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Experimental Results of the Nepheline Phase III Study

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EXECUTIVE SUMMARY

This study is the third phase in a series of experiments designed to reduce conservatism in the model that predicts the formation of nepheline, a crystalline phase that can reduce the durability of high level waste glass. A Phase I study developed a series of glass compositions that were very durable while their nepheline discriminator values were well below the current nepheline discriminator limit of 0.62, where nepheline is predicted to crystallize upon slow cooling. A Phase II study selected glass compositions to identify any linear effects of composition on nepheline crystallization and that were restricted to regions that fell within the validation ranges of the Defense Waste Processing Facility (DWPF) Product Composition Control System (PCCS) models. However, it was not possible to identify any linear effects of composition on chemical durability performance for this set of study glasses. The results of the Phase II study alone were not sufficient to recommend modification of the current nepheline discriminator. It was recommended that the next series of experiments continue to focus not only on compositional regions where the PCCS models are considered applicable (i.e., the model validation ranges), but also be restricted to compositional regions where the only constraint limiting processing is the current nepheline discriminator.

Two methods were used in selecting glasses for this Phase III nepheline study. The first was based on the relationship of the current nepheline discriminator model to the other DWPF PCCS models, and the second was based on theory of crystallization in mineral and glass melts. A series of 29 test glass compositions was selected for this study using a combination of the two approaches. The glasses were fabricated and characterized in the laboratory.

After reviewing the data, the study glasses generally met the target compositions with little issue. Product Consistency Test results correlated well with the crystallization analyses in that those glasses that were found to contain nepheline after the centerline canister cooled (ccc) heat treatment generally had normalized release values that were greater than their quenched counterparts on a statistically significant basis. The current nepheline discriminator as implemented at the DWPF was shown to continue to work well in predicting nepheline prone glass compositions.

A main objective of this study was to identify any compositional regions where conservatism in the current nepheline discriminator was preventing access to those regions that would otherwise be acceptable for DWPF processing by the PCCS models. Four glasses (based on the measured compositions) were identified through this study that met those criteria. However, a review of the individual compositions of these glasses revealed no clear trends that might indicate a driver for suppression of nepheline.

Another objective of this study was to evaluate an alternative nepheline discriminator model developed using theory of crystallization in mineral and glass melts. Unfortunately this new model, in its current state, was unsuccessful in predicting nepheline crystallization in the glass compositions selected for this study. It is recommended that the data collected in this study be incorporated into the new model for further refinement.

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LIST OF ABBREVIATIONS

AD	Analytical Development
ANOVA	ANalysis Of VAriance
ARM	Approved Reference Material
ccc	canister centerline cooled
DWPF	Defense Waste Processing Facility
EA	Environmental Assessment
ICP-AES	Inductively Coupled Plasma – Atomic Emission Spectroscopy
LM	Lithium Metaborate
MAR	Measurement Acceptability Region
NL	Normalized Leachate
PCCS	Product Composition Control System
PCT	Product Consistency Test
PF	Peroxide Fusion
PSAL	Process Science Analytical Laboratory
SRNL	Savannah River National Laboratory
XRD	X-ray Diffraction

1.0 Introduction

A Phase I study confirmed that some conservatism exists in the current nepheline discriminator.[1] Several glass compositions, particularly compositions that targeted higher Al_2O_3 concentrations, were shown to be very durable while their nepheline discriminator values were well below the current nepheline discriminator limit of 0.62. Increased concentrations of B_2O_3 and CaO were shown to improve durability responses and suppress the formation of nepheline. These results provided incentive to revise the nepheline discriminator to reduce some of this conservatism and incorporate the influence of B_2O_3. The Phase I study recommended that a second phase be undertaken to provide additional data in support of this revision.[1]

Twenty five glass compositions were subsequently selected for a Phase II study on reduction of conservatism in the nepheline discriminator.[2] The glass compositions were selected to identify any linear effects of composition on nepheline crystallization and were restricted to regions that fell within the validation ranges of the Defense Waste Processing Facility (DWPF) Product Composition Control System (PCCS) models.[3] The glasses were fabricated in the laboratory and characterized for crystallization and chemical durability after both quenching and slow cooling. Nepheline was identified in one of the quenched glasses and several of the centerline canister cooled (ccc) glasses. A partitioning algorithm was used to identify trends in crystallization behavior based on glass composition. Generally, for the slowly cooled glasses MnO concentration influenced the crystallization of spinels and B_2O_3 and SiO_2 concentrations influenced the crystallization of nepheline. Durability responses varied from acceptable to unacceptable (with respect to that of the Environmental Assessment benchmark glass) depending on the glass composition and type and extent of crystallization that occurred. It was not possible to identify any linear effects of composition on chemical durability performance for this set of study glasses. The results of the Phase II study alone were not sufficient to recommend modification of the current nepheline discriminator. It was recommended that the next series of experiments continue to focus not only on compositional regions where the PCCS models are considered applicable (i.e., the model validation ranges), but also be restricted to compositional regions where acceptable glasses are predicted to be produced but are prohibited by the current nepheline discriminator.[2]

The current nepheline discriminator model limits access to certain compositional regions based solely on the concentrations of silica, alumina and soda in the glass. While this model has been shown to be very effective in identifying glasses that are prone to nepheline crystallization upon slow cooling for DWPF-type compositions,[4] other waste glass compositions have revealed compositional regions that, while predicted to be prone to nepheline crystallization, are in fact free of nepheline upon slow cooling and have acceptable chemical durabilities.[5] The intent of this Phase III study is to investigate whether there are compositional regions available, particularly glasses with higher aluminum concentrations to support higher waste loadings, that are acceptable by all of the PCCS models with the exception of the nepheline discriminator.

Two routes were considered in selecting glasses for this phase of the nepheline study: one based on the relationship of the current nepheline discriminator model to the other DWPF PCCS models[3] and the other based on the theory of crystallization in mineral and glass melts.[6] In this document, the fabrication and characterization of these glasses is described, the data are reviewed and discussed, and conclusions are drawn regarding both the current and alternative nepheline discriminator models.

This work is performed in response to a Technical Task Request[7] from Waste Solidification Engineering and is controlled under a Task Technical and Quality Assurance Plan.[8]

2.0 Experimental Procedure

2.1 Selection of Glass Compositions

A detailed description of the glass selection process is provided in a previous report.[6] Briefly, a series of 29 test glass compositions were selected for this study using a combination of two approaches. The first approach was based on evaluating the glass composition region allowable by all of the DWPF PCCS models[3] with the exception of the current nepheline discriminator.[4] This approach was taken to determine whether there are glass compositions that, while predicted to crystallize nepheline upon slow cooling, would otherwise be acceptable for processing in the DWPF. The second approach was based on quasicrystalline theory of glass structure. A detailed description of this methodology is forthcoming, but in brief, ACT™ was used to relate simple ratios of the cation components of a series of glasses to the quasicrystalline phases calculated using NORMCALC™.[a] The 29 glass compositions selected for testing address both of these approaches in evaluating both a reduction in conservatism for the current nepheline discriminator and possible implementation of the alternative discriminator based on glass structural theory.

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 150 g batches.[9] 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 target melt temperature of 1150 °C.[10] The crucible was removed from the furnace after an isothermal hold at the melt temperature 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, including chemical composition and durability testing.

Approximately 25 g of each glass was heat-treated to simulate cooling along the centerline of a DWPF-type canister[11] to gauge the effects of thermal history on the product performance. This cooling schedule is referred to as the ccc heat treatment. Visual observations of both quenched and ccc glasses were documented.

2.3 Property Measurements

2.3.1 *Compositional Analysis*

To confirm that the as-fabricated glasses met the target compositions, a representative sample from each quenched glass was submitted to the Process Science Analytical Laboratory (PSAL) for chemical analysis under the auspices of an analytical plan.[12] Two dissolution techniques, sodium peroxide fusion (PF) and lithium-metaborate fusion (LM), were used to prepare the 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.

[a] Jantzen and Pareizs, *Journal of Nuclear Materials,* accepted for publication.

2.3.2 *X-Ray Diffraction Analysis*

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

2.3.3 *Product Consistency Test*

The Product Consistency Test (PCT) Method-A[13] was performed in triplicate on each quenched and ccc glass to assess chemical durability. Also included in the experimental test matrix was the Environmental Assessment (EA) benchmark glass,[14] the Approved Reference Material (ARM) glass, and blanks from the sample cleaning batch. Samples were ground, washed, and prepared according to the standard procedure.[13] 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 PSAL under the auspices of an analytical plan.[15] Samples of a multi-element, standard solution were also included in the analytical plan as a check on the accuracy of the ICP-AES instrument used for these measurements. Normalized release rates were calculated based on the target, measured, and measured bias-corrected compositions using the average of the common logarithms of the leachate concentrations.

3.0 Results and Discussion

3.1 Homogeneity

The presence or absence of crystallization in the study glasses was determined using visual observations and XRD. For the quenched glasses, visual observations of the pour patty and the crucible after pouring were recorded. Both the surface of the pour patty, and the bulk, meaning a cross-section of the patty, are described. For the ccc glass, visual observations of the glass surface were recorded before removing the glass from the crucible. The glass was then removed and fractured to record a description of the cross-section, or bulk. The visual observations for each quenched and ccc glass are given in Table 3-1. The term ‘clean’ is used to describe glasses with no visible signs of crystallization. The term ‘undissolved solids’ means visible batch material that was not incorporated into the glass melt. Descriptions of “swirls” or a “matte” finish on the surface of the glasses are indicative of surface crystallization.

The crystalline phases identified by XRD are also provided in Table 3-1. Phases described as “possible” were difficult to identify due to very low peak intensities. In general, the XRD results corroborate the visual observations whenever crystals were observed in the bulk of the glasses. Several glasses had crystallization visible on the surface while the XRD results indicate that they were amorphous. In these cases, the volume of crystallization in the glass sample was likely too low to be detectible via XRD. Glasses that were found to contain nepheline are highlighted in the table. Further discussion of these glasses will be provided later in this section.

Table 3-1. Summary of visual observations and XRD results for the study glasses

Glass ID	Heat Treatment	Visual Observations	XRD Results
NE3-01	quenched	Patty: Milky swirls on surface, chocolate brown crystals in bulk; Crucible: clean with many bubbles	Trevorite
	ccc	Dull silver surface with bumps; Crystals in bulk	Magnetite, possible Nepheline
NE3-02	quenched	Patty: Surface and bulk clean; Crucible: Clean with some bubbles	Amorphous
	ccc	Slight sheen on surface with small spots of crystals; Bulk clean	Amorphous
NE3-03	quenched	Patty: Surface and bulk clean; Crucible: Some undissolved material	Amorphous
	ccc	Large splotches of crystals across surface; Bulk clean	Magnetite, Nepheline
NE3-04	quenched	Patty: Surface and bulk clean; Crucible: Clean	Amorphous
	ccc	Orange colored spots of crystals across entire surface; Bulk appears clean	Nepheline, Lithium Silicate
NE3-05	quenched	Patty: Surface and bulk clean; Crucible: Bubbles	Amorphous
	ccc	A few small spots of crystals on surface; Bulk clean	Amorphous
NE3-06	quenched	Patty: One light brown swirl on surface, bulk clean; Crucible: Several small spots of undissolved material	Amorphous
	ccc	Silvery crystals across surface; Bulk crystallized	Magnetite, Trevorite, Nepheline
NE3-07	quenched	Patty: One light brown swirl on surface, bulk clean; Crucible: Bubbles, some small spots of undissolved material, possible crystals	Amorphous
	ccc	Rough crystals across surface; Bulk crystallized	Magnetite, Nepheline
NE3-08	quenched	Patty: Clean; Crucible: Clean	Amorphous
	ccc	Crystals across surface; Bulk crystallized	Trevorite, Nepheline
NE3-09	quenched	Patty: Silver crystal swirls on surface, bulk clean; Crucible: Bubbles, silver on edge	Amorphous
	ccc	Some silver splotches and crystals across surface; Chocolate brown crystals in bulk	Nepheline, possible Trevorite
NE3-10	quenched	Patty: Clean; Crucible: Small amount of undissolved material	Amorphous
	ccc	Dull, silver matte surface; Bulk has glassy layer in center, top and bottom devitrified	Nepheline, Lithium Silicate, Magnetite, Hematite

Table 3-1. Summary of visual observations and XRD results for the study glasses (continued)

Glass ID	Heat Treatment	Visual Observations	XRD Results
NE3-11	quenched	Patty: Silver foam spots on surface, bulk has some crystal specks; Crucible: Bubbles, silver foam on melt line, some undissolved material	Magnetite
	ccc	Dull, matte surface; Bulk crystallized	Nepheline, Lithium Silicate, Magnetite
NE3-12	quenched	Patty: Pits on surface and in bulk; Crucible: Bubbles with silver foam on melt line	Amorphous
	ccc	Mirror shine with crystals across surface; Bulk may have crystals	Nepheline
NE3-13	quenched	Patty: Silver spots on surface with a few swirls and small pits, bulk clean; Crucible: Clean	Amorphous
	ccc	Dull, cracked, matte surface; Bulk devitrified	Nepheline, Lithium Silicate, Magnetite
NE3-14	quenched	Patty: Surface and bulk clean; Crucible: Clean with bubbles	Amorphous
	ccc	Dull, cracked, matte surface; Bulk devitrified	Nepheline, Lithium Silicate, Trevorite
NE3-15	quenched	Patty: Surface and bulk clean; Crucible: Clean with bubbles	Amorphous
	ccc	Dull silver, crystallized surface; Bulk clean	Amorphous
NE3-16	quenched	Patty: Surface and bulk clean; Crucible: Clean	Amorphous
	ccc	Very light amount of crystals on surface; Bulk clean	Amorphous
NE3-17	quenched	Patty: Milky swirls on surface, bulk clean; Crucible: A couple spots of undissolved material	Amorphous
	ccc	Silvery crystals on surface; Bulk has crystals	Trevorite, Magnetite
NE3-18	quenched	Patty: Surface and bulk clean; Crucible: Clean with bubbles	Amorphous
	ccc	Crystals on surface; Bulk appears clean	Possible Trevorite
NE3-19	quenched	Patty: Surface and bulk clean; Crucible: Clean with bubbles	Amorphous
	ccc	Light silver crystals on surface; Bulk appears clean	Amorphous
NE3-20	quenched	Patty: Surface and bulk clean; Crucible: Clean with bubbles	Amorphous
	ccc	Very light mirror shine on surface; Bulk clean	Amorphous
NE3-21	quenched	Patty: Purple haze on surface, brown splotches with silver across some of the bottom, bulk clean; Crucible: Clean with bubbles	Amorphous
	ccc	Dull, matte, crusty surface; Devitrified, chocolate brown bulk	Nepheline, Lithium Silicate, Franklinite ($ZnFe_2O_4$)

Table 3-1. Summary of visual observations and XRD results for the study glasses (continued)

Glass ID	Heat Treatment	Visual Observations	XRD Results
NE3-22	quenched	Patty: A few swirls on surface with some crystals; Crucibles: Clean with bubbles	Amorphous
	ccc	Crystals across surface; Dark, shiny crystals in bulk	Magnetite
NE3-23	quenched	Patty: Surface and bulk clean; Crucible: Clean with bubbles	Amorphous
	ccc	Surface clean; Bulk clean	Amorphous
NE3-24	quenched	Patty: Surface and bulk clean; Crucible: Clean with bubbles	Amorphous
	ccc	Dull, matte, crusty surface; Glassy layer at center of bulk, completely surrounded by crystals	Nepheline, Lithium Silicate
NE3-25	quenched	Patty: Silvery, mirrored shine on surface, bulk clean; Crucible: Clean with bubbles	Amorphous
	ccc	Dull, matte, crusty surface; Bulk mostly devitrified with a thin layer of glass in center	Nepheline, Lithium Silicate, Magnetite
NE3-26	quenched	Patty: Purplish, mirrored haze across surface, chocolate brown crystals in bulk; Crucible: Bubbles with a mirror shine on surface of remaining glass	Trevorite
	ccc	Dull, matte, crusty surface; Bulk devitrified	Nepheline, Lithium Silicate, Magnetite, possible Kyanite (Al_2SiO_5)
NE3-27	quenched	Patty: Light brown swirls and crystals on surface and bottom, bulk clean; Crucible: Clean with bubbles	Possible Trevorite
	ccc	Dull, matte, crusty surface; Bulk devitrified	Nepheline, Lithium Silicate, Magnetite
NE3-28	quenched	Patty: Some silver swirls and spots on surface, bulk may have some crystals; Crucible: Bubbles and two small spots of undissolved material	Amorphous
	ccc	Light amount of crystals on surface; Chocolate brown crystals in bulk	Bunsenite, Trevorite, Nepheline
NE3-29	quenched	Patty: Some light brown swirls on surface, bulk clean; Crucible: Clean with bubbles	Amorphous
	ccc	Dull, matte, crusty surface; Bulk devitrified	Nepheline, Franklinite ($ZnFe_2O_4$)

3.2 Statistical Review of the Chemical Composition Measurements

In this section, the measured versus targeted compositions of the study glasses are presented and compared. The identifiers and targeted compositions for the study glasses are provided, in two parts, in Table A1 of Appendix A. Table A2 in Appendix A, also in two parts, provides the elemental concentration measurements from the study glasses that were prepared using LM, and Table A3 in Appendix A provides the measurements from the samples of these glasses prepared 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 two tables.

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.

In the sections that follow, the analytical sequences of the measurements are explored, the measurements of the standard are investigated and used for bias correction, the measurements for each glass are reviewed, the average chemical compositions (measured and bias-corrected) for each glass are determined, and comparisons are made between the measurements and the targeted compositions of the glasses.

3.2.1 *Measurements in Analytical Sequence*

Exhibit A1 in Appendix A provides plots in analytical sequence of the sample measurements generated by PSAL for each oxide over both preparation methods (i.e., LM and PF). The plots are in analytical sequence with different symbols and colors being used to represent each of the study glasses and the standard glass. These plots include all of the measurement data from Tables A2 and A3. While looking for patterns in these plots is difficult, there do not appear to be any gross patterns or trends due to the analytical sequence. A better opportunity for a review of the measurements for each glass is provided in the discussions that follow.

3.2.2 *Composition Measurements by Glass Identifier*

Exhibit A2 in Appendix A provides plots of the oxide concentration measurements by Glass ID (including the Batch 1 standard) by analytical solution or Lab ID. 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 these exhibits reveals the repeatability of the four individual values for each oxide for each glass. While there appears to be good repeatability of these measurements for each of the oxides for most of the glasses, some observations that may be made for these results include: In block 1, the CaO values for NE3-03 and the Fe_2O_3 values for NE3-09 show what appears to be a calibration effect, and there is an unusually large value in the series of SO_4^{2-} measurements for NE3-08. In block 2, there appears to be more scatter in the B_2O_3 measurements, there is an unusually large value in the series of CaO measurements for NE3-01, there are a few outliers in the Li_2O values, and there is an unusually small value in the series of SiO_2 measurements for NE3-16. In block 3, there appear to be calibration effects in the CaO and Li_2O measurements for NE3-17 and in the Na_2O measurements in general, and the SiO_2 measurements for NE3-17 are consistently higher than the targeted concentration for SiO_2 for this study glass. In block 4, there appear to be general dissolution effects in the B_2O_3 measurements and general calibration effects in the Na_2O measurements, as well as an unusually low value for

SO_4^{2-} for NE3-20. None of the observations discussed here suggest a significant issue in the batching of the study glasses or in the analytical process used to provide representative measurements of their compositions.

3.2.3 *Results for the Batch 1 Standard*

In this section, the measurements of the chemical compositions of the samples of the Batch 1 standard glass are reviewed. Exhibit A3 in Appendix A provides statistical analyses of the Batch 1 results 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 results from the statistical tests for the Batch 1 standard may be summarized as follows: Al_2O_3, CaO, Fe_2O_3, Li_2O, MnO, Na_2O, NiO, SiO_2, and TiO_2 have measurements that indicate a significant ICP-AES calibration effect on the block averages at the 5% significance level. The reference values for the oxide concentrations of the standard are given in the header for each set of measurements in the exhibit.

Thus, results from the statistical analyses provide incentive for adjusting the measurements by the effects of the ICP-AES calibration. As a result, bias correction of these data was pursued to evaluate whether the compositional view provided by the bias-corrected measurements has an impact on the conclusions of this study. The oxide measurements of the study glasses were bias corrected for the effect of the ICP-AES calibration on each of the analytical blocks and sub-blocks. The basis for this bias correction is presented as part of Exhibit A3: the average measurement for Batch 1 for each set/ICP-AES block/sub-block for Al_2O_3, B_2O_3, BaO, CaO, Cr_2O_3, CuO, Fe_2O_3, Li_2O, MgO, MnO, Na_2O, NiO, SiO_2, and TiO_2. The Batch 1 results were used to conduct the bias correction as long as the reference value for the oxide concentration in the Batch 1 glass was greater than or equal to 0.1 wt%. Thus, applying this approach and based upon the information in the exhibit, the Batch 1 results were used to bias correct the Al_2O_3, B_2O_3, BaO, CaO, Cr_2O_3, CuO, Fe_2O_3, Li_2O, MgO, MnO, Na_2O, NiO, SiO_2, and TiO_2 measurements. No bias correction was conducted for CdO, Ce_2O_3, La_2O_3, PbO, SO_4^{2-}, ZnO, or ZrO_2.

The bias correction was conducted as follows. For each oxide, let $\overline{a}_{ij}$ be the average measurement for the i^{th} oxide at analytical block j for Batch 1, and let t_i be the reference value for the i^{th} oxide for Batch 1. (The averages and reference values are provided in Exhibit A3). Let $\overline{c}_{ijk}$ be the average measurement for the i^{th} oxide at analytical block j for the k^{th} glass. The bias adjustment was conducted as follows:

$$\overline{c}_{ijk} \bullet \left(1 - \frac{\overline{a}_{ij} - t_i}{\overline{a}_{ij}}\right) = \overline{c}_{ijk} \bullet \frac{t_i}{\overline{a}_{ij}}$$

Bias-corrected measurements are indicated by a "bc" suffix, and such adjustments were performed for all of the oxides of this study except for CdO, Ce_2O_3, La_2O_3, PbO, SO_4, ZnO, and ZrO_2. Both measured and measured "bc" values are included in the discussion that follows. In these discussions bias-corrected values for CdO, Ce_2O_3, La_2O_3, PbO, SO_4^{2-}, ZnO, and ZrO_2 are included for completeness (e.g., to allow a sum of oxides to be computed for the bias-corrected results). These bias-corrected values are the same as the original CdO, Ce_2O_3, La_2O_3, PbO, SO_4^{2-}, ZnO, and ZrO_2 values.

3.2.4 *Measured versus Targeted Compositions*

All of the measurements for each oxide for each glass (i.e., all of the measurements in Tables A2 through A3) were averaged to determine a representative chemical composition for each glass. These determinations were conducted both for the measured and for the bias-corrected data. A sum of oxides was also computed for each glass based upon both the measured and bias-corrected values. Exhibit A4 in Appendix A provides plots showing results for each glass for each oxide to help highlight the comparisons among the measured, bias-corrected, and targeted values. Some observations from the plots of Exhibit A4 for the major oxides (those oxides at concentrations greater than 0.5 wt %) are offered. In general, there appear to have been only minor difficulties in meeting the targeted concentrations for the study glasses. Bias correcting the Al_2O_3 and MnO measurements generally pushed the values above the targets. The CaO measurements for some of the study glasses with higher targeted concentrations fell above the targets. The measured Cr_2O_3 concentrations were low for glasses NE3-11 and NE3-12. The measured Fe_2O_3 values for glasses NE3-06, NE3-07, and NE3-28 were below their intended targets. Several of the Li_2O and NiO values fell slightly below target. The measured concentrations of MgO for glasses NE3-13 and NE3-17 missed their targets. The measured values for Na_2O (particularly NE3-13) and NiO for some of the study glasses fell below their targets. The measured SO_4^{2-} concentrations were generally below the target values, likely due to volatility during melting. Bias correcting the SiO_2 measurements pushed the values above the targets. The measured SiO_2 value for NE3-16 was low and that for NE3-17 was substantially above its intended target. The Ce_2O_3, TiO_2, ZnO, and ZrO_2 values for NE3-13 and NE3-17 missed their intended targets.

Table A4 in Appendix A provides a summary of the average compositions as well as the targeted compositions and some associated differences and relative differences. Notice that the targeted sums of oxides for the standard glasses do not sum to 100% due to an incomplete coverage of the oxides in the Batch 1 glass. All of the sums of oxides (both measured and bias-corrected) for the study glasses fall within the interval of 95 to 105 wt% except the bias-corrected value for NE3-17 whose sum of oxides is above the 105 wt% value. Entries in Table A4 show the relative differences between the measured or bias-corrected 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 suggest only minor difficulties in hitting the targeted compositions for the majority of the study glasses. As mentioned above, glasses NE3-13 and NE3-17 missed the target values for several of the oxides. While these inconsistencies are unlikely to impact the outcome of this study, it is recommended that these data be recorded as non-model values should they be incorporated into the ComPro database.[16]

3.3 MAR Assessment of the Study Glasses

Another assessment that can be made for the study glasses is how well they satisfy the Measurement Acceptability Region (MAR) criteria of the DWPF PCCS. As discussed earlier, glasses were selected for this study to investigate nepheline issues for future DWPF processing. In this section, the results of the MAR assessment of the measured and measured bias-corrected compositions for these glasses are presented along with the results for the targeted compositions.

Table 3-2 provides this information. The columns in the table give the glass identifier, the compositional view, the ΔG_p value for boron, the predicted normalized leachate for boron (NL[B (g/L)]), the predicted liquidus temperature (T_L Pred (°C)), the predicted viscosity (Visc Pred (P)), the concentrations of the oxides of Al, Ti and alkali (in wt %), the homogeneity constraint (Homog wt %), the nepheline discriminator value (calculated using the current nepheline discriminator), and the overall MAR assessment result (MAR Status) excluding any limitation on the concentration of Na_2SO_4. The constraints identified by the MAR assessments are listed as TL (for high predicted liquidus temperature), TiO_2 (for high TiO_2 concentration), Neph (for

nepheline formation predicted by the current nepheline discriminator), newlv (for a low predicted viscosity), newhv (for a high predicted viscosity), and hsum (for a high sum of oxides). Note that due to slight differences between target and measured composition, the MAR assessments do not predict the formation of nepheline for some of the glasses based on the measured and bias corrected compositional views. However, the values remain very close to the critical 0.62 values and therefore remain quite useful in evaluating both the current and alternative nepheline discriminators. Also, some of the glasses are shown to fail constraints other than just nepheline based on the targeted compositional view. This occurs for a few reasons. First, some of the selected glasses had predicted properties that were very close to the PCCS limits, and that fail the constraints when measurement uncertainty is applied. Second, the glass compositions were renormalized without uranium, which in some cases shifted the composition enough to fail some of the constraints other than nepheline. Those glasses with nepheline discriminator values slightly above 0.62 based on the targeted compositional view (e.g., a value of 0.626 for glass NE3-15) fail the nepheline discriminator when measurement uncertainty is applied.

Table 3-2. MAR Assessment Results for the Study Glasses by Compositional View

Glass ID	Compositional View	ΔG_p Value for B	NL [B (g/L)]	T_L Pred (°C)	Visc Pred (P)	Al_2O_3 wt %	TiO_2 wt %	R_2O wt %	Homog wt %	Neph Value	MAR Status
NE3-01	targeted	-13.236	3.14	1012.2	25.08	10.53	2.00	21.34	241.07	0.598	TL TiO_2 Neph
NE3-02	targeted	-10.812	1.14	842.8	39.42	12.69	2.00	19.56	234.12	0.600	TiO_2 Neph
NE3-03	targeted	-10.000	0.81	964.2	31.45	12.86	0.28	17.69	265.12	0.598	Neph
NE3-04	targeted	-11.533	1.54	813.7	27.43	13.38	0.00	23.44	261.50	0.593	Neph
NE3-05	targeted	-10.781	1.13	866.4	25.08	14.51	0.80	20.68	235.45	0.586	Neph
NE3-06	targeted	-5.287	0.11	1025.3	25.13	14.38	2.12	15.47	275.98	0.594	TL newlv TiO_2 Neph
NE3-07	targeted	-6.470	0.19	1020.6	25.04	14.65	2.03	15.54	277.53	0.587	TL newlv TiO_2 Neph
NE3-08	targeted	-10.777	1.13	977.6	25.08	14.20	0.18	20.41	252.34	0.600	Neph
NE3-09	targeted	-7.880	0.34	987.0	95.81	16.08	0.00	17.90	260.94	0.600	TL Neph
NE3-10	targeted	-7.852	0.33	960.1	49.32	14.70	0.00	17.62	265.23	0.600	Neph
NE3-11	targeted	-7.714	0.31	1040.8	25.01	16.18	0.00	18.21	271.20	0.600	TL newlv Neph
NE3-12	targeted	-6.188	0.17	937.4	102.07	17.02	0.52	17.63	267.05	0.599	newhv Neph
NE3-13	targeted	-12.612	2.42	954.4	25.07	17.19	0.00	22.88	238.61	0.524	newlv Neph
NE3-14	targeted	-6.904	0.22	923.9	26.07	18.00	2.00	18.73	293.32	0.559	TiO_2 Neph
NE3-15	targeted	-12.902	2.73	950.8	30.64	10.71	0.14	22.70	224.13	0.626	Neph
NE3-16	targeted	-11.321	1.41	920.8	29.34	11.68	1.83	17.99	240.37	0.615	Neph
NE3-17	targeted	-10.515	1.01	996.8	31.79	11.58	1.75	19.63	255.29	0.610	Neph
NE3-18	targeted	-11.845	1.76	941.1	37.93	11.93	0.75	21.26	237.56	0.628	Neph
NE3-19	targeted	-10.541	1.02	901.0	35.96	12.30	0.84	19.20	251.23	0.628	Neph
NE3-20	targeted	-12.533	2.34	758.9	37.33	13.21	0.94	23.45	231.43	0.610	Neph
NE3-21	targeted	-12.150	2.00	864.0	25.52	13.63	1.50	20.36	236.92	0.607	Neph
NE3-22	targeted	-8.524	0.44	999.9	45.81	14.36	1.62	18.09	254.03	0.601	Neph
NE3-23	targeted	-9.073	0.55	874.8	58.78	14.15	0.40	16.27	247.95	0.628	Neph
NE3-24	targeted	-12.157	2.00	896.5	26.63	14.68	0.46	21.92	253.89	0.566	Neph
NE3-25	targeted	-9.562	0.68	923.7	34.94	17.13	1.41	19.29	255.68	0.575	Neph
NE3-26	targeted	-11.125	1.30	962.0	28.69	17.96	0.64	22.09	260.71	0.525	Neph
NE3-27	targeted	-9.040	0.55	959.1	52.11	18.31	0.96	20.20	261.70	0.548	Neph
NE3-28	targeted	-8.107	0.37	950.4	65.09	17.75	0.05	18.60	248.44	0.572	Neph
NE3-29	targeted	-10.034	0.83	957.0	29.13	18.01	0.44	18.77	268.22	0.519	Neph
NE3-01	measured	-12.470	2.28	1003.3	29.18	10.54	1.91	20.12	239.40	0.603	Neph
NE3-02	measured	-10.544	1.02	844.0	41.91	12.92	1.89	19.21	230.55	0.596	Neph
NE3-03	measured	-10.087	0.84	951.9	33.38	12.86	0.29	17.53	264.48	0.595	Neph
NE3-04	measured	-10.327	0.93	826.9	33.88	13.40	0.01	22.00	257.54	0.601	Neph
NE3-05	measured	-10.446	0.98	861.6	25.64	14.58	0.78	20.30	234.83	0.586	Neph
NE3-06	measured	-5.483	0.12	965.5	28.78	14.46	1.94	15.54	265.62	0.592	TiO_2 Neph
NE3-07	measured	-6.341	0.18	1013.5	28.46	14.68	1.91	15.25	270.66	0.587	TL Neph
NE3-08	measured	-10.333	0.94	976.7	27.27	14.00	0.19	19.78	249.74	0.603	Neph
NE3-09	measured	-7.567	0.29	962.5	98.40	16.21	0.01	17.61	265.75	0.599	Neph
NE3-10	measured	-7.652	0.31	963.2	52.94	14.83	0.01	17.41	264.39	0.600	Neph
NE3-11	measured	-7.553	0.29	1011.2	28.77	16.07	0.01	17.74	266.45	0.604	Neph
NE3-12	measured	-6.252	0.17	912.5	101.21	16.69	0.52	17.58	260.84	0.598	newhv Neph
NE3-13	measured	-10.979	1.22	957.0	34.42	17.29	0.84	21.07	234.47	0.532	Neph
NE3-14	measured	-6.218	0.17	931.3	32.91	17.99	1.76	17.80	291.00	0.565	Neph
NE3-15	measured	-11.799	1.72	954.8	38.04	10.76	0.15	21.44	221.06	0.634	
NE3-16	measured	-11.039	1.26	908.1	29.08	11.32	1.72	17.36	234.05	0.614	Neph
NE3-17	measured	-10.323	0.93	964.5	50.24	11.63	0.84	19.37	258.51	0.638	
NE3-18	measured	-11.227	1.36	935.8	42.31	11.88	0.73	20.52	235.09	0.631	
NE3-19	measured	-10.697	1.09	889.7	33.49	12.21	0.81	19.18	249.91	0.623	Neph
NE3-20	measured	-12.316	2.14	751.8	38.06	12.87	0.91	23.01	225.56	0.611	Neph
NE3-21	measured	-12.032	1.90	858.1	26.53	13.56	1.42	20.00	235.11	0.607	Neph
NE3-22	measured	-8.638	0.46	974.8	46.02	14.37	1.55	18.06	249.59	0.598	Neph
NE3-23	measured	-8.604	0.45	881.4	65.91	14.05	0.39	15.53	246.37	0.633	
NE3-24	measured	-12.127	1.98	884.4	26.49	14.71	0.45	21.77	252.28	0.561	Neph
NE3-25	measured	-9.613	0.69	912.0	35.84	17.21	1.35	19.20	256.39	0.574	Neph
NE3-26	measured	-10.781	1.13	940.2	31.40	17.63	0.62	21.48	253.20	0.532	Neph
NE3-27	measured	-8.918	0.52	938.8	54.32	18.23	0.93	19.90	257.72	0.546	Neph
NE3-28	measured	-7.903	0.34	923.0	68.65	17.64	0.05	18.21	242.38	0.570	Neph
NE3-29	measured	-9.610	0.69	953.0	34.81	18.13	0.43	18.18	266.02	0.520	Neph
NE3-01	measured bc	-12.615	2.42	1009.0	35.49	10.98	1.97	20.52	247.94	0.609	TL TiO_2 Neph
NE3-02	measured bc	-10.370	0.95	849.4	51.96	13.52	1.93	19.26	238.06	0.601	TiO_2 Neph
NE3-03	measured bc	-10.228	0.90	948.7	40.11	13.24	0.30	17.87	271.79	0.601	Neph
NE3-04	measured bc	-10.373	0.95	823.3	40.48	13.80	0.01	22.41	264.63	0.607	Neph
NE3-05	measured bc	-10.378	0.95	860.7	31.10	15.28	0.81	20.69	241.57	0.587	Neph
NE3-06	measured bc	-5.354	0.12	964.7	34.71	15.13	2.02	15.84	274.22	0.595	TiO_2 Neph
NE3-07	measured bc	-6.276	0.17	1015.0	34.43	15.35	1.98	15.54	279.52	0.589	TL TiO_2 Neph
NE3-08	measured bc	-10.288	0.92	985.7	32.80	14.67	0.20	20.15	256.82	0.604	Neph

Table 3-2. MAR Assessment Results for the Study Glasses by Compositional View (continued)

Glass ID	Compositional View	ΔG_p Value for B	NL [B (g/L)]	T_L Pred (°C)	Visc Pred (P)	Al_2O_3 wt %	TiO_2 wt %	R_2O wt %	Homog wt %	Neph Value	MAR Status
NE3-09	measured bc	-7.382	0.27	970.0	117.91	16.69	0.01	17.72	273.56	0.606	newhv Neph
NE3-10	measured bc	-7.511	0.29	964.5	65.11	15.27	0.01	17.52	271.10	0.607	Neph
NE3-11	measured bc	-7.508	0.29	1010.0	35.15	16.84	0.01	18.04	273.65	0.604	Neph
NE3-12	measured bc	-5.953	0.15	912.8	122.70	17.19	0.53	17.60	267.88	0.606	newhv Neph
NE3-13	measured bc	-10.796	1.13	968.0	43.56	18.12	0.87	21.22	241.52	0.535	Neph
NE3-14	measured bc	-6.153	0.16	927.9	40.69	18.53	1.83	18.07	298.86	0.571	Neph
NE3-15	measured bc	-11.901	1.80	959.6	44.91	11.08	0.16	21.85	227.70	0.640	
NE3-16	measured bc	-10.932	1.20	913.2	37.94	11.79	1.79	17.48	241.65	0.621	Neph
NE3-17	measured bc	-10.372	0.95	970.0	57.96	12.16	0.87	19.76	267.53	0.641	hsum
NE3-18	measured bc	-11.258	1.38	945.8	49.32	12.43	0.75	20.91	243.58	0.634	
NE3-19	measured bc	-10.401	0.96	896.9	43.78	12.71	0.83	19.22	258.04	0.631	
NE3-20	measured bc	-11.985	1.86	757.6	49.11	13.40	0.93	23.06	233.10	0.619	Neph
NE3-21	measured bc	-11.944	1.83	865.2	34.59	14.12	1.47	20.13	243.26	0.614	Neph
NE3-22	measured bc	-8.462	0.43	982.0	56.20	15.03	1.61	18.20	257.95	0.603	Neph
NE3-23	measured bc	-8.565	0.45	881.4	78.43	14.72	0.41	15.81	253.32	0.633	
NE3-24	measured bc	-11.848	1.76	896.7	33.88	15.38	0.46	21.83	260.71	0.567	Neph
NE3-25	measured bc	-9.340	0.62	919.0	45.78	18.03	1.38	19.26	263.80	0.577	Neph
NE3-26	measured bc	-10.785	1.13	944.0	39.49	18.36	0.64	21.88	262.14	0.538	Neph
NE3-27	measured bc	-8.662	0.47	947.8	69.78	18.99	0.96	20.03	266.69	0.553	Neph
NE3-28	measured bc	-7.539	0.29	932.2	86.39	18.48	0.05	18.25	249.44	0.573	Neph
NE3-29	measured bc	-9.732	0.73	952.4	42.41	18.67	0.45	18.51	273.51	0.526	Neph

3.4 Statistical Review of the PCT Results

In this and the following sections, the measurements generated by the PSAL for the PCTs are presented and reviewed. Table B1 in Appendix B provides the elemental leachate concentration measurements determined by the PSAL for the solution samples generated by the PCTs. One of the quality control checkpoints for the PCT procedure is solution-weight loss over the course of the seven day test. Only one of the vessels from these three sets of PCTs indicated a solution weight loss problem: a solution from the ccc version of NE3-26 labeled x61 in the analytical plan. Thus, this PCT result will not be used to represent the PCT response for the ccc version of this study glass. The values were adjusted for the dilution factors: the values for the study glasses, the blanks, and the ARM glass in Table B1 were multiplied by 1.6667 to determine the values in parts per million (ppm) and the values for EA were multiplied by 16.6667. Table B1 in Appendix B also provides the resulting ppm measurements.

