary of Fit

Rsquare	0.95252
Adj Rsquare	0.934714
Root Mean Square Error	0.001361
Mean of Response	0.045477
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00029739	0.000099	53.4969	<.0001
Error	8	0.00001482	1.853e-6		
C. Total	11	0.00031221			

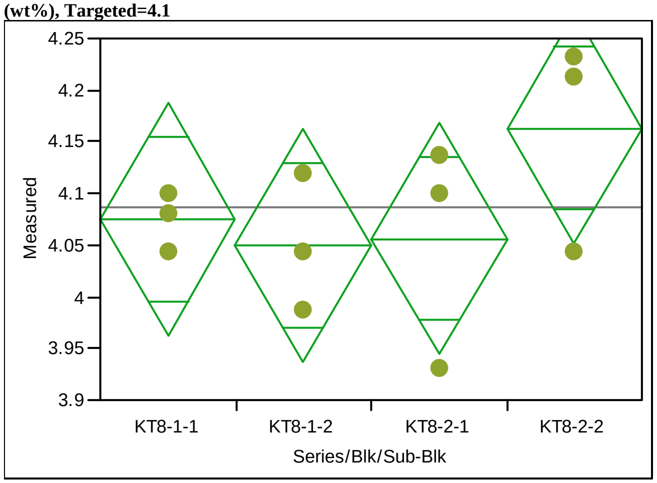
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.048962	0.00079	0.04715	0.05077
KT8-1-2	3	0.050041	0.00079	0.04823	0.05185
KT8-2-1	3	0.037344	0.00079	0.03553	0.03916
KT8-2-2	3	0.045560	0.00079	0.04375	0.04737

Std Error uses a pooled estimate of error variance

Exhibit A-4. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series Ustd Results by Oxide.

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=Al2O3 (wt%), Targeted=4.1



Oneway Anova
Summary of Fit

Rsquare	0.304856
Adj Rsquare	0.044177
Root Mean Square Error	0.084148
Mean of Response	4.086044
Observations (or Sum Wgts)	12

Analysis of Variance

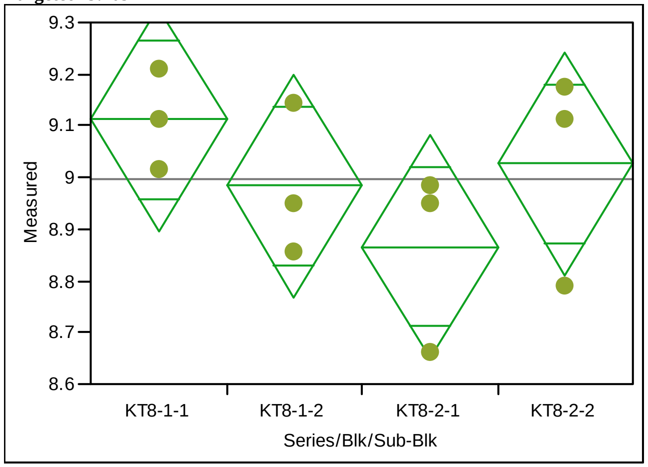
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.02484271	0.008281	1.1695	0.3800
Error	8	0.05664734	0.007081		
C. Total	11	0.08149005			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	4.07502	0.04858	3.9630	4.1871
KT8-1-2	3	4.04983	0.04858	3.9378	4.1619
KT8-2-1	3	4.05613	0.04858	3.9441	4.1682
KT8-2-2	3	4.16320	0.04858	4.0512	4.2752

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=B2O3 (wt%), Targeted=9.209



Oneway Anova
Summary of Fit

Rsquare	0.31054
Adj Rsquare	0.051992
Root Mean Square Error	0.162331
Mean of Response	8.996937
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.09495137	0.031650	1.2011	0.3697
Error	8	0.21081104	0.026351		
C. Total	11	0.30576240			

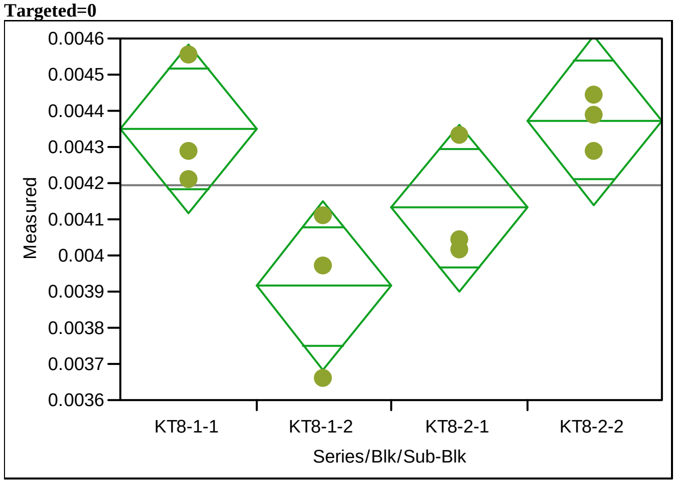
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	9.11232	0.09372	8.8962	9.3284
KT8-1-2	3	8.98352	0.09372	8.7674	9.1996
KT8-2-1	3	8.86546	0.09372	8.6493	9.0816
KT8-2-2	3	9.02645	0.09372	8.8103	9.2426

Std Error uses a pooled estimate of error variance

Exhibit A-4. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series Ustd Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=BaO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0.629279
Adj Rsquare	0.490259
Root Mean Square Error	0.000175
Mean of Response	0.004192
Observations (or Sum Wgts)	12

Analysis of Variance

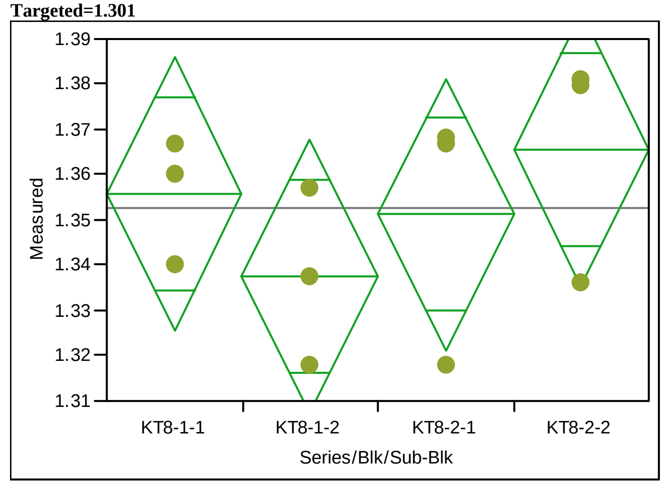
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	4.14735e-7	1.3824e-7	4.5265	0.0390
Error	8	2.44328e-7	3.0541e-8		
C. Total	11	6.59063e-7			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.004351	0.00010	0.00412	0.00458
KT8-1-2	3	0.003915	0.00010	0.00368	0.00415
KT8-2-1	3	0.004131	0.00010	0.00390	0.00436
KT8-2-2	3	0.004373	0.00010	0.00414	0.00461

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=CaO (wt%), Targeted=1.301



Oneway Anova
Summary of Fit

Rsquare	0.229464
Adj Rsquare	-0.05949
Root Mean Square Error	0.022608
Mean of Response	1.35256
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00121773	0.000406	0.7941	0.5307
Error	8	0.00408911	0.000511		
C. Total	11	0.00530684			

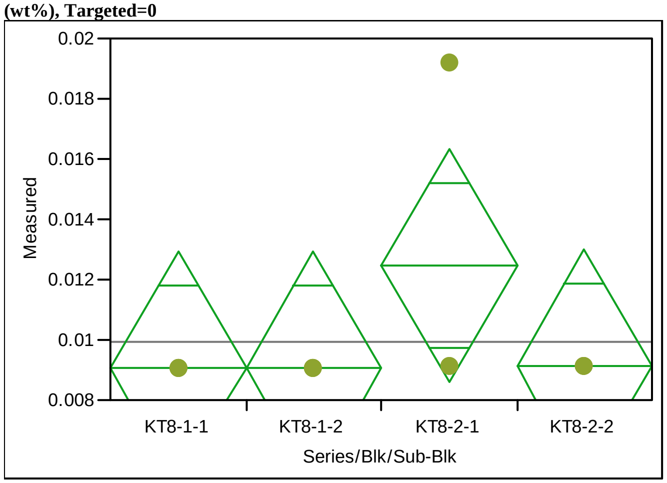
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	1.35582	0.01305	1.3257	1.3859
KT8-1-2	3	1.33764	0.01305	1.3075	1.3677
KT8-2-1	3	1.35116	0.01305	1.3211	1.3813
KT8-2-2	3	1.36562	0.01305	1.3355	1.3957

Std Error uses a pooled estimate of error variance

Exhibit A-4. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series Ustd Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=Ce2O3 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0.27739
Adj Rsquare	0.006412
Root Mean Square Error	0.002908
Mean of Response	0.009946
Observations (or Sum Wgts)	12

Analysis of Variance

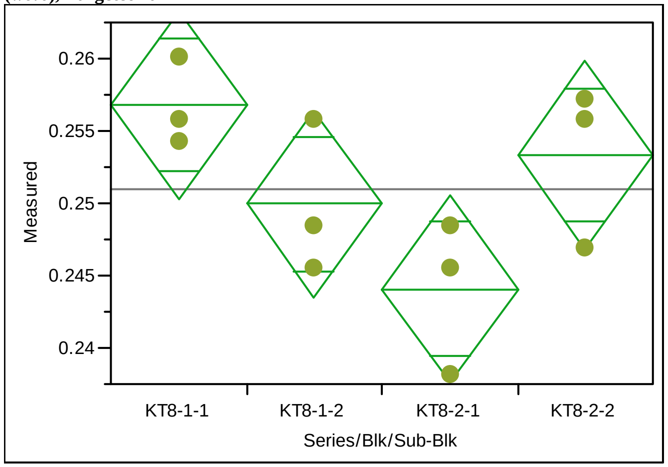
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00002597	8.6558e-6	1.0237	0.4319
Error	8	0.00006765	8.4557e-6		
C. Total	11	0.00009361			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.009078	0.00168	0.00521	0.01295
KT8-1-2	3	0.009078	0.00168	0.00521	0.01295
KT8-2-1	3	0.012494	0.00168	0.00862	0.01637
KT8-2-2	3	0.009136	0.00168	0.00526	0.01301

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=Cr2O3 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0.579113
Adj Rsquare	0.42128
Root Mean Square Error	0.004884
Mean of Response	0.25103
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00026258	0.000088	3.6692	0.0628
Error	8	0.00019084	0.000024		
C. Total	11	0.00045342			

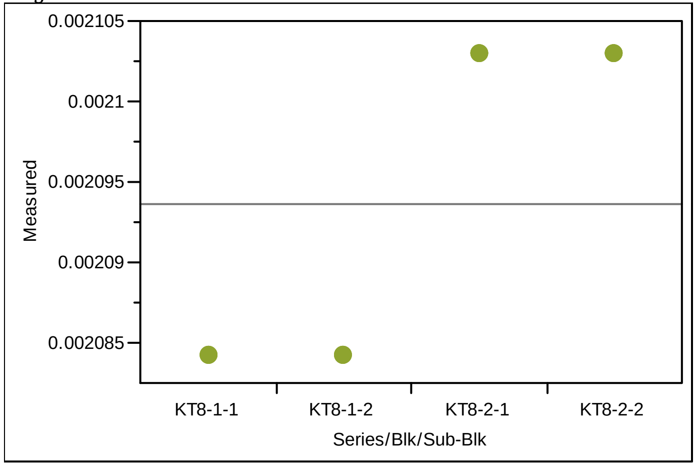
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.256754	0.00282	0.25025	0.26326
KT8-1-2	3	0.249934	0.00282	0.24343	0.25644
KT8-2-1	3	0.244087	0.00282	0.23758	0.25059
KT8-2-2	3	0.253344	0.00282	0.24684	0.25985

Std Error uses a pooled estimate of error variance

Exhibit A-4. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series Ustd Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=CuO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	.
Mean of Response	0.002094
Observations (or Sum Wgts)	12

Analysis of Variance

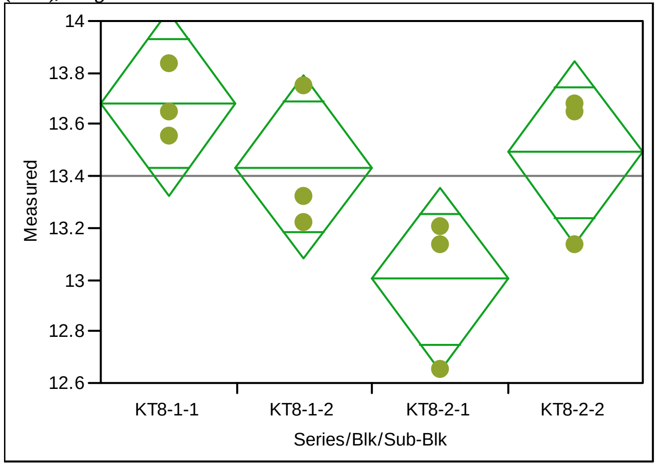
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	1.05773e-9	3.526e-10	-1.4e+16	0.0000
Error	8	-2.068e-25	-2.58e-26		
C. Total	11	1.05773e-9			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.002084	.	.	.
KT8-1-2	3	0.002084	.	.	.
KT8-2-1	3	0.002103	.	.	.
KT8-2-2	3	0.002103	.	.	.

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=Fe2O3 (wt%), Targeted=13.196



Oneway Anova
Summary of Fit

Rsquare	0.566345
Adj Rsquare	0.403725
Root Mean Square Error	0.267186
Mean of Response	13.40225
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.7458539	0.248618	3.4826	0.0702
Error	8	0.5711054	0.071388		
C. Total	11	1.3169593			

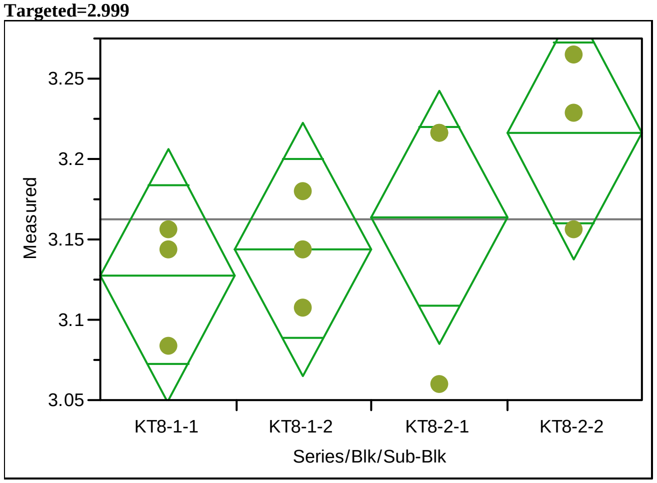
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	13.6822	0.15426	13.327	14.038
KT8-1-2	3	13.4344	0.15426	13.079	13.790
KT8-2-1	3	13.0007	0.15426	12.645	13.356
KT8-2-2	3	13.4916	0.15426	13.136	13.847

Std Error uses a pooled estimate of error variance

Exhibit A-4. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series Ustd Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=K2O (wt%), Targeted=2.999



Oneway Anova
Summary of Fit

Rsquare	0.321439
Adj Rsquare	0.066979
Root Mean Square Error	0.059218
Mean of Response	3.163079
Observations (or Sum Wgts)	12

Analysis of Variance

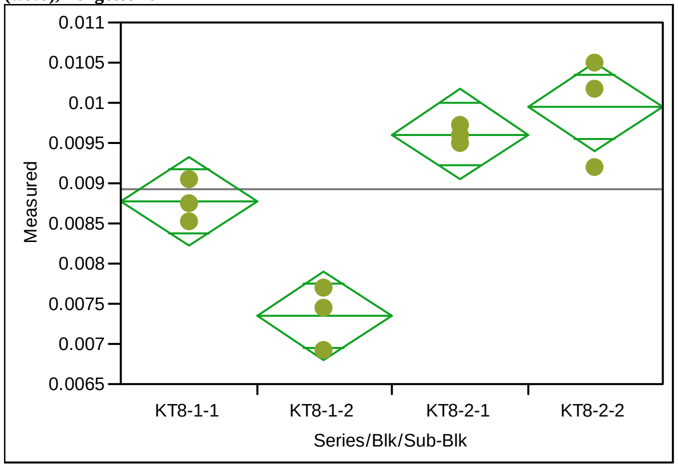
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.01328930	0.004430	1.2632	0.3504
Error	8	0.02805385	0.003507		
C. Total	11	0.04134315			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	3.12794	0.03419	3.0491	3.2068
KT8-1-2	3	3.14401	0.03419	3.0652	3.2228
KT8-2-1	3	3.16408	0.03419	3.0852	3.2429
KT8-2-2	3	3.21628	0.03419	3.1374	3.2951

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=La2O3 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0.896358
Adj Rsquare	0.857492
Root Mean Square Error	0.000417
Mean of Response	0.008922
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00001205	4.0181e-6	23.0629	0.0003
Error	8	0.00000139	1.7422e-7		
C. Total	11	0.00001345			

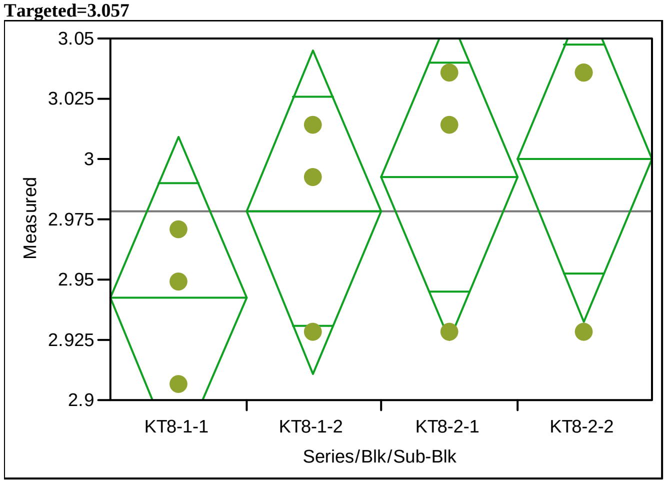
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.008773	0.00024	0.00822	0.00933
KT8-1-2	3	0.007353	0.00024	0.00680	0.00791
KT8-2-1	3	0.009609	0.00024	0.00905	0.01016
KT8-2-2	3	0.009953	0.00024	0.00940	0.01051

Std Error uses a pooled estimate of error variance

Exhibit A-4. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series Ustd Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=Li2O (wt%), Targeted=3.057



Oneway Anova
Summary of Fit

Rsquare	0.223529
Adj Rsquare	-0.06765
Root Mean Square Error	0.05049
Mean of Response	2.978178
Observations (or Sum Wgts)	12

Analysis of Variance

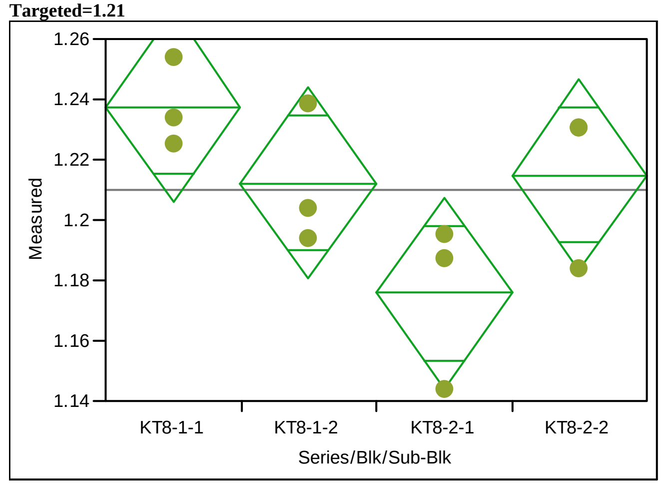
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00587097	0.001957	0.7677	0.5435
Error	8	0.02039391	0.002549		
C. Total	11	0.02626488			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	2.94230	0.02915	2.8751	3.0095
KT8-1-2	3	2.97818	0.02915	2.9110	3.0454
KT8-2-1	3	2.99253	0.02915	2.9253	3.0598
KT8-2-2	3	2.99971	0.02915	2.9325	3.0669

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=MgO (wt%), Targeted=1.21



Oneway Anova
Summary of Fit

Rsquare	0.56823
Adj Rsquare	0.406317
Root Mean Square Error	0.02368
Mean of Response	1.210144
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00590393	0.001968	3.5095	0.0691
Error	8	0.00448610	0.000561		
C. Total	11	0.01039003			

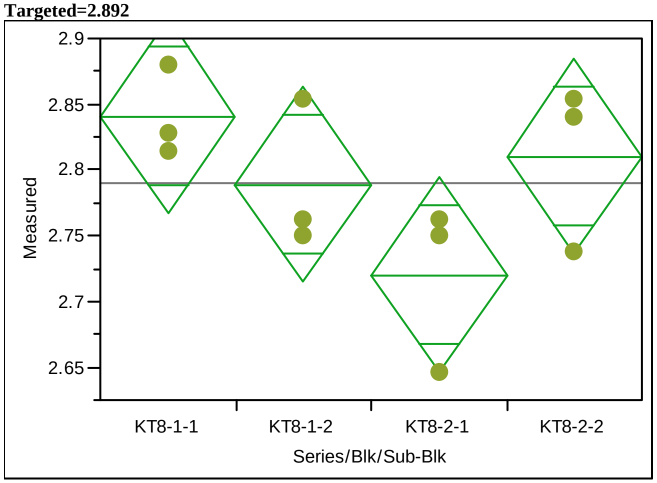
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	1.23764	0.01367	1.2061	1.2692
KT8-1-2	3	1.21222	0.01367	1.1807	1.2437
KT8-2-1	3	1.17573	0.01367	1.1442	1.2073
KT8-2-2	3	1.21498	0.01367	1.1835	1.2465

Std Error uses a pooled estimate of error variance

Exhibit A-4. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series Ustd Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=MnO (wt%), Targeted=2.892



Oneway Anova
Summary of Fit

Rsquare	0.48668
Adj Rsquare	0.294185
Root Mean Square Error	0.055786
Mean of Response	2.790068
Observations (or Sum Wgts)	12

Analysis of Variance

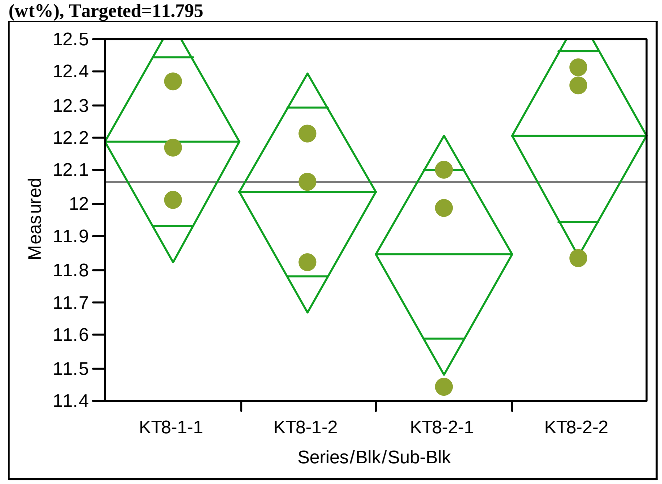
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.02360474	0.007868	2.5283	0.1309
Error	8	0.02489682	0.003112		
C. Total	11	0.04850155			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	2.84064	0.03221	2.7664	2.9149
KT8-1-2	3	2.78899	0.03221	2.7147	2.8633
KT8-2-1	3	2.72013	0.03221	2.6459	2.7944
KT8-2-2	3	2.81051	0.03221	2.7362	2.8848

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=Na2O (wt%), Targeted=11.795



Oneway Anova
Summary of Fit

Rsquare	0.295833
Adj Rsquare	0.03177
Root Mean Square Error	0.273116
Mean of Response	12.06685
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.25069978	0.083567	1.1203	0.3966
Error	8	0.59673695	0.074592		
C. Total	11	0.84743674			

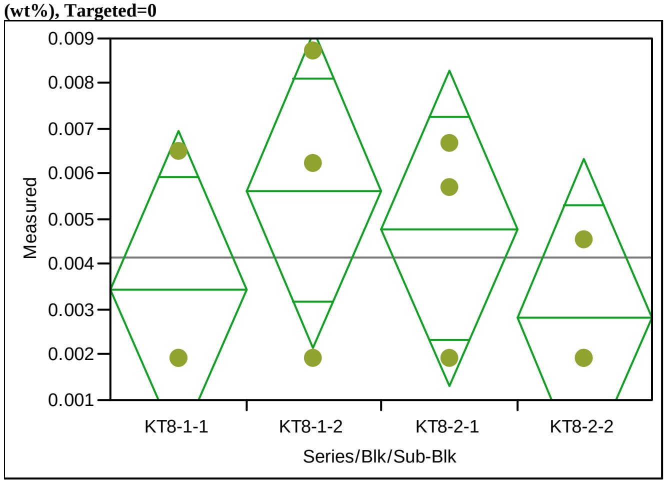
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	12.1859	0.15768	11.822	12.550
KT8-1-2	3	12.0331	0.15768	11.670	12.397
KT8-2-1	3	11.8444	0.15768	11.481	12.208
KT8-2-2	3	12.2039	0.15768	11.840	12.568

Std Error uses a pooled estimate of error variance

Exhibit A-4. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series Ustd Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=Nb2O5 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0.20998
Adj Rsquare	-0.08628
Root Mean Square Error	0.002623
Mean of Response	0.004175
Observations (or Sum Wgts)	12

Analysis of Variance

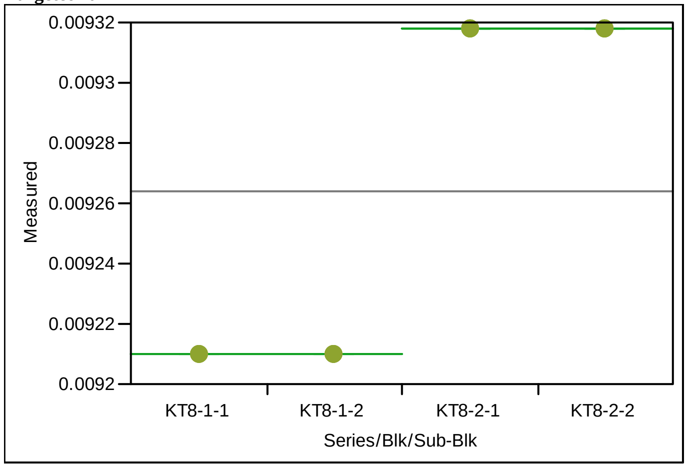
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00001463	4.8758e-6	0.7088	0.5734
Error	8	0.00005503	6.8793e-6		
C. Total	11	0.00006966			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.003452	0.00151	-4e-5	0.00694
KT8-1-2	3	0.005643	0.00151	0.0022	0.00914
KT8-2-1	3	0.004783	0.00151	0.0013	0.00827
KT8-2-2	3	0.002823	0.00151	-0.0007	0.00631

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=PbO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	9.09e-13
Mean of Response	0.009264
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	3.48108e-8	1.1604e-8	1.4e+16	<.0001
Error	8	6.6174e-24	8.272e-25		
C. Total	11	3.48108e-8			

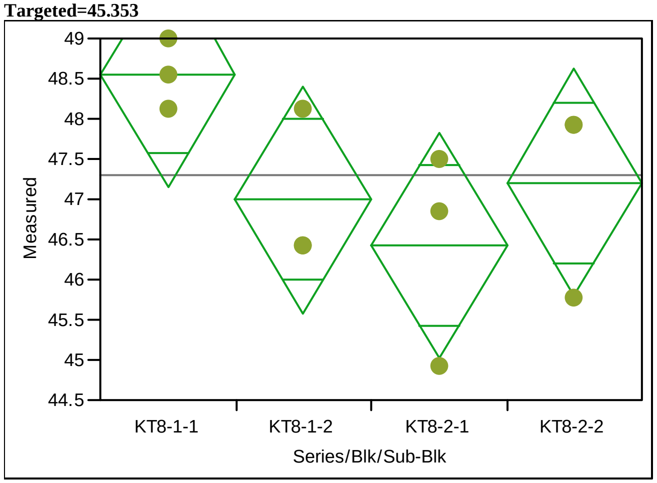
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.009210	5.251e-13	0.00921	0.00921
KT8-1-2	3	0.009210	5.251e-13	0.00921	0.00921
KT8-2-1	3	0.009318	5.251e-13	0.00932	0.00932
KT8-2-2	3	0.009318	5.251e-13	0.00932	0.00932

Std Error uses a pooled estimate of error variance

Exhibit A-4. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series Ustd Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=SiO2 (wt%), Targeted=45.353



Oneway Anova
Summary of Fit

Rsquare	0.45272
Adj Rsquare	0.24749
Root Mean Square Error	1.057097
Mean of Response	47.29636
Observations (or Sum Wgts)	12

Analysis of Variance

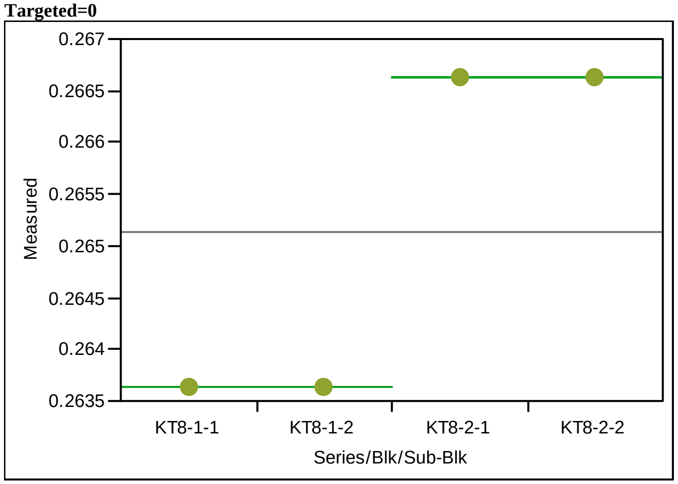
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	7.395030	2.46501	2.2059	0.1650
Error	8	8.939634	1.11745		
C. Total	11	16.334664			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	48.5621	0.61032	47.155	49.969
KT8-1-2	3	46.9933	0.61032	45.586	48.401
KT8-2-1	3	46.4228	0.61032	45.015	47.830
KT8-2-2	3	47.2072	0.61032	45.800	48.615

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=SO4 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	0
Mean of Response	0.265137
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00002693	8.9754e-6	.	.
Error	8	0.00000000	0		
C. Total	11	0.00002693			

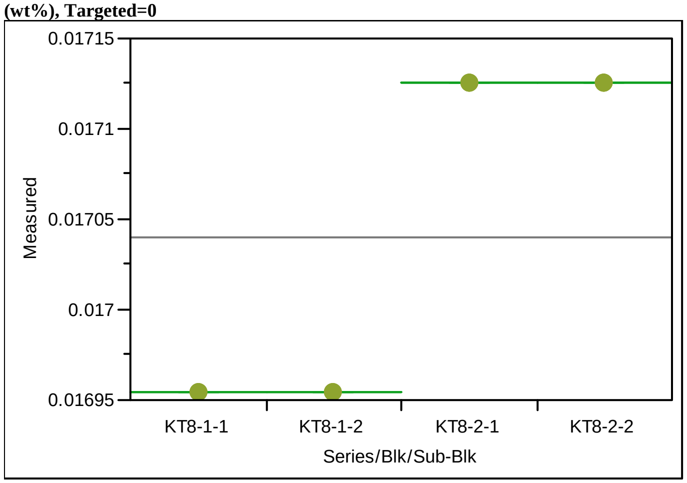
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.263639	0	0.26364	0.26364
KT8-1-2	3	0.263639	0	0.26364	0.26364
KT8-2-1	3	0.266635	0	0.26664	0.26664
KT8-2-2	3	0.266635	0	0.26664	0.26664

Std Error uses a pooled estimate of error variance

Exhibit A-4. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series Ustd Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=ThO2 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	1.82e-12
Mean of Response	0.01704
Observations (or Sum Wgts)	12

Analysis of Variance

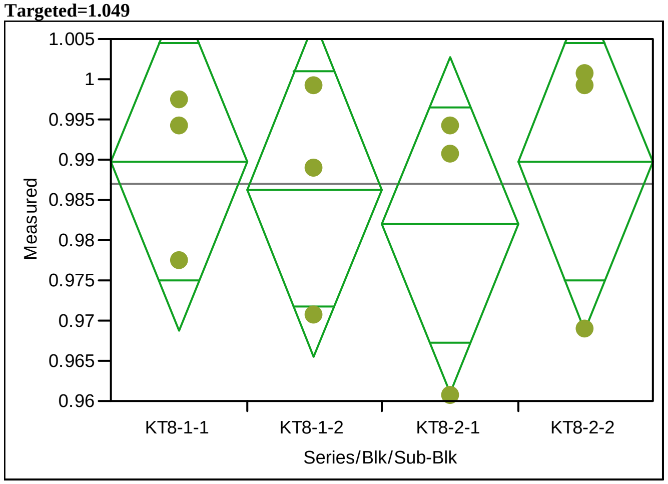
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	8.74001e-8	2.9133e-8	8.81e+15	<.0001
Error	8	2.647e-23	3.309e-24		
C. Total	11	8.74001e-8			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.016955	1.05e-12	0.01695	0.01695
KT8-1-2	3	0.016955	1.05e-12	0.01695	0.01695
KT8-2-1	3	0.017125	1.05e-12	0.01713	0.01713
KT8-2-2	3	0.017125	1.05e-12	0.01713	0.01713

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=TiO2 (wt%), Targeted=1.049



Oneway Anova
Summary of Fit

Rsquare	0.058929
Adj Rsquare	-0.29397
Root Mean Square Error	0.015632
Mean of Response	0.9869
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00012242	0.000041	0.1670	0.9157
Error	8	0.00195498	0.000244		
C. Total	11	0.00207739			

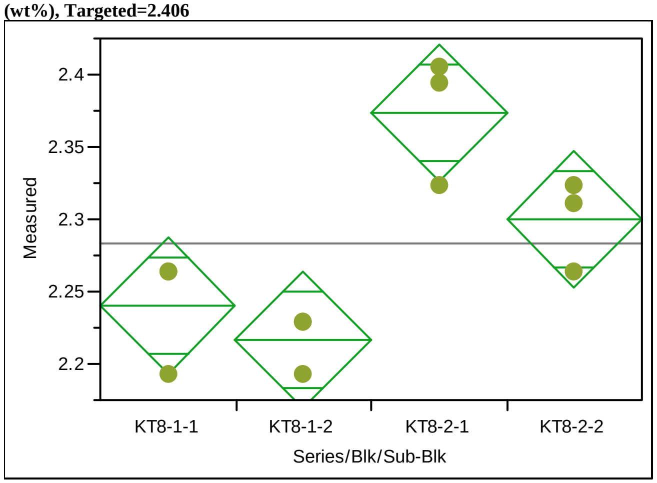
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.989680	0.00903	0.96887	1.0105
KT8-1-2	3	0.986344	0.00903	0.96553	1.0072
KT8-2-1	3	0.981896	0.00903	0.96108	1.0027
KT8-2-2	3	0.989680	0.00903	0.96887	1.0105

Std Error uses a pooled estimate of error variance

Exhibit A-4. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series Ustd Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=U3O8 (wt%), Targeted=2.406



Oneway Anova
Summary of Fit

Rsquare	0.814112
Adj Rsquare	0.744404
Root Mean Square Error	0.035539
Mean of Response	2.282735
Observations (or Sum Wgts)	12

Analysis of Variance

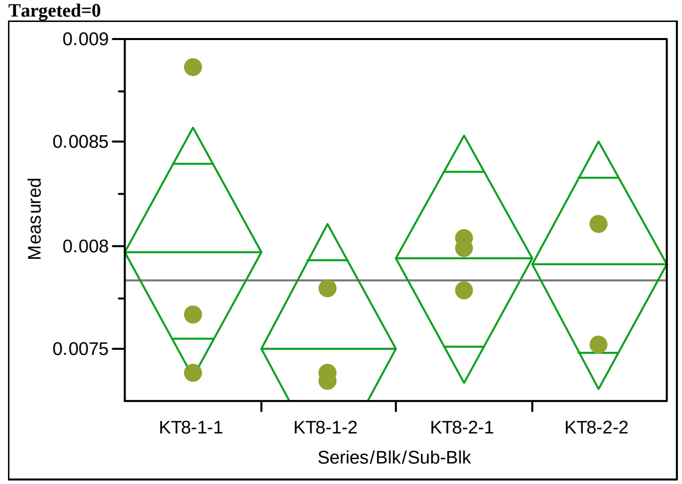
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.04425306	0.014751	11.6789	0.0027
Error	8	0.01010439	0.001263		
C. Total	11	0.05435746			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	2.24048	0.02052	2.1932	2.2878
KT8-1-2	3	2.21690	0.02052	2.1696	2.2642
KT8-2-1	3	2.37412	0.02052	2.3268	2.4214
KT8-2-2	3	2.29944	0.02052	2.2521	2.3468

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=ZnO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0.208269
Adj Rsquare	-0.08863
Root Mean Square Error	0.000451
Mean of Response	0.007831
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	4.27502e-7	1.425e-7	0.7015	0.5772
Error	8	1.62514e-6	2.0314e-7		
C. Total	11	2.05265e-6			

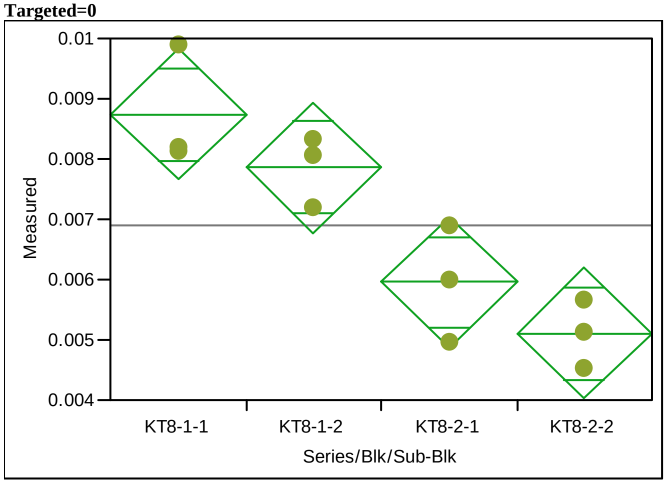
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.007971	0.00026	0.00737	0.00857
KT8-1-2	3	0.007506	0.00026	0.00691	0.00811
KT8-2-1	3	0.007938	0.00026	0.00734	0.00854
KT8-2-2	3	0.007909	0.00026	0.00731	0.00851

Std Error uses a pooled estimate of error variance

Exhibit A-4. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series Ustd Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=CH, Oxide=ZrO2 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0.827612
Adj Rsquare	0.762967
Root Mean Square Error	0.000811
Mean of Response	0.006915
Observations (or Sum Wgts)	12

Analysis of Variance

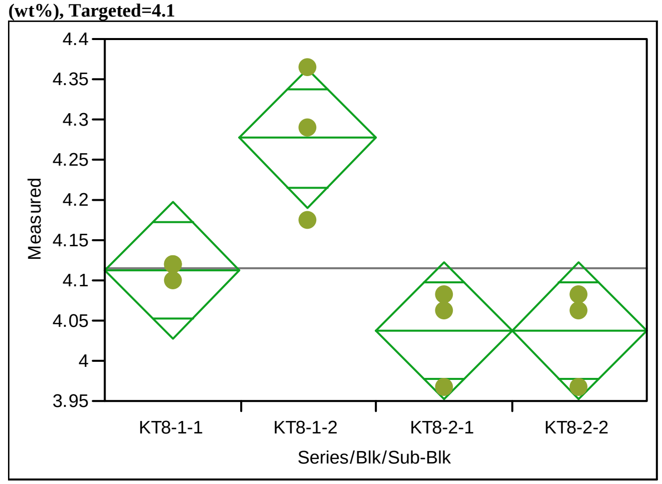
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00002527	8.4244e-6	12.8023	0.0020
Error	8	0.00000526	6.5803e-7		
C. Total	11	0.00003054			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.008740	0.00047	0.00766	0.00982
KT8-1-2	3	0.007862	0.00047	0.00678	0.00894
KT8-2-1	3	0.005953	0.00047	0.00487	0.00703
KT8-2-2	3	0.005106	0.00047	0.00403	0.00619

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=PF, Oxide=Al2O3 (wt%), Targeted=4.1



Oneway Anova
Summary of Fit

Rsquare	0.775987
Adj Rsquare	0.691982
Root Mean Square Error	0.064308
Mean of Response	4.115961
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.11460375	0.038201	9.2374	0.0056
Error	8	0.03308395	0.004135		
C. Total	11	0.14768770			

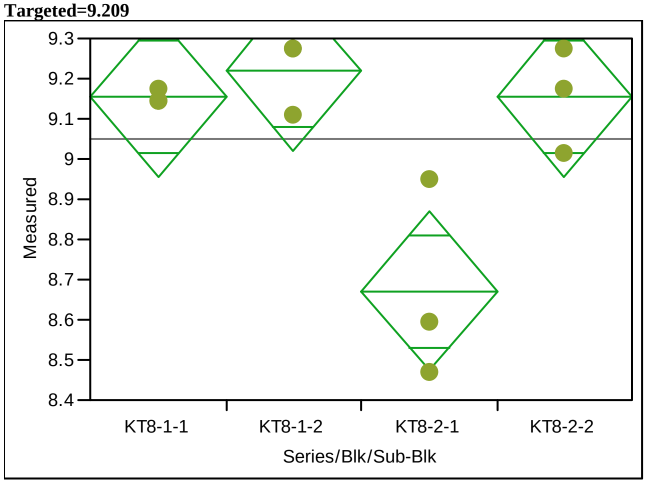
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	4.11281	0.03713	4.0272	4.1984
KT8-1-2	3	4.27657	0.03713	4.1910	4.3622
KT8-2-1	3	4.03723	0.03713	3.9516	4.1228
KT8-2-2	3	4.03723	0.03713	3.9516	4.1228

Std Error uses a pooled estimate of error variance

Exhibit A-4. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series Ustd Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=PF, Oxide=B2O3 (wt%), Targeted=9.209



Oneway Anova
Summary of Fit

Rsquare	0.766503
Adj Rsquare	0.678942
Root Mean Square Error	0.148721
Mean of Response	9.050602
Observations (or Sum Wgts)	12

Analysis of Variance

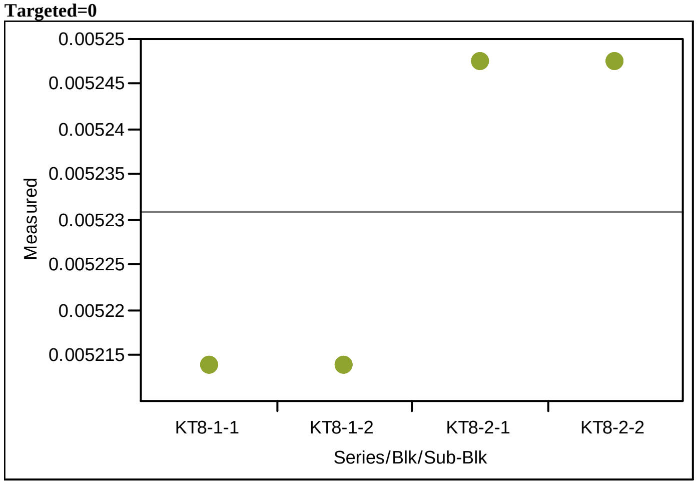
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.58085353	0.193618	8.7539	0.0066
Error	8	0.17694304	0.022118		
C. Total	11	0.75779657			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	9.15525	0.08586	8.9572	9.3533
KT8-1-2	3	9.21965	0.08586	9.0216	9.4176
KT8-2-1	3	8.67226	0.08586	8.4743	8.8703
KT8-2-2	3	9.15525	0.08586	8.9572	9.3533

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=PF, Oxide=BaO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	.
Mean of Response	0.005231
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	3.36575e-9	1.1219e-9	-5.1e+13	0.0000
Error	8	-1.749e-22	-2.19e-23		
C. Total	11	3.36575e-9			

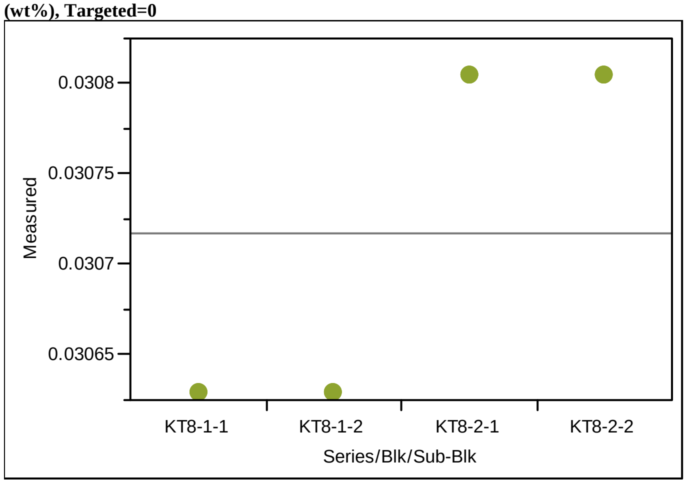
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.005214	.	.	.
KT8-1-2	3	0.005214	.	.	.
KT8-2-1	3	0.005248	.	.	.
KT8-2-2	3	0.005248	.	.	.

Std Error uses a pooled estimate of error variance

Exhibit A-4. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series Ustd Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=PF, Oxide=Ce2O3 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	.
Mean of Response	0.030717
Observations (or Sum Wgts)	12

Analysis of Variance

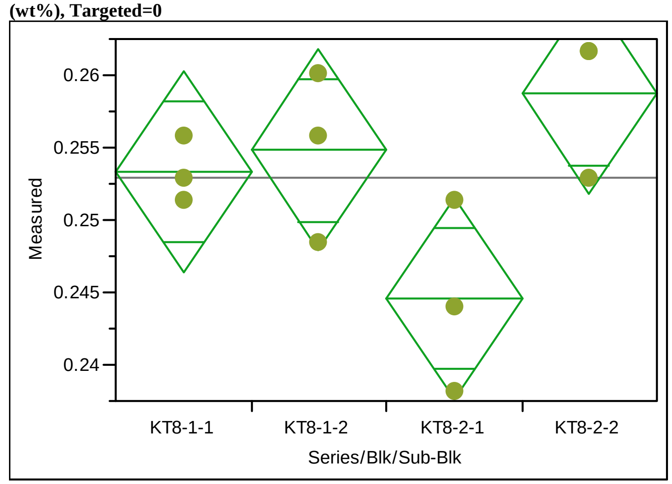
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	9.26062e-8	3.0869e-8	-1.9e+16	0.0000
Error	8	-1.323e-23	-1.65e-24		
C. Total	11	9.26062e-8			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.030629	.	.	.
KT8-1-2	3	0.030629	.	.	.
KT8-2-1	3	0.030805	.	.	.
KT8-2-2	3	0.030805	.	.	.

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=PF, Oxide=Cr2O3 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0.595238
Adj Rsquare	0.443452
Root Mean Square Error	0.005219
Mean of Response	0.252857
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00032044	0.000107	3.9216	0.0543
Error	8	0.00021790	0.000027		
C. Total	11	0.00053834			

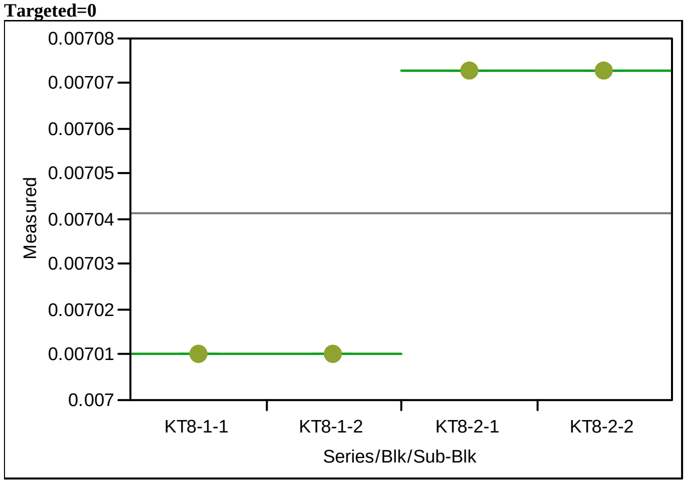
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.253344	0.00301	0.24640	0.26029
KT8-1-2	3	0.254806	0.00301	0.24786	0.26175
KT8-2-1	3	0.244574	0.00301	0.23763	0.25152
KT8-2-2	3	0.258703	0.00301	0.25175	0.26565

Std Error uses a pooled estimate of error variance

Exhibit A-4. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series Ustd Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=PF, Oxide=CuO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	4.55e-13
Mean of Response	0.007041
Observations (or Sum Wgts)	12

Analysis of Variance

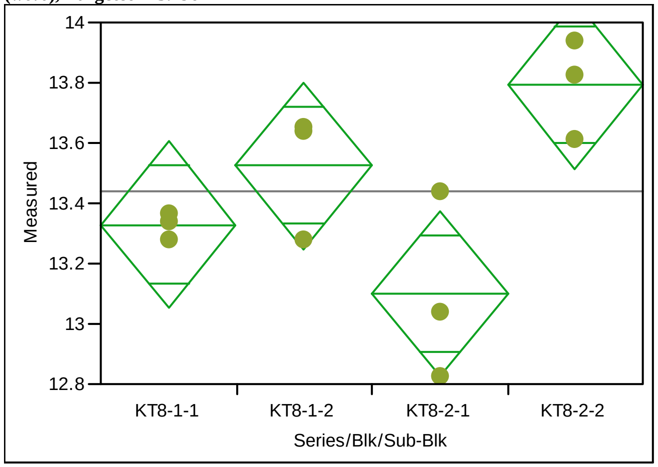
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	1.17525e-8	3.9175e-9	1.89e+16	<.0001
Error	8	1.6544e-24	2.068e-25		
C. Total	11	1.17525e-8			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.007010	2.625e-13	0.00701	0.00701
KT8-1-2	3	0.007010	2.625e-13	0.00701	0.00701
KT8-2-1	3	0.007073	2.625e-13	0.00707	0.00707
KT8-2-2	3	0.007073	2.625e-13	0.00707	0.00707

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=PF, Oxide=Fe2O3 (wt%), Targeted=13.196



Oneway Anova
Summary of Fit

Rsquare	0.693105
Adj Rsquare	0.578019
Root Mean Square Error	0.20706
Mean of Response	13.4368
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.7746238	0.258208	6.0225	0.0190
Error	8	0.3429903	0.042874		
C. Total	11	1.1176141			

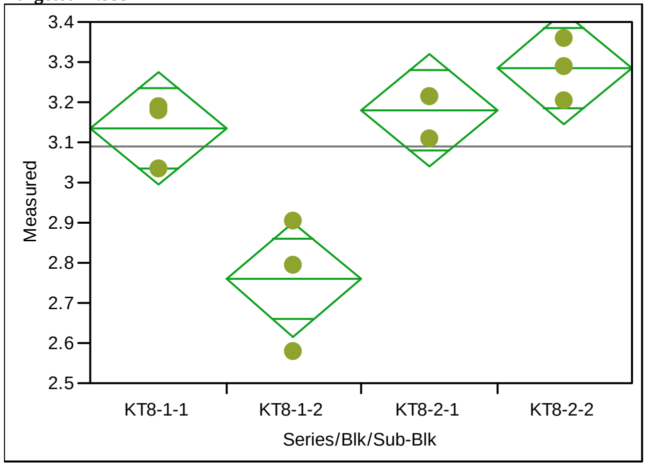
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	13.3296	0.11955	13.054	13.605
KT8-1-2	3	13.5250	0.11955	13.249	13.801
KT8-2-1	3	13.1008	0.11955	12.825	13.376
KT8-2-2	3	13.7918	0.11955	13.516	14.068

Std Error uses a pooled estimate of error variance

Exhibit A-4. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series Ustd Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=PF, Oxide=K2O (wt%), Targeted=2.999



Oneway Anova
Summary of Fit

Rsquare	0.840151
Adj Rsquare	0.780208
Root Mean Square Error	0.10616
Mean of Response	3.089799
Observations (or Sum Wgts)	12

Analysis of Variance

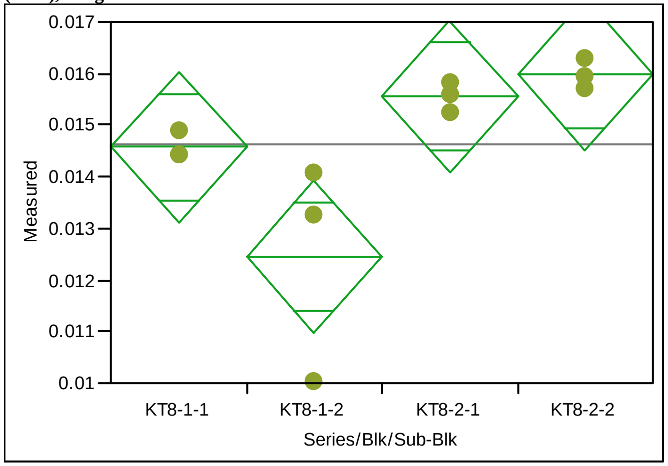
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.47386821	0.157956	14.0157	0.0015
Error	8	0.09015927	0.011270		
C. Total	11	0.56402747			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	3.13598	0.06129	2.9946	3.2773
KT8-1-2	3	2.75853	0.06129	2.6172	2.8999
KT8-2-1	3	3.18014	0.06129	3.0388	3.3215
KT8-2-2	3	3.28454	0.06129	3.1432	3.4259

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=PF, Oxide=La2O3 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0.69882
Adj Rsquare	0.585877
Root Mean Square Error	0.001098
Mean of Response	0.014645
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00002238	7.4591e-6	6.1874	0.0176
Error	8	0.00000964	1.2055e-6		
C. Total	11	0.00003202			

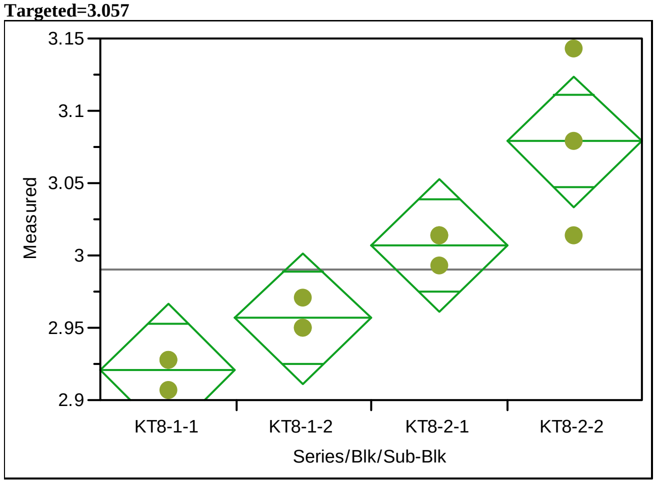
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.014582	0.00063	0.01312	0.01604
KT8-1-2	3	0.012451	0.00063	0.01099	0.01391
KT8-2-1	3	0.015559	0.00063	0.01410	0.01702
KT8-2-2	3	0.015989	0.00063	0.01453	0.01745

Std Error uses a pooled estimate of error variance

Exhibit A-4. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series Ustd Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=PF, Oxide=Li2O (wt%), Targeted=3.057



Oneway Anova
Summary of Fit

Rsquare	0.819684
Adj Rsquare	0.752066
Root Mean Square Error	0.03404
Mean of Response	2.990737
Observations (or Sum Wgts)	12

Analysis of Variance

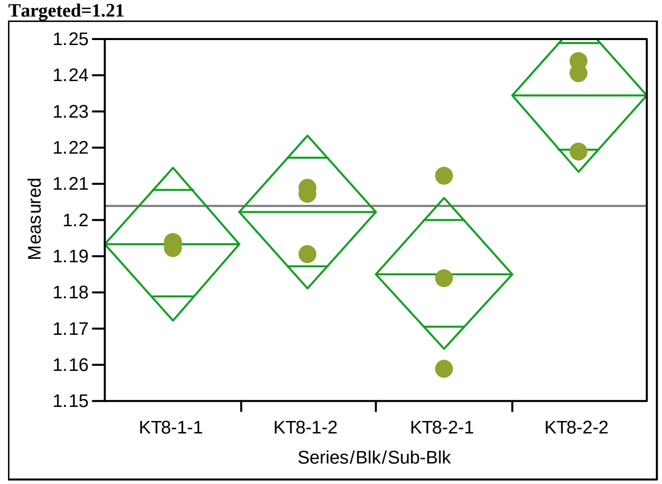
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.04213968	0.014047	12.1222	0.0024
Error	8	0.00926996	0.001159		
C. Total	11	0.05140964			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	2.92077	0.01965	2.8754	2.9661
KT8-1-2	3	2.95665	0.01965	2.9113	3.0020
KT8-2-1	3	3.00688	0.01965	2.9616	3.0522
KT8-2-2	3	3.07865	0.01965	3.0333	3.1240

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=PF, Oxide=MgO (wt%), Targeted=1.21



Oneway Anova
Summary of Fit

Rsquare	0.678128
Adj Rsquare	0.557427
Root Mean Square Error	0.015732
Mean of Response	1.203788
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00417146	0.001390	5.6182	0.0227
Error	8	0.00197997	0.000247		
C. Total	11	0.00615143			

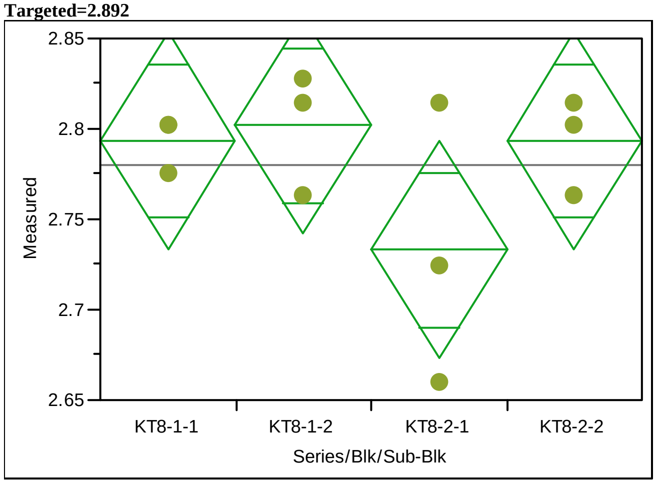
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	1.19342	0.00908	1.1725	1.2144
KT8-1-2	3	1.20227	0.00908	1.1813	1.2232
KT8-2-1	3	1.18513	0.00908	1.1642	1.2061
KT8-2-2	3	1.23433	0.00908	1.2134	1.2553

Std Error uses a pooled estimate of error variance

Exhibit A-4. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series Ustd Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=PF, Oxide=MnO (wt%), Targeted=2.892



Oneway Anova
Summary of Fit

Rsquare	0.358079
Adj Rsquare	0.117358
Root Mean Square Error	0.045192
Mean of Response	2.780384
Observations (or Sum Wgts)	12

Analysis of Variance

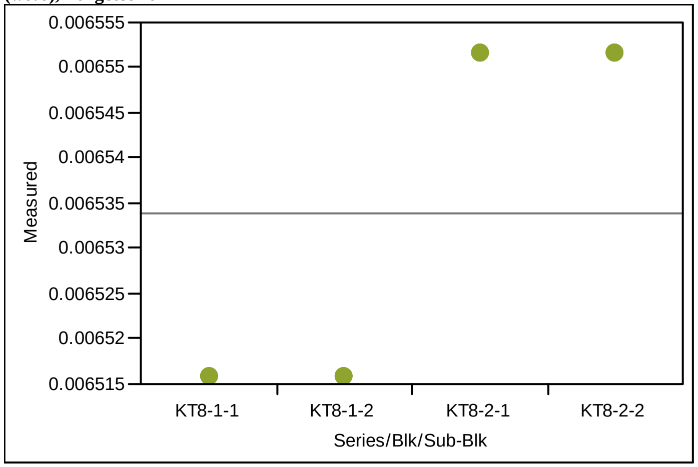
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00911401	0.003038	1.4875	0.2899
Error	8	0.01633853	0.002042		
C. Total	11	0.02545255			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	2.79330	0.02609	2.7331	2.8535
KT8-1-2	3	2.80190	0.02609	2.7417	2.8621
KT8-2-1	3	2.73304	0.02609	2.6729	2.7932
KT8-2-2	3	2.79330	0.02609	2.7331	2.8535

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=PF, Oxide=Nb2O5 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	.
Mean of Response	0.006534
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	3.83687e-9	1.279e-9	-1.2e+16	0.0000
Error	8	-8.272e-25	-1.03e-25		
C. Total	11	3.83687e-9			

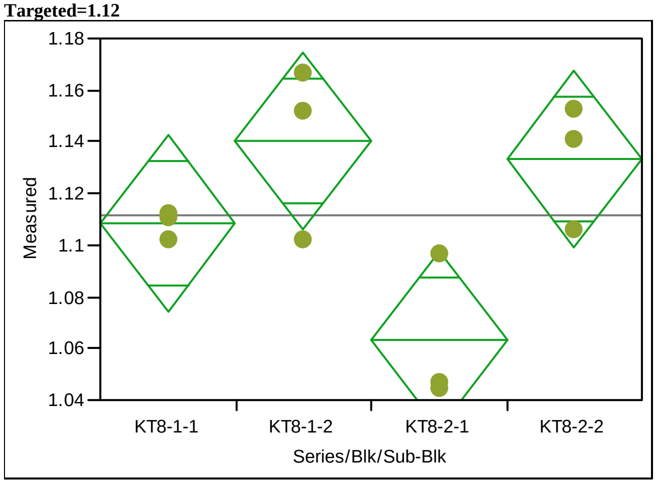
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.006516	.	.	.
KT8-1-2	3	0.006516	.	.	.
KT8-2-1	3	0.006552	.	.	.
KT8-2-2	3	0.006552	.	.	.