In the sections that follow, 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, measured, and bias-corrected) presented in Table A7, and the normalized PCTs are compared to durability predictions for these compositions generated from the current DWPF models.[3]

3.4.1 *Measurements in Analytical Sequence*

Exhibit B1 in Appendix B provides plots of the leachate (ppm) concentrations in analytical sequence as generated by the PSAL for all of the data from all three sets of PCTs. Different colors and symbols are used for each of the study glasses and standards. No problems are seen in these plots.

3.4.2 *Results for the Samples of the Multi-Element Solution Standard*

Exhibit B2 in Appendix B provides analyses of the PSAL measurements of the samples of the multi-element standard solution by analytical set and ICP-AES calibration block. An ANOVA investigating for statistically significant differences among the block averages for these samples for each element of interest is included in these exhibits. A statistically significant (at a 5% level) difference among the averages of these measurements was indicated for Li and Si. However, no attempt was made to bias correct for these effects since averaging the measured concentrations for each set of triplicates helps to minimize the impact of any potential ICP-AES bias effects.

Table 3-3 summarizes the average measurements and the reference values for the four elements of interest. The results indicate consistent and accurate measurements from the PSAL processes used to conduct these analyses.

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

Set	Block	B (ppm)	Li (ppm)	Na (ppm)	Si (ppm)
1	1	20.5	9.6	82.2	50.0
1	1	20.5	9.7	82.8	50.1
1	1	20.5	9.7	83.7	50.2
1	2	20.9	10.1	83.1	50.7
1	2	20.1	9.8	89.7	49.6
1	2	21.8	10.0	84.7	50.1
1	3	20.2	9.8	83.3	49.5
1	3	19.5	9.7	82.3	48.8
1	3	19.3	9.9	84.7	49.0
Average		20.4	9.8	84.1	49.8
2	1	20.4	9.9	83.5	50.0
2	1	20.6	9.7	79.8	49.8
2	1	19.7	9.4	76.0	48.6
2	2	20.4	9.7	79.8	49.1
2	2	21.3	10.0	84.6	49.3
2	2	21.4	10.0	82.8	49.6
2	3	21.1	10.1	83.1	51.1
2	3	21.0	9.8	82.8	50.4
2	3	21.2	9.9	82.8	50.5
Average		20.8	9.8	81.7	49.8
3	1	20.1	9.6	85.0	49.7
3	1	19.4	9.8	80.9	49.3
3	1	21.0	9.7	80.9	49.7
3	2	19.6	9.6	79.5	48.9
3	2	28.2	9.7	78.9	49.3
3	2	19.0	9.6	79.2	48.5
3	3	19.9	9.4	78.5	49.0
3	3	28.5	9.6	82.5	49.4
3	3	19.6	9.6	83.5	48.8
Average		21.7	9.6	81.0	49.2
Grand Average		21.0	9.8	82.2	49.6
Reference Value		20	10	81	50
% difference		4.8%	-2.4%	1.5%	-0.8%

3.4.3 *Measurements by Glass Identifier*

Exhibit B3 in Appendix B 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). There are two units of measure in these plots: ppm values and the common logarithms of the ppm values. The common logarithm plots allow for the assessment of the repeatability of the measurements, which suggest some scatter in the triplicate values for some analytes for some of the glasses. Glass NE3-11 has one low value for B and one low value for Li in Set 2. Glasses NE3-26 and NE3-27 each have one low value for B in Set 3. Glass NE3-29 in Set 3 has one high value for each of the elements. Glass NE3-21 in Set 3 has one low value for each of the elements. Also of interest in this plot are any differences between the values for the two heat treatments for a study glass. More will be said regarding comparisons between the heat treatments in the discussions that follow.

3.4.4 *Normalized PCT Results*

PCT leachate concentrations are typically normalized using the cation composition (expressed as a weight percent) in the glass to obtain a grams-per-liter (g/L) leachate concentration. The normalization of the PCT results is usually conducted using the measured compositions of the glasses. This is the preferred normalization process for the PCTs. For completeness, the targeted cation and the bias-corrected cation compositions were also used to conduct this normalization.

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

1. Determine the common logarithm of the elemental parts per million (ppm) leachate concentration for each of the triplicates and each of the elements of interest (these values are provided in Table B1 of Appendix B),

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

Normalizing Using Measured Composition (preferred method)

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

Or Normalizing Using Target Composition

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

Or Normalizing Using Measured Bias-Corrected Composition

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

Exhibit B4 in Appendix B provides scatter plots for these results and offers an opportunity to investigate the consistency in the leaching across the elements for the glasses of this study. All combinations of the normalizations of the PCTs (i.e., those generated using the targeted, measured, and bias-corrected 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 Li and Si with a value of ~81.0%, indicating relatively linear correlations for all of the element pairs.

Table 3-4 summarizes the normalized PCTs for the glasses of this study. The PCTs are listed by heat treatment and compositional view for each glass. Several of the study glasses had NL [B] values that approached or were greater than that of the benchmark EA glass. Glasses NE3-04ccc, NE3-11ccc, NE3-21ccc, NE3-24ccc, NE3-25ccc, and NE3-29ccc had elevated NL [B] values, while glasses NE3-10ccc, NE3-13ccc, NE3-26ccc, and NE3-27ccc had NL [B] values significantly higher than that of the EA glass. These results will be discussed further in the following sections.

Table 3-4. Normalized PCT Values by Glass ID and Compositional View

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	-0.312	-0.246	-0.283	-0.566	0.49	0.57	0.52	0.27
ARM	ref	reference	-0.316	-0.249	-0.331	-0.563	0.48	0.56	0.47	0.27
ARM	ref	reference	-0.308	-0.257	-0.315	-0.570	0.49	0.55	0.48	0.27
EA	ref	reference	1.221	0.960	1.120	0.585	16.62	9.11	13.18	3.85
EA	ref	reference	1.094	0.876	1.020	0.521	12.43	7.52	10.46	3.32
EA	ref	reference	1.257	0.982	1.139	0.602	18.06	9.60	13.77	4.00
NE3-01	ccc	measured	0.029	0.121	0.213	-0.254	1.07	1.32	1.63	0.56
NE3-01	ccc	measured bc	0.041	0.119	0.203	-0.277	1.10	1.32	1.60	0.53
NE3-01	ccc	targeted	0.050	0.115	0.183	-0.263	1.12	1.30	1.52	0.55
NE3-01	quenched	measured	0.016	0.066	0.215	-0.240	1.04	1.16	1.64	0.57
NE3-01	quenched	measured bc	0.029	0.064	0.204	-0.263	1.07	1.16	1.60	0.55
NE3-01	quenched	targeted	0.038	0.060	0.184	-0.250	1.09	1.15	1.53	0.56
NE3-02	ccc	measured	-0.192	-0.161	-0.157	-0.349	0.64	0.69	0.70	0.45
NE3-02	ccc	measured bc	-0.193	-0.164	-0.158	-0.369	0.64	0.69	0.70	0.43
NE3-02	ccc	targeted	-0.200	-0.167	-0.165	-0.358	0.63	0.68	0.68	0.44
NE3-02	quenched	measured	-0.222	-0.208	-0.126	-0.356	0.60	0.62	0.75	0.44
NE3-02	quenched	measured bc	-0.224	-0.212	-0.126	-0.376	0.60	0.61	0.75	0.42
NE3-02	quenched	targeted	-0.231	-0.215	-0.134	-0.365	0.59	0.61	0.73	0.43
NE3-03	ccc	measured	0.306	0.282	0.118	-0.333	2.03	1.91	1.31	0.46
NE3-03	ccc	measured bc	0.304	0.281	0.107	-0.355	2.01	1.91	1.28	0.44
NE3-03	ccc	targeted	0.293	0.272	0.116	-0.338	1.96	1.87	1.30	0.46
NE3-03	quenched	measured	-0.089	-0.068	-0.058	-0.434	0.81	0.85	0.87	0.37
NE3-03	quenched	measured bc	-0.092	-0.070	-0.069	-0.456	0.81	0.85	0.85	0.35
NE3-03	quenched	targeted	-0.103	-0.079	-0.060	-0.439	0.79	0.83	0.87	0.36
NE3-04	ccc	measured	0.680	0.572	0.333	0.112	4.78	3.74	2.15	1.29
NE3-04	ccc	measured bc	0.677	0.571	0.323	0.089	4.76	3.73	2.10	1.23
NE3-04	ccc	targeted	0.678	0.566	0.300	0.106	4.77	3.68	1.99	1.28
NE3-04	quenched	measured	-0.176	-0.209	0.098	-0.254	0.67	0.62	1.25	0.56
NE3-04	quenched	measured bc	-0.179	-0.210	0.088	-0.277	0.66	0.62	1.23	0.53
NE3-04	quenched	targeted	-0.178	-0.216	0.065	-0.260	0.66	0.61	1.16	0.55
NE3-05	ccc	measured	-0.037	-0.092	-0.086	-0.370	0.92	0.81	0.82	0.43
NE3-05	ccc	measured bc	-0.025	-0.095	-0.096	-0.387	0.94	0.80	0.80	0.41
NE3-05	ccc	targeted	-0.029	-0.096	-0.096	-0.374	0.94	0.80	0.80	0.42
NE3-05	quenched	measured	0.005	-0.091	-0.066	-0.359	1.01	0.81	0.86	0.44
NE3-05	quenched	measured bc	0.017	-0.094	-0.077	-0.376	1.04	0.81	0.84	0.42
NE3-05	quenched	targeted	0.013	-0.094	-0.076	-0.363	1.03	0.80	0.84	0.43
NE3-06	ccc	measured	0.313	0.209	-0.060	-0.344	2.05	1.62	0.87	0.45
NE3-06	ccc	measured bc	0.311	0.205	-0.070	-0.364	2.05	1.60	0.85	0.43
NE3-06	ccc	targeted	0.312	0.206	-0.056	-0.345	2.05	1.61	0.88	0.45
NE3-06	quenched	measured	-0.210	-0.108	-0.273	-0.378	0.62	0.78	0.53	0.42
NE3-06	quenched	measured bc	-0.211	-0.111	-0.283	-0.398	0.61	0.77	0.52	0.40
NE3-06	quenched	targeted	-0.211	-0.111	-0.269	-0.380	0.62	0.77	0.54	0.42
NE3-07	ccc	measured	0.532	0.457	0.154	-0.298	3.40	2.86	1.42	0.50
NE3-07	ccc	measured bc	0.530	0.453	0.144	-0.318	3.39	2.84	1.39	0.48
NE3-07	ccc	targeted	0.526	0.451	0.144	-0.303	3.35	2.82	1.39	0.50
NE3-07	quenched	measured	-0.159	-0.109	-0.212	-0.451	0.69	0.78	0.61	0.35
NE3-07	quenched	measured bc	-0.160	-0.112	-0.222	-0.471	0.69	0.77	0.60	0.34
NE3-07	quenched	targeted	-0.165	-0.114	-0.221	-0.456	0.68	0.77	0.60	0.35
NE3-08	ccc	measured	0.133	0.208	0.055	-0.296	1.36	1.62	1.14	0.51
NE3-08	ccc	measured bc	0.144	0.205	0.045	-0.313	1.39	1.60	1.11	0.49
NE3-08	ccc	targeted	0.147	0.190	0.043	-0.299	1.40	1.55	1.11	0.50
NE3-08	quenched	measured	-0.206	-0.150	-0.058	-0.426	0.62	0.71	0.87	0.38
NE3-08	quenched	measured bc	-0.195	-0.153	-0.069	-0.443	0.64	0.70	0.85	0.36
NE3-08	quenched	targeted	-0.193	-0.168	-0.070	-0.429	0.64	0.68	0.85	0.37
NE3-09	ccc	measured	-0.364	-0.262	-0.335	-0.722	0.43	0.55	0.46	0.19
NE3-09	ccc	measured bc	-0.367	-0.263	-0.338	-0.744	0.43	0.55	0.46	0.18
NE3-09	ccc	targeted	-0.374	-0.272	-0.341	-0.725	0.42	0.53	0.46	0.19
NE3-09	quenched	measured	-0.492	-0.381	-0.335	-0.729	0.32	0.42	0.46	0.19
NE3-09	quenched	measured bc	-0.494	-0.382	-0.338	-0.752	0.32	0.41	0.46	0.18
NE3-09	quenched	targeted	-0.501	-0.391	-0.341	-0.733	0.32	0.41	0.46	0.19
NE3-10	ccc	measured	1.597	1.328	1.042	0.162	39.52	21.27	11.00	1.45
NE3-10	ccc	measured bc	1.594	1.327	1.038	0.140	39.30	21.22	10.92	1.38
NE3-10	ccc	targeted	1.598	1.321	1.037	0.161	39.60	20.96	10.89	1.45
NE3-10	quenched	measured	-0.170	-0.156	-0.158	-0.390	0.68	0.70	0.70	0.41
NE3-10	quenched	measured bc	-0.172	-0.157	-0.161	-0.412	0.67	0.70	0.69	0.39
NE3-10	quenched	targeted	-0.169	-0.163	-0.162	-0.391	0.68	0.69	0.69	0.41

Table 3-4. Normalized PCT Values by Glass ID and Compositional View (continued)

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)
NE3-11	ccc	measured	0.829	0.507	0.349	-0.060	6.75	3.22	2.24	0.87
NE3-11	ccc	measured bc	0.841	0.504	0.339	-0.077	6.93	3.19	2.18	0.84
NE3-11	ccc	targeted	0.849	0.495	0.339	-0.060	7.07	3.12	2.18	0.87
NE3-11	quenched	measured	-0.043	-0.035	-0.074	-0.210	0.91	0.92	0.84	0.62
NE3-11	quenched	measured bc	-0.032	-0.038	-0.085	-0.227	0.93	0.92	0.82	0.59
NE3-11	quenched	targeted	-0.023	-0.047	-0.085	-0.210	0.95	0.90	0.82	0.62
NE3-12	ccc	measured	0.297	0.171	-0.128	-0.306	1.98	1.48	0.74	0.49
NE3-12	ccc	measured bc	0.295	0.170	-0.129	-0.329	1.97	1.48	0.74	0.47
NE3-12	ccc	targeted	0.291	0.154	-0.125	-0.312	1.95	1.43	0.75	0.49
NE3-12	quenched	measured	-0.245	-0.193	-0.301	-0.381	0.57	0.64	0.50	0.42
NE3-12	quenched	measured bc	-0.248	-0.194	-0.302	-0.403	0.57	0.64	0.50	0.40
NE3-12	quenched	targeted	-0.252	-0.210	-0.298	-0.387	0.56	0.62	0.50	0.41
NE3-13	ccc	measured	1.951	1.259	1.534	0.535	89.32	18.15	34.22	3.43
NE3-13	ccc	measured bc	1.962	1.256	1.531	0.518	91.71	18.03	33.97	3.30
NE3-13	ccc	targeted	1.961	1.251	1.491	0.528	91.36	17.81	30.95	3.38
NE3-13	quenched	measured	-0.051	-0.168	0.067	-0.291	0.89	0.68	1.17	0.51
NE3-13	quenched	measured bc	-0.040	-0.171	0.063	-0.307	0.91	0.67	1.16	0.49
NE3-13	quenched	targeted	-0.041	-0.176	0.023	-0.297	0.91	0.67	1.05	0.50
NE3-14	ccc	measured	0.513	0.520	-0.351	-0.047	3.25	3.31	0.45	0.90
NE3-14	ccc	measured bc	0.510	0.519	-0.361	-0.069	3.24	3.30	0.44	0.85
NE3-14	ccc	targeted	0.508	0.510	-0.381	-0.049	3.22	3.24	0.42	0.89
NE3-14	quenched	measured	0.068	0.010	0.023	-0.346	1.17	1.02	1.05	0.45
NE3-14	quenched	measured bc	0.065	0.009	0.013	-0.369	1.16	1.02	1.03	0.43
NE3-14	quenched	targeted	0.063	0.000	-0.007	-0.348	1.16	1.00	0.98	0.45
NE3-15	ccc	measured	0.031	-0.107	0.044	-0.245	1.07	0.78	1.11	0.57
NE3-15	ccc	measured bc	0.028	-0.108	0.034	-0.267	1.07	0.78	1.08	0.54
NE3-15	ccc	targeted	0.028	-0.115	0.015	-0.246	1.07	0.77	1.03	0.57
NE3-15	quenched	measured	-0.071	-0.138	0.093	-0.242	0.85	0.73	1.24	0.57
NE3-15	quenched	measured bc	-0.074	-0.139	0.083	-0.265	0.84	0.73	1.21	0.54
NE3-15	quenched	targeted	-0.075	-0.147	0.063	-0.244	0.84	0.71	1.16	0.57
NE3-16	ccc	measured	-0.044	-0.015	-0.034	-0.376	0.90	0.97	0.92	0.42
NE3-16	ccc	measured bc	-0.031	-0.017	-0.037	-0.399	0.93	0.96	0.92	0.40
NE3-16	ccc	targeted	-0.049	-0.035	-0.048	-0.392	0.89	0.92	0.90	0.41
NE3-16	quenched	measured	-0.021	-0.023	-0.006	-0.372	0.95	0.95	0.99	0.43
NE3-16	quenched	measured bc	-0.009	-0.025	-0.010	-0.395	0.98	0.94	0.98	0.40
NE3-16	quenched	targeted	-0.026	-0.043	-0.020	-0.388	0.94	0.90	0.95	0.41
NE3-17	ccc	measured	-0.167	-0.093	0.006	-0.423	0.68	0.81	1.01	0.38
NE3-17	ccc	measured bc	-0.169	-0.096	-0.004	-0.444	0.68	0.80	0.99	0.36
NE3-17	ccc	targeted	-0.174	-0.064	-0.010	-0.381	0.67	0.86	0.98	0.42
NE3-17	quenched	measured	0.063	-0.091	0.075	-0.382	1.16	0.81	1.19	0.41
NE3-17	quenched	measured bc	0.062	-0.095	0.065	-0.402	1.15	0.80	1.16	0.40
NE3-17	quenched	targeted	0.057	-0.063	0.059	-0.339	1.14	0.87	1.15	0.46
NE3-18	ccc	measured	-0.125	-0.061	-0.006	-0.411	0.75	0.87	0.99	0.39
NE3-18	ccc	measured bc	-0.126	-0.065	-0.016	-0.431	0.75	0.86	0.96	0.37
NE3-18	ccc	targeted	-0.126	-0.073	-0.022	-0.415	0.75	0.84	0.95	0.38
NE3-18	quenched	measured	-0.163	-0.077	0.073	-0.380	0.69	0.84	1.18	0.42
NE3-18	quenched	measured bc	-0.165	-0.081	0.062	-0.400	0.68	0.83	1.15	0.40
NE3-18	quenched	targeted	-0.165	-0.089	0.056	-0.385	0.68	0.81	1.14	0.41
NE3-19	ccc	measured	-0.263	-0.184	-0.168	-0.485	0.55	0.65	0.68	0.33
NE3-19	ccc	measured bc	-0.250	-0.186	-0.169	-0.508	0.56	0.65	0.68	0.31
NE3-19	ccc	targeted	-0.253	-0.192	-0.166	-0.493	0.56	0.64	0.68	0.32
NE3-19	quenched	measured	-0.103	-0.175	-0.120	-0.470	0.79	0.67	0.76	0.34
NE3-19	quenched	measured bc	-0.090	-0.177	-0.121	-0.493	0.81	0.67	0.76	0.32
NE3-19	quenched	targeted	-0.094	-0.183	-0.118	-0.478	0.81	0.66	0.76	0.33
NE3-20	ccc	measured	-0.167	-0.125	0.013	-0.263	0.68	0.75	1.03	0.55
NE3-20	ccc	measured bc	-0.154	-0.127	0.013	-0.286	0.70	0.75	1.03	0.52
NE3-20	ccc	targeted	-0.167	-0.141	0.007	-0.270	0.68	0.72	1.02	0.54
NE3-20	quenched	measured	-0.158	-0.159	0.072	-0.253	0.70	0.69	1.18	0.56
NE3-20	quenched	measured bc	-0.145	-0.161	0.072	-0.276	0.72	0.69	1.18	0.53
NE3-20	quenched	targeted	-0.157	-0.175	0.067	-0.260	0.70	0.67	1.17	0.55
NE3-21	ccc	measured	0.721	0.556	0.327	-0.042	5.25	3.60	2.12	0.91
NE3-21	ccc	measured bc	0.733	0.554	0.324	-0.065	5.41	3.58	2.11	0.86
NE3-21	ccc	targeted	0.741	0.547	0.320	-0.046	5.50	3.52	2.09	0.90
NE3-21	quenched	measured	0.138	0.030	0.056	-0.271	1.38	1.07	1.14	0.54
NE3-21	quenched	measured bc	0.151	0.028	0.053	-0.294	1.42	1.07	1.13	0.51
NE3-21	quenched	targeted	0.159	0.021	0.049	-0.275	1.44	1.05	1.12	0.53

Table 3-4. Normalized PCT Values by Glass ID and Compositional View (continued)

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)
NE3-22	ccc	measured	-0.129	-0.108	-0.168	-0.329	0.74	0.78	0.68	0.47
NE3-22	ccc	measured bc	-0.130	-0.111	-0.171	-0.349	0.74	0.77	0.67	0.45
NE3-22	ccc	targeted	-0.126	-0.110	-0.169	-0.335	0.75	0.78	0.68	0.46
NE3-22	quenched	measured	-0.015	-0.175	-0.174	-0.363	0.97	0.67	0.67	0.43
NE3-22	quenched	measured bc	-0.016	-0.179	-0.178	-0.383	0.96	0.66	0.66	0.41
NE3-22	quenched	targeted	-0.013	-0.177	-0.175	-0.369	0.97	0.66	0.67	0.43
NE3-23	ccc	measured	-0.273	-0.237	-0.306	-0.582	0.53	0.58	0.49	0.26
NE3-23	ccc	measured bc	-0.262	-0.240	-0.316	-0.599	0.55	0.58	0.48	0.25
NE3-23	ccc	targeted	-0.262	-0.255	-0.328	-0.585	0.55	0.56	0.47	0.26
NE3-23	quenched	measured	-0.245	-0.234	-0.306	-0.582	0.57	0.58	0.49	0.26
NE3-23	quenched	measured bc	-0.233	-0.237	-0.316	-0.599	0.58	0.58	0.48	0.25
NE3-23	quenched	targeted	-0.234	-0.251	-0.327	-0.584	0.58	0.56	0.47	0.26
NE3-24	ccc	measured	0.763	0.707	0.412	0.028	5.79	5.09	2.58	1.07
NE3-24	ccc	measured bc	0.762	0.703	0.411	0.008	5.77	5.05	2.58	1.02
NE3-24	ccc	targeted	0.757	0.697	0.411	0.020	5.71	4.98	2.57	1.05
NE3-24	quenched	measured	-0.175	-0.173	0.005	-0.444	0.67	0.67	1.01	0.36
NE3-24	quenched	measured bc	-0.176	-0.176	0.005	-0.464	0.67	0.67	1.01	0.34
NE3-24	quenched	targeted	-0.181	-0.183	0.005	-0.453	0.66	0.66	1.01	0.35
NE3-25	ccc	measured	0.713	0.714	0.065	0.041	5.16	5.17	1.16	1.10
NE3-25	ccc	measured bc	0.724	0.711	0.064	0.024	5.30	5.14	1.16	1.06
NE3-25	ccc	targeted	0.735	0.708	0.065	0.041	5.43	5.10	1.16	1.10
NE3-25	quenched	measured	-0.075	-0.068	-0.040	-0.373	0.84	0.85	0.91	0.42
NE3-25	quenched	measured bc	-0.063	-0.071	-0.040	-0.389	0.86	0.85	0.91	0.41
NE3-25	quenched	targeted	-0.053	-0.074	-0.040	-0.373	0.89	0.84	0.91	0.42
NE3-26	ccc	measured	1.930	1.177	1.421	0.398	85.04	15.03	26.36	2.50
NE3-26	ccc	measured bc	1.942	1.175	1.411	0.375	87.57	14.97	25.77	2.37
NE3-26	ccc	targeted	1.948	1.185	1.403	0.397	88.79	15.31	25.27	2.50
NE3-26	quenched	measured	-0.119	-0.127	0.075	-0.256	0.76	0.75	1.19	0.55
NE3-26	quenched	measured bc	-0.106	-0.129	0.065	-0.279	0.78	0.74	1.16	0.53
NE3-26	quenched	targeted	-0.100	-0.119	0.057	-0.256	0.79	0.76	1.14	0.55
NE3-27	ccc	measured	1.531	0.932	0.892	-0.159	33.98	8.55	7.80	0.69
NE3-27	ccc	measured bc	1.544	0.930	0.889	-0.182	34.98	8.51	7.74	0.66
NE3-27	ccc	targeted	1.547	0.920	0.887	-0.166	35.28	8.32	7.71	0.68
NE3-27	quenched	measured	-0.124	-0.158	-0.053	-0.382	0.75	0.69	0.88	0.42
NE3-27	quenched	measured bc	-0.111	-0.160	-0.057	-0.405	0.77	0.69	0.88	0.39
NE3-27	quenched	targeted	-0.107	-0.170	-0.058	-0.389	0.78	0.68	0.87	0.41
NE3-28	ccc	measured	0.378	0.279	0.013	-0.294	2.39	1.90	1.03	0.51
NE3-28	ccc	measured bc	0.389	0.277	0.013	-0.310	2.45	1.89	1.03	0.49
NE3-28	ccc	targeted	0.380	0.268	0.004	-0.302	2.40	1.85	1.01	0.50
NE3-28	quenched	measured	-0.194	-0.185	-0.224	-0.362	0.64	0.65	0.60	0.43
NE3-28	quenched	measured bc	-0.183	-0.187	-0.225	-0.379	0.66	0.65	0.60	0.42
NE3-28	quenched	targeted	-0.192	-0.196	-0.233	-0.370	0.64	0.64	0.58	0.43
NE3-29	ccc	measured	0.810	0.751	0.249	-0.585	6.46	5.64	1.78	0.26
NE3-29	ccc	measured bc	0.808	0.750	0.239	-0.607	6.42	5.62	1.73	0.25
NE3-29	ccc	targeted	0.801	0.744	0.233	-0.589	6.32	5.55	1.71	0.26
NE3-29	quenched	measured	0.023	-0.089	-0.028	-0.417	1.05	0.82	0.94	0.38
NE3-29	quenched	measured bc	0.020	-0.090	-0.038	-0.439	1.05	0.81	0.92	0.36
NE3-29	quenched	targeted	0.013	-0.095	-0.044	-0.421	1.03	0.80	0.90	0.38

3.4.5 *Effects of Heat Treatment on PCTs*

Exhibit B5 in Appendix B provides a series of plots and statistical comparisons that show the effects of heat treatment on the common logarithm ppm responses of interest of the triplicate PCTs for each element for each study glass. The quenched version of a given glass yielded measurements indicating a significantly (at the 5% significance level) different mean log(ppm) response when compared the ccc version of the glass for a given element if the **Prob>|t|** value in the exhibit is 0.05 or smaller. Table 3-5 summaries the comparisons between the quenched and ccc versions of the study glasses for the four elements of the PCTs. Entries for each element in the table indicate a statistically significant – at the 5% level – difference in PCT response, with the less durable heat treatment (quenched or ccc) listed. The table also indicates those glasses that were found to contain nepheline via XRD after the ccc heat treatment.

Table 3-5. Effects of Heat Treatment on PCT Responses

Glass ID	B	Li	Na	Si	Nepheline Detected After ccc Heat Treatment
NE3-01		ccc			yes
NE3-02		ccc	quenched		no
NE3-03	ccc	ccc	ccc	ccc	yes
NE3-04	ccc	ccc	ccc	ccc	yes
NE3-05					no
NE3-06	ccc	ccc	ccc	ccc	yes
NE3-07	ccc	ccc	ccc	ccc	yes
NE3-08	ccc	ccc	ccc	ccc	yes
NE3-09	ccc	ccc			yes
NE3-10	ccc	ccc	ccc	ccc	yes
NE3-11	ccc		ccc		yes
NE3-12	ccc	ccc	ccc	ccc	yes
NE3-13	ccc	ccc	ccc	ccc	yes
NE3-14	ccc	ccc	quenched	ccc	yes
NE3-15		ccc	quenched		no
NE3-16					no
NE3-17	quenched		quenched	quenched	no
NE3-18		ccc	quenched	quenched	no
NE3-19					no
NE3-20		ccc	quenched		no
NE3-21					yes
NE3-22		ccc		ccc	no
NE3-23					no
NE3-24	ccc	ccc	ccc	ccc	yes
NE3-25	ccc	ccc	ccc	ccc	yes
NE3-26	ccc	ccc	ccc	ccc	yes
NE3-27	ccc	ccc	ccc		yes
NE3-28	ccc	ccc	ccc	ccc	yes
NE3-29					yes

Many of the study glasses showed a statistically significant difference between the ccc versus the quenched versions for one or more of the PCT elements. With a small number of exceptions, the glasses that crystallized nepheline after the ccc heat treatment were significantly less durable than their quenched versions for several or all of the four elements (B, Li, Na and Si). Glasses NE3-21 and NE3-29 appear to be exceptions to this statement. However, a review of Table 3-4 shows that the quenched versions of these glasses had relatively high normalized release values, as well

as the ccc versions. So, while the difference in PCT response with heat treatment was not significantly different, the glasses do show poorer durabilities as a result of nepheline crystallization. Exhibit B6 in Appendix B provides plots of the normalized PCT responses between the two heat treatments. These plots provide a basis for judging the practical impact of differences in the PCT response due to the heat treatment of the glass, and corroborate the effects identified in Table 3-5.

3.4.6 *Predicted versus Measured PCTs*

Another aspect of interest in regard to the durabilities of the study glasses is their predictability by the DWPF models that predict the PCT response of a glass using its composition. However, care has to be taken in making these comparisons as the models only apply to amorphous glasses; the models would not be expected to predict the durabilities of glasses containing nepheline. Therefore, the PCTs for those glasses whose ccc versions were found to contain nepheline were not included in these comparisons. Exhibits B7 through B10 in Appendix B provide 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, kcal/100g glass) derived from all of the compositional views and heat treatments of the remaining glasses.[17] 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 plot for boron is also included below as Figure 3-1. Note that there are some points in this plot that fall above and below the confidence limits for the study glasses. None of these points are of particular concern to the outcome of this study as the measured NL [B] values for these glasses are all less than 2.0 g/L, regardless of heat treatment or compositional view, which is considerably lower than the EA benchmark value of 16.695 g/L.

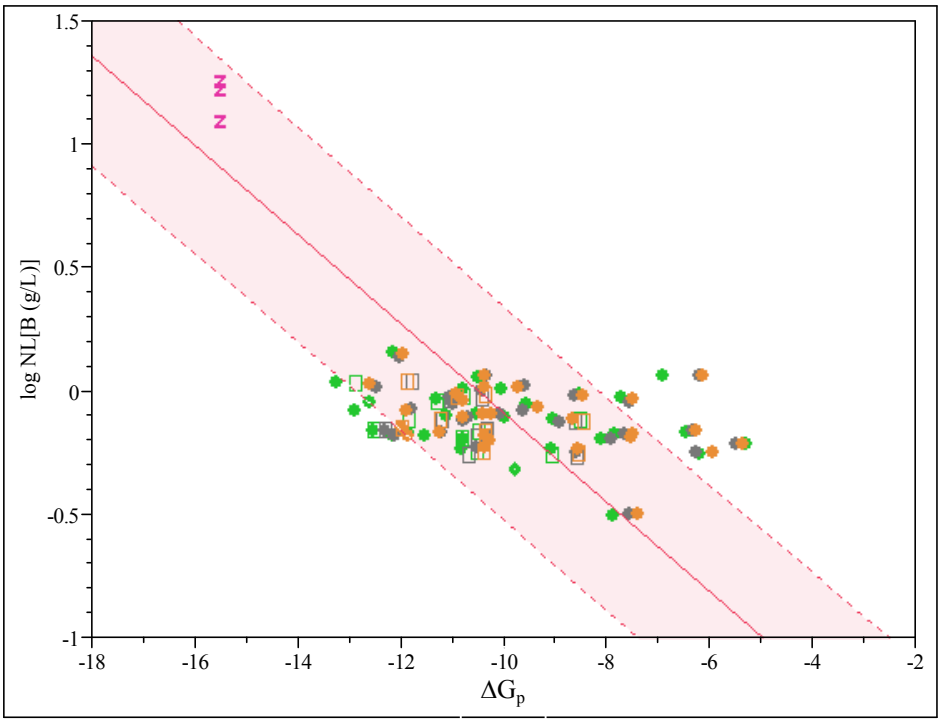


Figure 3-1. Measured NL [B] versus Predictions of the Model, with the 95% Confidence Interval for Individual PCTs.

3.4.7 *Predicting Nepheline Formation*

A major objective of this study is better prediction of the formation of nepheline. Two tools, the current nepheline discriminator[4] and the alternative nepheline discriminator (described in the glass selection report for this study[6]), were used in selecting the glasses that were fabricated and characterized for this study. Table 3-6 provides the nepheline discriminator values computed using both of these models for each of the study glasses as a function of compositional view, as well as the XRD results (simplified to nepheline only) for the ccc version of each glass.