Std Error uses a pooled estimate of error variance

Exhibit A-4. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series Ustd Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=PF, Oxide=NiO (wt%), Targeted=1.12



Oneway Anova
Summary of Fit

Rsquare	0.674756
Adj Rsquare	0.55279
Root Mean Square Error	0.02574
Mean of Response	1.111211
Observations (or Sum Wgts)	12

Analysis of Variance

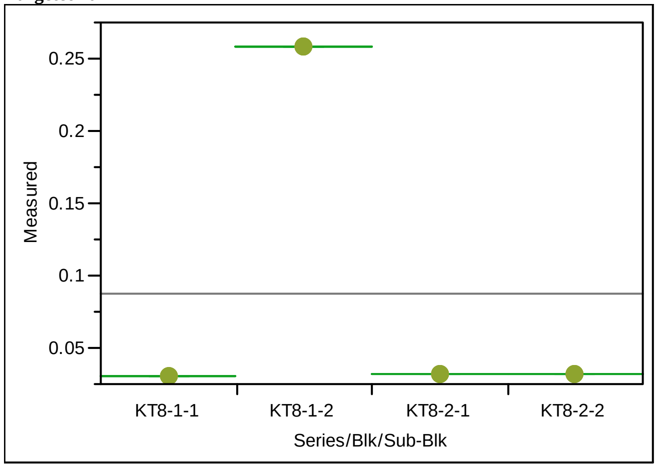
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.01099623	0.003665	5.5323	0.0237
Error	8	0.00530037	0.000663		
C. Total	11	0.01629660			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	1.10835	0.01486	1.0741	1.1426
KT8-1-2	3	1.14016	0.01486	1.1059	1.1744
KT8-2-1	3	1.06296	0.01486	1.0287	1.0972
KT8-2-2	3	1.13337	0.01486	1.0991	1.1676

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=PF, Oxide=PbO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	1.317e-9
Mean of Response	0.088101
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.11618083	0.038727	2.23e+16	<.0001
Error	8	1.3878e-17	1.73e-18		
C. Total	11	0.11618083			

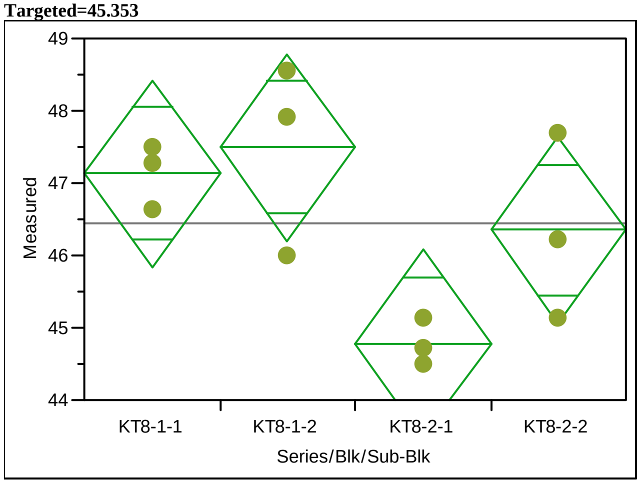
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.031185	7.604e-10	0.03118	0.03118
KT8-1-2	3	0.258528	7.604e-10	0.25853	0.25853
KT8-2-1	3	0.031347	7.604e-10	0.03135	0.03135
KT8-2-2	3	0.031347	7.604e-10	0.03135	0.03135

Std Error uses a pooled estimate of error variance

Exhibit A-4. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series Ustd Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=PF, Oxide=SiO2 (wt%), Targeted=45.353



Oneway Anova
Summary of Fit

Rsquare	0.634676
Adj Rsquare	0.49768
Root Mean Square Error	0.968609
Mean of Response	46.44064
Observations (or Sum Wgts)	12

Analysis of Variance

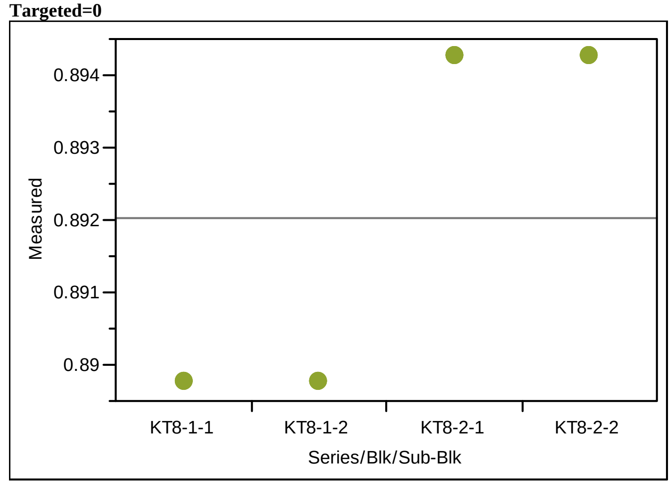
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	13.039509	4.34650	4.6328	0.0368
Error	8	7.505631	0.93820		
C. Total	11	20.545140			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	47.1359	0.55923	45.846	48.425
KT8-1-2	3	47.4925	0.55923	46.203	48.782
KT8-2-1	3	44.7827	0.55923	43.493	46.072
KT8-2-2	3	46.3515	0.55923	45.062	47.641

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=PF, Oxide=SO4 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	1
Adj Rsquare	1
Root Mean Square Error	.
Mean of Response	0.892029
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.0000606	2.019e-5	-5.4e+13	0.0000
Error	8	-2.988e-18	-3.7e-19		
C. Total	11	0.0000606			

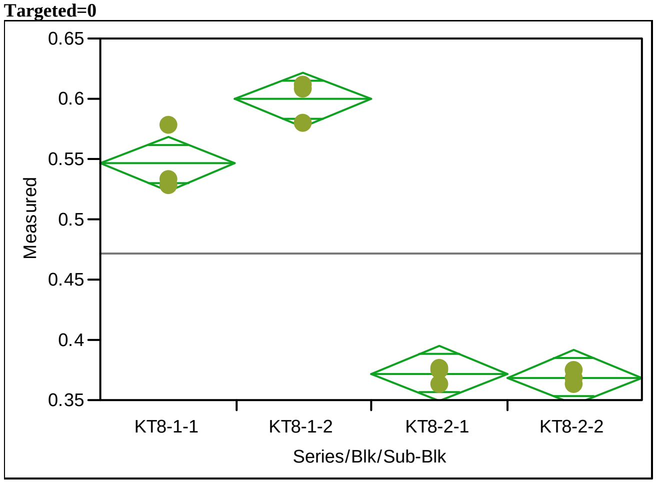
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.889782	.	.	.
KT8-1-2	3	0.889782	.	.	.
KT8-2-1	3	0.894276	.	.	.
KT8-2-2	3	0.894276	.	.	.

Std Error uses a pooled estimate of error variance

Exhibit A-4. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series Ustd Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=PF, Oxide=ThO2 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0.981875
Adj Rsquare	0.975079
Root Mean Square Error	0.017128
Mean of Response	0.471754
Observations (or Sum Wgts)	12

Analysis of Variance

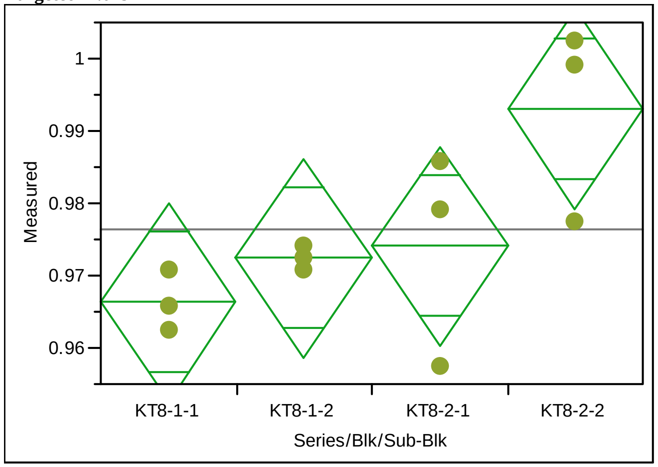
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.12714871	0.042383	144.4623	<.0001
Error	8	0.00234707	0.000293		
C. Total	11	0.12949578			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.546192	0.00989	0.52339	0.56900
KT8-1-2	3	0.599673	0.00989	0.57687	0.62248
KT8-2-1	3	0.372093	0.00989	0.34929	0.39490
KT8-2-2	3	0.369059	0.00989	0.34625	0.39186

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=PF, Oxide=TiO2 (wt%), Targeted=1.049



Oneway Anova
Summary of Fit

Rsquare	0.584533
Adj Rsquare	0.428733
Root Mean Square Error	0.010305
Mean of Response	0.976475
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00119520	0.000398	3.7518	0.0598
Error	8	0.00084951	0.000106		
C. Total	11	0.00204470			

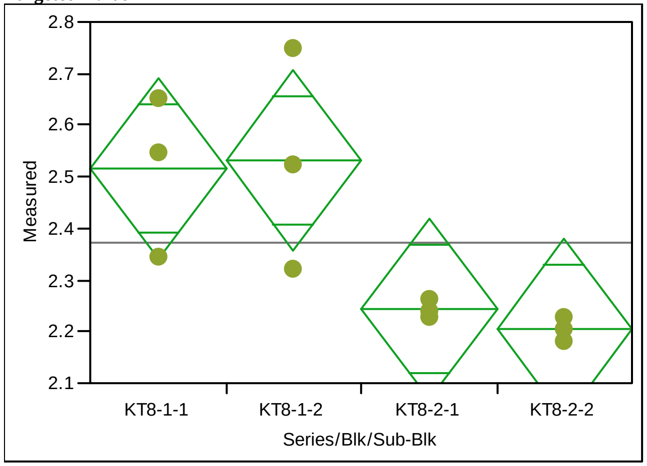
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.966328	0.00595	0.95261	0.9800
KT8-1-2	3	0.972444	0.00595	0.95872	0.9862
KT8-2-1	3	0.974112	0.00595	0.96039	0.9878
KT8-2-2	3	0.993016	0.00595	0.97930	1.0067

Std Error uses a pooled estimate of error variance

Exhibit A-4. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08-Series Ustd Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=PF, Oxide=U3O8 (wt%), Targeted=2.406



Oneway Anova
Summary of Fit

Rsquare	0.658168
Adj Rsquare	0.529981
Root Mean Square Error	0.132496
Mean of Response	2.374123
Observations (or Sum Wgts)	12

Analysis of Variance

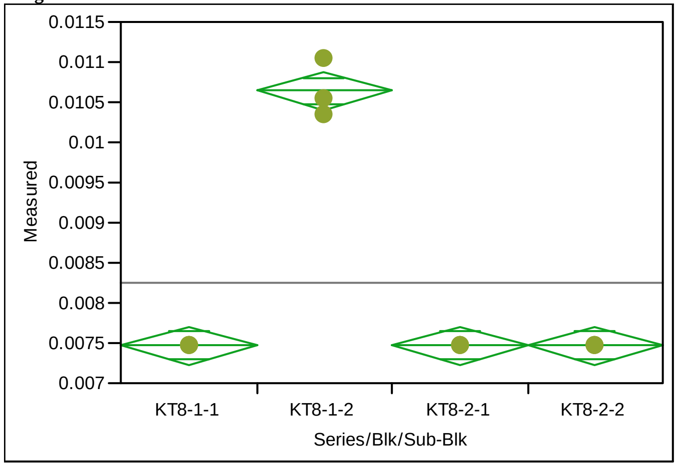
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.27040836	0.090136	5.1344	0.0286
Error	8	0.14044178	0.017555		
C. Total	11	0.41085013			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	2.51563	0.07650	2.3392	2.6920
KT8-1-2	3	2.53135	0.07650	2.3549	2.7078
KT8-2-1	3	2.24441	0.07650	2.0680	2.4208
KT8-2-2	3	2.20510	0.07650	2.0287	2.3815

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk Type=U std, Prep Method=PF, Oxide=ZnO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0.988754
Adj Rsquare	0.984537
Root Mean Square Error	0.00018
Mean of Response	0.008262
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00002267	7.5568e-6	234.4651	<.0001
Error	8	0.00000026	3.223e-8		
C. Total	11	0.00002293			

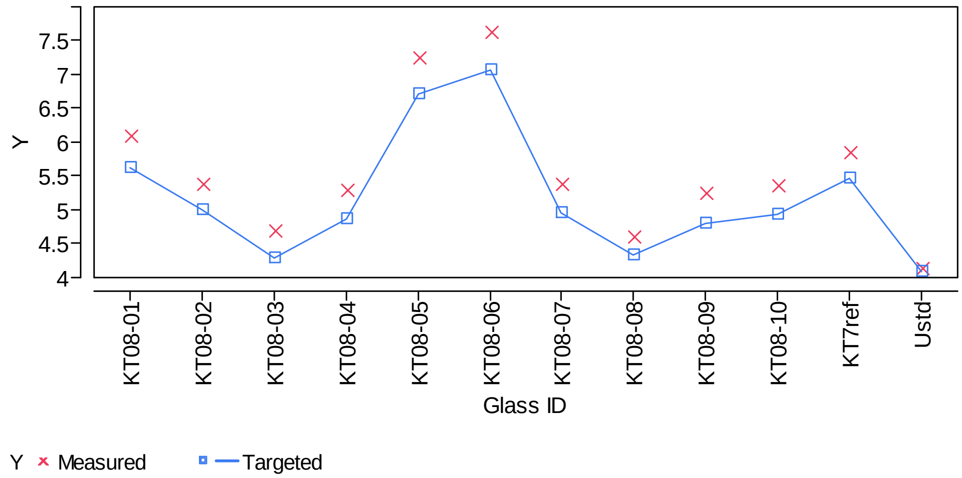
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT8-1-1	3	0.007469	0.00010	0.00723	0.00771
KT8-1-2	3	0.010643	0.00010	0.01040	0.01088
KT8-2-1	3	0.007469	0.00010	0.00723	0.00771
KT8-2-2	3	0.007469	0.00010	0.00723	0.00771

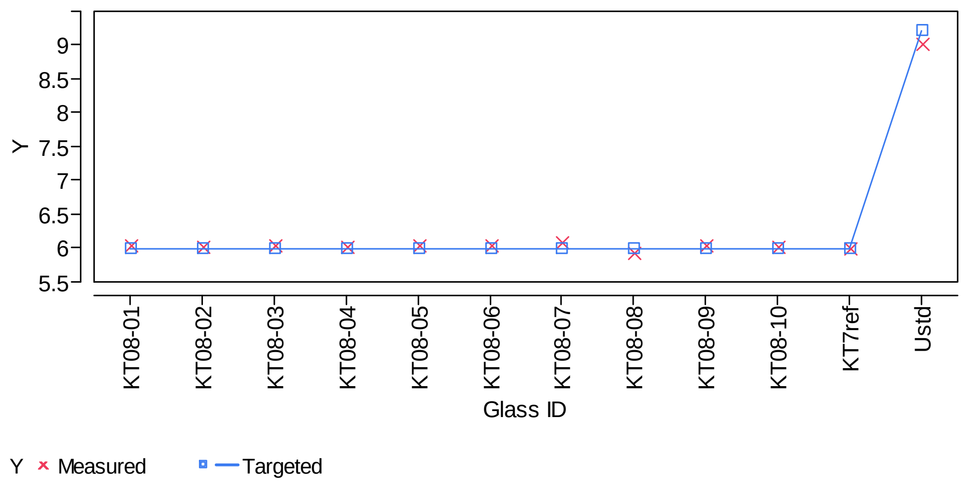
Std Error uses a pooled estimate of error variance

Exhibit A-5. Measured versus Targeted Concentrations by Glass ID by Oxide.

Oxide=Al2O3 (wt%)



Oxide=B2O3 (wt%)



Oxide=BaO (wt%)

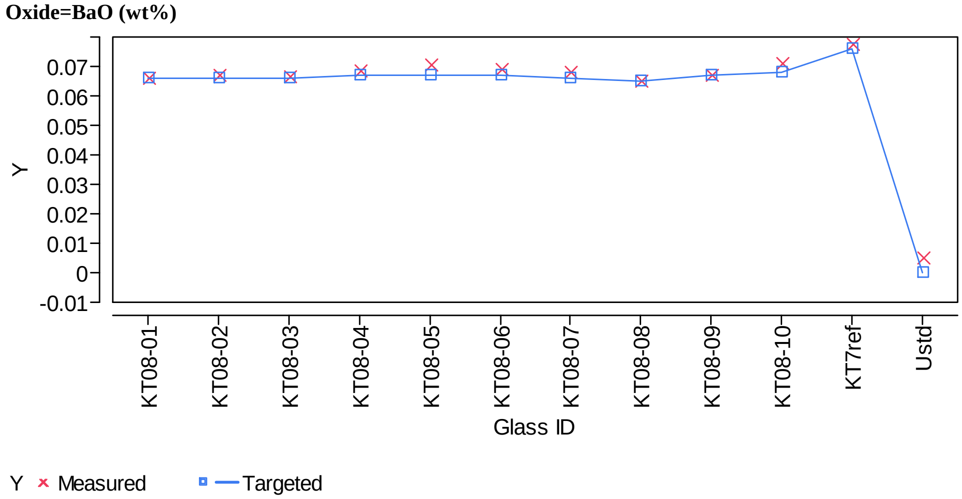
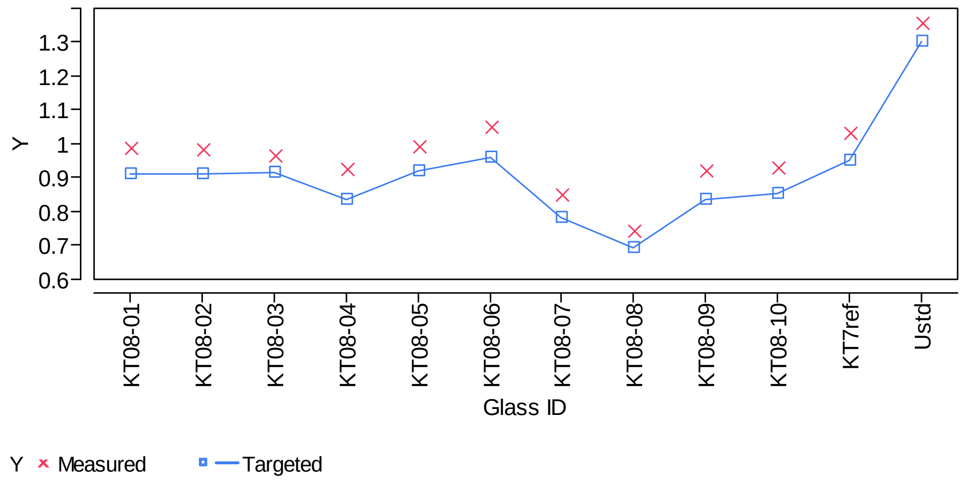
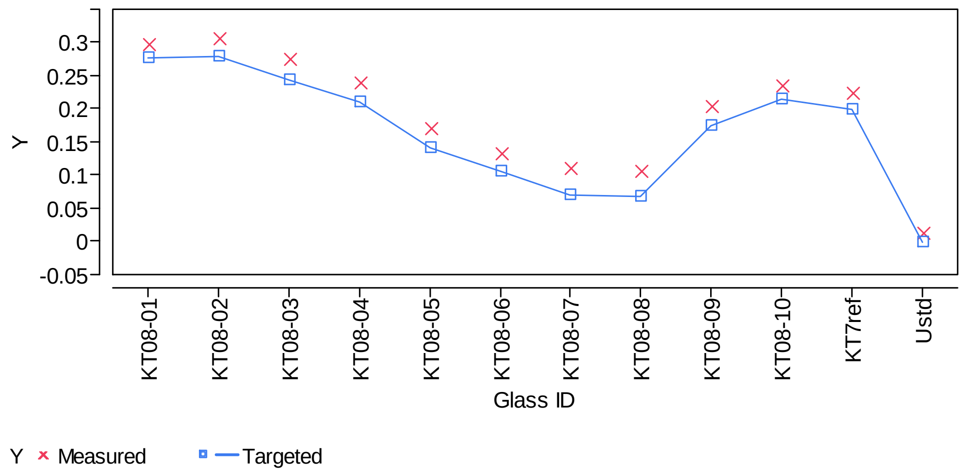


Exhibit A-5. Measured versus Targeted Concentrations by Glass ID by Oxide. (continued)

Oxide=CaO (wt%)



Oxide=Ce2O3 (wt%)



Oxide=Cr2O3 (wt%)

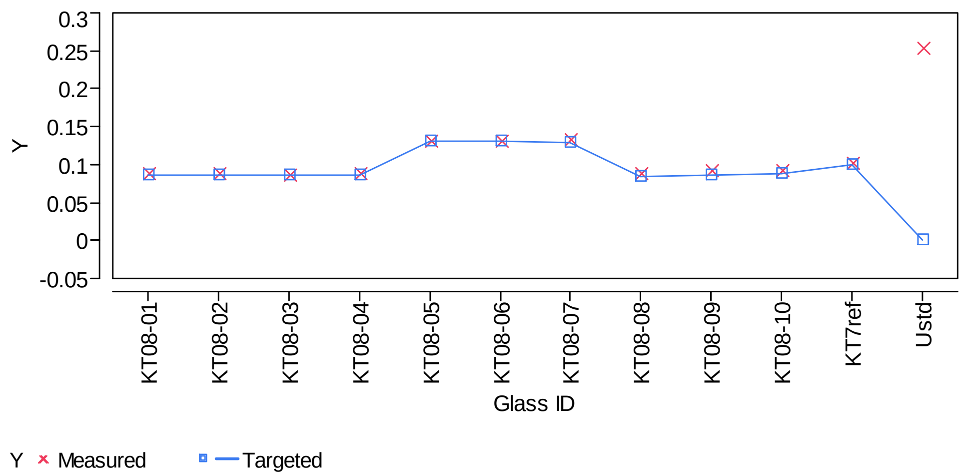
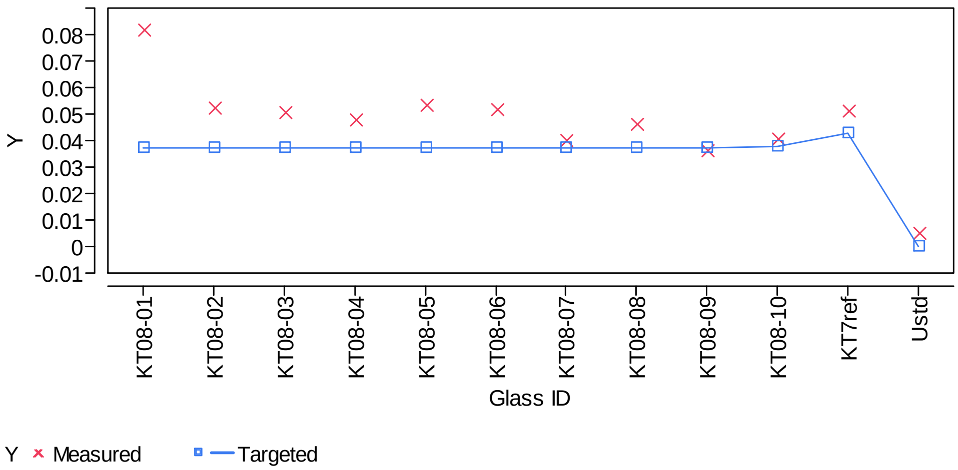
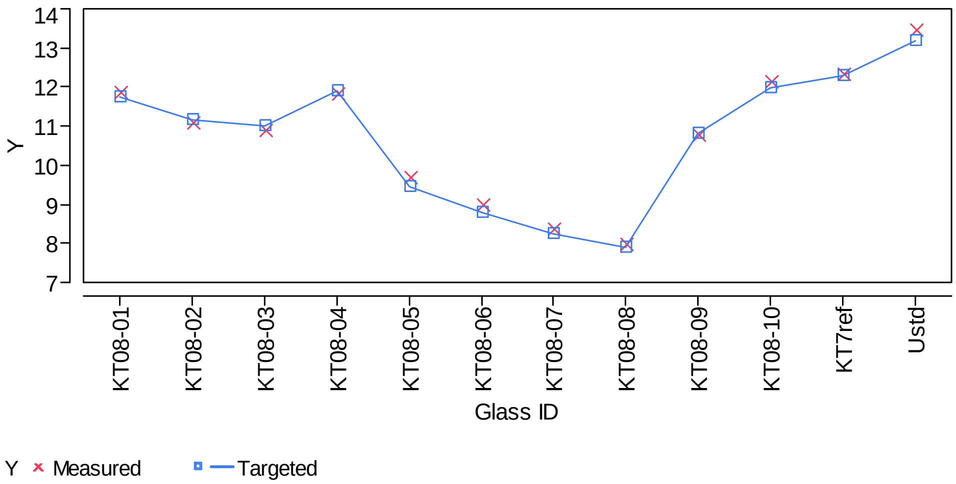


Exhibit A-5. Measured versus Targeted Concentrations by Glass ID by Oxide. (continued)

Oxide=CuO (wt%)



Oxide=Fe2O3 (wt%)



Oxide=K2O (wt%)

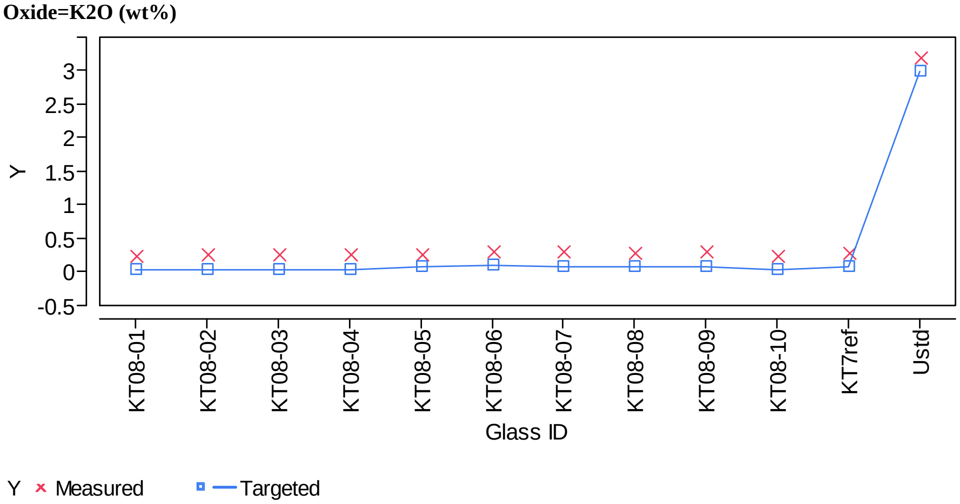
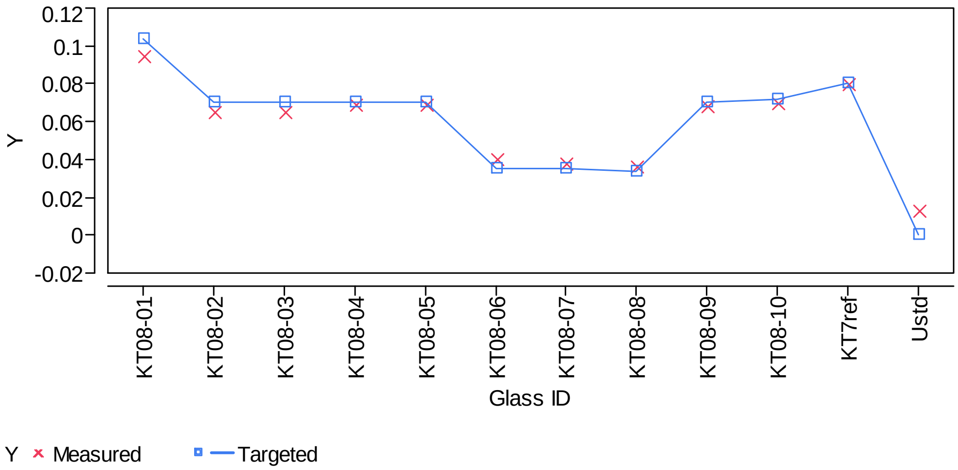
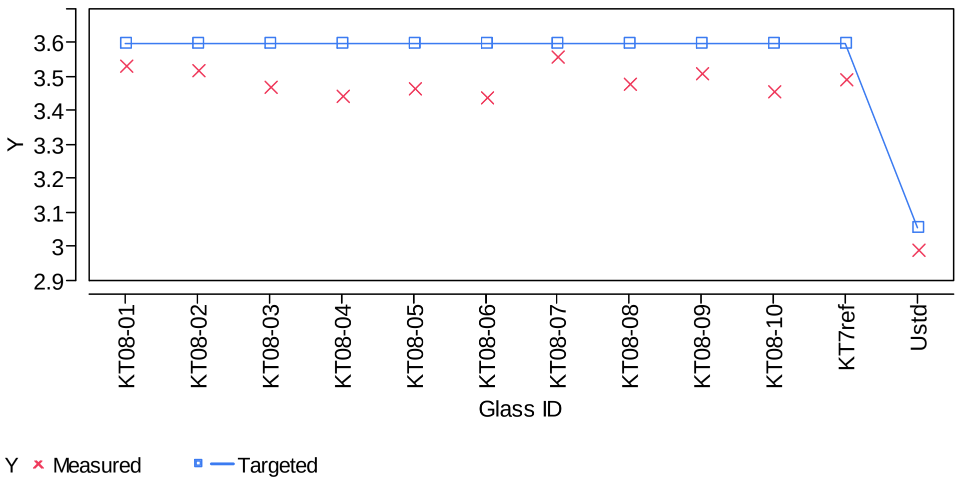


Exhibit A-5. Measured versus Targeted Concentrations by Glass ID by Oxide. (continued)

Oxide=La2O3 (wt%)



Oxide=Li2O (wt%)



Oxide=MgO (wt%)

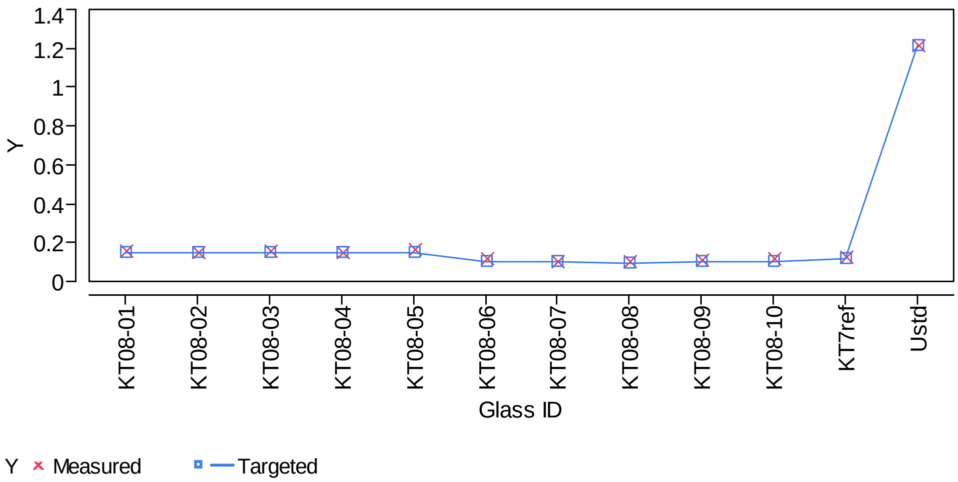
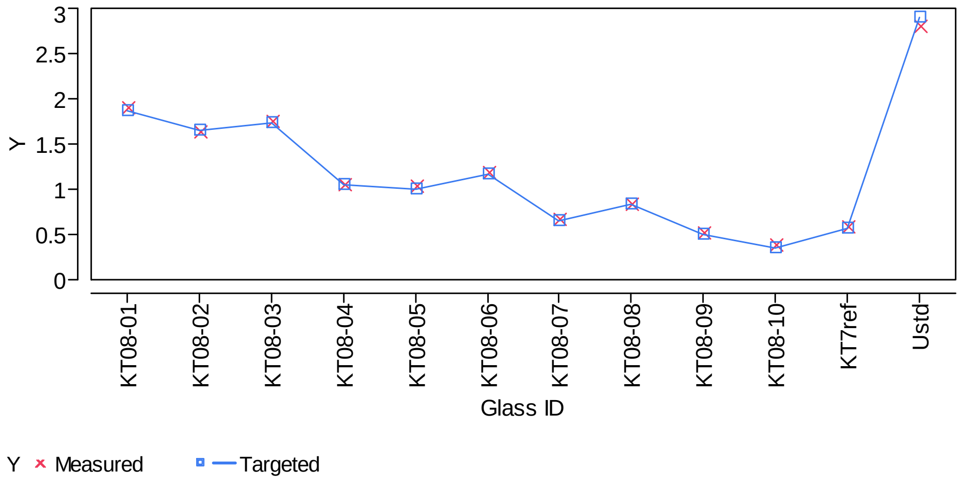
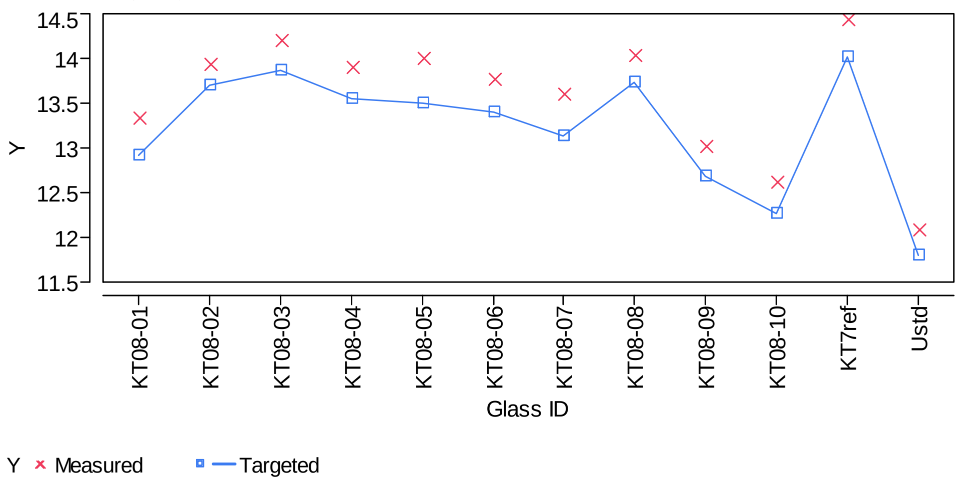


Exhibit A-5. Measured versus Targeted Concentrations by Glass ID by Oxide. (continued)

Oxide=MnO (wt%)



Oxide=Na2O (wt%)



Oxide=Nb2O5 (wt%)

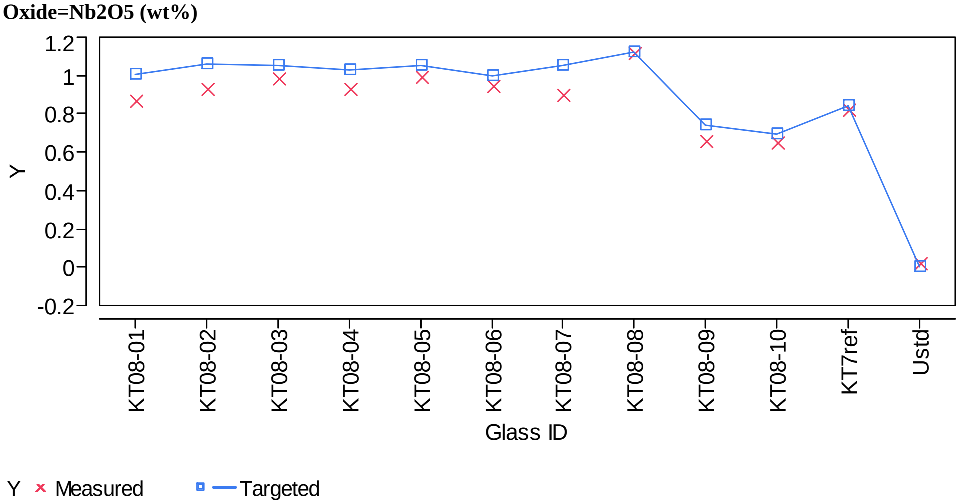
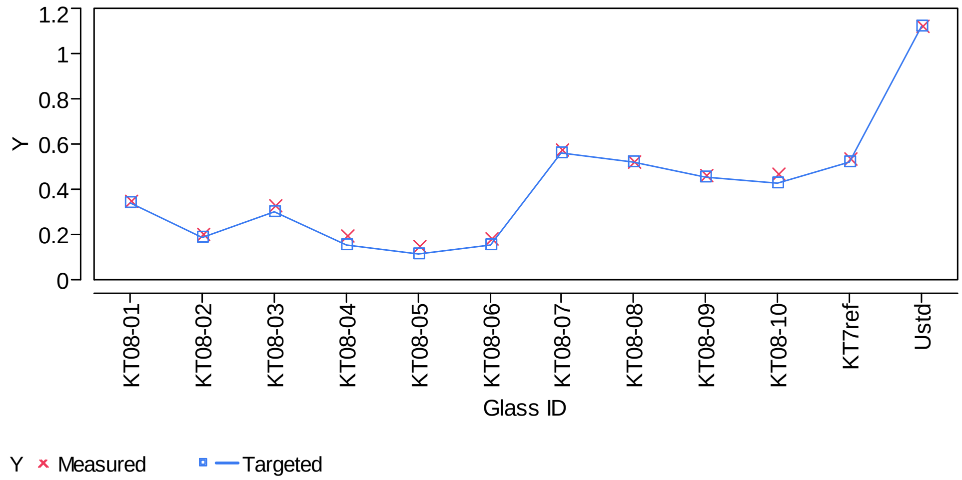
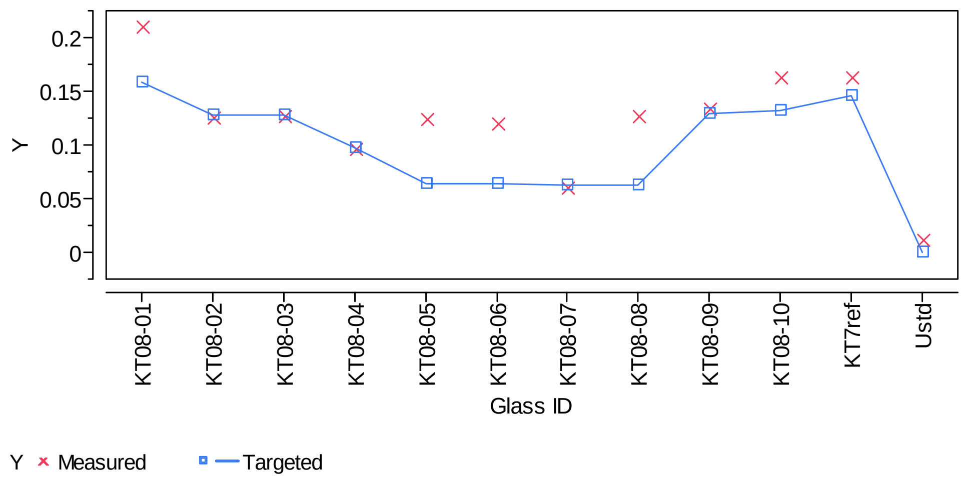


Exhibit A-5. Measured versus Targeted Concentrations by Glass ID by Oxide. (continued)

Oxide=NiO (wt%)



Oxide=PbO (wt%)



Oxide=SiO2 (wt%)

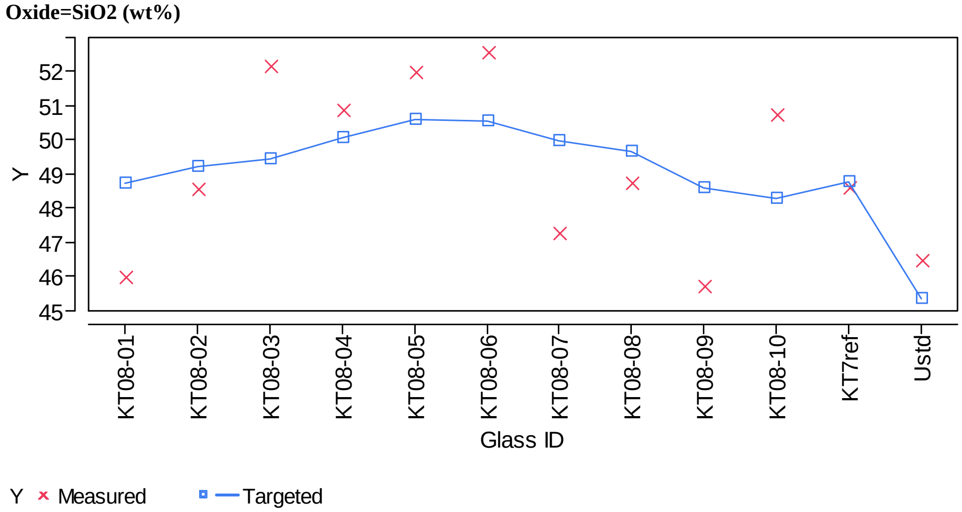
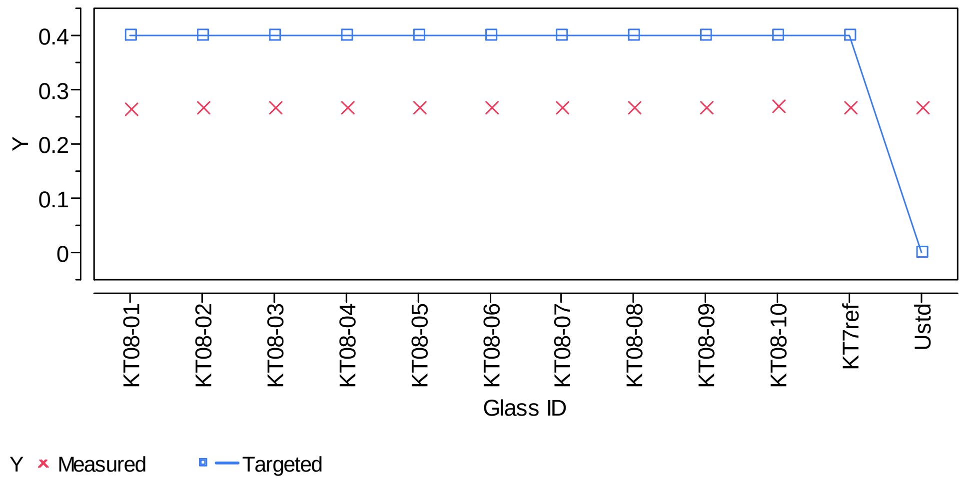
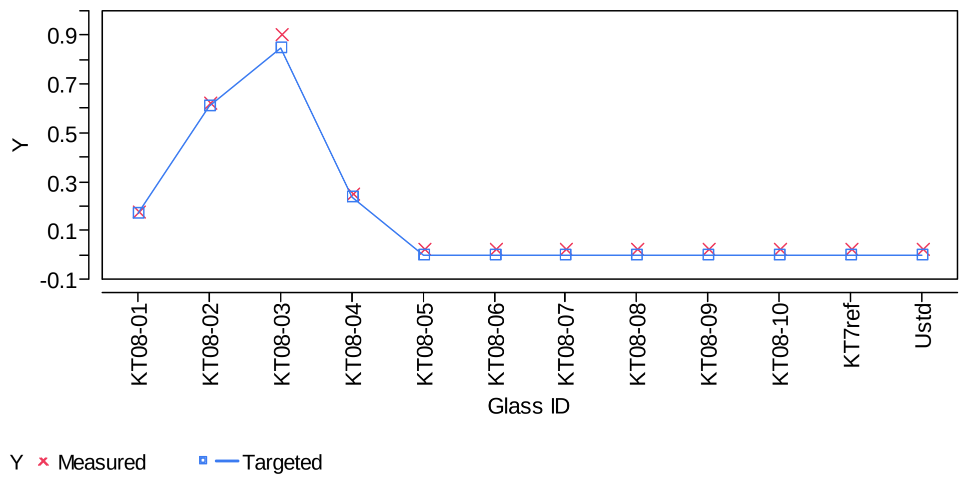


Exhibit A-5. Measured versus Targeted Concentrations by Glass ID by Oxide. (continued)

Oxide=SO4 (wt%)



Oxide=ThO2 (wt%)



Oxide=TiO2 (wt%)

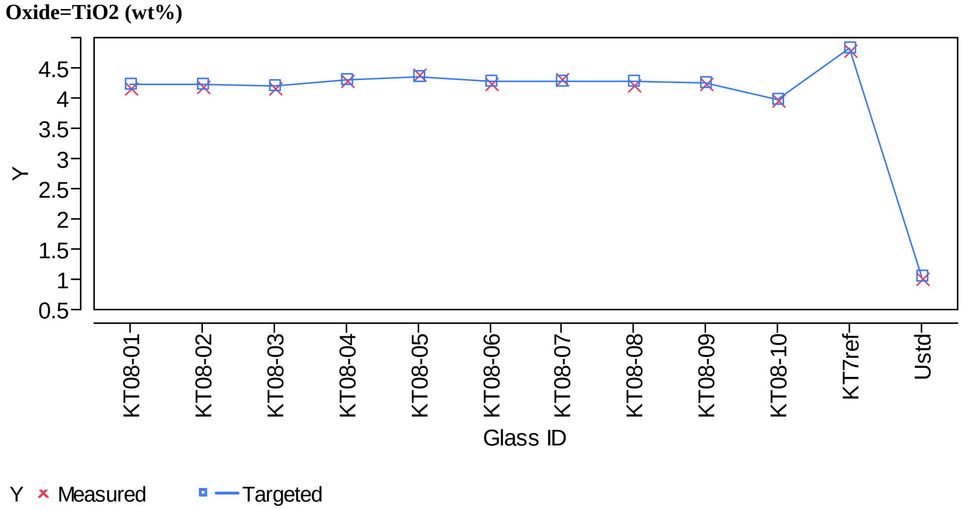
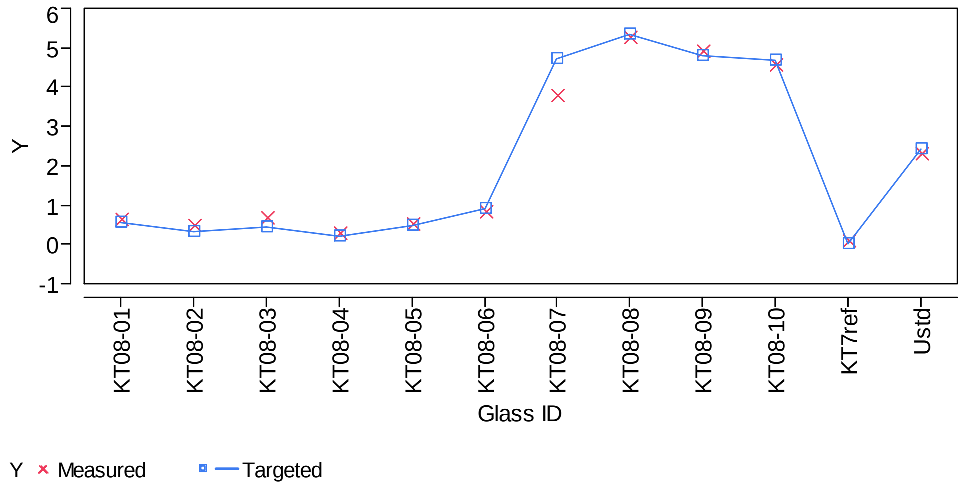
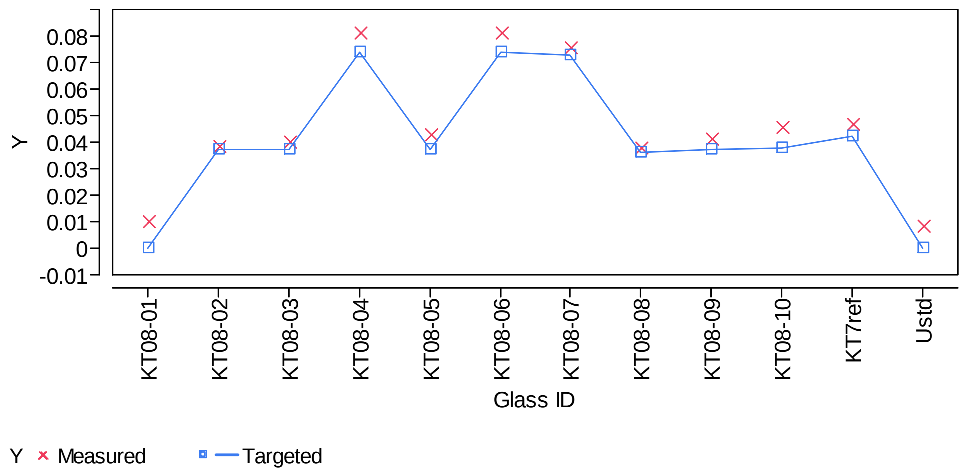


Exhibit A-5. Measured versus Targeted Concentrations by Glass ID by Oxide. (continued)

Oxide=U3O8 (wt%)



Oxide=ZnO (wt%)



Oxide=ZrO2 (wt%)

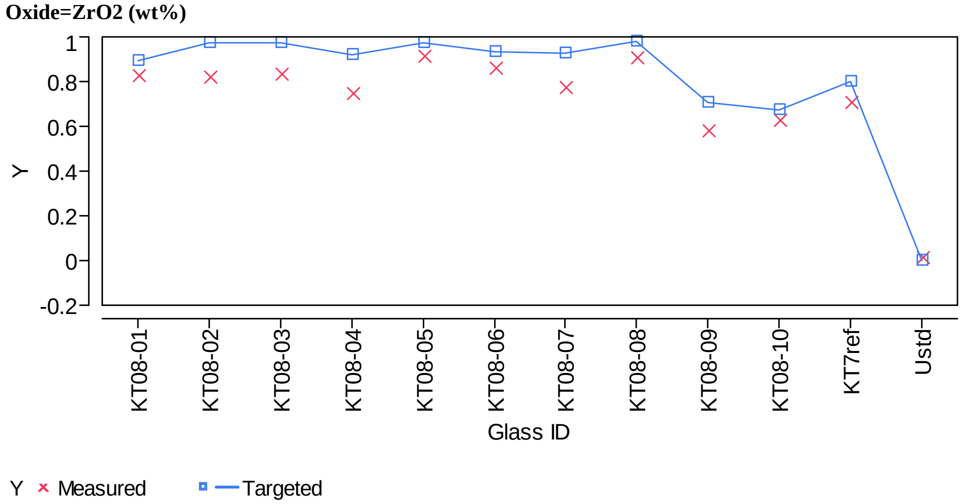
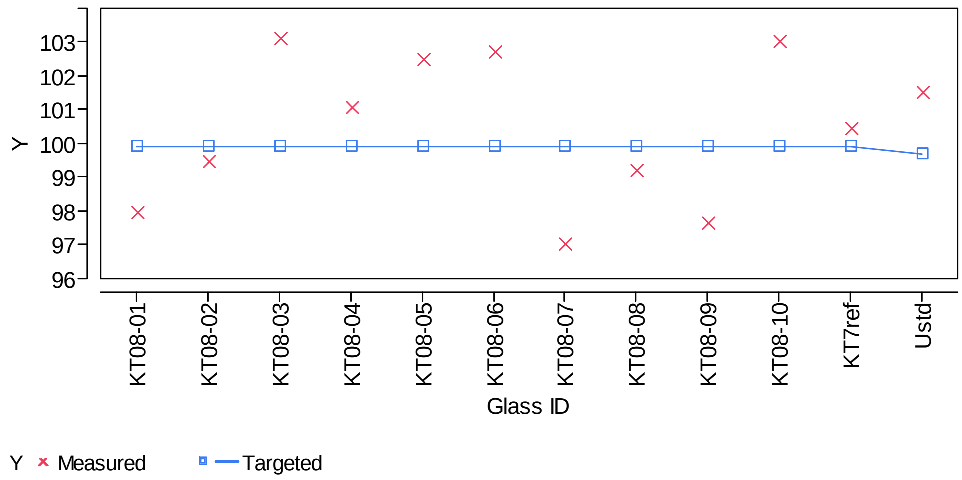


Exhibit A-5. Measured versus Targeted Concentrations by Glass ID by Oxide. (continued)

Oxide=Sum of Oxides



Appendix B. Data Supporting the Chemical Composition Measurements of the KT10-Series Glasses

Table B-1 Chemical Composition Measurements of the KT10-Series of Glasses Using LM Preparation Method (part 1).

Glass ID	Block	Sub-Blk	Sequence	Lab ID	Al (wt%)	Ba (wt%)	Ca (wt%)	Ce (wt%)	Cr (wt%)	Cu (wt%)	Fe (wt%)	K (wt%)	La (wt%)
Batch 1	1	1	1	BCHLM111	2.54	0.127	0.818	<0.010	0.075	0.305	8.98	2.76	<0.010
KT10-09	1	1	2	Q10LM21	2.73	0.061	0.611	0.152	0.068	0.044	7.85	0.067	0.055
KT10-07	1	1	3	Q04LM11	2.83	0.059	0.588	0.063	0.096	0.036	6.00	0.069	0.028
KT10-08	1	1	4	Q02LM11	2.48	0.060	0.521	0.063	0.068	0.036	5.77	0.068	0.028
KT10-03	1	1	5	Q03LM11	2.21	0.054	0.597	0.190	0.062	0.027	7.21	0.031	0.052
KT10-06	1	1	6	Q06LM21	3.66	0.054	0.612	0.084	0.087	0.032	5.85	0.094	0.028
Batch 1	1	1	7	BCHLM112	2.77	0.128	0.821	<0.010	0.076	0.306	9.04	2.76	<0.010
KT10-07	1	1	8	Q04LM21	2.80	0.059	0.579	0.062	0.097	0.037	5.94	0.066	0.028
KT10-06	1	1	9	Q06LM11	3.63	0.055	0.629	0.086	0.089	0.037	5.78	0.092	0.028
KT10-08	1	1	10	Q02LM21	2.46	0.060	0.519	0.065	0.069	0.035	5.72	0.065	0.028
KT10-09	1	1	11	Q10LM11	2.77	0.060	0.597	0.150	0.067	0.035	7.85	0.066	0.054
KT10-03	1	1	12	Q03LM21	2.24	0.054	0.594	0.191	0.061	0.031	7.24	0.032	0.051
Batch 1	1	1	13	BCHLM113	2.55	0.126	0.808	<0.010	0.075	0.302	8.94	2.73	<0.010
Batch 1	1	2	1	BCHLM121	2.60	0.125	0.821	<0.010	0.075	0.304	9.05	2.79	<0.010
KT10-06	1	2	2	Q06LM22	3.68	0.046	0.579	0.075	0.078	0.027	5.85	0.085	0.022
KT10-06	1	2	3	Q06LM12	3.75	0.053	0.628	0.085	0.090	0.035	5.92	0.091	0.026
KT10-03	1	2	4	Q03LM12	2.30	0.053	0.616	0.195	0.063	0.026	7.38	0.031	0.050
KT10-07	1	2	5	Q04LM12	2.88	0.058	0.609	0.063	0.098	0.037	6.05	0.074	0.026
KT10-08	1	2	6	Q02LM12	2.43	0.057	0.519	0.062	0.067	0.034	5.60	0.067	0.026
Batch 1	1	2	7	BCHLM122	2.42	0.126	0.830	<0.010	0.075	0.307	8.52	2.81	<0.010
KT10-08	1	2	8	Q02LM22	2.53	0.057	0.517	0.062	0.066	0.033	5.85	0.063	0.026
KT10-09	1	2	9	Q10LM22	2.74	0.057	0.614	0.149	0.064	0.041	7.84	0.064	0.052
KT10-03	1	2	10	Q03LM22	2.24	0.052	0.614	0.194	0.061	0.029	7.27	0.031	0.050
KT10-09	1	2	11	Q10LM12	2.79	0.058	0.612	0.150	0.065	0.034	7.93	0.065	0.053
KT10-07	1	2	12	Q04LM22	2.86	0.056	0.584	0.061	0.095	0.035	6.04	0.065	0.025
Batch 1	1	2	13	BCHLM123	2.60	0.126	0.818	<0.010	0.075	0.309	9.13	2.71	<0.010
Batch 1	2	1	1	BCHLM211	2.57	0.124	0.829	<0.010	0.077	0.305	8.98	2.77	<0.010
KT10-05	2	1	2	Q01LM21	3.49	0.051	0.600	0.111	0.087	0.031	6.28	0.062	0.047
KT10-10	2	1	3	Q05LM21	2.85	0.061	0.636	0.187	0.069	0.034	8.72	0.036	0.055
KT10-10	2	1	4	Q05LM11	2.83	0.060	0.639	0.185	0.068	0.034	8.67	0.037	0.055
KT10-02	2	1	5	Q07LM21	2.66	0.052	0.625	0.219	0.060	0.030	7.38	0.033	0.049
KT10-01	2	1	6	Q08LM11	2.96	0.052	0.614	0.212	0.061	0.032	7.72	0.033	0.073
Batch 1	2	1	7	BCHLM212	2.58	0.125	0.841	<0.010	0.075	0.306	9.02	2.80	<0.010
KT10-01	2	1	8	Q08LM21	2.90	0.053	0.612	0.217	0.062	0.031	7.67	0.032	0.074
KT10-05	2	1	9	Q01LM11	3.40	0.051	0.601	0.112	0.087	0.030	6.09	0.061	0.048
KT10-04	2	1	10	Q09LM11	2.49	0.051	0.560	0.159	0.063	0.037	7.61	0.032	0.048
KT10-02	2	1	11	Q07LM11	2.60	0.051	0.610	0.213	0.057	0.030	7.22	0.031	0.049
KT10-04	2	1	12	Q09LM21	2.51	0.051	0.569	0.160	0.062	0.032	7.68	0.031	0.049
Batch 1	2	1	13	BCHLM213	2.58	0.125	0.835	<0.010	0.075	0.305	9.02	2.78	<0.010
Batch 1	2	2	1	BCHLM221	2.51	0.125	0.856	<0.010	0.071	0.311	8.77	2.85	<0.010
KT10-01	2	2	2	Q08LM22	2.89	0.048	0.633	0.222	0.057	0.024	7.62	0.025	0.070
KT10-05	2	2	3	Q01LM22	3.42	0.047	0.645	0.113	0.086	0.025	6.13	0.060	0.042
KT10-01	2	2	4	Q08LM12	2.89	0.048	0.652	0.219	0.059	0.026	7.52	0.028	0.069
KT10-10	2	2	5	Q05LM12	2.79	0.058	0.688	0.193	0.065	0.029	8.51	0.032	0.051
KT10-02	2	2	6	Q07LM22	2.62	0.048	0.672	0.228	0.056	0.024	7.27	0.029	0.045
Batch 1	2	2	7	BCHLM222	2.54	0.127	0.889	<0.010	0.072	0.323	8.84	2.95	<0.010
KT10-04	2	2	8	Q09LM12	2.44	0.046	0.595	0.164	0.058	0.031	7.46	0.026	0.044
KT10-05	2	2	9	Q01LM12	3.33	0.046	0.627	0.110	0.083	0.023	5.95	0.056	0.042
KT10-04	2	2	10	Q09LM22	2.42	0.046	0.587	0.161	0.059	0.025	7.41	0.024	0.043
KT10-10	2	2	11	Q05LM22	2.73	0.057	0.658	0.189	0.064	0.028	8.33	0.030	0.050
KT10-02	2	2	12	Q07LM12	2.55	0.048	0.645	0.223	0.054	0.024	7.08	0.026	0.044
Batch 1	2	2	13	BCHLM223	2.53	0.124	0.847	<0.010	0.072	0.314	8.83	2.84	<0.010

Table B-2. Chemical Composition Measurements of the KT10-Series of Glasses Using LM Preparation Method (part 2).

Glass ID	Block	Sub-Blk	Sequence	Lab ID	Mg (wt%)	Mn (wt%)	Na (wt%)	Nb (wt%)	Ni (wt%)	Pb (wt%)	Ti (wt%)	Zn (wt%)	Zr (wt%)
Batch 1	1	1	1	BCHLM111	0.815	1.33	6.68	<0.100	0.539	<0.010	0.406	<0.010	0.068
KT10-09	1	1	2	Q10LM21	0.064	0.389	8.98	0.814	0.350	0.115	3.93	0.034	0.761
KT10-07	1	1	3	Q04LM11	0.068	0.509	9.24	1.11	0.426	0.055	3.90	0.062	0.973
KT10-08	1	1	4	Q02LM11	0.061	0.659	9.76	1.21	0.399	0.059	3.94	0.034	1.032
KT10-03	1	1	5	Q03LM11	0.084	1.27	9.01	1.03	0.211	0.105	3.59	0.030	0.939
KT10-06	1	1	6	Q06LM21	0.057	0.842	8.78	0.880	0.104	0.051	3.65	0.059	0.809
Batch 1	1	1	7	BCHLM112	0.813	1.34	6.71	<0.100	0.538	<0.010	0.408	<0.010	0.069
KT10-07	1	1	8	Q04LM21	0.068	0.502	9.05	1.10	0.427	0.053	3.87	0.061	0.975
KT10-06	1	1	9	Q06LM11	0.057	0.848	8.66	0.968	0.108	0.054	3.64	0.060	0.913
KT10-08	1	1	10	Q02LM21	0.061	0.657	9.69	1.21	0.399	0.059	3.93	0.034	1.055
KT10-09	1	1	11	Q10LM11	0.062	0.396	8.98	0.80	0.340	0.111	3.96	0.033	0.754
KT10-03	1	1	12	Q03LM21	0.084	1.28	9.11	1.05	0.207	0.102	3.61	0.029	0.935
Batch 1	1	1	13	BCHLM113	0.802	1.32	6.68	<0.100	0.530	<0.010	0.405	<0.010	0.068
Batch 1	1	2	1	BCHLM121	0.807	1.35	6.78	<0.100	0.540	<0.010	0.420	<0.010	0.066
KT10-06	1	2	2	Q06LM22	0.051	0.857	8.74	0.909	0.092	0.044	3.67	0.051	0.727
KT10-06	1	2	3	Q06LM12	0.058	0.884	8.91	0.992	0.107	0.050	3.74	0.059	0.919
KT10-03	1	2	4	Q03LM12	0.086	1.32	9.29	1.07	0.217	0.104	3.70	0.029	0.964
KT10-07	1	2	5	Q04LM12	0.070	0.531	9.36	1.12	0.431	0.053	3.94	0.061	0.992
KT10-08	1	2	6	Q02LM12	0.061	0.659	9.52	1.16	0.399	0.057	3.89	0.032	1.036
Batch 1	1	2	7	BCHLM122	0.810	1.27	6.31	<0.100	0.546	<0.010	0.394	<0.010	0.067
KT10-08	1	2	8	Q02LM22	0.061	0.688	9.86	1.25	0.399	0.056	4.03	0.032	1.054
KT10-09	1	2	9	Q10LM22	0.062	0.407	8.91	0.818	0.343	0.109	3.96	0.031	0.756
KT10-03	1	2	10	Q03LM22	0.085	1.30	9.04	1.07	0.213	0.101	3.63	0.028	0.957
KT10-09	1	2	11	Q10LM12	0.063	0.416	9.02	0.831	0.347	0.110	4.02	0.031	0.762
KT10-07	1	2	12	Q04LM22	0.068	0.530	9.22	1.13	0.429	0.051	3.94	0.060	0.980
Batch 1	1	2	13	BCHLM123	0.807	1.37	6.78	<0.100	0.547	<0.010	0.424	<0.010	0.070
Batch 1	2	1	1	BCHLM211	0.807	1.33	6.76	<0.100	0.538	<0.010	0.414	<0.010	0.066
KT10-05	2	1	2	Q01LM21	0.084	0.728	8.91	1.04	0.081	0.047	3.74	0.026	0.920
KT10-10	2	1	3	Q05LM21	0.066	0.265	8.79	0.778	0.325	0.117	3.82	0.033	0.729
KT10-10	2	1	4	Q05LM11	0.066	0.260	8.72	0.733	0.323	0.116	3.77	0.033	0.697
KT10-02	2	1	5	Q07LM21	0.088	1.22	9.09	1.08	0.132	0.102	3.66	0.028	0.959
KT10-01	2	1	6	Q08LM11	0.084	1.37	8.51	0.865	0.231	0.119	3.60	<0.010	0.794
Batch 1	2	1	7	BCHLM212	0.803	1.33	6.78	<0.100	0.537	<0.010	0.409	<0.010	0.068
KT10-01	2	1	8	Q08LM21	0.086	1.38	8.35	1.01	0.236	0.125	3.60	<0.010	0.880
KT10-05	2	1	9	Q01LM11	0.084	0.696	8.63	1.02	0.080	0.048	3.63	0.027	0.941
KT10-04	2	1	10	Q09LM11	0.084	0.756	8.71	1.01	0.112	0.076	3.60	0.056	0.878
KT10-02	2	1	11	Q07LM11	0.084	1.18	8.84	0.729	0.131	0.093	3.50	0.028	0.667
KT10-04	2	1	12	Q09LM21	0.085	0.761	8.76	0.972	0.108	0.071	3.61	0.056	0.853
Batch 1	2	1	13	BCHLM213	0.800	1.33	6.75	<0.100	0.536	<0.010	0.409	<0.010	0.067
Batch 1	2	2	1	BCHLM221	0.836	1.31	6.61	<0.100	0.558	<0.010	0.404	<0.010	0.063
KT10-01	2	2	2	Q08LM22	0.083	1.39	8.38	1.02	0.242	0.122	3.61	<0.010	0.928
KT10-05	2	2	3	Q01LM22	0.082	0.725	8.72	1.03	0.079	0.042	3.67	0.020	0.993
KT10-01	2	2	4	Q08LM12	0.082	1.36	8.25	0.881	0.240	0.119	3.53	<0.010	0.848
KT10-10	2	2	5	Q05LM12	0.063	0.272	8.51	0.742	0.341	0.118	3.74	0.027	0.750
KT10-02	2	2	6	Q07LM22	0.087	1.22	8.89	1.08	0.135	0.098	3.62	0.022	1.027
Batch 1	2	2	7	BCHLM222	0.855	1.33	6.62	<0.100	0.576	<0.010	0.407	<0.010	0.067
KT10-04	2	2	8	Q09LM12	0.083	0.762	8.52	1.00	0.112	0.074	3.56	0.051	0.934
KT10-05	2	2	9	Q01LM12	0.081	0.702	8.47	1.03	0.078	0.041	3.59	0.020	0.990
KT10-04	2	2	10	Q09LM22	0.082	0.755	8.44	0.959	0.107	0.070	3.52	0.051	0.899
KT10-10	2	2	11	Q05LM22	0.063	0.269	8.36	0.762	0.333	0.118	3.69	0.027	0.767
KT10-02	2	2	12	Q07LM12	0.084	1.18	8.64	0.759	0.134	0.096	3.48	0.021	0.712
Batch 1	2	2	13	BCHLM223	0.846	1.33	6.61	<0.100	0.564	<0.010	0.408	<0.010	0.066

Table B-3. Chemical Composition Measurements of the KT10-Series of Glasses Using PF Preparation Method.

Glass ID	Block	Sub-Blk	Sequence	Lab ID	B (wt%)	Li (wt%)	Si (wt%)
Batch 1	1	1	1	BCHPF111	2.59	2.09	23.0
KT10-10	1	1	2	Q05PF21	1.71	2.53	23.1
KT10-01	1	1	3	Q08PF21	1.70	2.51	22.0
KT10-02	1	1	4	Q07PF21	1.60	2.50	23.6
KT10-02	1	1	5	Q07PF11	1.65	2.55	24.7
KT10-04	1	1	6	Q09PF21	1.54	2.50	24.1
Batch 1	1	1	7	BCHPF112	2.57	2.18	23.2
KT10-10	1	1	8	Q05PF11	1.58	2.53	22.7
KT10-01	1	1	9	Q08PF11	1.61	2.57	21.9
KT10-03	1	1	10	Q03PF11	1.54	2.55	23.2
KT10-03	1	1	11	Q03PF21	1.55	2.55	22.6
KT10-04	1	1	12	Q09PF11	1.62	2.58	22.0
Batch 1	1	1	13	BCHPF113	2.53	2.19	23.2
Batch 1	1	2	1	BCHPF121	2.41	2.08	23.4
KT10-03	1	2	2	Q03PF12	1.47	2.44	23.2
KT10-10	1	2	3	Q05PF12	1.47	2.44	22.7
KT10-04	1	2	4	Q09PF22	1.52	2.48	23.2
KT10-04	1	2	5	Q09PF12	1.50	2.48	24.0
KT10-01	1	2	6	Q08PF22	1.44	2.45	22.9
Batch 1	1	2	7	BCHPF122	2.36	2.11	23.8
KT10-02	1	2	8	Q07PF22	1.43	2.44	22.1
KT10-03	1	2	9	Q03PF22	1.43	2.48	23.2
KT10-02	1	2	10	Q07PF12	1.40	2.44	22.9
KT10-10	1	2	11	Q05PF22	1.43	2.49	23.0
KT10-01	1	2	12	Q08PF12	1.44	2.49	23.4
Batch 1	1	2	13	BCHPF123	2.30	2.12	23.5
Batch 1	2	1	1	BCHPF211	2.48	2.06	22.9
KT10-09	2	1	2	Q10PF21	1.39	2.51	23.0
KT10-05	2	1	3	Q01PF21	1.48	2.59	22.7
KT10-06	2	1	4	Q06PF11	1.47	2.58	22.9
KT10-07	2	1	5	Q04PF21	1.48	2.56	22.7
KT10-07	2	1	6	Q04PF11	1.49	2.42	24.1
Batch 1	2	1	7	BCHPF212	2.37	2.05	22.7
KT10-08	2	1	8	Q02PF11	1.52	2.49	24.6
KT10-05	2	1	9	Q01PF11	1.47	2.45	24.6
KT10-08	2	1	10	Q02PF21	1.37	2.43	23.6
KT10-09	2	1	11	Q10PF11	1.45	2.48	23.7
KT10-06	2	1	12	Q06PF21	1.49	2.47	24.8
Batch 1	2	1	13	BCHPF213	2.40	2.13	22.5
Batch 1	2	2	1	BCHPF221	2.51	2.10	22.2
KT10-08	2	2	2	Q02PF12	1.47	2.42	23.8
KT10-05	2	2	3	Q01PF12	1.50	2.43	24.3
KT10-09	2	2	4	Q10PF22	1.50	2.53	23.3
KT10-07	2	2	5	Q04PF12	1.46	2.41	23.7
KT10-06	2	2	6	Q06PF12	1.46	2.54	23.4
Batch 1	2	2	7	BCHPF222	2.48	2.11	22.3
KT10-05	2	2	8	Q01PF22	1.52	2.54	22.4
KT10-08	2	2	9	Q02PF22	1.50	2.50	24.1
KT10-09	2	2	10	Q10PF12	1.48	2.44	23.4
KT10-07	2	2	11	Q04PF22	1.57	2.54	23.1
KT10-06	2	2	12	Q06PF22	1.40	2.48	24.5
Batch 1	2	2	13	BCHPF223	2.34	2.13	22.3

Table B-4. Comparison of Measured versus Targeted Composition for the KT10-Series of Glasses.

Glass ID	Oxide	Measured (wt %)	Targeted (wt %)	Difference of Measured (wt %)	% Difference of Measured
Batch 1	Al_2O_3	4.8481	4.8770	-0.0289	-0.6%
Batch 1	B_2O_3	7.8727	7.7770	0.0957	1.2%
Batch 1	BaO	0.1403	0.1510	-0.0107	-7.1%
Batch 1	CaO	1.1675	1.2200	-0.0525	-4.3%
Batch 1	Ce_2O_3	0.0059	0.0000	0.0059	
Batch 1	Cr_2O_3	0.1088	0.1070	0.0018	1.7%
Batch 1	CuO	0.3857	0.3990	-0.0133	-3.3%
Batch 1	Fe_2O_3	12.7625	12.8390	-0.0765	-0.6%
Batch 1	K_2O	3.3679	3.3270	0.0409	1.2%
Batch 1	La_2O_3	0.0059	0.0000	0.0059	
Batch 1	Li_2O	4.5480	4.4290	0.1190	2.7%
Batch 1	MgO	1.3544	1.4190	-0.0646	-4.6%
Batch 1	MnO	1.7151	1.7260	-0.0109	-0.6%
Batch 1	Na_2O	8.9945	9.0030	-0.0085	-0.1%
Batch 1	Nb_2O_5	0.0715	0.0000	0.0715	
Batch 1	NiO	0.6945	0.7510	-0.0565	-7.5%
Batch 1	PbO	0.0054	0.0000	0.0054	
Batch 1	SiO_2	49.0256	50.2200	-1.1944	-2.4%
Batch 1	SO_4	Not Measured			
Batch 1	TiO_2	0.6822	0.6770	0.0052	0.8%
Batch 1	ZnO	0.0062	0.0000	0.0062	
Batch 1	ZrO_2	0.0906	0.0980	-0.0074	-7.5%
Batch 1	Sum	97.8532	99.0200	-1.1668	-1.2%
KT10-01	Al_2O_3	5.4984	5.3200	0.1784	3.4%
KT10-01	B_2O_3	4.9828	4.8000	0.1828	3.8%
KT10-01	BaO	0.0561	0.0600	-0.0039	-6.5%
KT10-01	CaO	0.8783	0.8600	0.0183	2.1%
KT10-01	Ce_2O_3	0.2548	0.2600	-0.0052	-2.0%
KT10-01	Cr_2O_3	0.0873	0.0800	0.0073	9.2%
KT10-01	CuO	0.0354	0.0300	0.0054	17.9%
KT10-01	Fe_2O_3	10.9122	11.1000	-0.1878	-1.7%
KT10-01	K_2O	0.0355	0.0300	0.0055	18.5%
KT10-01	La_2O_3	0.0839	0.1000	-0.0161	-16.1%
KT10-01	Li_2O	5.3930	5.4000	-0.0070	-0.1%
KT10-01	MgO	0.1389	0.1400	-0.0011	-0.8%
KT10-01	MnO	1.7754	1.7700	0.0054	0.3%
KT10-01	Na_2O	11.2861	11.1700	0.1161	1.0%
KT10-01	Nb_2O_5	1.3504	1.4300	-0.0796	-5.6%
KT10-01	NiO	0.3019	0.3200	-0.0181	-5.7%
KT10-01	PbO	0.1306	0.1500	-0.0194	-12.9%
KT10-01	SiO_2	48.2412	49.2800	-1.0388	-2.1%
KT10-01	SO_4	Not Measured			
KT10-01	TiO_2	5.9798	5.9800	-0.0002	0.0%
KT10-01	ZnO	0.0062	0.0000	0.0062	
KT10-01	ZrO_2	1.1651	1.2700	-0.1049	-8.3%
KT10-01	Sum	98.5933	99.5500	-0.9567	-1.0%
KT10-02	Al_2O_3	4.9269	4.7500	0.1769	3.7%
KT10-02	B_2O_3	4.8942	4.8000	0.0942	2.0%
KT10-02	BaO	0.0555	0.0600	-0.0045	-7.4%
KT10-02	CaO	0.8927	0.8700	0.0227	2.6%
KT10-02	Ce_2O_3	0.2586	0.2600	-0.0014	-0.6%
KT10-02	Cr_2O_3	0.0829	0.0800	0.0029	3.7%
KT10-02	CuO	0.0338	0.0400	-0.0062	-15.5%
KT10-02	Fe_2O_3	10.3475	10.5700	-0.2225	-2.1%
KT10-02	K_2O	0.0358	0.0300	0.0058	19.5%
KT10-02	La_2O_3	0.0548	0.0700	-0.0152	-21.7%
KT10-02	Li_2O	5.3446	5.4000	-0.0554	-1.0%
KT10-02	MgO	0.1422	0.1400	0.0022	1.6%
KT10-02	MnO	1.5494	1.5600	-0.0106	-0.7%
KT10-02	Na_2O	11.9500	11.9300	0.0200	0.2%

Table B-4. Comparison of Measured versus Targeted Composition for the KT10-Series of Glasses. (continued)

Glass ID	Oxide	Measured (wt %)	Targeted (wt %)	Difference of Measured (wt %)	% Difference of Measured
KT10-02	Nb_2O_5	1.3046	1.5100	-0.2054	-13.6%
KT10-02	NiO	0.1692	0.1800	-0.0108	-6.0%
KT10-02	PbO	0.1048	0.1200	-0.0152	-12.7%
KT10-02	SiO_2	49.8992	49.7500	0.1492	0.3%
KT10-02	SO_4	Not Measured			
KT10-02	TiO_2	5.9464	6.0100	-0.0636	-1.1%
KT10-02	ZnO	0.0308	0.0300	0.0008	2.7%
KT10-02	ZrO_2	1.1364	1.3900	-0.2536	-18.2%
KT10-02	Sum	99.1604	99.5500	-0.3896	-0.4%
KT10-03	Al_2O_3	4.2467	4.1000	0.1467	3.6%
KT10-03	B_2O_3	4.8218	4.8000	0.0218	0.5%
KT10-03	BaO	0.0595	0.0600	-0.0005	-0.9%
KT10-03	CaO	0.8469	0.8800	-0.0331	-3.8%
KT10-03	Ce_2O_3	0.2255	0.2300	-0.0045	-2.0%
KT10-03	Cr_2O_3	0.0903	0.0800	0.0103	12.8%
KT10-03	CuO	0.0354	0.0400	-0.0046	-11.6%
KT10-03	Fe_2O_3	10.4011	10.5400	-0.1389	-1.3%
KT10-03	K_2O	0.0376	0.0300	0.0076	25.5%
KT10-03	La_2O_3	0.0595	0.0700	-0.0105	-15.0%
KT10-03	Li_2O	5.3930	5.4000	-0.0070	-0.1%
KT10-03	MgO	0.1405	0.1400	0.0005	0.4%
KT10-03	MnO	1.6689	1.6500	0.0189	1.1%
KT10-03	Na_2O	12.2837	12.1900	0.0937	0.8%
KT10-03	Nb_2O_5	1.5092	1.5100	-0.0008	-0.1%
KT10-03	NiO	0.2698	0.2900	-0.0202	-7.0%
KT10-03	PbO	0.1110	0.1200	-0.0090	-7.5%
KT10-03	SiO_2	49.3109	49.9500	-0.6391	-1.3%
KT10-03	SO_4	Not Measured			
KT10-03	TiO_2	6.0590	6.0400	0.0190	0.3%
KT10-03	ZnO	0.0361	0.0400	-0.0039	-9.8%
KT10-03	ZrO_2	1.2816	1.3900	-0.1084	-7.8%
KT10-03	Sum	98.8876	99.5500	-0.6624	-0.7%
KT10-04	Al_2O_3	4.6576	4.5500	0.1076	2.4%
KT10-04	B_2O_3	4.9747	4.8000	0.1747	3.6%
KT10-04	BaO	0.0542	0.0600	-0.0058	-9.7%
KT10-04	CaO	0.8084	0.7800	0.0284	3.6%
KT10-04	Ce_2O_3	0.1886	0.2000	-0.0114	-5.7%
KT10-04	Cr_2O_3	0.0884	0.0800	0.0084	10.5%
KT10-04	CuO	0.0391	0.0400	-0.0009	-2.2%
KT10-04	Fe_2O_3	10.7799	11.1400	-0.3601	-3.2%
KT10-04	K_2O	0.0340	0.0300	0.0040	13.4%
KT10-04	La_2O_3	0.0539	0.0700	-0.0161	-22.9%
KT10-04	Li_2O	5.4038	5.4000	0.0038	0.1%
KT10-04	MgO	0.1385	0.1400	-0.0015	-1.1%
KT10-04	MnO	0.9794	0.9800	-0.0006	-0.1%
KT10-04	Na_2O	11.6029	11.6900	-0.0871	-0.7%
KT10-04	Nb_2O_5	1.4094	1.4500	-0.0406	-2.8%
KT10-04	NiO	0.1397	0.1400	-0.0003	-0.2%
KT10-04	PbO	0.0784	0.0900	-0.0116	-12.9%
KT10-04	SiO_2	49.8992	50.5000	-0.6008	-1.2%
KT10-04	SO_4	Not Measured			
KT10-04	TiO_2	5.9589	6.0600	-0.1011	-1.7%
KT10-04	ZnO	0.0666	0.0700	-0.0034	-4.9%
KT10-04	ZrO_2	1.2036	1.2900	-0.0864	-6.7%
KT10-04	Sum	98.5592	99.5600	-1.0008	-1.0%
KT10-05	Al_2O_3	6.4432	6.2900	0.1532	2.4%
KT10-05	B_2O_3	4.8057	4.8000	0.0057	0.1%
KT10-05	BaO	0.0544	0.0600	-0.0056	-9.3%
KT10-05	CaO	0.8651	0.8600	0.0051	0.6%

Table B-4. Comparison of Measured versus Targeted Composition for the KT10-Series of Glasses. (continued)

Glass ID	Oxide	Measured (wt %)	Targeted (wt %)	Difference of Measured (wt %)	% Difference of Measured
KT10-05	Ce_2O_3	0.1306	0.1300	0.0006	0.5%
KT10-05	Cr_2O_3	0.1253	0.1200	0.0053	4.4%
KT10-05	CuO	0.0341	0.0400	-0.0059	-14.7%
KT10-05	Fe_2O_3	8.7390	8.8400	-0.1010	-1.1%
KT10-05	K_2O	0.0720	0.0700	0.0020	2.8%
KT10-05	La_2O_3	0.0525	0.0700	-0.0175	-25.0%
KT10-05	Li_2O	5.3876	5.4000	-0.0124	-0.2%
KT10-05	MgO	0.1372	0.1400	-0.0028	-2.0%
KT10-05	MnO	0.9203	0.9400	-0.0197	-2.1%
KT10-05	Na_2O	11.7040	11.6300	0.0740	0.6%
KT10-05	Nb_2O_5	1.4734	1.4800	-0.0066	-0.4%
KT10-05	NiO	0.1012	0.1100	-0.0088	-8.0%
KT10-05	PbO	0.0479	0.0600	-0.0121	-20.1%
KT10-05	SiO_2	50.2736	50.9900	-0.7165	-1.4%
KT10-05	SO_4	Not Measured			
KT10-05	TiO_2	6.1007	6.1300	-0.0293	-0.5%
KT10-05	ZnO	0.0289	0.0300	-0.0011	-3.5%
KT10-05	ZrO_2	1.2981	1.3700	-0.0719	-5.2%
KT10-05	Sum	98.7949	99.5600	-0.7651	-0.8%
KT10-06	Al_2O_3	6.9534	6.6900	0.2634	3.9%
KT10-06	B_2O_3	4.6850	4.8000	-0.1150	-2.4%
KT10-06	BaO	0.0581	0.0600	-0.0019	-3.2%
KT10-06	CaO	0.8563	0.9100	-0.0537	-5.9%
KT10-06	Ce_2O_3	0.0966	0.1000	-0.0034	-3.4%
KT10-06	Cr_2O_3	0.1257	0.1200	0.0057	4.7%
KT10-06	CuO	0.0410	0.0400	0.0010	2.5%
KT10-06	Fe_2O_3	8.3637	8.3500	0.0137	0.2%
KT10-06	K_2O	0.1090	0.1000	0.0090	9.0%
KT10-06	La_2O_3	0.0305	0.0300	0.0005	1.6%
KT10-06	Li_2O	5.4199	5.4000	0.0199	0.4%
KT10-06	MgO	0.0925	0.0900	0.0025	2.7%
KT10-06	MnO	1.1075	1.1000	0.0075	0.7%
KT10-06	Na_2O	11.8253	11.6600	0.1653	1.4%
KT10-06	Nb_2O_5	1.3407	1.4200	-0.0793	-5.6%
KT10-06	NiO	0.1307	0.1400	-0.0093	-6.6%
KT10-06	PbO	0.0536	0.0600	-0.0064	-10.7%
KT10-06	SiO_2	51.1293	50.9900	0.1393	0.3%
KT10-06	SO_4	Not Measured			
KT10-06	TiO_2	6.1299	6.0700	0.0599	1.0%
KT10-06	ZnO	0.0713	0.0700	0.0013	1.8%
KT10-06	ZrO_2	1.1374	1.3300	-0.1926	-14.5%
KT10-06	Sum	99.7574	99.5300	0.2274	0.2%
KT10-07	Al_2O_3	5.3709	5.1500	0.2209	4.3%
KT10-07	B_2O_3	4.8299	4.8000	0.0299	0.6%
KT10-07	BaO	0.0648	0.0700	-0.0052	-7.5%
KT10-07	CaO	0.8255	0.8200	0.0055	0.7%
KT10-07	Ce_2O_3	0.0729	0.0700	0.0029	4.2%
KT10-07	Cr_2O_3	0.1410	0.1300	0.0110	8.5%
KT10-07	CuO	0.0454	0.0400	0.0054	13.4%
KT10-07	Fe_2O_3	8.5889	8.6000	-0.0111	-0.1%
KT10-07	K_2O	0.0825	0.0700	0.0125	17.9%
KT10-07	La_2O_3	0.0314	0.0400	-0.0086	-21.6%
KT10-07	Li_2O	5.3446	5.4000	-0.0554	-1.0%
KT10-07	MgO	0.1136	0.1000	0.0136	13.6%
KT10-07	MnO	0.6688	0.6700	-0.0012	-0.2%
KT10-07	Na_2O	12.4252	12.3500	0.0752	0.6%
KT10-07	Nb_2O_5	1.5950	1.6400	-0.0450	-2.7%
KT10-07	NiO	0.5449	0.5900	-0.0451	-7.6%
KT10-07	PbO	0.0571	0.0700	-0.0129	-18.4%

Table B-4. Comparison of Measured versus Targeted Composition for the KT10-Series of Glasses. (continued)

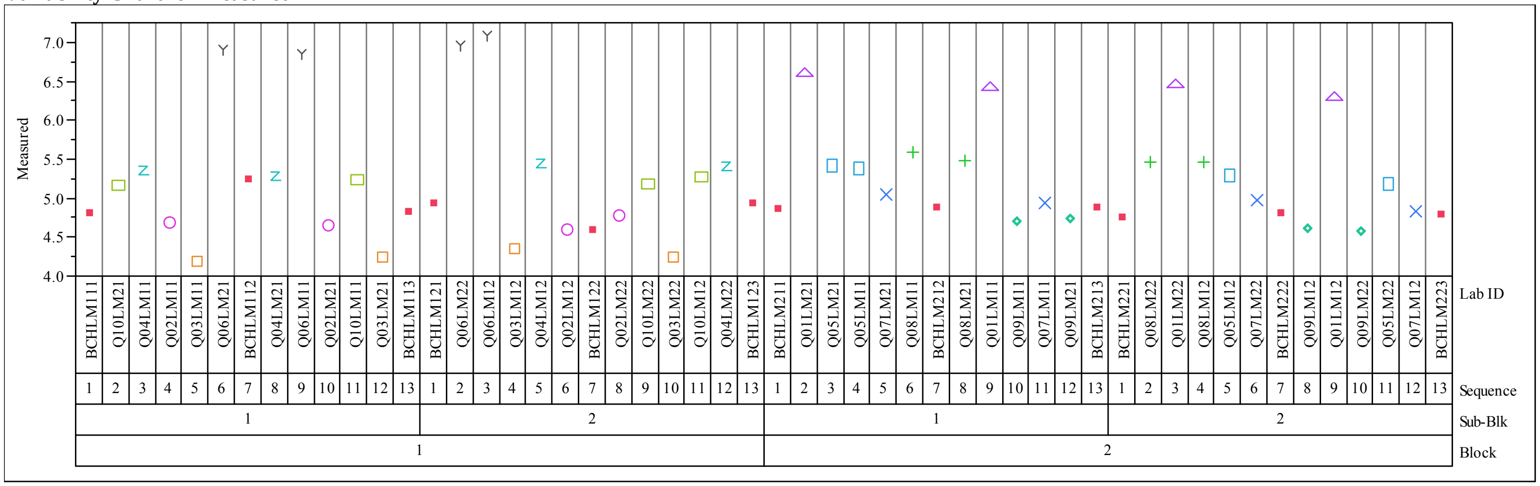
Glass ID	Oxide	Measured (wt %)	Targeted (wt %)	Difference of Measured (wt %)	% Difference of Measured
KT10-07	SiO_2	50.0596	50.7000	-0.6404	-1.3%
KT10-07	SO_4	Not Measured			
KT10-07	TiO_2	6.5261	6.6700	-0.1440	-2.2%
KT10-07	ZnO	0.0759	0.0800	-0.0041	-5.1%
KT10-07	ZrO_2	1.3238	1.4500	-0.1262	-8.7%
KT10-07	Sum	98.7878	99.5100	-0.7222	-0.7%
KT10-08	Al_2O_3	4.6765	4.5800	0.0965	2.1%
KT10-08	B_2O_3	4.7172	4.8000	-0.0828	-1.7%
KT10-08	BaO	0.0653	0.0700	-0.0047	-6.7%
KT10-08	CaO	0.7262	0.7300	-0.0038	-0.5%
KT10-08	Ce_2O_3	0.0738	0.0700	0.0038	5.4%
KT10-08	Cr_2O_3	0.0987	0.0900	0.0087	9.6%
KT10-08	CuO	0.0432	0.0400	0.0032	8.0%
KT10-08	Fe_2O_3	8.1993	8.3500	-0.1507	-1.8%
KT10-08	K_2O	0.0792	0.0700	0.0092	13.1%
KT10-08	La_2O_3	0.0317	0.0400	-0.0083	-20.8%
KT10-08	Li_2O	5.2961	5.4000	-0.1039	-1.9%
KT10-08	MgO	0.1012	0.1000	0.0012	1.2%
KT10-08	MnO	0.8596	0.8800	-0.0204	-2.3%
KT10-08	Na_2O	13.0857	13.1500	-0.0643	-0.5%
KT10-08	Nb_2O_5	1.7273	1.7700	-0.0427	-2.4%
KT10-08	NiO	0.5077	0.5500	-0.0423	-7.7%
KT10-08	PbO	0.0622	0.0700	-0.0078	-11.1%
KT10-08	SiO_2	51.3967	50.3900	1.0067	2.0%
KT10-08	SO_4	Not Measured			
KT10-08	TiO_2	6.5844	6.7600	-0.1756	-2.6%
KT10-08	ZnO	0.0411	0.0400	0.0011	2.7%
KT10-08	ZrO_2	1.4106	1.5500	-0.1394	-9.0%
KT10-08	Sum	99.7836	99.5000	0.2836	0.3%
KT10-09	Al_2O_3	5.2103	5.0400	0.1703	3.4%
KT10-09	B_2O_3	4.6850	4.8000	-0.1150	-2.4%
KT10-09	BaO	0.0659	0.0700	-0.0041	-5.9%
KT10-09	CaO	0.8514	0.8800	-0.0286	-3.2%
KT10-09	Ce_2O_3	0.1760	0.1800	-0.0040	-2.2%
KT10-09	Cr_2O_3	0.0965	0.0900	0.0065	7.2%
KT10-09	CuO	0.0482	0.0400	0.0082	20.5%
KT10-09	Fe_2O_3	11.2482	11.3500	-0.1018	-0.9%
KT10-09	K_2O	0.0789	0.0800	-0.0011	-1.4%
KT10-09	La_2O_3	0.0627	0.0700	-0.0073	-10.4%
KT10-09	Li_2O	5.3607	5.4000	-0.0393	-0.7%
KT10-09	MgO	0.1041	0.1000	0.0041	4.1%
KT10-09	MnO	0.5191	0.5300	-0.0109	-2.1%
KT10-09	Na_2O	12.0949	11.9800	0.1149	1.0%
KT10-09	Nb_2O_5	1.1669	1.1700	-0.0031	-0.3%
KT10-09	NiO	0.4390	0.4800	-0.0410	-8.5%
KT10-09	PbO	0.1198	0.1400	-0.0202	-14.4%
KT10-09	SiO_2	49.9527	49.2600	0.6927	1.4%
KT10-09	SO_4	Not Measured			
KT10-09	TiO_2	6.6178	6.6800	-0.0622	-0.9%
KT10-09	ZnO	0.0401	0.0400	0.0001	0.4%
KT10-09	ZrO_2	1.0242	1.1100	-0.0858	-7.7%
KT10-09	Sum	99.9624	99.4900	0.4724	0.5%
KT10-10	Al_2O_3	5.2906	5.2100	0.0806	1.5%
KT10-10	B_2O_3	4.9828	4.8000	0.1828	3.8%
KT10-10	BaO	0.0659	0.0700	-0.0041	-5.9%
KT10-10	CaO	0.9168	0.9000	0.0168	1.9%
KT10-10	Ce_2O_3	0.2208	0.2300	-0.0092	-4.0%
KT10-10	Cr_2O_3	0.0972	0.0900	0.0072	8.0%
KT10-10	CuO	0.0391	0.0400	-0.0009	-2.2%

Table B-4. Comparison of Measured versus Targeted Composition for the KT10-Series of Glasses. (continued)

Glass ID	Oxide	Measured (wt %)	Targeted (wt %)	Difference of Measured (wt %)	% Difference of Measured
KT10-10	Fe_2O_3	12.2347	12.6000	-0.3653	-2.9%
KT10-10	K_2O	0.0407	0.0400	0.0007	1.6%
KT10-10	La_2O_3	0.0619	0.0800	-0.0181	-22.7%
KT10-10	Li_2O	5.3769	5.4000	-0.0231	-0.4%
KT10-10	MgO	0.1070	0.1100	-0.0030	-2.8%
KT10-10	MnO	0.3441	0.3700	-0.0259	-7.0%
KT10-10	Na_2O	11.5861	11.5500	0.0361	0.3%
KT10-10	Nb_2O_5	1.0782	1.0900	-0.0118	-1.1%
KT10-10	NiO	0.4206	0.4500	-0.0294	-6.5%
KT10-10	PbO	0.1263	0.1400	-0.0137	-9.8%
KT10-10	SiO_2	48.9365	48.9600	-0.0235	0.0%
KT10-10	SO_4	Not Measured			
KT10-10	TiO_2	6.2633	6.2700	-0.0067	-0.1%
KT10-10	ZnO	0.0373	0.0400	-0.0027	-6.6%
KT10-10	ZrO_2	0.9939	1.0600	-0.0661	-6.2%
KT10-10	Sum	99.2205	99.5000	-0.2795	-0.3%

Exhibit B-1. Measurements in Analytical Sequence for the KT10-Series Glasses by Preparation Method by Oxide.

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



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

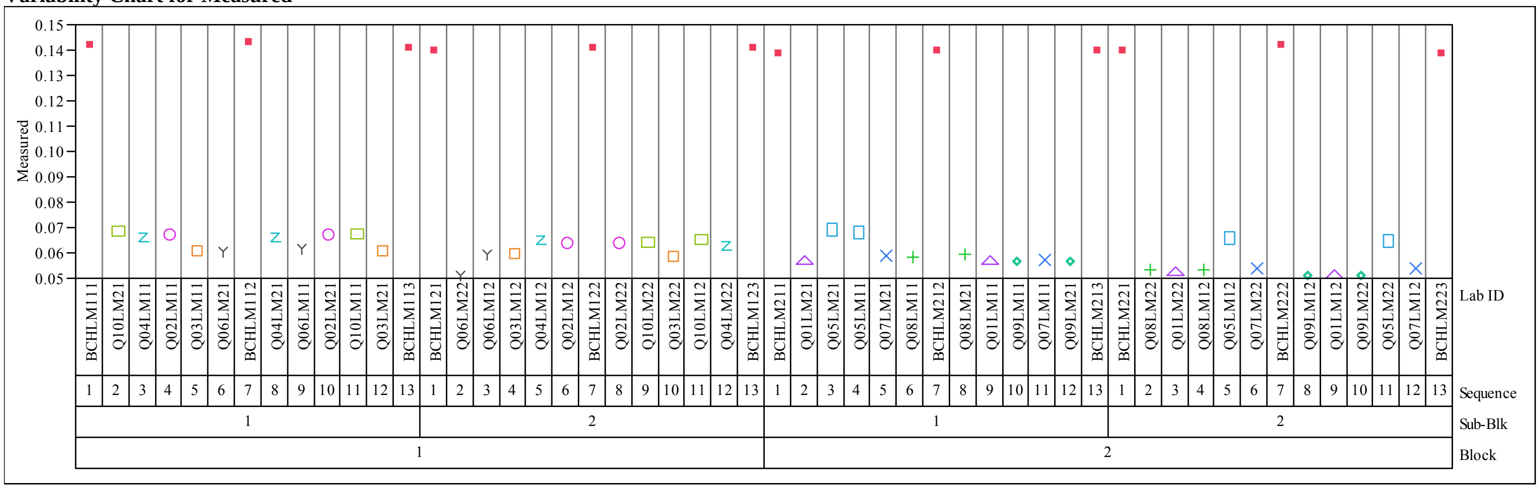
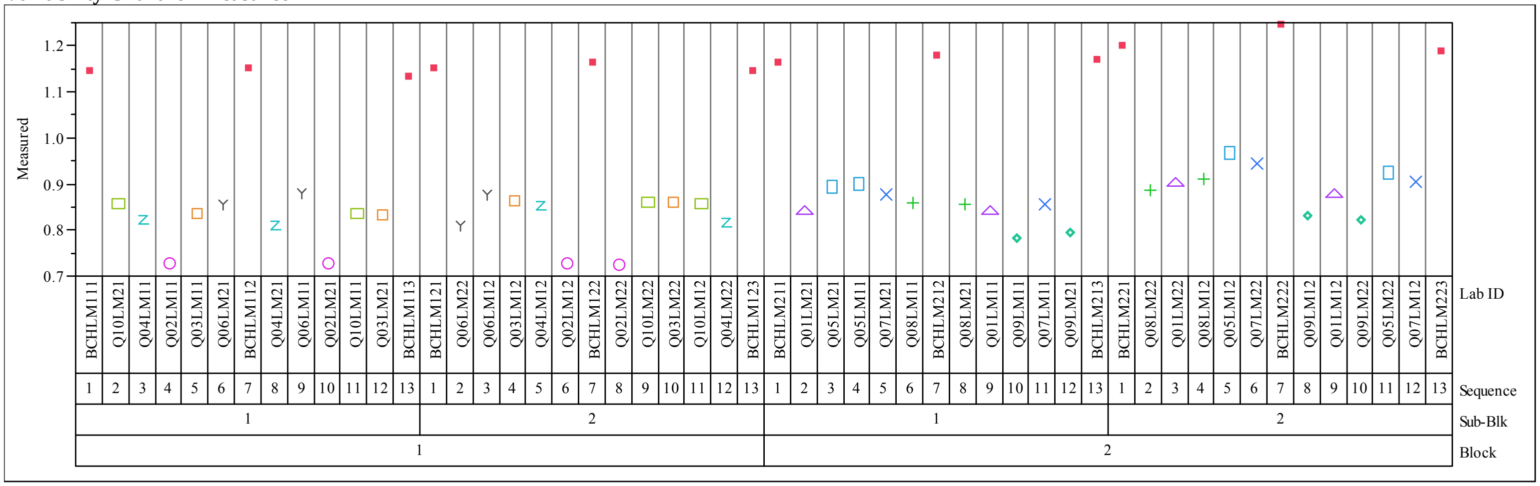


Exhibit B-1. Measurements in Analytical Sequence for the KT10-Series Glasses by Preparation Method by Oxide. (continued)

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



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

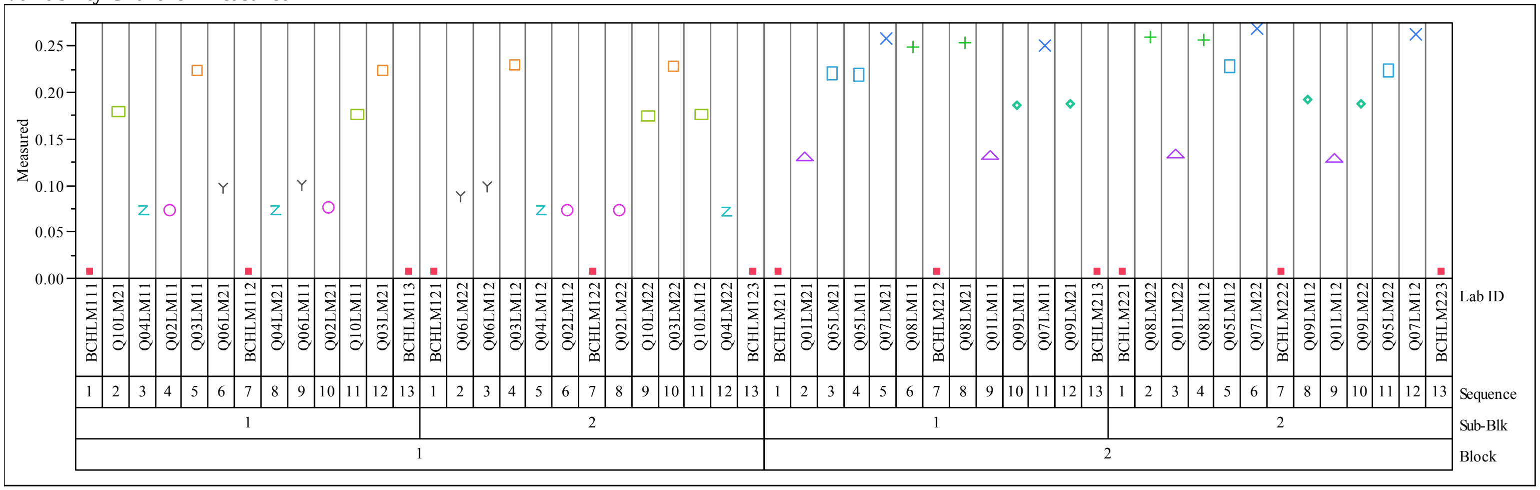
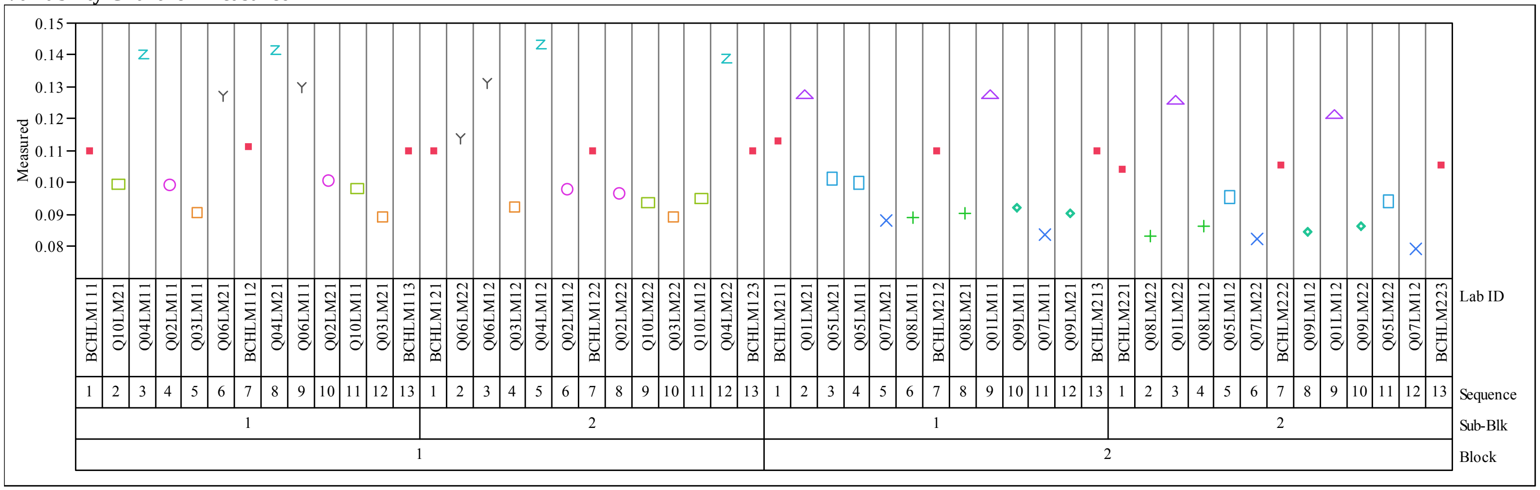


Exhibit B-1. Measurements in Analytical Sequence for the KT10-Series Glasses by Preparation Method by Oxide. (continued)

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



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

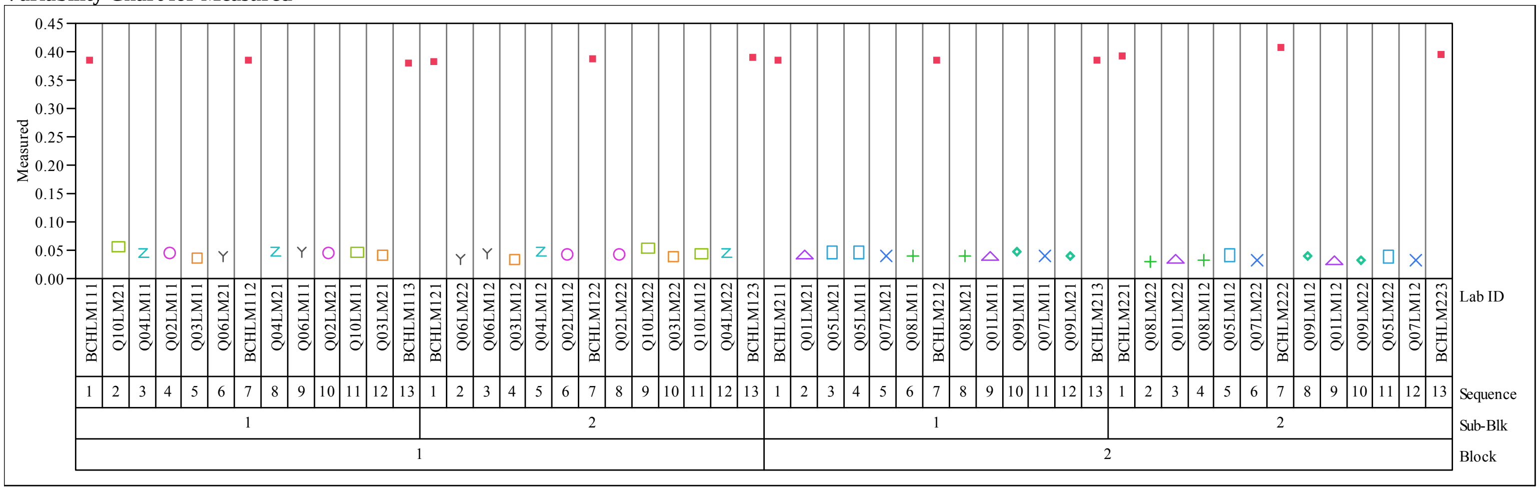
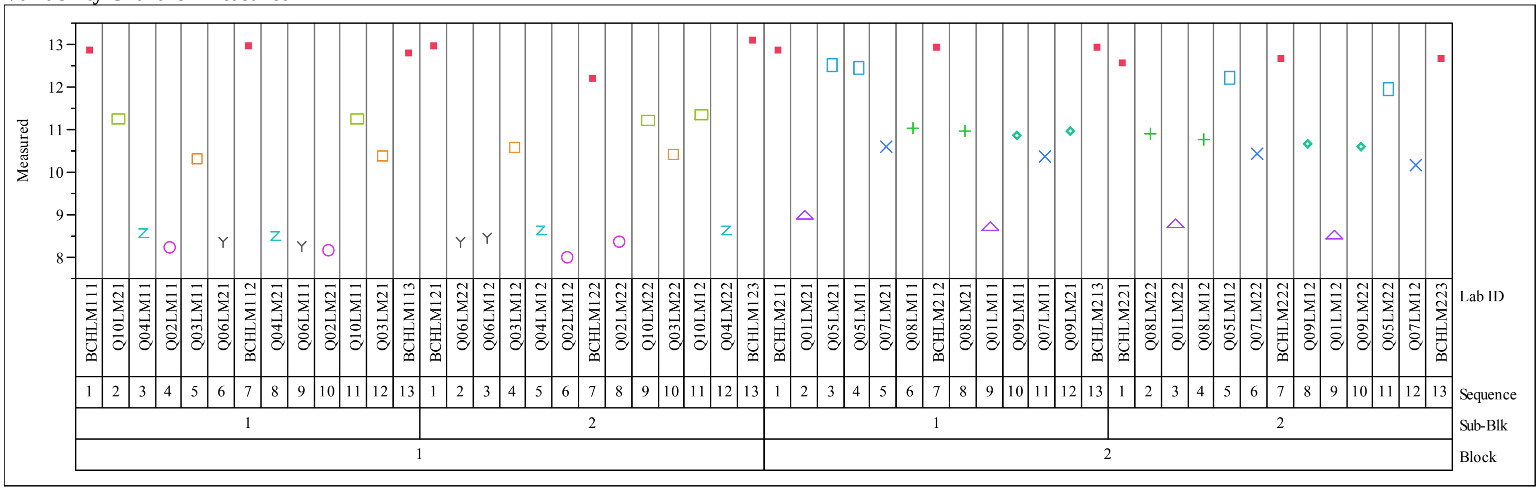


Exhibit B-1. Measurements in Analytical Sequence for the KT10-Series Glasses by Preparation Method by Oxide. (continued)

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



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

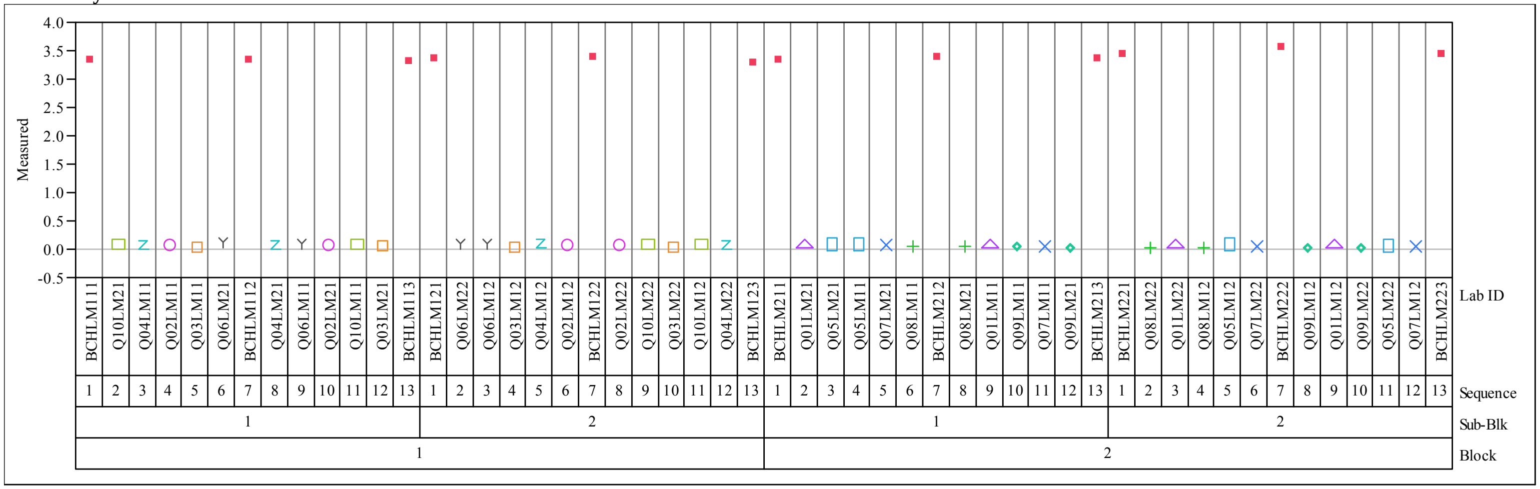
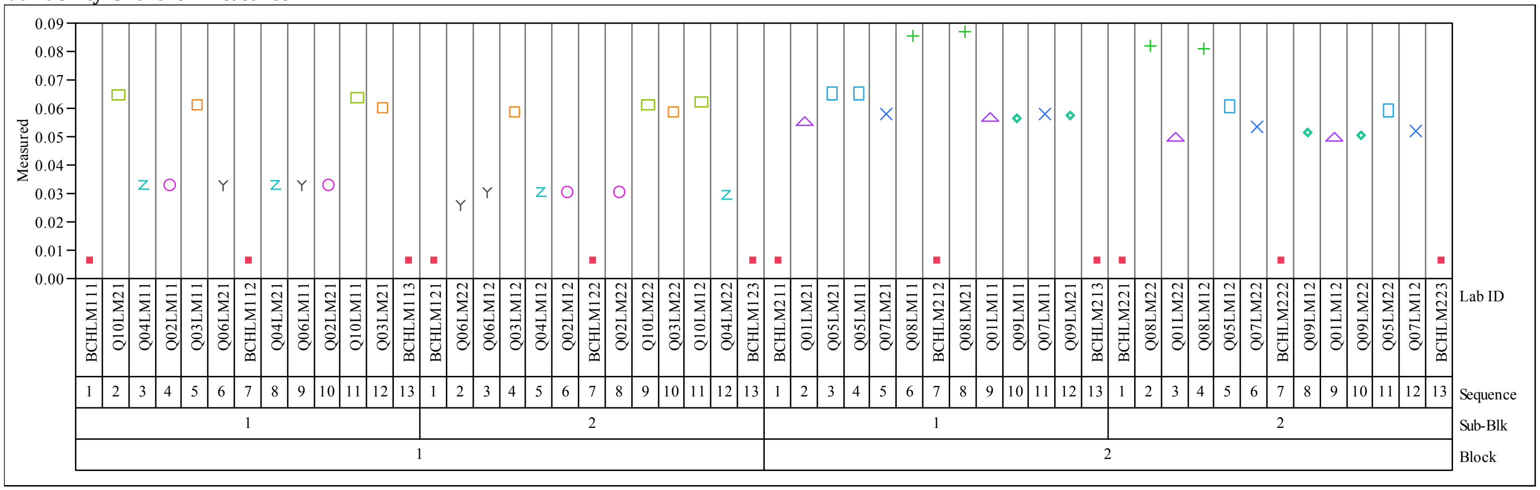


Exhibit B-1. Measurements in Analytical Sequence for the KT10-Series Glasses by Preparation Method by Oxide. (continued)

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



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

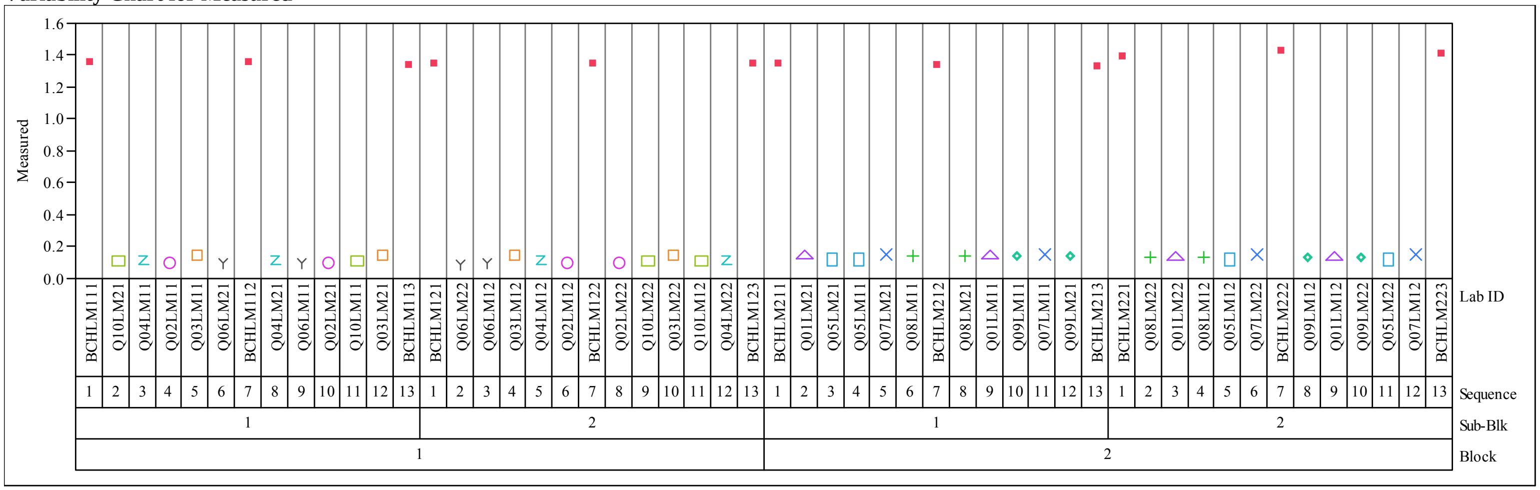
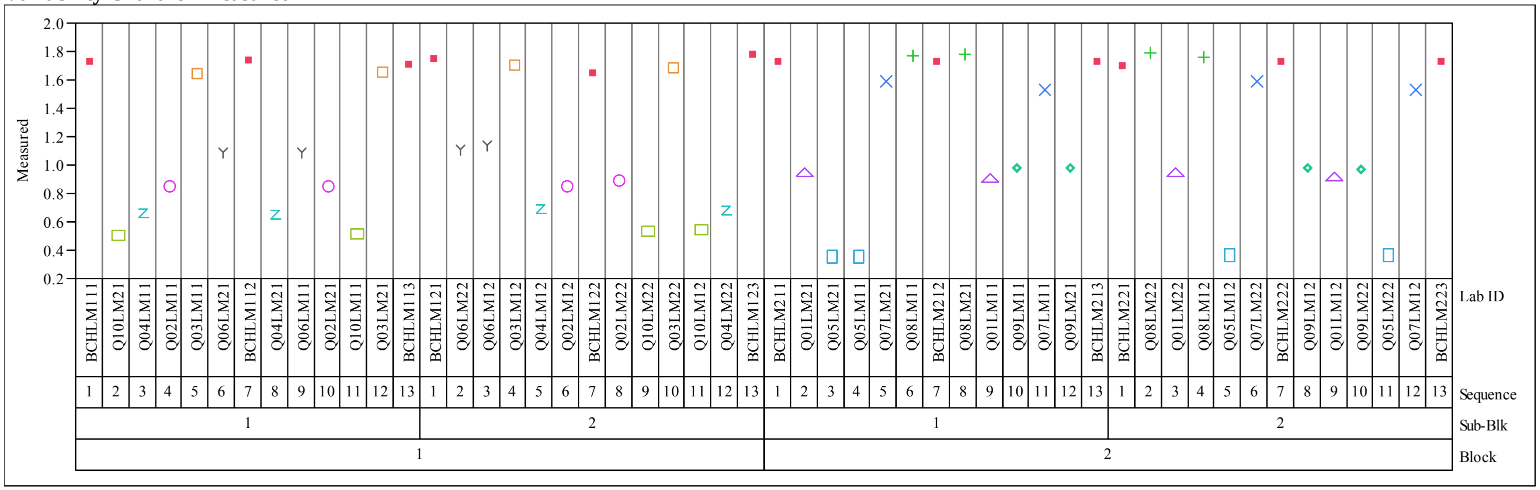


Exhibit B-1. Measurements in Analytical Sequence for the KT10-Series Glasses by Preparation Method by Oxide. (continued)

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



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

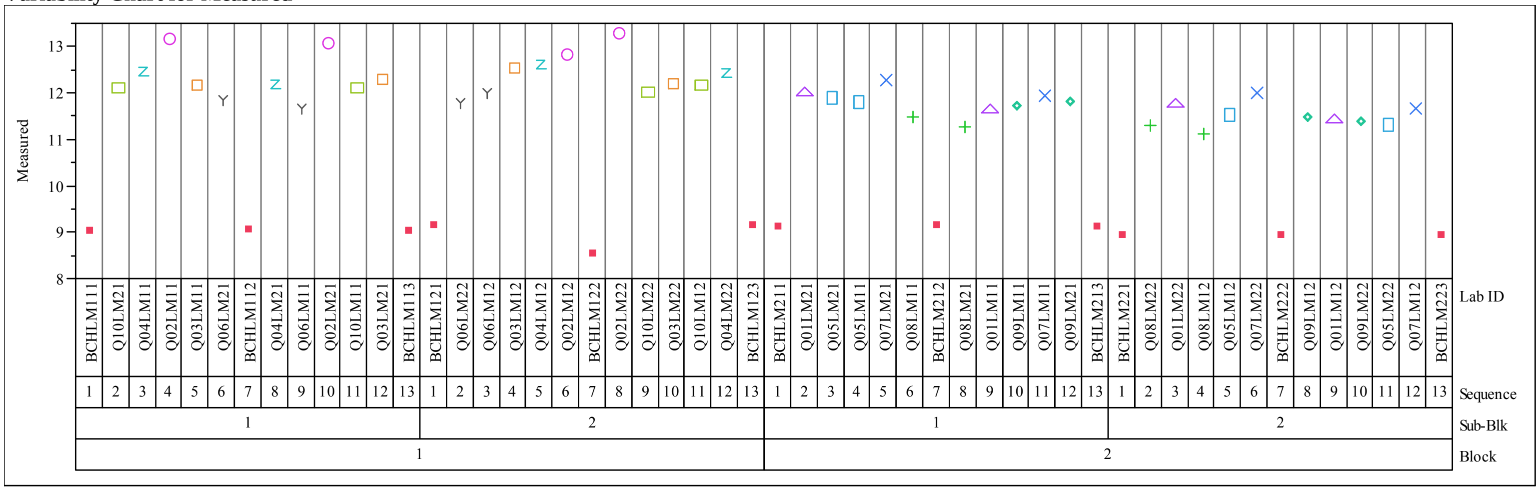
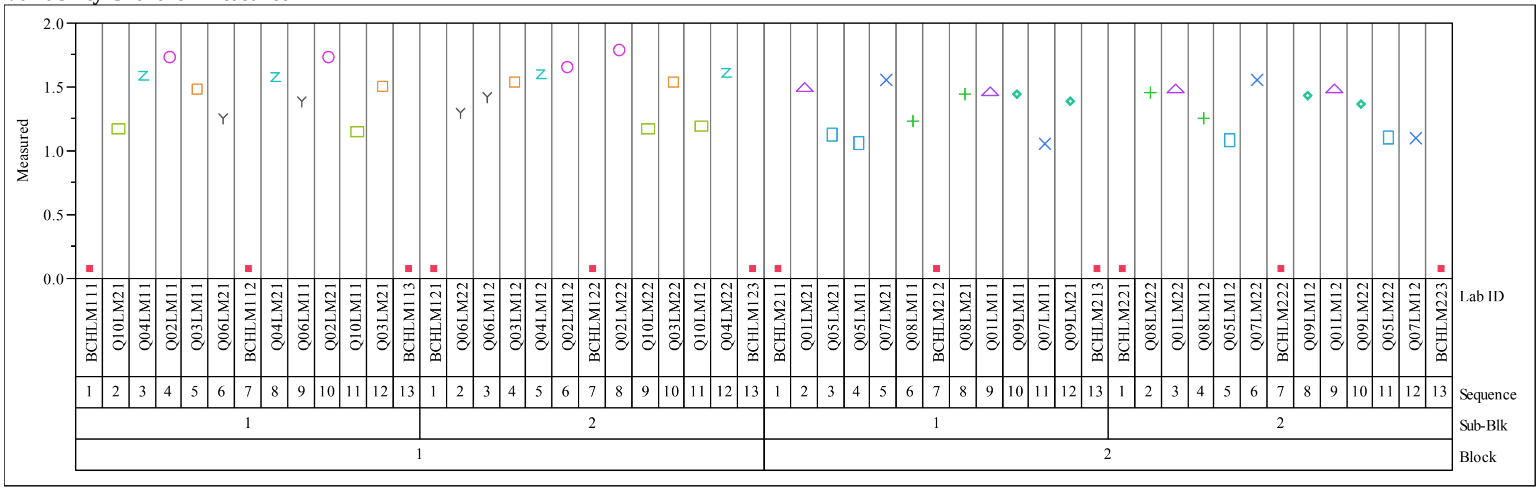