Table 3-6. Nepheline Discriminator Values, Using Both the Current and Alternative Models, for Each of the Study Glasses by Compositional View

Glass ID	Compositional View	Current Nepheline Discriminator	Alternative Nepheline Discriminator	XRD Results for ccc Glass
NE3-01	measured	0.603	0.493	Nepheline
NE3-02	measured	0.596	0.513	No Nepheline
NE3-03	measured	0.595	0.521	Nepheline
NE3-04	measured	0.601	0.484	Nepheline
NE3-05	measured	0.586	0.557	No Nepheline
NE3-06	measured	0.592	0.534	Nepheline
NE3-07	measured	0.587	0.533	Nepheline
NE3-08	measured	0.603	0.543	Nepheline
NE3-09	measured	0.599	0.527	Nepheline
NE3-10	measured	0.600	0.515	Nepheline
NE3-11	measured	0.604	0.522	Nepheline
NE3-12	measured	0.598	0.525	Nepheline
NE3-13	measured	0.532	0.484	Nepheline
NE3-14	measured	0.565	0.477	Nepheline
NE3-15	measured	0.634	0.539	No Nepheline
NE3-16	measured	0.614	0.560	No Nepheline
NE3-17	measured	0.638	0.530	No Nepheline
NE3-18	measured	0.631	0.541	No Nepheline
NE3-19	measured	0.623	0.558	No Nepheline
NE3-20	measured	0.611	0.526	No Nepheline
NE3-21	measured	0.607	0.528	Nepheline
NE3-22	measured	0.598	0.523	No Nepheline
NE3-23	measured	0.633	0.606	No Nepheline
NE3-24	measured	0.561	0.494	Nepheline
NE3-25	measured	0.574	0.525	Nepheline
NE3-26	measured	0.532	0.460	Nepheline
NE3-27	measured	0.546	0.472	Nepheline
NE3-28	measured	0.570	0.538	Nepheline
NE3-29	measured	0.520	0.491	Nepheline
NE3-01	measured bc	0.609	0.496	Nepheline
NE3-02	measured bc	0.601	0.518	No Nepheline
NE3-03	measured bc	0.601	0.525	Nepheline
NE3-04	measured bc	0.607	0.489	Nepheline
NE3-05	measured bc	0.587	0.554	No Nepheline
NE3-06	measured bc	0.595	0.535	Nepheline
NE3-07	measured bc	0.589	0.534	Nepheline
NE3-08	measured bc	0.604	0.541	Nepheline
NE3-09	measured bc	0.606	0.534	Nepheline
NE3-10	measured bc	0.608	0.521	Nepheline
NE3-11	measured bc	0.604	0.521	Nepheline
NE3-12	measured bc	0.606	0.533	Nepheline

Table 3-6. Nepheline Discriminator Values, Using Both the Current and Alternative Models, for Each of the Study Glasses by Compositional View (continued)

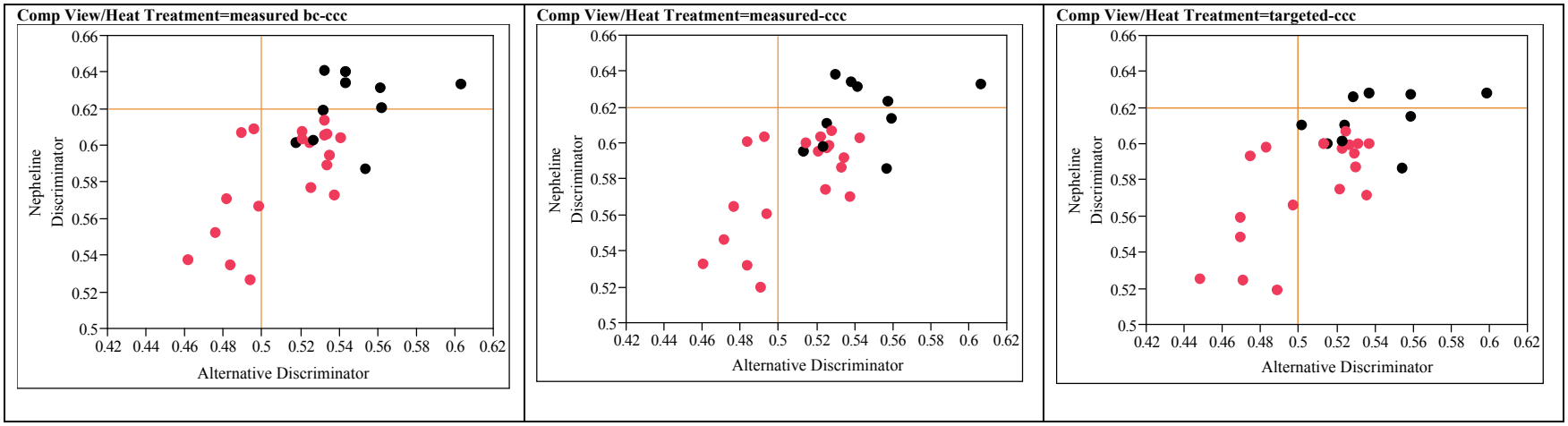
Glass ID	Compositional View	Current Nepheline Discriminator	Alternative Nepheline Discriminator	XRD Results for ccc Glass
NE3-13	measured bc	0.535	0.484	Nepheline
NE3-14	measured bc	0.571	0.482	Nepheline
NE3-15	measured bc	0.640	0.543	No Nepheline
NE3-16	measured bc	0.621	0.562	No Nepheline
NE3-17	measured bc	0.641	0.533	No Nepheline
NE3-18	measured bc	0.634	0.544	No Nepheline
NE3-19	measured bc	0.631	0.561	No Nepheline
NE3-20	measured bc	0.619	0.532	No Nepheline
NE3-21	measured bc	0.614	0.533	Nepheline
NE3-22	measured bc	0.603	0.527	No Nepheline
NE3-23	measured bc	0.633	0.603	No Nepheline
NE3-24	measured bc	0.567	0.499	Nepheline
NE3-25	measured bc	0.577	0.525	Nepheline
NE3-26	measured bc	0.538	0.462	Nepheline
NE3-27	measured bc	0.553	0.476	Nepheline
NE3-28	measured bc	0.573	0.538	Nepheline
NE3-29	measured bc	0.526	0.494	Nepheline
NE3-01	targeted	0.598	0.483	Nepheline
NE3-02	targeted	0.600	0.515	No Nepheline
NE3-03	targeted	0.598	0.523	Nepheline
NE3-04	targeted	0.593	0.475	Nepheline
NE3-05	targeted	0.586	0.554	No Nepheline
NE3-06	targeted	0.594	0.530	Nepheline
NE3-07	targeted	0.587	0.530	Nepheline
NE3-08	targeted	0.600	0.537	Nepheline
NE3-09	targeted	0.600	0.531	Nepheline
NE3-10	targeted	0.600	0.513	Nepheline
NE3-11	targeted	0.600	0.513	Nepheline
NE3-12	targeted	0.599	0.527	Nepheline
NE3-13	targeted	0.524	0.470	Nepheline
NE3-14	targeted	0.559	0.470	Nepheline
NE3-15	targeted	0.626	0.528	No Nepheline
NE3-16	targeted	0.615	0.559	No Nepheline
NE3-17	targeted	0.610	0.502	No Nepheline
NE3-18	targeted	0.628	0.537	No Nepheline
NE3-19	targeted	0.628	0.559	No Nepheline
NE3-20	targeted	0.610	0.524	No Nepheline
NE3-21	targeted	0.607	0.525	Nepheline
NE3-22	targeted	0.601	0.523	No Nepheline
NE3-23	targeted	0.628	0.599	No Nepheline
NE3-24	targeted	0.566	0.497	Nepheline

Table 3-6. Nepheline Discriminator Values, Using Both the Current and Alternative Models, for Each of the Study Glasses by Compositional View (continued)

Glass ID	Compositional View	Current Nepheline Discriminator	Alternative Nepheline Discriminator	XRD Results for ccc Glass
NE3-25	targeted	0.575	0.521	Nepheline
NE3-26	targeted	0.525	0.448	Nepheline
NE3-27	targeted	0.548	0.470	Nepheline
NE3-28	targeted	0.572	0.536	Nepheline
NE3-29	targeted	0.519	0.489	Nepheline

Figure 3-2 provides a series of plots for the two nepheline discriminator models to provide a graphical representation of these data. A review of the table and the plots show that the nepheline discriminator currently being used by the DWPF appears to be a conservative predictor of the formation of nepheline during slow cooling (ccc). None of the ccc glasses that were found to contain nepheline (the red circles in Figure 3-2) fall above the 0.62 line drawn by the current nepheline discriminator. There are, however, a small number of glasses that fall below the 0.62 line that did not crystallize nepheline after the ccc heat treatment (the black circles in Figure 3-2). This continues to point to some conservatism in the current nepheline discriminator model.

Also apparent in Figure 3-2 is the inability of the alternative discriminator to predict the formation of nepheline in several of the study glasses after the ccc heat treatment. Several of the glasses that contained nepheline fall above the 0.50 line drawn by the alternative discriminator. It is possible that the addition of the data collected in this study to the process used to develop this new discriminator[6] may be useful in refining and improving the model.



(● – nepheline present; ● – no nepheline)

Figure 3-2. Plots of the Values for the Nepheline Discriminators for ccc Glasses by Compositional View.

Partitioning of the data using a statistical analysis software package was completed as an additional attempt to identify any compositional trends that might indicate a preference for nepheline crystallization or a glass composition region where the current nepheline discriminator is conservative. Exhibit B11 in Appendix B provides the results of partitioning the data based on nepheline formation after the ccc heat treatment for the study glasses for each compositional view. Only the Al_2O_3, B_2O_3, CaO, Na_2O and SiO_2 components of the glasses were activated in this partitioning, as these oxides were considered to be most influential in the crystallization of nepheline. The results varied somewhat depending on the compositional view and did not provide the opportunity to draw specific conclusions. In general, those glasses with Al_2O_3 concentrations greater than 14.3 to 15.6 wt % were more prone to nepheline crystallization, although several glasses with lesser Al_2O_3 concentrations also formed nepheline. Exhibit B12 in Appendix B provides the results of partitioning the data based on nepheline formation after the ccc heat treatment for all of the major oxides. The results are similar to those in Exhibit B11, in that the first partitioning step occurs at Al_2O_3 concentrations of approximately 15 wt %, but the variation with compositional view makes further trends difficult to identify.

4.0 Summary and Conclusions

The study glasses generally met the target compositions with only minor issues. In particular, problems were identified with some of the oxides for glasses NE3-13 and NE3-17, although these problems had little impact on the outcome of the study. These two glasses should not be included as 'model' data if incorporated into the ComPro database. PCT results correlated well with the XRD analyses in that those glasses that were found to contain nepheline after the ccc heat treatment generally had normalized release values that were greater than their quenched counterparts on a statistically significant basis. Glasses that remained amorphous or contained spinels generally showed similar PCT responses for both their quenched and ccc versions. The glasses that did not contain nepheline had PCT responses that were generally predictable via the ΔG_p models, although a few of the measured values fell above or below the 95% confidence bands of the model. These results were of little concern as the measured NL [B] values for these glasses were all less than 2.0 g/L, regardless of heat treatment or compositional view, which is considerably lower than the EA benchmark.

A main objective of this study was to identify any compositional region where conservatism in the current nepheline discriminator was preventing access to that region that would otherwise be acceptable for DWPF processing by the PCCS models. Four glasses (based on the measured compositions) were identified through this study that met those criteria. However, a review of the individual compositions of these glasses revealed no clear trends that might indicate a driver for suppression of nepheline. Partitioning of the data using a statistical analysis software package gave results that varied somewhat depending on the compositional view and did not provide the opportunity to draw specific conclusions.

Another objective of this study was to evaluate an alternative nepheline discriminator model developed using theory of crystallization in mineral and glass melts. Unfortunately this new model, in its current state, was unsuccessful in predicting nepheline crystallization in the glass compositions studied here.

5.0 Recommendations

The results of this study show that the current nepheline discriminator as implemented at the DWPF continues to work well. Some conservatism was identified in this study; four glasses with values below the 0.62 nepheline discriminator value did not contain nepheline or have statistically significant differences in PCT response after ccc. However, the experimental approach used was

not successful in being able to identify any clear trends to explain this result. No clear compositional relationships were identified that would help locate a specific glass component or compositional region that contributed to conservatism in the current nepheline discriminator. The alternative nepheline discriminator that was investigated as part of this study did not correctly predict glass compositions that were prone to nepheline crystallization. It is recommended that the data collected in this study be incorporated into the new model for further refinement.

A more general recommendation for future work is that studies aimed at identifying the factors responsible for suppression of nepheline crystallization use simplified glass compositions in order to develop a more fundamental understanding of how the structure of a borosilicate glass changes as aluminum and alkali concentrations are varied.

6.0 References

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Appendix A

Tables and Exhibits Supporting the Analysis of the Chemical Composition Measurements of the Study Glasses

Table A1. Targeted Oxide Concentrations (wt %) for the Nepheline Phase III Study Glasses

Glass ID	Al_2O_3 (wt %)	B_2O_3 (wt %)	BaO (wt %)	CaO (wt %)	CdO (wt %)	Ce_2O_3 (wt %)	Cr_2O_3 (wt %)	CuO (wt %)	Fe_2O_3 (wt %)	La_2O_3 (wt %)	Li_2O (wt %)
NE3-01	10.53	4.51	0	4	0	0	0.2	0	9.03	0	4
NE3-02	12.69	7.22	0.08	0	0.3	0.36	0	0.13	8.67	0.1	4
NE3-03	12.86	8.82	0.08	4	0.3	0.36	0.1	0.13	10.9	0.1	4
NE3-04	13.38	4.62	0	0.19	0	0	0	0	11.56	0	4.96
NE3-05	14.51	12.11	0.09	0	0.32	0.39	0.22	0.14	5.39	0.11	5.41
NE3-06	14.38	11.23	0.08	0.01	0.31	0.38	0.05	0.14	15.75	0.1	4.23
NE3-07	14.65	11.51	0	1.46	0	0	0	0	14.85	0	4.22
NE3-08	14.2	8.66	0	3.04	0	0	0	0	7.16	0	6.37
NE3-09	16.08	6.64	0.09	4.42	0.33	0.4	0	0.14	5.76	0.11	4.71
NE3-10	14.7	7.43	0.08	0.99	0.3	0.36	0	0.13	11.79	0.1	4.36
NE3-11	16.18	7.07	0	0	0	0	0.22	0	13.08	0	7.2
NE3-12	17.02	7.86	0	0.92	0	0	0.2	0	9.14	0	4.1
NE3-13	17.19	7.87	0.06	0	0.21	0.25	0.15	0.09	5	0.07	4.88
NE3-14	18	5.3	0.08	4	0.3	0.36	0	0.13	11.94	0.1	7
NE3-15	10.71	6.35	0.05	0.06	0.17	0.21	0.2	0.07	6.91	0.06	4.99
NE3-16	11.68	9.84	0.07	4.18	0.25	0.3	0.16	0.11	7.07	0.08	4.64
NE3-17	11.58	5.43	0.08	3.79	0.29	0.35	0.13	0.13	10.34	0.1	4.38
NE3-18	11.93	5.53	0.05	3.69	0.18	0.22	0.08	0.08	5.47	0.06	5.92
NE3-19	12.3	9.12	0.01	3.86	0.03	0.04	0.12	0.01	7.64	0.01	5.19
NE3-20	13.21	6.3	0.02	0.3	0.06	0.07	0.13	0.02	5.17	0.02	5.69
NE3-21	13.63	5.28	0.07	3.36	0.25	0.31	0.05	0.11	5.6	0.08	7.31
NE3-22	14.36	7.86	0	1.15	0.01	0.01	0.14	0.01	10.15	0	4.58
NE3-23	14.15	11.82	0.05	3.97	0.17	0.2	0.12	0.07	5.45	0.05	5.18
NE3-24	14.68	7.37	0.05	4.07	0.19	0.23	0.01	0.08	5.96	0.06	5.14
NE3-25	17.13	7.32	0.06	3.42	0.22	0.26	0.13	0.09	5.57	0.07	7.09
NE3-26	17.96	5.89	0.01	1.37	0.02	0.03	0.21	0.01	7.88	0.01	5.11
NE3-27	18.31	5.11	0.06	2.32	0.22	0.26	0.01	0.09	6.84	0.07	5.55
NE3-28	17.75	10.31	0.06	0.02	0.24	0.29	0.11	0.1	5.69	0.08	4.81
NE3-29	18.01	10.38	0	3.04	0	0.01	0.06	0	8.19	0	4.29

Table A1. Targeted Oxide Concentrations (wt%) for the Nepheline Phase III Study Glasses (continued)

Glass ID	MgO (wt %)	MnO (wt %)	Na_2O (wt %)	NiO (wt %)	PbO (wt %)	SiO_2 (wt %)	SO_4^{2-} (wt %)	TiO_2 (wt %)	ZnO (wt %)	ZrO_2 (wt %)
NE3-01	1.5	3.5	17.34	1.88	0	41.51	0	2	0	0
NE3-02	0	5.5	15.56	0	0.22	42.37	0.48	2	0.14	0.21
NE3-03	0	3.45	13.69	0.46	0.22	39.43	0.48	0.28	0.14	0.21
NE3-04	0	0.31	18.48	0	0	46.51	0	0	0	0
NE3-05	1.62	0.32	15.27	0	0.23	42.19	0.52	0.8	0.15	0.22
NE3-06	0.12	0.69	11.24	0.51	0.23	37.56	0.51	2.12	0.14	0.22
NE3-07	0.32	2.66	11.32	0	0	36.98	0	2.03	0	0
NE3-08	0.9	0.69	14.04	2.39	0	42.36	0	0.18	0	0
NE3-09	0	0.33	13.19	2.76	0.24	43.9	0.53	0	0.15	0.23
NE3-10	1.51	1.99	13.26	0	0.22	41.95	0.48	0	0.14	0.21
NE3-11	0	3.98	11.01	0.46	0	40.79	0	0	0	0
NE3-12	0	0.64	13.53	0.41	0	45.67	0	0.52	0	0
NE3-13	0	4.38	18	2.36	0.15	38.77	0.34	0	0.09	0.14
NE3-14	0	0.3	11.73	0	0.22	37.73	0.48	2	0.13	0.2
NE3-15	0.53	1.42	17.71	2.33	0.12	47.5	0.27	0.14	0.08	0.12
NE3-16	0.2	4.74	13.35	0.67	0.18	39.97	0.4	1.83	0.11	0.17
NE3-17	0.37	1.5	15.25	1.51	0.21	42.01	0.47	1.75	0.13	0.2
NE3-18	1.34	0.44	15.34	2.21	0.13	46.09	0.29	0.75	0.08	0.13
NE3-19	0.85	0.93	14.01	0.58	0.02	44.35	0.05	0.84	0.01	0.02
NE3-20	0.18	1.48	17.76	0	0.04	48.47	0.09	0.94	0.03	0.04
NE3-21	0.94	5.59	13.05	0.79	0.18	41.17	0.41	1.5	0.11	0.17
NE3-22	0.06	3.51	13.51	0.92	0.01	42.06	0.02	1.62	0.01	0.01
NE3-23	0.29	3.73	11.09	0.03	0.12	42.64	0.27	0.4	0.08	0.12
NE3-24	1.19	0.47	16.78	1.59	0.14	40.99	0.31	0.46	0.09	0.13
NE3-25	0.83	3.26	12.2	0.49	0.16	39.68	0.35	1.41	0.1	0.15
NE3-26	0.32	3.79	16.98	1.05	0.02	38.63	0.04	0.64	0.01	0.02
NE3-27	1.37	2.12	14.65	1.3	0.16	39.98	0.35	0.96	0.1	0.15
NE3-28	0.52	2.05	13.79	1.21	0.18	42.09	0.39	0.05	0.11	0.17
NE3-29	0.76	4.69	14.48	0.53	0	35.1	0.01	0.44	0	0

Table A2. Measured Elemental Concentrations (wt %) for the Study Glasses Prepared Using Lithium Metaborate (part 1)

Glass ID	Block	Sub-Block	Sequence	Lab ID	Ba (wt %)	Cd (wt %)	Ce (wt %)	Cr (wt %)	Cu (wt %)	La (wt %)	Mg (wt %)
Batch 1	1	1	1	BCHLM111	0.126	<0.010	<0.010	0.074	0.304	<0.010	0.821
NE3-01	1	1	2	y16LM21	<0.010	<0.010	<0.010	0.113	<0.010	<0.010	0.832
NE3-15	1	1	3	y11LM11	0.038	0.129	0.169	0.123	0.061	0.041	0.331
NE3-05	1	1	4	y02LM21	0.072	0.237	0.323	0.133	0.110	0.083	0.935
NE3-03	1	1	5	y06LM21	0.065	0.221	0.304	0.064	0.104	0.075	<0.010
NE3-01	1	1	6	y16LM11	<0.010	<0.010	<0.010	0.116	<0.010	<0.010	0.848
NE3-18	1	1	7	y12LM21	0.039	0.130	0.177	0.047	0.065	0.044	0.760
NE3-17	1	1	8	y15LM21	0.053	0.173	0.126	0.079	0.083	0.059	0.107
NE3-18	1	1	9	y12LM11	0.039	0.131	0.181	0.048	0.066	0.045	0.769
Batch 1	1	1	10	BCHLM112	0.125	<0.010	<0.010	0.074	0.311	<0.010	0.812
NE3-03	1	1	11	y06LM11	0.064	0.219	0.308	0.063	0.105	0.076	<0.010
NE3-05	1	1	12	y02LM11	0.071	0.231	0.325	0.132	0.111	0.083	0.924
NE3-11	1	1	13	y28LM11	<0.010	<0.010	<0.010	0.092	<0.010	<0.010	<0.010
NE3-11	1	1	14	y28LM21	<0.010	<0.010	<0.010	0.092	<0.010	<0.010	<0.010
NE3-08	1	1	15	y26LM21	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.524
NE3-17	1	1	16	y15LM11	0.052	0.170	0.123	0.078	0.084	0.059	0.109
NE3-08	1	1	17	y26LM11	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.522
NE3-15	1	1	18	y11LM21	0.039	0.124	0.170	0.120	0.061	0.042	0.322
Batch 1	1	1	19	BCHLM113	0.124	<0.010	<0.010	0.074	0.313	<0.010	0.804
Batch 1	1	2	1	BCHLM121	0.126	<0.010	<0.010	0.075	0.308	<0.010	0.810
NE3-18	1	2	2	y12LM12	0.042	0.133	0.179	0.049	0.065	0.044	0.774
NE3-08	1	2	3	y26LM12	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.527
NE3-03	1	2	4	y06LM22	0.066	0.219	0.302	0.063	0.103	0.074	<0.010
NE3-05	1	2	5	y02LM22	0.074	0.237	0.322	0.133	0.109	0.082	0.934
NE3-15	1	2	6	y11LM22	0.041	0.126	0.170	0.121	0.060	0.041	0.327
NE3-15	1	2	7	y11LM12	0.040	0.128	0.170	0.123	0.060	0.041	0.331
NE3-11	1	2	8	y28LM22	<0.010	<0.010	<0.010	0.093	<0.010	<0.010	<0.010
NE3-18	1	2	9	y12LM22	0.041	0.129	0.177	0.047	0.064	0.043	0.757
Batch 1	1	2	10	BCHLM122	0.127	<0.010	<0.010	0.075	0.310	<0.010	0.813
NE3-03	1	2	11	y06LM12	0.067	0.221	0.312	0.064	0.106	0.076	<0.010
NE3-08	1	2	12	y26LM22	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.524
NE3-11	1	2	13	y28LM12	<0.010	<0.010	<0.010	0.092	<0.010	<0.010	<0.010
NE3-01	1	2	14	y16LM22	<0.010	<0.010	<0.010	0.111	<0.010	<0.010	0.813
NE3-01	1	2	15	y16LM12	<0.010	<0.010	<0.010	0.114	<0.010	<0.010	0.843
NE3-05	1	2	16	y02LM12	0.073	0.230	0.325	0.132	0.110	0.083	0.923
NE3-17	1	2	17	y15LM12	0.053	0.169	0.123	0.078	0.083	0.058	0.110
NE3-17	1	2	18	y15LM22	0.054	0.170	0.127	0.079	0.083	0.058	0.107
Batch 1	1	2	19	BCHLM123	0.124	<0.010	<0.010	0.074	0.310	<0.010	0.815
Batch 1	2	1	1	BCHLM211	0.127	<0.010	<0.010	0.074	0.309	<0.010	0.814
NE3-23	2	1	2	y29LM21	0.040	0.118	0.167	0.077	0.056	0.041	0.170
NE3-23	2	1	3	y29LM11	0.041	0.121	0.170	0.078	0.057	0.042	0.173
NE3-26	2	1	4	y09LM11	<0.010	0.013	0.020	0.117	0.011	<0.010	0.195
NE3-14	2	1	5	y14LM21	0.066	0.213	0.288	0.014	0.100	0.072	0.024
NE3-26	2	1	6	y09LM21	<0.010	0.013	0.020	0.117	0.011	<0.010	0.194
NE3-29	2	1	7	y13LM21	<0.010	<0.010	<0.010	0.039	<0.010	<0.010	0.442
NE3-04	2	1	8	y05LM21	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Batch 1	2	1	9	BCHLM212	0.126	<0.010	<0.010	0.074	0.309	<0.010	0.806
NE3-29	2	1	10	y13LM11	<0.010	<0.010	<0.010	0.041	<0.010	<0.010	0.451
NE3-14	2	1	11	y14LM11	0.065	0.206	0.285	0.015	0.099	0.071	0.029
NE3-07	2	1	12	y04LM11	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.191
NE3-06	2	1	13	y17LM11	0.069	0.217	0.302	0.018	0.103	0.075	0.032
NE3-07	2	1	14	y04LM21	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.188
NE3-04	2	1	15	y05LM11	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
NE3-06	2	1	16	y17LM21	0.071	0.224	0.310	0.018	0.107	0.078	0.032
Batch 1	2	1	17	BCHLM213	0.126	<0.010	<0.010	0.074	0.306	<0.010	0.807
Batch 1	2	2	1	BCHLM221	0.125	<0.010	<0.010	0.073	0.309	<0.010	0.811
NE3-04	2	2	2	y05LM12	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
NE3-14	2	2	3	y14LM22	0.065	0.213	0.286	0.013	0.100	0.072	0.022
NE3-23	2	2	4	y29LM12	0.039	0.120	0.169	0.077	0.058	0.042	0.173
NE3-06	2	2	5	y17LM12	0.068	0.220	0.297	0.018	0.103	0.074	0.031
NE3-07	2	2	6	y04LM22	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.189
NE3-26	2	2	7	y09LM12	<0.010	0.012	0.021	0.117	0.012	<0.010	0.194
NE3-23	2	2	8	y29LM22	0.038	0.118	0.165	0.076	0.056	0.041	0.169
Batch 1	2	2	9	BCHLM222	0.126	<0.010	<0.010	0.074	0.306	<0.010	0.819
NE3-06	2	2	10	y17LM22	0.070	0.225	0.307	0.018	0.106	0.077	0.031
NE3-26	2	2	11	y09LM22	<0.010	0.012	0.021	0.117	0.012	<0.010	0.194
NE3-14	2	2	12	y14LM12	0.063	0.205	0.283	0.014	0.100	0.070	0.028
NE3-04	2	2	13	y05LM22	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
NE3-07	2	2	14	y04LM12	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.190
NE3-29	2	2	15	y13LM12	<0.010	<0.010	<0.010	0.039	<0.010	<0.010	0.452
NE3-29	2	2	16	y13LM22	<0.010	<0.010	<0.010	0.039	<0.010	<0.010	0.441

Table A2. Measured Elemental Concentrations (wt %) for the Study Glasses Prepared Using Lithium Metaborate (part 1, continued)

Glass ID	Block	Sub-Block	Sequence	Lab ID	Ba (wt %)	Cd (wt %)	Ce (wt %)	Cr (wt %)	Cu (wt %)	La (wt %)	Mg (wt %)
Batch 1	2	2	17	BCHLM223	0.125	<0.010	<0.010	0.073	0.308	<0.010	0.811
Batch 1	3	1	1	BCHLM311	0.126	<0.010	<0.010	0.074	0.307	<0.010	0.815
NE3-09	3	1	2	y25LM11	0.070	0.249	0.328	<0.010	0.111	0.083	<0.010
NE3-27	3	1	3	y01LM11	0.048	0.154	0.218	0.011	0.078	0.053	0.784
NE3-27	3	1	4	y01LM21	0.048	0.153	0.219	0.011	0.079	0.053	0.788
NE3-13	3	1	5	y19LM11	0.058	0.185	0.140	0.086	0.091	0.064	0.113
NE3-22	3	1	6	y10LM21	<0.010	<0.010	0.013	0.074	<0.010	<0.010	0.030
NE3-21	3	1	7	y23LM21	0.054	0.180	0.252	0.037	0.089	0.063	0.539
NE3-22	3	1	8	y10LM11	<0.010	<0.010	0.012	0.075	<0.010	<0.010	0.029
Batch 1	3	1	9	BCHLM312	0.124	<0.010	<0.010	0.073	0.314	<0.010	0.800
NE3-10	3	1	10	y20LM11	0.068	0.221	0.303	0.011	0.106	0.077	0.860
NE3-13	3	1	11	y19LM21	0.056	0.180	0.144	0.084	0.089	0.063	0.102
NE3-09	3	1	12	y25LM21	0.069	0.242	0.333	<0.010	0.115	0.083	<0.010
NE3-21	3	1	13	y23LM11	0.055	0.180	0.258	0.037	0.092	0.064	0.548
NE3-10	3	1	14	y20LM21	0.067	0.217	0.305	0.011	0.107	0.077	0.850
NE3-16	3	1	15	y07LM11	0.054	0.171	0.252	0.090	0.093	0.059	0.117
NE3-16	3	1	16	y07LM21	0.052	0.165	0.249	0.087	0.093	0.058	0.112
Batch 1	3	1	17	BCHLM313	0.123	<0.010	<0.010	0.071	0.323	<0.010	0.788
Batch 1	3	2	1	BCHLM321	0.126	<0.010	<0.010	0.075	0.305	<0.010	0.817
NE3-22	3	2	2	y10LM12	<0.010	<0.010	0.010	0.076	<0.010	<0.010	0.030
NE3-09	3	2	3	y25LM22	0.069	0.250	0.328	<0.010	0.110	0.083	<0.010
NE3-22	3	2	4	y10LM22	<0.010	<0.010	0.011	0.076	<0.010	<0.010	0.030
NE3-21	3	2	5	y23LM12	0.054	0.186	0.251	0.039	0.086	0.064	0.563
NE3-21	3	2	6	y23LM22	0.053	0.181	0.248	0.038	0.087	0.063	0.550
NE3-27	3	2	7	y01LM22	0.046	0.154	0.215	0.011	0.076	0.053	0.782
NE3-09	3	2	8	y25LM12	0.069	0.250	0.326	<0.010	0.109	0.083	<0.010
Batch 1	3	2	9	BCHLM322	0.125	<0.010	<0.010	0.074	0.305	<0.010	0.813
NE3-13	3	2	10	y19LM12	0.056	0.186	0.138	0.086	0.089	0.064	0.113
NE3-16	3	2	11	y07LM12	0.053	0.175	0.247	0.092	0.089	0.058	0.118
NE3-10	3	2	12	y20LM22	0.067	0.220	0.300	0.012	0.102	0.076	0.871
NE3-16	3	2	13	y07LM22	0.052	0.172	0.240	0.089	0.086	0.057	0.116
NE3-27	3	2	14	y01LM12	0.046	0.153	0.214	0.011	0.075	0.053	0.783
NE3-10	3	2	15	y20LM12	0.067	0.223	0.298	0.011	0.101	0.076	0.860
NE3-13	3	2	16	y19LM22	0.055	0.181	0.141	0.085	0.085	0.062	0.103
Batch 1	3	2	17	BCHLM323	0.125	<0.010	<0.010	0.074	0.305	<0.010	0.799
Batch 1	4	1	1	BCHLM411	0.124	<0.010	<0.010	0.073	0.312	<0.010	0.809
NE3-20	4	1	2	y21LM21	0.014	0.036	0.058	0.082	0.026	0.013	0.103
NE3-02	4	1	3	y24LM21	0.062	0.212	0.299	<0.010	0.105	0.075	<0.010
NE3-02	4	1	4	y24LM11	0.062	0.212	0.298	<0.010	0.104	0.075	<0.010
NE3-12	4	1	5	y27LM11	<0.010	<0.010	<0.010	0.098	0.004	<0.010	<0.010
NE3-25	4	1	6	y22LM21	0.047	0.158	0.213	0.075	0.073	0.053	0.488
NE3-24	4	1	7	y18LM21	0.041	0.136	0.187	0.014	0.066	0.045	0.679
NE3-28	4	1	8	y03LM11	0.052	0.164	0.233	0.050	0.081	0.057	0.295
Batch 1	4	1	9	BCHLM412	0.125	<0.010	<0.010	0.074	0.311	<0.010	0.811
NE3-12	4	1	10	y27LM21	<0.010	<0.010	<0.010	0.097	<0.010	<0.010	<0.010
NE3-24	4	1	11	y18LM11	0.042	0.138	0.190	0.014	0.067	0.046	0.694
NE3-19	4	1	12	y08LM21	<0.010	0.018	0.029	0.075	0.014	<0.010	0.506
NE3-20	4	1	13	y21LM11	0.014	0.035	0.058	0.081	0.027	0.013	0.100
NE3-19	4	1	14	y08LM11	<0.010	0.017	0.029	0.075	0.014	<0.010	0.504
NE3-25	4	1	15	y22LM11	0.047	0.156	0.216	0.074	0.074	0.053	0.480
NE3-28	4	1	16	y03LM21	0.052	0.162	0.235	0.049	0.082	0.057	0.292
Batch 1	4	1	17	BCHLM413	0.124	<0.010	<0.010	0.073	0.304	<0.010	0.811
Batch 1	4	2	1	BCHLM421	0.125	<0.010	<0.010	0.074	0.308	<0.010	0.812
NE3-28	4	2	2	y03LM22	0.051	0.166	0.231	0.050	0.080	0.057	0.297
NE3-24	4	2	3	y18LM22	0.039	0.135	0.186	0.014	0.065	0.045	0.680
NE3-12	4	2	4	y27LM22	<0.010	<0.010	<0.010	0.097	<0.010	<0.010	<0.010
NE3-20	4	2	5	y21LM22	0.012	0.036	0.059	0.081	0.027	0.013	0.102
NE3-20	4	2	6	y21LM12	0.012	0.035	0.058	0.080	0.026	0.013	0.101
NE3-02	4	2	7	y24LM12	0.060	0.210	0.296	<0.010	0.103	0.075	<0.010
NE3-12	4	2	8	y27LM12	<0.010	<0.010	<0.010	0.097	<0.010	<0.010	<0.010
Batch 1	4	2	9	BCHLM422	0.124	<0.010	<0.010	0.073	0.310	<0.010	0.796
NE3-24	4	2	10	y18LM12	0.039	0.132	0.193	0.014	0.070	0.046	0.676
NE3-19	4	2	11	y08LM12	<0.010	0.017	0.030	0.075	0.015	<0.010	0.496
NE3-25	4	2	12	y22LM22	0.045	0.154	0.215	0.074	0.075	0.053	0.478
NE3-19	4	2	13	y08LM22	<0.010	0.017	0.029	0.075	0.015	<0.010	0.504
NE3-25	4	2	14	y22LM12	0.045	0.154	0.214	0.074	0.074	0.053	0.478
NE3-28	4	2	15	y03LM12	0.051	0.162	0.233	0.049	0.082	0.057	0.293
NE3-02	4	2	16	y24LM22	0.060	0.208	0.298	<0.010	0.106	0.075	<0.010
Batch 1	4	2	17	BCHLM423	0.122	<0.010	<0.010	0.072	0.310	<0.010	0.801

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

Glass ID	Block	Sub-Block	Sequence	Lab ID	Na (wt %)	Ni (wt %)	Pb (wt %)	S (wt %)	Ti (wt %)	Zn (wt %)	Zr (wt %)
Batch 1	1	1	1	BCHLM111	6.58	0.550	<0.010	<0.050	0.388	<0.010	0.067
NE3-01	1	1	2	y16LM21	11.8	1.27	<0.010	<0.050	1.12	<0.010	<0.010
NE3-15	1	1	3	y11LM11	12.2	1.64	0.100	0.087	0.091	0.066	0.088
NE3-05	1	1	4	y02LM21	11.0	<0.010	0.194	0.159	0.462	0.115	0.162
NE3-03	1	1	5	y06LM21	9.92	0.331	0.182	0.161	0.171	0.107	0.153
NE3-01	1	1	6	y16LM11	11.9	1.30	<0.010	<0.050	1.14	<0.010	<0.010
NE3-18	1	1	7	y12LM21	10.8	1.53	0.108	0.087	0.432	0.067	0.092
NE3-17	1	1	8	y15LM21	10.9	1.17	0.146	0.127	0.496	0.087	0.116
NE3-18	1	1	9	y12LM11	10.9	1.53	0.109	0.094	0.439	0.068	0.094
Batch 1	1	1	10	BCHLM112	6.48	0.541	<0.010	<0.050	0.393	<0.010	0.067
NE3-03	1	1	11	y06LM11	10.3	0.334	0.181	0.156	0.173	0.107	0.155
NE3-05	1	1	12	y02LM11	11.0	<0.010	0.191	0.159	0.468	0.114	0.164
NE3-11	1	1	13	y28LM11	7.85	0.315	<0.010	<0.050	<0.010	<0.010	<0.010
NE3-11	1	1	14	y28LM21	7.86	0.315	<0.010	<0.050	<0.010	<0.010	<0.010
NE3-08	1	1	15	y26LM21	9.96	1.67	<0.010	0.050	0.114	<0.010	<0.010
NE3-17	1	1	16	y15LM11	10.6	1.15	0.142	0.127	0.504	0.086	0.116
NE3-08	1	1	17	y26LM11	9.90	1.67	<0.010	<0.050	0.115	<0.010	<0.010
NE3-15	1	1	18	y11LM21	12.0	1.59	0.098	0.091	0.090	0.064	0.087
Batch 1	1	1	19	BCHLM113	6.33	0.539	<0.010	<0.050	0.386	<0.010	0.067
Batch 1	1	2	1	BCHLM121	6.62	0.549	<0.010	<0.050	0.400	<0.010	0.067
NE3-18	1	2	2	y12LM12	11.2	1.55	0.109	0.092	0.439	0.068	0.094
NE3-08	1	2	3	y26LM12	10.3	1.69	<0.010	<0.050	0.115	<0.010	<0.010
NE3-03	1	2	4	y06LM22	10.0	0.331	0.178	0.152	0.170	0.106	0.152
NE3-05	1	2	5	y02LM22	11.2	<0.010	0.193	0.153	0.469	0.115	0.162
NE3-15	1	2	6	y11LM22	12.3	1.63	0.099	0.090	0.089	0.065	0.088
NE3-15	1	2	7	y11LM12	12.6	1.64	0.101	0.090	0.090	0.066	0.088
NE3-11	1	2	8	y28LM22	8.06	0.320	<0.010	<0.050	<0.010	<0.010	<0.010
NE3-18	1	2	9	y12LM22	10.9	1.52	0.108	0.091	0.436	0.067	0.092
Batch 1	1	2	10	BCHLM122	6.60	0.553	<0.010	<0.050	0.403	<0.010	0.067
NE3-03	1	2	11	y06LM12	10.2	0.336	0.181	0.160	0.176	0.108	0.156
NE3-08	1	2	12	y26LM22	10.4	1.66	<0.010	<0.050	0.113	<0.010	<0.010
NE3-11	1	2	13	y28LM12	8.10	0.315	<0.010	<0.050	<0.010	<0.010	<0.010
NE3-01	1	2	14	y16LM22	12.1	1.26	<0.010	<0.050	1.14	<0.010	<0.010
NE3-01	1	2	15	y16LM12	12.2	1.30	<0.010	<0.050	1.18	<0.010	<0.010
NE3-05	1	2	16	y02LM12	11.1	<0.010	0.190	0.158	0.478	0.113	0.164
NE3-17	1	2	17	y15LM12	11.0	1.16	0.143	0.126	0.515	0.086	0.117
NE3-17	1	2	18	y15LM22	11.1	1.18	0.142	0.126	0.494	0.086	0.117
Batch 1	1	2	19	BCHLM123	6.53	0.543	<0.010	<0.050	0.389	<0.010	0.067
Batch 1	2	1	1	BCHLM211	6.56	0.548	<0.010	<0.050	0.397	<0.010	0.067
NE3-23	2	1	2	y29LM21	7.84	0.021	0.099	0.097	0.233	0.055	0.084
NE3-23	2	1	3	y29LM11	7.94	0.021	0.102	0.102	0.238	0.056	0.086
NE3-26	2	1	4	y09LM11	12.1	0.741	0.016	<0.050	0.377	<0.010	0.014
NE3-14	2	1	5	y14LM21	8.32	<0.010	0.174	0.137	1.09	0.099	0.150
NE3-26	2	1	6	y09LM21	12.3	0.739	0.016	<0.050	0.377	<0.010	0.014
NE3-29	2	1	7	y13LM21	10.3	0.354	<0.010	<0.050	0.259	<0.010	0.011
NE3-04	2	1	8	y05LM21	12.9	<0.010	<0.010	<0.050	<0.010	<0.010	<0.010
Batch 1	2	1	9	BCHLM212	6.64	0.547	<0.010	<0.050	0.397	<0.010	0.067
NE3-29	2	1	10	y13LM11	10.5	0.362	<0.010	<0.050	0.265	<0.010	0.011
NE3-14	2	1	11	y14LM11	8.13	<0.010	0.170	0.137	1.06	0.096	0.146
NE3-07	2	1	12	y04LM11	8.39	<0.010	<0.010	<0.050	1.16	<0.010	<0.010
NE3-06	2	1	13	y17LM11	8.37	<0.010	0.178	0.146	1.16	0.105	0.148
NE3-07	2	1	14	y04LM21	8.29	<0.010	<0.010	<0.050	1.16	<0.010	<0.010
NE3-04	2	1	15	y05LM11	12.8	<0.010	<0.010	<0.050	<0.010	<0.010	<0.010
NE3-06	2	1	16	y17LM21	8.78	<0.010	0.183	0.141	1.21	0.108	0.153
Batch 1	2	1	17	BCHLM213	6.68	0.547	<0.010	<0.050	0.394	<0.010	0.067
Batch 1	2	2	1	BCHLM221	6.50	0.544	<0.010	<0.050	0.383	<0.010	0.067
NE3-04	2	2	2	y05LM12	12.6	<0.010	<0.010	<0.050	<0.010	<0.010	<0.010
NE3-14	2	2	3	y14LM22	8.15	<0.010	0.175	0.142	1.06	0.099	0.148
NE3-23	2	2	4	y29LM12	7.85	0.020	0.101	0.099	0.234	0.056	0.085
NE3-06	2	2	5	y17LM12	8.12	<0.010	0.180	0.144	1.12	0.105	0.145
NE3-07	2	2	6	y04LM22	8.04	<0.010	<0.010	<0.050	1.12	<0.010	<0.010
NE3-26	2	2	7	y09LM12	11.9	0.729	0.017	<0.050	0.364	<0.010	0.014
NE3-23	2	2	8	y29LM22	7.68	0.020	0.101	0.098	0.230	0.055	0.083
Batch 1	2	2	9	BCHLM222	6.39	0.542	<0.010	<0.050	0.386	<0.010	0.067
NE3-06	2	2	10	y17LM22	8.38	<0.010	0.185	0.146	1.16	0.108	0.151
NE3-26	2	2	11	y09LM22	12.0	0.729	0.016	<0.050	0.367	<0.010	0.015
NE3-14	2	2	12	y14LM12	7.92	<0.010	0.170	0.133	1.02	0.095	0.145
NE3-04	2	2	13	y05LM22	12.5	<0.010	<0.010	<0.050	<0.010	<0.010	<0.010
NE3-07	2	2	14	y04LM12	8.16	<0.010	<0.010	<0.050	1.13	<0.010	<0.010
NE3-29	2	2	15	y13LM12	10.5	0.356	<0.010	<0.050	0.259	<0.010	0.011
NE3-29	2	2	16	y13LM22	10.1	0.349	<0.010	<0.050	0.256	<0.010	0.012