Exhibit B-1. Measurements in Analytical Sequence for the KT10-Series Glasses by Preparation Method by Oxide. (continued)

Prep Method=LM, Oxide=Nb2O5 (wt%)
Variability Chart for Measured



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

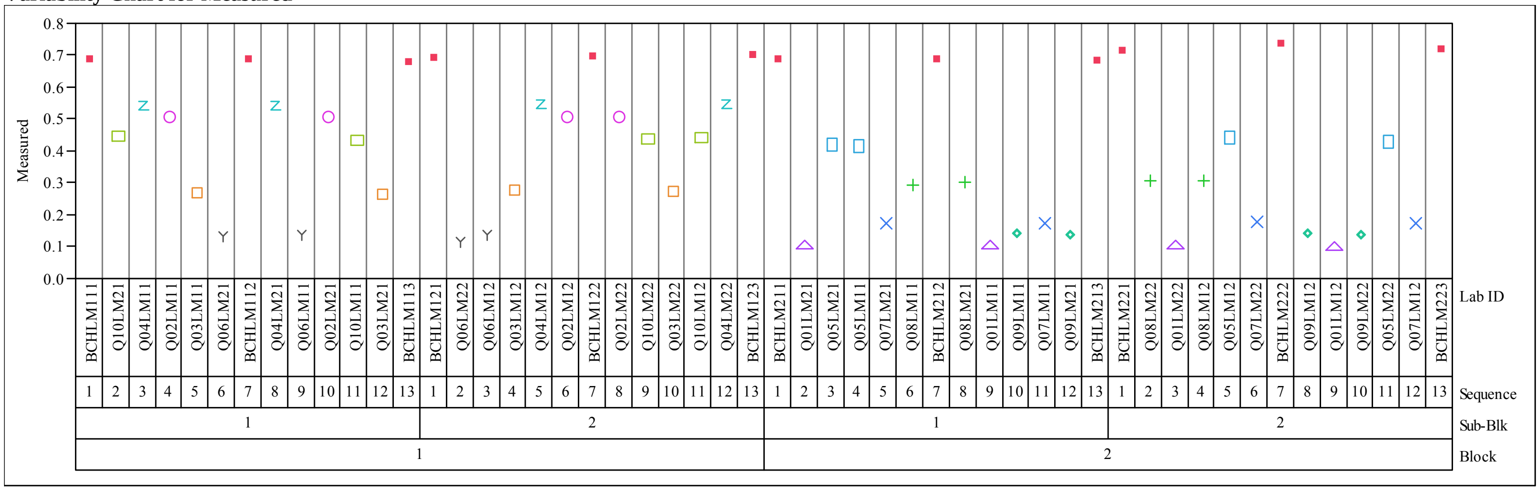
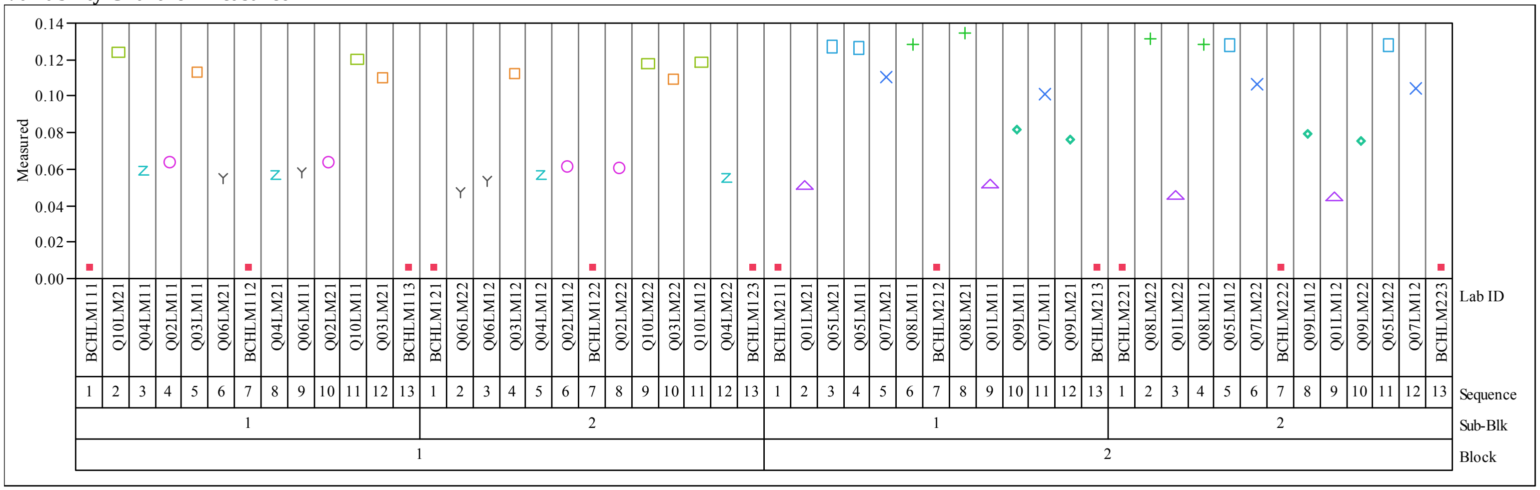


Exhibit B-1. Measurements in Analytical Sequence for the KT10-Series Glasses by Preparation Method by Oxide. (continued)

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



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

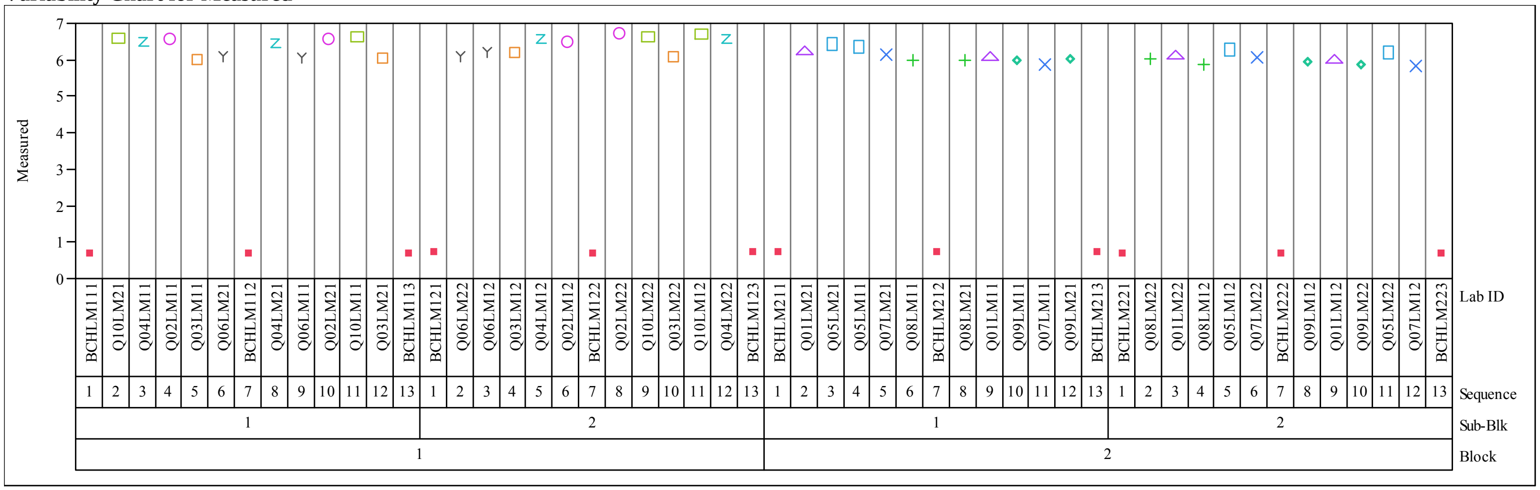
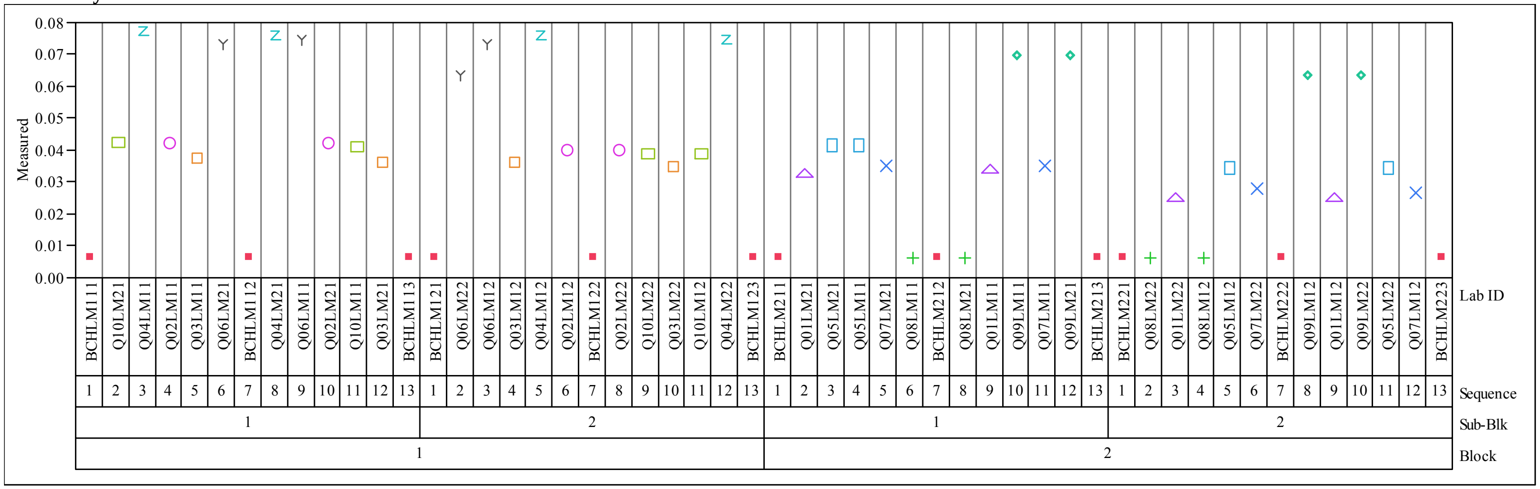


Exhibit B-1. Measurements in Analytical Sequence for the KT10-Series Glasses by Preparation Method by Oxide. (continued)

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



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

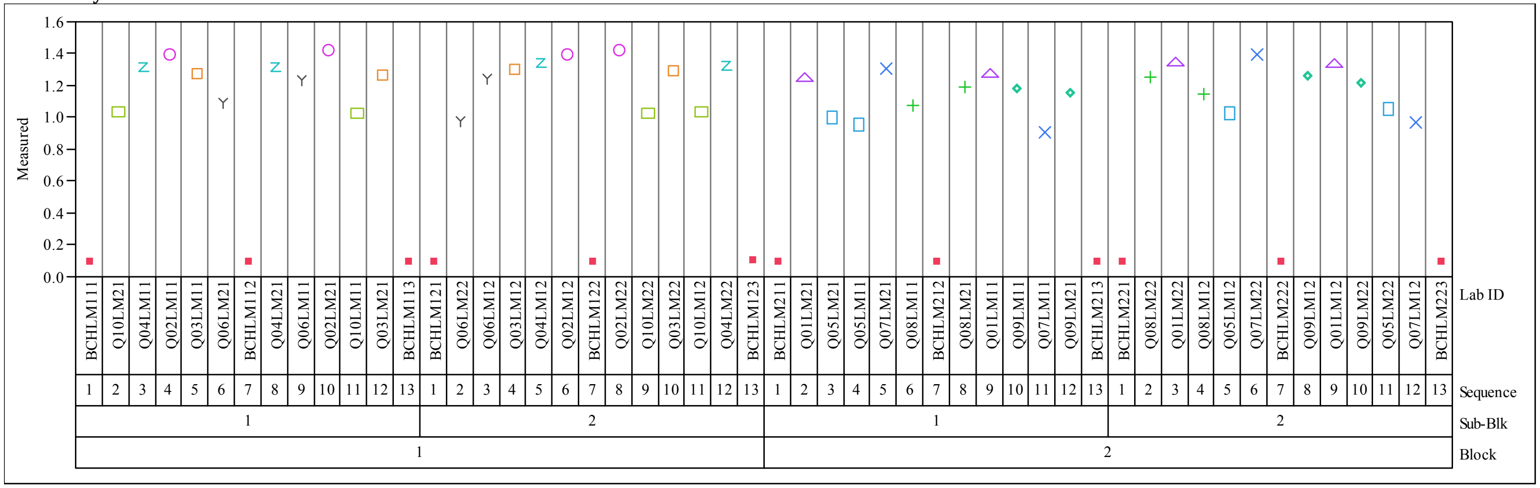
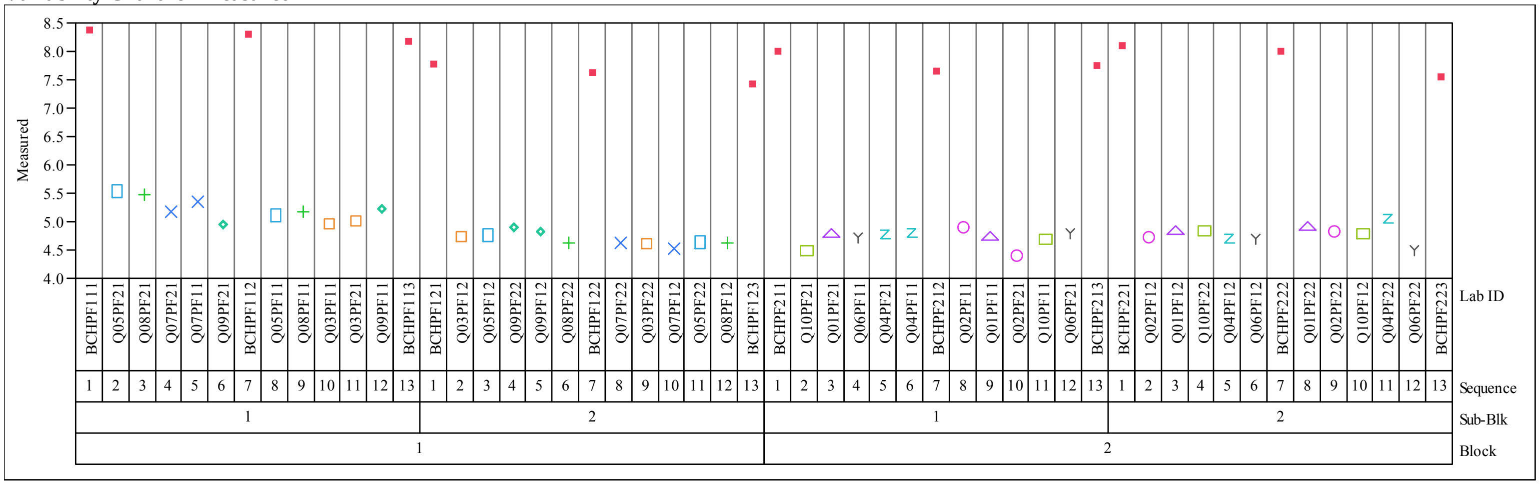


Exhibit B-1. Measurements in Analytical Sequence for the KT10-Series Glasses by Preparation Method by Oxide. (continued)

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



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

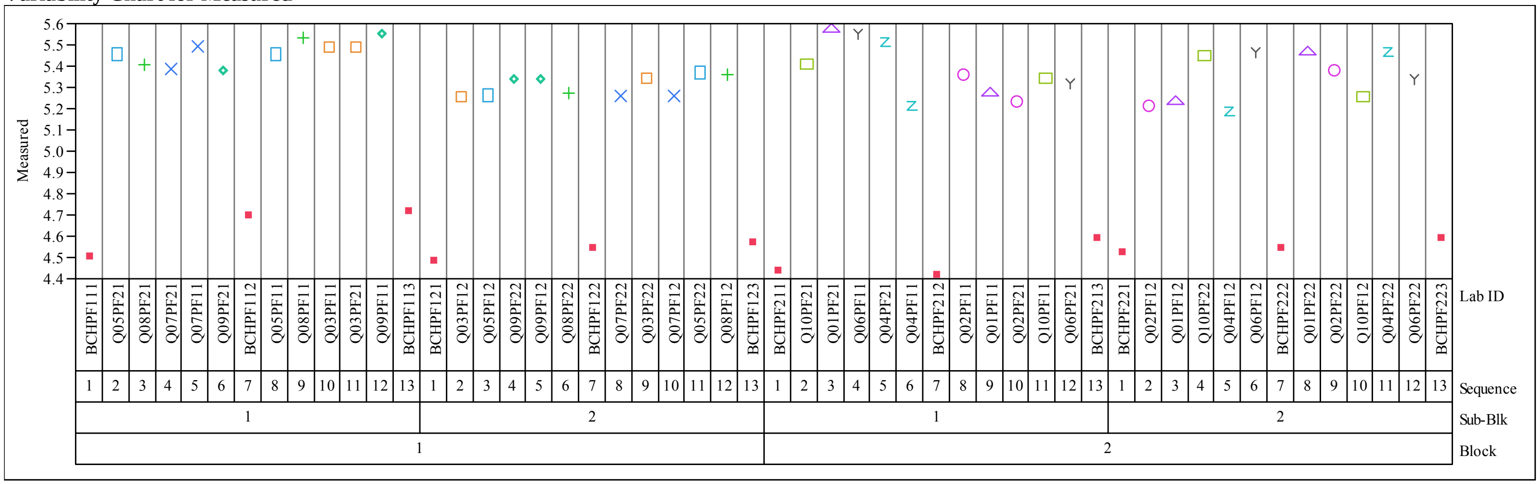


Exhibit B-1. Measurements in Analytical Sequence for the KT10-Series Glasses by Preparation Method by Oxide. (continued)

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

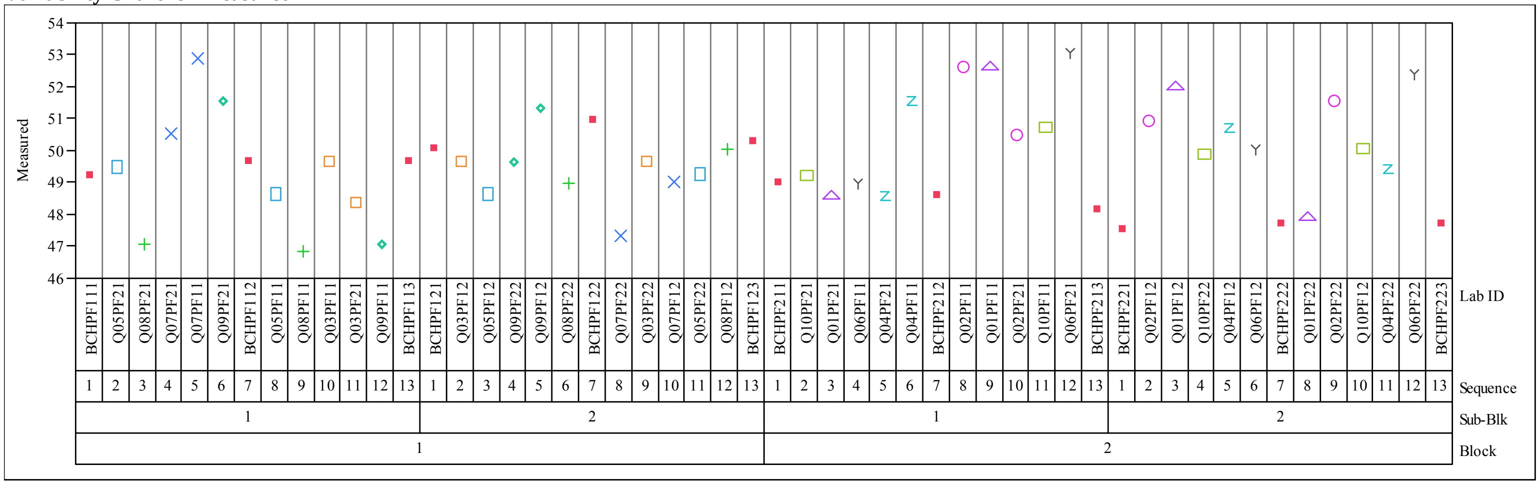
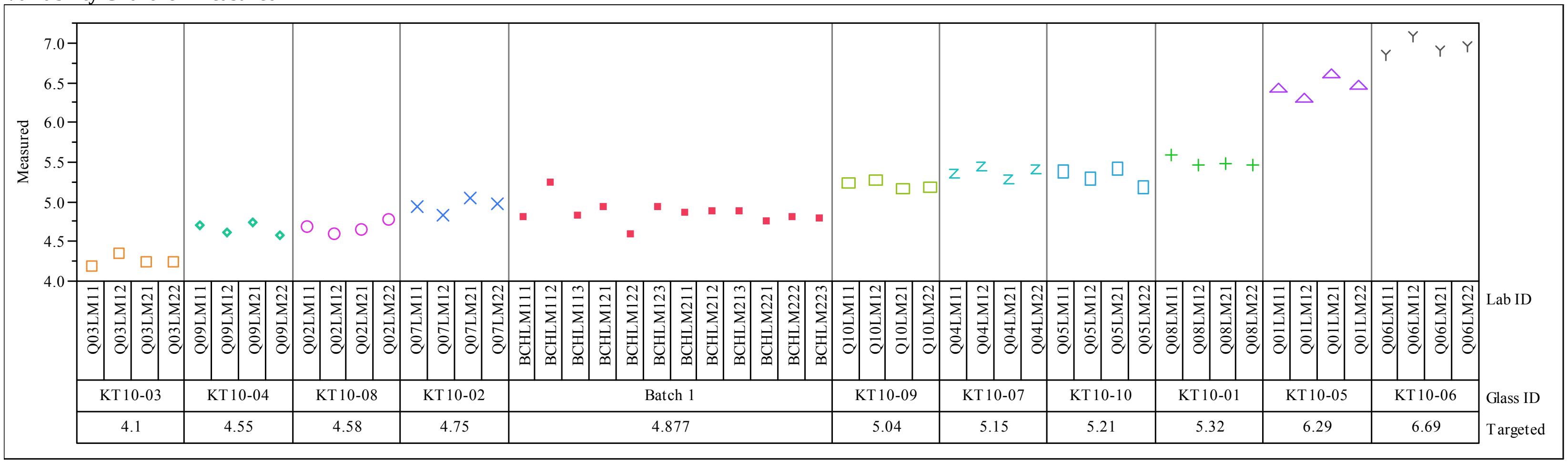


Exhibit B-2. Measurements for Each KT10-Series Glass by Preparation Method by Oxide.

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



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

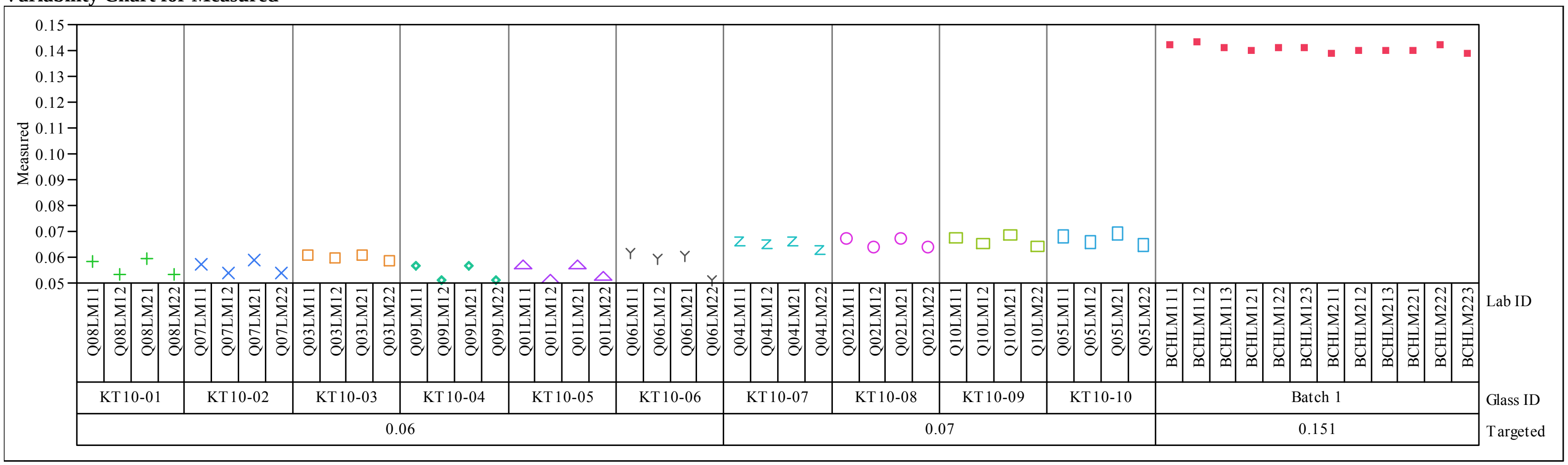
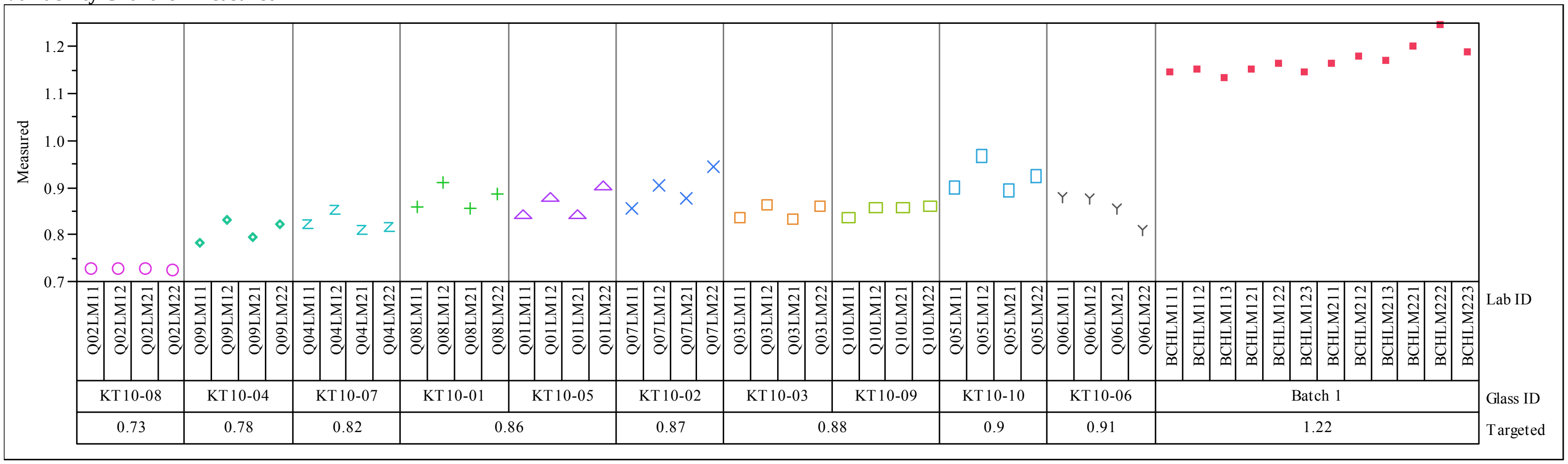


Exhibit B-2. Measurements for Each KT10-Series Glass by Preparation Method by Oxide. (continued)

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



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

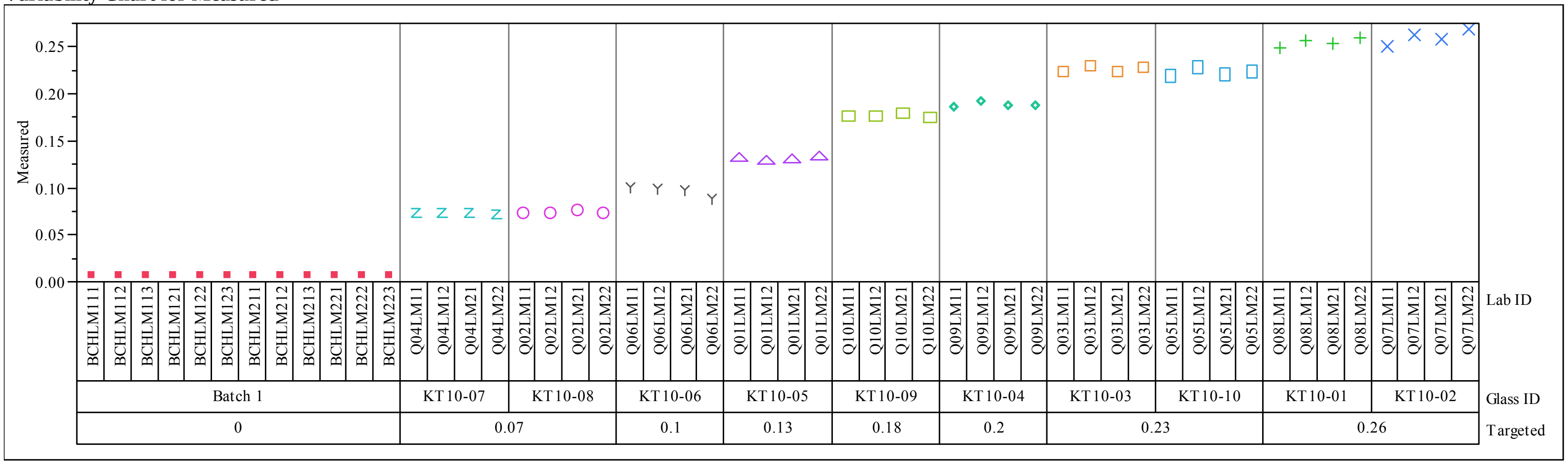
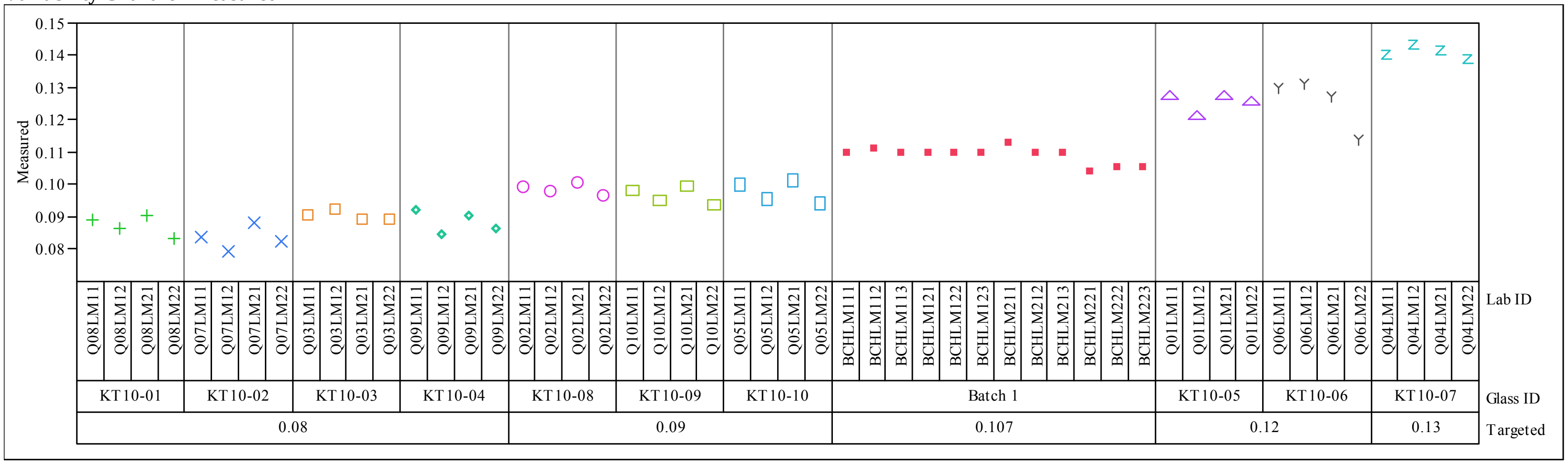


Exhibit B-2. Measurements for Each KT10-Series Glass by Preparation Method by Oxide. (continued)

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



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

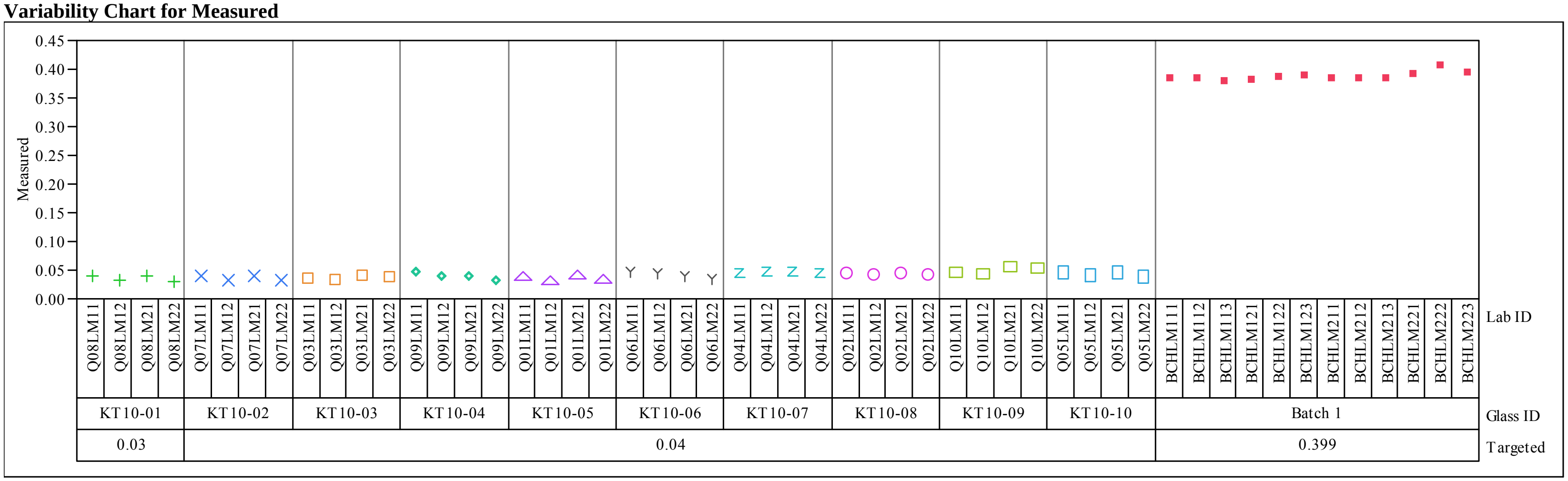
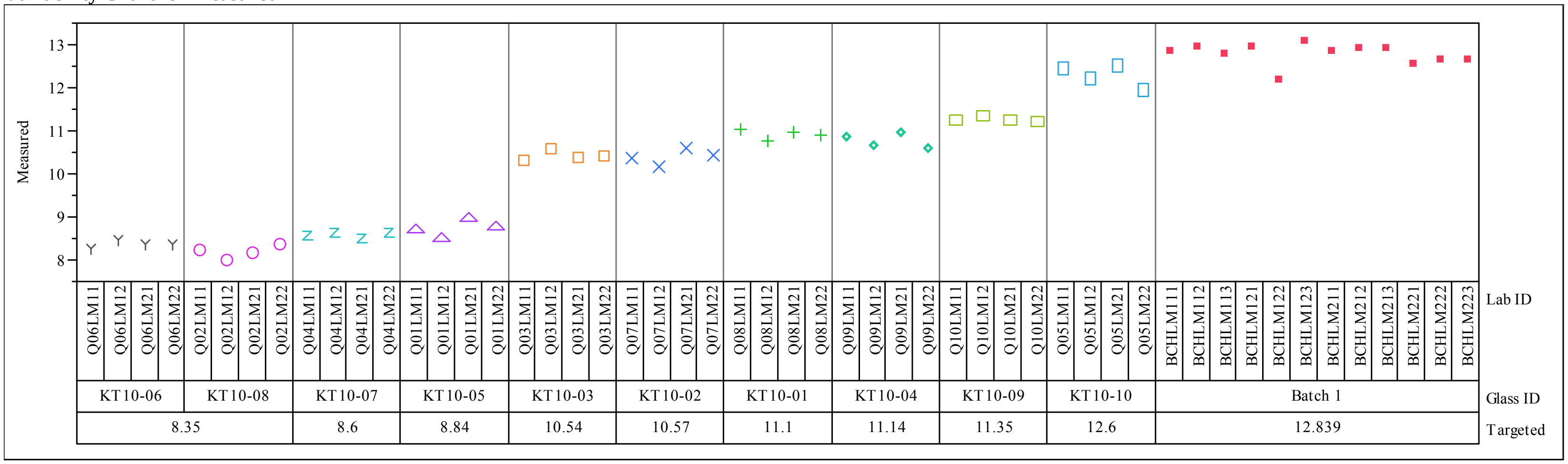


Exhibit B-2. Measurements for Each KT10-Series Glass by Preparation Method by Oxide. (continued)

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



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

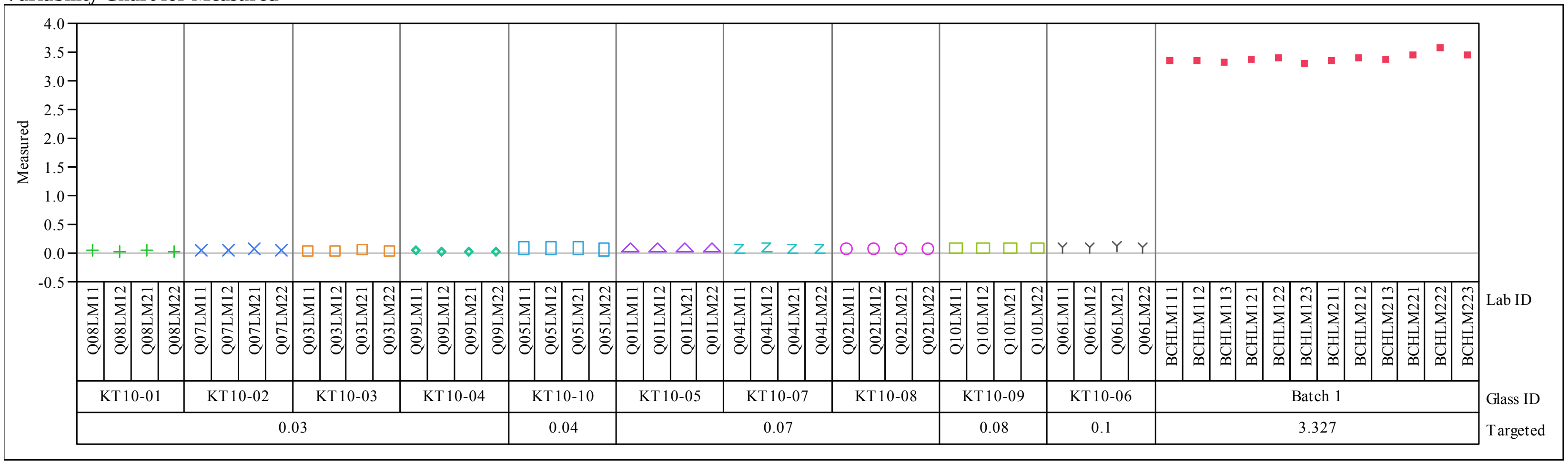
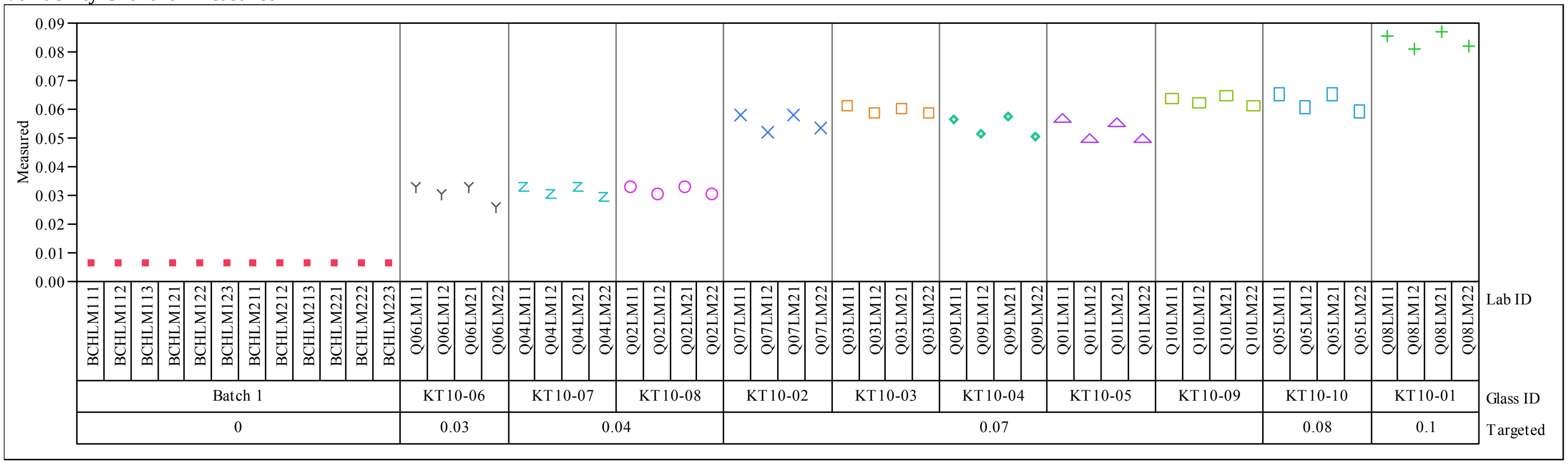


Exhibit B-2. Measurements for Each KT10-Series Glass by Preparation Method by Oxide. (continued)

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



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

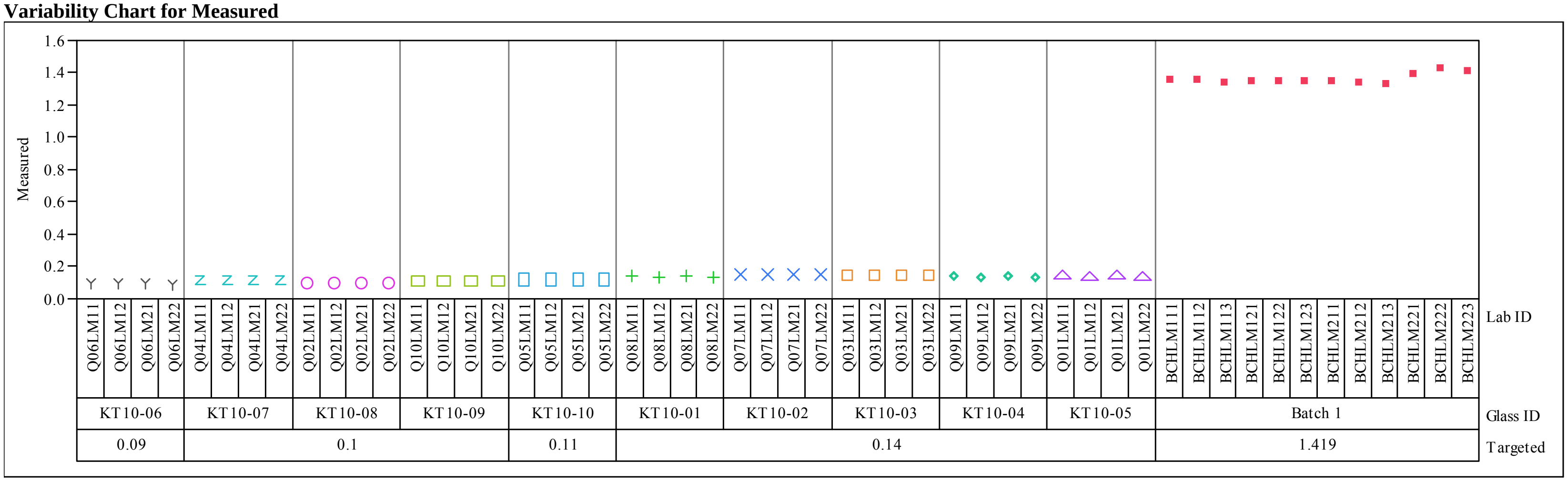
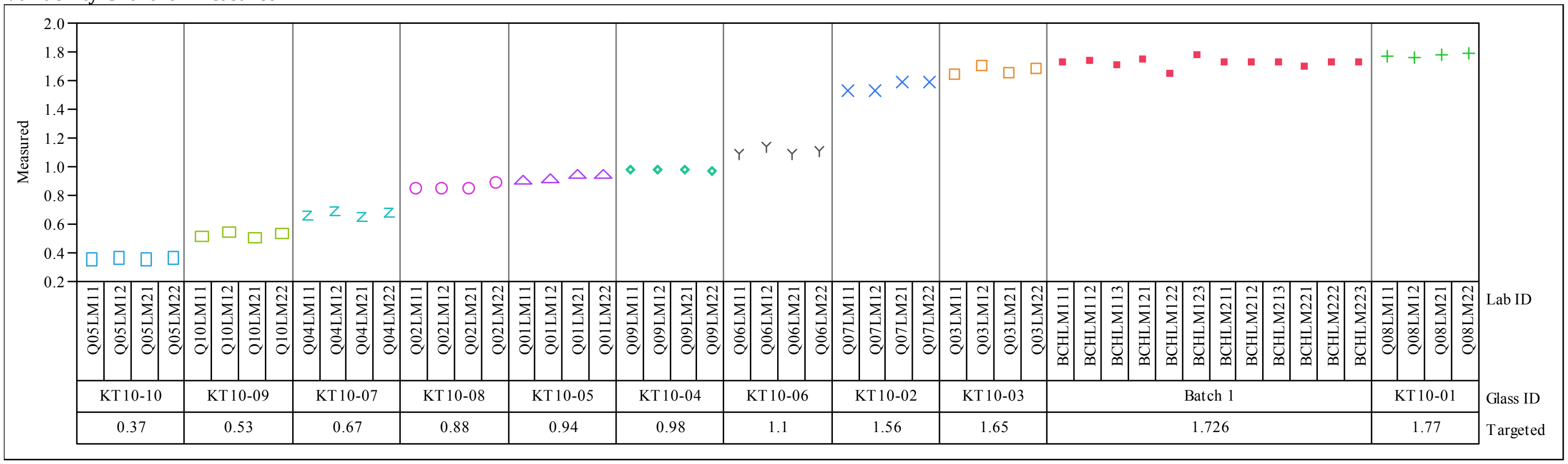


Exhibit B-2. Measurements for Each KT10-Series Glass by Preparation Method by Oxide. (continued)

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



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

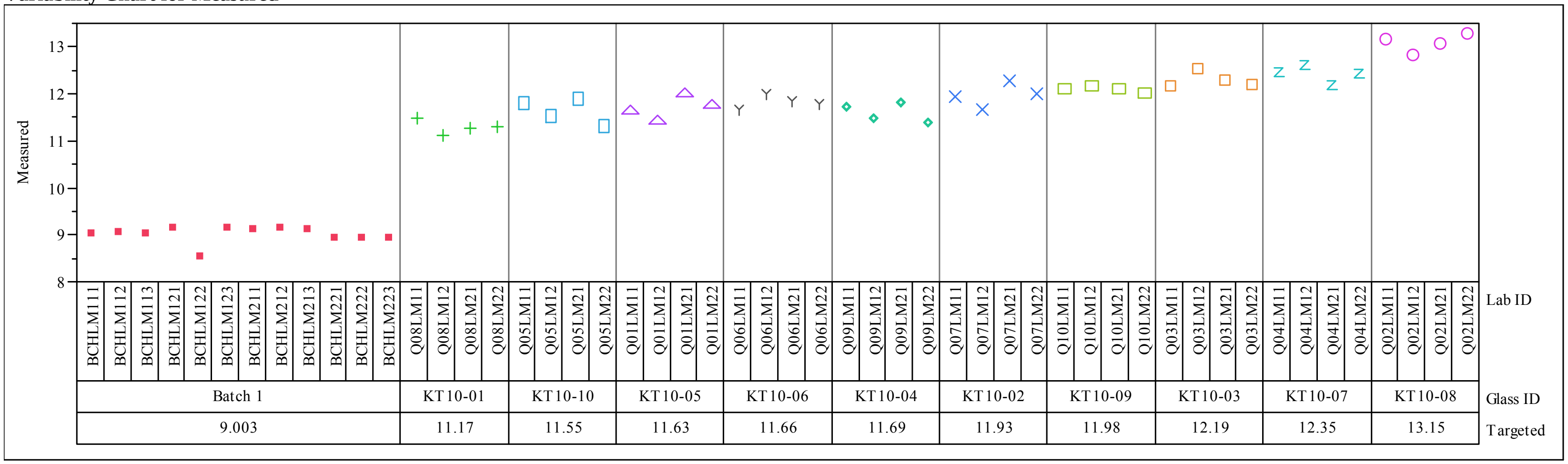
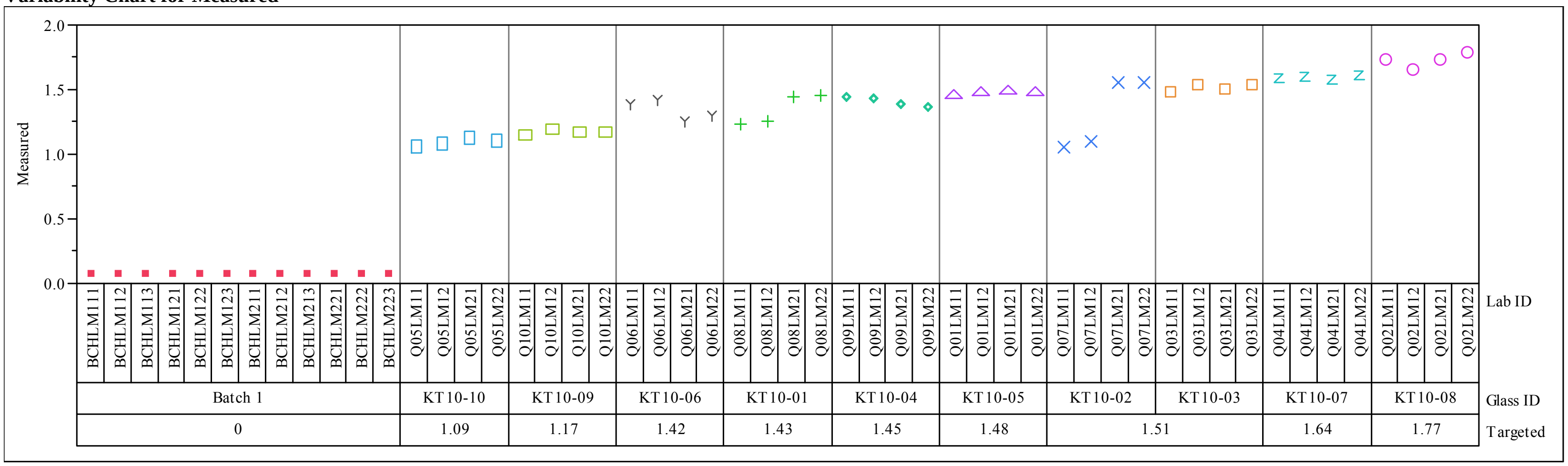


Exhibit B-2. Measurements for Each KT10-Series Glass by Preparation Method by Oxide. (continued)

Prep Method=LM, Oxide=Nb2O5 (wt%)
Variability Chart for Measured



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

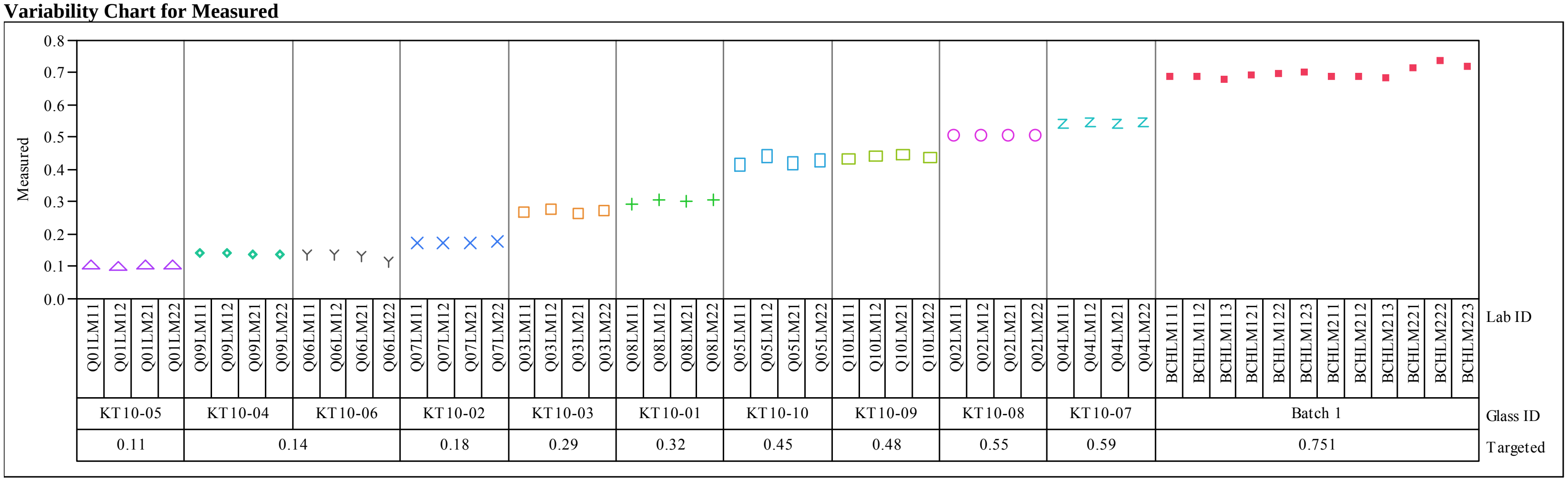
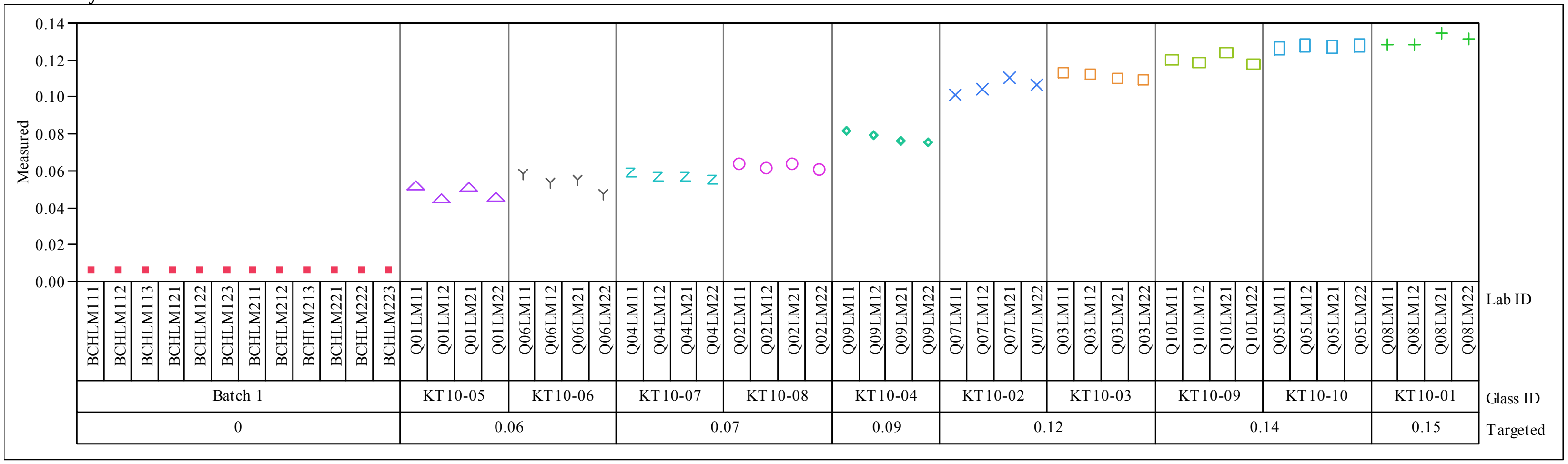


Exhibit B-2. Measurements for Each KT10-Series Glass by Preparation Method by Oxide. (continued)

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



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

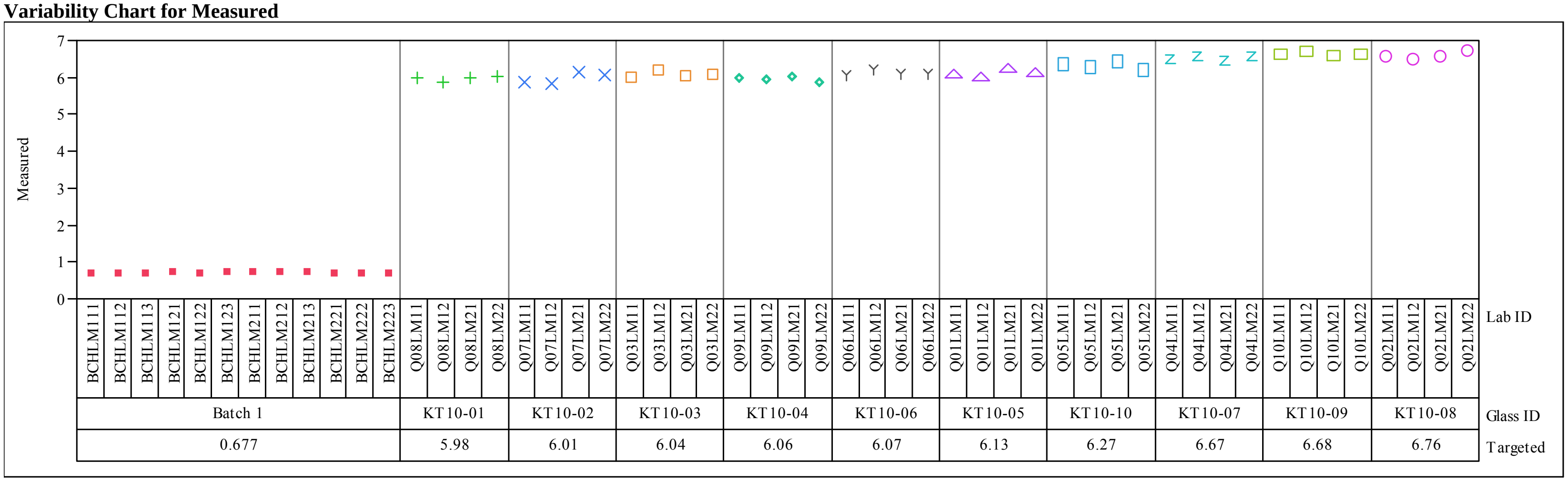
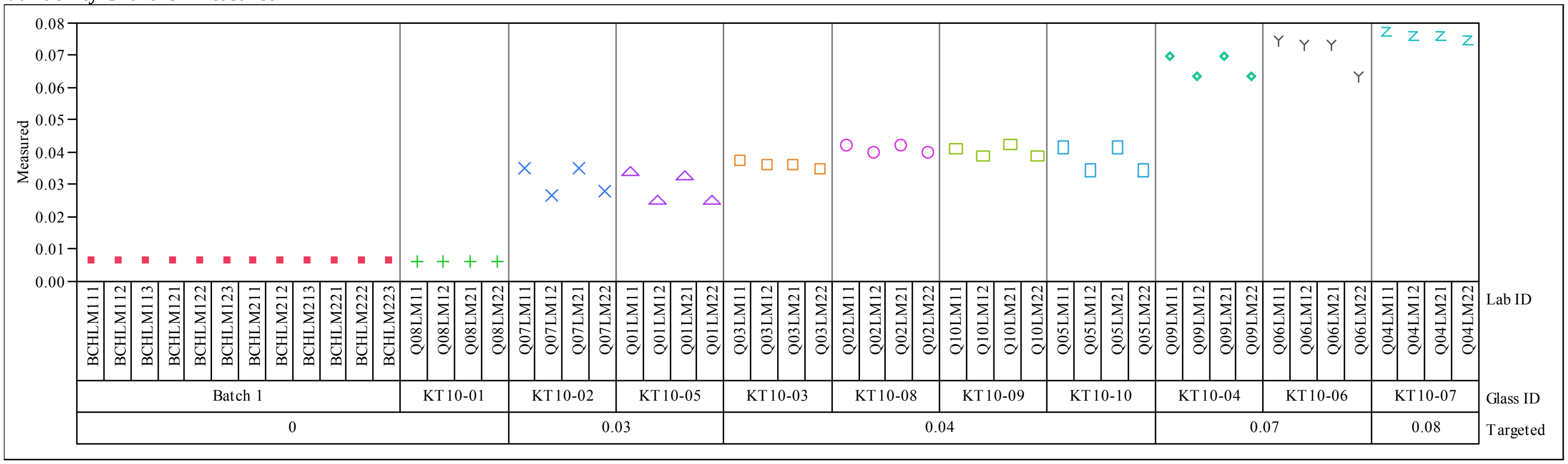


Exhibit B-2. Measurements for Each KT10-Series Glass by Preparation Method by Oxide. (continued)

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



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

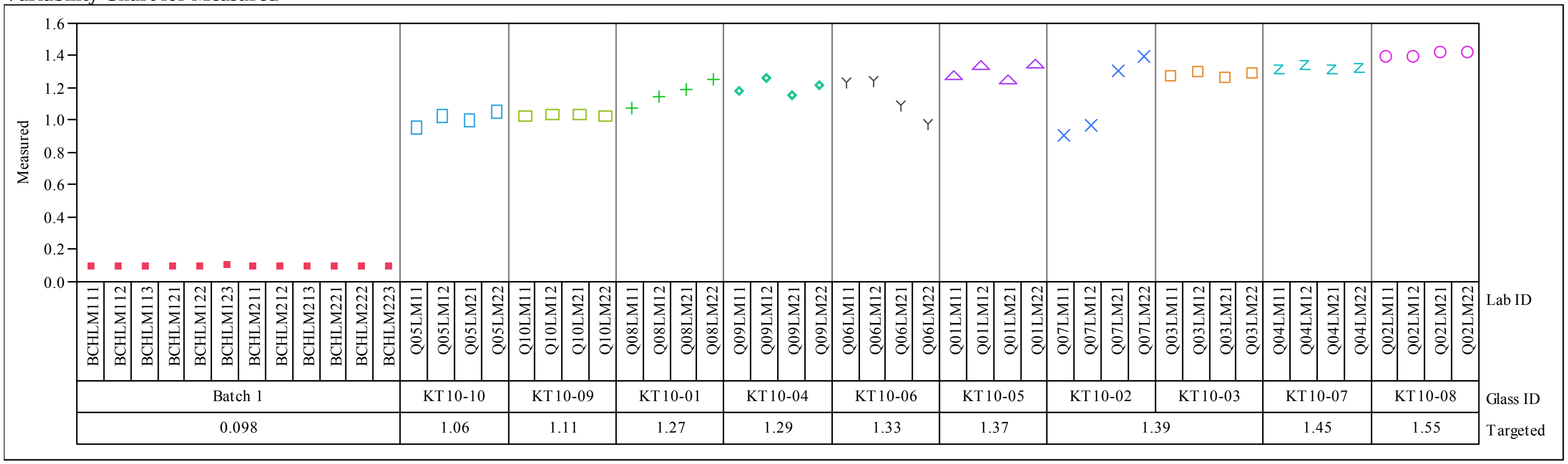
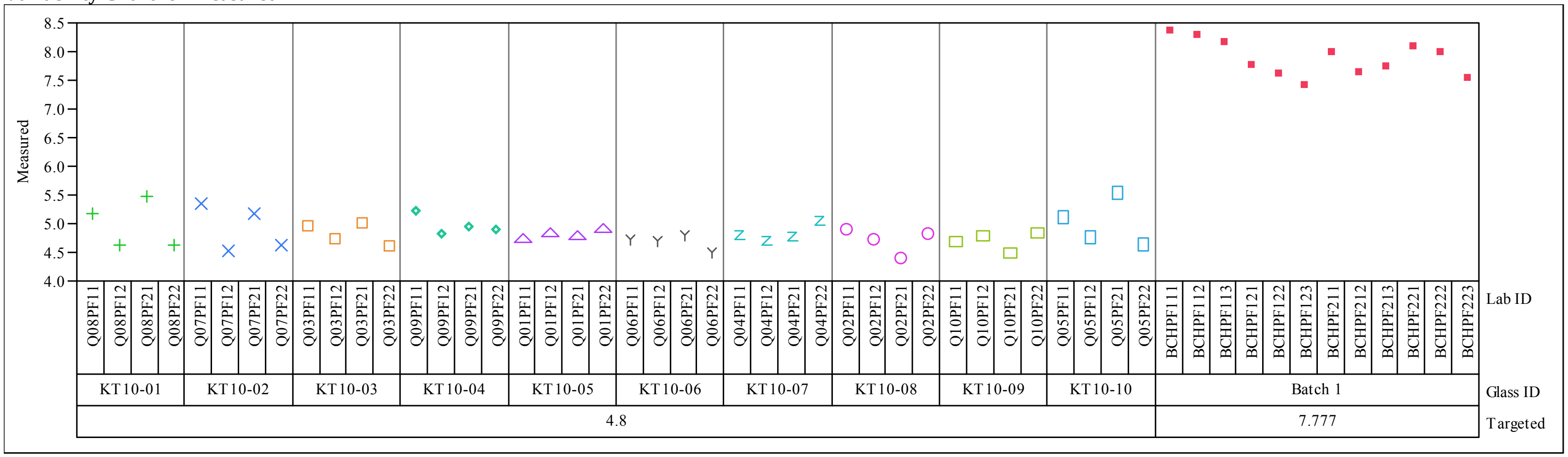


Exhibit B-2. Measurements for Each KT10-Series Glass by Preparation Method by Oxide. (continued)

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



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

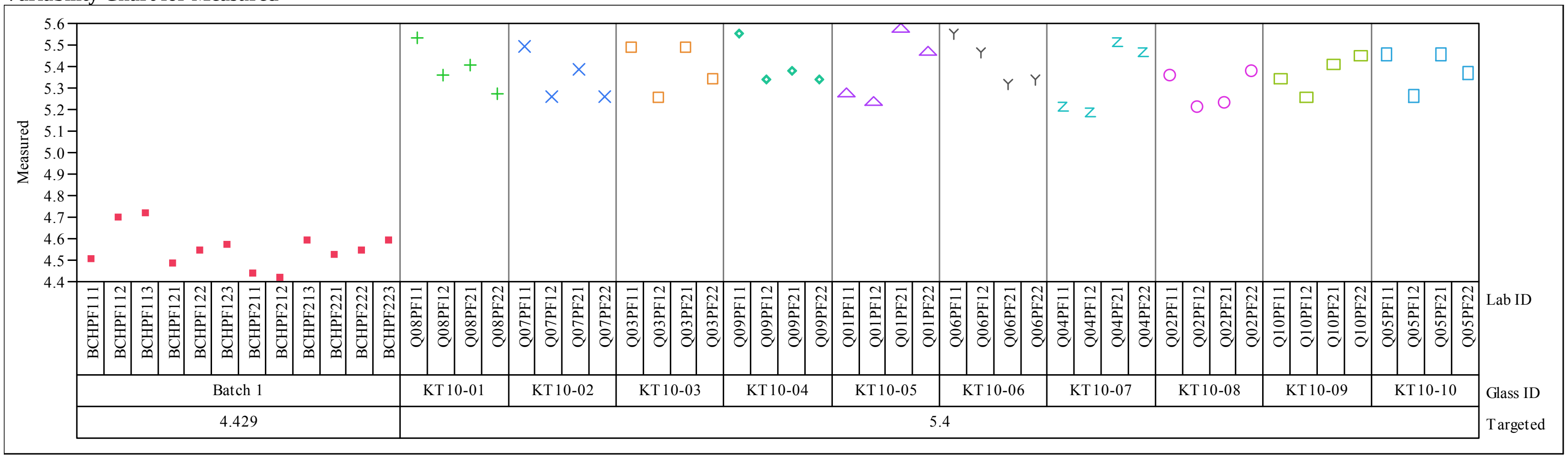


Exhibit B-2. Measurements for Each KT10-Series Glass by Preparation Method by Oxide. (continued)

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

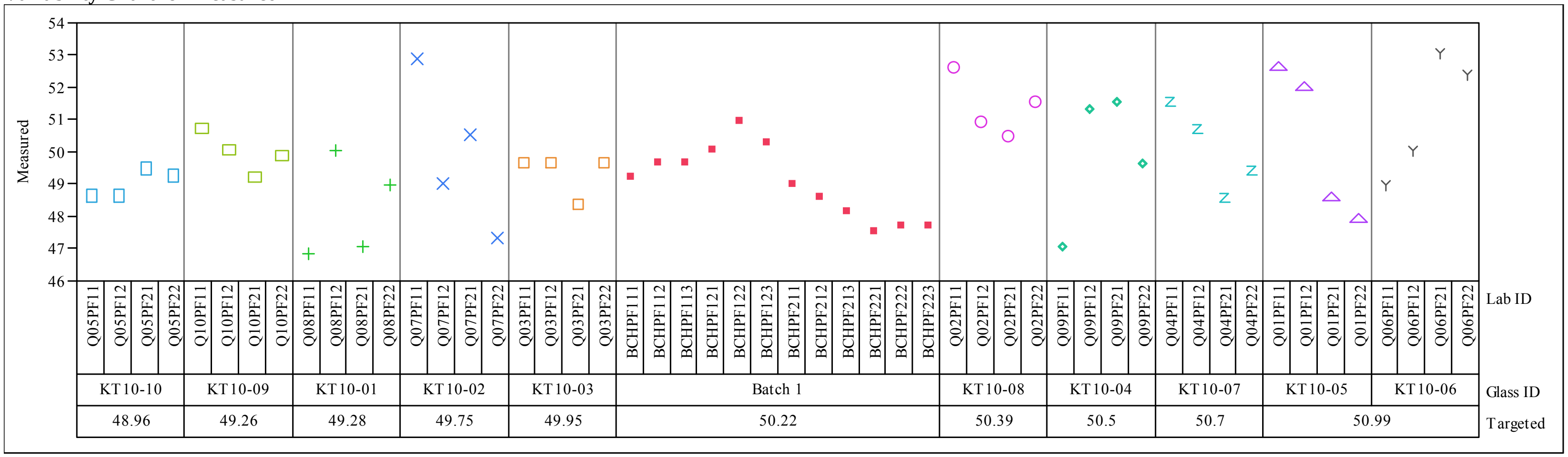
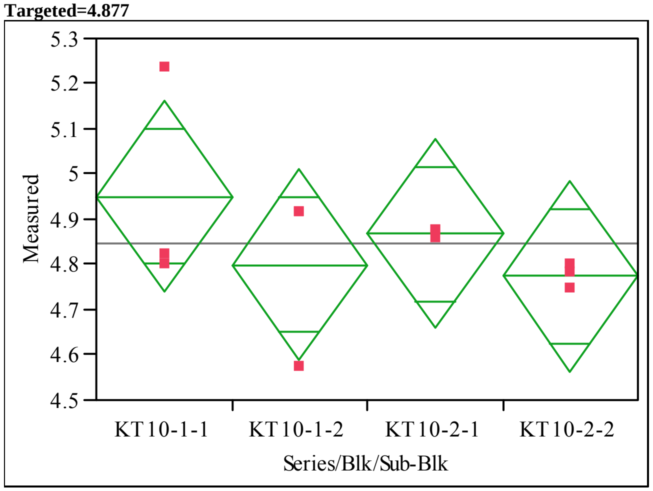


Exhibit B-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT10-Series Batch 1 Results by Oxide.

Oneway Analysis of Measured By Series/Blk/Sub-Blk, Prep Method=LM, Oxide=Al2O3 (wt%), Targeted=4.877



Oneway Anova
Summary of Fit

Rsquare	0.219807
Adj Rsquare	-0.07277
Root Mean Square Error	0.157993
Mean of Response	4.848142
Observations (or Sum Wgts)	12

Analysis of Variance

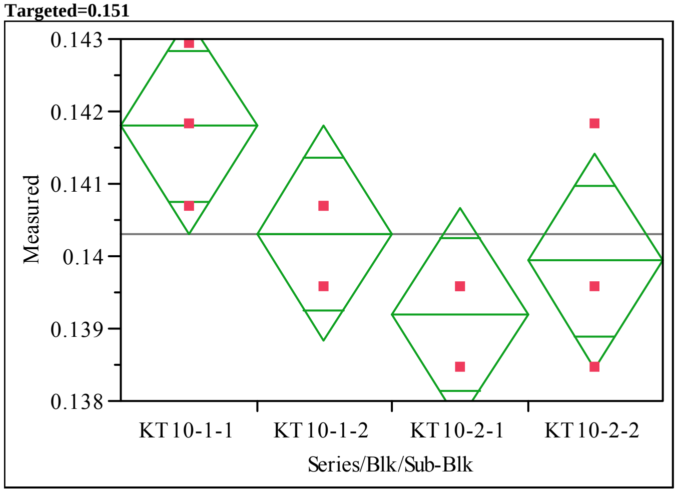
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.05626056	0.018754	0.7513	0.5517
Error	8	0.19969376	0.024962		
C. Total	11	0.25595432			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT10-1-1	3	4.95049	0.09122	4.7401	5.1608
KT10-1-2	3	4.79933	0.09122	4.5890	5.0097
KT10-2-1	3	4.86861	0.09122	4.6583	5.0790
KT10-2-2	3	4.77414	0.09122	4.5638	4.9845

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk, Prep Method=LM, Oxide=BaO (wt%), Targeted=0.151



Oneway Anova
Summary of Fit

Rsquare	0.52
Adj Rsquare	0.34
Root Mean Square Error	0.001117
Mean of Response	0.140307
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00001080	3.6012e-6	2.8889	0.1023
Error	8	0.00000997	1.2466e-6		
C. Total	11	0.00002078			

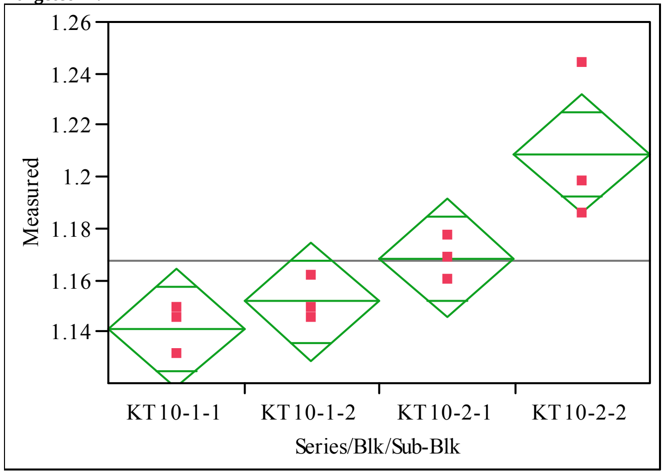
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT10-1-1	3	0.141796	0.00064	0.14031	0.14328
KT10-1-2	3	0.140307	0.00064	0.13882	0.14179
KT10-2-1	3	0.139190	0.00064	0.13770	0.14068
KT10-2-2	3	0.139935	0.00064	0.13845	0.14142

Std Error uses a pooled estimate of error variance

Exhibit B-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT10-Series Batch 1 Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk, Prep Method=LM, Oxide=CaO (wt%), Targeted=1.22



Oneway Anova
Summary of Fit

Rsquare	0.769377
Adj Rsquare	0.682894
Root Mean Square Error	0.017284
Mean of Response	1.167516
Observations (or Sum Wgts)	12

Analysis of Variance

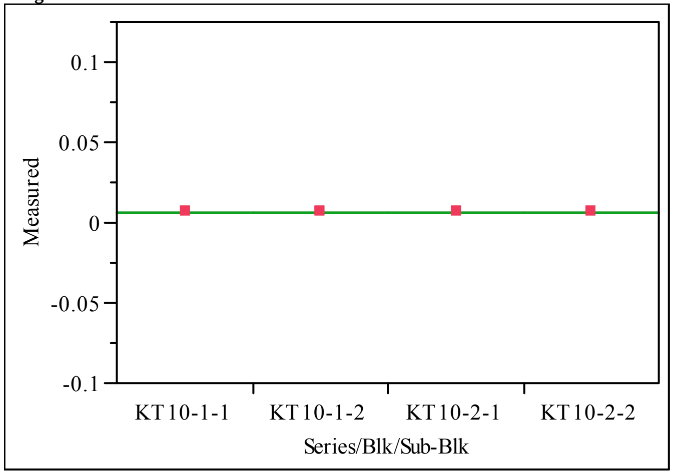
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00797249	0.002657	8.8962	0.0063
Error	8	0.00238977	0.000299		
C. Total	11	0.01036226			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT10-1-1	3	1.14128	0.00998	1.1183	1.1643
KT10-1-2	3	1.15154	0.00998	1.1285	1.1746
KT10-2-1	3	1.16833	0.00998	1.1453	1.1913
KT10-2-2	3	1.20891	0.00998	1.1859	1.2319

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk, Prep Method=LM, Oxide=Ce2O3 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.005857
Observations (or Sum Wgts)	12

Analysis of Variance

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

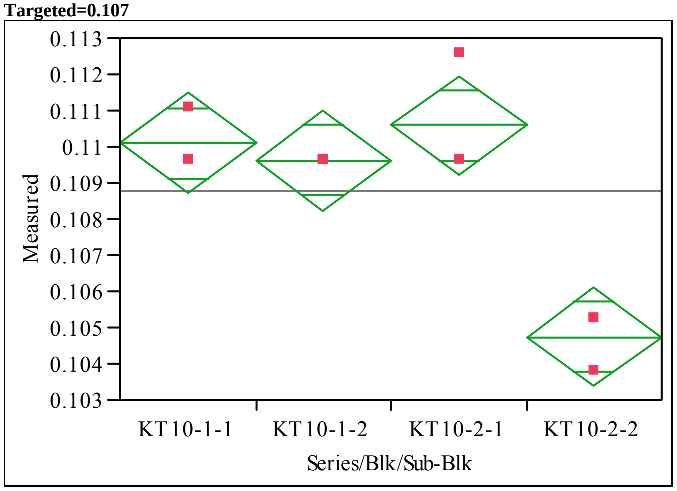
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT10-1-1	3	0.005857	0	0.00586	0.00586
KT10-1-2	3	0.005857	0	0.00586	0.00586
KT10-2-1	3	0.005857	0	0.00586	0.00586
KT10-2-2	3	0.005857	0	0.00586	0.00586

Std Error uses a pooled estimate of error variance

Exhibit B-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT10-Series Batch 1 Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk, Prep Method=LM, Oxide=Cr2O3 (wt%), Targeted=0.107



Oneway Anova
Summary of Fit

Rsquare	0.885442
Adj Rsquare	0.842482
Root Mean Square Error	0.001034
Mean of Response	0.108767
Observations (or Sum Wgts)	12

Analysis of Variance

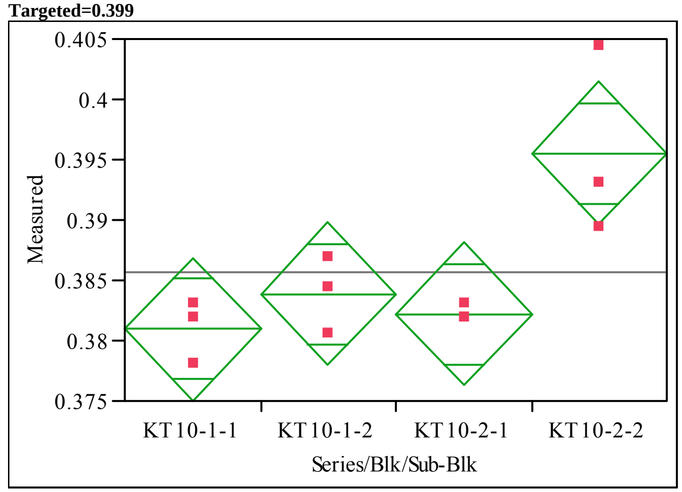
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00006605	0.000022	20.6111	0.0004
Error	8	0.00000855	1.068e-6		
C. Total	11	0.00007459			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT10-1-1	3	0.110107	0.00060	0.10873	0.11148
KT10-1-2	3	0.109620	0.00060	0.10824	0.11100
KT10-2-1	3	0.110594	0.00060	0.10922	0.11197
KT10-2-2	3	0.104748	0.00060	0.10337	0.10612

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk, Prep Method=LM, Oxide=CuO (wt%), Targeted=0.399



Oneway Anova
Summary of Fit

Rsquare	0.721384
Adj Rsquare	0.616903
Root Mean Square Error	0.004426
Mean of Response	0.385659
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00040572	0.000135	6.9044	0.0131
Error	8	0.00015670	0.000020		
C. Total	11	0.00056242			

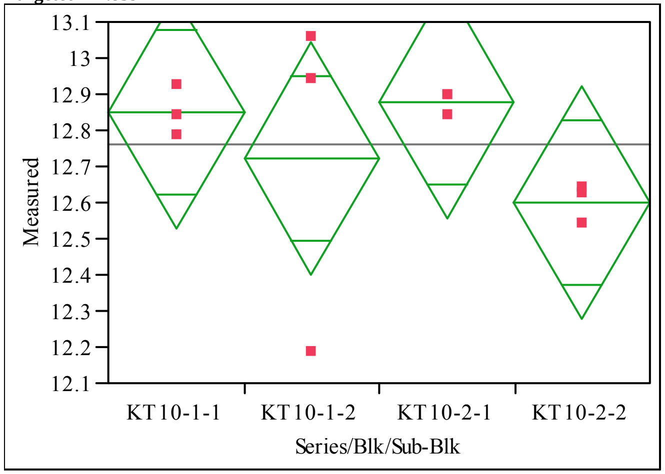
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT10-1-1	3	0.380964	0.00256	0.37507	0.38686
KT10-1-2	3	0.383885	0.00256	0.37799	0.38978
KT10-2-1	3	0.382216	0.00256	0.37632	0.38811
KT10-2-2	3	0.395569	0.00256	0.38968	0.40146

Std Error uses a pooled estimate of error variance

Exhibit B-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT10-Series Batch 1 Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk, Prep Method=LM, Oxide=Fe2O3 (wt%), Targeted=12.839



Oneway Anova
Summary of Fit

Rsquare	0.235975
Adj Rsquare	-0.05053
Root Mean Square Error	0.241784
Mean of Response	12.76246
Observations (or Sum Wgts)	12

Analysis of Variance

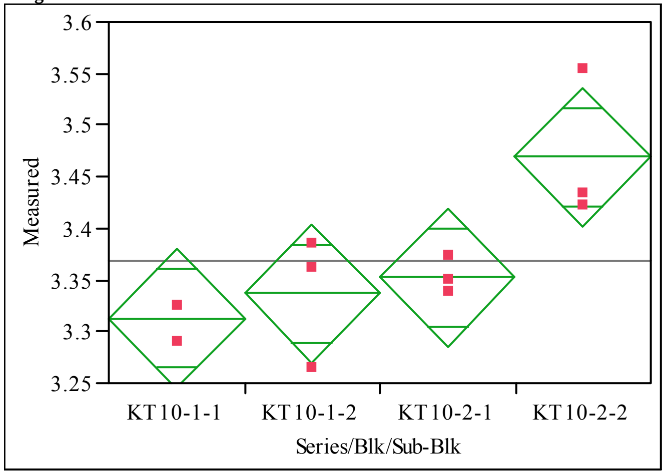
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.14444564	0.048149	0.8236	0.5167
Error	8	0.46767683	0.058460		
C. Total	11	0.61212247			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT10-1-1	3	12.8482	0.13959	12.526	13.170
KT10-1-2	3	12.7243	0.13959	12.402	13.046
KT10-2-1	3	12.8768	0.13959	12.555	13.199
KT10-2-2	3	12.6004	0.13959	12.279	12.922

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk, Prep Method=LM, Oxide=K2O (wt%), Targeted=3.327



Oneway Anova
Summary of Fit

Rsquare	0.680968
Adj Rsquare	0.561331
Root Mean Square Error	0.050512
Mean of Response	3.367861
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.04356811	0.014523	5.6919	0.0220
Error	8	0.02041159	0.002551		
C. Total	11	0.06397970			

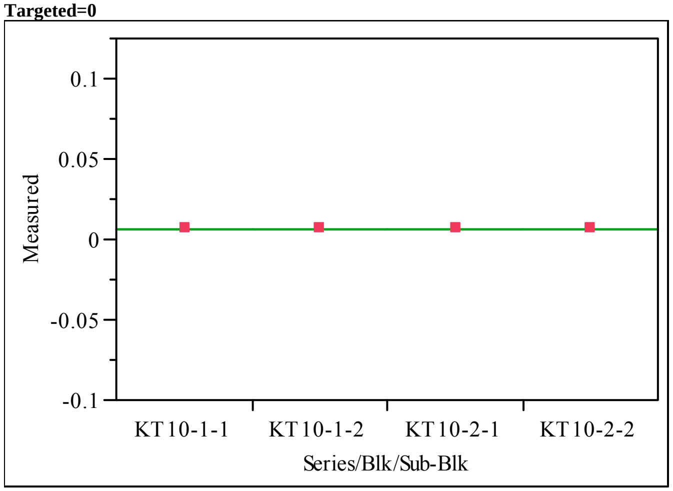
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT10-1-1	3	3.31265	0.02916	3.2454	3.3799
KT10-1-2	3	3.33674	0.02916	3.2695	3.4040
KT10-2-1	3	3.35280	0.02916	3.2856	3.4201
KT10-2-2	3	3.46925	0.02916	3.4020	3.5365

Std Error uses a pooled estimate of error variance

Exhibit B-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT10-Series Batch 1 Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk, Prep Method=LM, Oxide=La2O3 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.005864
Observations (or Sum Wgts)	12

Analysis of Variance

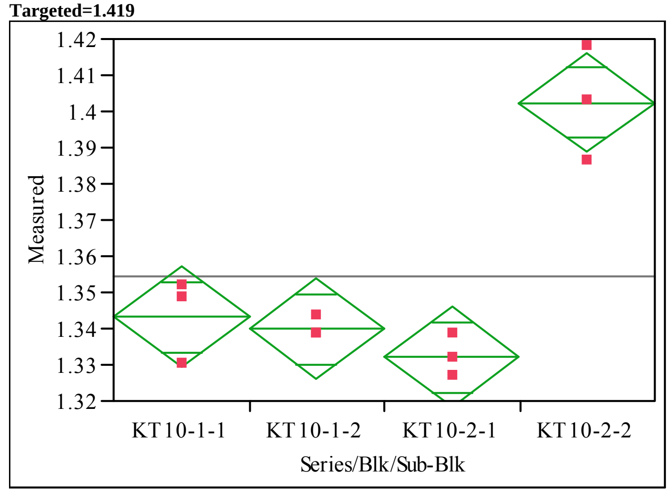
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0	0	.	.
Error	8	0	0		
C. Total	11	0			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT10-1-1	3	0.005864	0	0.00586	0.00586
KT10-1-2	3	0.005864	0	0.00586	0.00586
KT10-2-1	3	0.005864	0	0.00586	0.00586
KT10-2-2	3	0.005864	0	0.00586	0.00586

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk, Prep Method=LM, Oxide=MgO (wt%), Targeted=1.419



Oneway Anova
Summary of Fit

Rsquare	0.916941
Adj Rsquare	0.885794
Root Mean Square Error	0.010312
Mean of Response	1.354417
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00939088	0.003130	29.4389	0.0001
Error	8	0.00085065	0.000106		
C. Total	11	0.01024153			

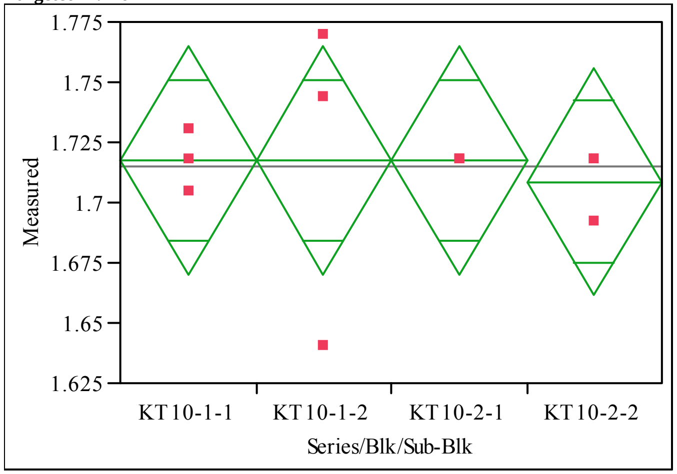
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT10-1-1	3	1.34322	0.00595	1.3295	1.3570
KT10-1-2	3	1.33991	0.00595	1.3262	1.3536
KT10-2-1	3	1.33217	0.00595	1.3184	1.3459
KT10-2-2	3	1.40237	0.00595	1.3886	1.4161

Std Error uses a pooled estimate of error variance

Exhibit B-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT10-Series Batch 1 Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk, Prep Method=LM, Oxide=MnO (wt%), Targeted=1.726



Oneway Anova
Summary of Fit

Rsquare	0.016216
Adj Rsquare	-0.3527
Root Mean Square Error	0.035557
Mean of Response	1.715144
Observations (or Sum Wgts)	12

Analysis of Variance

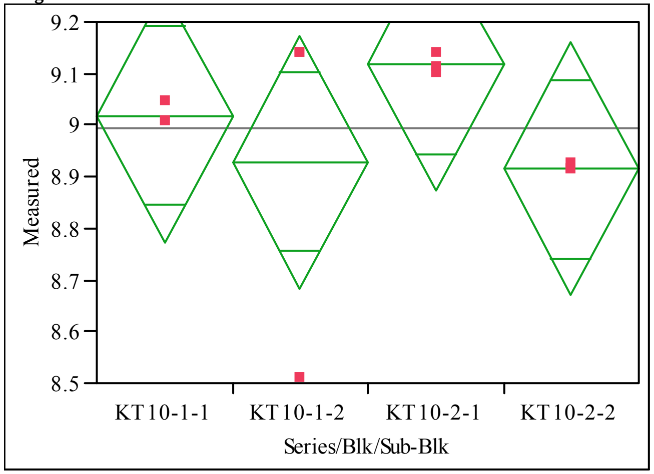
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00016672	0.000056	0.0440	0.9868
Error	8	0.01011433	0.001264		
C. Total	11	0.01028105			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT10-1-1	3	1.71730	0.02053	1.6700	1.7646
KT10-1-2	3	1.71730	0.02053	1.6700	1.7646
KT10-2-1	3	1.71730	0.02053	1.6700	1.7646
KT10-2-2	3	1.70869	0.02053	1.6613	1.7560

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk, Prep Method=LM, Oxide=Na2O (wt%), Targeted=9.003



Oneway Anova
Summary of Fit

Rsquare	0.226378
Adj Rsquare	-0.06373
Root Mean Square Error	0.183595
Mean of Response	8.99453
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.07890774	0.026303	0.7803	0.5373
Error	8	0.26965823	0.033707		
C. Total	11	0.34856597			

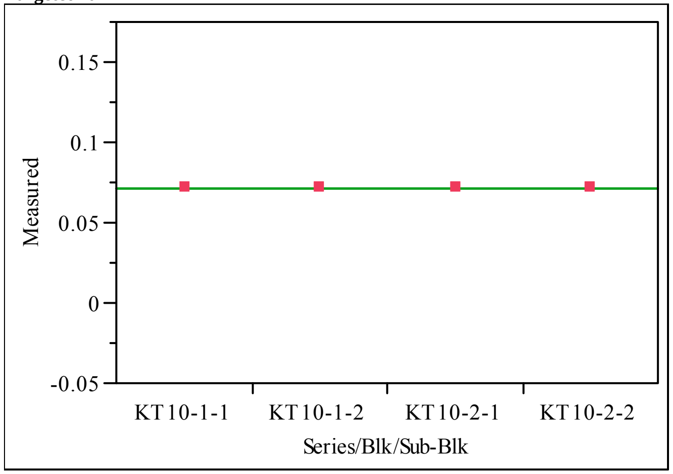
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT10-1-1	3	9.01812	0.10600	8.7737	9.2626
KT10-1-2	3	8.92825	0.10600	8.6838	9.1727
KT10-2-1	3	9.11697	0.10600	8.8725	9.3614
KT10-2-2	3	8.91477	0.10600	8.6703	9.1592

Std Error uses a pooled estimate of error variance

Exhibit B-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT10-Series Batch 1 Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk, Prep Method=LM, Oxide=Nb2O5 (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.071525
Observations (or Sum Wgts)	12

Analysis of Variance

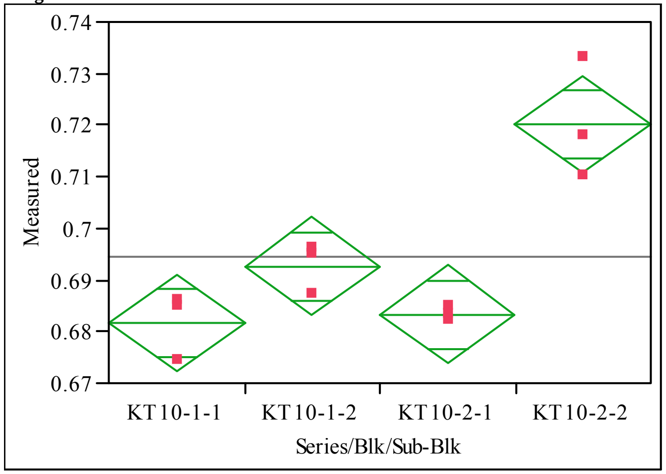
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0	0	.	.
Error	8	0	0		
C. Total	11	0			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT10-1-1	3	0.071525	0	0.07153	0.07153
KT10-1-2	3	0.071525	0	0.07153	0.07153
KT10-2-1	3	0.071525	0	0.07153	0.07153
KT10-2-2	3	0.071525	0	0.07153	0.07153

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk, Prep Method=LM, Oxide=NiO (wt%), Targeted=0.751



Oneway Anova
Summary of Fit

Rsquare	0.877452
Adj Rsquare	0.831496
Root Mean Square Error	0.007075
Mean of Response	0.694467
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00286757	0.000956	19.0934	0.0005
Error	8	0.00040050	0.000050		
C. Total	11	0.00326806			

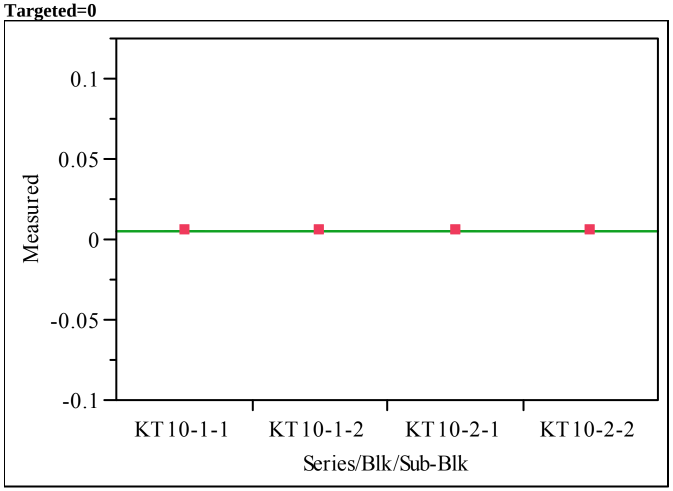
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT10-1-1	3	0.681636	0.00409	0.67222	0.69106
KT10-1-2	3	0.692664	0.00409	0.68324	0.70208
KT10-2-1	3	0.683333	0.00409	0.67391	0.69275
KT10-2-2	3	0.720235	0.00409	0.71081	0.72966

Std Error uses a pooled estimate of error variance

Exhibit B-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT10-Series Batch 1 Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk, Prep Method=LM, Oxide=PbO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	0
Adj Rsquare	-0.375
Root Mean Square Error	1.06e-18
Mean of Response	0.005386
Observations (or Sum Wgts)	12

Analysis of Variance

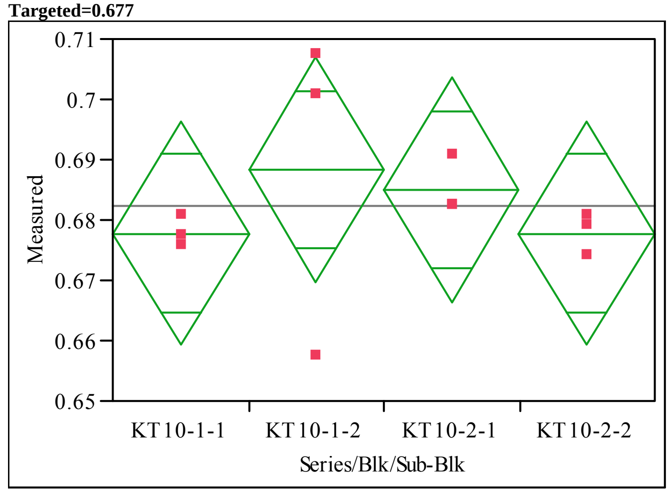
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0	0	0.0000	1.0000
Error	8	9.0278e-36	1.128e-36		
C. Total	11	9.0278e-36			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT10-1-1	3	0.005386	6.133e-19	0.00539	0.00539
KT10-1-2	3	0.005386	6.133e-19	0.00539	0.00539
KT10-2-1	3	0.005386	6.133e-19	0.00539	0.00539
KT10-2-2	3	0.005386	6.133e-19	0.00539	0.00539

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk, Prep Method=LM, Oxide=TiO2 (wt%), Targeted=0.677



Oneway Anova
Summary of Fit

Rsquare	0.140082
Adj Rsquare	-0.18239
Root Mean Square Error	0.013964
Mean of Response	0.682212
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00025411	0.000085	0.4344	0.7343
Error	8	0.00155990	0.000195		
C. Total	11	0.00181401			

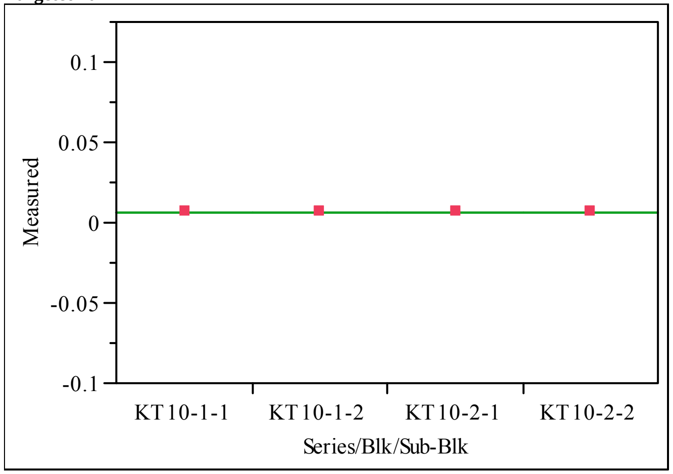
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT10-1-1	3	0.677764	0.00806	0.65917	0.69636
KT10-1-2	3	0.688328	0.00806	0.66974	0.70692
KT10-2-1	3	0.684992	0.00806	0.66640	0.70358
KT10-2-2	3	0.677764	0.00806	0.65917	0.69636

Std Error uses a pooled estimate of error variance

Exhibit B-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT10-Series Batch 1 Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk, Prep Method=LM, Oxide=ZnO (wt%), Targeted=0



Oneway Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.006224
Observations (or Sum Wgts)	12

Analysis of Variance

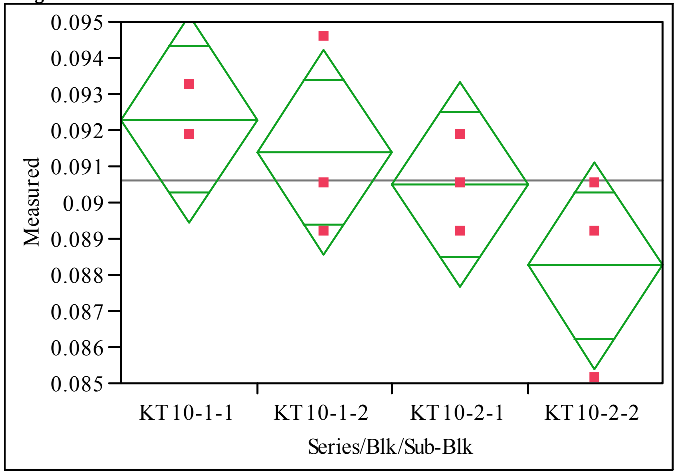
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0	0	.	.
Error	8	0	0		
C. Total	11	0			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT10-1-1	3	0.006224	0	0.00622	0.00622
KT10-1-2	3	0.006224	0	0.00622	0.00622
KT10-2-1	3	0.006224	0	0.00622	0.00622
KT10-2-2	3	0.006224	0	0.00622	0.00622

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk, Prep Method=LM, Oxide=ZrO2 (wt%), Targeted=0.098



Oneway Anova
Summary of Fit

Rsquare	0.427208
Adj Rsquare	0.212411
Root Mean Square Error	0.002136
Mean of Response	0.090616
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.00002722	9.0726e-6	1.9889	0.1943
Error	8	0.00003649	4.5617e-6		
C. Total	11	0.00006371			

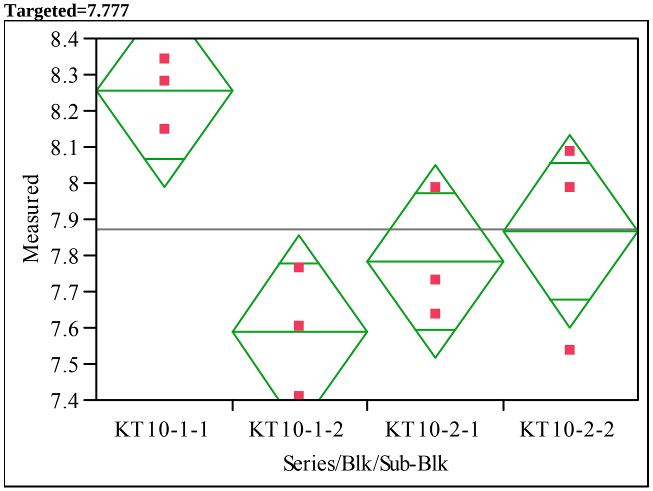
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT10-1-1	3	0.092305	0.00123	0.08946	0.09515
KT10-1-2	3	0.091404	0.00123	0.08856	0.09425
KT10-2-1	3	0.090504	0.00123	0.08766	0.09335
KT10-2-2	3	0.088252	0.00123	0.08541	0.09110

Std Error uses a pooled estimate of error variance

Exhibit B-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT10-Series Batch 1 Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk, Prep Method=PF, Oxide=B2O3 (wt%), Targeted=7.777



Oneway Anova
Summary of Fit

Rsquare	0.687268
Adj Rsquare	0.569993
Root Mean Square Error	0.200006
Mean of Response	7.872656
Observations (or Sum Wgts)	12

Analysis of Variance

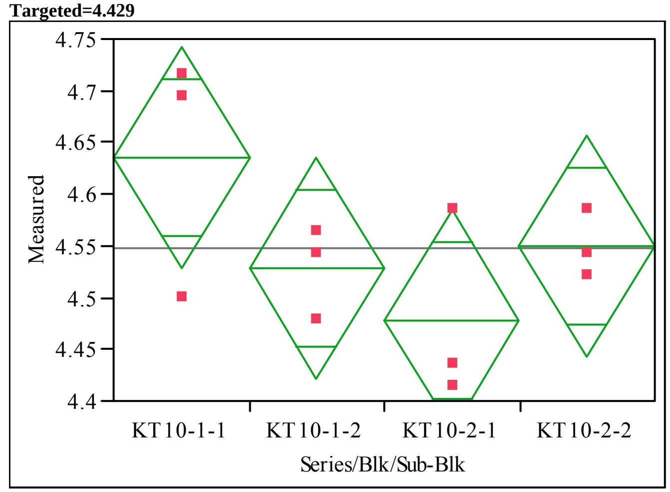
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.7032794	0.234426	5.8603	0.0204
Error	8	0.3200181	0.040002		
C. Total	11	1.0232975			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT10-1-1	3	8.25368	0.11547	7.9874	8.5200
KT10-1-2	3	7.58823	0.11547	7.3219	7.8545
KT10-2-1	3	7.78143	0.11547	7.5151	8.0477
KT10-2-2	3	7.86729	0.11547	7.6010	8.1336

Std Error uses a pooled estimate of error variance

Oneway Analysis of Measured By Series/Blk/Sub-Blk, Prep Method=PF, Oxide=Li2O (wt%), Targeted=4.429



Oneway Anova
Summary of Fit

Rsquare	0.429299
Adj Rsquare	0.215287
Root Mean Square Error	0.080554
Mean of Response	4.548001
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	0.03904969	0.013017	2.0060	0.1918
Error	8	0.05191176	0.006489		
C. Total	11	0.09096145			

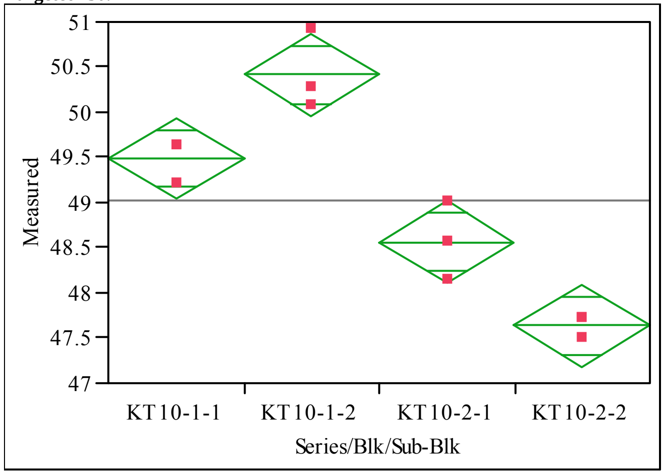
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT10-1-1	3	4.63591	0.04651	4.5287	4.7432
KT10-1-2	3	4.52827	0.04651	4.4210	4.6355
KT10-2-1	3	4.47803	0.04651	4.3708	4.5853
KT10-2-2	3	4.54980	0.04651	4.4425	4.6570

Std Error uses a pooled estimate of error variance

Exhibit B-3. Statistical Evaluation of the ICP-AES Calibration Effects from the KT10-Series Batch 1 Results by Oxide. (continued)

Oneway Analysis of Measured By Series/Blk/Sub-Blk, Prep Method=PF, Oxide=SiO2 (wt%), Targeted=50.22



Oneway Anova
Summary of Fit

Rsquare	0.933702
Adj Rsquare	0.90884
Root Mean Square Error	0.338253
Mean of Response	49.02563
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Series/Blk/Sub-Blk	3	12.890769	4.29692	37.5556	<.0001
Error	8	0.915321	0.11442		
C. Total	11	13.806090			

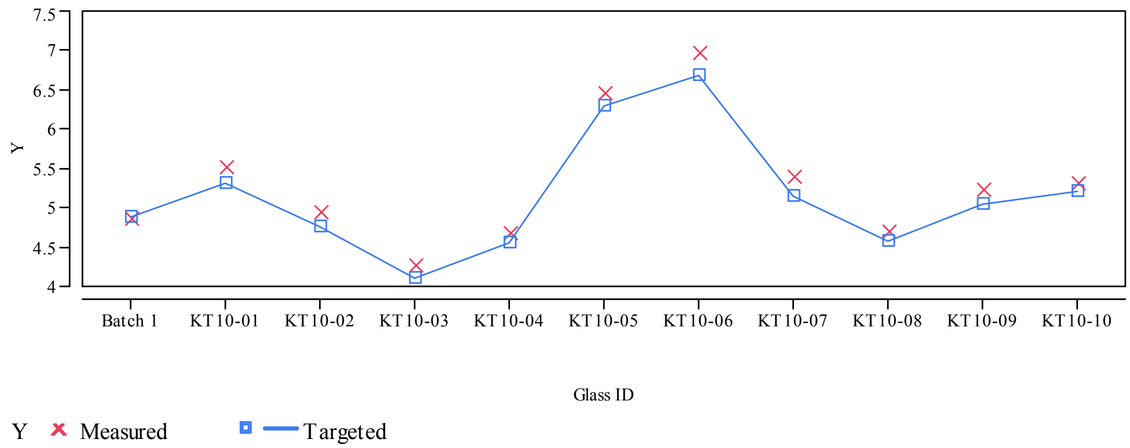
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
KT10-1-1	3	49.4891	0.19529	49.039	49.939
KT10-1-2	3	50.4162	0.19529	49.966	50.867
KT10-2-1	3	48.5621	0.19529	48.112	49.012
KT10-2-2	3	47.6351	0.19529	47.185	48.085

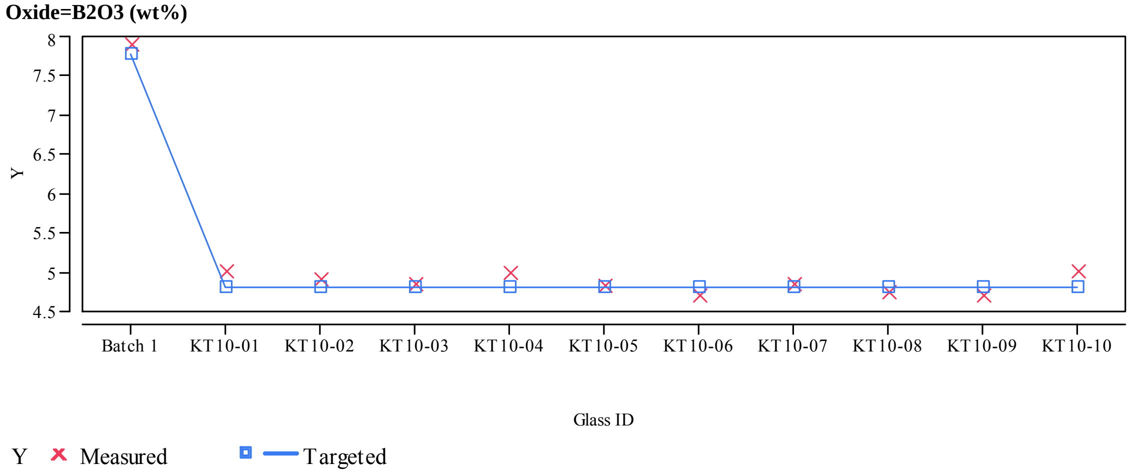
Std Error uses a pooled estimate of error variance

Exhibit B-4. Measured versus Targeted Concentrations by Glass ID by Oxide.

Oxide=Al2O3 (wt%)



Oxide=B2O3 (wt%)



Oxide=BaO (wt%)

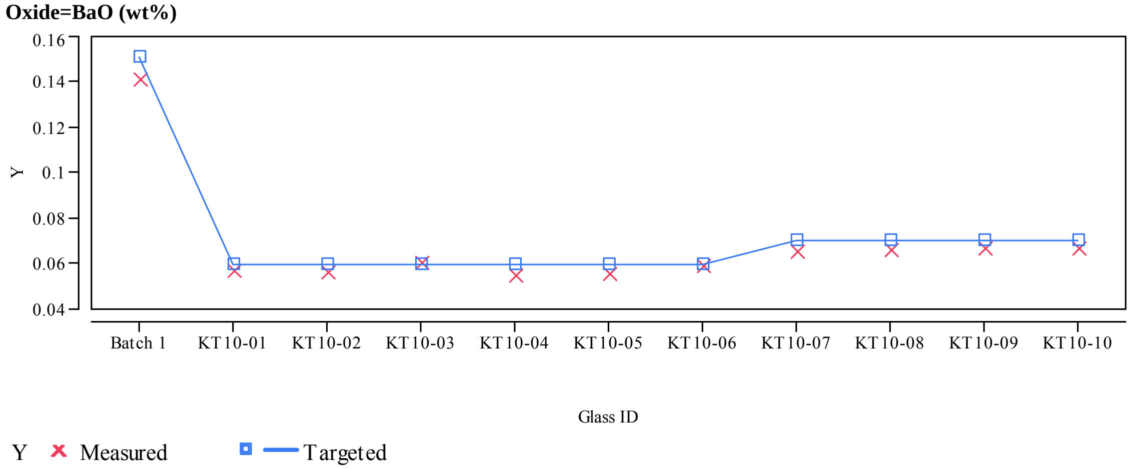
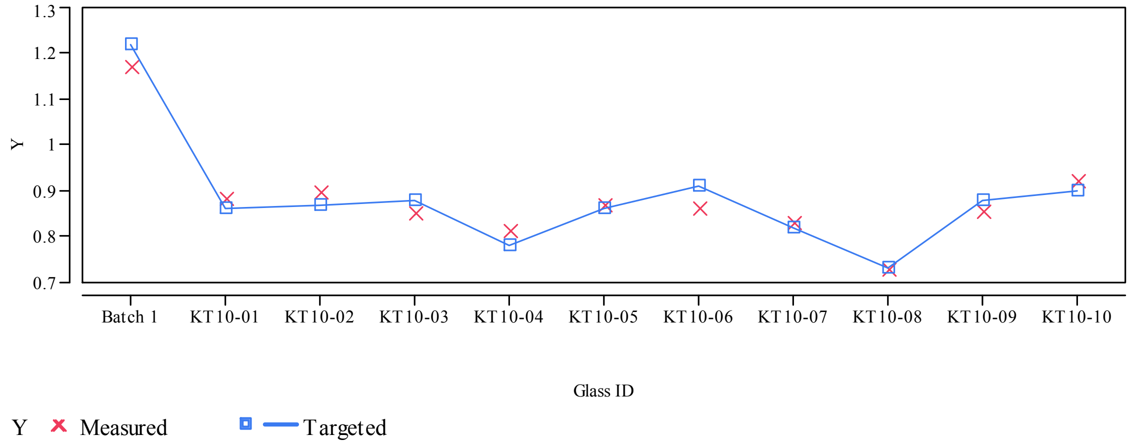
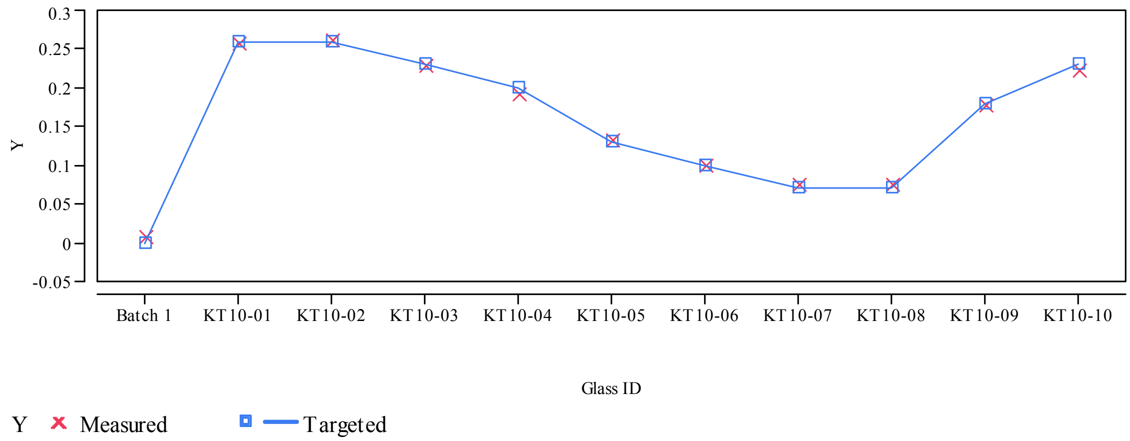


Exhibit B-4. Measured versus Targeted Concentrations by Glass ID by Oxide. (continued)

Oxide=CaO (wt%)



Oxide=Ce2O3 (wt%)



Oxide=Cr2O3 (wt%)

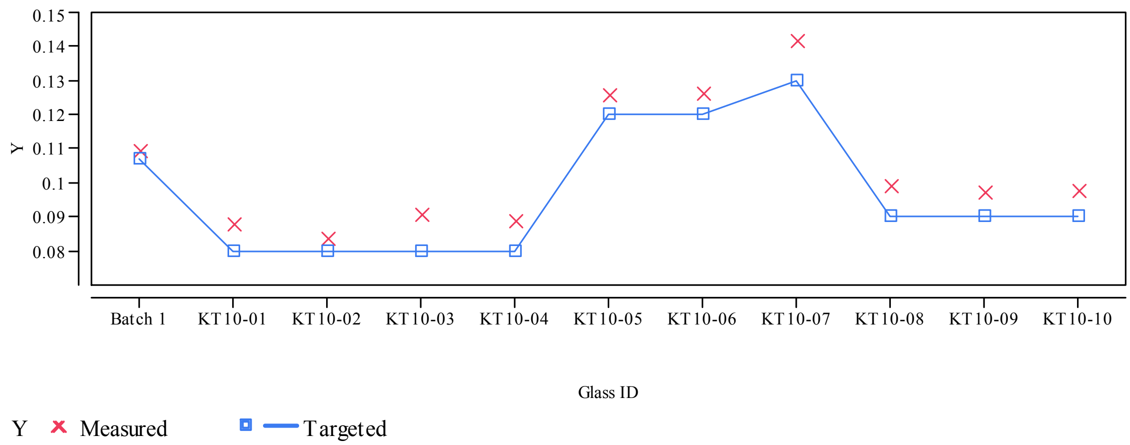
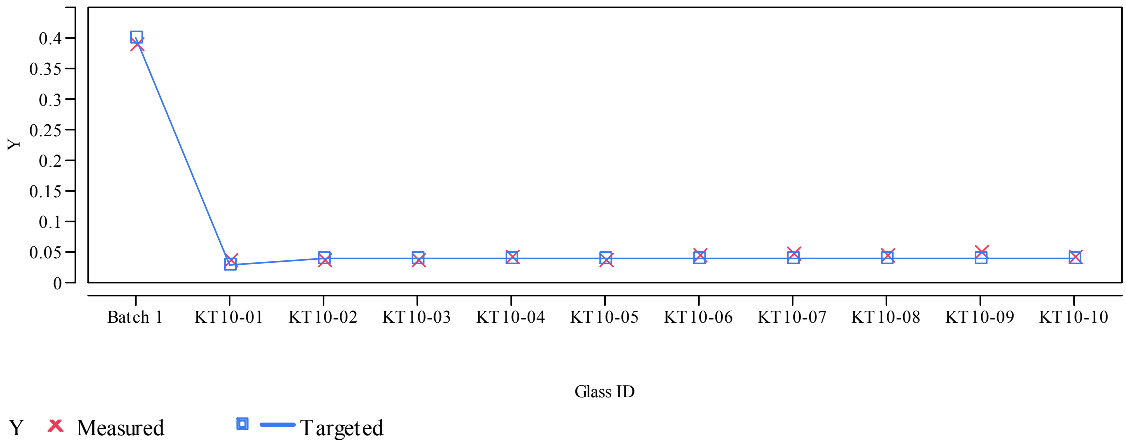
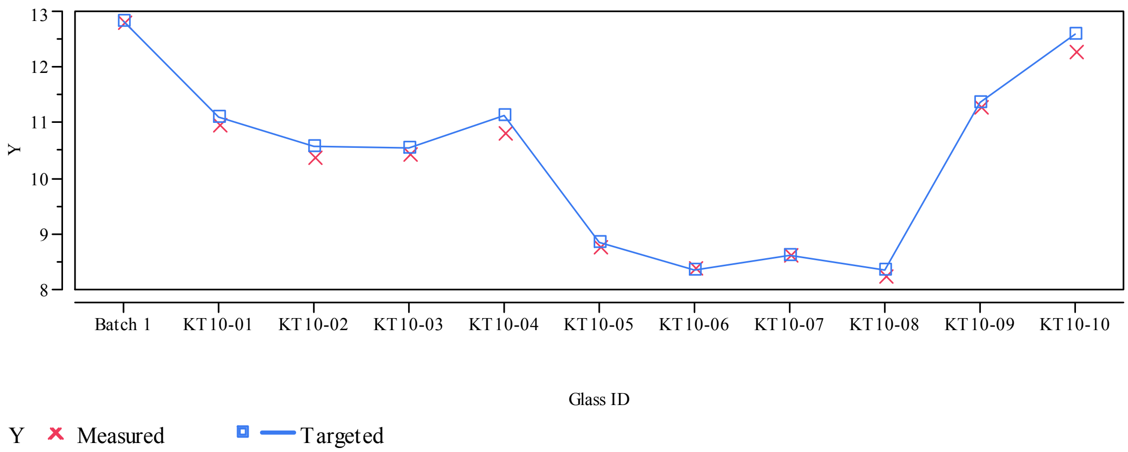


Exhibit B-4. Measured versus Targeted Concentrations by Glass ID by Oxide. (continued)

Oxide=CuO (wt%)



Oxide=Fe2O3 (wt%)



Oxide=K2O (wt%)

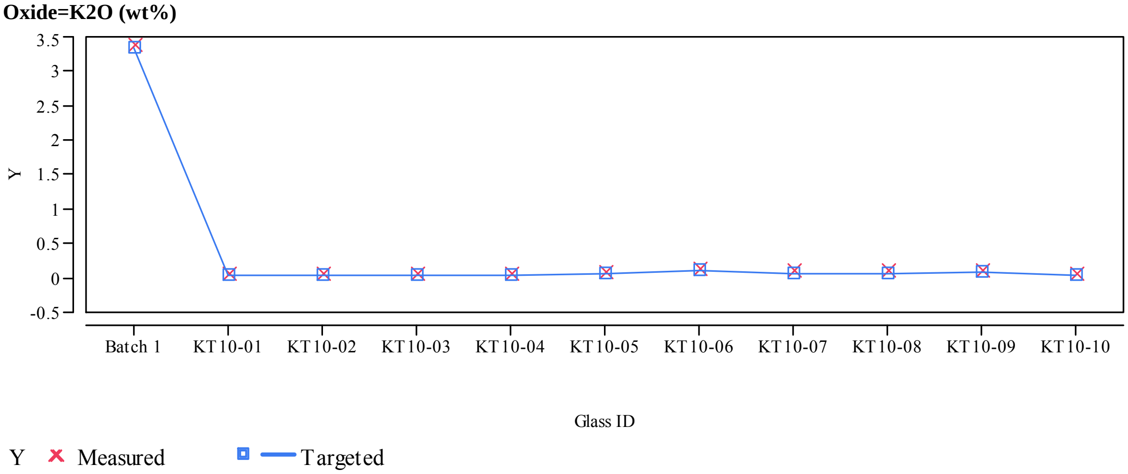
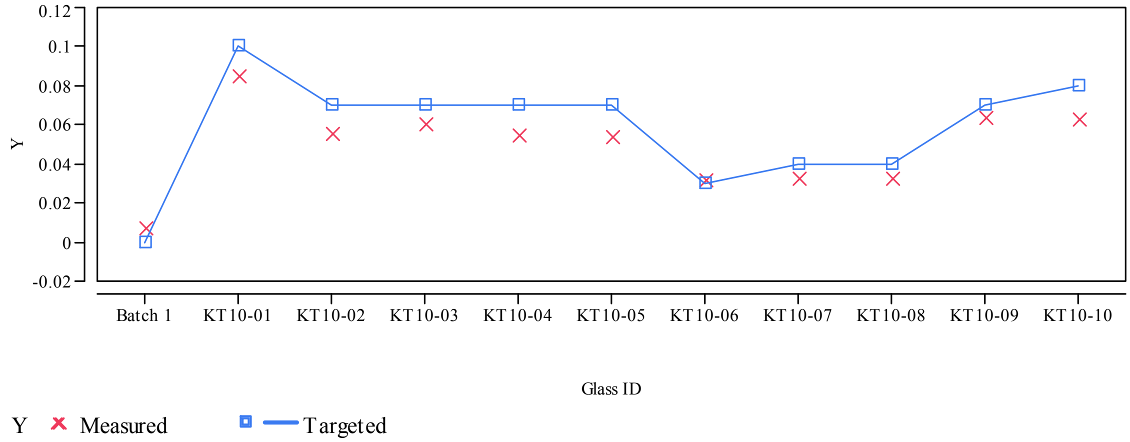
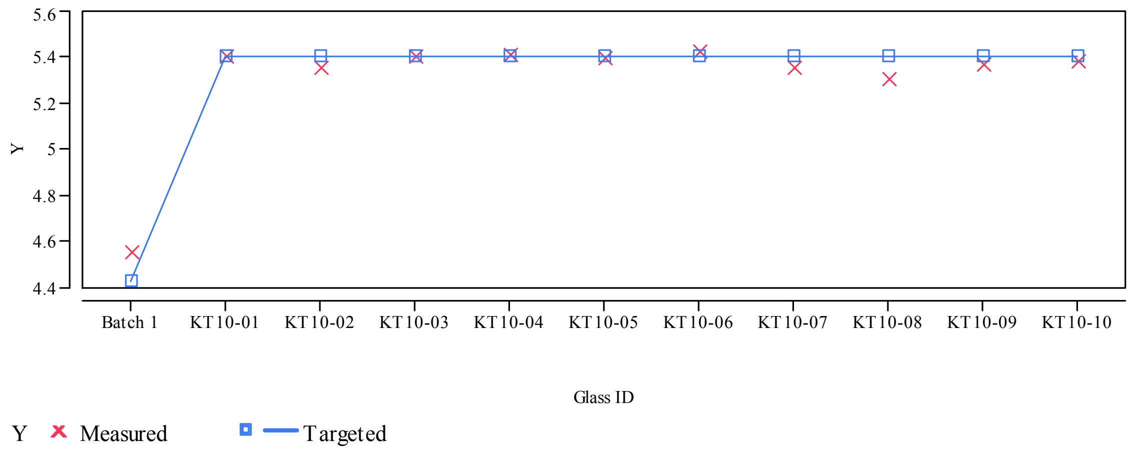