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

Glass ID	Block	Sub-Block	Sequence	Lab ID	Na (wt %)	Ni (wt %)	Pb (wt %)	S (wt %)	Ti (wt %)	Zn (wt %)	Zr (wt %)
Batch 1	2	2	17	BCHLM223	6.40	0.540	<0.010	<0.050	0.386	<0.010	0.067
Batch 1	3	1	1	BCHLM311	6.56	0.547	<0.010	<0.050	0.391	<0.010	0.067
NE3-09	3	1	2	y25LM11	9.45	1.60	0.202	0.156	<0.010	0.123	0.164
NE3-27	3	1	3	y01LM11	10.6	0.828	0.134	0.114	0.560	0.081	0.112
NE3-27	3	1	4	y01LM21	10.4	0.824	0.134	0.116	0.555	0.081	0.113
NE3-13	3	1	5	y19LM11	11.9	1.27	0.155	0.131	0.527	0.094	0.125
NE3-22	3	1	6	y10LM21	9.84	0.624	0.011	<0.050	0.930	<0.010	0.011
NE3-21	3	1	7	y23LM21	9.10	0.552	0.147	0.132	0.842	0.089	0.127
NE3-22	3	1	8	y10LM11	9.72	0.630	0.010	<0.050	0.919	<0.010	0.010
Batch 1	3	1	9	BCHLM312	6.54	0.541	<0.010	<0.050	0.388	<0.010	0.067
NE3-10	3	1	10	y20LM11	9.55	<0.010	0.181	0.150	<0.010	0.106	0.144
NE3-13	3	1	11	y19LM21	11.8	1.26	0.149	0.127	0.485	0.091	0.122
NE3-09	3	1	12	y25LM21	9.40	1.58	0.197	0.163	<0.010	0.123	0.166
NE3-21	3	1	13	y23LM11	9.37	0.557	0.148	0.135	0.862	0.090	0.130
NE3-10	3	1	14	y20LM21	9.33	<0.010	0.179	0.148	<0.010	0.106	0.146
NE3-16	3	1	15	y07LM11	9.46	0.465	0.144	0.127	1.04	0.088	0.125
NE3-16	3	1	16	y07LM21	9.28	0.451	0.140	0.124	1.03	0.086	0.123
Batch 1	3	1	17	BCHLM313	6.41	0.533	<0.010	<0.050	0.393	<0.010	0.069
Batch 1	3	2	1	BCHLM321	6.64	0.549	<0.010	<0.050	0.388	<0.010	0.067
NE3-22	3	2	2	y10LM12	10.2	0.639	0.010	<0.050	0.939	<0.010	0.010
NE3-09	3	2	3	y25LM22	9.87	1.60	0.203	0.163	<0.010	0.125	0.164
NE3-22	3	2	4	y10LM22	10.3	0.630	0.011	<0.050	0.922	<0.010	0.011
NE3-21	3	2	5	y23LM12	9.94	0.564	0.151	0.137	0.847	0.090	0.127
NE3-21	3	2	6	y23LM22	9.69	0.552	0.148	0.130	0.843	0.089	0.126
NE3-27	3	2	7	y01LM22	11.0	0.821	0.133	0.112	0.555	0.081	0.112
NE3-09	3	2	8	y25LM12	9.89	1.60	0.202	0.162	<0.010	0.124	0.164
Batch 1	3	2	9	BCHLM322	6.86	0.544	<0.010	<0.050	0.392	<0.010	0.067
NE3-13	3	2	10	y19LM12	12.3	1.26	0.155	0.126	0.518	0.094	0.123
NE3-16	3	2	11	y07LM12	10.0	0.468	0.144	0.124	1.04	0.089	0.123
NE3-10	3	2	12	y20LM22	9.94	<0.010	0.181	0.146	<0.010	0.106	0.144
NE3-16	3	2	13	y07LM22	9.64	0.459	0.141	0.121	1.01	0.087	0.120
NE3-27	3	2	14	y01LM12	11.0	0.820	0.132	0.112	0.549	0.080	0.112
NE3-10	3	2	15	y20LM12	10.1	<0.010	0.184	0.152	<0.010	0.106	0.142
NE3-13	3	2	16	y19LM22	12.3	1.27	0.150	0.128	0.476	0.091	0.120
Batch 1	3	2	17	BCHLM323	6.76	0.542	<0.010	<0.050	0.389	<0.010	0.067
Batch 1	4	1	1	BCHLM411	6.62	0.546	<0.010	<0.050	0.401	<0.010	0.067
NE3-20	4	1	2	y21LM21	13.1	<0.010	0.030	0.050	0.546	0.016	0.035
NE3-02	4	1	3	y24LM21	11.4	<0.010	0.179	0.149	1.13	0.106	0.151
NE3-02	4	1	4	y24LM11	11.5	<0.010	0.179	0.155	1.12	0.106	0.150
NE3-12	4	1	5	y27LM11	10.2	0.297	<0.010	<0.050	0.310	<0.010	<0.010
NE3-25	4	1	6	y22LM21	9.22	0.342	0.126	0.112	0.797	0.071	0.106
NE3-24	4	1	7	y18LM21	12.5	1.10	0.112	0.097	0.269	0.066	0.089
NE3-28	4	1	8	y03LM11	10.2	0.765	0.135	0.121	0.031	0.083	0.125
Batch 1	4	1	9	BCHLM412	6.84	0.544	<0.010	<0.050	0.395	<0.010	0.068
NE3-12	4	1	10	y27LM21	10.4	0.291	<0.010	<0.050	0.313	<0.010	<0.010
NE3-24	4	1	11	y18LM11	12.9	1.12	0.113	0.097	0.276	0.067	0.090
NE3-19	4	1	12	y08LM21	10.7	0.412	0.021	<0.050	0.489	<0.010	0.018
NE3-20	4	1	13	y21LM11	13.2	<0.010	0.028	<0.050	0.549	0.016	0.035
NE3-19	4	1	14	y08LM11	10.6	0.410	0.021	<0.050	0.482	0.010	0.018
NE3-25	4	1	15	y22LM11	9.37	0.338	0.125	0.112	0.808	0.071	0.106
NE3-28	4	1	16	y03LM21	10.4	0.752	0.135	0.123	0.031	0.083	0.125
Batch 1	4	1	17	BCHLM413	7.02	0.544	<0.010	<0.050	0.391	<0.010	0.067
Batch 1	4	2	1	BCHLM421	6.46	0.548	<0.010	<0.050	0.397	<0.010	0.067
NE3-28	4	2	2	y03LM22	9.63	0.767	0.137	0.123	0.031	0.083	0.123
NE3-24	4	2	3	y18LM22	12.0	1.10	0.111	0.092	0.268	0.065	0.088
NE3-12	4	2	4	y27LM22	9.93	0.295	<0.010	<0.050	0.313	<0.010	<0.010
NE3-20	4	2	5	y21LM22	13.0	<0.010	0.030	0.054	0.542	0.015	0.035
NE3-20	4	2	6	y21LM12	12.7	<0.010	0.029	0.048	0.542	0.015	0.034
NE3-02	4	2	7	y24LM12	11.3	<0.010	0.176	0.151	1.14	0.105	0.150
NE3-12	4	2	8	y27LM12	9.93	0.296	<0.010	<0.050	0.315	<0.010	<0.010
Batch 1	4	2	9	BCHLM422	6.59	0.547	<0.010	<0.050	0.404	<0.010	0.067
NE3-24	4	2	10	y18LM12	12.3	1.10	0.111	0.095	0.271	0.066	0.090
NE3-19	4	2	11	y08LM12	10.2	0.410	0.019	<0.050	0.485	0.010	0.018
NE3-25	4	2	12	y22LM22	8.99	0.335	0.124	0.106	0.811	0.070	0.105
NE3-19	4	2	13	y08LM22	10.3	0.412	0.020	<0.050	0.491	<0.010	0.018
NE3-25	4	2	14	y22LM12	8.64	0.337	0.126	0.117	0.817	0.070	0.106
NE3-28	4	2	15	y03LM12	9.88	0.761	0.136	0.122	0.031	0.083	0.125
NE3-02	4	2	16	y24LM22	11.1	<0.010	0.175	0.152	1.138	0.105	0.150
Batch 1	4	2	17	BCHLM423	6.50	0.538	<0.010	<0.050	0.397	<0.010	0.067

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

Glass ID	Block	Sub-Block	Sequence	Lab ID	Al (wt%)	B (wt%)	Ca (wt%)	Fe (wt%)	Li (wt%)	Mn (wt%)	Ni (wt%)	Si (wt%)
Batch 1	1	1	1	BCHPF111	2.48	2.42	0.854	8.95	2.04	1.31	0.543	22.0
NE3-12	1	1	2	Y27PF12	8.86	2.41	0.468	6.21	1.81	0.444	0.281	21.4
NE3-03	1	1	3	Y06PF12	6.77	2.64	3.12	7.35	1.80	2.73	0.317	18.4
NE3-09	1	1	4	Y25PF11	8.62	2.02	3.38	5.09	2.13	0.200	1.77	20.4
NE3-14	1	1	5	Y14PF11	9.53	1.63	3.03	8.24	3.17	0.147	<0.010	17.7
NE3-15	1	1	6	Y11PF11	5.67	1.96	<0.010	4.79	2.26	1.09	1.72	22.2
NE3-09	1	1	7	Y25PF12	8.56	2.03	3.28	3.99	2.12	0.177	1.71	20.6
NE3-29	1	1	8	Y13PF11	9.54	3.14	2.32	5.45	1.94	3.72	0.351	16.3
NE3-14	1	1	9	Y14PF12	9.54	1.64	2.98	8.25	3.17	0.147	<0.010	17.7
Batch 1	1	1	10	BCHPF112	2.48	2.39	0.840	9.10	2.03	1.33	0.559	22.4
NE3-10	1	1	11	Y20PF11	7.84	2.39	0.645	8.22	1.97	1.58	<0.010	19.8
NE3-04	1	1	12	Y05PF11	7.06	1.48	0.150	8.11	2.24	0.157	<0.010	21.6
NE3-04	1	1	13	Y05PF12	7.15	1.45	0.175	8.00	2.28	0.160	<0.010	21.7
NE3-15	1	1	14	Y11PF12	5.69	1.98	<0.010	4.87	2.25	1.10	1.76	22.4
NE3-12	1	1	15	Y27PF11	8.82	2.44	0.460	6.26	1.82	0.446	0.267	21.0
NE3-29	1	1	16	Y13PF12	9.67	3.22	2.34	5.52	1.96	3.79	0.355	16.5
NE3-10	1	1	17	Y20PF12	7.90	2.34	0.732	8.26	2.00	1.60	<0.010	19.7
NE3-03	1	1	18	Y06PF11	6.83	2.68	3.50	7.36	1.80	2.74	0.310	18.3
Batch 1	1	1	19	BCHPF113	2.53	2.42	0.857	9.19	2.05	1.35	0.560	22.5
Batch 1	1	2	1	BCHPF121	2.47	2.51	0.887	8.80	2.04	1.28	0.544	22.1
NE3-09	1	2	2	Y25PF21	8.54	2.03	3.41	5.02	2.15	0.188	1.75	20.2
NE3-10	1	2	3	Y20PF22	7.81	2.27	0.791	8.00	2.01	1.54	<0.010	19.5
NE3-15	1	2	4	Y11PF22	5.70	1.95	<0.010	4.72	2.29	1.06	1.70	22.0
NE3-29	1	2	5	Y13PF22	9.60	3.15	2.40	5.34	1.98	3.66	0.346	16.2
NE3-15	1	2	6	Y11PF21	5.71	1.94	<0.010	4.69	2.29	1.05	1.68	21.9
NE3-14	1	2	7	Y14PF21	9.51	1.61	3.10	8.07	3.19	0.137	<0.010	17.5
NE3-04	1	2	8	Y05PF21	7.09	1.40	0.121	7.91	2.28	0.143	<0.010	21.4
NE3-12	1	2	9	Y27PF22	8.83	2.37	0.539	6.07	1.83	0.425	0.278	21.1
Batch 1	1	2	10	BCHPF122	2.51	2.32	0.930	8.78	2.07	1.27	0.539	22.4
NE3-03	1	2	11	Y06PF21	6.80	2.67	3.57	7.12	1.83	2.63	0.301	18.0
NE3-14	1	2	12	Y14PF22	9.51	1.63	3.06	8.01	3.18	0.137	<0.010	17.4
NE3-10	1	2	13	Y20PF21	7.84	2.25	0.721	7.93	2.00	1.51	<0.010	19.3
NE3-03	1	2	14	Y06PF22	6.82	2.62	3.24	7.18	1.83	2.65	0.307	18.1
NE3-12	1	2	15	Y27PF21	8.83	2.40	0.538	6.09	1.86	0.426	0.261	20.7
NE3-29	1	2	16	Y13PF21	9.57	3.11	2.42	5.31	1.97	3.61	0.341	16.0
NE3-04	1	2	17	Y05PF22	7.06	1.39	0.234	7.75	2.27	0.150	<0.010	21.2
NE3-09	1	2	18	Y25PF22	8.60	1.99	3.38	3.90	2.15	0.170	1.66	20.3
Batch 1	1	2	19	BCHPF123	2.57	2.35	0.943	8.88	2.08	1.29	0.547	22.4
Batch 1	2	1	1	BCHPF211	2.45	2.59	0.885	8.85	2.05	1.29	0.541	21.9
NE3-26	2	1	2	Y09PF11	9.56	1.98	0.915	5.09	2.48	2.95	0.733	18.2
NE3-20	2	1	3	Y21PF11	6.94	2.03	0.174	3.47	2.61	1.08	<0.010	22.2
NE3-16	2	1	4	Y07PF12	6.08	3.10	3.19	4.81	2.10	3.57	0.459	18.3
NE3-20	2	1	5	Y21PF12	6.91	2.03	0.148	3.54	2.60	1.09	<0.010	22.3
NE3-16	2	1	6	Y07PF11	6.04	3.09	3.10	4.85	2.09	3.59	0.462	18.3
NE3-19	2	1	7	Y08PF12	6.48	2.94	2.94	5.28	2.39	0.661	0.405	20.5
NE3-01	2	1	8	Y16PF12	5.53	1.48	3.04	6.04	1.83	2.70	1.31	18.8
Batch 1	2	1	9	BCHPF212	2.50	2.49	0.928	8.84	2.06	1.29	0.541	22.2
NE3-26	2	1	10	Y09PF12	9.37	1.97	0.860	5.04	2.44	2.92	0.736	18.0
NE3-01	2	1	11	Y16PF11	5.54	1.53	3.85	6.10	1.83	2.72	1.32	19.1
NE3-21	2	1	12	Y23PF11	7.17	1.76	2.46	3.85	3.34	4.43	0.556	19.2
NE3-27	2	1	13	Y01PF12	9.64	1.67	1.72	4.47	2.52	1.58	0.818	18.5
NE3-19	2	1	14	Y08PF11	6.45	2.90	2.85	5.28	2.37	0.667	0.409	20.4
NE3-27	2	1	15	Y01PF11	9.52	1.66	1.69	4.39	2.49	1.56	0.802	18.2
NE3-21	2	1	16	Y23PF12	7.07	1.71	2.48	3.68	3.30	4.32	0.541	18.7
Batch 1	2	1	17	BCHPF213	2.46	2.47	0.902	8.75	2.05	1.28	0.535	22.3
Batch 1	2	2	1	BCHPF221	2.48	2.57	0.862	8.82	2.04	1.29	0.536	22.1
NE3-26	2	2	2	Y09PF22	9.46	1.94	0.865	5.05	2.44	2.95	0.736	17.9
NE3-27	2	2	3	Y01PF22	9.76	1.67	1.76	4.47	2.53	1.59	0.816	18.5
NE3-20	2	2	4	Y21PF22	6.95	1.98	0.136	3.52	2.59	1.10	<0.010	22.1
NE3-16	2	2	5	Y07PF21	6.11	3.03	3.18	4.80	2.08	3.58	0.460	18.2
NE3-16	2	2	6	Y07PF22	5.73	2.86	3.00	4.51	1.96	3.36	0.433	17.2
NE3-19	2	2	7	Y08PF21	6.40	2.81	2.88	5.13	2.33	0.651	0.395	20.1
NE3-21	2	2	8	Y23PF22	7.16	1.67	2.54	3.72	3.31	4.36	0.552	19.0
Batch 1	2	2	9	BCHPF222	2.50	2.41	0.880	8.78	2.05	1.28	0.537	22.5
NE3-19	2	2	10	Y08PF22	6.51	2.93	3.00	5.20	2.38	0.660	0.399	20.4
NE3-21	2	2	11	Y23PF21	7.30	1.73	2.55	3.79	3.35	4.43	0.563	19.3
NE3-01	2	2	12	Y16PF22	5.62	1.44	3.14	5.99	1.84	2.70	1.31	19.0
NE3-01	2	2	13	Y16PF21	5.62	1.44	3.10	6.06	1.83	2.73	1.32	19.1
NE3-27	2	2	14	Y01PF21	9.68	1.59	1.73	4.40	2.50	1.56	0.804	18.4
NE3-20	2	2	15	Y21PF21	6.44	1.79	0.104	3.24	2.40	1.01	<0.010	22.6
NE3-26	2	2	16	Y09PF21	8.93	1.75	0.816	4.84	2.31	2.80	0.700	18.1
Batch 1	2	2	17	BCHPF223	2.48	2.39	0.871	8.81	2.04	1.28	0.538	22.6

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

Glass ID	Block	Sub-Block	Sequence	Lab ID	Al (wt%)	B (wt%)	Ca (wt%)	Fe (wt%)	Li (wt%)	Mn (wt%)	Ni (wt%)	Si (wt%)
Batch 1	3	1	1	BCHPF311	2.50	2.57	0.896	8.86	2.06	1.30	0.548	22.9
NE3-22	3	1	2	Y10PF11	7.67	2.54	0.805	6.64	2.13	2.75	0.643	19.7
NE3-06	3	1	3	Y17PF11	7.70	3.56	<0.010	9.77	1.96	0.460	<0.010	17.7
NE3-02	3	1	4	Y24PF11	7.09	2.28	<0.010	5.74	1.85	4.29	<0.010	19.5
NE3-24	3	1	5	Y18PF11	7.94	2.32	3.18	3.99	2.36	0.289	1.14	19.0
NE3-07	3	1	6	Y04PF12	7.93	3.60	1.07	9.68	1.97	2.05	0.007	17.4
NE3-22	3	1	7	Y10PF12	7.67	2.46	0.912	6.61	2.14	2.73	0.634	19.5
NE3-24	3	1	8	Y18PF12	7.70	2.27	3.13	3.97	2.33	0.284	1.13	18.8
Batch 1	3	1	9	BCHPF312	2.47	2.38	0.894	8.78	2.04	1.28	0.547	22.5
NE3-18	3	1	10	Y12PF12	6.35	1.80	2.65	3.86	2.69	0.273	1.63	21.5
NE3-17	3	1	11	Y15PF12	6.23	1.65	3.26	6.41	2.33	1.36	1.15	21.9
NE3-18	3	1	12	Y12PF11	6.29	1.72	2.66	3.79	2.67	0.260	1.62	21.3
NE3-07	3	1	13	Y04PF11	7.77	3.51	1.13	9.55	1.94	2.02	<0.010	17.1
NE3-17	3	1	14	Y15PF11	6.15	1.69	2.91	6.81	2.04	1.13	1.09	21.7
NE3-06	3	1	15	Y17PF12	7.68	3.47	<0.010	9.68	1.96	0.455	<0.010	17.6
NE3-02	3	1	16	Y24PF12	6.64	2.19	<0.010	5.75	1.82	4.26	<0.010	19.4
Batch 1	3	1	17	BCHPF313	2.56	2.41	0.906	8.92	2.07	1.31	0.554	22.6
Batch 1	3	2	1	BCHPF321	2.44	2.48	0.881	8.75	2.02	1.26	0.540	22.0
NE3-06	3	2	2	Y17PF21	7.58	3.47	<0.010	9.82	1.93	0.448	<0.010	17.4
NE3-22	3	2	3	Y10PF21	7.53	2.40	0.793	6.61	2.10	2.74	0.633	19.2
NE3-07	3	2	4	Y04PF21	7.65	3.49	1.11	9.55	1.90	2.02	<0.010	16.8
NE3-24	3	2	5	Y18PF22	7.65	2.23	3.11	3.91	2.32	0.266	1.12	18.6
NE3-06	3	2	6	Y17PF22	7.66	3.43	<0.010	9.59	1.95	0.435	<0.010	17.3
NE3-17	3	2	7	Y15PF21	6.09	1.65	2.89	6.77	2.02	1.12	1.07	21.4
NE3-24	3	2	8	Y18PF21	7.84	2.21	3.13	3.94	2.32	0.269	1.13	18.7
Batch 1	3	2	9	BCHPF322	2.40	2.30	0.879	8.75	2.02	1.27	0.535	22.3
NE3-22	3	2	10	Y10PF22	7.56	2.42	0.903	6.58	2.10	2.73	0.625	19.2
NE3-18	3	2	11	Y12PF21	6.22	1.67	2.66	3.74	2.66	0.242	1.62	21.2
NE3-02	3	2	12	Y24PF22	6.63	2.16	<0.010	5.73	1.82	4.29	<0.010	19.3
NE3-17	3	2	13	Y15PF22	6.15	1.66	3.20	6.46	2.30	1.36	1.15	21.7
NE3-07	3	2	14	Y04PF22	7.73	3.50	1.03	9.76	1.93	2.06	<0.010	17.1
NE3-02	3	2	15	Y24PF21	7.00	2.17	<0.010	5.74	1.83	4.32	<0.010	19.4
NE3-18	3	2	16	Y12PF22	6.29	1.66	2.63	3.81	2.67	0.255	1.62	21.3
Batch 1	3	2	17	BCHPF323	2.44	2.31	0.892	8.82	2.03	1.28	0.536	22.2
Batch 1	4	1	1	BCHPF411	2.53	2.61	0.855	9.26	2.06	1.33	0.565	22.2
NE3-05	4	1	2	Y02PF12	7.91	3.95	<0.010	3.85	2.53	0.200	<0.010	19.6
NE3-05	4	1	3	Y02PF11	7.74	3.90	<0.010	3.74	2.50	0.166	<0.010	19.4
NE3-25	4	1	4	Y22PF11	9.18	2.46	2.63	3.73	3.26	2.57	0.342	18.4
NE3-23	4	1	5	Y29PF11	7.52	3.84	2.91	3.84	2.34	3.01	0.009	19.7
NE3-11	4	1	6	Y28PF12	8.61	2.37	<0.010	8.69	3.28	3.25	0.325	19.0
NE3-28	4	1	7	Y03PF12	9.46	3.31	<0.010	3.63	2.20	1.57	0.833	19.4
NE3-13	4	1	8	Y19PF11	9.27	2.57	0.042	3.41	2.25	3.43	1.52	17.8
Batch 1	4	1	9	BCHPF412	2.49	2.52	0.873	9.01	2.05	1.31	0.551	22.6
NE3-08	4	1	10	Y26PF12	7.51	2.88	2.11	4.97	2.86	0.477	1.75	19.7
NE3-11	4	1	11	Y28PF11	8.56	2.37	<0.010	8.72	3.25	3.28	0.322	19.0
NE3-25	4	1	12	Y22PF12	9.25	2.48	2.54	3.88	3.29	2.67	0.363	18.7
NE3-28	4	1	13	Y03PF11	9.46	3.30	<0.010	3.59	2.19	1.56	0.811	19.2
NE3-23	4	1	14	Y29PF12	7.52	3.88	2.80	3.88	2.31	3.08	0.006	19.8
NE3-13	4	1	15	Y19PF12	9.21	2.56	<0.010	3.42	2.23	3.47	1.52	17.8
NE3-08	4	1	16	Y26PF11	7.47	2.83	2.14	5.13	2.86	0.490	1.80	19.6
Batch 1	4	1	17	BCHPF413	2.50	2.53	0.872	9.06	2.07	1.33	0.561	22.7
Batch 1	4	2	1	BCHPF421	2.42	2.50	0.877	8.83	2.02	1.27	0.533	22.7
NE3-05	4	2	2	Y02PF22	7.71	3.78	<0.010	3.80	2.49	0.168	<0.010	19.8
NE3-11	4	2	3	Y28PF22	8.49	2.27	<0.010	8.61	3.27	3.20	0.306	19.3
NE3-13	4	2	4	Y19PF21	9.11	2.46	0.057	3.36	2.23	3.40	1.52	18.0
NE3-28	4	2	5	Y03PF21	9.22	3.14	<0.010	3.51	2.16	1.50	0.794	19.3
NE3-08	4	2	6	Y26PF22	7.35	2.72	2.10	4.90	2.83	0.441	1.74	19.7
NE3-23	4	2	7	Y29PF21	7.38	3.67	2.87	3.81	2.32	2.99	<0.010	19.9
NE3-25	4	2	8	Y22PF21	8.94	2.29	2.55	3.69	3.21	2.53	0.319	18.4
Batch 1	4	2	9	BCHPF422	2.42	2.36	0.882	8.80	2.03	1.25	0.525	22.6
NE3-23	4	2	10	Y29PF22	7.32	3.66	2.76	3.78	2.28	2.99	<0.010	19.9
NE3-05	4	2	11	Y02PF21	7.51	3.70	<0.010	3.69	2.45	0.132	<0.010	19.3
NE3-25	4	2	12	Y22PF22	9.06	2.34	2.50	3.79	3.24	2.60	0.343	18.7
NE3-13	4	2	13	Y19PF22	9.01	2.41	<0.010	3.35	2.19	3.39	1.50	17.8
NE3-11	4	2	14	Y28PF21	8.35	2.19	<0.010	8.59	3.20	3.21	0.302	19.0
NE3-28	4	2	15	Y03PF22	9.20	3.11	<0.010	3.54	2.16	1.52	0.806	19.3
NE3-08	4	2	16	Y26PF21	7.31	2.67	2.11	5.03	2.81	0.450	1.78	19.6
Batch 1	4	2	17	BCHPF423	2.42	2.36	0.868	8.87	2.03	1.27	0.533	22.7

Table A4. Average Measured and Bias-Corrected Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID

Glass ID	Oxide	Measured (wt %)	Measured Bias-Corrected (wt %)	Targeted (wt %)	Diff of Measured	Diff of Meas BC	% Diff of Measured	% Diff of Meas BC
Batch 1	Al_2O_3	4.6844	4.8770	4.8770	-0.1926	0.0000	-3.9%	0.0%
Batch 1	B_2O_3	7.8700	7.7770	7.7770	0.0930	0.0000	1.2%	0.0%
Batch 1	BaO	0.1396	0.1510	0.1510	-0.0114	0.0000	-7.6%	0.0%
Batch 1	CaO	1.2368	1.2800	1.2200	0.0168	0.0600	1.4%	4.9%
Batch 1	CdO	0.0057	0.0057	0.0000	0.0057	0.0057		
Batch 1	Ce_2O_3	0.0059	0.0059	0.0000	0.0059	0.0059		
Batch 1	Cr_2O_3	0.1077	0.1070	0.1070	0.0007	0.0000	0.6%	0.0%
Batch 1	CuO	0.3869	0.3990	0.3990	-0.0121	0.0000	-3.0%	0.0%
Batch 1	Fe_2O_3	12.7041	12.8390	12.8390	-0.1349	0.0000	-1.1%	0.0%
Batch 1	La_2O_3	0.0059	0.0059	0.0000	0.0059	0.0059		
Batch 1	Li_2O	4.4045	4.4290	4.4290	-0.0245	0.0000	-0.6%	0.0%
Batch 1	MgO	1.3415	1.4190	1.4190	-0.0775	0.0000	-5.5%	0.0%
Batch 1	MnO	1.6678	1.7992	1.7260	-0.0582	0.0732	-3.4%	4.2%
Batch 1	Na_2O	8.8805	9.0030	9.0030	-0.1225	0.0000	-1.4%	0.0%
Batch 1	NiO	0.6918	0.7500	0.7510	-0.0592	-0.0010	-7.9%	-0.1%
Batch 1	PbO	0.0054	0.0054	0.0000	0.0054	0.0054		
Batch 1	SiO_2	47.9025	50.2200	50.2200	-2.3175	0.0000	-4.6%	0.0%
Batch 1	SO_4^{2-}	0.0749	0.0749	0.0000	0.0749	0.0749		
Batch 1	TiO_2	0.6552	0.6770	0.6770	-0.0218	0.0000	-3.2%	0.0%
Batch 1	ZnO	0.0062	0.0062	0.0000	0.0062	0.0062		
Batch 1	ZrO_2	0.0907	0.0907	0.0980	-0.0073	-0.0073	-7.5%	-7.5%
Batch 1	Sum	92.8678	95.9218	95.6930	-2.8253	0.2288	-3.0%	0.2%
NE3-01	Al_2O_3	10.5387	10.9756	10.5300	0.0087	0.4456	0.1%	4.2%
NE3-01	B_2O_3	4.7413	4.6047	4.5100	0.2313	0.0947	5.1%	2.1%
NE3-01	BaO	0.0056	0.0060	0.0000	0.0056	0.0060		
NE3-01	CaO	4.5929	4.7960	4.0000	0.5929	0.7960	14.8%	19.9%
NE3-01	CdO	0.0057	0.0057	0.0000	0.0057	0.0057		
NE3-01	Ce_2O_3	0.0059	0.0059	0.0000	0.0059	0.0059		
NE3-01	Cr_2O_3	0.1659	0.1634	0.2000	-0.0341	-0.0366	-17.1%	-18.3%
NE3-01	CuO	0.0063	0.0064	0.0000	0.0063	0.0064		
NE3-01	Fe_2O_3	8.6461	8.8148	9.0300	-0.3839	-0.2152	-4.3%	-2.4%
NE3-01	La_2O_3	0.0059	0.0059	0.0000	0.0059	0.0059		
NE3-01	Li_2O	3.9452	3.9624	4.0000	-0.0548	-0.0376	-1.4%	-0.9%
NE3-01	MgO	1.3830	1.4566	1.5000	-0.1170	-0.0434	-7.8%	-2.9%
NE3-01	MnO	3.5024	3.7859	3.5000	0.0024	0.2859	0.1%	8.2%
NE3-01	Na_2O	16.1760	16.5610	17.3400	-1.1640	-0.7790	-6.7%	-4.5%
NE3-01	NiO	1.6733	1.8132	1.8800	-0.2067	-0.0668	-11.0%	-3.6%
NE3-01	PbO	0.0054	0.0054	0.0000	0.0054	0.0054		
NE3-01	SiO_2	40.6467	42.8533	41.5100	-0.8633	1.3433	-2.1%	3.2%
NE3-01	SO_4^{2-}	0.0749	0.0749	0.0000	0.0749	0.0749		
NE3-01	TiO_2	1.9099	1.9715	2.0000	-0.0901	-0.0285	-4.5%	-1.4%
NE3-01	ZnO	0.0062	0.0062	0.0000	0.0062	0.0062		
NE3-01	ZrO_2	0.0068	0.0068	0.0000	0.0068	0.0068		
NE3-01	Sum	98.0439	101.8814	100.0000	-1.9561	1.8814	-2.0%	1.9%
NE3-02	Al_2O_3	12.9242	13.5177	12.6900	0.2342	0.8277	1.8%	6.5%
NE3-02	B_2O_3	7.0838	7.1046	7.2200	-0.1362	-0.1154	-1.9%	-1.6%
NE3-02	BaO	0.0681	0.0743	0.0800	-0.0119	-0.0057	-14.9%	-7.2%
NE3-02	CaO	0.0070	0.0072	0.0000	0.0070	0.0072		
NE3-02	CdO	0.2405	0.2405	0.3000	-0.0595	-0.0595	-19.8%	-19.8%
NE3-02	Ce_2O_3	0.3488	0.3488	0.3600	-0.0112	-0.0112	-3.1%	-3.1%
NE3-02	Cr_2O_3	0.0073	0.0073	0.0000	0.0073	0.0073		
NE3-02	CuO	0.1308	0.1349	0.1300	0.0008	0.0049	0.6%	3.7%
NE3-02	Fe_2O_3	8.2065	8.3620	8.6700	-0.4635	-0.3080	-5.3%	-3.6%
NE3-02	La_2O_3	0.0880	0.0880	0.1000	-0.0120	-0.0120	-12.0%	-12.0%
NE3-02	Li_2O	3.9398	3.9733	4.0000	-0.0602	-0.0267	-1.5%	-0.7%
NE3-02	MgO	0.0083	0.0088	0.0000	0.0083	0.0088		
NE3-02	MnO	5.5392	5.9795	5.5000	0.0392	0.4795	0.7%	8.7%
NE3-02	Na_2O	15.2661	15.2867	15.5600	-0.2939	-0.2733	-1.9%	-1.8%
NE3-02	NiO	0.0064	0.0069	0.0000	0.0064	0.0069		
NE3-02	PbO	0.1909	0.1909	0.2200	-0.0291	-0.0291	-13.2%	-13.2%
NE3-02	SiO_2	41.5024	43.4659	42.3700	-0.8676	1.0959	-2.0%	2.6%
NE3-02	SO_4^{2-}	0.4546	0.4546	0.4800	-0.0254	-0.0254	-5.3%	-5.3%

Table A4. Average Measured and Bias-Corrected Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID (continued)