Exhibit B-4. Measured versus Targeted Concentrations by Glass ID by Oxide. (continued)

Oxide=La2O3 (wt%)



Oxide=Li2O (wt%)



Oxide=MgO (wt%)

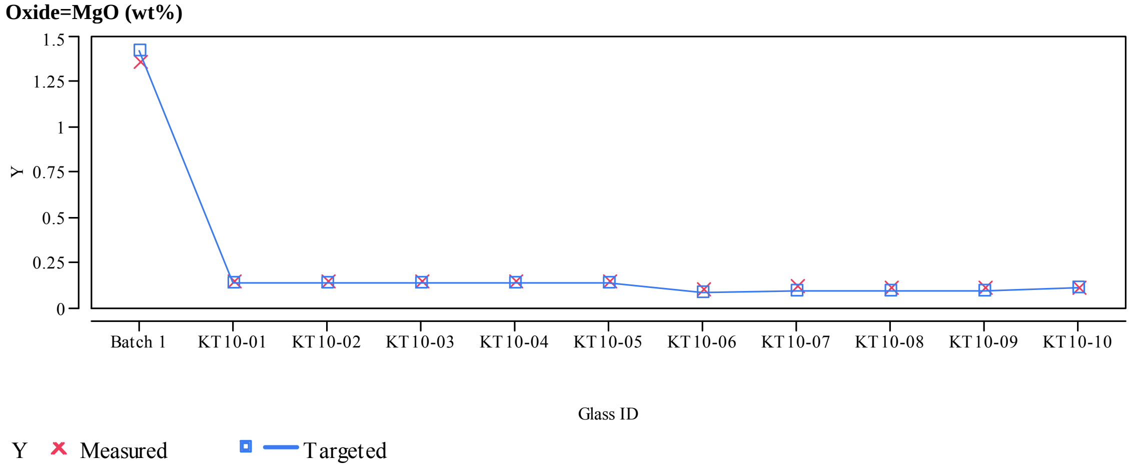
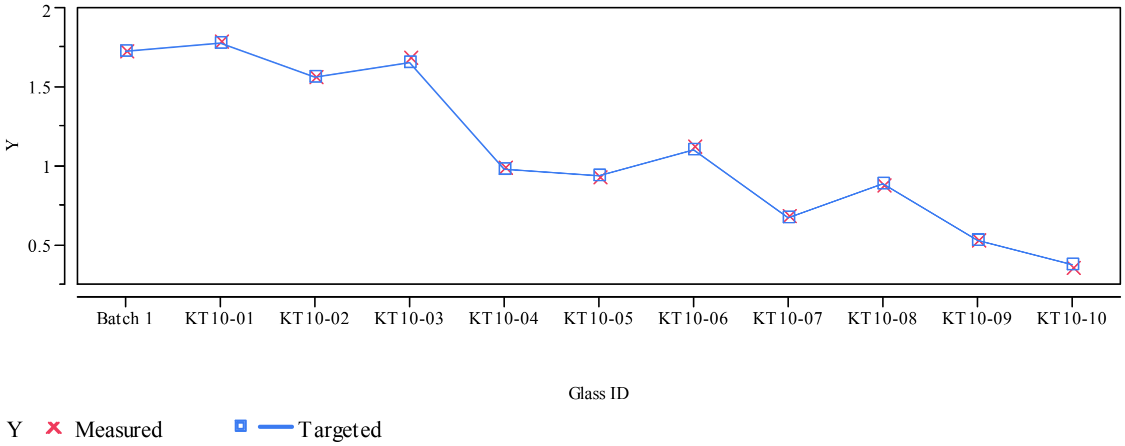
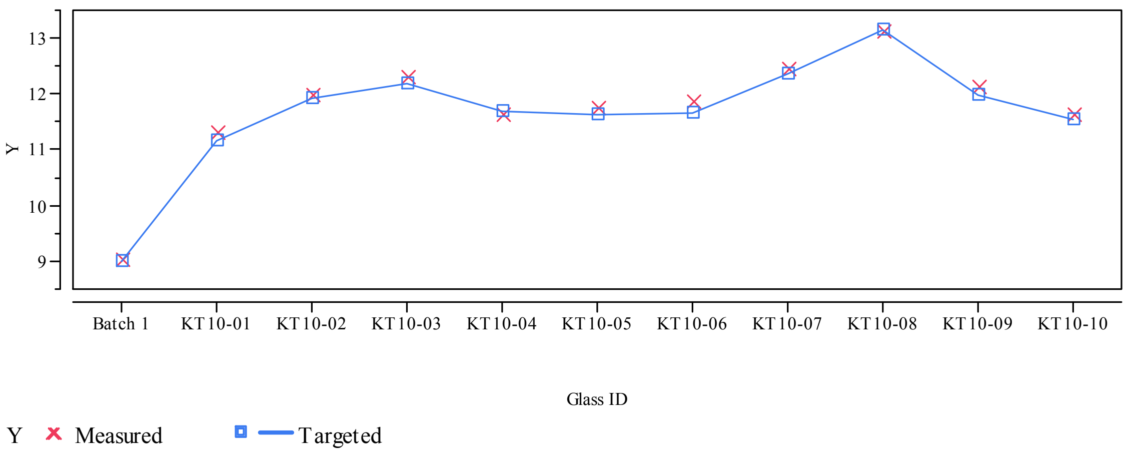


Exhibit B-4. Measured versus Targeted Concentrations by Glass ID by Oxide. (continued)

Oxide=MnO (wt%)



Oxide=Na2O (wt%)



Oxide=Nb2O5 (wt%)

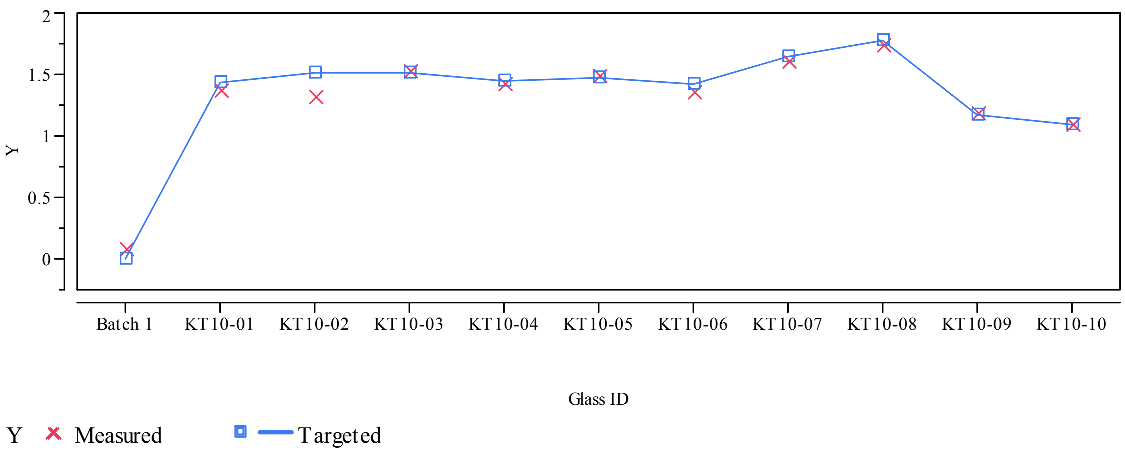
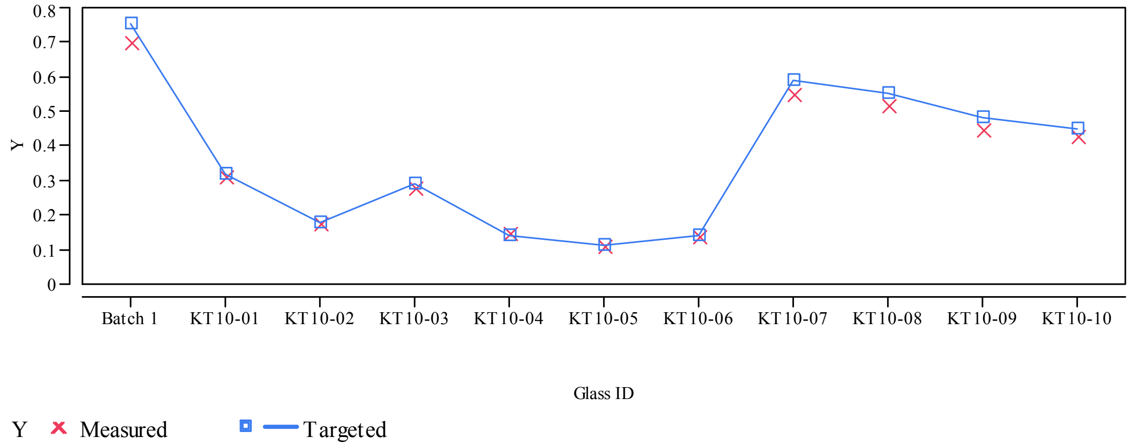
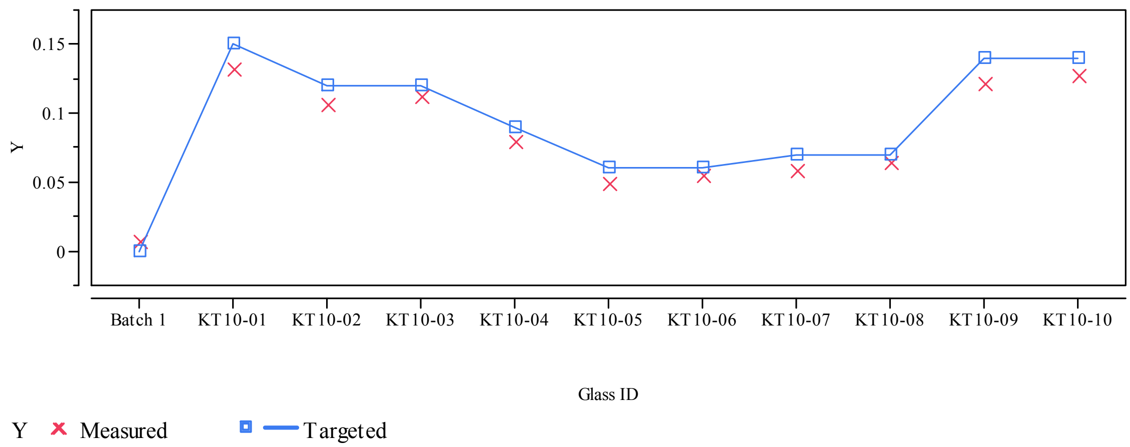


Exhibit B-4. Measured versus Targeted Concentrations by Glass ID by Oxide. (continued)

Oxide=NiO (wt%)



Oxide=PbO (wt%)



Oxide=SiO2 (wt%)

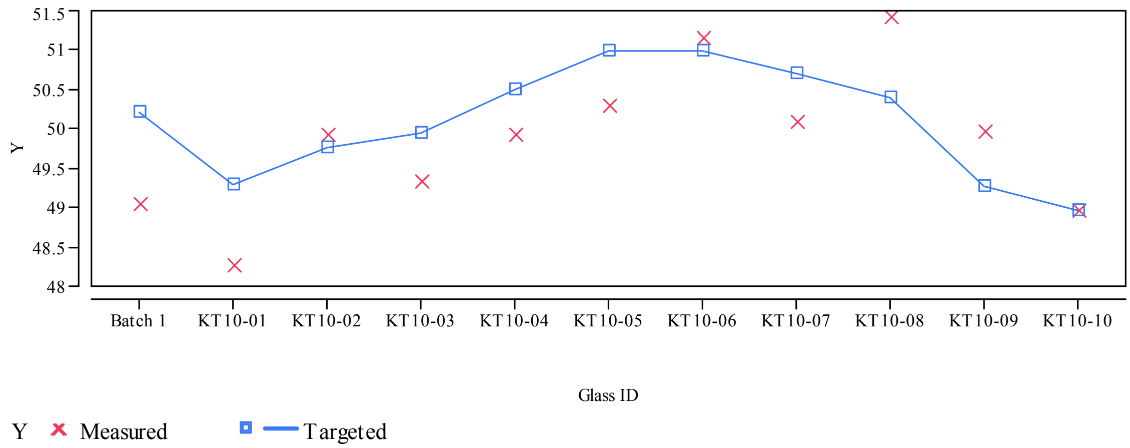
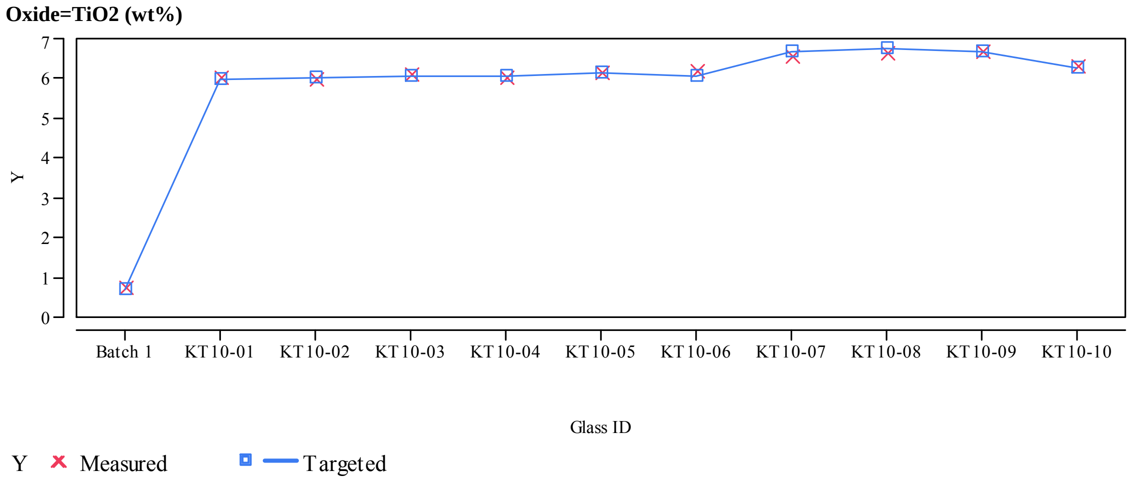
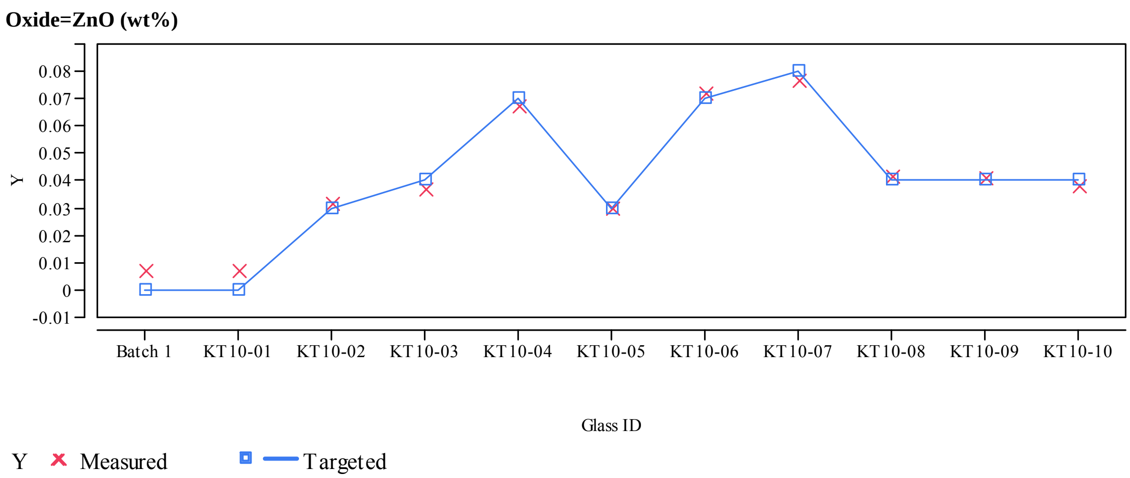


Exhibit B-4. Measured versus Targeted Concentrations by Glass ID by Oxide. (continued)





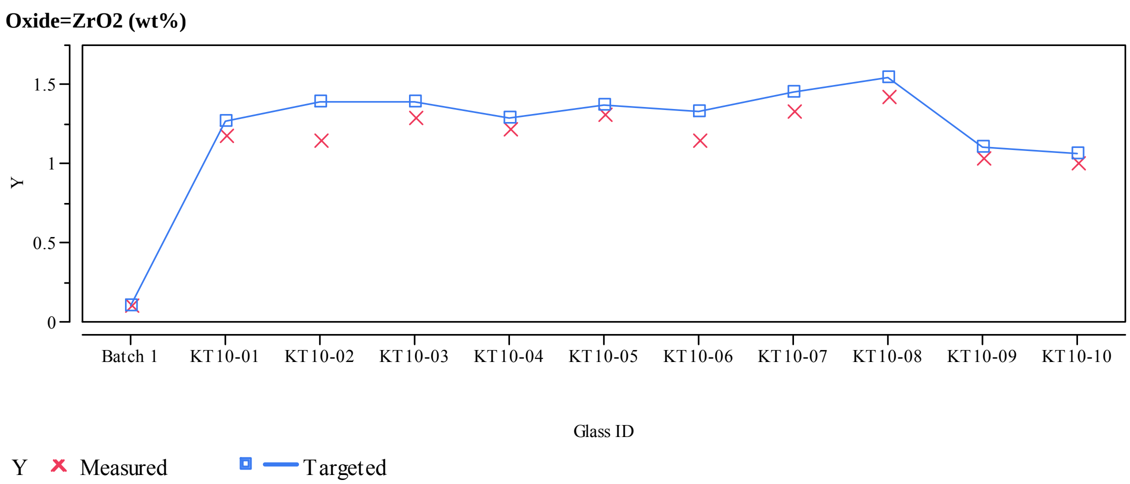
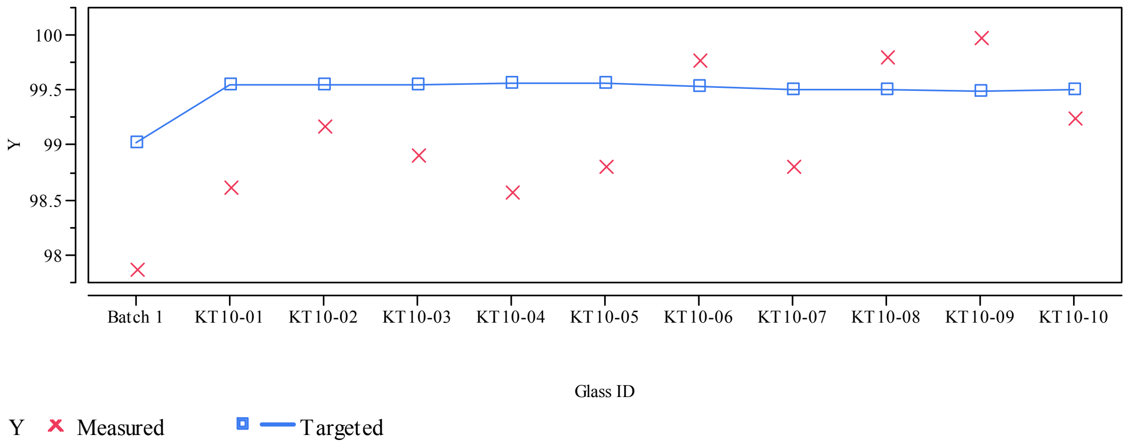


Exhibit B-4. Measured versus Targeted Concentrations by Glass ID by Oxide. (continued)

Oxide=Sum of Oxides (wt%)



Appendix C. Data Supporting the PCT Measurements of the KT08-Series Glasses

Table C-1. PCT Measurement Data for the KT08 Glasses, As Received (ar) and Corrected for Dilution (ppm).

Glass ID	Heat Treatment	Block	Seq	Lab ID	B ar	Li ar	Na ar	Si ar	B (ppm)	Li (ppm)	Na (ppm)	Si (ppm)
Soln Std	ref	1	1	STD_11	19.5	9.33	80.2	50.3	19.50	9.33	80.20	50.30
KT08-05	ccc	1	2	N39	5.01	5.74	32.2	56.4	8.35	9.57	53.67	94.00
KT08-08	quenched	1	3	N16	6.35	6.89	43	66.3	10.58	11.48	71.67	110.50
KT08-10	ccc	1	4	N02	6.02	6.53	30.2	58	10.03	10.88	50.33	96.67
EA	ref	1	5	N52	32	9.57	88.6	50.4	533.33	159.50	1476.67	840.00
KT08-07	quenched	1	6	N49	5.87	6.52	36.8	63.1	9.78	10.87	61.33	105.17
KT08-02	quenched	1	7	N47	6.24	6.44	40.8	57.4	10.40	10.73	68.00	95.67
Soln Std	ref	1	8	STD_12	19.6	9.25	79.9	50.4	19.60	9.25	79.90	50.40
KT08-07	ccc	1	9	N66	5.63	6.36	34.4	62.3	9.38	10.60	57.33	103.84
blank	ref	1	10	N31	< 0.443	< 0.302	< 0.345	< 0.382	0.37	0.25	0.29	0.32
KT08-05	quenched	1	11	N62	5.22	5.87	34.6	58.2	8.70	9.78	57.67	97.00
KT08-08	ccc	1	12	N20	6.29	6.85	40.6	66.8	10.48	11.42	67.67	111.34
KT08-02	ccc	1	13	N28	6.03	6.19	37.4	56.6	10.05	10.32	62.33	94.34
KT08-10	quenched	1	14	N14	6.34	6.91	31.9	60.2	10.57	11.52	53.17	100.34
Soln Std	ref	1	15	STD_13	19.9	9.29	79.9	50.9	19.90	9.29	79.90	50.90
Soln Std	ref	2	1	STD_21	19.6	9.51	79.8	50	19.60	9.51	79.80	50.00
KT08-08	quenched	2	2	N43	6.54	7.11	43.2	66	10.90	11.85	72.00	110.00
KT08-02	quenched	2	3	N61	6.44	6.66	41.2	57.5	10.73	11.10	68.67	95.84
KT08-08	ccc	2	4	N41	6.49	7.16	41.3	66.8	10.82	11.93	68.83	111.34
KT08-05	ccc	2	5	N23	5.15	5.87	32.3	56.2	8.58	9.78	53.83	93.67
KT08-05	quenched	2	6	N59	5.29	6	34.7	57.5	8.82	10.00	57.83	95.84
KT08-07	quenched	2	7	N30	6.06	6.86	37.4	63.6	10.10	11.43	62.33	106.00
Soln Std	ref	2	8	STD_22	19.9	9.61	80.5	50.8	19.90	9.61	80.50	50.80
KT08-10	quenched	2	9	N05	6.46	7.06	31.8	59.6	10.77	11.77	53.00	99.34
KT08-02	ccc	2	10	N54	6.13	6.33	37.5	56.3	10.22	10.55	62.50	93.84
EA	ref	2	11	N09	30.8	9.91	85.2	51.1	513.33	165.17	1420.00	851.67
KT08-07	ccc	2	12	N44	5.61	6.22	33.4	60.4	9.35	10.37	55.67	100.67
KT08-10	ccc	2	13	N27	6.33	6.81	30.7	59.3	10.55	11.35	51.17	98.84
Soln Std	ref	2	14	STD_23	20.1	9.57	80.9	51	20.10	9.57	80.90	51.00
Soln Std	ref	3	1	STD_31	19.6	9.39	80.1	49.9	19.60	9.39	80.10	49.90
KT08-02	ccc	3	2	N15	6.12	6.22	37.5	55.7	10.20	10.37	62.50	92.84
KT08-02	quenched	3	3	N19	6.46	6.57	41.4	57.6	10.77	10.95	69.00	96.00
KT08-08	quenched	3	4	N46	6.58	6.91	43.4	66.4	10.97	11.52	72.33	110.67
EA	ref	3	5	N40	28.4	9.07	79.5	47.9	473.33	151.17	1325.00	798.33
blank	ref	3	6	N25	< 0.15	< 0.302	< 0.345	< 0.382	0.13	0.25	0.29	0.32
KT08-08	ccc	3	7	N21	6.2	6.41	38.8	62.9	10.33	10.68	64.67	104.84
Soln Std	ref	3	8	STD_32	19.8	9.26	79.9	49.9	19.80	9.26	79.90	49.90
KT08-10	quenched	3	9	N45	6.49	6.92	32.5	60.2	10.82	11.53	54.17	100.34
KT08-05	quenched	3	10	N55	5.17	5.64	34.2	56.2	8.62	9.40	57.00	93.67
KT08-10	ccc	3	11	N37	6.17	6.42	30.2	57.6	10.28	10.70	50.33	96.00
KT08-07	quenched	3	12	N11	6.04	6.46	37.1	62.5	10.07	10.77	61.83	104.17
KT08-07	ccc	3	13	N04	5.8	6.15	34.7	61.6	9.67	10.25	57.83	102.67
KT08-05	ccc	3	14	N12	5.11	5.44	32	56.1	8.52	9.07	53.33	93.50
Soln Std	ref	3	15	STD_33	19.8	8.98	80	50.1	19.80	8.98	80.00	50.10
Soln Std	ref	4	1	STD_41	19.6	9.51	81.1	50.3	19.60	9.51	81.10	50.30
KT08-01	quenched	4	2	N33	6.15	6.52	35.8	55.6	10.25	10.87	59.67	92.67
KT08-03	ccc	4	3	N10	6.64	6.63	41.1	59	11.07	11.05	68.50	98.34
KT08-04	ccc	4	4	N06	5.98	6.28	36.5	58.8	9.97	10.47	60.83	98.00
KT08-03	quenched	4	5	N08	7.27	7.05	47.2	62.4	12.12	11.75	78.67	104.00
KT08-09	ccc	4	6	N36	6.33	6.94	34.3	62.5	10.55	11.57	57.17	104.17
KT08-06	ccc	4	7	N42	5.08	5.86	32.5	57	8.47	9.77	54.17	95.00
Soln Std	ref	4	8	STD_42	19.6	9.41	80.9	50.6	19.60	9.41	80.90	50.60
KT08-04	quenched	4	9	N13	6.35	6.56	40.3	60.6	10.58	10.93	67.17	101.00
KT08-09	quenched	4	10	N60	6.44	6.98	35.5	62.5	10.73	11.63	59.17	104.17
ARM-1	ref	4	11	N01	9.22	7.35	21.2	35.2	15.37	12.25	35.33	58.67
KT08-06	quenched	4	12	N57	5.21	6.05	35	58.3	8.68	10.08	58.33	97.17
KT08-01	ccc	4	13	N18	5.75	5.95	32.3	53.5	9.58	9.92	53.83	89.17
Soln Std	ref	4	14	STD_43	19.7	9.38	81.4	51.1	19.70	9.38	81.40	51.10
Soln Std	ref	5	1	STD_51	19.6	9.56	81.1	49.9	19.60	9.56	81.10	49.90
KT08-06	quenched	5	2	N03	5.28	6.17	35.4	57.7	8.80	10.28	59.00	96.17
KT08-06	ccc	5	3	N26	5.09	5.86	32.4	56.2	8.48	9.77	54.00	93.67
KT08-03	ccc	5	4	N68	6.81	6.79	41.6	59.8	11.35	11.32	69.33	99.67
KT08-01	ccc	5	5	N58	5.78	6.01	32.3	52.8	9.63	10.02	53.83	88.00
KT08-04	quenched	5	6	N53	6.24	6.55	40	59.1	10.40	10.92	66.67	98.50
KT08-01	quenched	5	7	N64	6.22	6.61	36.1	55.8	10.37	11.02	60.17	93.00
Soln Std	ref	5	8	STD_52	19.7	9.49	81.6	50	19.70	9.49	81.60	50.00
KT08-04	ccc	5	9	N67	6.04	6.31	36.7	58.4	10.07	10.52	61.17	97.34

Table C-1. PCT Measurement Data for the KT08 Glasses, As Received (ar) and Corrected for Dilution (ppm). (continued)

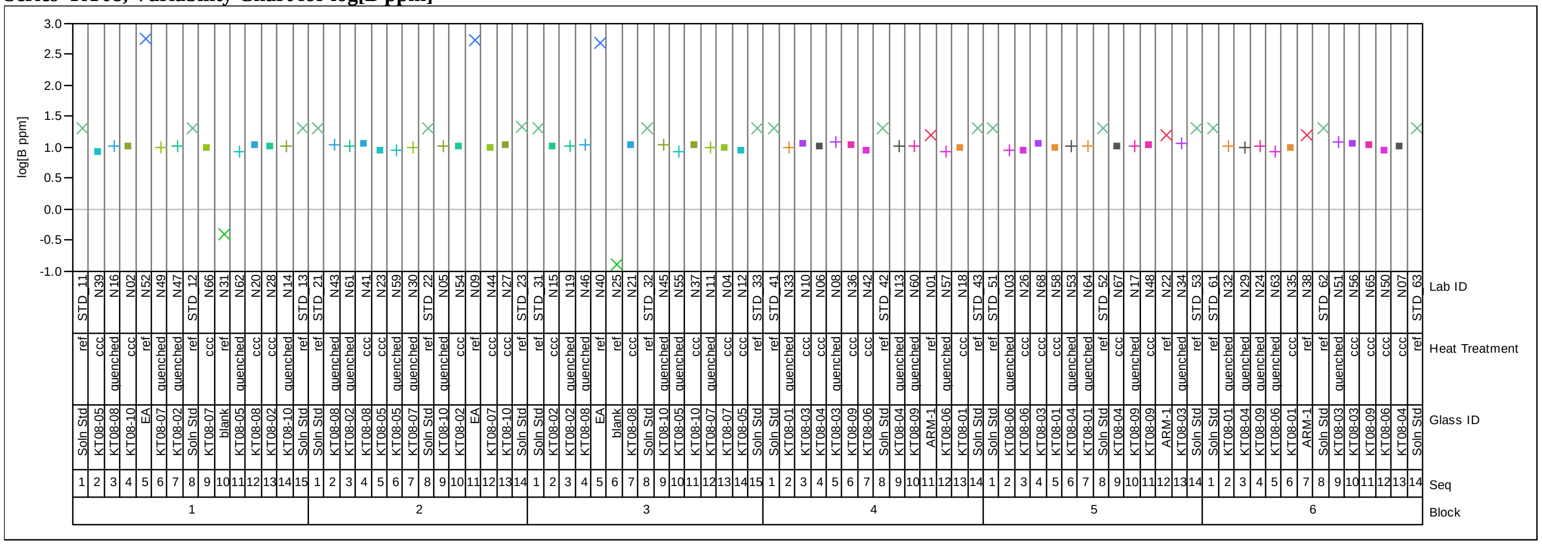
Glass ID	Heat Treatment	Block	Seq	Lab ID	B ar	Li ar	Na ar	Si ar	B (ppm)	Li (ppm)	Na (ppm)	Si (ppm)
KT08-09	quenched	5	10	N17	6.41	6.95	35.5	61.6	10.68	11.58	59.17	102.67
KT08-09	ccc	5	11	N48	6.26	6.86	34.3	61.4	10.43	11.43	57.17	102.34
ARM-1	ref	5	12	N22	8.94	7.06	20.7	34.3	14.90	11.77	34.50	57.17
KT08-03	quenched	5	13	N34	7.17	6.92	47.1	61.5	11.95	11.53	78.50	102.50
Soln Std	ref	5	14	STD_53	19.5	9.3	80.9	49.9	19.50	9.30	80.90	49.90
Soln Std	ref	6	1	STD_61	19.7	9.51	80.7	50.1	19.70	9.51	80.70	50.10
KT08-01	quenched	6	2	N32	6.24	6.8	36.3	56.8	10.40	11.33	60.50	94.67
KT08-04	quenched	6	3	N29	6.1	6.38	38.5	58.4	10.17	10.63	64.17	97.34
KT08-09	quenched	6	4	N24	6.34	6.85	34.7	60.7	10.57	11.42	57.83	101.17
KT08-06	quenched	6	5	N63	5.25	6.19	35.5	58.4	8.75	10.32	59.17	97.34
KT08-01	ccc	6	6	N35	5.81	6.1	32.4	53.7	9.68	10.17	54.00	89.50
ARM-1	ref	6	7	N38	9.12	7.37	21	35	15.20	12.28	35.00	58.33
Soln Std	ref	6	8	STD_62	19.7	9.62	80.8	50.5	19.70	9.62	80.80	50.50
KT08-03	quenched	6	9	N51	7.24	7.1	46.8	62.2	12.07	11.83	78.00	103.67
KT08-03	ccc	6	10	N56	6.65	6.72	41.1	59.3	11.08	11.20	68.50	98.84
KT08-09	ccc	6	11	N65	6.31	7.01	34	62.3	10.52	11.68	56.67	103.84
KT08-06	ccc	6	12	N50	5.08	5.96	32.3	57.4	8.47	9.93	53.83	95.67
KT08-04	ccc	6	13	N07	6.02	6.39	36.6	59.5	10.03	10.65	61.00	99.17
Soln Std	ref	6	14	STD_63	19.8	9.6	80.9	50.8	19.80	9.60	80.90	50.80

Table C-2. Normalized PCT Responses for the KT08-Series 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	-0.365	-0.290	-0.312	-0.573	0.43	0.51	0.49	0.27
EA	ref	reference	1.159	0.904	1.052	0.561	14.42	8.01	11.28	3.64
KT08-01	ccc	targeted	-0.286	-0.222	-0.250	-0.409	0.52	0.60	0.56	0.39
KT08-02	ccc	targeted	-0.264	-0.206	-0.211	-0.390	0.55	0.62	0.61	0.41
KT08-03	ccc	targeted	-0.222	-0.174	-0.175	-0.368	0.60	0.67	0.67	0.43
KT08-04	ccc	targeted	-0.269	-0.200	-0.217	-0.377	0.54	0.63	0.61	0.42
KT08-05	ccc	targeted	-0.342	-0.247	-0.271	-0.402	0.46	0.57	0.54	0.40
KT08-06	ccc	targeted	-0.342	-0.231	-0.265	-0.397	0.45	0.59	0.54	0.40
KT08-07	ccc	targeted	-0.294	-0.206	-0.233	-0.358	0.51	0.62	0.58	0.44
KT08-08	ccc	targeted	-0.247	-0.169	-0.182	-0.328	0.57	0.68	0.66	0.47
KT08-09	ccc	targeted	-0.249	-0.160	-0.218	-0.342	0.56	0.69	0.61	0.46
KT08-10	ccc	targeted	-0.258	-0.183	-0.255	-0.366	0.55	0.66	0.56	0.43
KT08-01	quenched	targeted	-0.256	-0.179	-0.202	-0.387	0.55	0.66	0.63	0.41
KT08-02	quenched	targeted	-0.244	-0.185	-0.171	-0.381	0.57	0.65	0.67	0.42
KT08-03	quenched	targeted	-0.189	-0.155	-0.118	-0.349	0.65	0.70	0.76	0.45
KT08-04	quenched	targeted	-0.249	-0.185	-0.177	-0.370	0.56	0.65	0.67	0.43
KT08-05	quenched	targeted	-0.330	-0.235	-0.241	-0.394	0.47	0.58	0.57	0.40
KT08-06	quenched	targeted	-0.329	-0.213	-0.228	-0.387	0.47	0.61	0.59	0.41
KT08-07	quenched	targeted	-0.271	-0.181	-0.197	-0.347	0.54	0.66	0.63	0.45
KT08-08	quenched	targeted	-0.236	-0.158	-0.151	-0.323	0.58	0.69	0.71	0.48
KT08-09	quenched	targeted	-0.242	-0.161	-0.205	-0.345	0.57	0.69	0.62	0.45
KT08-10	quenched	targeted	-0.240	-0.159	-0.231	-0.354	0.58	0.69	0.59	0.44
KT08-01	ccc	measured	-0.287	-0.213	-0.263	-0.383	0.52	0.61	0.55	0.41
KT08-02	ccc	measured	-0.262	-0.195	-0.218	-0.384	0.55	0.64	0.60	0.41
KT08-03	ccc	measured	-0.223	-0.158	-0.185	-0.391	0.60	0.69	0.65	0.41
KT08-04	ccc	measured	-0.268	-0.180	-0.228	-0.384	0.54	0.66	0.59	0.41
KT08-05	ccc	measured	-0.342	-0.230	-0.287	-0.413	0.45	0.59	0.52	0.39
KT08-06	ccc	measured	-0.343	-0.210	-0.276	-0.413	0.45	0.62	0.53	0.39
KT08-07	ccc	measured	-0.299	-0.200	-0.248	-0.334	0.50	0.63	0.57	0.46
KT08-08	ccc	measured	-0.240	-0.153	-0.191	-0.319	0.58	0.70	0.64	0.48
KT08-09	ccc	measured	-0.251	-0.149	-0.229	-0.315	0.56	0.71	0.59	0.48
KT08-10	ccc	measured	-0.257	-0.164	-0.266	-0.387	0.55	0.68	0.54	0.41
KT08-01	quenched	measured	-0.257	-0.170	-0.216	-0.361	0.55	0.68	0.61	0.44
KT08-02	quenched	measured	-0.242	-0.174	-0.178	-0.374	0.57	0.67	0.66	0.42
KT08-03	quenched	measured	-0.190	-0.138	-0.128	-0.372	0.65	0.73	0.74	0.42
KT08-04	quenched	measured	-0.248	-0.165	-0.187	-0.377	0.56	0.68	0.65	0.42
KT08-05	quenched	measured	-0.331	-0.218	-0.256	-0.405	0.47	0.61	0.55	0.39
KT08-06	quenched	measured	-0.329	-0.193	-0.239	-0.404	0.47	0.64	0.58	0.39
KT08-07	quenched	measured	-0.275	-0.175	-0.212	-0.322	0.53	0.67	0.61	0.48
KT08-08	quenched	measured	-0.228	-0.142	-0.160	-0.314	0.59	0.72	0.69	0.49
KT08-09	quenched	measured	-0.244	-0.149	-0.216	-0.318	0.57	0.71	0.61	0.48
KT08-10	quenched	measured	-0.239	-0.140	-0.243	-0.375	0.58	0.72	0.57	0.42

Exhibit C-1. KT08 PCT Measurements (as Common Logarithms) in Analytical Sequence by Element.

Series=KT08, Variability Chart for log[B ppm]



Series=KT08, Variability Chart for log[Li ppm]

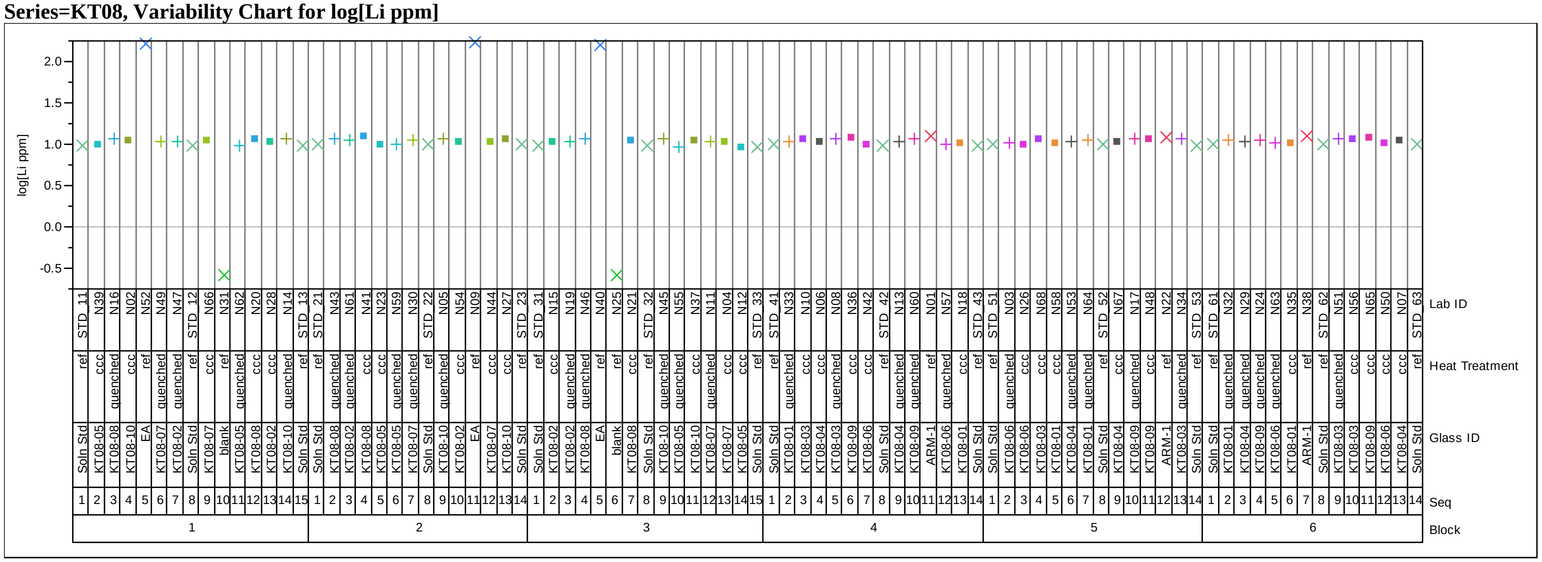
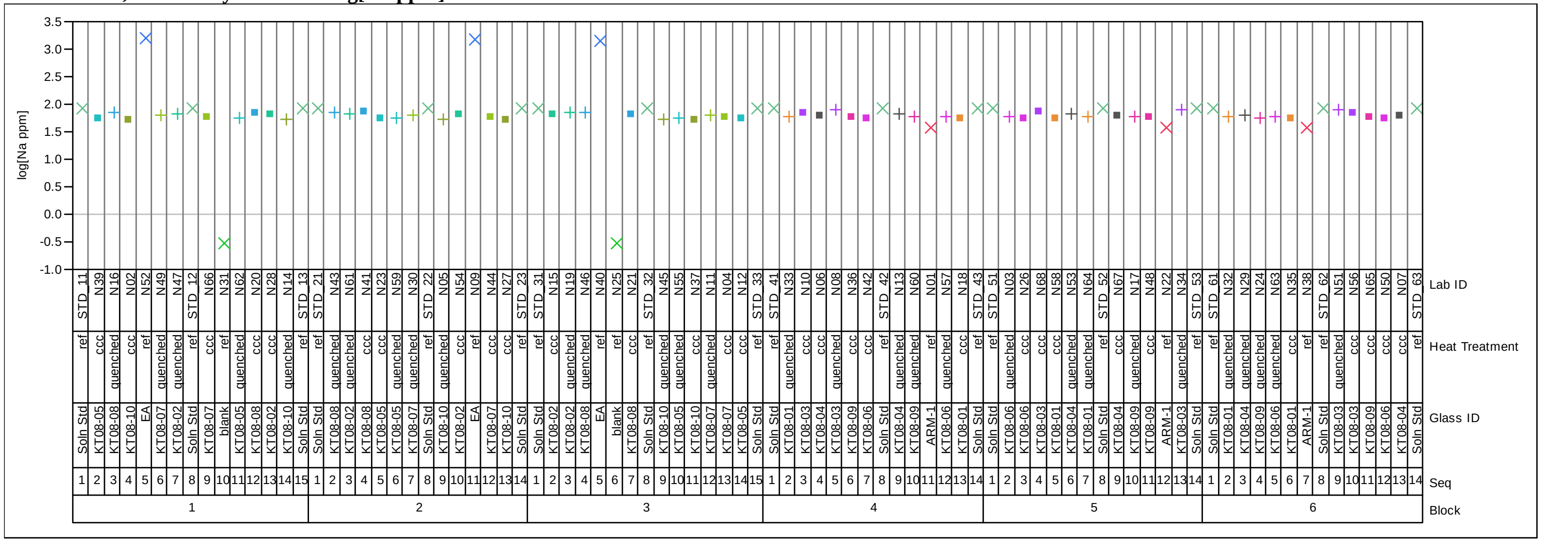


Exhibit C-1. KT08 PCT Measurements (as Common Logarithms) in Analytical Sequence by Element. (continued)

Series=KT08, Variability Chart for log[Na ppm]



Series=KT08, Variability Chart for log[Si ppm]

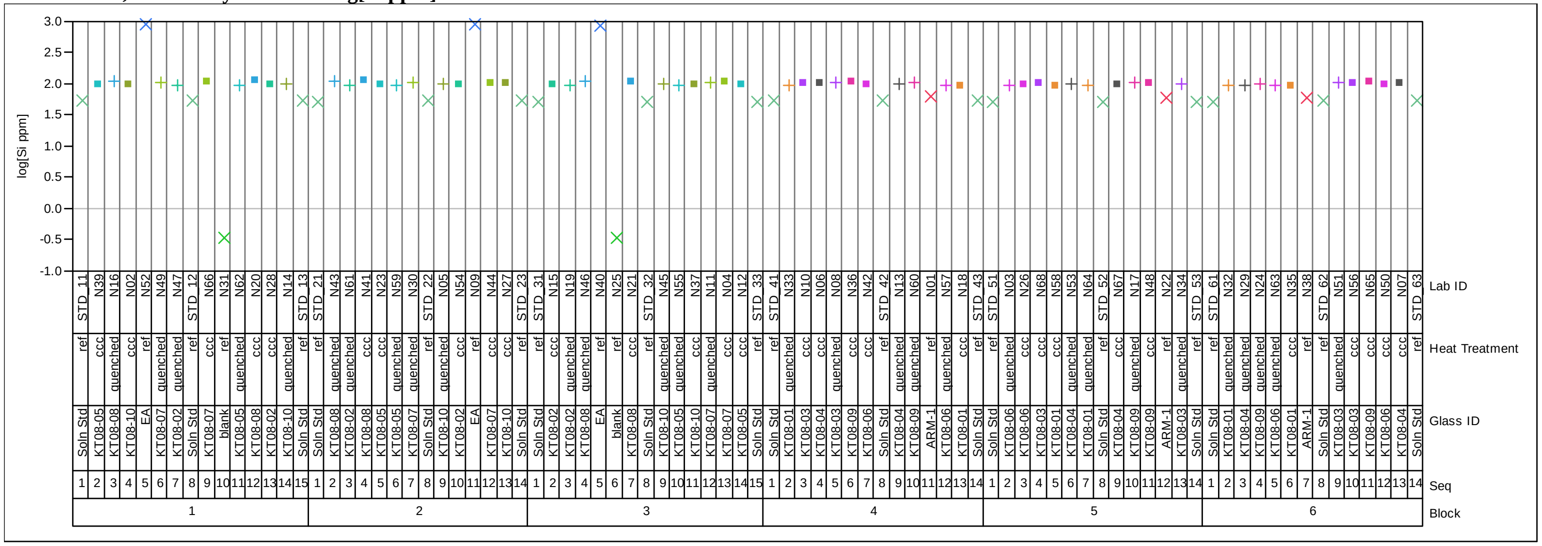
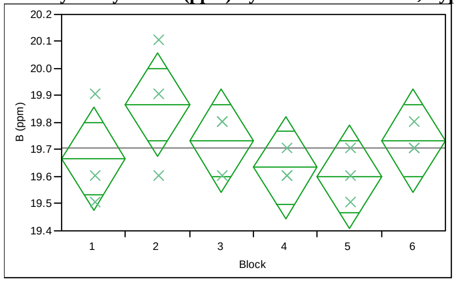


Exhibit C-2. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08 Multi-Element Standard Solution Results by Oxide.

Oneway Analysis of B (ppm) By Block Series=KT08, Type=Soln Std



Oneway Anova

Summary of Fit

Rsquare	0.332429
Adj Rsquare	0.054274
Root Mean Square Error	0.150923
Mean of Response	19.70556
Observations (or Sum Wgts)	18

Analysis of Variance

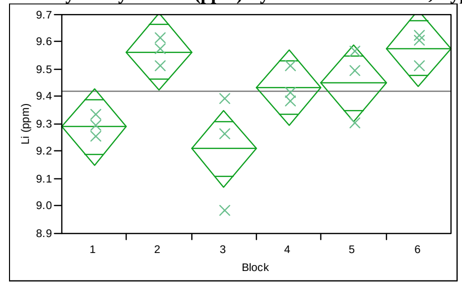
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block	5	0.13611111	0.027222	1.1951	0.3680
Error	12	0.27333333	0.022778		
C. Total	17	0.40944444			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	19.6667	0.08714	19.477	19.857
2	3	19.8667	0.08714	19.677	20.057
3	3	19.7333	0.08714	19.543	19.923
4	3	19.6333	0.08714	19.443	19.823
5	3	19.6000	0.08714	19.410	19.790
6	3	19.7333	0.08714	19.543	19.923

Std Error uses a pooled estimate of error variance

Oneway Analysis of Li (ppm) By Block Series=KT08, Type=Soln Std



Oneway Anova

Summary of Fit

Rsquare	0.684184
Adj Rsquare	0.552595
Root Mean Square Error	0.111206
Mean of Response	9.420556
Observations (or Sum Wgts)	18

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block	5	0.32149444	0.064299	5.1994	0.0091
Error	12	0.14840000	0.012367		
C. Total	17	0.46989444			

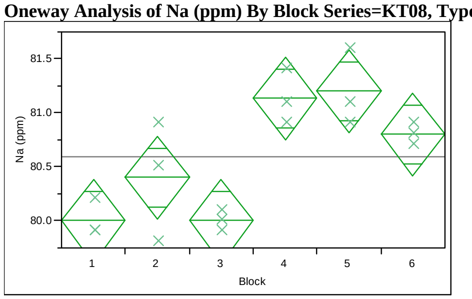
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	9.29000	0.06420	9.1501	9.4299
2	3	9.56333	0.06420	9.4234	9.7032
3	3	9.21000	0.06420	9.0701	9.3499
4	3	9.43333	0.06420	9.2934	9.5732
5	3	9.45000	0.06420	9.3101	9.5899
6	3	9.57667	0.06420	9.4368	9.7166

Std Error uses a pooled estimate of error variance

Exhibit C-2. Statistical Evaluation of the ICP-AES Calibration Effects from the KT08 Multi-Element Standard Solution Results by Oxide. (continued)

Oneway Analysis of Na (ppm) By Block Series=KT08, Type=Soln Std



Oneway Anova

Summary of Fit

Rsquare	0.796485
Adj Rsquare	0.711688
Root Mean Square Error	0.303681
Mean of Response	80.58889
Observations (or Sum Wgts)	18

Analysis of Variance

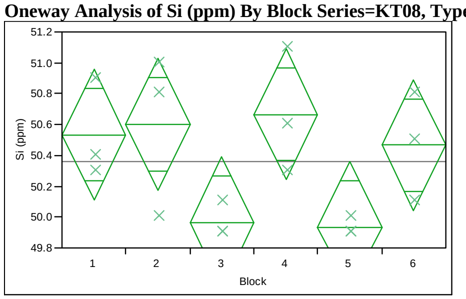
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block	5	4.3311111	0.866222	9.3928	0.0008
Error	12	1.1066667	0.092222		
C. Total	17	5.4377778			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	80.0000	0.17533	79.618	80.382
2	3	80.4000	0.17533	80.018	80.782
3	3	80.0000	0.17533	79.618	80.382
4	3	81.1333	0.17533	80.751	81.515
5	3	81.2000	0.17533	80.818	81.582
6	3	80.8000	0.17533	80.418	81.182

Std Error uses a pooled estimate of error variance

Oneway Analysis of Si (ppm) By Block Series=KT08, Type=Soln Std



Oneway Anova

Summary of Fit

Rsquare	0.536471
Adj Rsquare	0.343334
Root Mean Square Error	0.338296
Mean of Response	50.36111
Observations (or Sum Wgts)	18

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block	5	1.5894444	0.317889	2.7777	0.0683
Error	12	1.3733333	0.114444		
C. Total	17	2.9627778			

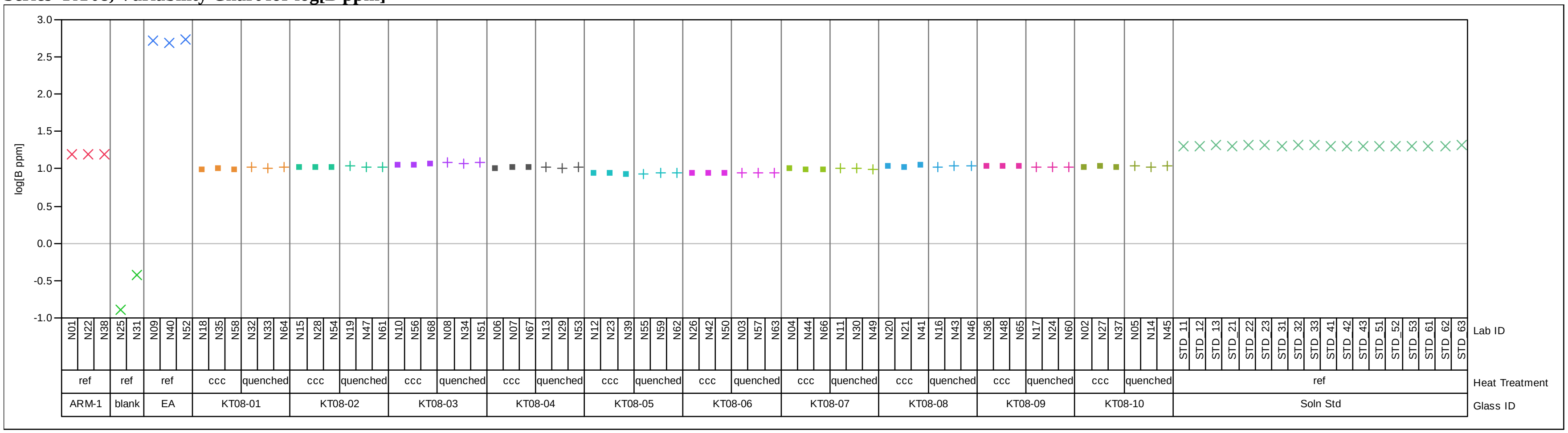
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	50.5333	0.19532	50.108	50.959
2	3	50.6000	0.19532	50.174	51.026
3	3	49.9667	0.19532	49.541	50.392
4	3	50.6667	0.19532	50.241	51.092
5	3	49.9333	0.19532	49.508	50.359
6	3	50.4667	0.19532	50.041	50.892

Std Error uses a pooled estimate of error variance

Exhibit C-3. KT08 PCT Results (as common logarithms) Grouped by Glass ID and Heat Treatment.

Series=KT08, Variability Chart for log[B ppm]



Series=KT08, Variability Chart for log[Li ppm]

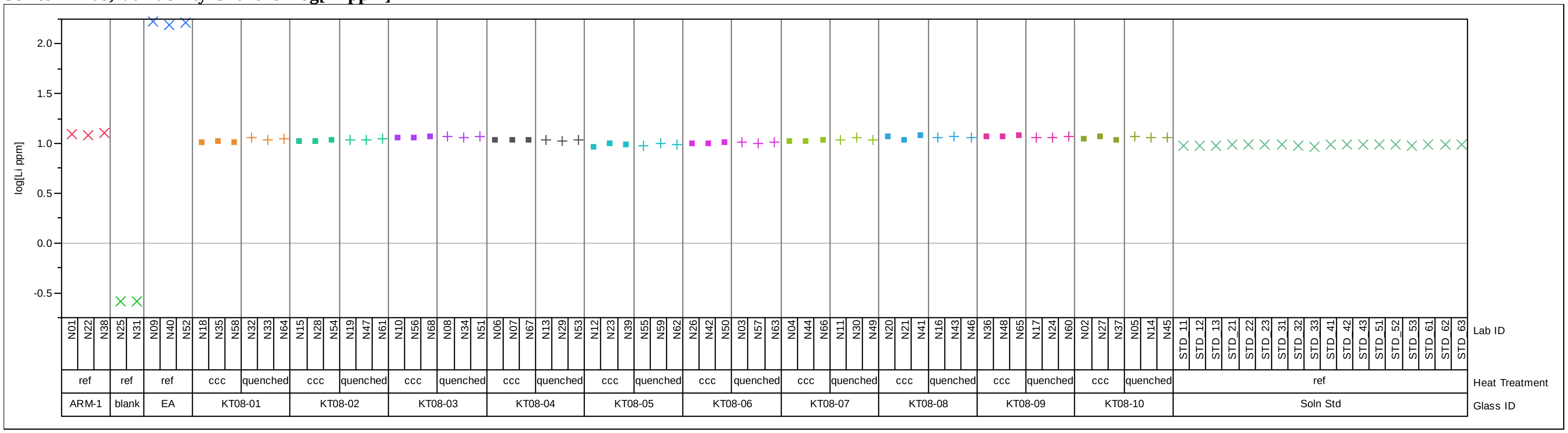
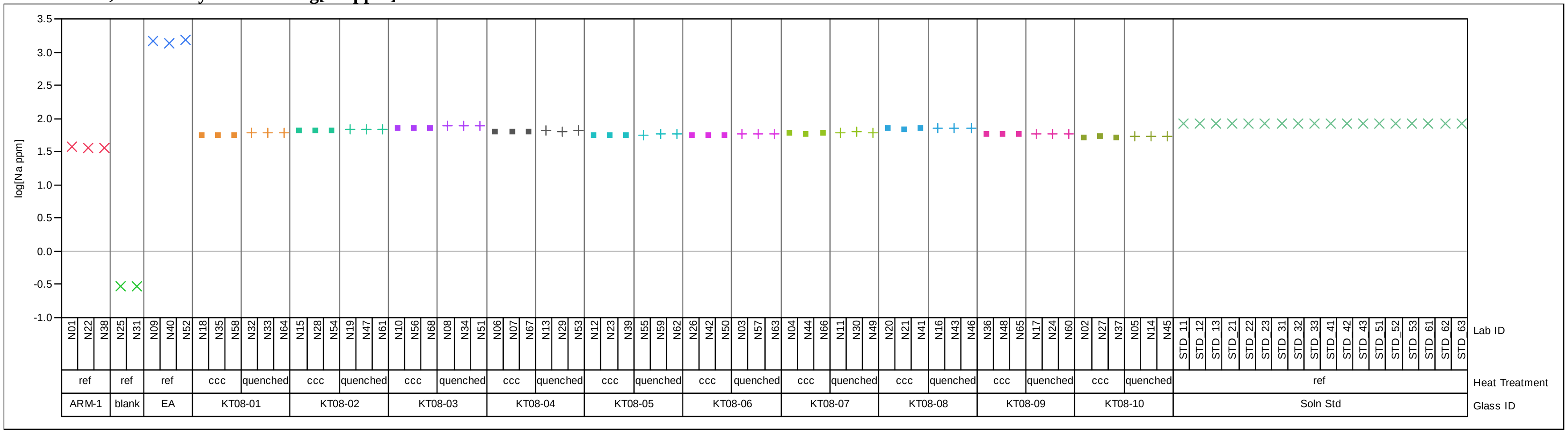


Exhibit C-3. KT08 PCT Results (as common logarithms) Grouped by Glass ID and Heat Treatment. (continued)

Series=KT08, Variability Chart for log[Na ppm]



Series=KT08, Variability Chart for log[Si ppm]

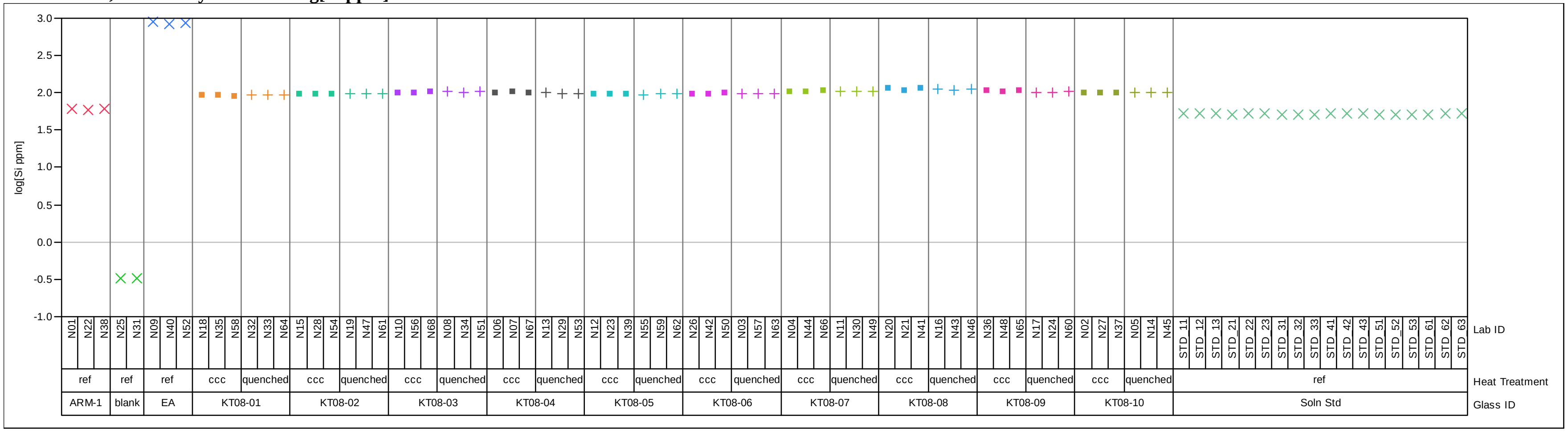


Exhibit C-4. Correlations Among KT08 Normalized PCT Results (as common logarithms)

(Both Comp Views and Both Heat Treatments)

Multivariate Correlations

	log NL[B (g/L)]	log NL[Li(g/L)]	log NL[Na (g/L)]	log NL[Si (g/L)]
log NL[B (g/L)]	1.0000	0.9956	0.9929	0.9737
log NL[Li(g/L)]	0.9956	1.0000	0.9878	0.9823
log NL[Na (g/L)]	0.9929	0.9878	1.0000	0.9710
log NL[Si (g/L)]	0.9737	0.9823	0.9710	1.0000

Scatterplot Matrix

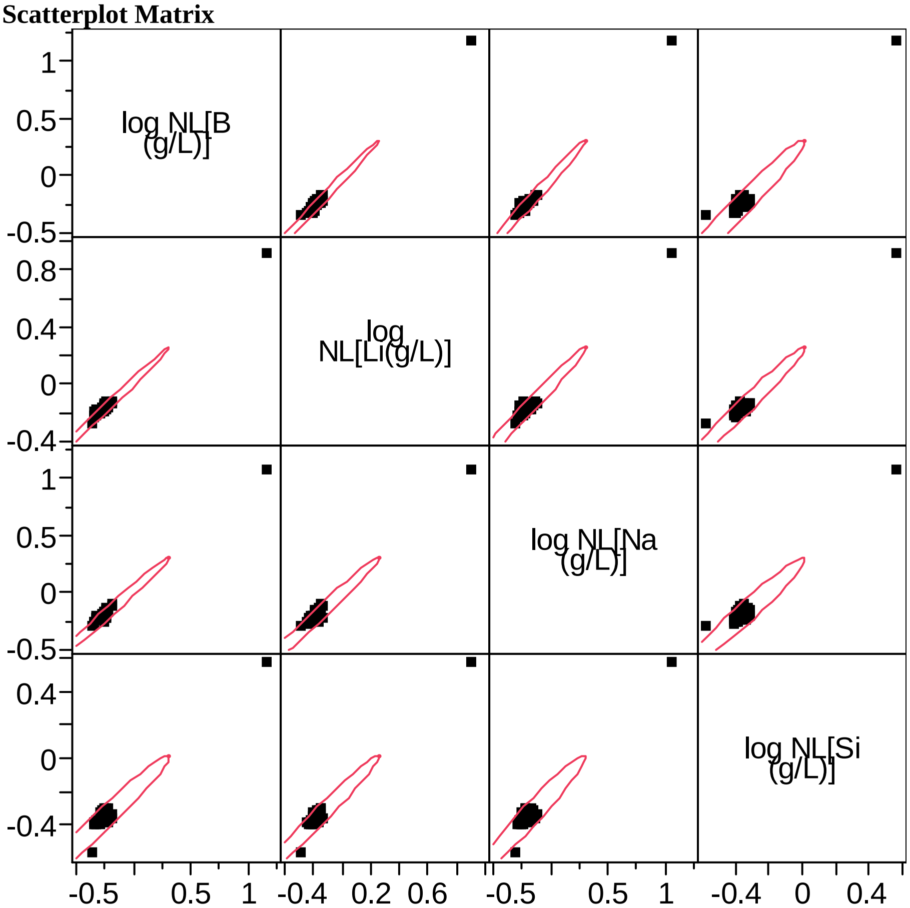


Exhibit C-5. Normalized PCT Response by Compositional View and Heat Treatment for KT08-Series Glasses.