Glass ID	Oxide	Measured (wt %)	Measured Bias-Corrected (wt %)	Targeted (wt %)	Diff of Measured	Diff of Meas BC	% Diff of Measured	% Diff of Meas BC
NE3-02	TiO_2	1.8882	1.9279	2.0000	-0.1118	-0.0721	-5.6%	-3.6%
NE3-02	ZnO	0.1313	0.1313	0.1400	-0.0087	-0.0087	-6.2%	-6.2%
NE3-02	ZrO_2	0.2030	0.2030	0.2100	-0.0070	-0.0070	-3.4%	-3.4%
NE3-02	Sum	98.2351	101.5140	100.0300	-1.7949	1.4840	-1.8%	1.5%
NE3-03	Al_2O_3	12.8580	13.2401	12.8600	-0.0020	0.3801	0.0%	3.0%
NE3-03	B_2O_3	8.5408	8.5893	8.8200	-0.2792	-0.2307	-3.2%	-2.6%
NE3-03	BaO	0.0731	0.0789	0.0800	-0.0069	-0.0011	-8.6%	-1.4%
NE3-03	CaO	4.6978	4.8839	4.0000	0.6978	0.8839	17.4%	22.1%
NE3-03	CdO	0.2513	0.2513	0.3000	-0.0487	-0.0487	-16.2%	-16.2%
NE3-03	Ce_2O_3	0.3590	0.3590	0.3600	-0.0010	-0.0010	-0.3%	-0.3%
NE3-03	Cr_2O_3	0.0928	0.0914	0.1000	-0.0072	-0.0086	-7.2%	-8.6%
NE3-03	CuO	0.1308	0.1348	0.1300	0.0008	0.0048	0.6%	3.7%
NE3-03	Fe_2O_3	10.3689	10.4040	10.9000	-0.5311	-0.4960	-4.9%	-4.6%
NE3-03	La_2O_3	0.0883	0.0883	0.1000	-0.0117	-0.0117	-11.7%	-11.7%
NE3-03	Li_2O	3.9075	3.9180	4.0000	-0.0925	-0.0820	-2.3%	-2.0%
NE3-03	MgO	0.0083	0.0087	0.0000	0.0083	0.0087		
NE3-03	MnO	3.4701	3.7162	3.4500	0.0201	0.2662	0.6%	7.7%
NE3-03	Na_2O	13.6215	13.9474	13.6900	-0.0685	0.2574	-0.5%	1.9%
NE3-03	NiO	0.3929	0.4248	0.4600	-0.0671	-0.0352	-14.6%	-7.6%
NE3-03	PbO	0.1944	0.1944	0.2200	-0.0256	-0.0256	-11.6%	-11.6%
NE3-03	SiO_2	38.9353	40.9867	39.4300	-0.4947	1.5567	-1.3%	3.9%
NE3-03	SO_4^{2-}	0.4711	0.4711	0.4800	-0.0089	-0.0089	-1.9%	-1.9%
NE3-03	TiO_2	0.2877	0.2971	0.2800	0.0077	0.0171	2.8%	6.1%
NE3-03	ZnO	0.1332	0.1332	0.1400	-0.0068	-0.0068	-4.9%	-4.9%
NE3-03	ZrO_2	0.2080	0.2080	0.2100	-0.0020	-0.0020	-0.9%	-0.9%
NE3-03	Sum	99.0909	102.4266	100.0100	-0.9191	2.4166	-0.9%	2.4%
NE3-04	Al_2O_3	13.3966	13.7947	13.3800	0.0166	0.4147	0.1%	3.1%
NE3-04	B_2O_3	4.6045	4.6302	4.6200	-0.0155	0.0102	-0.3%	0.2%
NE3-04	BaO	0.0056	0.0060	0.0000	0.0056	0.0060		
NE3-04	CaO	0.2379	0.2473	0.1900	0.0479	0.0573	25.2%	30.1%
NE3-04	CdO	0.0057	0.0057	0.0000	0.0057	0.0057		
NE3-04	Ce_2O_3	0.0059	0.0059	0.0000	0.0059	0.0059		
NE3-04	Cr_2O_3	0.0073	0.0073	0.0000	0.0073	0.0073		
NE3-04	CuO	0.0063	0.0065	0.0000	0.0063	0.0065		
NE3-04	Fe_2O_3	11.3554	11.3938	11.5600	-0.2046	-0.1662	-1.8%	-1.4%
NE3-04	La_2O_3	0.0059	0.0059	0.0000	0.0059	0.0059		
NE3-04	Li_2O	4.8817	4.8950	4.9600	-0.0783	-0.0650	-1.6%	-1.3%
NE3-04	MgO	0.0083	0.0087	0.0000	0.0083	0.0087		
NE3-04	MnO	0.1969	0.2109	0.3100	-0.1131	-0.0991	-36.5%	-32.0%
NE3-04	Na_2O	17.1196	17.5150	18.4800	-1.3604	-0.9650	-7.4%	-5.2%
NE3-04	NiO	0.0064	0.0069	0.0000	0.0064	0.0069		
NE3-04	PbO	0.0054	0.0054	0.0000	0.0054	0.0054		
NE3-04	SiO_2	45.9415	48.3621	46.5100	-0.5685	1.8521	-1.2%	4.0%
NE3-04	SO_4^{2-}	0.0749	0.0749	0.0000	0.0749	0.0749		
NE3-04	TiO_2	0.0083	0.0087	0.0000	0.0083	0.0087		
NE3-04	ZnO	0.0062	0.0062	0.0000	0.0062	0.0062		
NE3-04	ZrO_2	0.0068	0.0068	0.0000	0.0068	0.0068		
NE3-04	Sum	97.8868	101.2037	100.0100	-2.1232	1.1937	-2.1%	1.2%
NE3-05	Al_2O_3	14.5822	15.2804	14.5100	0.0722	0.7704	0.5%	5.3%
NE3-05	B_2O_3	12.3403	12.0202	12.1100	0.2303	-0.0898	1.9%	-0.7%
NE3-05	BaO	0.0809	0.0873	0.0900	-0.0091	-0.0027	-10.1%	-3.0%
NE3-05	CaO	0.0070	0.0071	0.0000	0.0070	0.0071		
NE3-05	CdO	0.2670	0.2670	0.3200	-0.0530	-0.0530	-16.6%	-16.6%
NE3-05	Ce_2O_3	0.3792	0.3792	0.3900	-0.0108	-0.0108	-2.8%	-2.8%
NE3-05	Cr_2O_3	0.1937	0.1907	0.2200	-0.0263	-0.0293	-12.0%	-13.3%
NE3-05	CuO	0.1377	0.1419	0.1400	-0.0023	0.0019	-1.6%	1.3%
NE3-05	Fe_2O_3	5.3900	5.3958	5.3900	0.0000	0.0058	0.0%	0.1%
NE3-05	La_2O_3	0.0970	0.0970	0.1100	-0.0130	-0.0130	-11.8%	-11.8%
NE3-05	Li_2O	5.3661	5.4025	5.4100	-0.0439	-0.0075	-0.8%	-0.1%
NE3-05	MgO	1.5406	1.6225	1.6200	-0.0794	0.0025	-4.9%	0.2%
NE3-05	MnO	0.2150	0.2330	0.3200	-0.1050	-0.0870	-32.8%	-27.2%
NE3-05	Na_2O	14.9291	15.2852	15.2700	-0.3409	0.0152	-2.2%	0.1%
NE3-05	NiO	0.0064	0.0069	0.0000	0.0064	0.0069		
NE3-05	PbO	0.2068	0.2068	0.2300	-0.0232	-0.0232	-10.1%	-10.1%
NE3-05	SiO_2	41.7698	43.4194	42.1900	-0.4202	1.2294	-1.0%	2.9%

Table A4. Average Measured and Bias-Corrected Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID (continued)

Glass ID	Oxide	Measured (wt %)	Measured Bias-Corrected (wt %)	Targeted (wt %)	Diff of Measured	Diff of Meas BC	% Diff of Measured	% Diff of Meas BC
NE3-05	SO_4^{2-}	0.4711	0.4711	0.5200	-0.0489	-0.0489	-9.4%	-9.4%
NE3-05	TiO_2	0.7827	0.8080	0.8000	-0.0173	0.0080	-2.2%	1.0%
NE3-05	ZnO	0.1422	0.1422	0.1500	-0.0078	-0.0078	-5.2%	-5.2%
NE3-05	ZrO_2	0.2202	0.2202	0.2200	0.0002	0.0002	0.1%	0.1%
NE3-05	Sum	99.1250	101.6847	100.0100	-0.8850	1.6747	-0.9%	1.7%
NE3-06	Al_2O_3	14.4641	15.1281	14.3800	0.0841	0.7481	0.6%	5.2%
NE3-06	B_2O_3	11.2133	11.2477	11.2300	-0.0167	0.0177	-0.1%	0.2%
NE3-06	BaO	0.0776	0.0834	0.0800	-0.0024	0.0034	-3.0%	4.2%
NE3-06	CaO	0.0070	0.0072	0.0100	-0.0030	-0.0028	-30.0%	-27.7%
NE3-06	CdO	0.2530	0.2530	0.3100	-0.0570	-0.0570	-18.4%	-18.4%
NE3-06	Ce_2O_3	0.3561	0.3561	0.3800	-0.0239	-0.0239	-6.3%	-6.3%
NE3-06	Cr_2O_3	0.0263	0.0261	0.0500	-0.0237	-0.0239	-47.4%	-47.7%
NE3-06	CuO	0.1311	0.1358	0.1400	-0.0089	-0.0042	-6.3%	-3.0%
NE3-06	Fe_2O_3	13.8895	14.1527	15.7500	-1.8605	-1.5973	-11.8%	-10.1%
NE3-06	La_2O_3	0.0891	0.0891	0.1000	-0.0109	-0.0109	-10.9%	-10.9%
NE3-06	Li_2O	4.1982	4.2337	4.2300	-0.0318	0.0037	-0.8%	0.1%
NE3-06	MgO	0.0522	0.0551	0.1200	-0.0678	-0.0649	-56.5%	-54.1%
NE3-06	MnO	0.5804	0.6265	0.6900	-0.1096	-0.0635	-15.9%	-9.2%
NE3-06	Na_2O	11.3401	11.6006	11.2400	0.1001	0.3606	0.9%	3.2%
NE3-06	NiO	0.0064	0.0069	0.5100	-0.5036	-0.5031	-98.8%	-98.6%
NE3-06	PbO	0.1955	0.1955	0.2300	-0.0345	-0.0345	-15.0%	-15.0%
NE3-06	SiO_2	37.4378	39.2063	37.5600	-0.1223	1.6463	-0.3%	4.4%
NE3-06	SO_4^{2-}	0.4322	0.4322	0.5100	-0.0778	-0.0778	-15.3%	-15.3%
NE3-06	TiO_2	1.9391	2.0152	2.1200	-0.1810	-0.1048	-8.5%	-4.9%
NE3-06	ZnO	0.1326	0.1326	0.1400	-0.0074	-0.0074	-5.3%	-5.3%
NE3-06	ZrO_2	0.2016	0.2016	0.2200	-0.0184	-0.0184	-8.4%	-8.4%
NE3-06	Sum	97.0231	100.1856	100.0000	-2.9769	0.1856	-3.0%	0.2%
NE3-07	Al_2O_3	14.6814	15.3539	14.6500	0.0314	0.7039	0.2%	4.8%
NE3-07	B_2O_3	11.3501	11.3851	11.5100	-0.1599	-0.1249	-1.4%	-1.1%
NE3-07	BaO	0.0056	0.0060	0.0000	0.0056	0.0060		
NE3-07	CaO	1.5181	1.5695	1.4600	0.0581	0.1095	4.0%	7.5%
NE3-07	CdO	0.0057	0.0057	0.0000	0.0057	0.0057		
NE3-07	Ce_2O_3	0.0059	0.0059	0.0000	0.0059	0.0059		
NE3-07	Cr_2O_3	0.0073	0.0073	0.0000	0.0073	0.0073		
NE3-07	CuO	0.0063	0.0065	0.0000	0.0063	0.0065		
NE3-07	Fe_2O_3	13.7752	14.0364	14.8500	-1.0748	-0.8136	-7.2%	-5.5%
NE3-07	La_2O_3	0.0059	0.0059	0.0000	0.0059	0.0059		
NE3-07	Li_2O	4.1659	4.2010	4.2200	-0.0541	-0.0190	-1.3%	-0.5%
NE3-07	MgO	0.3142	0.3314	0.3200	-0.0058	0.0114	-1.8%	3.6%
NE3-07	MnO	2.6308	2.8399	2.6600	-0.0292	0.1799	-1.1%	6.8%
NE3-07	Na_2O	11.0806	11.3360	11.3200	-0.2394	0.0160	-2.1%	0.1%
NE3-07	NiO	0.0070	0.0076	0.0000	0.0070	0.0076		
NE3-07	PbO	0.0054	0.0054	0.0000	0.0054	0.0054		
NE3-07	SiO_2	36.5820	38.3101	36.9800	-0.3980	1.3301	-1.1%	3.6%
NE3-07	SO_4^{2-}	0.0749	0.0749	0.0000	0.0749	0.0749		
NE3-07	TiO_2	1.9057	1.9807	2.0300	-0.1243	-0.0493	-6.1%	-2.4%
NE3-07	ZnO	0.0062	0.0062	0.0000	0.0062	0.0062		
NE3-07	ZrO_2	0.0068	0.0068	0.0000	0.0068	0.0068		
NE3-07	Sum	98.1409	101.4821	100.0000	-1.8591	1.4821	-1.9%	1.5%
NE3-08	Al_2O_3	14.0012	14.6724	14.2000	-0.1988	0.4724	-1.4%	3.3%
NE3-08	B_2O_3	8.9352	8.7023	8.6600	0.2752	0.0423	3.2%	0.5%
NE3-08	BaO	0.0056	0.0060	0.0000	0.0056	0.0060		
NE3-08	CaO	2.9593	3.0240	3.0400	-0.0807	-0.0160	-2.7%	-0.5%
NE3-08	CdO	0.0057	0.0057	0.0000	0.0057	0.0057		
NE3-08	Ce_2O_3	0.0059	0.0059	0.0000	0.0059	0.0059		
NE3-08	Cr_2O_3	0.0073	0.0072	0.0000	0.0073	0.0072		
NE3-08	CuO	0.0063	0.0064	0.0000	0.0063	0.0064		
NE3-08	Fe_2O_3	7.1592	7.1668	7.1600	-0.0008	0.0068	0.0%	0.1%
NE3-08	La_2O_3	0.0059	0.0059	0.0000	0.0059	0.0059		
NE3-08	Li_2O	6.1142	6.1559	6.3700	-0.2558	-0.2141	-4.0%	-3.4%
NE3-08	MgO	0.8694	0.9156	0.9000	-0.0306	0.0156	-3.4%	1.7%
NE3-08	MnO	0.5998	0.6500	0.6900	-0.0902	-0.0400	-13.1%	-5.8%
NE3-08	Na_2O	13.6687	13.9930	14.0400	-0.3713	-0.0470	-2.6%	-0.3%
NE3-08	NiO	2.2491	2.4378	2.3900	-0.1409	0.0478	-5.9%	2.0%
NE3-08	PbO	0.0054	0.0054	0.0000	0.0054	0.0054		

Table A4. Average Measured and Bias-Corrected Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID (continued)

Glass ID	Oxide	Measured (wt %)	Measured Bias-Corrected (wt %)	Targeted (wt %)	Diff of Measured	Diff of Meas BC	% Diff of Measured	% Diff of Meas BC
NE3-08	SiO_2	42.0372	43.6976	42.3600	-0.3228	1.3376	-0.8%	3.2%
NE3-08	SO_4^{2-}	0.0936	0.0936	0.0000	0.0936	0.0936		
NE3-08	TiO_2	0.1906	0.1968	0.1800	0.0106	0.0168	5.9%	9.3%
NE3-08	ZnO	0.0062	0.0062	0.0000	0.0062	0.0062		
NE3-08	ZrO_2	0.0068	0.0068	0.0000	0.0068	0.0068		
NE3-08	Sum	98.9326	101.7611	99.9900	-1.0574	1.7711	-1.1%	1.8%
NE3-09	Al_2O_3	16.2119	16.6937	16.0800	0.1319	0.6137	0.8%	3.8%
NE3-09	B_2O_3	6.4961	6.5330	6.6400	-0.1439	-0.1070	-2.2%	-1.6%
NE3-09	BaO	0.0773	0.0838	0.0900	-0.0127	-0.0062	-14.1%	-6.9%
NE3-09	CaO	4.7048	4.8913	4.4200	0.2848	0.4713	6.4%	10.7%
NE3-09	CdO	0.2830	0.2830	0.3300	-0.0470	-0.0470	-14.2%	-14.2%
NE3-09	Ce_2O_3	0.3851	0.3851	0.4000	-0.0149	-0.0149	-3.7%	-3.7%
NE3-09	Cr_2O_3	0.0073	0.0073	0.0000	0.0073	0.0073		
NE3-09	CuO	0.1393	0.1433	0.1400	-0.0007	0.0033	-0.5%	2.3%
NE3-09	Fe_2O_3	6.4337	6.4559	5.7600	0.6737	0.6959	11.7%	12.1%
NE3-09	La_2O_3	0.0973	0.0973	0.1100	-0.0127	-0.0127	-11.5%	-11.5%
NE3-09	Li_2O	4.6018	4.6143	4.7100	-0.1082	-0.0957	-2.3%	-2.0%
NE3-09	MgO	0.0083	0.0088	0.0000	0.0083	0.0088		
NE3-09	MnO	0.2373	0.2541	0.3300	-0.0927	-0.0759	-28.1%	-23.0%
NE3-09	Na_2O	13.0116	13.1094	13.1900	-0.1784	-0.0806	-1.4%	-0.6%
NE3-09	NiO	2.1919	2.3701	2.7600	-0.5681	-0.3899	-20.6%	-14.1%
NE3-09	PbO	0.2165	0.2165	0.2400	-0.0235	-0.0235	-9.8%	-9.8%
NE3-09	SiO_2	43.5882	45.8849	43.9000	-0.3118	1.9849	-0.7%	4.5%
NE3-09	SO_4^{2-}	0.4823	0.4823	0.5300	-0.0477	-0.0477	-9.0%	-9.0%
NE3-09	TiO_2	0.0083	0.0087	0.0000	0.0083	0.0087		
NE3-09	ZnO	0.1540	0.1540	0.1500	0.0040	0.0040	2.7%	2.7%
NE3-09	ZrO_2	0.2222	0.2222	0.2300	-0.0078	-0.0078	-3.4%	-3.4%
NE3-09	Sum	99.5583	102.8990	100.0100	-0.4517	2.8890	-0.5%	2.9%
NE3-10	Al_2O_3	14.8279	15.2686	14.7000	0.1279	0.5686	0.9%	3.9%
NE3-10	B_2O_3	7.4460	7.4878	7.4300	0.0160	0.0578	0.2%	0.8%
NE3-10	BaO	0.0751	0.0813	0.0800	-0.0049	0.0013	-6.1%	1.7%
NE3-10	CaO	1.0106	1.0505	0.9900	0.0206	0.0605	2.1%	6.1%
NE3-10	CdO	0.2516	0.2516	0.3000	-0.0484	-0.0484	-16.1%	-16.1%
NE3-10	Ce_2O_3	0.3531	0.3531	0.3600	-0.0069	-0.0069	-1.9%	-1.9%
NE3-10	Cr_2O_3	0.0164	0.0164	0.0000	0.0164	0.0164		
NE3-10	CuO	0.1302	0.1339	0.1300	0.0002	0.0039	0.1%	3.0%
NE3-10	Fe_2O_3	11.5841	11.6228	11.7900	-0.2059	-0.1672	-1.7%	-1.4%
NE3-10	La_2O_3	0.0897	0.0897	0.1000	-0.0103	-0.0103	-10.3%	-10.3%
NE3-10	Li_2O	4.2950	4.3067	4.3600	-0.0650	-0.0533	-1.5%	-1.2%
NE3-10	MgO	1.4266	1.5158	1.5100	-0.0834	0.0058	-5.5%	0.4%
NE3-10	MnO	2.0110	2.1537	1.9900	0.0210	0.1637	1.1%	8.2%
NE3-10	Na_2O	13.1160	13.2131	13.2600	-0.1440	-0.0469	-1.1%	-0.4%
NE3-10	NiO	0.0064	0.0069	0.0000	0.0064	0.0069		
NE3-10	PbO	0.1952	0.1952	0.2200	-0.0248	-0.0248	-11.3%	-11.3%
NE3-10	SiO_2	41.8768	44.0833	41.9500	-0.0732	2.1333	-0.2%	5.1%
NE3-10	SO_4^{2-}	0.4464	0.4464	0.4800	-0.0336	-0.0336	-7.0%	-7.0%
NE3-10	TiO_2	0.0083	0.0087	0.0000	0.0083	0.0087		
NE3-10	ZnO	0.1319	0.1319	0.1400	-0.0081	-0.0081	-5.8%	-5.8%
NE3-10	ZrO_2	0.1945	0.1945	0.2100	-0.0155	-0.0155	-7.4%	-7.4%
NE3-10	Sum	99.4930	102.6119	100.0000	-0.5070	2.6119	-0.5%	2.6%
NE3-11	Al_2O_3	16.0655	16.8359	16.1800	-0.1145	0.6559	-0.7%	4.1%
NE3-11	B_2O_3	7.4058	7.2124	7.0700	0.3358	0.1424	4.7%	2.0%
NE3-11	BaO	0.0056	0.0060	0.0000	0.0056	0.0060		
NE3-11	CaO	0.0070	0.0071	0.0000	0.0070	0.0071		
NE3-11	CdO	0.0057	0.0057	0.0000	0.0057	0.0057		
NE3-11	Ce_2O_3	0.0059	0.0059	0.0000	0.0059	0.0059		
NE3-11	Cr_2O_3	0.1348	0.1328	0.2200	-0.0852	-0.0872	-38.7%	-39.6%
NE3-11	CuO	0.0063	0.0064	0.0000	0.0063	0.0064		
NE3-11	Fe_2O_3	12.3705	12.3840	13.0800	-0.7095	-0.6960	-5.4%	-5.3%
NE3-11	La_2O_3	0.0059	0.0059	0.0000	0.0059	0.0059		
NE3-11	Li_2O	6.9969	7.0447	7.2000	-0.2031	-0.1553	-2.8%	-2.2%
NE3-11	MgO	0.0083	0.0087	0.0000	0.0083	0.0087		
NE3-11	MnO	4.1770	4.5273	3.9800	0.1970	0.5473	5.0%	13.8%
NE3-11	Na_2O	10.7402	10.9956	11.0100	-0.2698	-0.0144	-2.5%	-0.1%
NE3-11	NiO	0.3992	0.4327	0.4600	-0.0608	-0.0273	-13.2%	-5.9%

Table A4. Average Measured and Bias-Corrected Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID (continued)

Glass ID	Oxide	Measured (wt %)	Measured Bias-Corrected (wt %)	Targeted (wt %)	Diff of Measured	Diff of Meas BC	% Diff of Measured	% Diff of Meas BC
NE3-11	PbO	0.0054	0.0054	0.0000	0.0054	0.0054		
NE3-11	SiO_2	40.8071	42.4183	40.7900	0.0171	1.6283	0.0%	4.0%
NE3-11	SO_4^{2-}	0.0749	0.0749	0.0000	0.0749	0.0749		
NE3-11	TiO_2	0.0083	0.0086	0.0000	0.0083	0.0086		
NE3-11	ZnO	0.0062	0.0062	0.0000	0.0062	0.0062		
NE3-11	ZrO_2	0.0068	0.0068	0.0000	0.0068	0.0068		
NE3-11	Sum	99.2433	102.1313	99.9900	-0.7467	2.1413	-0.7%	2.1%
NE3-12	Al_2O_3	16.6937	17.1898	17.0200	-0.3263	0.1698	-1.9%	1.0%
NE3-12	B_2O_3	7.7439	7.7877	7.8600	-0.1161	-0.0723	-1.5%	-0.9%
NE3-12	BaO	0.0056	0.0061	0.0000	0.0056	0.0061		
NE3-12	CaO	0.7013	0.7290	0.9200	-0.2187	-0.1910	-23.8%	-20.8%
NE3-12	CdO	0.0057	0.0057	0.0000	0.0057	0.0057		
NE3-12	Ce_2O_3	0.0059	0.0059	0.0000	0.0059	0.0059		
NE3-12	Cr_2O_3	0.1421	0.1422	0.2000	-0.0579	-0.0578	-28.9%	-28.9%
NE3-12	CuO	0.0059	0.0061	0.0000	0.0059	0.0061		
NE3-12	Fe_2O_3	8.8034	8.8333	9.1400	-0.3366	-0.3067	-3.7%	-3.4%
NE3-12	La_2O_3	0.0059	0.0059	0.0000	0.0059	0.0059		
NE3-12	Li_2O	3.9398	3.9504	4.1000	-0.1602	-0.1496	-3.9%	-3.6%
NE3-12	MgO	0.0083	0.0088	0.0000	0.0083	0.0088		
NE3-12	MnO	0.5620	0.6019	0.6400	-0.0780	-0.0381	-12.2%	-6.0%
NE3-12	Na_2O	13.6350	13.6511	13.5300	0.1050	0.1211	0.8%	0.9%
NE3-12	NiO	0.3458	0.3739	0.4100	-0.0642	-0.0361	-15.7%	-8.8%
NE3-12	PbO	0.0054	0.0054	0.0000	0.0054	0.0054		
NE3-12	SiO_2	45.0323	47.4050	45.6700	-0.6377	1.7350	-1.4%	3.8%
NE3-12	SO_4^{2-}	0.0749	0.0749	0.0000	0.0749	0.0749		
NE3-12	TiO_2	0.5217	0.5327	0.5200	0.0017	0.0127	0.3%	2.4%
NE3-12	ZnO	0.0062	0.0062	0.0000	0.0062	0.0062		
NE3-12	ZrO_2	0.0068	0.0068	0.0000	0.0068	0.0068		
NE3-12	Sum	98.2515	101.3287	100.0100	-1.7585	1.3186	-1.8%	1.3%
NE3-13	Al_2O_3	17.2889	18.1180	17.1900	0.0989	0.9280	0.6%	5.4%
NE3-13	B_2O_3	8.0498	7.8405	7.8700	0.1797	-0.0295	2.3%	-0.4%
NE3-13	BaO	0.0628	0.0680	0.0600	0.0028	0.0080	4.7%	13.4%
NE3-13	CaO	0.0381	0.0390	0.0000	0.0381	0.0390		
NE3-13	CdO	0.2090	0.2090	0.2100	-0.0010	-0.0010	-0.5%	-0.5%
NE3-13	Ce_2O_3	0.1649	0.1649	0.2500	-0.0851	-0.0851	-34.1%	-34.1%
NE3-13	Cr_2O_3	0.1246	0.1241	0.1500	-0.0254	-0.0259	-16.9%	-17.3%
NE3-13	CuO	0.1108	0.1140	0.0900	0.0208	0.0240	23.1%	26.6%
NE3-13	Fe_2O_3	4.8395	4.8446	5.0000	-0.1605	-0.1554	-3.2%	-3.1%
NE3-13	La_2O_3	0.0742	0.0742	0.0700	0.0042	0.0042	6.0%	6.0%
NE3-13	Li_2O	4.7902	4.8228	4.8800	-0.0898	-0.0572	-1.8%	-1.2%
NE3-13	MgO	0.1787	0.1899	0.0000	0.1787	0.1899		
NE3-13	MnO	4.4191	4.7897	4.3800	0.0391	0.4097	0.9%	9.4%
NE3-13	Na_2O	16.2771	16.4011	18.0000	-1.7229	-1.5989	-9.6%	-8.9%
NE3-13	NiO	1.9278	2.0896	2.3600	-0.4322	-0.2704	-18.3%	-11.5%
NE3-13	PbO	0.1640	0.1640	0.1500	0.0140	0.0140	9.3%	9.3%
NE3-13	SiO_2	38.1865	39.6943	38.7700	-0.5835	0.9243	-1.5%	2.4%
NE3-13	SO_4^{2-}	0.3835	0.3835	0.3400	0.0435	0.0435	12.8%	12.8%
NE3-13	TiO_2	0.8365	0.8702	0.0000	0.8365	0.8702		
NE3-13	ZnO	0.1151	0.1151	0.0900	0.0251	0.0251	27.9%	27.9%
NE3-13	ZrO_2	0.1655	0.1655	0.1400	0.0255	0.0255	18.2%	18.2%
NE3-13	Sum	98.4067	101.2819	100.0000	-1.5933	1.2819	-1.6%	1.3%
NE3-14	Al_2O_3	17.9928	18.5275	18.0000	-0.0072	0.5275	0.0%	2.9%
NE3-14	B_2O_3	5.2404	5.2701	5.3000	-0.0596	-0.0299	-1.1%	-0.6%
NE3-14	BaO	0.0723	0.0777	0.0800	-0.0077	-0.0023	-9.6%	-2.9%
NE3-14	CaO	4.2571	4.4257	4.0000	0.2571	0.4257	6.4%	10.6%
NE3-14	CdO	0.2390	0.2390	0.3000	-0.0610	-0.0610	-20.3%	-20.3%
NE3-14	Ce_2O_3	0.3344	0.3344	0.3600	-0.0256	-0.0256	-7.1%	-7.1%
NE3-14	Cr_2O_3	0.0205	0.0203	0.0000	0.0205	0.0203		
NE3-14	CuO	0.1249	0.1293	0.1300	-0.0051	-0.0007	-3.9%	-0.5%
NE3-14	Fe_2O_3	11.6413	11.6809	11.9400	-0.2987	-0.2591	-2.5%	-2.2%
NE3-14	La_2O_3	0.0836	0.0836	0.1000	-0.0164	-0.0164	-16.4%	-16.4%
NE3-14	Li_2O	6.8408	6.8595	7.0000	-0.1592	-0.1405	-2.3%	-2.0%
NE3-14	MgO	0.0427	0.0450	0.0000	0.0427	0.0450		
NE3-14	MnO	0.1834	0.1964	0.3000	-0.1166	-0.1036	-38.9%	-34.5%
NE3-14	Na_2O	10.9592	11.2124	11.7300	-0.7708	-0.5176	-6.6%	-4.4%

Table A4. Average Measured and Bias-Corrected Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID (continued)

Glass ID	Oxide	Measured (wt %)	Measured Bias-Corrected (wt %)	Targeted (wt %)	Diff of Measured	Diff of Meas BC	% Diff of Measured	% Diff of Meas BC
NE3-14	NiO	0.0064	0.0069	0.0000	0.0064	0.0069		
NE3-14	PbO	0.1855	0.1855	0.2200	-0.0345	-0.0345	-15.7%	-15.7%
NE3-14	SiO_2	37.5982	39.5792	37.7300	-0.1318	1.8492	-0.3%	4.9%
NE3-14	SO_4^{2-}	0.4112	0.4112	0.4800	-0.0688	-0.0688	-14.3%	-14.3%
NE3-14	TiO_2	1.7639	1.8333	2.0000	-0.2361	-0.1667	-11.8%	-8.3%
NE3-14	ZnO	0.1211	0.1211	0.1300	-0.0089	-0.0089	-6.9%	-6.9%
NE3-14	ZrO_2	0.1989	0.1989	0.2000	-0.0011	-0.0011	-0.5%	-0.5%
NE3-14	Sum	98.3175	101.4380	100.0000	-1.6825	1.4380	-1.7%	1.4%
NE3-15	Al_2O_3	10.7560	11.0755	10.7100	0.0460	0.3655	0.4%	3.4%
NE3-15	B_2O_3	6.3030	6.3386	6.3500	-0.0470	-0.0114	-0.7%	-0.2%
NE3-15	BaO	0.0441	0.0476	0.0500	-0.0059	-0.0024	-11.8%	-4.8%
NE3-15	CaO	0.0070	0.0073	0.0600	-0.0530	-0.0527	-88.3%	-87.9%
NE3-15	CdO	0.1448	0.1448	0.1700	-0.0252	-0.0252	-14.8%	-14.8%
NE3-15	Ce_2O_3	0.1988	0.1988	0.2100	-0.0112	-0.0112	-5.3%	-5.3%
NE3-15	Cr_2O_3	0.1779	0.1753	0.2000	-0.0221	-0.0247	-11.0%	-12.4%
NE3-15	CuO	0.0757	0.0780	0.0700	0.0057	0.0080	8.2%	11.5%
NE3-15	Fe_2O_3	6.8161	6.8392	6.9100	-0.0939	-0.0708	-1.4%	-1.0%
NE3-15	La_2O_3	0.0484	0.0484	0.0600	-0.0116	-0.0116	-19.4%	-19.4%
NE3-15	Li_2O	4.8925	4.9057	4.9900	-0.0975	-0.0843	-2.0%	-1.7%
NE3-15	MgO	0.5435	0.5724	0.5300	0.0135	0.0424	2.5%	8.0%
NE3-15	MnO	1.3880	1.4865	1.4200	-0.0320	0.0665	-2.3%	4.7%
NE3-15	Na_2O	16.5467	16.9402	17.7100	-1.1633	-0.7698	-6.6%	-4.3%
NE3-15	NiO	2.1823	2.3598	2.3300	-0.1477	0.0298	-6.3%	1.3%
NE3-15	PbO	0.1072	0.1072	0.1200	-0.0128	-0.0128	-10.7%	-10.7%
NE3-15	SiO_2	47.3320	49.8259	47.5000	-0.1680	2.3259	-0.4%	4.9%
NE3-15	SO_4^{2-}	0.2681	0.2681	0.2700	-0.0019	-0.0019	-0.7%	-0.7%
NE3-15	TiO_2	0.1501	0.1550	0.1400	0.0101	0.0150	7.2%	10.7%
NE3-15	ZnO	0.0812	0.0812	0.0800	0.0012	0.0012	1.5%	1.5%
NE3-15	ZrO_2	0.1185	0.1185	0.1200	-0.0015	-0.0015	-1.2%	-1.2%
NE3-15	Sum	98.1821	101.7741	100.0000	-1.8179	1.7741	-1.8%	1.8%
NE3-16	Al_2O_3	11.3181	11.7880	11.6800	-0.3619	0.1080	-3.1%	0.9%
NE3-16	B_2O_3	9.7241	9.4435	9.8400	-0.1159	-0.3965	-1.2%	-4.0%
NE3-16	BaO	0.0589	0.0638	0.0700	-0.0111	-0.0062	-15.9%	-8.8%
NE3-16	CaO	4.3620	4.5557	4.1800	0.1820	0.3757	4.4%	9.0%
NE3-16	CdO	0.1950	0.1950	0.2500	-0.0550	-0.0550	-22.0%	-22.0%
NE3-16	Ce_2O_3	0.2893	0.2893	0.3000	-0.0107	-0.0107	-3.6%	-3.6%
NE3-16	Cr_2O_3	0.1308	0.1303	0.1600	-0.0292	-0.0297	-18.2%	-18.6%
NE3-16	CuO	0.1130	0.1162	0.1100	0.0030	0.0062	2.7%	5.6%
NE3-16	Fe_2O_3	6.7804	6.9126	7.0700	-0.2896	-0.1574	-4.1%	-2.2%
NE3-16	La_2O_3	0.0680	0.0680	0.0800	-0.0120	-0.0120	-15.0%	-15.0%
NE3-16	Li_2O	4.4296	4.4486	4.6400	-0.2104	-0.1914	-4.5%	-4.1%
NE3-16	MgO	0.1919	0.2039	0.2000	-0.0081	0.0039	-4.0%	2.0%
NE3-16	MnO	4.5515	4.9195	4.7400	-0.1885	0.1795	-4.0%	3.8%
NE3-16	Na_2O	12.9341	13.0314	13.3500	-0.4159	-0.3186	-3.1%	-2.4%
NE3-16	NiO	0.5771	0.6253	0.6700	-0.0929	-0.0447	-13.9%	-6.7%
NE3-16	PbO	0.1532	0.1532	0.1800	-0.0268	-0.0268	-14.9%	-14.9%
NE3-16	SiO_2	38.5074	40.6025	39.9700	-1.4626	0.6325	-3.7%	1.6%
NE3-16	SO_4^{2-}	0.3715	0.3715	0.4000	-0.0285	-0.0285	-7.1%	-7.1%
NE3-16	TiO_2	1.7180	1.7872	1.8300	-0.1120	-0.0428	-6.1%	-2.3%
NE3-16	ZnO	0.1089	0.1089	0.1100	-0.0011	-0.0011	-1.0%	-1.0%
NE3-16	ZrO_2	0.1658	0.1658	0.1700	-0.0042	-0.0042	-2.5%	-2.5%
NE3-16	Sum	96.7487	99.9805	100.0000	-3.2513	-0.0195	-3.3%	0.0%
NE3-17	Al_2O_3	11.6299	12.1635	11.5800	0.0499	0.5835	0.4%	5.0%
NE3-17	B_2O_3	5.3531	5.3700	5.4300	-0.0769	-0.0600	-1.4%	-1.1%
NE3-17	BaO	0.0592	0.0639	0.0800	-0.0208	-0.0161	-26.0%	-20.2%
NE3-17	CaO	4.2885	4.4339	3.7900	0.4985	0.6439	13.2%	17.0%
NE3-17	CdO	0.1948	0.1948	0.2900	-0.0952	-0.0952	-32.8%	-32.8%
NE3-17	Ce_2O_3	0.1461	0.1461	0.3500	-0.2039	-0.2039	-58.3%	-58.3%
NE3-17	Cr_2O_3	0.1147	0.1130	0.1300	-0.0153	-0.0170	-11.7%	-13.1%
NE3-17	CuO	0.1042	0.1074	0.1300	-0.0258	-0.0226	-19.8%	-17.4%
NE3-17	Fe_2O_3	9.4539	9.6331	10.3400	-0.8861	-0.7069	-8.6%	-6.8%
NE3-17	La_2O_3	0.0686	0.0686	0.1000	-0.0314	-0.0314	-31.4%	-31.4%
NE3-17	Li_2O	4.6772	4.7168	4.3800	0.2972	0.3368	6.8%	7.7%
NE3-17	MgO	0.1795	0.1891	0.3700	-0.1905	-0.1809	-51.5%	-48.9%
NE3-17	MnO	1.6043	1.7318	1.5000	0.1043	0.2318	7.0%	15.5%

Table A4. Average Measured and Bias-Corrected Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID (continued)

Glass ID	Oxide	Measured (wt %)	Measured Bias-Corrected (wt %)	Targeted (wt %)	Diff of Measured	Diff of Meas BC	% Diff of Measured	% Diff of Meas BC
NE3-17	Na_2O	14.6932	15.0427	15.2500	-0.5568	-0.2073	-3.7%	-1.4%
NE3-17	NiO	1.4188	1.5431	1.5100	-0.0912	0.0331	-6.0%	2.2%
NE3-17	PbO	0.1543	0.1543	0.2100	-0.0557	-0.0557	-26.5%	-26.5%
NE3-17	SiO_2	46.3693	48.5614	42.0100	4.3593	6.5514	10.4%	15.6%
NE3-17	SO_4^{2-}	0.3790	0.3790	0.4700	-0.0910	-0.0910	-19.4%	-19.4%
NE3-17	TiO_2	0.8378	0.8649	1.7500	-0.9122	-0.8851	-52.1%	-50.6%
NE3-17	ZnO	0.1074	0.1074	0.1300	-0.0226	-0.0226	-17.4%	-17.4%
NE3-17	ZrO_2	0.1574	0.1574	0.2000	-0.0426	-0.0426	-21.3%	-21.3%
NE3-17	Sum	101.9912	105.7420	100.0000	1.9912	5.7420	2.0%	5.7%
NE3-18	Al_2O_3	11.8802	12.4255	11.9300	-0.0498	0.4955	-0.4%	4.2%
NE3-18	B_2O_3	5.5141	5.5291	5.5300	-0.0159	-0.0009	-0.3%	0.0%
NE3-18	BaO	0.0449	0.0485	0.0500	-0.0051	-0.0015	-10.1%	-3.0%
NE3-18	CaO	3.7079	3.8337	3.6900	0.0179	0.1437	0.5%	3.9%
NE3-18	CdO	0.1494	0.1494	0.1800	-0.0306	-0.0306	-17.0%	-17.0%
NE3-18	Ce_2O_3	0.2091	0.2091	0.2200	-0.0109	-0.0109	-5.0%	-5.0%
NE3-18	Cr_2O_3	0.0698	0.0687	0.0800	-0.0102	-0.0113	-12.8%	-14.1%
NE3-18	CuO	0.0814	0.0838	0.0800	0.0014	0.0038	1.7%	4.8%
NE3-18	Fe_2O_3	5.4329	5.5357	5.4700	-0.0371	0.0657	-0.7%	1.2%
NE3-18	La_2O_3	0.0516	0.0516	0.0600	-0.0084	-0.0084	-14.0%	-14.0%
NE3-18	Li_2O	5.7536	5.8025	5.9200	-0.1664	-0.1175	-2.8%	-2.0%
NE3-18	MgO	1.2686	1.3360	1.3400	-0.0714	-0.0040	-5.3%	-0.3%
NE3-18	MnO	0.3325	0.3589	0.4400	-0.1075	-0.0811	-24.4%	-18.4%
NE3-18	Na_2O	14.7606	15.1124	15.3400	-0.5794	-0.2276	-3.8%	-1.5%
NE3-18	NiO	2.0646	2.2454	2.2100	-0.1454	0.0354	-6.6%	1.6%
NE3-18	PbO	0.1169	0.1169	0.1300	-0.0131	-0.0131	-10.1%	-10.1%
NE3-18	SiO_2	45.6206	47.7784	46.0900	-0.4694	1.6884	-1.0%	3.7%
NE3-18	SO_4^{2-}	0.2726	0.2726	0.2900	-0.0174	-0.0174	-6.0%	-6.0%
NE3-18	TiO_2	0.7281	0.7517	0.7500	-0.0219	0.0017	-2.9%	0.2%
NE3-18	ZnO	0.0840	0.0840	0.0800	0.0040	0.0040	5.0%	5.0%
NE3-18	ZrO_2	0.1256	0.1256	0.1300	-0.0044	-0.0044	-3.4%	-3.4%
NE3-18	Sum	98.2689	101.9194	100.0100	-1.7411	1.9094	-1.7%	1.9%
NE3-19	Al_2O_3	12.2062	12.7125	12.3000	-0.0938	0.4125	-0.8%	3.4%
NE3-19	B_2O_3	9.3216	9.0544	9.1200	0.2016	-0.0656	2.2%	-0.7%
NE3-19	BaO	0.0056	0.0061	0.0100	-0.0044	-0.0039	-44.2%	-39.1%
NE3-19	CaO	4.0822	4.2638	3.8600	0.2222	0.4038	5.8%	10.5%
NE3-19	CdO	0.0197	0.0197	0.0300	-0.0103	-0.0103	-34.3%	-34.3%
NE3-19	Ce_2O_3	0.0343	0.0343	0.0400	-0.0057	-0.0057	-14.3%	-14.3%
NE3-19	Cr_2O_3	0.1096	0.1097	0.1200	-0.0104	-0.0103	-8.7%	-8.6%
NE3-19	CuO	0.0182	0.0187	0.0100	0.0082	0.0087	81.5%	87.1%
NE3-19	Fe_2O_3	7.4666	7.6123	7.6400	-0.1734	-0.0277	-2.3%	-0.4%
NE3-19	La_2O_3	0.0059	0.0059	0.0100	-0.0041	-0.0041	-41.4%	-41.4%
NE3-19	Li_2O	5.0970	5.1191	5.1900	-0.0930	-0.0709	-1.8%	-1.4%
NE3-19	MgO	0.8333	0.8839	0.8500	-0.0167	0.0339	-2.0%	4.0%
NE3-19	MnO	0.8519	0.9208	0.9300	-0.0781	-0.0092	-8.4%	-1.0%
NE3-19	Na_2O	14.0866	14.1030	14.0100	0.0766	0.0930	0.5%	0.7%
NE3-19	NiO	0.5115	0.5543	0.5800	-0.0685	-0.0257	-11.8%	-4.4%
NE3-19	PbO	0.0218	0.0218	0.0200	0.0018	0.0018	9.1%	9.1%
NE3-19	SiO_2	43.5348	45.9002	44.3500	-0.8152	1.5502	-1.8%	3.5%
NE3-19	SO_4^{2-}	0.0749	0.0749	0.0500	0.0249	0.0249	49.8%	49.8%
NE3-19	TiO_2	0.8119	0.8290	0.8400	-0.0281	-0.0110	-3.3%	-1.3%
NE3-19	ZnO	0.0093	0.0093	0.0100	-0.0007	-0.0007	-6.6%	-6.6%
NE3-19	ZrO_2	0.0243	0.0243	0.0200	0.0043	0.0043	21.6%	21.6%
NE3-19	Sum	99.1271	102.2779	99.9900	-0.8629	2.2879	-0.9%	2.3%
NE3-20	Al_2O_3	12.8675	13.4020	13.2100	-0.3425	0.1920	-2.6%	1.5%
NE3-20	B_2O_3	6.3030	6.1202	6.3000	0.0030	-0.1798	0.0%	-2.9%
NE3-20	BaO	0.0145	0.0158	0.0200	-0.0055	-0.0042	-27.4%	-20.9%
NE3-20	CaO	0.1966	0.2052	0.3000	-0.1034	-0.0948	-34.5%	-31.6%
NE3-20	CdO	0.0406	0.0406	0.0600	-0.0194	-0.0194	-32.4%	-32.4%
NE3-20	Ce_2O_3	0.0682	0.0682	0.0700	-0.0018	-0.0018	-2.5%	-2.5%
NE3-20	Cr_2O_3	0.1184	0.1185	0.1300	-0.0116	-0.0115	-8.9%	-8.9%
NE3-20	CuO	0.0332	0.0342	0.0200	0.0132	0.0142	65.9%	71.0%
NE3-20	Fe_2O_3	4.9217	5.0177	5.1700	-0.2483	-0.1523	-4.8%	-2.9%
NE3-20	La_2O_3	0.0152	0.0152	0.0200	-0.0048	-0.0048	-23.8%	-23.8%
NE3-20	Li_2O	5.4899	5.5135	5.6900	-0.2001	-0.1765	-3.5%	-3.1%
NE3-20	MgO	0.1683	0.1786	0.1800	-0.0117	-0.0014	-6.5%	-0.8%

Table A4. Average Measured and Bias-Corrected Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID (continued)

Glass ID	Oxide	Measured (wt %)	Measured Bias-Corrected (wt %)	Targeted (wt %)	Diff of Measured	Diff of Meas BC	% Diff of Measured	% Diff of Meas BC
NE3-20	MnO	1.3816	1.4933	1.4800	-0.0984	0.0133	-6.6%	0.9%
NE3-20	Na_2O	17.5240	17.5475	17.7600	-0.2360	-0.2125	-1.3%	-1.2%
NE3-20	NiO	0.0064	0.0069	0.0000	0.0064	0.0069		
NE3-20	PbO	0.0315	0.0315	0.0400	-0.0085	-0.0085	-21.2%	-21.2%
NE3-20	SiO_2	47.7064	50.2963	48.4700	-0.7636	1.8263	-1.6%	3.8%
NE3-20	SO_4^{2-}	0.1326	0.1326	0.0900	0.0426	0.0426	47.3%	47.3%
NE3-20	TiO_2	0.9086	0.9278	0.9400	-0.0314	-0.0122	-3.3%	-1.3%
NE3-20	ZnO	0.0193	0.0193	0.0300	-0.0107	-0.0107	-35.7%	-35.7%
NE3-20	ZrO_2	0.0469	0.0469	0.0400	0.0069	0.0069	17.4%	17.4%
NE3-20	Sum	97.9944	101.2318	100.0200	-2.0256	1.2118	-2.0%	1.2%
NE3-21	Al_2O_3	13.5572	14.1192	13.6300	-0.0728	0.4892	-0.5%	3.6%
NE3-21	B_2O_3	5.5302	5.3716	5.2800	0.2502	0.0916	4.7%	1.7%
NE3-21	BaO	0.0603	0.0653	0.0700	-0.0097	-0.0047	-13.9%	-6.7%
NE3-21	CaO	3.5085	3.6647	3.3600	0.1485	0.3047	4.4%	9.1%
NE3-21	CdO	0.2076	0.2076	0.2500	-0.0424	-0.0424	-17.0%	-17.0%
NE3-21	Ce_2O_3	0.2955	0.2955	0.3100	-0.0145	-0.0145	-4.7%	-4.7%
NE3-21	Cr_2O_3	0.0552	0.0550	0.0500	0.0052	0.0050	10.4%	9.9%
NE3-21	CuO	0.1108	0.1140	0.1100	0.0008	0.0040	0.7%	3.6%
NE3-21	Fe_2O_3	5.3757	5.4806	5.6000	-0.2243	-0.1194	-4.0%	-2.1%
NE3-21	La_2O_3	0.0745	0.0745	0.0800	-0.0055	-0.0055	-6.9%	-6.9%
NE3-21	Li_2O	7.1584	7.1895	7.3100	-0.1516	-0.1205	-2.1%	-1.6%
NE3-21	MgO	0.9121	0.9691	0.9400	-0.0279	0.0291	-3.0%	3.1%
NE3-21	MnO	5.6619	6.1203	5.5900	0.0719	0.5303	1.3%	9.5%
NE3-21	Na_2O	12.8397	12.9346	13.0500	-0.2103	-0.1154	-1.6%	-0.9%
NE3-21	NiO	0.7037	0.7625	0.7900	-0.0863	-0.0275	-10.9%	-3.5%
NE3-21	PbO	0.1600	0.1600	0.1800	-0.0200	-0.0200	-11.1%	-11.1%
NE3-21	SiO_2	40.7537	42.9654	41.1700	-0.4163	1.7954	-1.0%	4.4%
NE3-21	SO_4^{2-}	0.4000	0.4000	0.4100	-0.0100	-0.0100	-2.5%	-2.5%
NE3-21	TiO_2	1.4153	1.4723	1.5000	-0.0847	-0.0277	-5.6%	-1.8%
NE3-21	ZnO	0.1114	0.1114	0.1100	0.0014	0.0014	1.3%	1.3%
NE3-21	ZrO_2	0.1722	0.1722	0.1700	0.0022	0.0022	1.3%	1.3%
NE3-21	Sum	99.0636	102.7050	99.9600	-0.8964	2.7450	-0.9%	2.7%
NE3-22	Al_2O_3	14.3744	15.0333	14.3600	0.0144	0.6733	0.1%	4.7%
NE3-22	B_2O_3	7.9049	7.9277	7.8600	0.0449	0.0677	0.6%	0.9%
NE3-22	BaO	0.0056	0.0060	0.0000	0.0056	0.0060		
NE3-22	CaO	1.1939	1.2343	1.1500	0.0439	0.0843	3.8%	7.3%
NE3-22	CdO	0.0057	0.0057	0.0100	-0.0043	-0.0043	-42.9%	-42.9%
NE3-22	Ce_2O_3	0.0135	0.0135	0.0100	0.0035	0.0035	34.7%	34.7%
NE3-22	Cr_2O_3	0.1100	0.1095	0.1400	-0.0300	-0.0305	-21.4%	-21.8%
NE3-22	CuO	0.0063	0.0064	0.0100	-0.0037	-0.0036	-37.4%	-35.6%
NE3-22	Fe_2O_3	9.4503	9.6293	10.1500	-0.6997	-0.5207	-6.9%	-5.1%
NE3-22	La_2O_3	0.0059	0.0059	0.0000	0.0059	0.0059		
NE3-22	Li_2O	4.5588	4.5973	4.5800	-0.0212	0.0173	-0.5%	0.4%
NE3-22	MgO	0.0493	0.0524	0.0600	-0.0107	-0.0076	-17.8%	-12.6%
NE3-22	MnO	3.5347	3.8156	3.5100	0.0247	0.3056	0.7%	8.7%
NE3-22	Na_2O	13.5002	13.6018	13.5100	-0.0098	0.0918	-0.1%	0.7%
NE3-22	NiO	0.8064	0.8771	0.9200	-0.1136	-0.0429	-12.3%	-4.7%
NE3-22	PbO	0.0113	0.0113	0.0100	0.0013	0.0013	13.1%	13.1%
NE3-22	SiO_2	41.5024	43.4622	42.0600	-0.5576	1.4022	-1.3%	3.3%
NE3-22	SO_4^{2-}	0.0749	0.0749	0.0200	0.0549	0.0549	274.5%	274.5%
NE3-22	TiO_2	1.5471	1.6094	1.6200	-0.0729	-0.0106	-4.5%	-0.7%
NE3-22	ZnO	0.0062	0.0062	0.0100	-0.0038	-0.0038	-37.8%	-37.8%
NE3-22	ZrO_2	0.0142	0.0142	0.0100	0.0042	0.0042	41.8%	41.8%
NE3-22	Sum	98.6758	102.0941	100.0000	-1.3242	2.0941	-1.3%	2.1%
NE3-23	Al_2O_3	14.0484	14.7217	14.1500	-0.1016	0.5717	-0.7%	4.0%
NE3-23	B_2O_3	12.1149	11.8001	11.8200	0.2949	-0.0199	2.5%	-0.2%
NE3-23	BaO	0.0441	0.0474	0.0500	-0.0059	-0.0026	-11.8%	-5.2%
NE3-23	CaO	3.9667	4.0533	3.9700	-0.0033	0.0833	-0.1%	2.1%
NE3-23	CdO	0.1362	0.1362	0.1700	-0.0338	-0.0338	-19.9%	-19.9%
NE3-23	Ce_2O_3	0.1965	0.1965	0.2000	-0.0035	-0.0035	-1.8%	-1.8%
NE3-23	Cr_2O_3	0.1125	0.1118	0.1200	-0.0075	-0.0082	-6.2%	-6.8%
NE3-23	CuO	0.0710	0.0736	0.0700	0.0010	0.0036	1.5%	5.1%
NE3-23	Fe_2O_3	5.4722	5.4780	5.4500	0.0222	0.0280	0.4%	0.5%
NE3-23	La_2O_3	0.0487	0.0487	0.0500	-0.0013	-0.0013	-2.7%	-2.7%
NE3-23	Li_2O	4.9786	5.0125	5.1800	-0.2014	-0.1675	-3.9%	-3.2%

Table A4. Average Measured and Bias-Corrected Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID (continued)

Glass ID	Oxide	Measured (wt %)	Measured Bias-Corrected (wt %)	Targeted (wt %)	Diff of Measured	Diff of Meas BC	% Diff of Measured	% Diff of Meas BC
NE3-23	MgO	0.2840	0.2995	0.2900	-0.0060	0.0095	-2.1%	3.3%
NE3-23	MnO	3.8962	4.2229	3.7300	0.1662	0.4929	4.5%	13.2%
NE3-23	Na_2O	10.5515	10.7958	11.0900	-0.5385	-0.2942	-4.9%	-2.7%
NE3-23	NiO	0.0080	0.0086	0.0300	-0.0220	-0.0214	-73.5%	-71.3%
NE3-23	PbO	0.1085	0.1085	0.1200	-0.0115	-0.0115	-9.6%	-9.6%
NE3-23	SiO_2	42.4116	44.0861	42.6400	-0.2284	1.4461	-0.5%	3.4%
NE3-23	SO_4^{2-}	0.2966	0.2966	0.2700	0.0266	0.0266	9.8%	9.8%
NE3-23	TiO_2	0.3899	0.4053	0.4000	-0.0101	0.0053	-2.5%	1.3%
NE3-23	ZnO	0.0691	0.0691	0.0800	-0.0109	-0.0109	-13.6%	-13.6%
NE3-23	ZrO_2	0.1141	0.1141	0.1200	-0.0059	-0.0059	-4.9%	-4.9%
NE3-23	Sum	99.3193	102.0863	100.0000	-0.6807	2.0863	-0.7%	2.1%
NE3-24	Al_2O_3	14.7050	15.3800	14.6800	0.0250	0.7000	0.2%	4.8%
NE3-24	B_2O_3	7.2689	7.2902	7.3700	-0.1011	-0.0798	-1.4%	-1.1%
NE3-24	BaO	0.0449	0.0490	0.0500	-0.0051	-0.0010	-10.1%	-2.0%
NE3-24	CaO	4.3900	4.5388	4.0700	0.3200	0.4688	7.9%	11.5%
NE3-24	CdO	0.1545	0.1545	0.1900	-0.0355	-0.0355	-18.7%	-18.7%
NE3-24	Ce_2O_3	0.2214	0.2214	0.2300	-0.0086	-0.0086	-3.7%	-3.7%
NE3-24	Cr_2O_3	0.0205	0.0205	0.0100	0.0105	0.0105	104.6%	104.7%
NE3-24	CuO	0.0839	0.0865	0.0800	0.0039	0.0065	4.8%	8.1%
NE3-24	Fe_2O_3	5.6509	5.7578	5.9600	-0.3091	-0.2022	-5.2%	-3.4%
NE3-24	La_2O_3	0.0534	0.0534	0.0600	-0.0066	-0.0066	-11.1%	-11.1%
NE3-24	Li_2O	5.0216	5.0642	5.1400	-0.1184	-0.0758	-2.3%	-1.5%
NE3-24	MgO	1.1314	1.2001	1.1900	-0.0586	0.0101	-4.9%	0.9%
NE3-24	MnO	0.3577	0.3861	0.4700	-0.1123	-0.0839	-23.9%	-17.9%
NE3-24	Na_2O	16.7489	16.7672	16.7800	-0.0311	-0.0128	-0.2%	-0.1%
NE3-24	NiO	1.4379	1.5639	1.5900	-0.1521	-0.0261	-9.6%	-1.6%
NE3-24	PbO	0.1204	0.1204	0.1400	-0.0196	-0.0196	-14.0%	-14.0%
NE3-24	SiO_2	40.1654	42.0637	40.9900	-0.8246	1.0737	-2.0%	2.6%
NE3-24	SO_4^{2-}	0.2854	0.2854	0.3100	-0.0246	-0.0246	-7.9%	-7.9%
NE3-24	TiO_2	0.4520	0.4616	0.4600	-0.0080	0.0016	-1.7%	0.3%
NE3-24	ZnO	0.0822	0.0822	0.0900	-0.0078	-0.0078	-8.7%	-8.7%
NE3-24	ZrO_2	0.1206	0.1206	0.1300	-0.0094	-0.0094	-7.3%	-7.3%
NE3-24	Sum	98.5167	101.6672	99.9900	-1.4733	1.6772	-1.5%	1.7%
NE3-25	Al_2O_3	17.2086	18.0332	17.1300	0.0786	0.9032	0.5%	5.3%
NE3-25	B_2O_3	7.7036	7.5020	7.3200	0.3836	0.1820	5.2%	2.5%
NE3-25	BaO	0.0514	0.0560	0.0600	-0.0086	-0.0040	-14.4%	-6.6%
NE3-25	CaO	3.5750	3.6528	3.4200	0.1550	0.2328	4.5%	6.8%
NE3-25	CdO	0.1776	0.1776	0.2200	-0.0424	-0.0424	-19.3%	-19.3%
NE3-25	Ce_2O_3	0.2512	0.2512	0.2600	-0.0088	-0.0088	-3.4%	-3.4%
NE3-25	Cr_2O_3	0.1085	0.1086	0.1300	-0.0215	-0.0214	-16.5%	-16.5%
NE3-25	CuO	0.0926	0.0955	0.0900	0.0026	0.0055	2.9%	6.1%
NE3-25	Fe_2O_3	5.3935	5.3992	5.5700	-0.1765	-0.1708	-3.2%	-3.1%
NE3-25	La_2O_3	0.0622	0.0622	0.0700	-0.0078	-0.0078	-11.2%	-11.2%
NE3-25	Li_2O	6.9969	7.0445	7.0900	-0.0931	-0.0455	-1.3%	-0.6%
NE3-25	MgO	0.7976	0.8461	0.8300	-0.0324	0.0161	-3.9%	1.9%
NE3-25	MnO	3.3474	3.6281	3.2600	0.0874	0.3681	2.7%	11.3%
NE3-25	Na_2O	12.2061	12.2182	12.2000	0.0061	0.0182	0.1%	0.1%
NE3-25	NiO	0.4349	0.4714	0.4900	-0.0551	-0.0186	-11.2%	-3.8%
NE3-25	PbO	0.1349	0.1349	0.1600	-0.0251	-0.0251	-15.7%	-15.7%
NE3-25	SiO_2	39.6840	41.2514	39.6800	0.0040	1.5714	0.0%	4.0%
NE3-25	SO_4^{2-}	0.3348	0.3348	0.3500	-0.0152	-0.0152	-4.3%	-4.3%
NE3-25	TiO_2	1.3482	1.3766	1.4100	-0.0618	-0.0334	-4.4%	-2.4%
NE3-25	ZnO	0.0878	0.0878	0.1000	-0.0122	-0.0122	-12.2%	-12.2%
NE3-25	ZrO_2	0.1428	0.1428	0.1500	-0.0072	-0.0072	-4.8%	-4.8%
NE3-25	Sum	100.1398	102.8749	99.9900	0.1498	2.8849	0.1%	2.9%
NE3-26	Al_2O_3	17.6290	18.3612	17.9600	-0.3310	0.4012	-1.8%	2.2%
NE3-26	B_2O_3	6.1500	5.9719	5.8900	0.2600	0.0819	4.4%	1.4%
NE3-26	BaO	0.0056	0.0060	0.0100	-0.0044	-0.0040	-44.2%	-40.0%
NE3-26	CaO	1.2089	1.2625	1.3700	-0.1611	-0.1075	-11.8%	-7.8%
NE3-26	CdO	0.0143	0.0143	0.0200	-0.0057	-0.0057	-28.6%	-28.6%
NE3-26	Ce_2O_3	0.0240	0.0240	0.0300	-0.0060	-0.0060	-20.0%	-20.0%
NE3-26	Cr_2O_3	0.1710	0.1699	0.2100	-0.0390	-0.0401	-18.6%	-19.1%
NE3-26	CuO	0.0144	0.0149	0.0100	0.0044	0.0049	44.0%	49.1%
NE3-26	Fe_2O_3	7.1556	7.2952	7.8800	-0.7244	-0.5848	-9.2%	-7.4%
NE3-26	La_2O_3	0.0059	0.0059	0.0100	-0.0041	-0.0041	-41.4%	-41.4%

Table A4. Average Measured and Bias-Corrected Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID (continued)

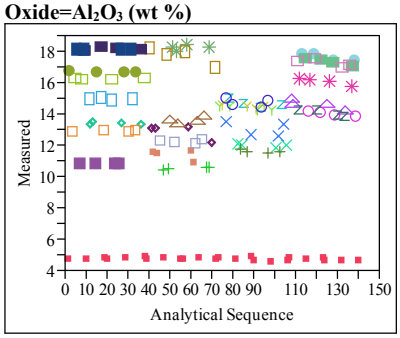
Glass ID	Oxide	Measured (wt %)	Measured Bias-Corrected (wt %)	Targeted (wt %)	Diff of Measured	Diff of Meas BC	% Diff of Measured	% Diff of Meas BC
NE3-26	Li_2O	5.2046	5.2270	5.1100	0.0946	0.1170	1.9%	2.3%
NE3-26	MgO	0.3221	0.3397	0.3200	0.0021	0.0197	0.7%	6.2%
NE3-26	MnO	3.7509	4.0544	3.7900	-0.0391	0.2644	-1.0%	7.0%
NE3-26	Na_2O	16.2771	16.6534	16.9800	-0.7029	-0.3266	-4.1%	-1.9%
NE3-26	NiO	0.9242	1.0013	1.0500	-0.1258	-0.0487	-12.0%	-4.6%
NE3-26	PbO	0.0175	0.0175	0.0200	-0.0025	-0.0025	-12.5%	-12.5%
NE3-26	SiO_2	38.6144	40.7119	38.6300	-0.0156	2.0819	0.0%	5.4%
NE3-26	SO_4^{2-}	0.0749	0.0749	0.0400	0.0349	0.0349	87.2%	87.2%
NE3-26	TiO_2	0.6192	0.6436	0.6400	-0.0208	0.0036	-3.2%	0.6%
NE3-26	ZnO	0.0062	0.0062	0.0100	-0.0038	-0.0038	-37.8%	-37.8%
NE3-26	ZrO_2	0.0192	0.0192	0.0200	-0.0008	-0.0008	-3.8%	-3.8%
NE3-26	Sum	98.2092	101.8751	100.0000	-1.7908	1.8751	-1.8%	1.9%
NE3-27	Al_2O_3	18.2337	18.9895	18.3100	-0.0763	0.6795	-0.4%	3.7%
NE3-27	B_2O_3	5.3048	5.1526	5.1100	0.1948	0.0426	3.8%	0.8%
NE3-27	BaO	0.0525	0.0569	0.0600	-0.0075	-0.0031	-12.5%	-5.2%
NE3-27	CaO	2.4136	2.5210	2.3200	0.0936	0.2010	4.0%	8.7%
NE3-27	CdO	0.1753	0.1753	0.2200	-0.0447	-0.0447	-20.3%	-20.3%
NE3-27	Ce_2O_3	0.2536	0.2536	0.2600	-0.0064	-0.0064	-2.5%	-2.5%
NE3-27	Cr_2O_3	0.0161	0.0160	0.0100	0.0061	0.0060	60.8%	60.2%
NE3-27	CuO	0.0964	0.0992	0.0900	0.0064	0.0092	7.1%	10.2%
NE3-27	Fe_2O_3	6.3371	6.4608	6.8400	-0.5029	-0.3792	-7.4%	-5.5%
NE3-27	La_2O_3	0.0622	0.0622	0.0700	-0.0078	-0.0078	-11.2%	-11.2%
NE3-27	Li_2O	5.4038	5.4273	5.5500	-0.1462	-0.1227	-2.6%	-2.2%
NE3-27	MgO	1.3005	1.3819	1.3700	-0.0695	0.0119	-5.1%	0.9%
NE3-27	MnO	2.0304	2.1948	2.1200	-0.0896	0.0748	-4.2%	3.5%
NE3-27	Na_2O	14.4910	14.6001	14.6500	-0.1590	-0.0499	-1.1%	-0.3%
NE3-27	NiO	1.0307	1.1169	1.3000	-0.2693	-0.1831	-20.7%	-14.1%
NE3-27	PbO	0.1435	0.1435	0.1600	-0.0165	-0.0165	-10.3%	-10.3%
NE3-27	SiO_2	39.3631	41.5000	39.9800	-0.6169	1.5200	-1.5%	3.8%
NE3-27	SO_4^{2-}	0.3400	0.3400	0.3500	-0.0100	-0.0100	-2.8%	-2.8%
NE3-27	TiO_2	0.9253	0.9626	0.9600	-0.0347	0.0026	-3.6%	0.3%
NE3-27	ZnO	0.1005	0.1005	0.1000	0.0005	0.0005	0.5%	0.5%
NE3-27	ZrO_2	0.1516	0.1516	0.1500	0.0016	0.0016	1.1%	1.1%
NE3-27	Sum	98.2259	101.7063	99.9800	-1.7541	1.7263	-1.8%	1.7%
NE3-28	Al_2O_3	17.6385	18.4832	17.7500	-0.1115	0.7332	-0.6%	4.1%
NE3-28	B_2O_3	10.3520	10.0823	10.3100	0.0420	-0.2277	0.4%	-2.2%
NE3-28	BaO	0.0575	0.0627	0.0600	-0.0025	0.0027	-4.2%	4.5%
NE3-28	CaO	0.0070	0.0071	0.0200	-0.0130	-0.0129	-65.0%	-64.3%
NE3-28	CdO	0.1868	0.1868	0.2400	-0.0532	-0.0532	-22.2%	-22.2%
NE3-28	Ce_2O_3	0.2729	0.2729	0.2900	-0.0171	-0.0171	-5.9%	-5.9%
NE3-28	Cr_2O_3	0.0723	0.0724	0.1100	-0.0377	-0.0376	-34.2%	-34.2%
NE3-28	CuO	0.1017	0.1049	0.1000	0.0017	0.0049	1.7%	4.9%
NE3-28	Fe_2O_3	5.1005	5.1056	5.6900	-0.5895	-0.5844	-10.4%	-10.3%
NE3-28	La_2O_3	0.0668	0.0668	0.0800	-0.0132	-0.0132	-16.4%	-16.4%
NE3-28	Li_2O	4.6879	4.7198	4.8100	-0.1221	-0.0902	-2.5%	-1.9%
NE3-28	MgO	0.4880	0.5176	0.5200	-0.0320	-0.0024	-6.2%	-0.5%
NE3-28	MnO	1.9852	2.1517	2.0500	-0.0648	0.1017	-3.2%	5.0%
NE3-28	Na_2O	13.5171	13.5302	13.7900	-0.2729	-0.2598	-2.0%	-1.9%
NE3-28	NiO	1.0320	1.1186	1.2100	-0.1780	-0.0914	-14.7%	-7.6%
NE3-28	PbO	0.1462	0.1462	0.1800	-0.0338	-0.0338	-18.8%	-18.8%
NE3-28	SiO_2	41.2885	42.9192	42.0900	-0.8015	0.8292	-1.9%	2.0%
NE3-28	SO_4^{2-}	0.3662	0.3662	0.3900	-0.0238	-0.0238	-6.1%	-6.1%
NE3-28	TiO_2	0.0517	0.0528	0.0500	0.0017	0.0028	3.4%	5.6%
NE3-28	ZnO	0.1033	0.1033	0.1100	-0.0067	-0.0067	-6.1%	-6.1%
NE3-28	ZrO_2	0.1682	0.1682	0.1700	-0.0018	-0.0018	-1.1%	-1.1%
NE3-28	Sum	97.6903	100.2386	100.0200	-2.3297	0.2186	-2.3%	0.2%
NE3-29	Al_2O_3	18.1298	18.6685	18.0100	0.1198	0.6585	0.7%	3.7%
NE3-29	B_2O_3	10.1588	10.2163	10.3800	-0.2212	-0.1637	-2.1%	-1.6%
NE3-29	BaO	0.0056	0.0060	0.0000	0.0056	0.0060		
NE3-29	CaO	3.3161	3.4474	3.0400	0.2761	0.4074	9.1%	13.4%
NE3-29	CdO	0.0057	0.0057	0.0000	0.0057	0.0057		
NE3-29	Ce_2O_3	0.0059	0.0059	0.0100	-0.0041	-0.0041	-41.4%	-41.4%
NE3-29	Cr_2O_3	0.0577	0.0574	0.0600	-0.0023	-0.0026	-3.8%	-4.4%
NE3-29	CuO	0.0063	0.0065	0.0000	0.0063	0.0065		
NE3-29	Fe_2O_3	7.7275	7.7536	8.1900	-0.4625	-0.4364	-5.6%	-5.3%

Table A4. Average Measured and Bias-Corrected Chemical Compositions Versus Targeted Compositions by Oxide by Glass ID (continued)

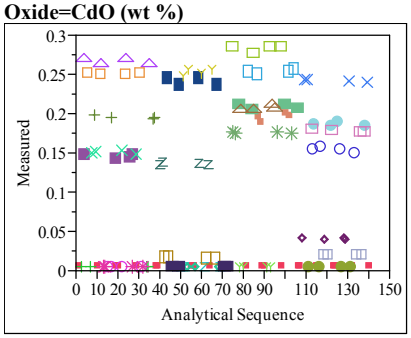
Glass ID	Oxide	Measured (wt %)	Measured Bias-Corrected (wt %)	Targeted (wt %)	Diff of Measured	Diff of Meas BC	% Diff of Measured	% Diff of Meas BC
NE3-29	La_2O_3	0.0059	0.0059	0.0000	0.0059	0.0059		
NE3-29	Li_2O	4.2251	4.2365	4.2900	-0.0649	-0.0535	-1.5%	-1.2%
NE3-29	MgO	0.7404	0.7809	0.7600	-0.0196	0.0209	-2.6%	2.8%
NE3-29	MnO	4.7710	5.1093	4.6900	0.0810	0.4193	1.7%	8.9%
NE3-29	Na_2O	13.9518	14.2755	14.4800	-0.5282	-0.2045	-3.6%	-1.4%
NE3-29	NiO	0.4431	0.4792	0.5300	-0.0869	-0.0508	-16.4%	-9.6%
NE3-29	PbO	0.0054	0.0054	0.0000	0.0054	0.0054		
NE3-29	SiO_2	34.7636	36.5953	35.1000	-0.3364	1.4953	-1.0%	4.3%
NE3-29	SO_4^{2-}	0.0749	0.0749	0.0100	0.0649	0.0649	649.0%	649.0%
NE3-29	TiO_2	0.4333	0.4504	0.4400	-0.0067	0.0104	-1.5%	2.4%
NE3-29	ZnO	0.0062	0.0062	0.0000	0.0062	0.0062		
NE3-29	ZrO_2	0.0152	0.0152	0.0000	0.0152	0.0152		
NE3-29	Sum	98.8492	102.2019	99.9900	-1.1408	2.2119	-1.1%	2.2%

Exhibit A1. Sample Measurements in Analytical Sequence by Oxide

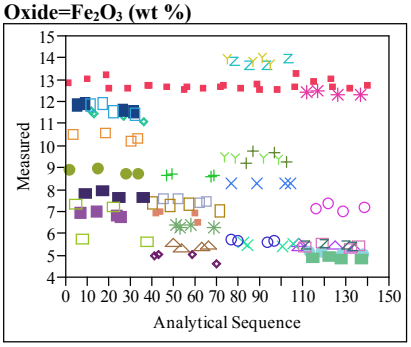
Measured By Analytical Sequence
Oxide=Al_2O_3 (wt %)



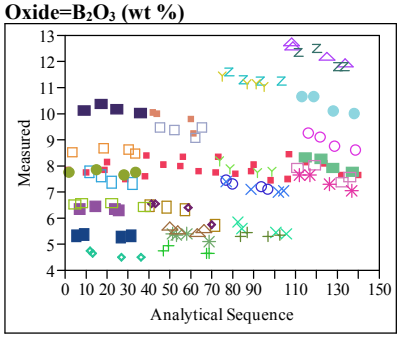
Measured By Analytical Sequence
Oxide=CdO (wt %)



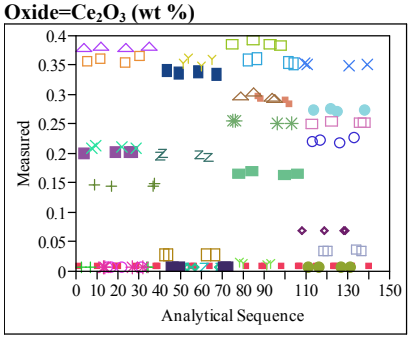
Measured By Analytical Sequence
Oxide=Fe_2O_3 (wt %)



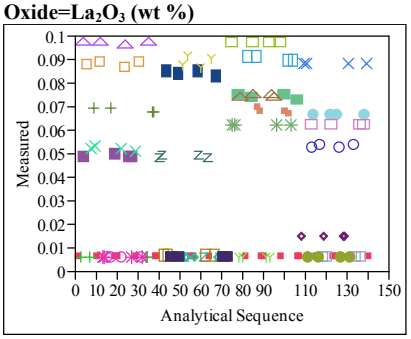
Measured By Analytical Sequence
Oxide=B_2O_3 (wt %)



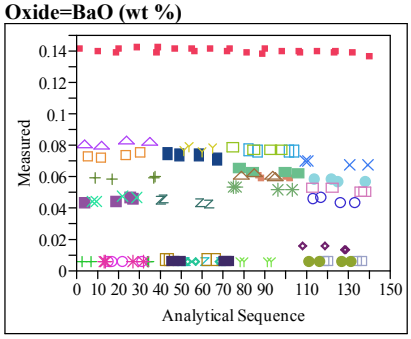
Measured By Analytical Sequence
Oxide=Ce_2O_3 (wt %)



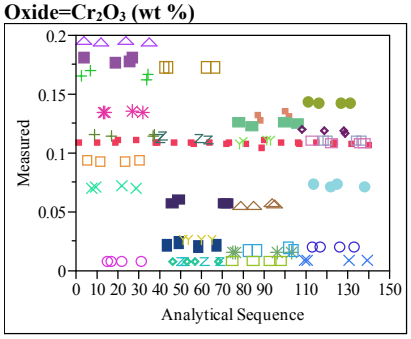
Measured By Analytical Sequence
Oxide=La_2O_3 (wt %)



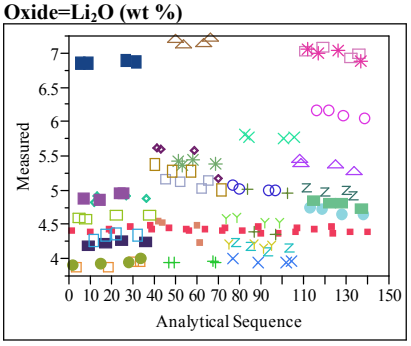
Measured By Analytical Sequence
Oxide=BaO (wt %)



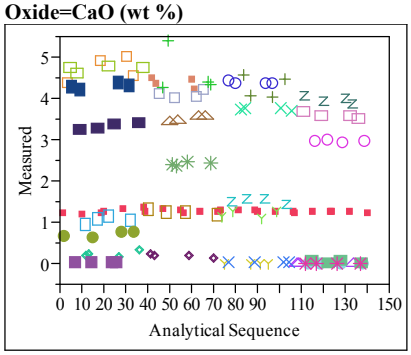
Measured By Analytical Sequence
Oxide=Cr_2O_3 (wt %)