Series=KT08, Variability Chart for log NL[B (g/L)]

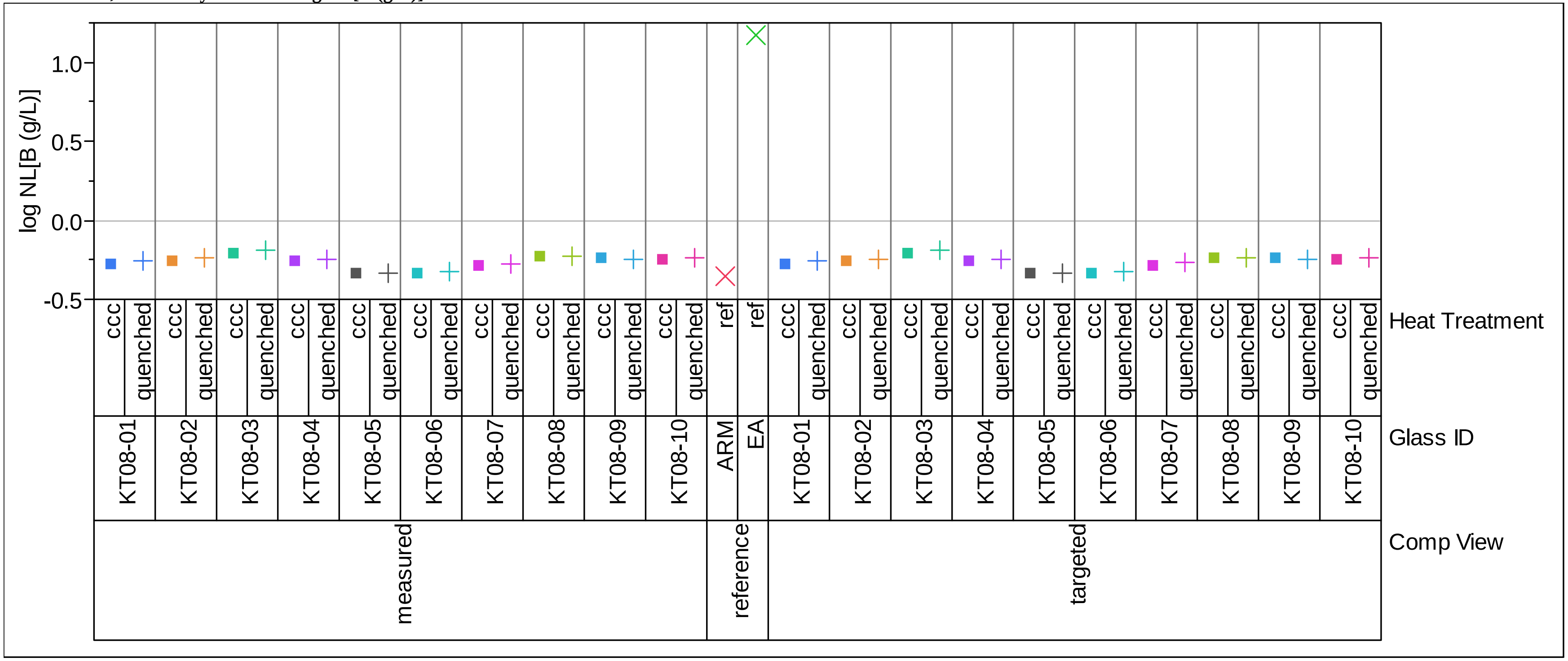


Exhibit C-5. Normalized PCT Response by Compositional View and Heat Treatment for KT08-Series Glasses. (continued)

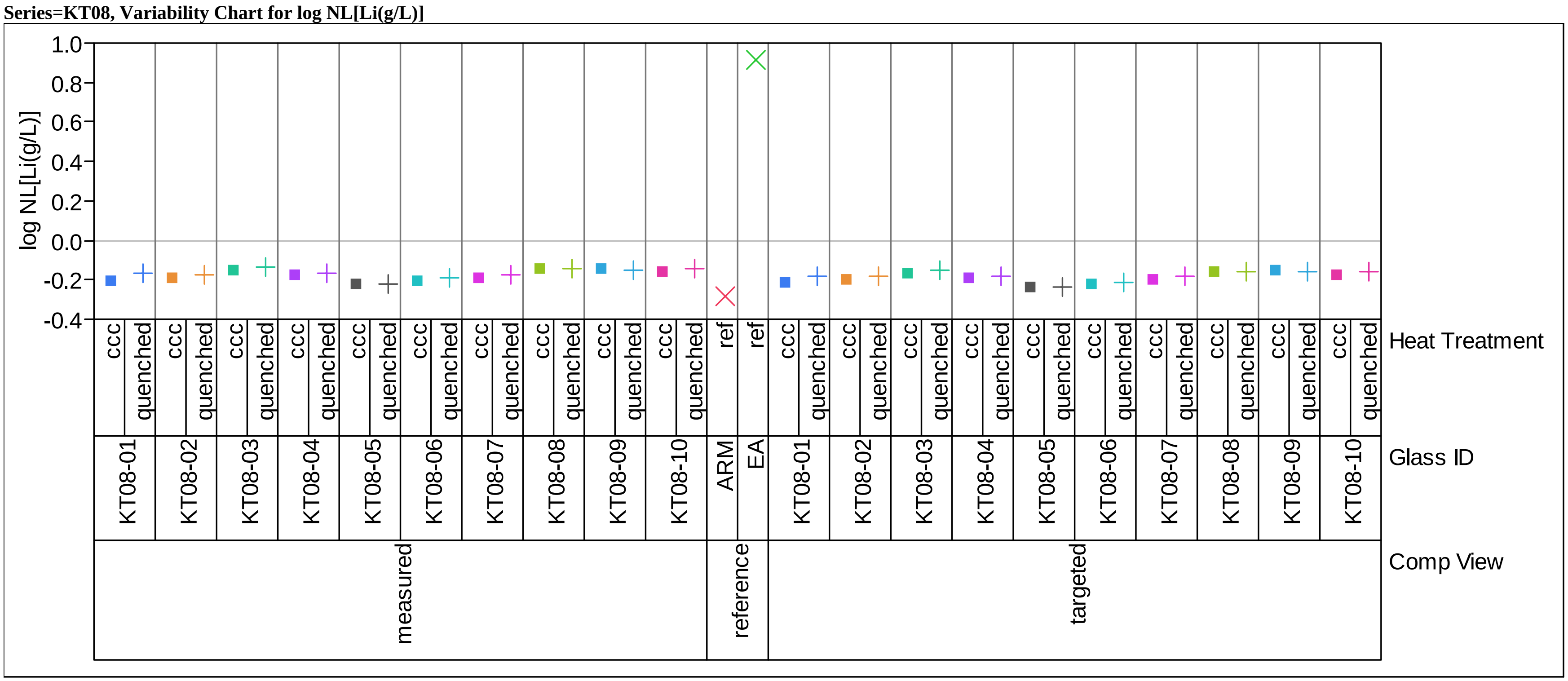


Exhibit C-5. Normalized PCT Response by Compositional View and Heat Treatment for KT08-Series Glasses. (continued)

Series=KT08, Variability Chart for log NL[Na (g/L)]

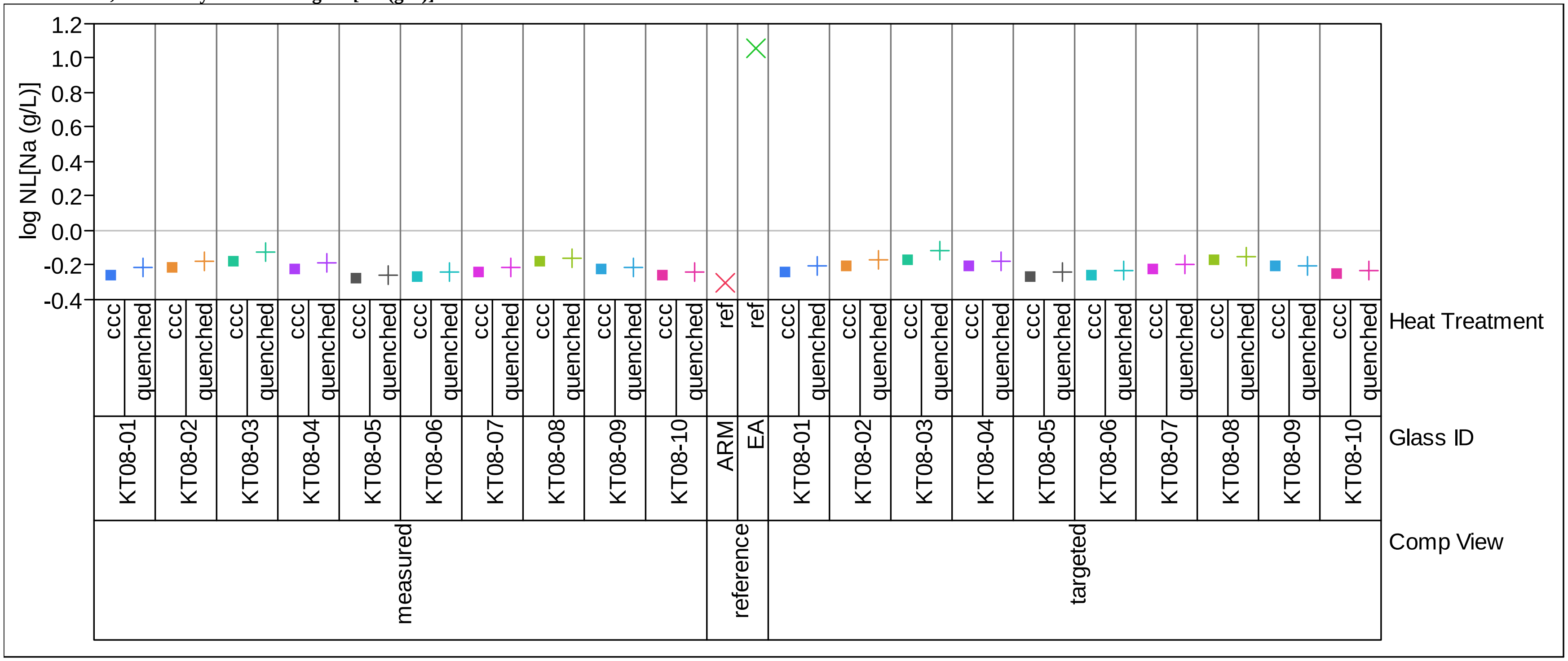


Exhibit C-5. Normalized PCT Response by Compositional View and Heat Treatment for KT08-Series Glasses. (continued)

Series=KT08, Variability Chart for log NL[Si (g/L)]

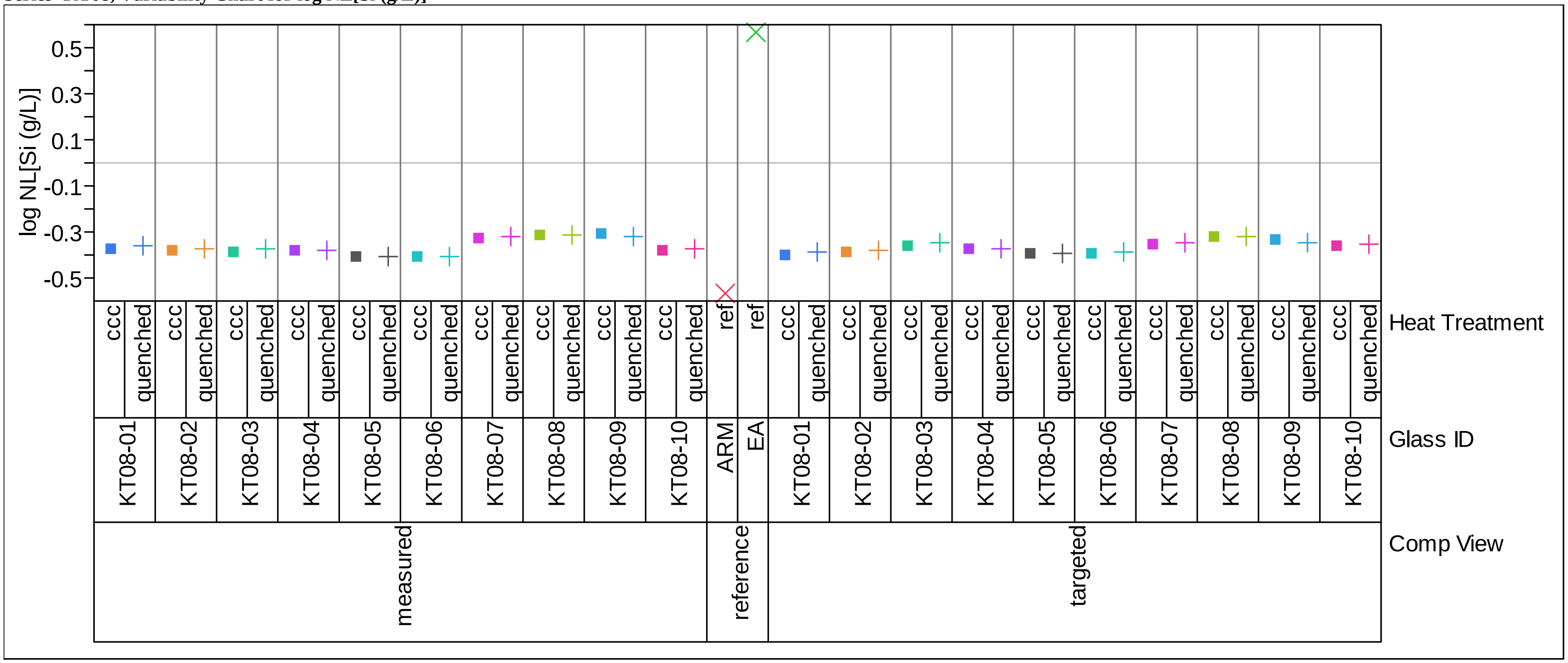
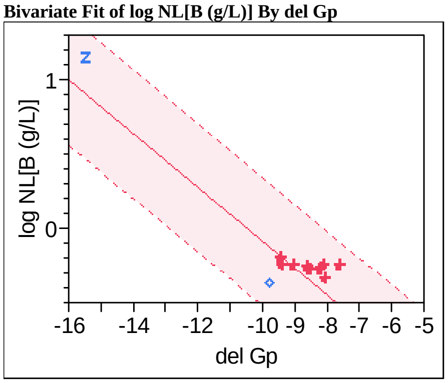


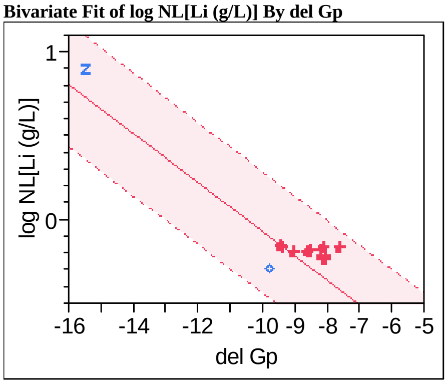
Exhibit C-6. PCT Measurements versus Durability Model Predictions for the KT08 Series Glasses.

Based Upon Targeted Compositions

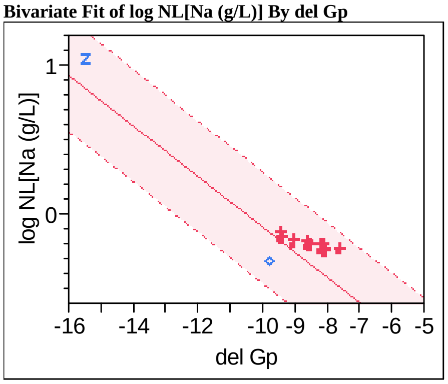
Bivariate Fit of log NL[B (g/L)] By del Gp



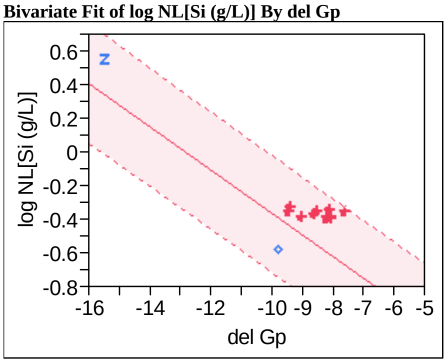
Bivariate Fit of log NL[Li (g/L)] By del Gp



Bivariate Fit of log NL[Na (g/L)] By del Gp

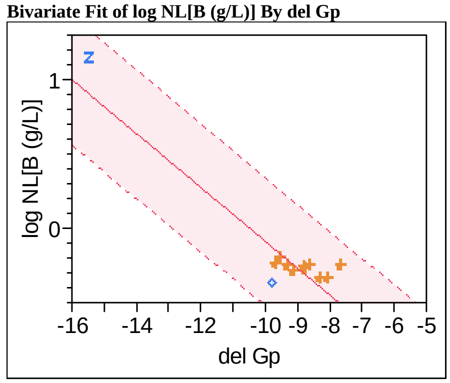


Bivariate Fit of log NL[Si (g/L)] By del Gp

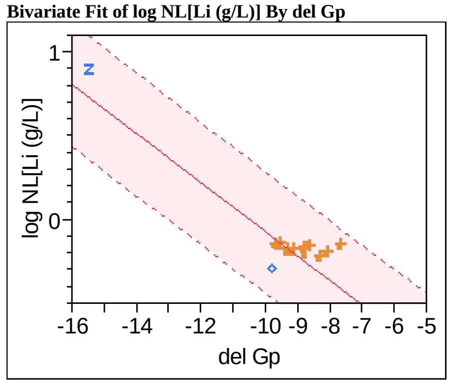


Based Upon Measured Compositions

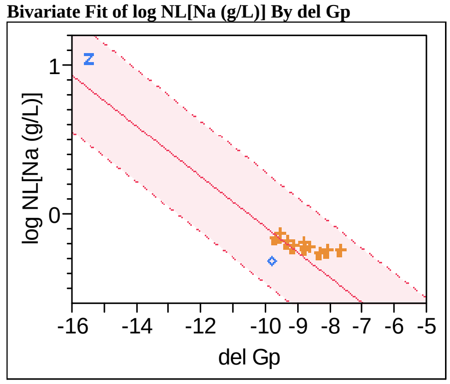
Bivariate Fit of log NL[B (g/L)] By del Gp



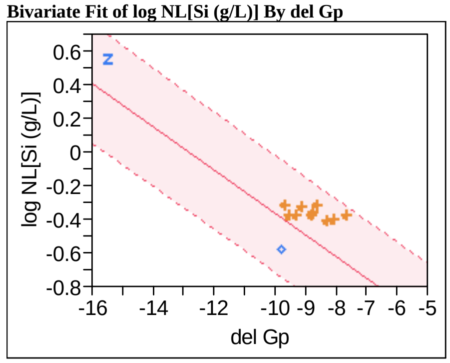
Bivariate Fit of log NL[Li (g/L)] By del Gp



Bivariate Fit of log NL[Na (g/L)] By del Gp



Bivariate Fit of log NL[Si (g/L)] By del Gp



Appendix D. Data Supporting the PCT Measurements of the KT10-Series Glasses

Table D-1. PCT Measurement Data for the KT10 Glasses, As Received (ar) and Correct for Dilution (ppm).

Glass ID	Heat Treatment	Block	Seq	Lab ID	B ar	Li ar	Na ar	Si ar	B (ppm)	Li (ppm)	Na (ppm)	Si (ppm)
Std Soln	ref	1	1	std-11	19.2	9.48	76.7	45.3	19.20	9.48	76.70	45.30
KT10-01	quenched	1	2	R33	6.91	13.2	35.2	70.4	11.52	22.00	58.67	117.34
KT10-03	ccc	1	3	R10	6.90	14.0	43.6	77.4	11.50	23.33	72.67	129.00
KT10-05	ccc	1	4	R39	5.46	11.9	32.0	68.8	9.10	19.83	53.33	114.67
KT10-04	ccc	1	5	R06	6.42	13.2	36.8	74.8	10.70	22.00	61.33	124.67
KT10-03	quenched	1	6	R08	6.92	13.8	44.6	76.4	11.53	23.00	74.33	127.34
KT10-08	quenched	1	7	R16	6.21	13.3	50.8	77.0	10.35	22.17	84.67	128.34
KT10-01	ccc	1	8	R36	5.74	13.0	38.1	71.3	9.57	21.67	63.50	118.84
KT10-10	ccc	1	9	R02	5.87	12.4	33.5	66.5	9.78	20.67	55.83	110.84
EA	ref	1	10	R52	19.4	6.91	56.9	33.5	323.33	115.17	948.34	558.33
KT10-06	ccc	1	11	R42	5.27	12.1	32.7	70.0	8.78	20.17	54.50	116.67
KT10-07	quenched	1	12	R49	5.70	12.7	43.9	73.8	9.50	21.17	73.17	123.00
KT10-04	quenched	1	13	R13	6.14	13.1	37.1	72.9	10.23	21.83	61.83	121.50
Std Soln	ref	1	14	std-12	19.5	9.78	80.0	46.5	19.50	9.78	80.00	46.50
KT10-09	quenched	1	15	R60	5.97	12.7	38.4	70.5	9.95	21.17	64.00	117.50
ARM-1	ref	1	16	R01	12.9	10.0	26.6	40.7	21.50	16.67	44.33	67.83
KT10-06	quenched	1	17	R57	5.15	12.3	33.5	68.7	8.58	20.50	55.83	114.50
KT10-02	quenched	1	18	R47	6.62	13.9	42.3	75.2	11.03	23.17	70.50	125.34
KT10-10	quenched	1	19	R14	5.75	12.2	33.9	66.1	9.58	20.33	56.50	110.17
KT10-07	ccc	1	20	R66	5.53	12.6	39.6	72.6	9.22	21.00	66.00	121.00
blank	ref	1	21	R31	<0.100	<1.00	<1.00	<0.100	0.08	0.83	0.83	0.08
KT10-05	quenched	1	22	R62	4.91	11.9	32.4	67.3	8.18	19.83	54.00	112.17
KT10-08	ccc	1	23	R20	5.45	12.8	45.1	71.9	9.08	21.33	75.17	119.84
KT10-02	ccc	1	24	R28	5.92	12.9	38.2	68.2	9.87	21.50	63.67	113.67
KT10-01	ccc	1	25	R18	6.09	13.3	34.4	68.9	10.15	22.17	57.33	114.84
Std Soln	ref	1	26	std-13	19.4	9.71	79.4	45.3	19.40	9.71	79.40	45.30
Std Soln	ref	2	1	std-21	19.0	9.67	78.5	46.9	19.00	9.67	78.50	46.90
KT10-06	quenched	2	2	R03	5.59	12.4	33.6	70.8	9.32	20.67	56.00	118.00
KT10-06	ccc	2	3	R26	5.02	11.5	31.9	65.6	8.37	19.17	53.17	109.34
KT10-08	quenched	2	4	R43	6.59	13.3	51.2	76.7	10.98	22.17	85.34	127.84
KT10-02	quenched	2	5	R61	6.46	13.4	41.4	73.2	10.77	22.33	69.00	122.00
KT10-03	ccc	2	6	R68	6.78	13.6	43.3	74.5	11.30	22.67	72.17	124.17
KT10-01	ccc	2	7	R58	6.18	12.5	33.9	67.3	10.30	20.83	56.50	112.17
KT10-08	ccc	2	8	R41	6.43	13.3	47.9	77.4	10.72	22.17	79.83	129.00
KT10-04	quenched	2	9	R53	6.14	12.9	36.9	71.7	10.23	21.50	61.50	119.50
KT10-05	ccc	2	10	R23	5.08	11.6	31.1	66.5	8.47	19.33	51.83	110.84
KT10-05	quenched	2	11	R59	5.15	11.6	31.4	65.7	8.58	19.33	52.33	109.50
KT10-07	quenched	2	12	R30	5.67	12.3	40.3	72.6	9.45	20.50	67.17	121.00
KT10-01	quenched	2	13	R64	6.74	13.5	35.7	71.2	11.23	22.50	59.50	118.67
Std Soln	ref	2	14	std-22	19.6	9.74	79.4	46.7	19.60	9.74	79.40	46.70
KT10-04	ccc	2	15	R67	6.24	12.7	35.4	70.9	10.40	21.17	59.00	118.17
KT10-09	quenched	2	16	R17	6.09	12.5	37.9	68.6	10.15	20.83	63.17	114.34
KT10-10	quenched	2	17	R05	5.49	11.8	33.2	63.3	9.15	19.67	55.33	105.50
KT10-02	ccc	2	18	R54	6.19	12.8	38.3	69.8	10.32	21.33	63.83	116.34
EA	ref	2	19	R09	20.8	7.73	59.9	36.6	346.67	128.83	998.34	610.00
KT10-09	ccc	2	20	R48	6.10	12.8	38.1	70.9	10.17	21.33	63.50	118.17
KT10-07	ccc	2	21	R44	5.84	12.6	39.6	73.2	9.73	21.00	66.00	122.00
ARM-1	ref	2	22	R22	13.1	10.0	26.1	39.8	21.83	16.67	43.50	66.33
KT10-10	ccc	2	23	R27	5.92	12.1	33.3	66.5	9.87	20.17	55.50	110.84
KT10-09	ccc	2	24	R37	6.84	13.7	44.7	75.9	11.40	22.83	74.50	126.50
Std Soln	ref	2	25	std-23	19.0	9.73	79.4	46.1	19.00	9.73	79.40	46.10
Std Soln	ref	3	1	std-31	18.9	9.58	79.0	46.6	18.90	9.58	79.00	46.60
KT10-01	quenched	3	2	R32	6.55	13.1	34.9	69.1	10.92	21.83	58.17	115.17
KT10-04	quenched	3	3	R29	5.80	12.9	36.9	72.5	9.67	21.50	61.50	120.84
KT10-09	quenched	3	4	R24	5.70	12.3	38.0	69.2	9.50	20.50	63.33	115.34
KT10-02	ccc	3	5	R15	5.83	12.7	38.3	70.4	9.72	21.17	63.83	117.34
KT10-02	quenched	3	6	R19	5.74	12.9	39.2	69.9	9.57	21.50	65.33	116.50
KT10-06	quenched	3	7	R63	4.43	11.3	31.5	64.4	7.38	18.83	52.50	107.34

Table D-1. PCT Measurement Data for the KT10 Glasses, As Received (ar) and Correct for Dilution (ppm). (continued)

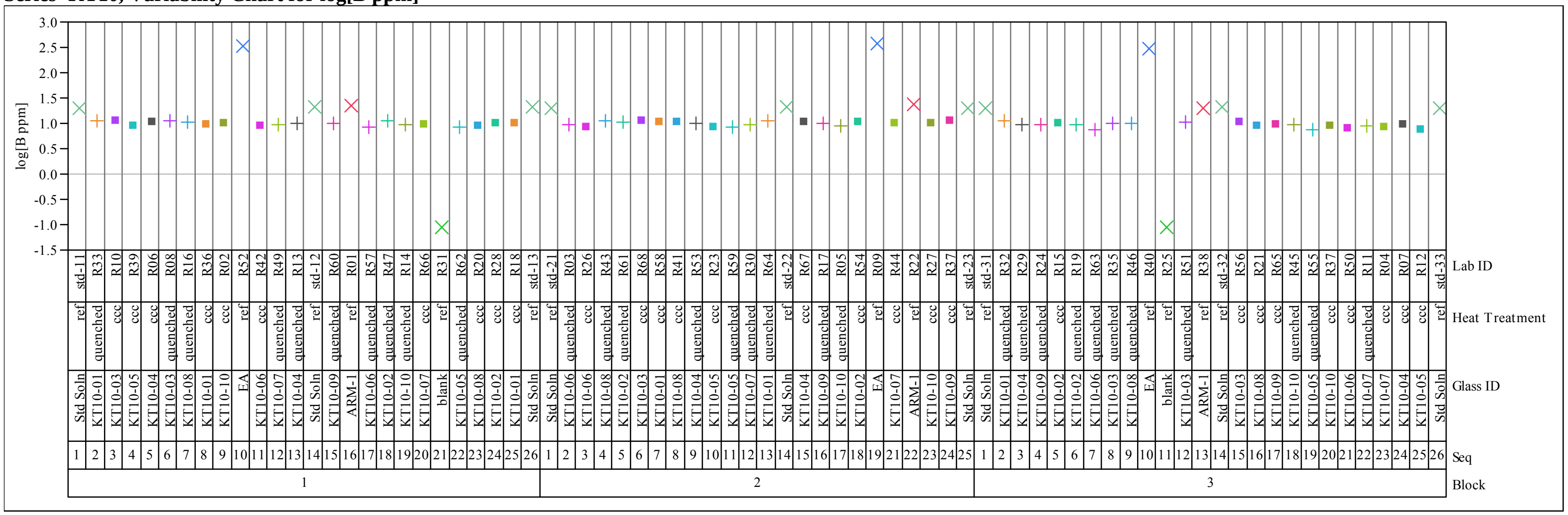
Glass ID	Heat Treatment	Block	Seq	Lab ID	B ar	Li ar	Na ar	Si ar	B (ppm)	Li (ppm)	Na (ppm)	Si (ppm)
KT10-03	quenched	3	8	R35	5.84	12.7	33.3	68.6	9.73	21.17	55.50	114.34
KT10-08	quenched	3	9	R46	6.05	13.1	50.9	76.7	10.08	21.83	84.84	127.84
EA	ref	3	10	R40	17.2	6.40	50.9	31.9	286.67	106.67	848.34	531.67
blank	ref	3	11	R25	<0.100	<1.00	<1.00	<0.100	0.08	0.83	0.83	0.08
KT10-03	quenched	3	12	R51	6.24	13.2	44.8	73.9	10.40	22.00	74.67	123.17
ARM-1	ref	3	13	R38	11.2	9.36	24.8	38.2	18.67	15.60	41.33	63.67
Std Soln	ref	3	14	std-32	19.5	9.76	81.6	47.1	19.50	9.76	81.60	47.10
KT10-03	ccc	3	15	R56	6.45	13.6	42.7	75.3	10.75	22.67	71.17	125.50
KT10-08	ccc	3	16	R21	5.30	12.2	44.2	70.9	8.83	20.33	73.67	118.17
KT10-09	ccc	3	17	R65	5.64	12.2	36.5	69.1	9.40	20.33	60.83	115.17
KT10-10	quenched	3	18	R45	5.79	12.5	35.3	68.3	9.65	20.83	58.83	113.84
KT10-05	quenched	3	19	R55	4.52	11.4	32.2	65.6	7.53	19.00	53.67	109.34
KT10-10	ccc	3	20	R37	5.37	11.8	33.3	64.7	8.95	19.67	55.50	107.84
KT10-06	ccc	3	21	R50	4.82	11.6	31.8	66.8	8.03	19.33	53.00	111.34
KT10-07	quenched	3	22	R11	5.26	12.3	40.1	70.9	8.77	20.50	66.83	118.17
KT10-07	ccc	3	23	R04	5.09	12.3	38.6	71.7	8.48	20.50	64.33	119.50
KT10-04	ccc	3	24	R07	5.69	12.8	36.0	72.1	9.48	21.33	60.00	120.17
KT10-05	ccc	3	25	R12	4.56	11.1	31.1	64.1	7.60	18.50	51.83	106.84
Std Soln	ref	3	26	std-33	19.0	9.54	79.0	46.1	19.00	9.54	79.00	46.10

Table D-2. Normalized PCT Responses for the KT10-Series 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	-0.231	-0.161	-0.222	-0.518	0.59	0.69	0.60	0.30
EA	ref	reference	0.957	0.770	0.873	0.395	9.06	5.89	7.46	2.48
KT10-01	ccc	measured	-0.190	-0.065	-0.152	-0.292	0.65	0.86	0.71	0.51
KT10-01	ccc	targeted	-0.173	-0.066	-0.147	-0.301	0.67	0.86	0.71	0.50
KT10-01	quenched	measured	-0.140	-0.054	-0.154	-0.285	0.73	0.88	0.70	0.52
KT10-01	quenched	targeted	-0.123	-0.055	-0.149	-0.294	0.75	0.88	0.71	0.51
KT10-02	ccc	measured	-0.183	-0.066	-0.143	-0.304	0.66	0.86	0.72	0.50
KT10-02	ccc	targeted	-0.175	-0.070	-0.142	-0.303	0.67	0.85	0.72	0.50
KT10-02	quenched	measured	-0.163	-0.046	-0.114	-0.284	0.69	0.90	0.77	0.52
KT10-02	quenched	targeted	-0.155	-0.051	-0.113	-0.283	0.70	0.89	0.77	0.52
KT10-03	ccc	measured	-0.127	-0.039	-0.102	-0.262	0.75	0.91	0.79	0.55
KT10-03	ccc	targeted	-0.125	-0.040	-0.099	-0.267	0.75	0.91	0.80	0.54
KT10-03	quenched	measured	-0.153	-0.056	-0.130	-0.278	0.70	0.88	0.74	0.53
KT10-03	quenched	targeted	-0.151	-0.056	-0.127	-0.284	0.71	0.88	0.75	0.52
KT10-04	ccc	measured	-0.181	-0.067	-0.156	-0.285	0.66	0.86	0.70	0.52
KT10-04	ccc	targeted	-0.166	-0.067	-0.159	-0.290	0.68	0.86	0.69	0.51
KT10-04	quenched	measured	-0.187	-0.065	-0.145	-0.286	0.65	0.86	0.72	0.52
KT10-04	quenched	targeted	-0.172	-0.065	-0.148	-0.292	0.67	0.86	0.71	0.51
KT10-05	ccc	measured	-0.251	-0.115	-0.220	-0.327	0.56	0.77	0.60	0.47
KT10-05	ccc	targeted	-0.251	-0.116	-0.217	-0.333	0.56	0.77	0.61	0.46
KT10-05	quenched	measured	-0.266	-0.111	-0.212	-0.328	0.54	0.77	0.61	0.47
KT10-05	quenched	targeted	-0.266	-0.112	-0.209	-0.335	0.54	0.77	0.62	0.46
KT10-06	ccc	measured	-0.239	-0.110	-0.214	-0.328	0.58	0.78	0.61	0.47
KT10-06	ccc	targeted	-0.250	-0.108	-0.208	-0.326	0.56	0.78	0.62	0.47
KT10-06	quenched	measured	-0.239	-0.100	-0.205	-0.325	0.58	0.79	0.62	0.47
KT10-06	quenched	targeted	-0.250	-0.099	-0.199	-0.323	0.56	0.80	0.63	0.47
KT10-07	ccc	measured	-0.216	-0.076	-0.149	-0.287	0.61	0.84	0.71	0.52
KT10-07	ccc	targeted	-0.213	-0.081	-0.146	-0.293	0.61	0.83	0.71	0.51
KT10-07	quenched	measured	-0.211	-0.078	-0.126	-0.287	0.62	0.83	0.75	0.52
KT10-07	quenched	targeted	-0.208	-0.083	-0.123	-0.293	0.62	0.83	0.75	0.51
KT10-08	ccc	measured	-0.188	-0.063	-0.105	-0.293	0.65	0.86	0.78	0.51
KT10-08	ccc	targeted	-0.195	-0.072	-0.107	-0.285	0.64	0.85	0.78	0.52
KT10-08	quenched	measured	-0.146	-0.047	-0.058	-0.273	0.71	0.90	0.88	0.53
KT10-08	quenched	targeted	-0.154	-0.056	-0.060	-0.265	0.70	0.88	0.87	0.54
KT10-09	ccc	measured	-0.148	-0.063	-0.125	-0.287	0.71	0.87	0.75	0.52
KT10-09	ccc	targeted	-0.158	-0.066	-0.121	-0.281	0.69	0.86	0.76	0.52
KT10-09	quenched	measured	-0.169	-0.077	-0.150	-0.305	0.68	0.84	0.71	0.50
KT10-09	quenched	targeted	-0.179	-0.081	-0.146	-0.299	0.66	0.83	0.71	0.50
KT10-10	ccc	measured	-0.211	-0.093	-0.189	-0.319	0.62	0.81	0.65	0.48
KT10-10	ccc	targeted	-0.195	-0.095	-0.188	-0.319	0.64	0.80	0.65	0.48
KT10-10	quenched	measured	-0.214	-0.091	-0.179	-0.319	0.61	0.81	0.66	0.48
KT10-10	quenched	targeted	-0.198	-0.092	-0.178	-0.319	0.63	0.81	0.66	0.48

Exhibit D-1. KT10 PCT Measurements (as Common Logarithms) in Analytical Sequence by Element.

Series=KT10, Variability Chart for log[B ppm]



Series=KT10, Variability Chart for log[Li ppm]

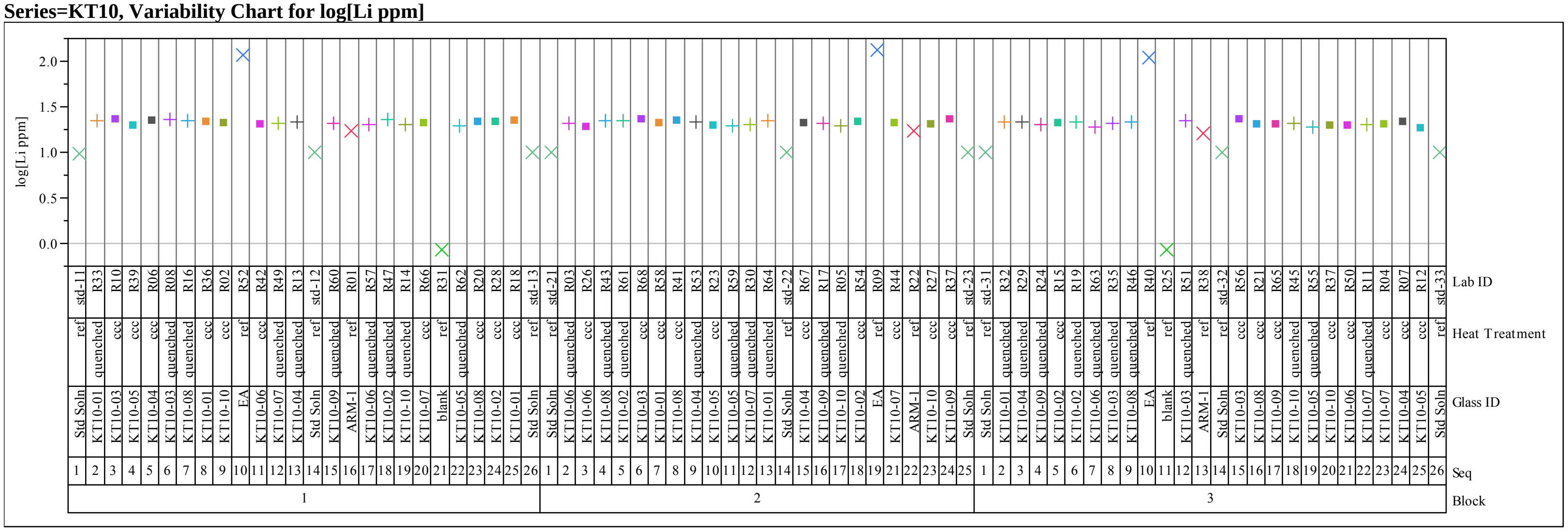
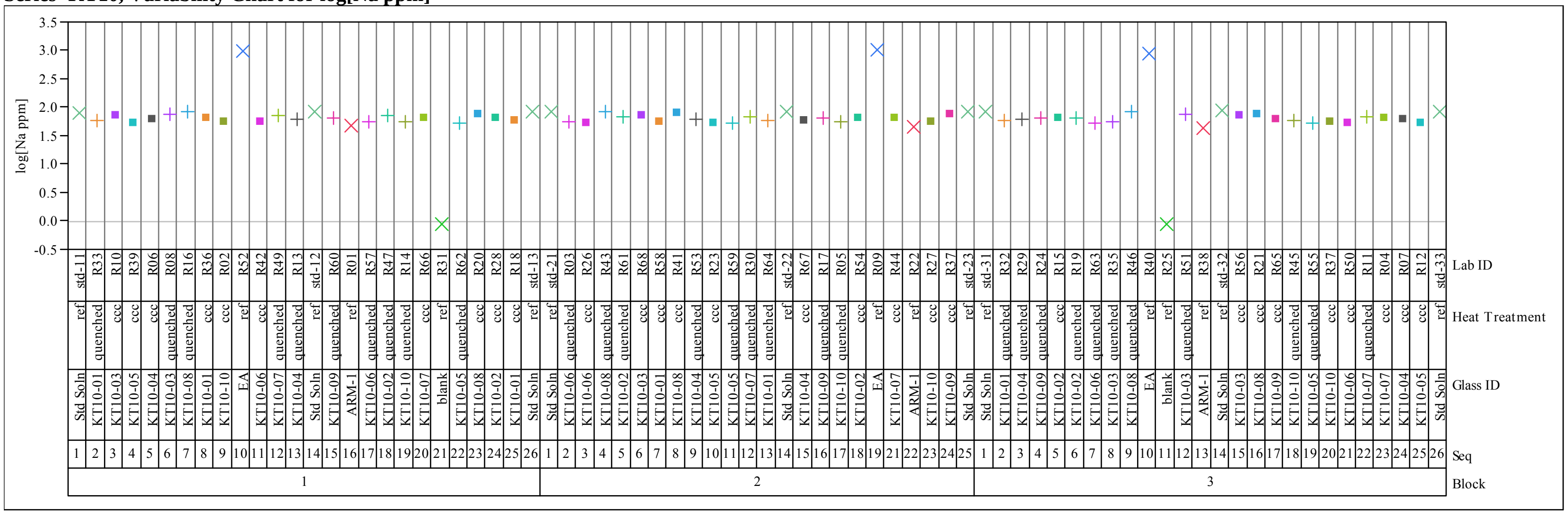


Exhibit D-1. KT10 PCT Measurements (as Common Logarithms) in Analytical Sequence by Element. (continued)

Series=KT10, Variability Chart for log[Na ppm]



Series=KT10, Variability Chart for log[Si ppm]

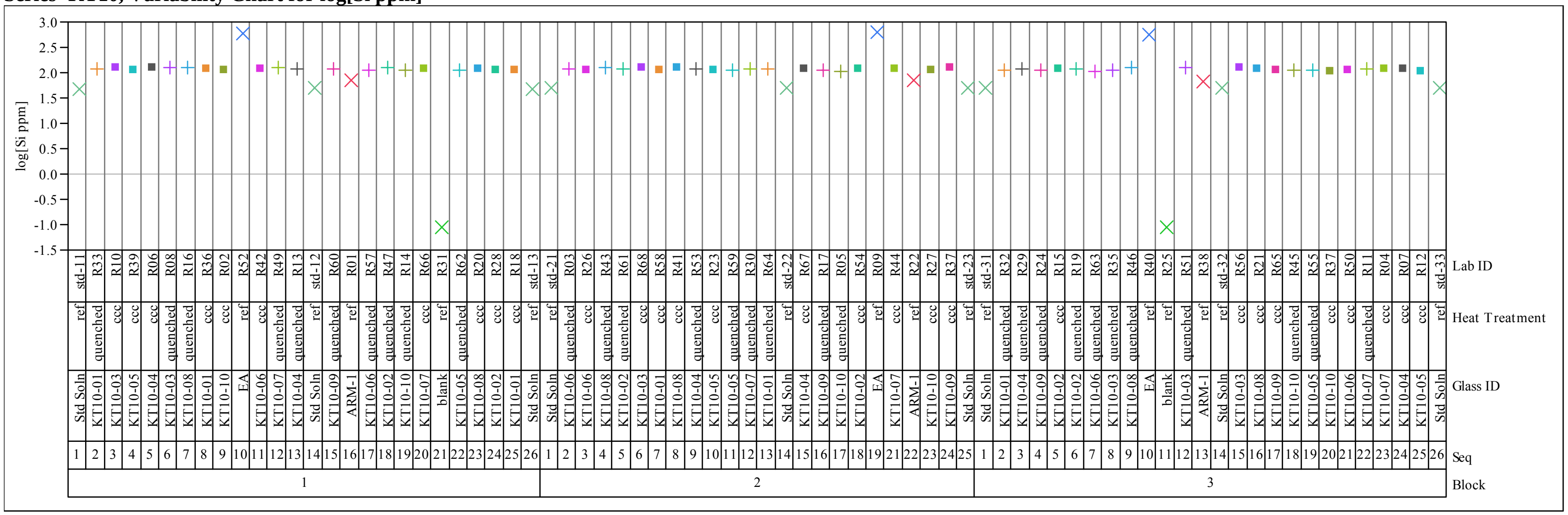
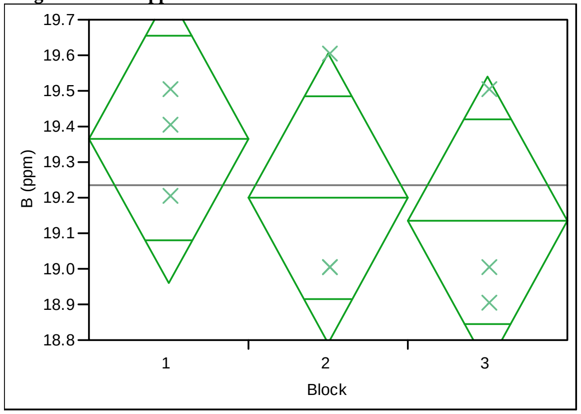


Exhibit D-2. Statistical Evaluation of the ICP-AES Calibration Effects from the KT10 Multi-Element Standard Solution Results by Oxide.

Oneway Analysis of B (ppm) By Block Series=KT10, Type=Soln Std
Target value = 20 ppm



Oneway Anova
Summary of Fit

Rsquare	0.149425
Adj Rsquare	-0.1341
Root Mean Square Error	0.286744
Mean of Response	19.23333
Observations (or Sum Wgts)	9

Analysis of Variance

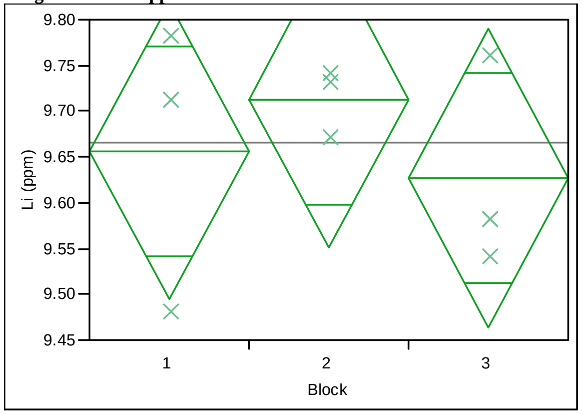
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block	2	0.08666667	0.043333	0.5270	0.6154
Error	6	0.49333333	0.082222		
C. Total	8	0.58000000			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	19.3667	0.16555	18.962	19.772
2	3	19.2000	0.16555	18.795	19.605
3	3	19.1333	0.16555	18.728	19.538

Std Error uses a pooled estimate of error variance

Oneway Analysis of Li (ppm) By Block Series=KT10, Type=Soln Std
Target value = 10 ppm



Oneway Anova
Summary of Fit

Rsquare	0.127406
Adj Rsquare	-0.16346
Root Mean Square Error	0.115181
Mean of Response	9.665556
Observations (or Sum Wgts)	9

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block	2	0.01162222	0.005811	0.4380	0.6644
Error	6	0.07960000	0.013267		
C. Total	8	0.09122222			

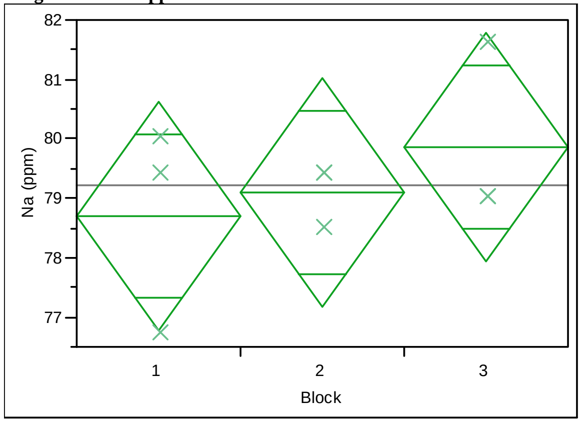
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	9.65667	0.06650	9.4939	9.8194
2	3	9.71333	0.06650	9.5506	9.8761
3	3	9.62667	0.06650	9.4639	9.7894

Std Error uses a pooled estimate of error variance

Exhibit D-2. Statistical Evaluation of the ICP-AES Calibration Effects from the KT10 Multi-Element Standard Solution Results by Oxide. (continued)

Oneway Analysis of Na (ppm) By Block Series=KT10, Type=Soln Std
Target value = 81 ppm



Oneway Anova
Summary of Fit

Rsquare	0.15814
Adj Rsquare	-0.12248
Root Mean Square Error	1.367886
Mean of Response	79.22222
Observations (or Sum Wgts)	9

Analysis of Variance

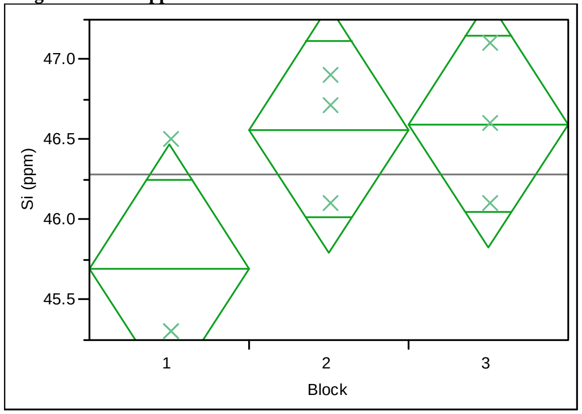
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block	2	2.108889	1.05444	0.5635	0.5966
Error	6	11.226667	1.87111		
C. Total	8	13.335556			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	78.7000	0.78975	76.768	80.632
2	3	79.1000	0.78975	77.168	81.032
3	3	79.8667	0.78975	77.934	81.799

Std Error uses a pooled estimate of error variance

Oneway Analysis of Si (ppm) By Block Series=KT10, Type=Soln Std
Target value = 50 ppm



Oneway Anova
Summary of Fit

Rsquare	0.46372
Adj Rsquare	0.28496
Root Mean Square Error	0.548736
Mean of Response	46.28889
Observations (or Sum Wgts)	9

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block	2	1.5622222	0.781111	2.5941	0.1542
Error	6	1.8066667	0.301111		
C. Total	8	3.3688889			

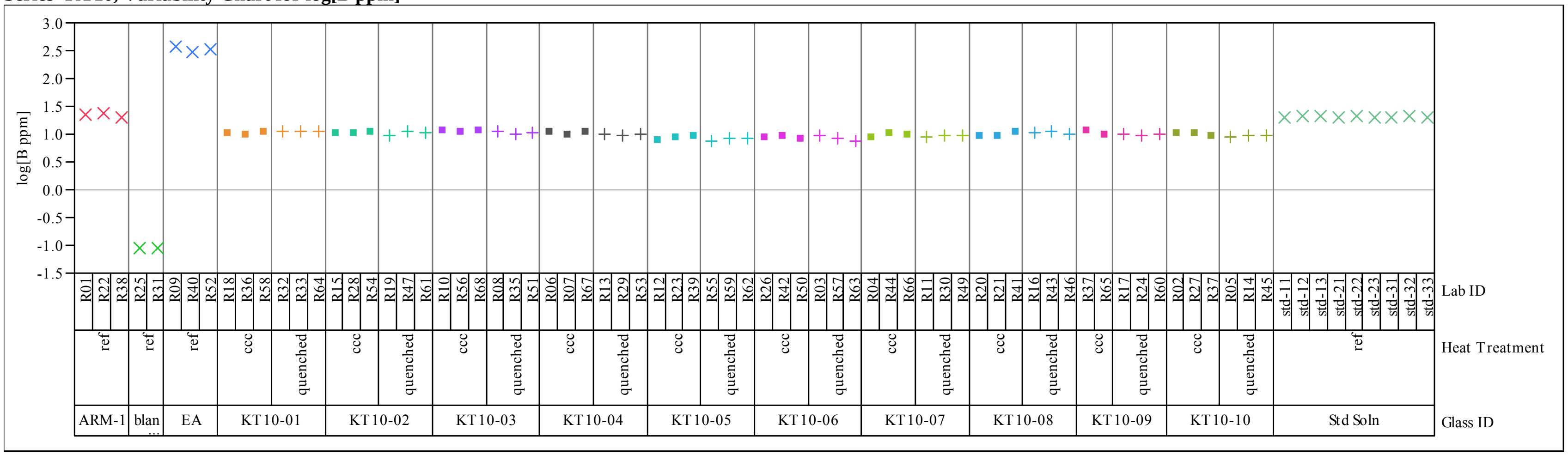
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	3	45.7000	0.31681	44.925	46.475
2	3	46.5667	0.31681	45.791	47.342
3	3	46.6000	0.31681	45.825	47.375

Std Error uses a pooled estimate of error variance

Exhibit D-3. KT10 PCT Results (as Common Logarithms) Grouped by Glass ID and Heat Treatment.

Series=KT10, Variability Chart for log[B ppm]



Series=KT10, Variability Chart for log[Li ppm]

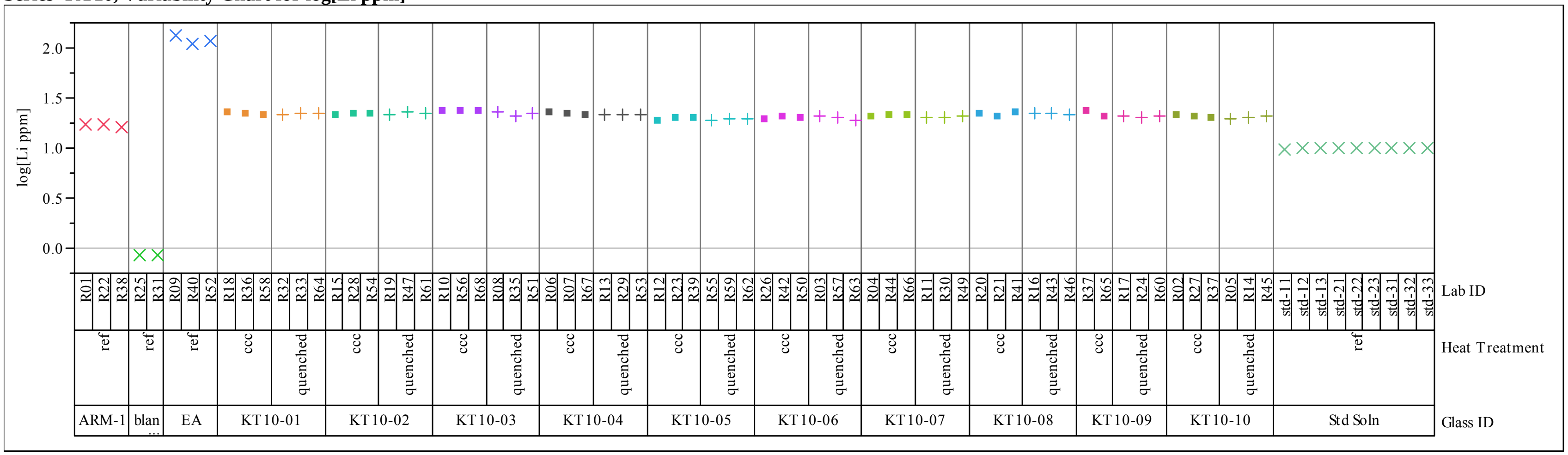
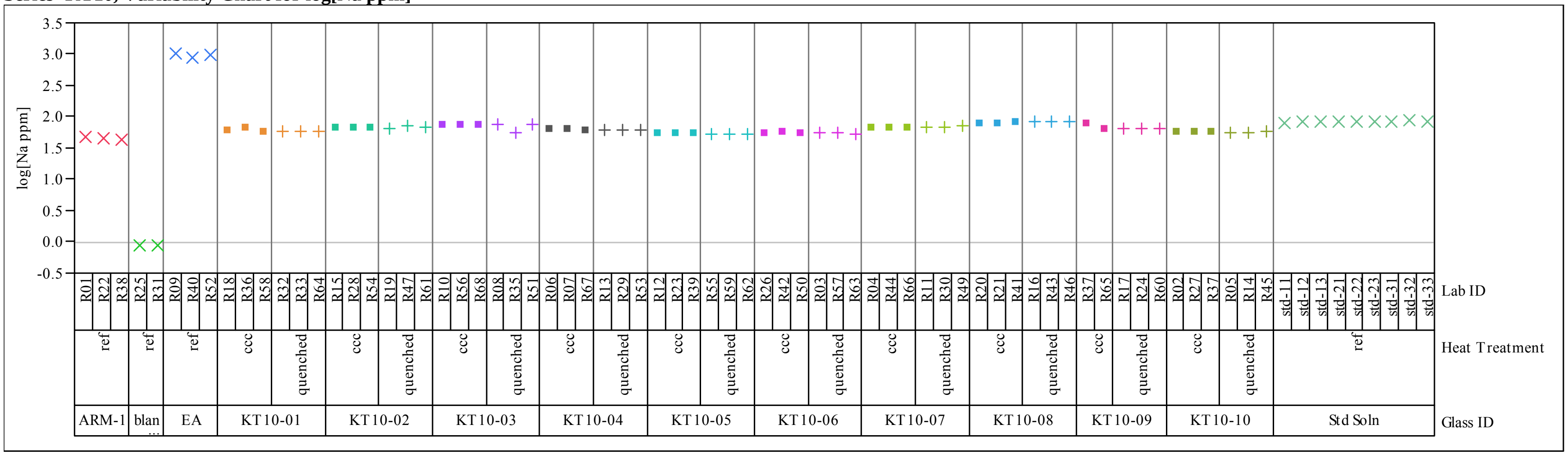


Exhibit D-3. KT10 PCT Results (as Common Logarithms) Grouped by Glass ID and Heat Treatment. (continued)

Series=KT10, Variability Chart for log[Na ppm]



Series=KT10, Variability Chart for log[Si ppm]

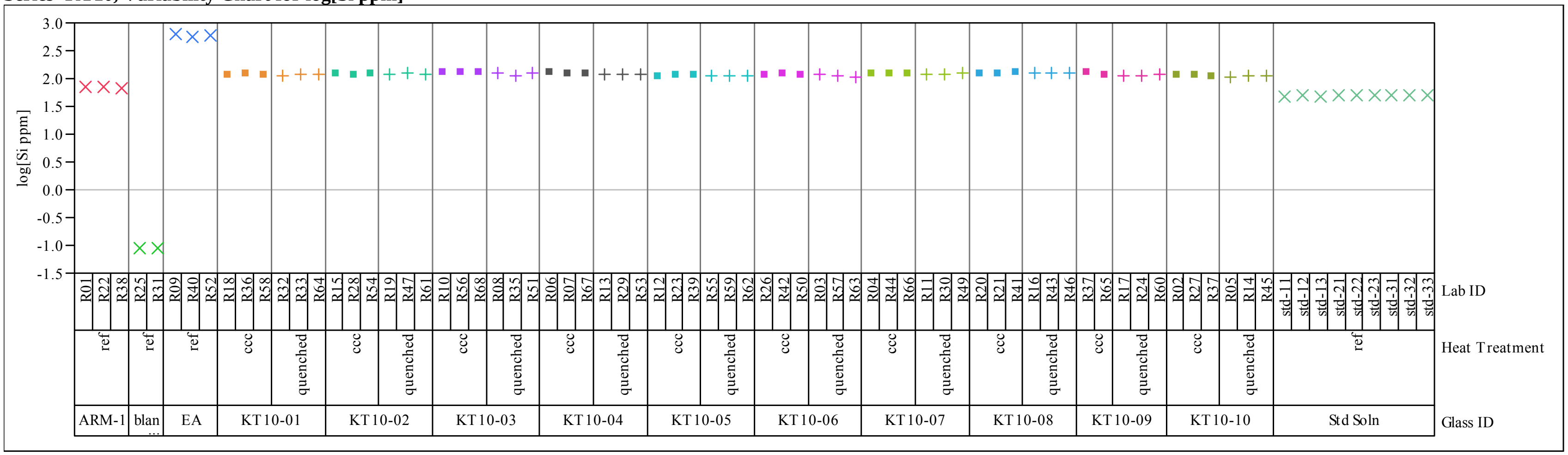


Exhibit D-4. Correlations among Normalized PCT Results (as common logarithms) for the KT10-Series Glasses.

(Both Compositional Views and Both Heat Treatments)

Multivariate Correlations

	log NL[B (g/L)]	log NL[Li(g/L)]	log NL[Na (g/L)]	log NL[Si (g/L)]
log NL[B (g/L)]	1.0000	0.9941	0.9872	0.9587
log NL[Li(g/L)]	0.9941	1.0000	0.9906	0.9777
log NL[Na (g/L)]	0.9872	0.9906	1.0000	0.9673
log NL[Si (g/L)]	0.9587	0.9777	0.9673	1.0000

Scatterplot Matrix

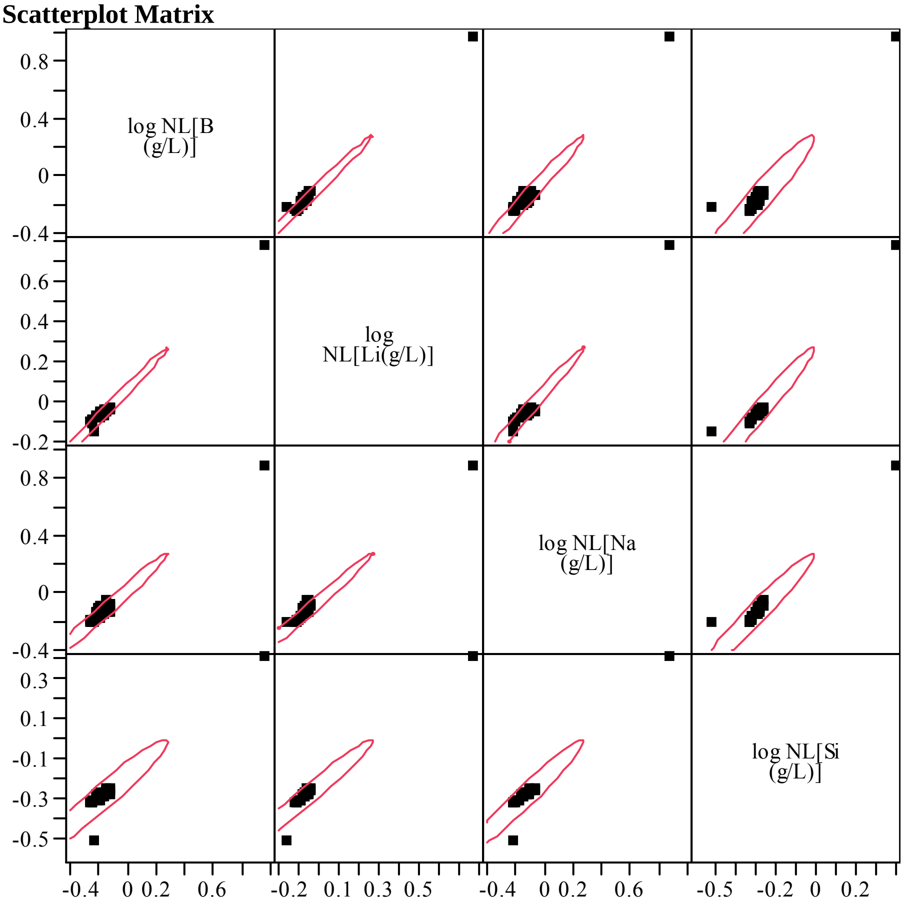
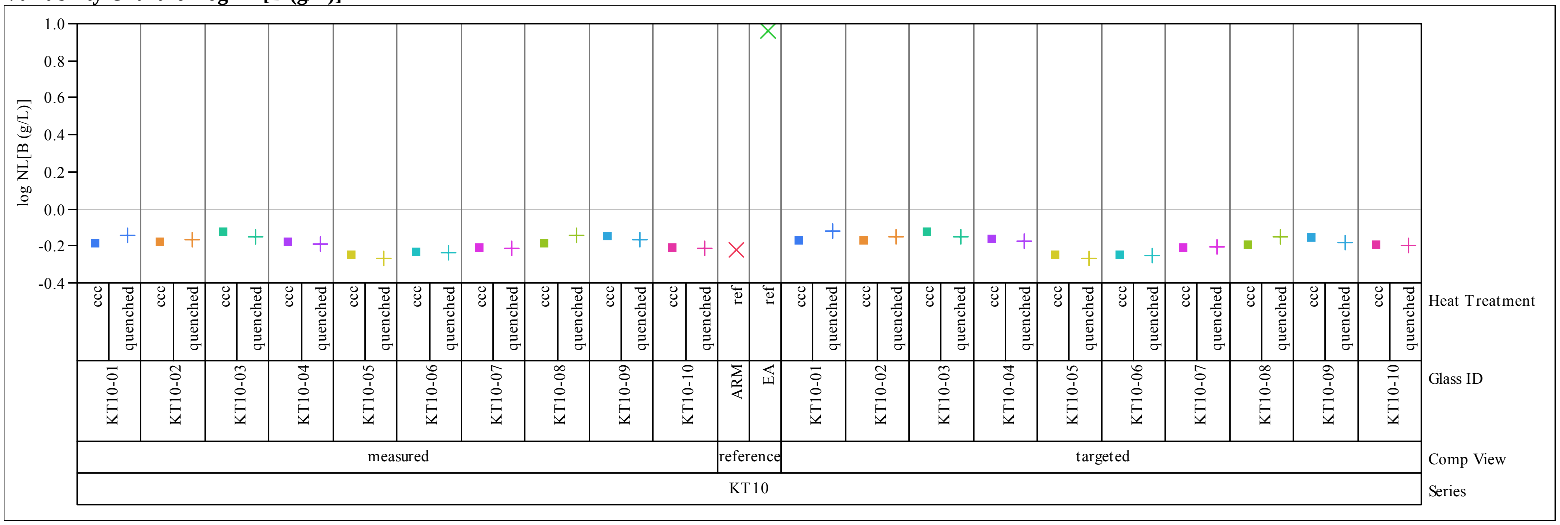


Exhibit D-5. Normalized PCT Response by Compositional View and Heat Treatment for the KT10-Series Glasses.

Variability Chart for log NL[B (g/L)]



Variability Chart for log NL[Li(g/L)]

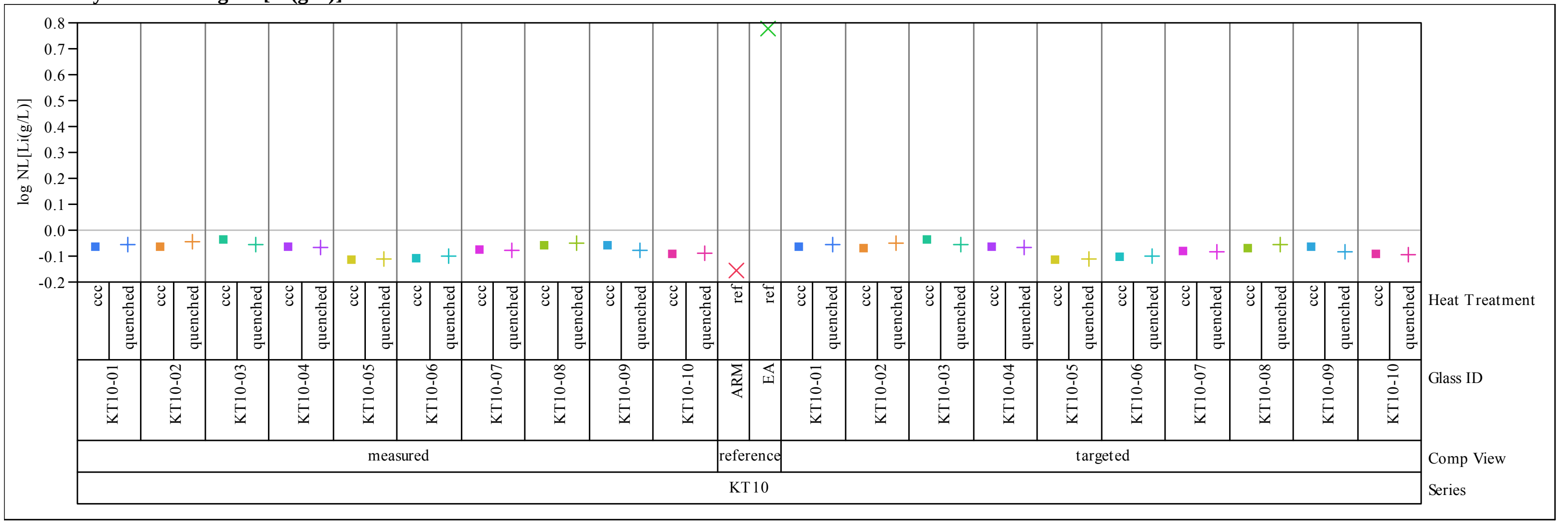
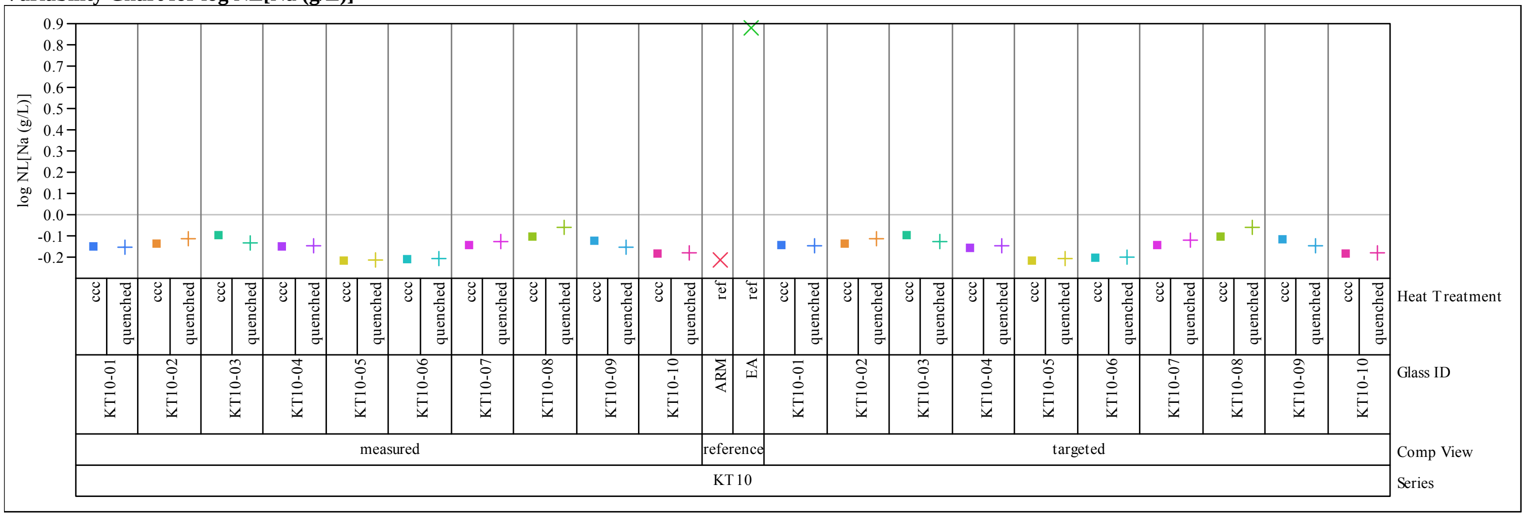


Exhibit D-5. Normalized PCT Response by Compositional View and Heat Treatment for the KT10-Series Glasses. (continued)

Variability Chart for log NL[Na (g/L)]



Variability Chart for log NL[Si (g/L)]

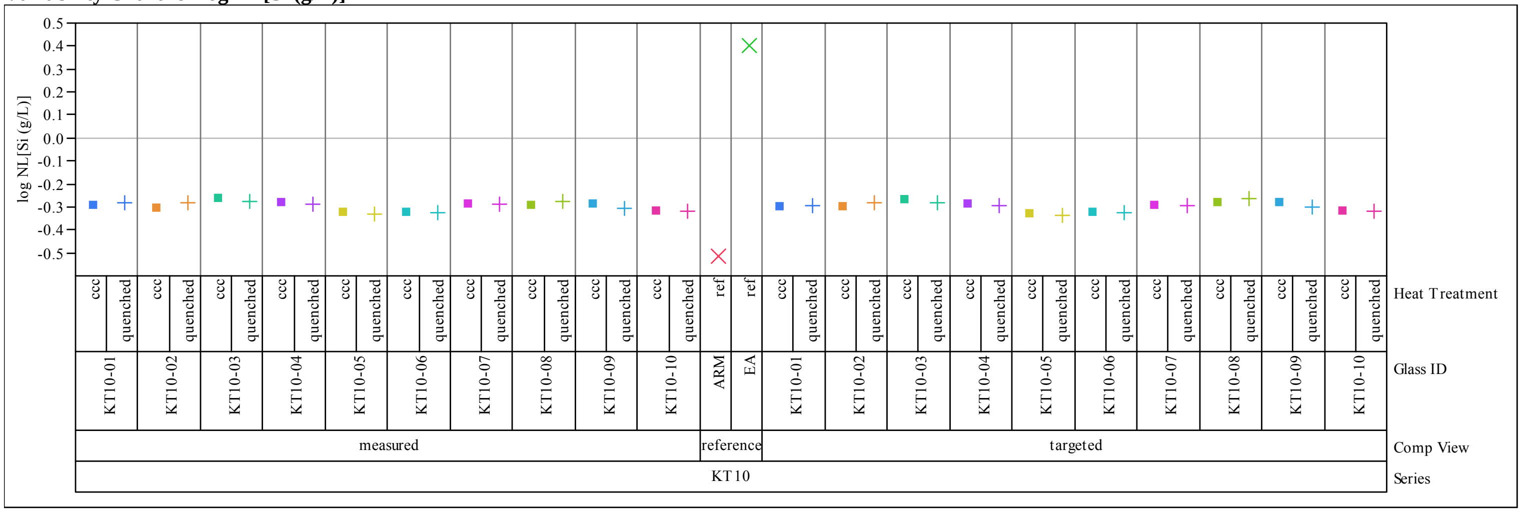
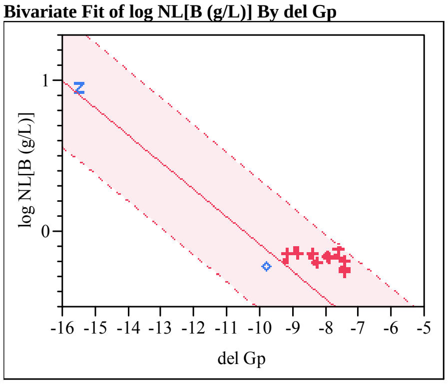


Exhibit D-6. PCT Measurements versus Durability Model Predictions for the KT10-Series Glasses.

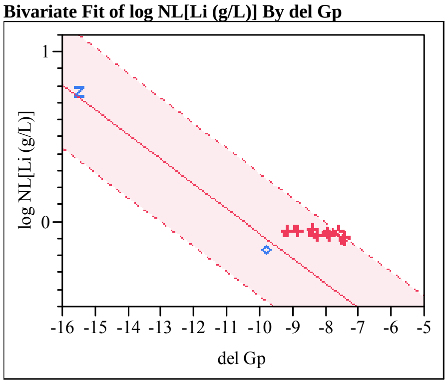
Based Upon Targeted Compositions	**Based Upon Measured Compositions**

Based Upon Targeted Compositions

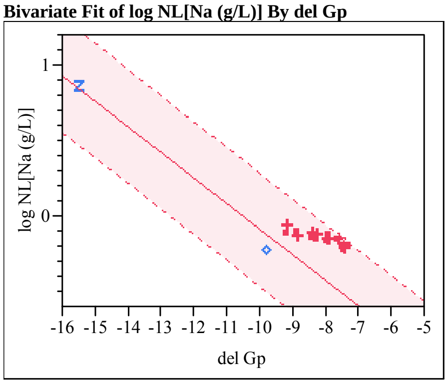
Bivariate Fit of log NL[B (g/L)] By del Gp



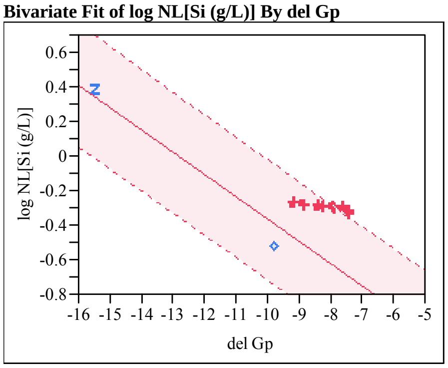
Bivariate Fit of log NL[Li (g/L)] By del Gp



Bivariate Fit of log NL[Na (g/L)] By del Gp

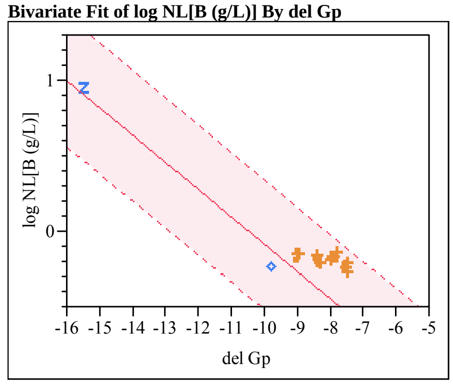


Bivariate Fit of log NL[Si (g/L)] By del Gp

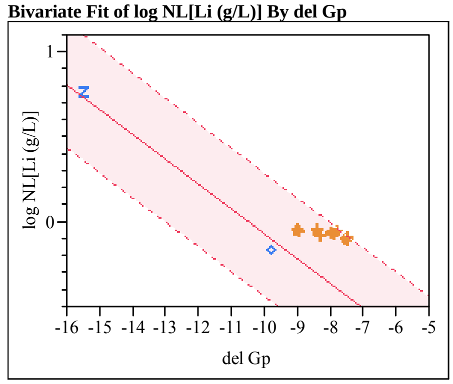


Based Upon Measured Compositions

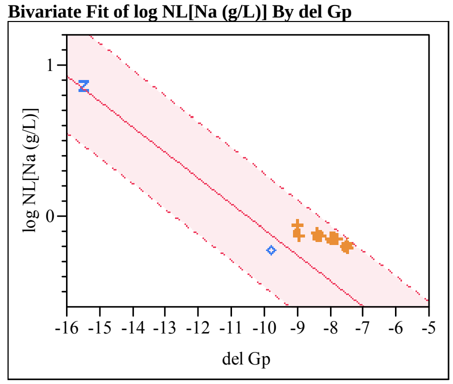
Bivariate Fit of log NL[B (g/L)] By del Gp



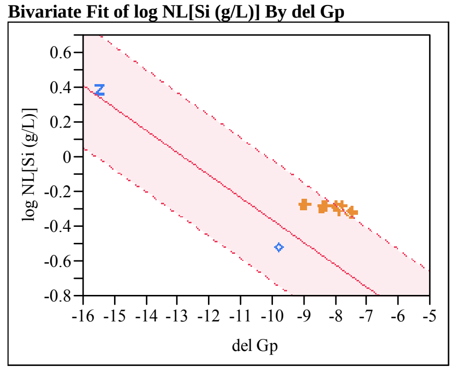
Bivariate Fit of log NL[Li (g/L)] By del Gp



Bivariate Fit of log NL[Na (g/L)] By del Gp



Bivariate Fit of log NL[Si (g/L)] By del Gp



Appendix E. Results from Fitting Fulcher Equations to the Viscosity Measurements for the KT08 Glasses

Exhibit E-1. Results of Fitting Fulcher Equations to the KT08-Series Viscosity Data.

Nonlinear Fit Glass ID=KT08-01

Response: ln(n; poise), Predictor: ln(n; VTF)

Control Panel

Converged in Gradient

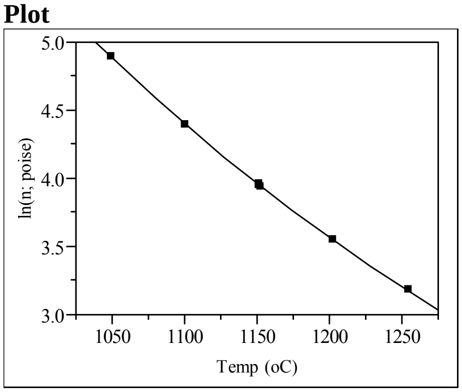
Criterion	Current	Stop Limit
Iteration	3	60
Obj Change	1.5334059e-8	1e-15
Relative Gradient	3.6536157e-8	0.000001
Gradient	2.3587237e-8	0.000001

Parameter	Current Value
C	138.4953915
B	8498.1460428
A	-4.444143657

SSE 0.0000858774
N 7

Edit
Alpha 0.050
Convergence Criterion 0.00001
Goal SSE for CL

Plot



Parameter	Estimate	Low	High
C	138.4953915	64.1049	192.315
B	8498.1460428	3212.47	9637.41
A	-4.444143657	-5.8424	-1.9475

Solution

SSE	DFE	MSE	RMSE
0.0000858774	4	2.1469e-5	0.0046335

Parameter	Estimate	ApproxStdErr
C	138.4953915	48.5365166
B	8498.1460428	824.189463
A	-4.444143657	0.41069757

Solved By:
Analytic NR

Nonlinear Fit Glass ID=KT08-02

Response: ln(n; poise), Predictor: ln(n; VTF)

Control Panel

Converged in Gradient

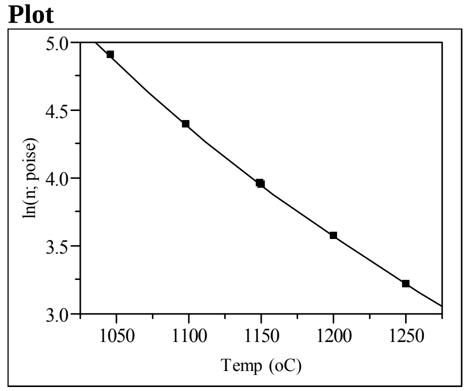
Criterion	Current	Stop Limit
Iteration	4	60
Obj Change	1.6057885e-7	1e-15
Relative Gradient	7.2886486e-7	0.000001
Gradient	7.2470749e-7	0.000001

Parameter	Current Value
C	256.74652338
B	6416.9373261
A	-3.240839037

SSE 0.0000338111
N 7

Edit
Alpha 0.050
Convergence Criterion 0.00001
Goal SSE for CL

Plot



Parameter	Estimate	Low	High
C	256.74652338	64.1049	192.315
B	6416.9373261	3212.47	9637.41
A	-3.240839037	-5.8424	-1.9475

Solution

SSE	DFE	MSE	RMSE
0.0000338111	4	8.4528e-6	0.0029074

Parameter	Estimate	ApproxStdErr
C	256.74652338	24.0402598
B	6416.9373261	351.58477
A	-3.240839037	0.1996708

Solved By:
Analytic NR

Exhibit E-1. Results of Fitting Fulcher Equations to the KT08-Series Viscosity Data.
(continued)

Nonlinear Fit Glass ID=KT08-03
Response: ln(n; poise), Predictor: ln(n; VTF)

Control Panel

Converged in Gradient

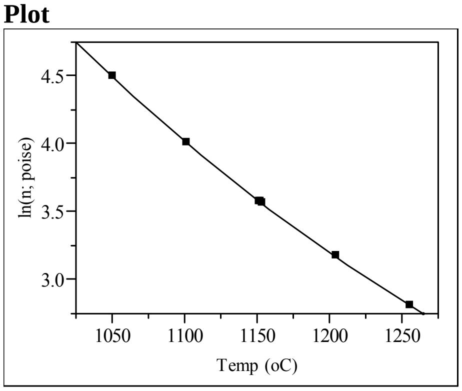
Criterion	Current	Stop Limit
Iteration	3	60
Obj Change	4.1410643e-7	1e-15
Relative Gradient	1.6833035e-7	0.000001
Gradient	1.5012691e-7	0.000001

Parameter	Current Value
C	153.68248633
B	8102.8568685
A	-4.547520402

SSE 0.0000179383
N 7

Edit
Alpha 0.050
Convergence Criterion 0.0000
Goal SSE for CL

Plot



Parameter	Estimate	Low	High
C	153.68248633	64.1049	192.315
B	8102.8568685	3212.47	9637.41
A	-4.547520402	-5.8424	-1.9475

Solution

SSE	DFE	MSE	RMSE
0.0000179383	4	4.4846e-6	0.0021177

Parameter	Estimate	ApproxStdErr
C	153.68248633	21.9081417
B	8102.8568685	359.849764
A	-4.547520402	0.18189378

Solved By:
Analytic NR

Nonlinear Fit Glass ID=KT08-04
Response: ln(n; poise), Predictor: ln(n; VTF)

Control Panel

Converged in Gradient

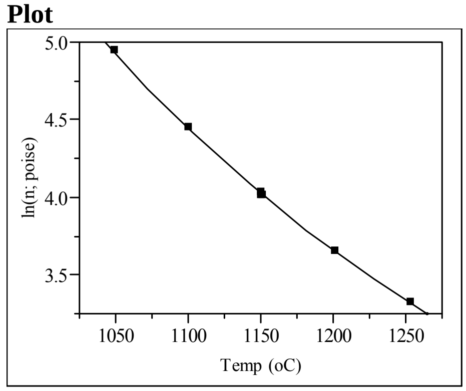
Criterion	Current	Stop Limit
Iteration	5	60
Obj Change	2.2885371e-8	1e-15
Relative Gradient	1.2215137e-8	0.000001
Gradient	8.4935116e-9	0.000001

Parameter	Current Value
C	408.29727449
B	4292.9934984
A	-1.766216074

SSE 0.0001217025
N 7

Edit
Alpha 0.050
Convergence Criterion 0.00001
Goal SSE for CL

Plot



Parameter	Estimate	Low	High
C	408.29727449	64.1049	192.315
B	4292.9934984	3212.47	9637.41
A	-1.766216074	-5.8424	-1.9475

Solution

SSE	DFE	MSE	RMSE
0.0001217025	4	3.0426e-5	0.0055159

Parameter	Estimate	ApproxStdErr
C	408.29727449	32.677422
B	4292.9934984	386.351152
A	-1.766216074	0.26474687

Solved By:
Analytic NR

Exhibit E-1. Results of Fitting Fulcher Equations to the KT08-Series Viscosity Data.
(continued)

Nonlinear Fit Glass ID=KT08-05

Response: ln(n; poise), Predictor: ln(n; VTF)

Control Panel

Converged in Gradient

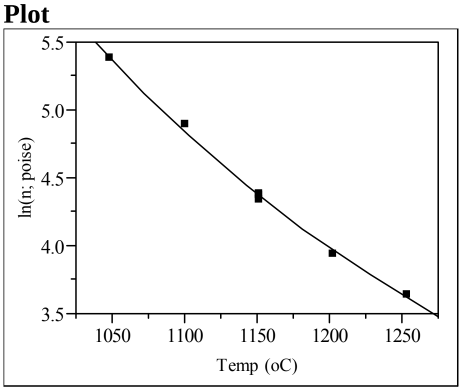
Criterion	Current	Stop Limit
Iteration	6	60
Obj Change	1.70793e-12	1e-15
Relative Gradient	1.4288286e-7	0.000001
Gradient	5.4576265e-9	0.000001

Parameter	Current Value
C	447.78213404
B	4183.9744819
A	-1.578332893

SSE 0.0049941307
N 7

Edit
Alpha 0.050
Convergence Criterion 0.00001
Goal SSE for CL

Plot



Parameter	Estimate	Low	High
C	447.78213404	64.1049	192.315
B	4183.9744819	3212.47	9637.41
A	-1.578332893	-5.8424	-1.9475

Solution

SSE	DFE	MSE	RMSE
0.0049941307	4	0.0012485	0.0353346

Parameter	Estimate	ApproxStdErr
C	447.78213404	170.905547
B	4183.9744819	2086.18216
A	-1.578332893	1.51332757

Solved By:
Analytic NR

Nonlinear Fit Glass ID=KT08-06

Response: ln(n; poise), Predictor: ln(n; VTF)

Control Panel

Converged in Gradient

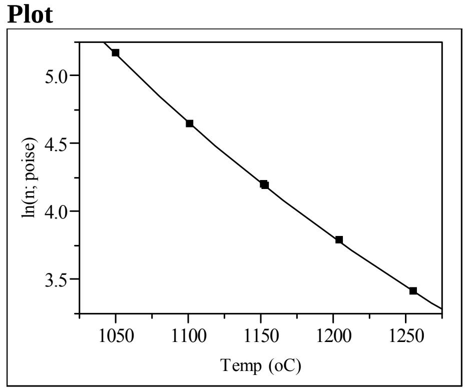
Criterion	Current	Stop Limit
Iteration	4	60
Obj Change	1.9533006e-9	1e-15
Relative Gradient	3.4561738e-8	0.000001
Gradient	3.3035195e-8	0.000001

Parameter	Current Value
C	210.73717341
B	7444.435498
A	-3.714707423

SSE 0.0000436079
N 7

Edit
Alpha 0.050
Convergence Criterion 0.00001
Goal SSE for CL

Plot



Parameter	Estimate	Low	High
C	210.73717341	64.1049	192.315
B	7444.435498	3212.47	9637.41
A	-3.714707423	-5.8424	-1.9475

Solution

SSE	DFE	MSE	RMSE
0.0000436079	4	0.0000109	0.0033018

Parameter	Estimate	ApproxStdErr
C	210.73717341	29.0784798
B	7444.435498	466.171509
A	-3.714707423	0.2502421

Solved By:
Analytic NR

Exhibit E-1. Results of Fitting Fulcher Equations to the KT08-Series Viscosity Data.
(continued)

Nonlinear Fit Glass ID=KT08-07

Response: ln(n; poise), Predictor: ln(n; VTF)

Control Panel

Converged in Gradient

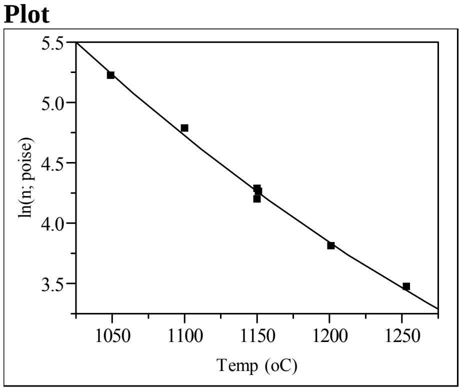
Criterion	Current	Stop Limit
Iteration	4	60
Obj Change	1.009855e-11	1e-15
Relative Gradient	9.6017516e-8	0.000001
Gradient	5.4498643e-9	0.000001

Parameter	Current Value
C	173.26744287
B	8314.7289505
A	-4.260181675

SSE 0.0086932722
N 7

Edit
Alpha 0.050
Convergence Criterion 0.00001
Goal SSE for CL

Plot



Parameter	Estimate	Low	High
C	173.26744287	64.1049	192.315
B	8314.7289505	3212.47	9637.41
A	-4.260181675	-5.8424	-1.9475

Solution

SSE	DFE	MSE	RMSE
0.0086932722	4	0.0021733	0.0466189

Parameter	Estimate	ApproxStdErr
C	173.26744287	434.498383
B	8314.7289505	7487.48476
A	-4.260181675	3.86916595

Solved By:
Analytic NR

Nonlinear Fit Glass ID=KT08-08

Response: ln(n; poise), Predictor: ln(n; VTF)

Control Panel

Converged in Gradient

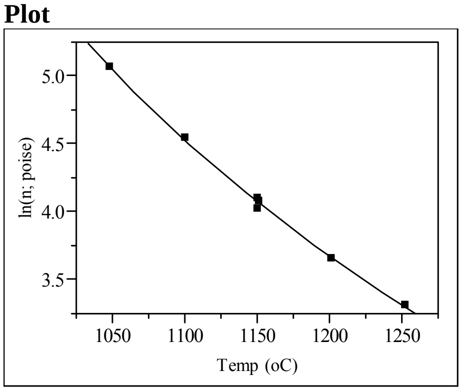
Criterion	Current	Stop Limit
Iteration	5	60
Obj Change	3.1729381e-7	1e-15
Relative Gradient	2.4713446e-7	0.000001
Gradient	2.6233128e-8	0.000001

Parameter	Current Value
C	355.64827876
B	5368.1114032
A	-2.689242628

SSE 0.0041313324
N 7

Edit
Alpha 0.050
Convergence Criterion 0.00001
Goal SSE for CL

Plot



Parameter	Estimate	Low	High
C	355.64827876	64.1049	192.315
B	5368.1114032	3212.47	9637.41
A	-2.689242628	-5.8424	-1.9475

Solution

SSE	DFE	MSE	RMSE
0.0041313324	4	0.0010328	0.0321377

Parameter	Estimate	ApproxStdErr
C	355.64827876	200.479475
B	5368.1114032	2761.72559
A	-2.689242628	1.76451066

Solved By:
Analytic NR

Exhibit E-1. Results of Fitting Fulcher Equations to the KT08-Series Viscosity Data.
(continued)

Nonlinear Fit Glass ID=KT08-09

Response: ln(n; poise), Predictor: ln(n; VTF)

Control Panel

Converged in Gradient

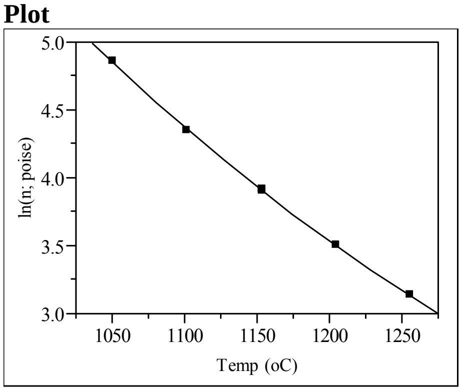
Criterion	Current	Stop Limit
Iteration	3	60
Obj Change	2.3506279e-7	1e-15
Relative Gradient	4.3511118e-8	0.000001
Gradient	2.6370388e-8	0.000001

Parameter	Current Value
C	148.29698162
B	8358.4458381
A	-4.416319163

SSE 0.0000795162
N 7

Edit
Alpha 0.050
Convergence Criterion 0.00001
Goal SSE for CL

Plot



Parameter	Estimate	Low	High
C	148.29698162	64.1049	192.315
B	8358.4458381	3212.47	9637.41
A	-4.416319163	-5.8424	-1.9475

Solution

SSE	DFE	MSE	RMSE
0.0000795162	4	1.9879e-5	0.0044586

Parameter	Estimate	ApproxStdErr
C	148.29698162	45.5612592
B	8358.4458381	767.559222
A	-4.416319163	0.38577459

Solved By:
Analytic NR

Nonlinear Fit Glass ID=KT08-10

Response: ln(n; poise), Predictor: ln(n; VTF)

Control Panel

Converged in Gradient

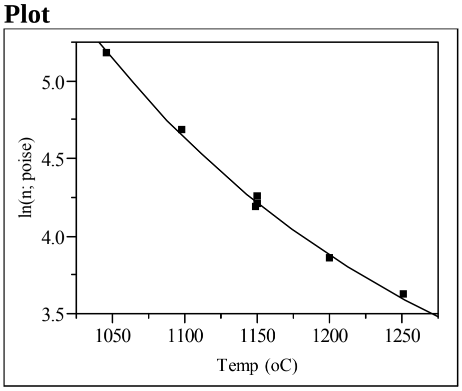
Criterion	Current	Stop Limit
Iteration	8	60
Obj Change	6.0499938e-8	1e-15
Relative Gradient	1.3694413e-6	0.000001
Gradient	8.8469937e-8	0.000001

Parameter	Current Value
C	664.64381427
B	1741.4895053
A	0.6242674055

SSE 0.0045044207
N 7

Edit
Alpha 0.050
Convergence Criterion 0.00001
Goal SSE for CL

Plot



Parameter	Estimate	Low	High
C	664.64381427	64.1049	192.315
B	1741.4895053	3212.47	9637.41
A	0.6242674055	-5.8424	-1.9475

Solution

SSE	DFE	MSE	RMSE
0.0045044207	4	0.0011261	0.0335575

Parameter	Estimate	ApproxStdErr
C	664.64381427	85.116678
B	1741.4895053	645.61708
A	0.6242674055	0.69429719

Solved By:
Analytic NR

Table E-1. Predicted and Measured Viscosity Values for the KT08-Series Glasses by Compositional View.

Glass ID	Compositional View	Viscosity Prediction (P)	Lower Confidence Interval for Prediction (P)	Upper Confidence Interval for Prediction (P)	Measured Viscosity (Fulcher Fit at 1150 °C) (P)	PCCS Predictable
KT08-01	measured	41	28	61	52	Yes
KT08-02	measured	46	31	67	52	Yes
KT08-03	measured	55	38	81	36	No
KT08-04	measured	54	37	78	56	Yes
KT08-05	measured	76	52	111	80	Yes
KT08-06	measured	88	60	129	67	Yes
KT08-07	measured	50	34	74	70	Yes
KT08-08	measured	52	36	76	58	Yes
KT08-09	measured	42	28	61	51	Yes
KT08-10	measured	63	43	93	68	Yes
KT08-01	targeted	53	36	78	52	Yes
KT08-02	targeted	48	33	70	52	Yes
KT08-03	targeted	45	30	66	36	Yes
KT08-04	targeted	49	34	72	56	Yes
KT08-05	targeted	70	48	103	80	Yes
KT08-06	targeted	76	52	111	67	Yes
KT08-07	targeted	65	44	95	70	Yes
KT08-08	targeted	56	38	82	58	Yes
KT08-09	targeted	53	36	78	51	Yes
KT08-10	targeted	53	36	77	68	Yes

Appendix F. Results from Fitting Fulcher Equations to the Viscosity Measurements for the KT10 Glasses

Exhibit F-1. Results of Fitting Fulcher Equations to the KT10-Series Viscosity Data.

Nonlinear Fit Glass ID=KT10-01

Response: ln(n; poise), Predictor: ln(n; VTF)

Control Panel

Converged in Gradient

Warning: 1 missing Y's.

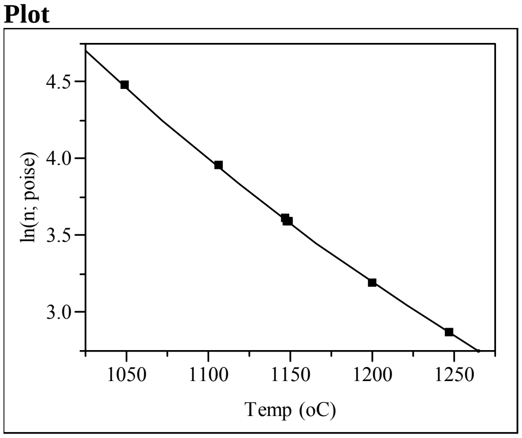
Criterion	Current	Stop Limit
Iteration	3	60
Obj Change	3.9411673e-6	1e-15
Relative Gradient	4.8973239e-7	0.000001
Gradient	3.1598361e-7	0.000001

Parameter	Current Value
C	79.201728336
B	9183.7812326
A	-5.000211754

SSE 0.0001070216
N 7

Edit Alpha 0.050
Convergence Criterion 0.00001
Goal SSE for CL

Plot



Parameter	Estimate	Low	High
C	79.201728336	64.1049	192.315
B	9183.7812326	3212.47	9637.41
A	-5.000211754	-5.8424	-1.9475

Solution

SSE	DFE	MSE	RMSE
0.0001070216	4	2.6755e-5	0.0051726

Parameter	Estimate	ApproxStdErr
C	79.201728336	65.9732289
B	9183.7812326	1144.54101
A	-5.000211754	0.53944704

Solved By:
Analytic NR

Nonlinear Fit Glass ID=KT10-02

Response: ln(n; poise), Predictor: ln(n; VTF)

Control Panel

Converged in Gradient

Warning: 1 missing Y's.

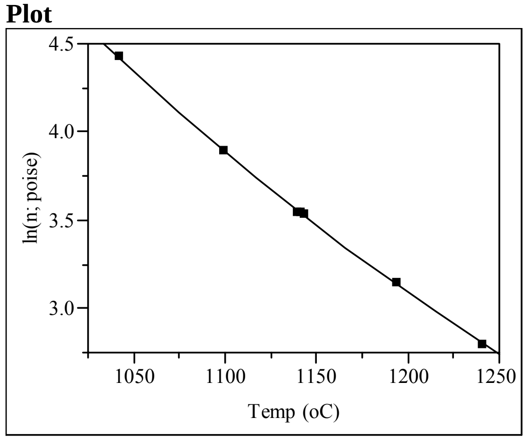
Criterion	Current	Stop Limit
Iteration	4	60
Obj Change	1.61012e-12	1e-15
Relative Gradient	3.1502711e-9	0.000001
Gradient	4.305327e-10	0.000001

Parameter	Current Value
C	63.614363062
B	9385.300668
A	-5.173397731

SSE 0.0002094369
N 7

Edit Alpha 0.050
Convergence Criterion 0.00001
Goal SSE for CL

Plot



Parameter	Estimate	Low	High
C	63.614363062	64.1049	192.315
B	9385.300668	3212.47	9637.41
A	-5.173397731	-5.8424	-1.9475

Solution

SSE	DFE	MSE	RMSE
0.0002094369	4	5.2359e-5	0.007236

Parameter	Estimate	ApproxStdErr
C	63.614363062	92.3276448
B	9385.300668	1623.14747
A	-5.173397731	0.75860419

Solved By:
Analytic NR

Exhibit F-1. Results of Fitting Fulcher Equations to the KT10-Series Viscosity Data.
(continued)

Nonlinear Fit Glass ID=KT10-03

Response: ln(n; poise), Predictor: ln(n; VTF)

Control Panel

Converged in Gradient

Warning: 1 missing Y's.

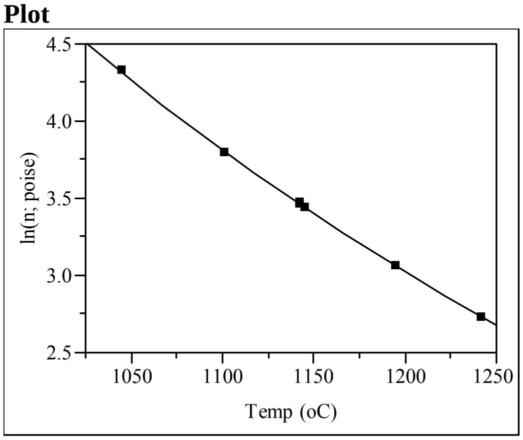
Criterion	Current	Stop Limit
Iteration	3	60
Obj Change	2.5562189e-7	1e-15
Relative Gradient	1.2172434e-7	0.000001
Gradient	1.0848384e-7	0.000001

Parameter	Current Value
C	101.04723033
B	8640.7959525
A	-4.84428275

SSE 0.0001439991
N 7

Edit Alpha 0.050
Convergence Criterion 0.00001
Goal SSE for CL

Plot



Parameter	Estimate	Low	High
C	101.04723033	64.1049	192.315
B	8640.7959525	3212.47	9637.41
A	-4.84428275	-5.8424	-1.9475

Solution

SSE	DFE	MSE	RMSE
0.0001439991	4	0.000036	0.006

Parameter	Estimate	ApproxStdErr
C	101.04723033	73.7424696
B	8640.7959525	1235.15973
A	-4.84428275	0.59732078

Solved By:
Analytic NR

Nonlinear Fit Glass ID=KT10-04

Response: ln(n; poise), Predictor: ln(n; VTF)

Control Panel

Converged in Gradient

Warning: 1 missing Y's.

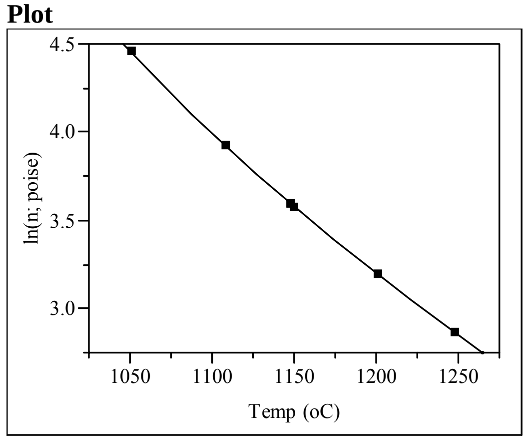
Criterion	Current	Stop Limit
Iteration	3	60
Obj Change	1.1866815e-8	1e-15
Relative Gradient	1.3055521e-8	0.000001
Gradient	9.01464e-9	0.000001

Parameter	Current Value
C	139.85432753
B	8137.6573456
A	-4.484201916

SSE 0.0000341591
N 7

Edit Alpha 0.050
Convergence Criterion 0.00001
Goal SSE for CL

Plot



Parameter	Estimate	Low	High
C	139.85432753	64.1049	192.315
B	8137.6573456	3212.47	9637.41
A	-4.484201916	-5.8424	-1.9475

Solution

SSE	DFE	MSE	RMSE
0.0000341591	4	8.5398e-6	0.0029223

Parameter	Estimate	ApproxStdErr
C	139.85432753	33.8905786
B	8137.6573456	552.195438
A	-4.484201916	0.27580053

Solved By:
Analytic NR

Exhibit F-1. Results of Fitting Fulcher Equations to the KT10-Series Viscosity Data.
(continued)

Nonlinear Fit Glass ID=KT10-05
Response: ln(n; poise), Predictor: ln(n; VTF)

Control Panel

Converged in Gradient

Warning: 1 missing Y's.

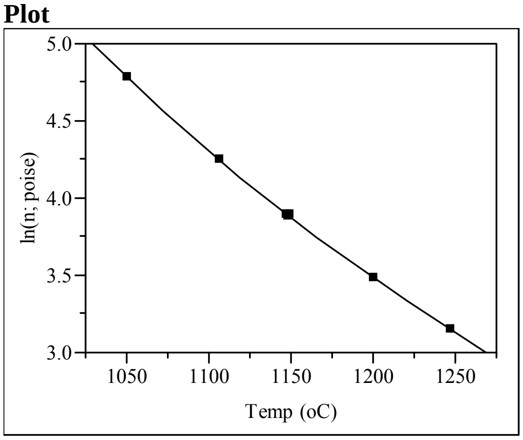
Criterion	Current	Stop Limit
Iteration	3	60
Obj Change	9.9162173e-7	1e-15
Relative Gradient	4.0980388e-7	0.000001
Gradient	3.7527704e-7	0.000001

Parameter	Current Value
C	158.98604961
B	8067.1845785
A	-4.271229689

SSE 0.0000477977
N 7

Edit Alpha 0.050
Convergence Criterion 0.00001
Goal SSE for CL

Plot



Parameter	Estimate	Low	High
C	158.98604961	64.1049	192.315
B	8067.1845785	3212.47	9637.41
A	-4.271229689	-5.8424	-1.9475

Solution

SSE	DFE	MSE	RMSE
0.0000477977	4	1.1949e-5	0.0034568

Parameter	Estimate	ApproxStdErr
C	158.98604961	37.1570533
B	8067.1845785	612.534031
A	-4.271229689	0.31220288

Solved By:
Analytic NR

Nonlinear Fit Glass ID=KT10-06
Response: ln(n; poise), Predictor: ln(n; VTF)

Control Panel

Converged in Gradient

Warning: 1 missing Y's.

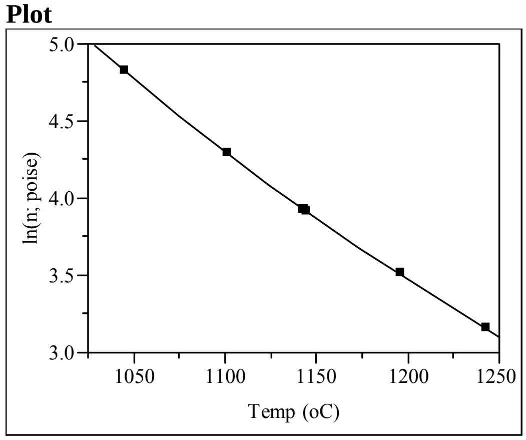
Criterion	Current	Stop Limit
Iteration	4	60
Obj Change	2.3765e-10	1e-15
Relative Gradient	7.6767604e-9	0.000001
Gradient	4.2794129e-9	0.000001

Parameter	Current Value
C	16.062079577
B	10671.163354
A	-5.548129594

SSE 0.0000877677
N 7

Edit Alpha 0.050
Convergence Criterion 0.00001
Goal SSE for CL

Plot



Parameter	Estimate	Low	High
C	16.062079577	64.1049	192.315
B	10671.163354	3212.47	9637.41
A	-5.548129594	-5.8424	-1.9475

Solution

SSE	DFE	MSE	RMSE
0.0000877677	4	2.1942e-5	0.0046842

Parameter	Estimate	ApproxStdErr
C	16.062079577	64.0029241
B	10671.163354	1221.84479
A	-5.548129594	0.54549502

Solved By:
Analytic NR

Exhibit F-1. Results of Fitting Fulcher Equations to the KT10-Series Viscosity Data.
(continued)

Nonlinear Fit Glass ID=KT10-07
Response: ln(n; poise), Predictor: ln(n; VTF)

Control Panel

Converged in Gradient

Warning: 1 missing Y's.

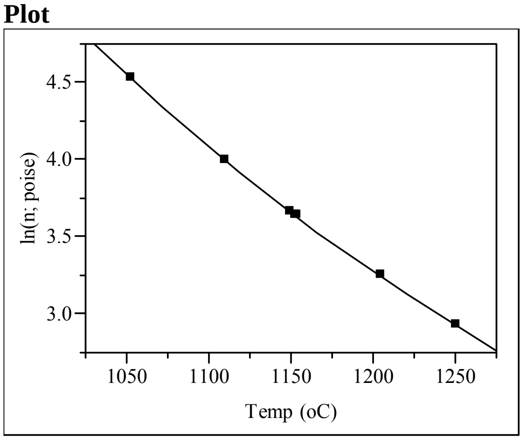
Criterion	Current	Stop Limit
Iteration	4	60
Obj Change	1.29384e-12	1e-15
Relative Gradient	2.9161251e-9	0.000001
Gradient	5.467595e-10	0.000001

Parameter	Current Value
C	170.97625405
B	7692.4073935
A	-4.20118848

SSE 0.0000794257
N 7

Edit Alpha 0.050
Convergence Criterion 0.00001
Goal SSE for CL

Plot



Parameter	Estimate	Low	High
C	170.97625405	64.1049	192.315
B	7692.4073935	3212.47	9637.41
A	-4.20118848	-5.8424	-1.9475

Solution

SSE	DFE	MSE	RMSE
0.0000794257	4	1.9856e-5	0.0044561

Parameter	Estimate	ApproxStdErr
C	170.97625405	47.8663333
B	7692.4073935	759.964529
A	-4.20118848	0.39118878

Solved By:
Analytic NR

Nonlinear Fit Glass ID=KT10-08
Response: ln(n; poise), Predictor: ln(n; VTF)

Control Panel

Converged in Gradient

Warning: 1 missing Y's.

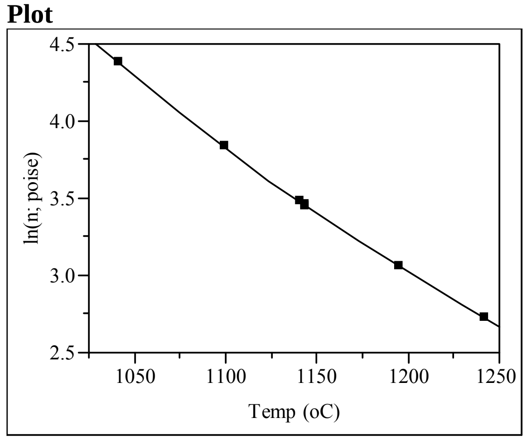
Criterion	Current	Stop Limit
Iteration	3	60
Obj Change	2.6046525e-8	1e-15
Relative Gradient	1.4585699e-8	0.000001
Gradient	1.0617348e-8	0.000001

Parameter	Current Value
C	114.73865914
B	8616.9122355
A	-4.928171424

SSE 0.00017102
N 7

Edit Alpha 0.050
Convergence Criterion 0.00001
Goal SSE for CL

Plot



Parameter	Estimate	Low	High
C	114.73865914	64.1049	192.315
B	8616.9122355	3212.47	9637.41
A	-4.928171424	-5.8424	-1.9475

Solution

SSE	DFE	MSE	RMSE
0.00017102	4	4.2755e-5	0.0065387

Parameter	Estimate	ApproxStdErr
C	114.73865914	73.8164772
B	8616.9122355	1252.63068
A	-4.928171424	0.61532644

Solved By:
Analytic NR

Exhibit F-1. Results of Fitting Fulcher Equations to the KT10-Series Viscosity Data.
(continued)

Nonlinear Fit Glass ID=KT10-09
Response: ln(n; poise), Predictor: ln(n; VTF)

Control Panel

Converged in Gradient

Warning: 1 missing Y's.

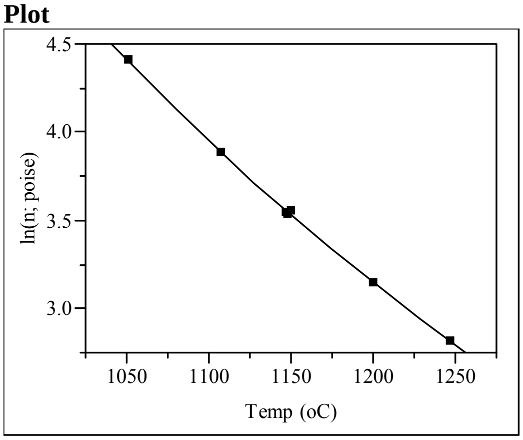
Criterion	Current	Stop Limit
Iteration	4	60
Obj Change	2.445666e-13	1e-15
Relative Gradient	1.721275e-10	0.000001
Gradient	2.592324e-11	0.000001

Parameter	Current Value
C	77.084928103
B	9226.6232053
A	-5.074688764

SSE 0.0008156388
N 7

Edit Alpha 0.050
Convergence Criterion 0.00001
Goal SSE for CL

Plot



Parameter	Estimate	Low	High
C	77.084928103	64.1049	192.315
B	9226.6232053	3212.47	9637.41
A	-5.074688764	-5.8424	-1.9475

Solution

SSE	DFE	MSE	RMSE
0.0008156388	4	0.0002039	0.0142797

Parameter	Estimate	ApproxStdErr
C	77.084928103	186.778769
B	9226.6232053	3244.83307
A	-5.074688764	1.52447475

Solved By:
Analytic NR

Nonlinear Fit Glass ID=KT10-10
Response: ln(n; poise), Predictor: ln(n; VTF)

Control Panel

Converged in Gradient

Warning: 1 missing Y's.

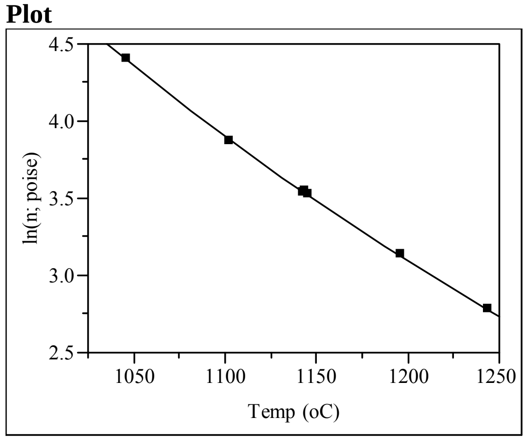
Criterion	Current	Stop Limit
Iteration	4	60
Obj Change	1.669312e-10	1e-15
Relative Gradient	1.6161653e-8	0.000001
Gradient	6.5215414e-9	0.000001

Parameter	Current Value
C	-2.894912126
B	10720.622323
A	-5.823291679

SSE 0.000351071
N 7

Edit Alpha 0.050
Convergence Criterion 0.00001
Goal SSE for CL

Plot



Parameter	Estimate	Low	High
C	-2.894912126	64.1049	192.315
B	10720.622323	3212.47	9637.41
A	-5.823291679	-5.8424	-1.9475

Solution

SSE	DFE	MSE	RMSE
0.000351071	4	8.7768e-5	0.0093684

Parameter	Estimate	ApproxStdErr
C	-2.894912126	137.012388
B	10720.622323	2581.44676
A	-5.823291679	1.13227838

Solved By:
Analytic NR

Table F-1. Predicted and Measured Viscosity Values for the KT10-Series Glasses by Compositional View.

Glass ID	Compositional View	Viscosity Prediction (P)	Lower Confidence Interval for Prediction (P)	Upper Confidence Interval for Prediction (P)	Measured Viscosity (Fulcher Fit at 1150 °C) (P)	PCCS Predictable
KT10-01	measured	41	28	60	36	Yes
KT10-02	measured	43	29	62	32	Yes
KT10-03	measured	36	24	52	30	Yes
KT10-04	measured	42	28	61	36	Yes
KT10-05	measured	57	39	83	48	Yes
KT10-06	measured	63	43	92	48	Yes
KT10-07	measured	46	32	68	39	Yes
KT10-08	measured	46	31	67	30	No
KT10-09	measured	41	28	60	34	Yes
KT10-10	measured	38	26	55	32	Yes
KT10-01	targeted	45	31	66	36	Yes
KT10-02	targeted	41	28	59	32	Yes
KT10-03	targeted	37	25	55	30	Yes
KT10-04	targeted	42	29	62	36	Yes
KT10-05	targeted	59	40	86	48	Yes
KT10-06	targeted	62	43	92	48	Yes
KT10-07	targeted	47	32	70	39	Yes
KT10-08	targeted	40	27	58	30	Yes
KT10-09	targeted	38	26	55	34	Yes
KT10-10	targeted	37	25	55	32	Yes

Distribution:

J. W. Amoroso, 999-W
C. J. Bannochie, 773-42A
A. B. Barnes, 999-W
A. L. Billings, 999-W
J. M. Bricker, 704-27S
M. A. Broome, 704-29S
C. L. Crawford, 773-42A
D. A. Crowley, 773-43A
R. E. Edwards, 773-67A
T. B. Edwards, 999-W
T. L. Fellinger, 704-26S
S. D. Fink, 773-A
K. M. Fox, 999-W
B. J. Giddings, 786-5A
J. M. Gillam, 766-H
B. A. Hamm, 766-H
C. C. Herman, 999-W
D. T. Herman, 735-11A
R. N. Hinds, 704-S
E. W. Holtzscheiter, 704-15S
T. H. Huff, 773-66A
J. F. Iaukea, 704-30S
P. R. Jackson, 703-46A
C. M. Jantzen, 773-A
F. C. Johnson, 999-W
D. C. Koopman, 999-W
P. L. Lee, 703-41A
S. L. Marra, 773-A
D. W. Mcilmoyle, 766-H
D. H. Miller, 999-W
J. E. Occhipinti, 704-S
D. K. Peeler, 999-W
F. M. Pennebaker, 773-42A
J. W. Ray, 704-S
M. A. Rios-Armstrong, 773-66A
H. B. Shah, 766-H
D. C. Sherburne, 704-S
A. V. Staub, 704-27S
M. E. Stone, 999-W
K. H. Subramanian, 766-H
J. P. Vaughan, 773-41A