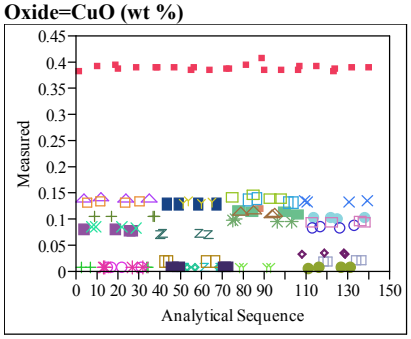
Measured By Analytical Sequence
Oxide=Li_2O (wt %)



Measured By Analytical Sequence
Oxide=CaO (wt %)



Measured By Analytical Sequence
Oxide=CuO (wt %)



Measured By Analytical Sequence
Oxide=MgO (wt %)

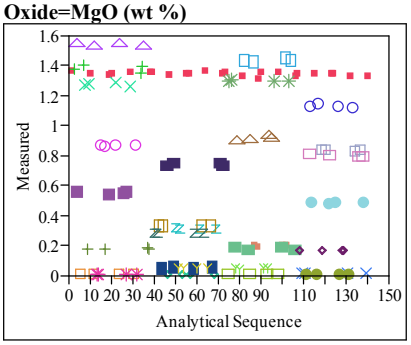
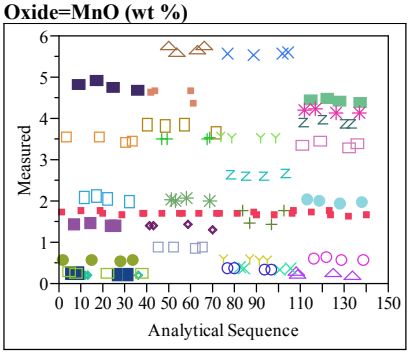
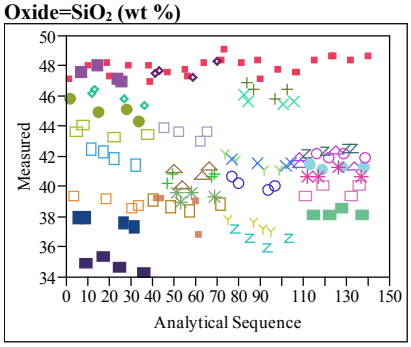


Exhibit A1. Sample Measurements in Analytical Sequence by Oxide (continued)

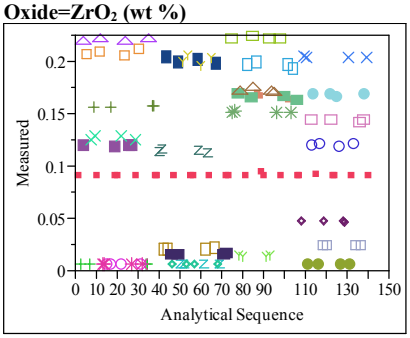
Measured By Analytical Sequence
Oxide=MnO (wt %)



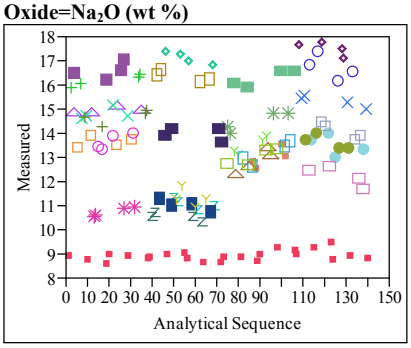
Measured By Analytical Sequence
Oxide=SiO_2 (wt %)



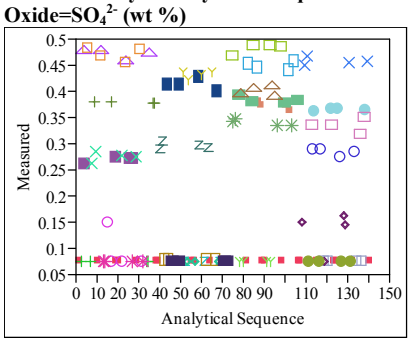
Measured By Analytical Sequence
Oxide=ZrO_2 (wt %)



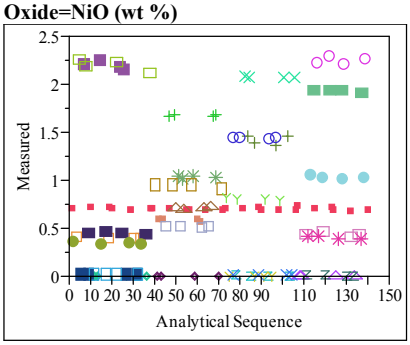
Measured By Analytical Sequence
Oxide=Na_2O (wt %)



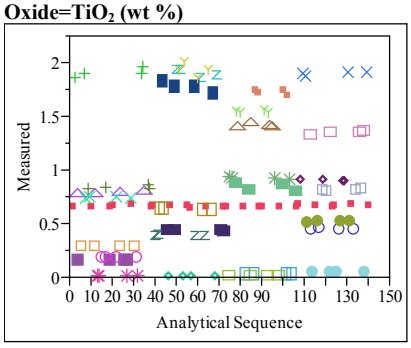
Measured By Analytical Sequence
Oxide=SO_4^{2-} (wt %)



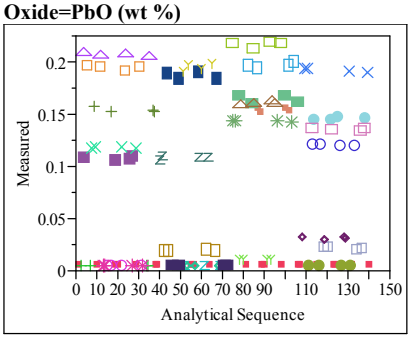
Measured By Analytical Sequence
Oxide=NiO (wt %)



Measured By Analytical Sequence
Oxide=TiO_2 (wt %)



Measured By Analytical Sequence
Oxide=PbO (wt %)



Measured By Analytical Sequence
Oxide=ZnO (wt %)

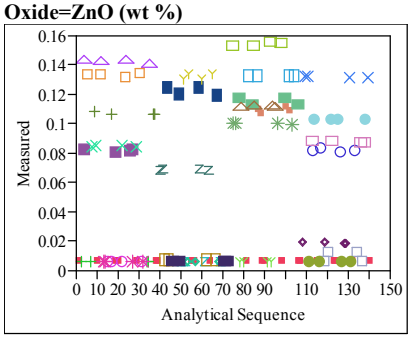
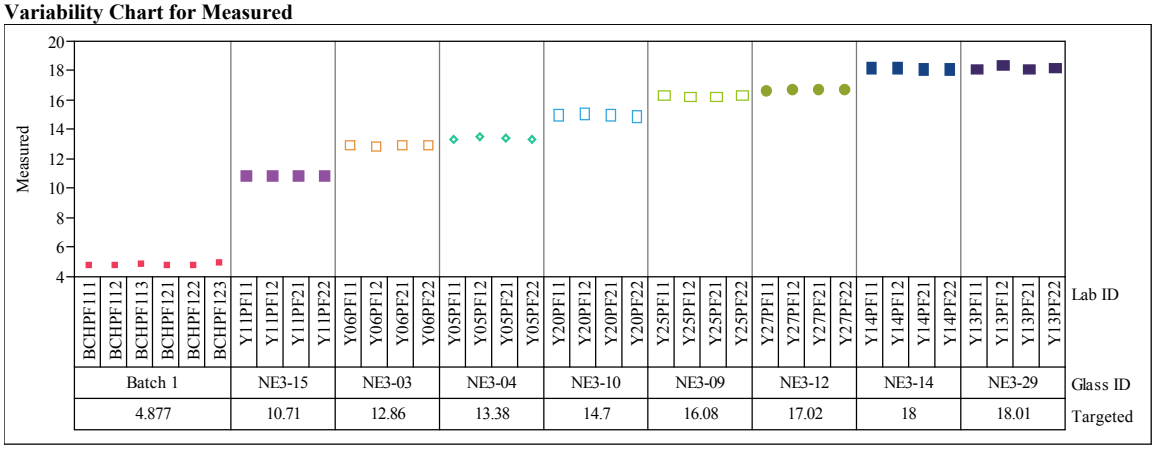
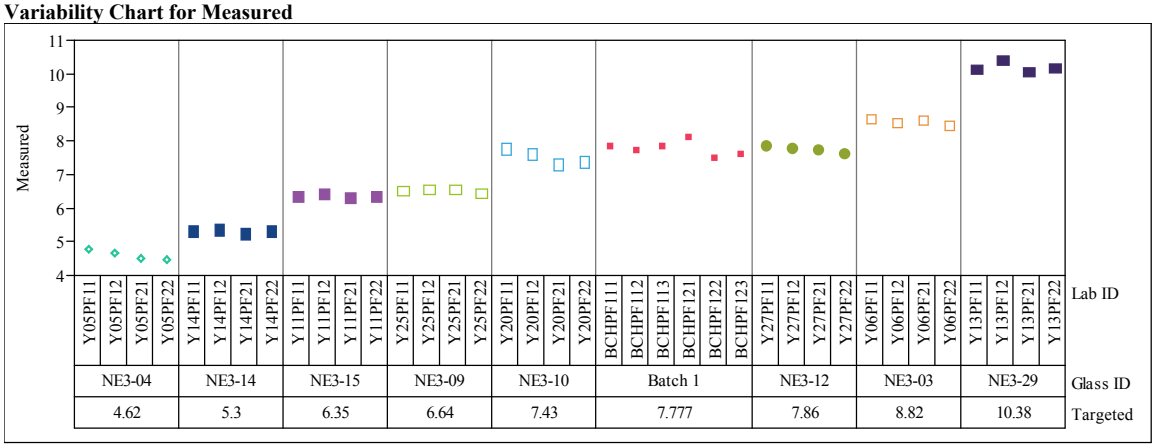


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block

Block=1, Oxide=Al_2O_3 (wt %)
Variability Chart for Measured



Block=1, Oxide=B_2O_3 (wt %)
Variability Chart for Measured



Block=1, Oxide=BaO (wt %)
Variability Chart for Measured

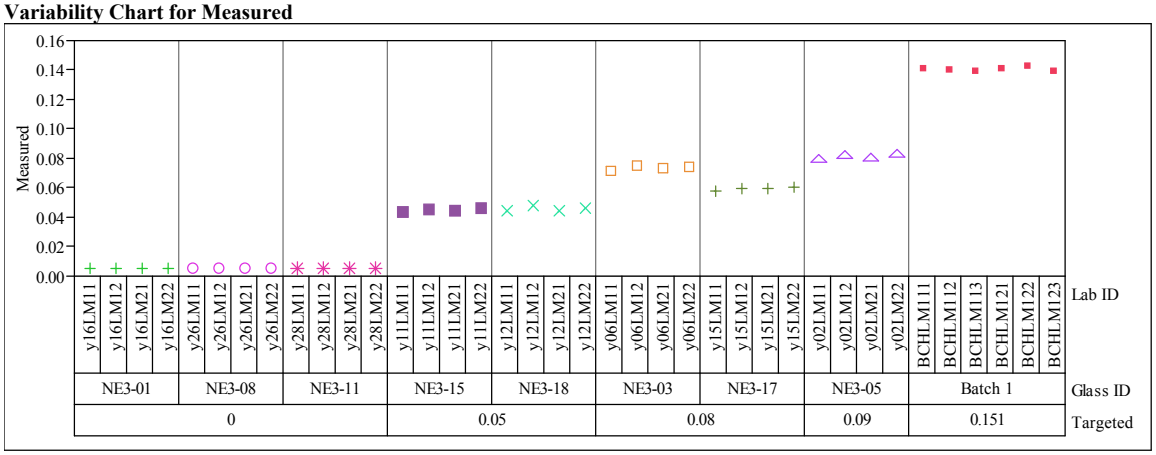
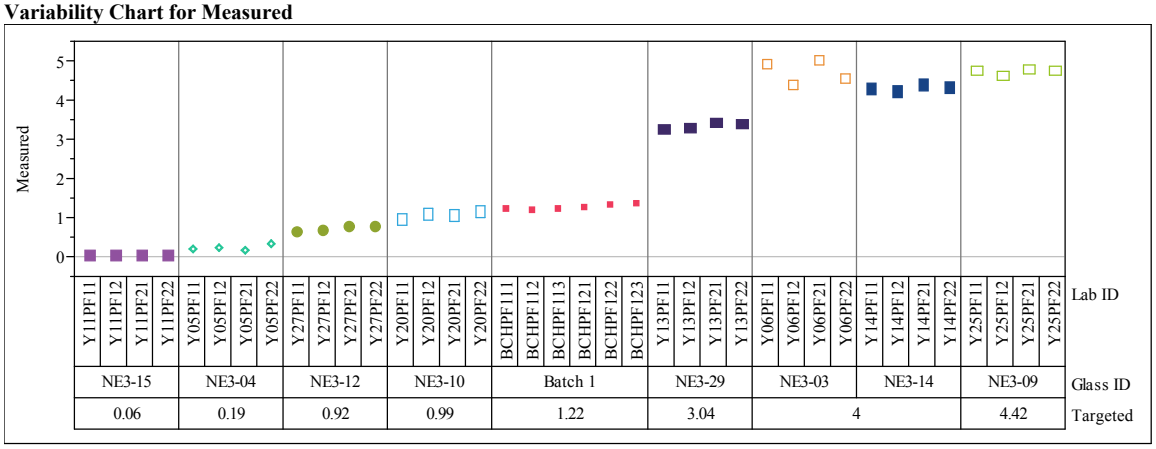
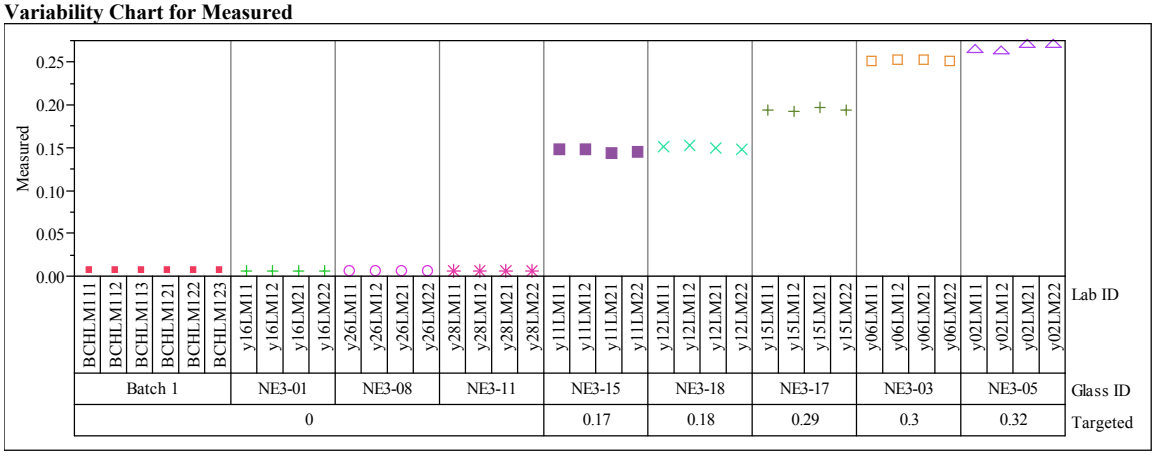


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=1, Oxide=CaO (wt %)
Variability Chart for Measured



Block=1, Oxide=CdO (wt %)
Variability Chart for Measured



Block=1, Oxide=Ce_2O_3 (wt %)
Variability Chart for Measured

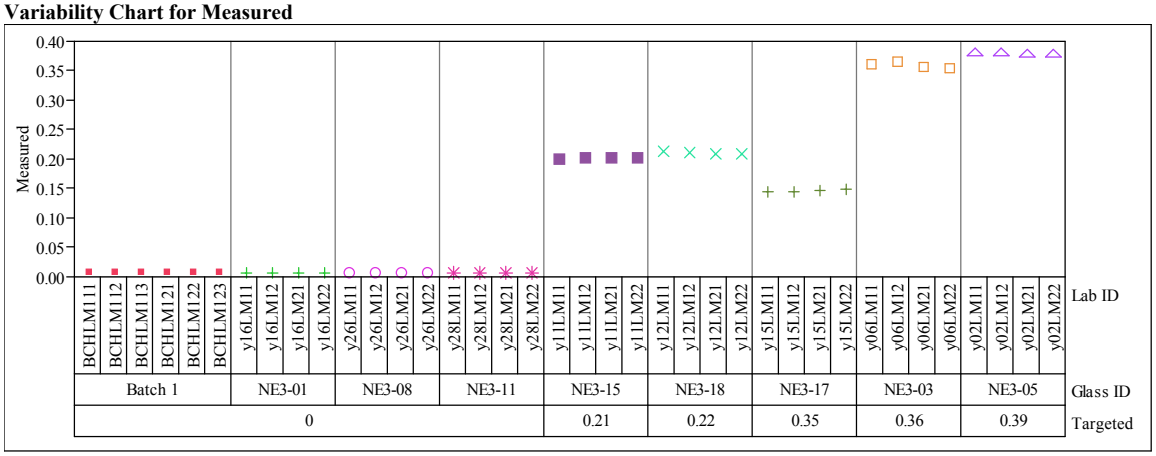
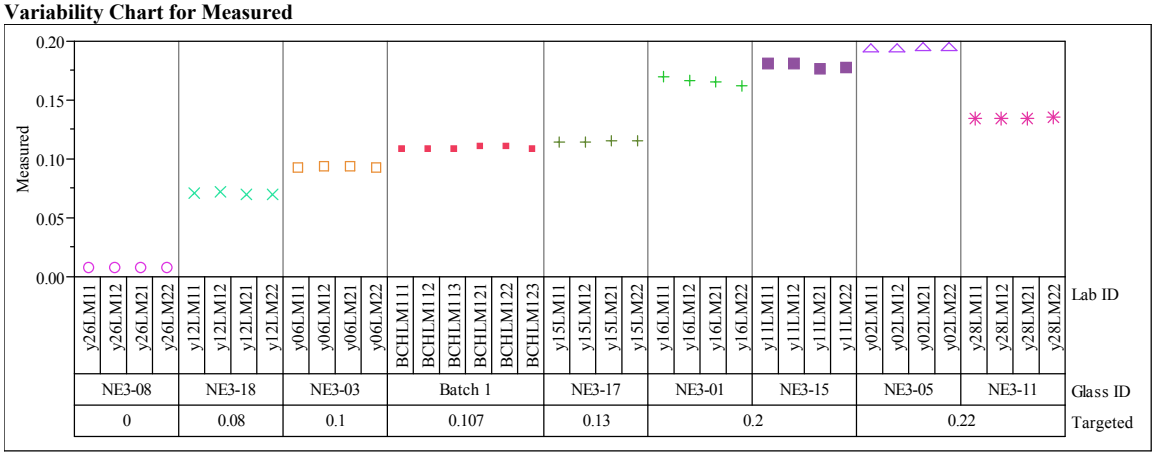
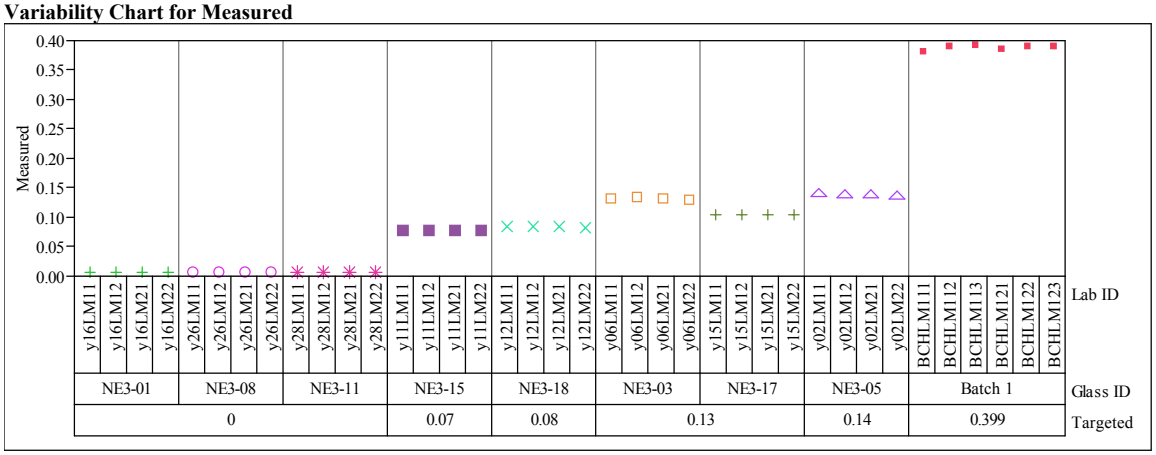


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=1, Oxide=Cr_2O_3 (wt %)
Variability Chart for Measured



Block=1, Oxide=CuO (wt %)
Variability Chart for Measured



Block=1, Oxide=Fe_2O_3 (wt %)
Variability Chart for Measured

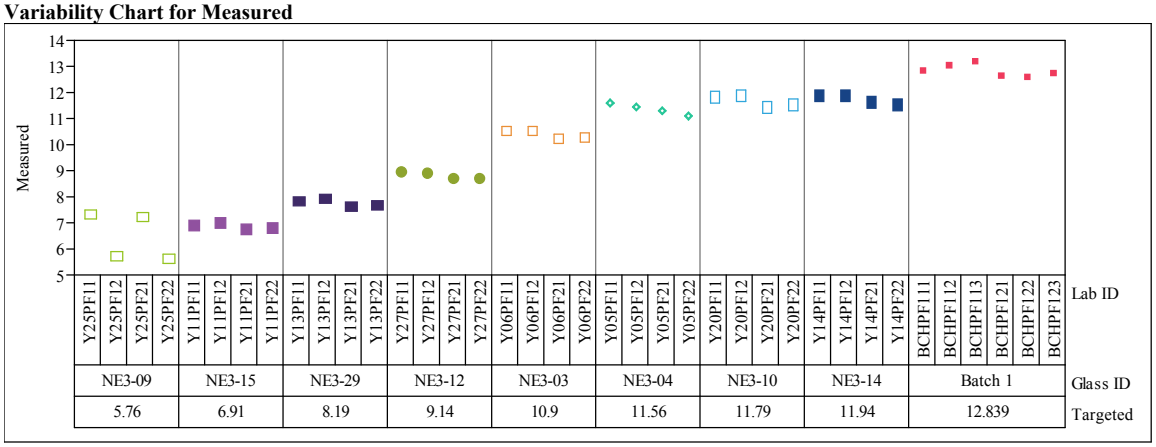
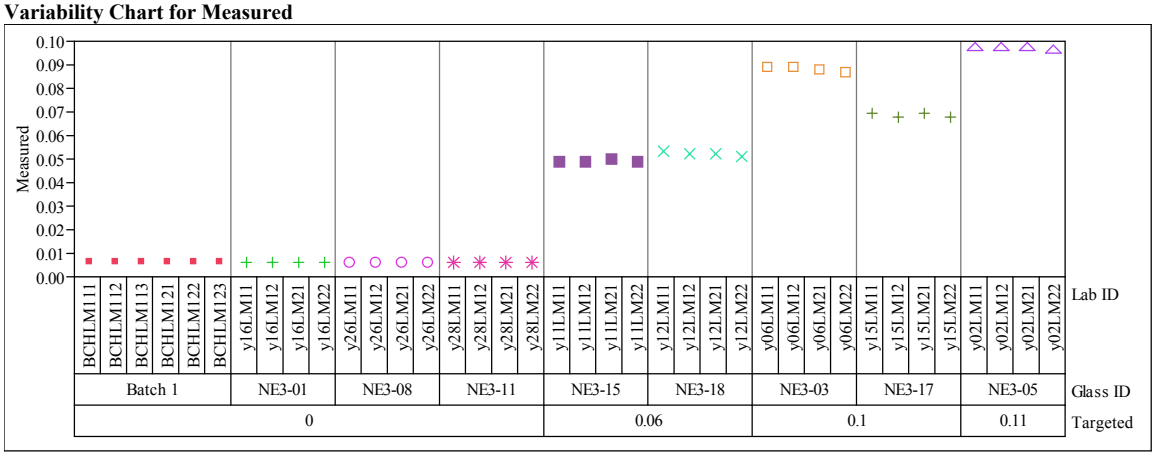
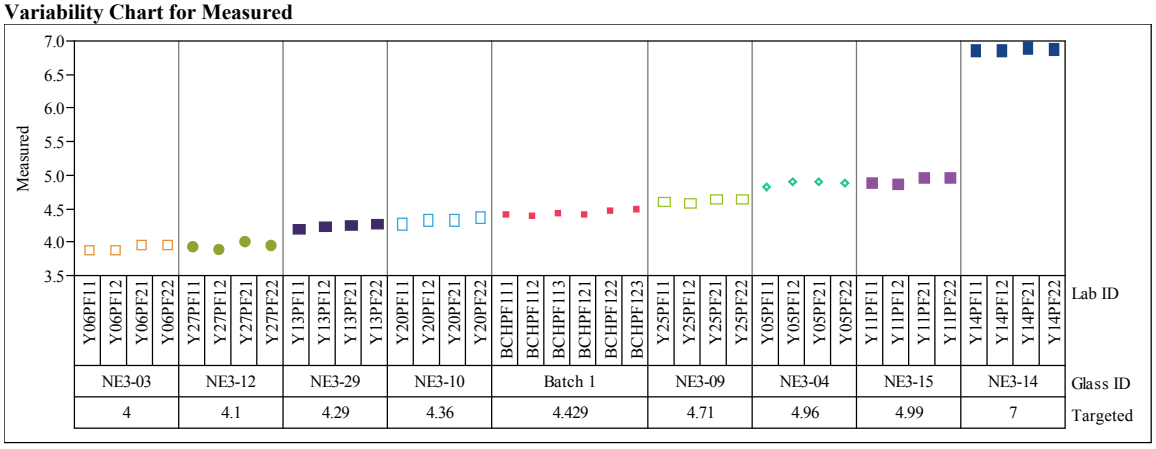


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=1, Oxide=La_2O_3 (wt %)
Variability Chart for Measured



Block=1, Oxide=Li_2O (wt %)
Variability Chart for Measured



Block=1, Oxide=MgO (wt %)
Variability Chart for Measured

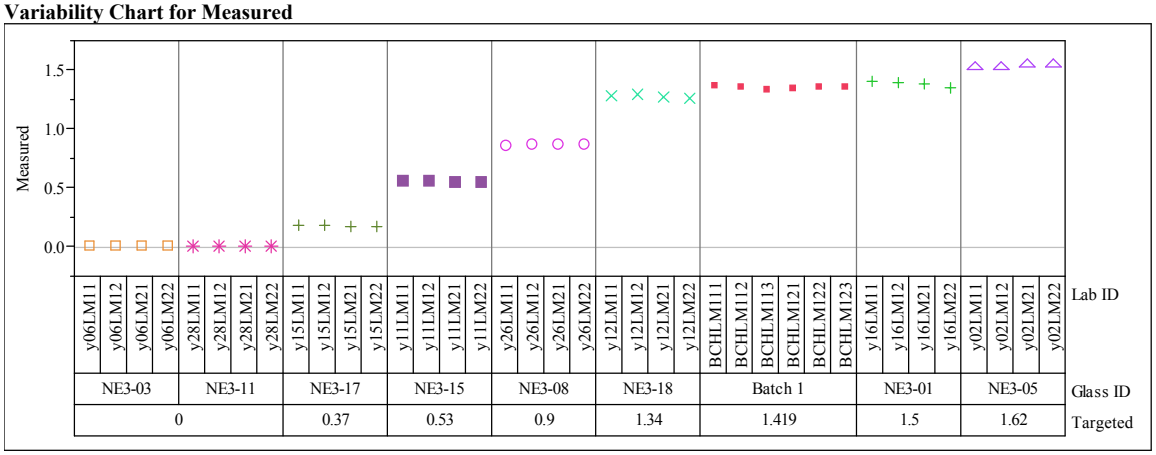
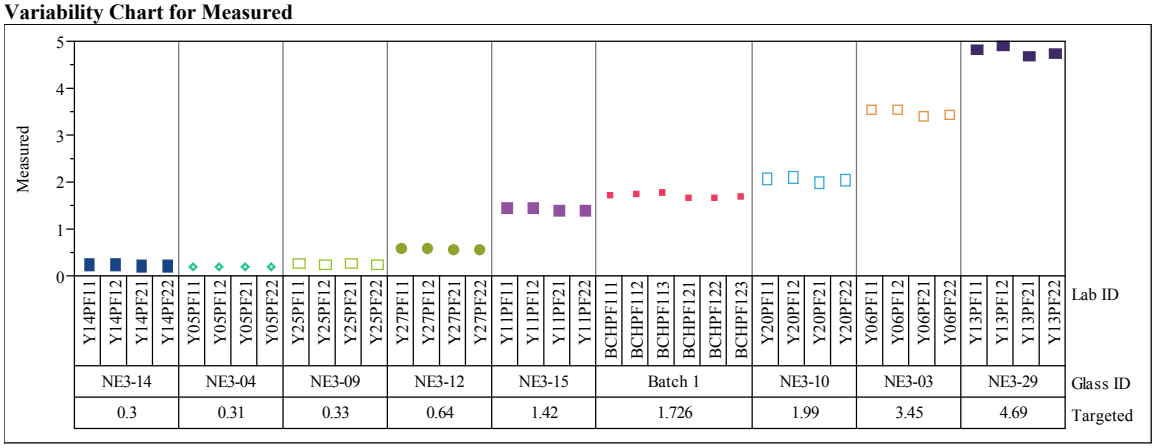
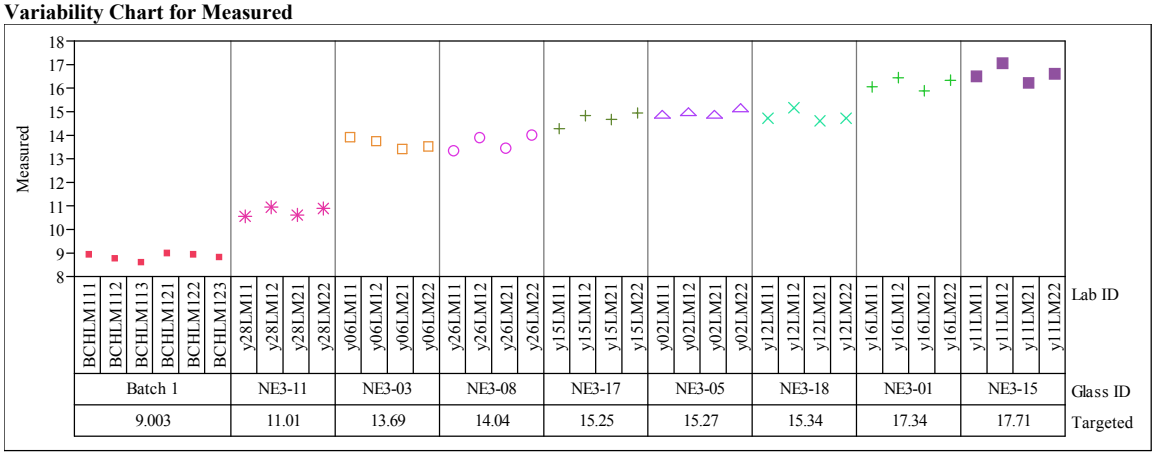


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=1, Oxide=MnO (wt %)
Variability Chart for Measured



Block=1, Oxide=Na_2O (wt %)
Variability Chart for Measured



Block=1, Oxide=NiO (wt %)
Variability Chart for Measured

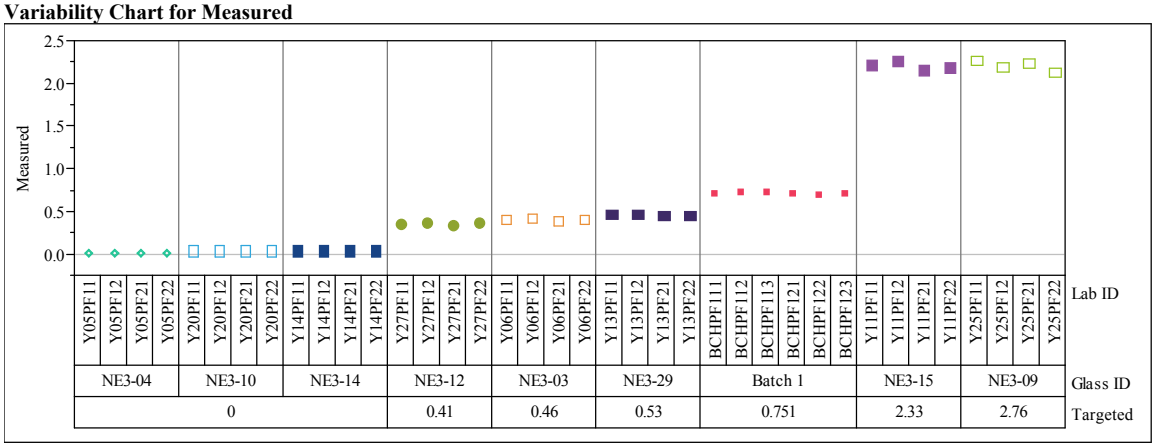
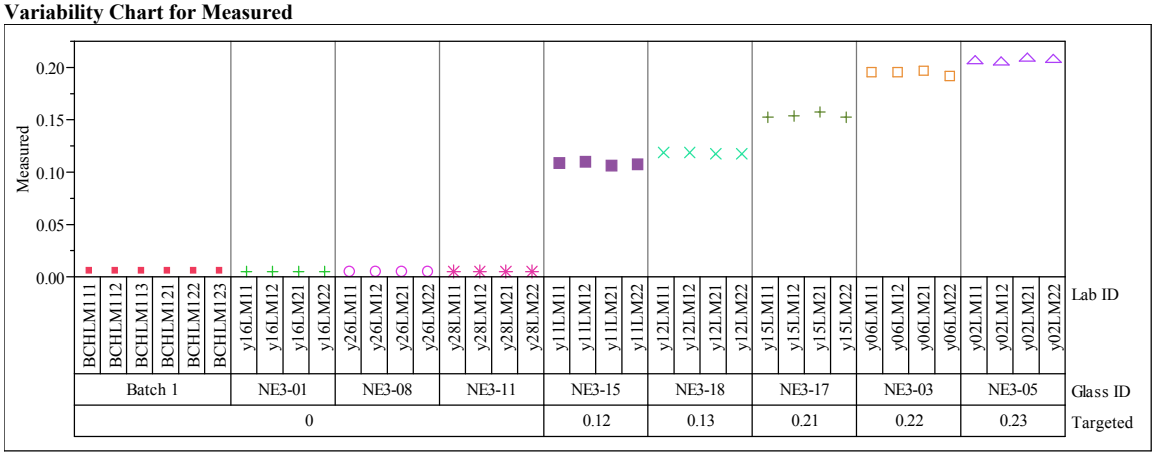
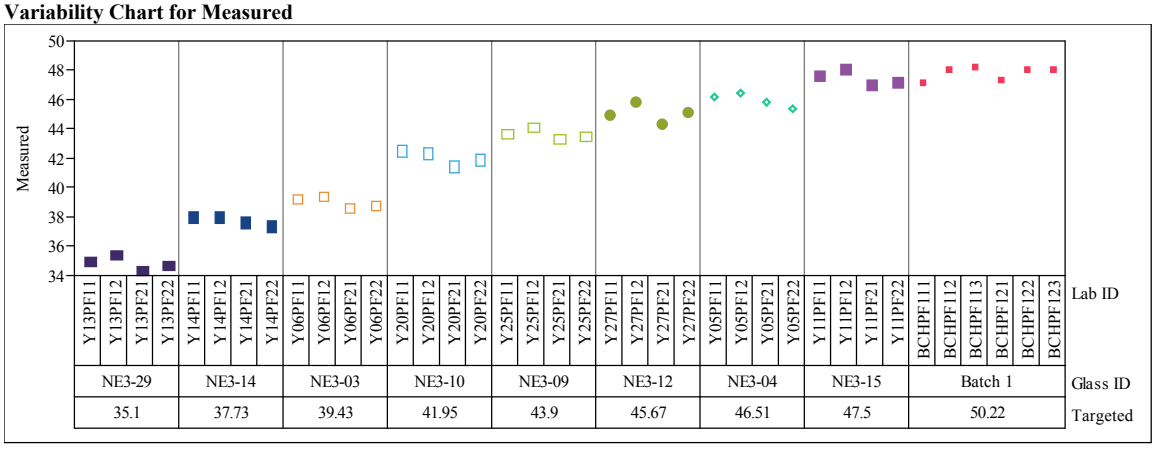


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=1, Oxide=PbO (wt %)
Variability Chart for Measured



Block=1, Oxide=SiO_2 (wt %)
Variability Chart for Measured



Block=1, Oxide=SO_4^{2-} (wt %)
Variability Chart for Measured

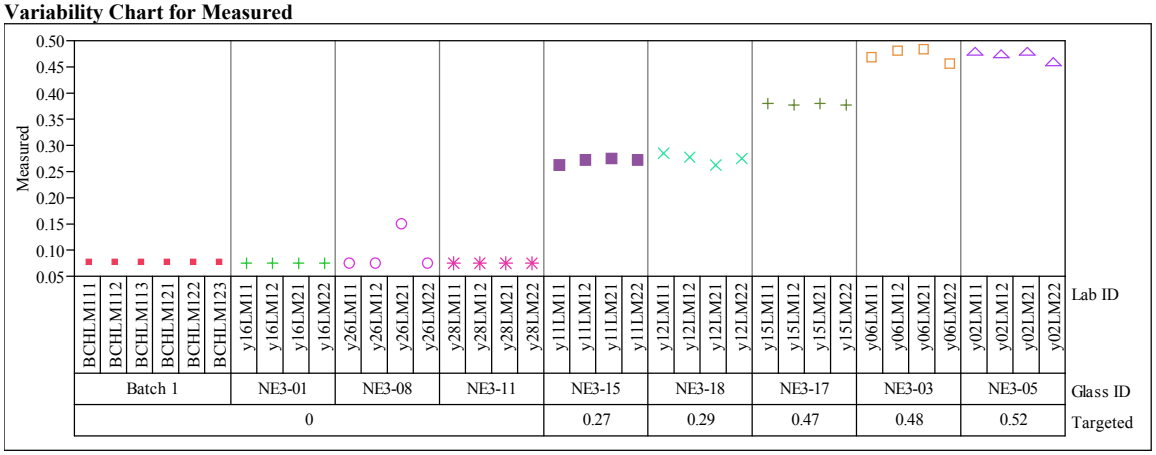
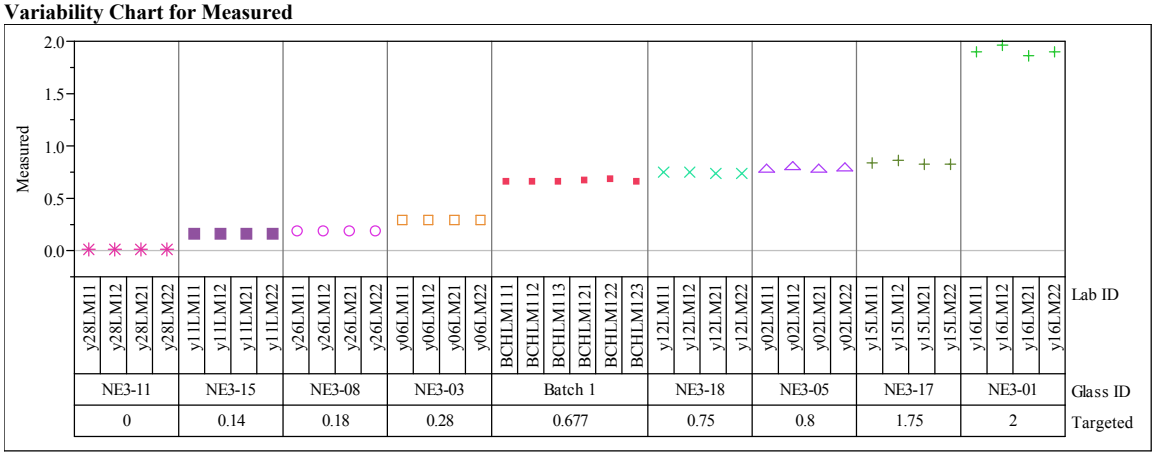
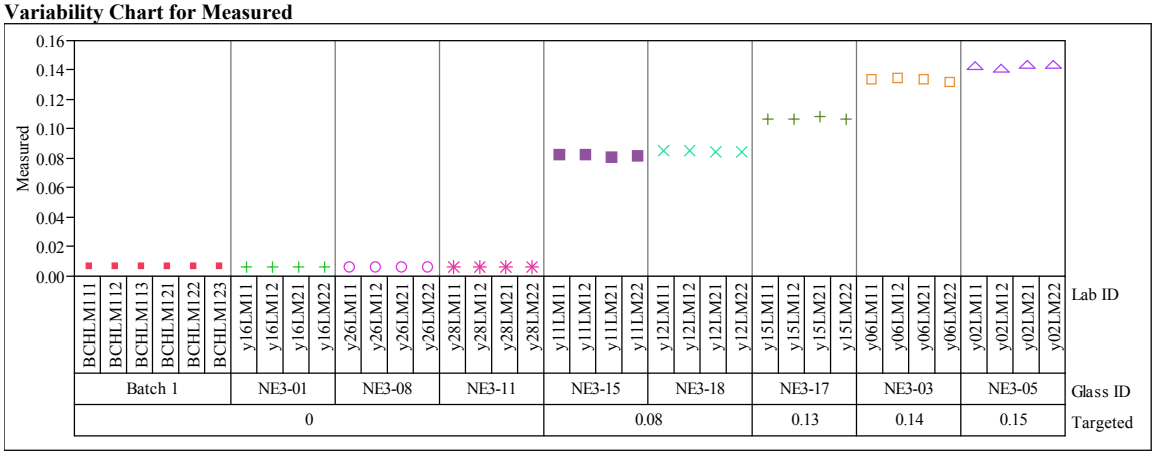


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=1, Oxide=TiO_2 (wt %)
Variability Chart for Measured



Block=1, Oxide=ZnO (wt %)
Variability Chart for Measured



Block=1, Oxide=ZrO_2 (wt %)
Variability Chart for Measured

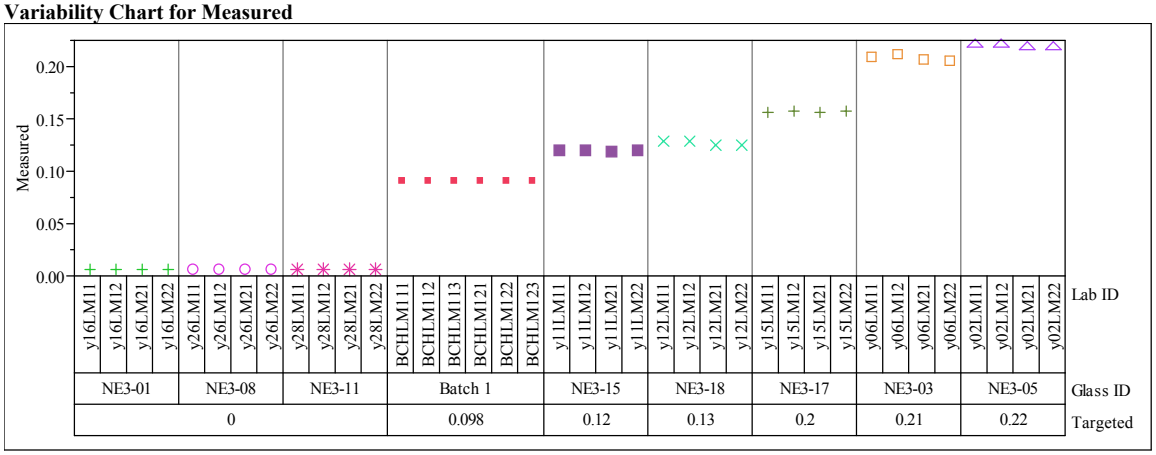
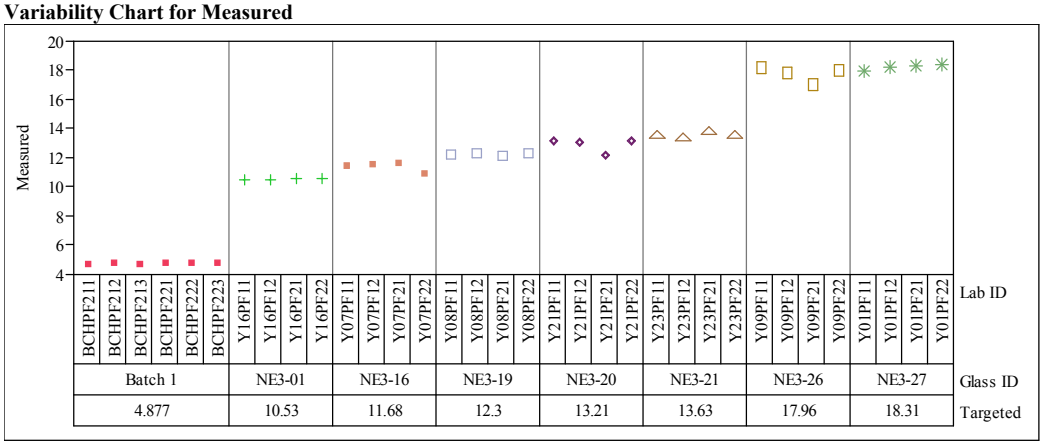
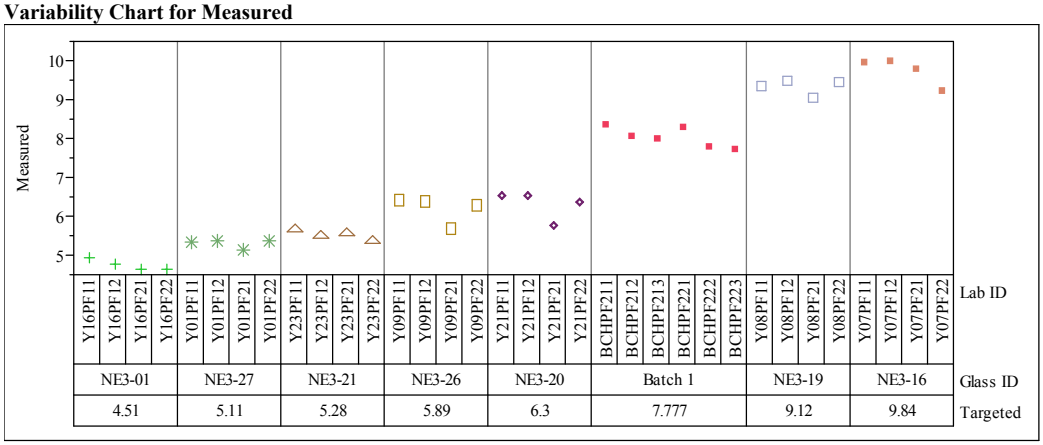


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=$_2$, Oxide=Al_2O_3 (wt %)
Variability Chart for Measured



Block=$_2$, Oxide=B_2O_3 (wt %)
Variability Chart for Measured



Block=$_2$, Oxide=BaO (wt %)
Variability Chart for Measured

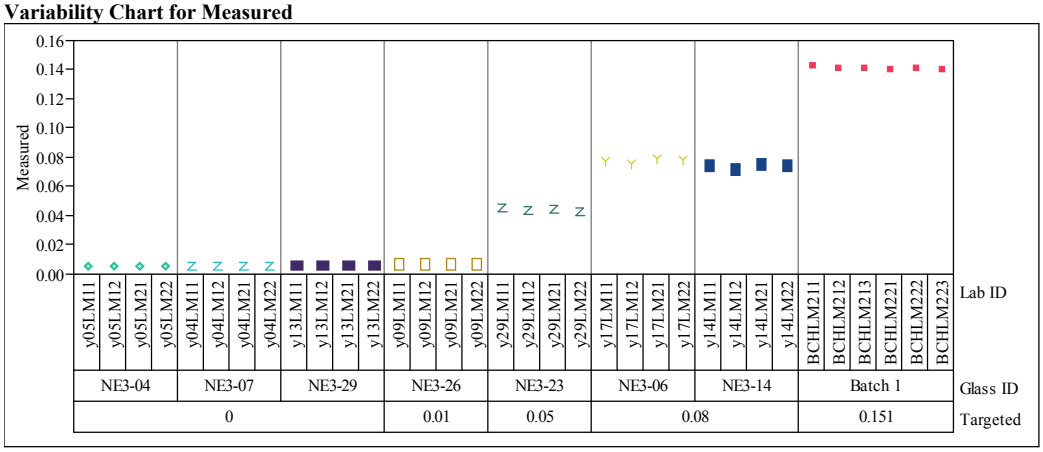
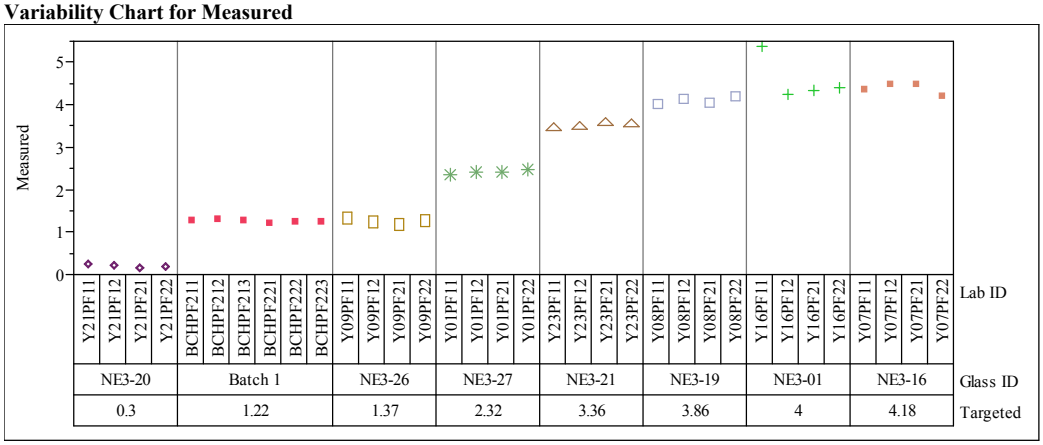
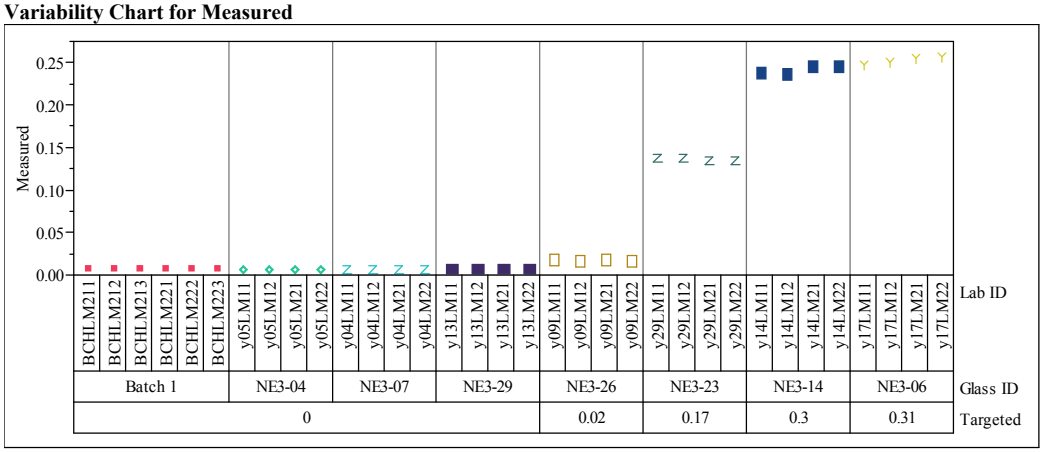


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=$_2$, Oxide=CaO (wt %)
Variability Chart for Measured



Block=$_2$, Oxide=CdO (wt %)
Variability Chart for Measured



Block=$_2$, Oxide=Ce_2O_3 (wt %)
Variability Chart for Measured

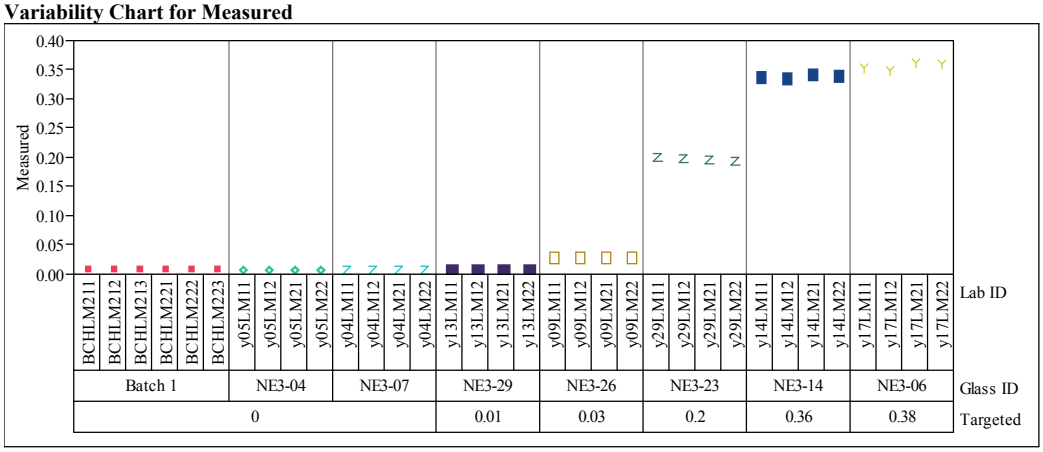
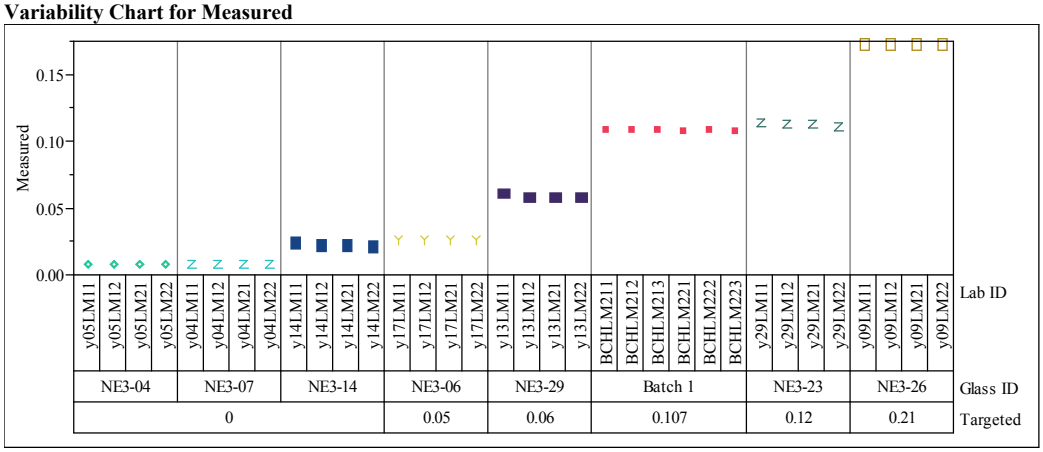
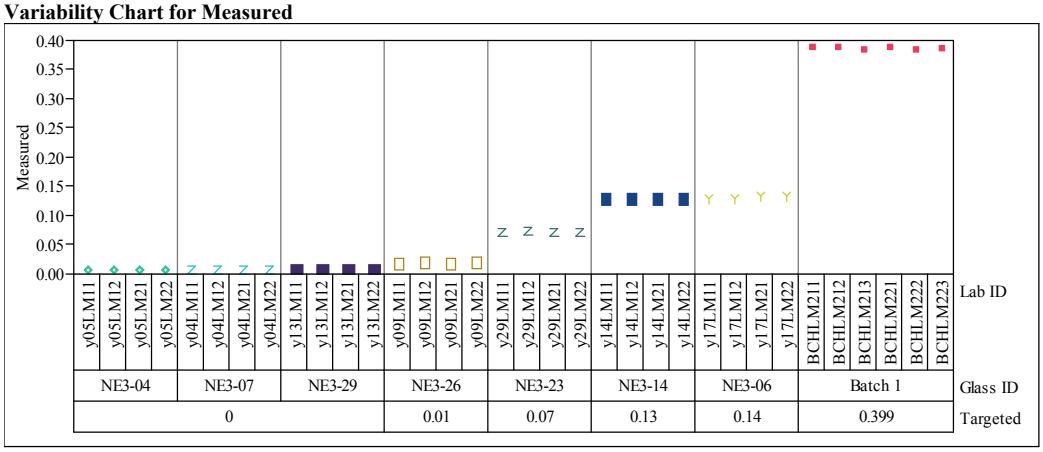


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=$_2$, Oxide=Cr_2O_3 (wt %)
Variability Chart for Measured



Block=$_2$, Oxide=CuO (wt %)
Variability Chart for Measured



Block=$_2$, Oxide=Fe_2O_3 (wt %)
Variability Chart for Measured

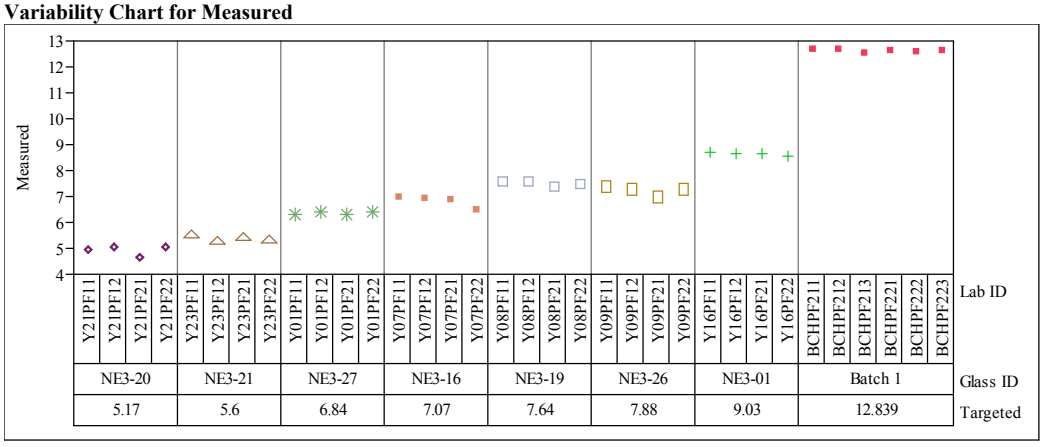
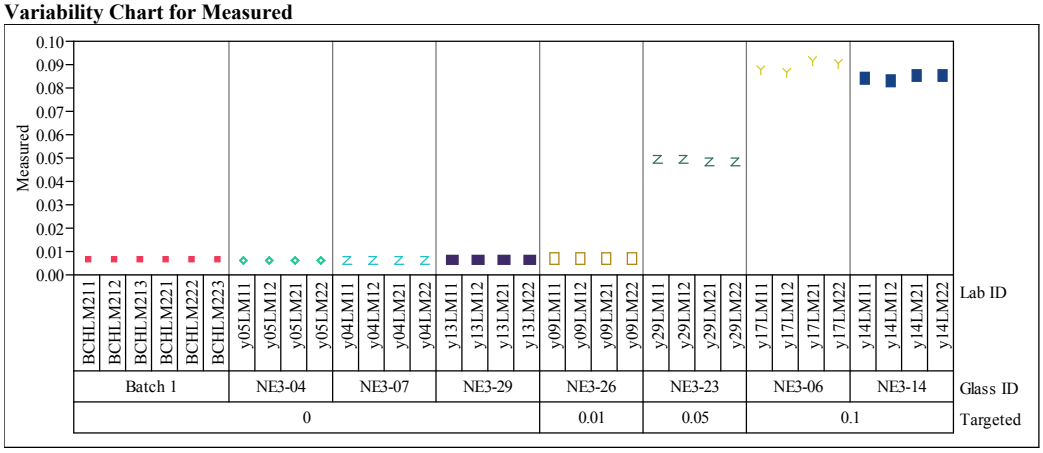
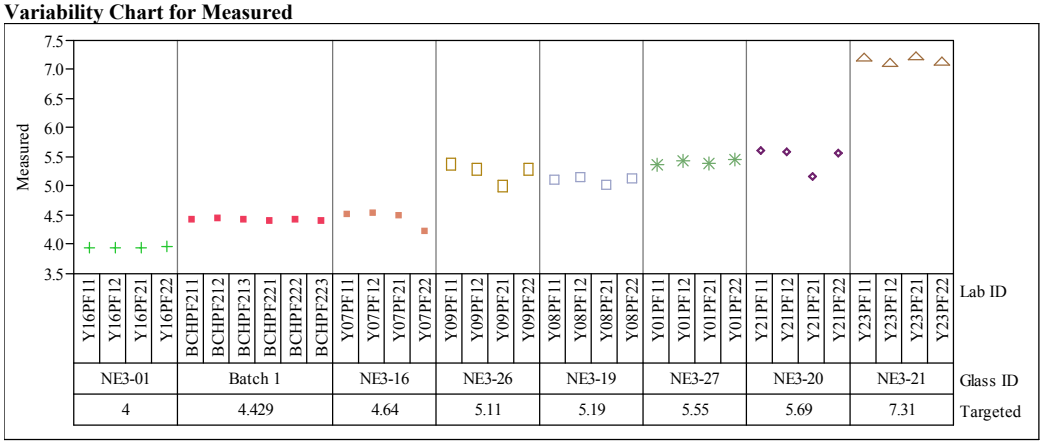


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=$_2$, Oxide=La_2O_3 (wt %)
Variability Chart for Measured



Block=$_2$, Oxide=Li_2O (wt %)
Variability Chart for Measured



Block=$_2$, Oxide=MgO (wt %)
Variability Chart for Measured

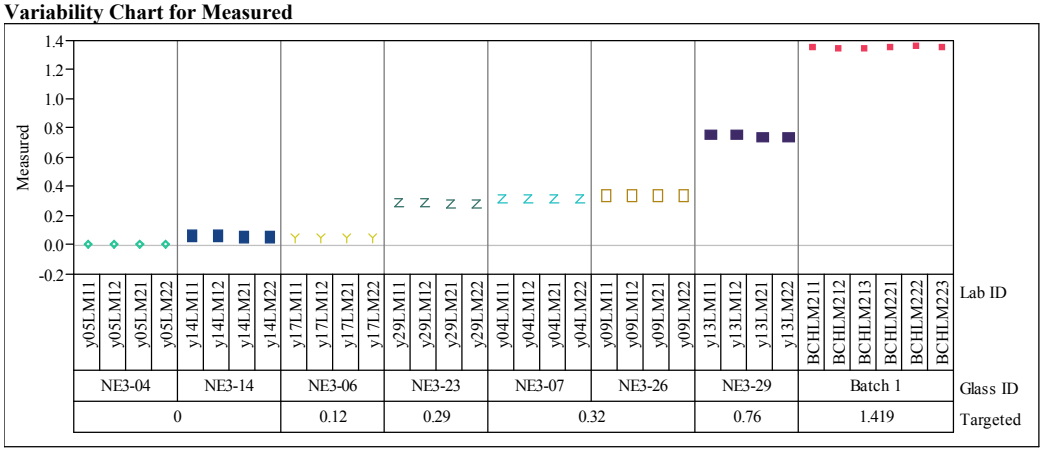
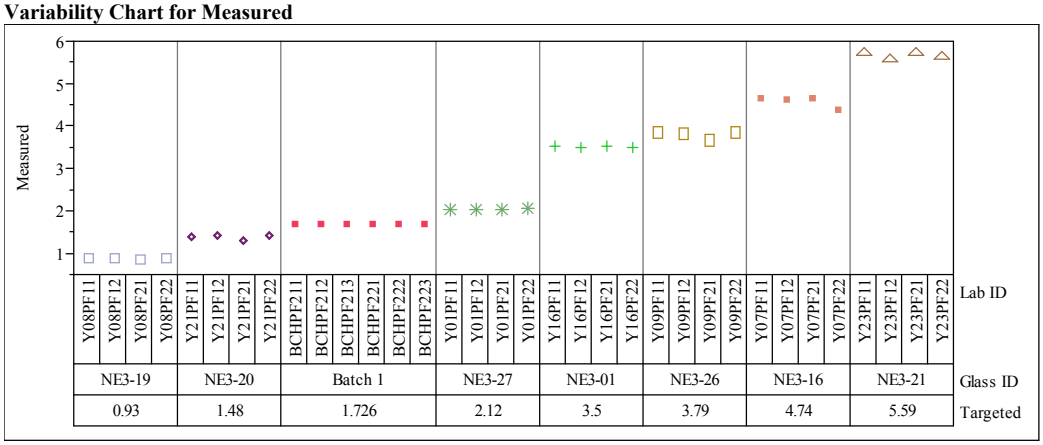
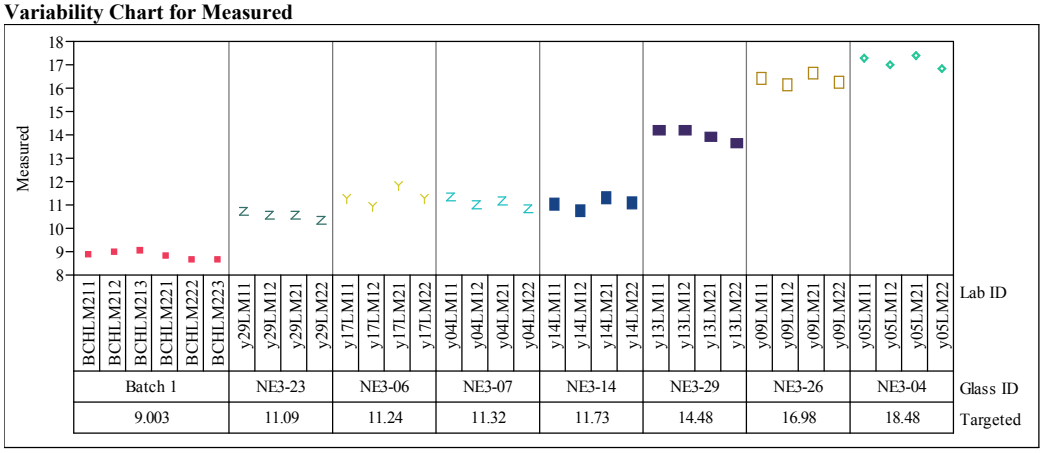


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=$_2$, Oxide=MnO (wt %)
Variability Chart for Measured



Block=$_2$, Oxide=Na_2O (wt %)
Variability Chart for Measured



Block=$_2$, Oxide=NiO (wt %)
Variability Chart for Measured

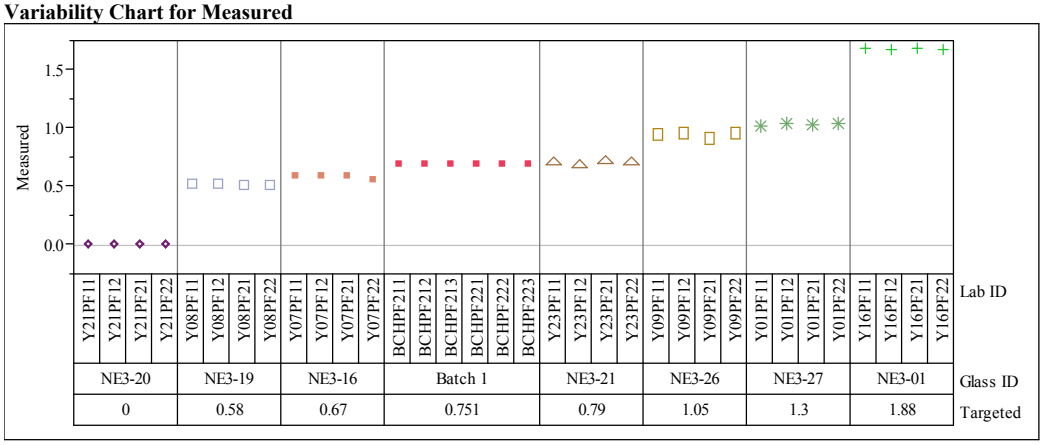
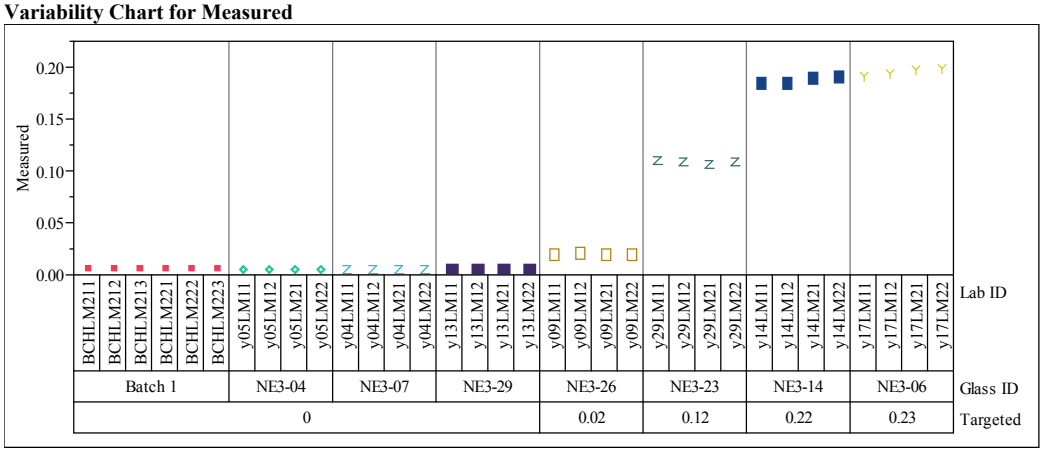
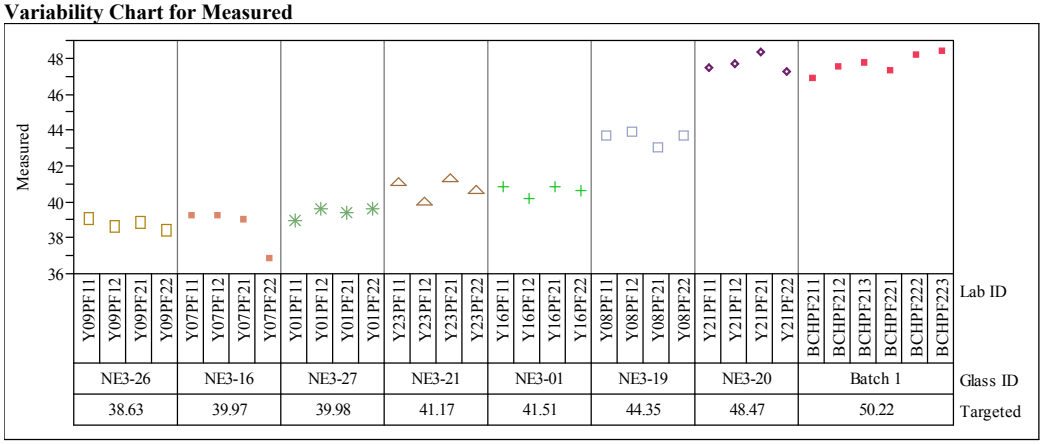


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=$_2$, Oxide=PbO (wt %)
Variability Chart for Measured



Block=$_2$, Oxide=SiO_2 (wt %)
Variability Chart for Measured



Block=$_2$, Oxide=SO_4^{2-} (wt %)
Variability Chart for Measured

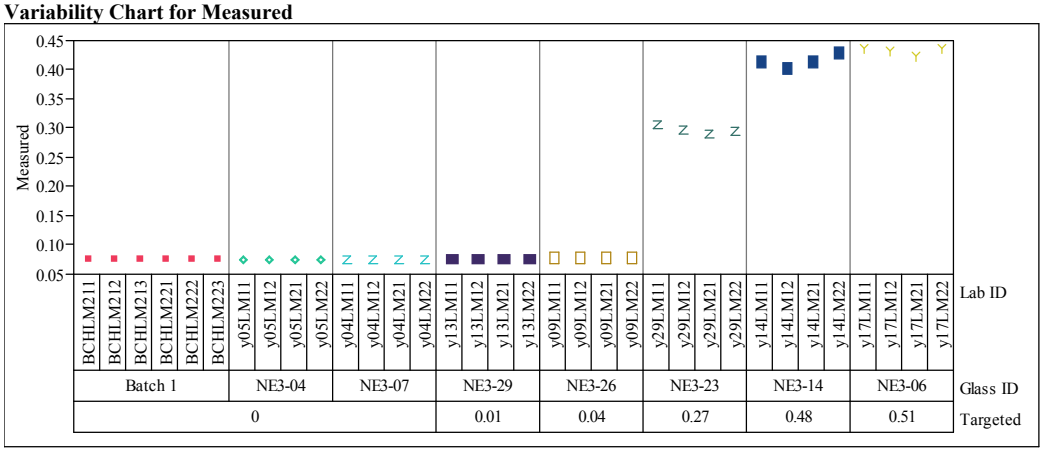
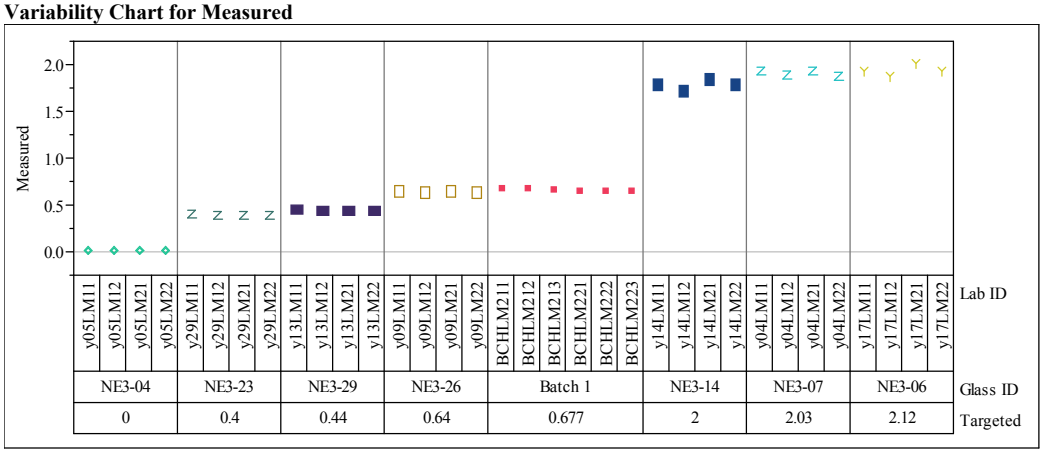
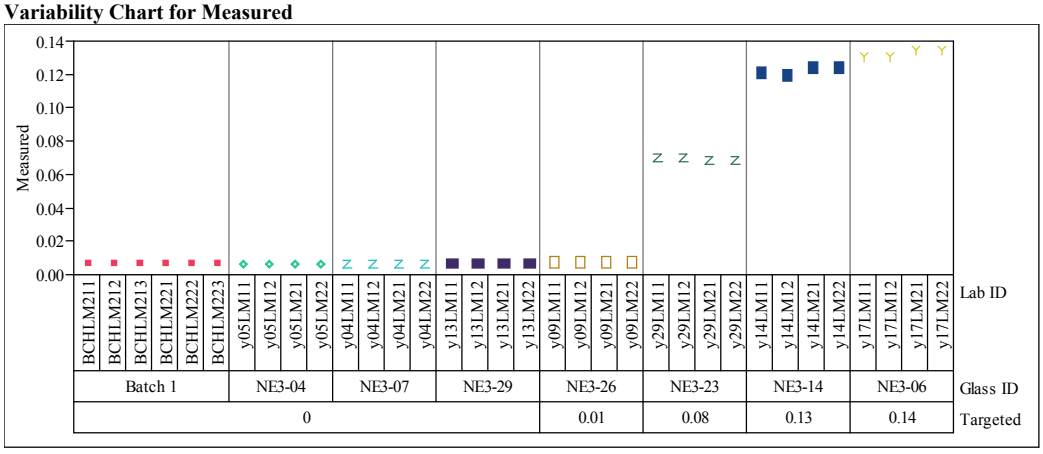


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=$_2$, Oxide=TiO_2 (wt %)
Variability Chart for Measured



Block=$_2$, Oxide=ZnO (wt %)
Variability Chart for Measured



Block=$_2$, Oxide=ZrO_2 (wt %)
Variability Chart for Measured

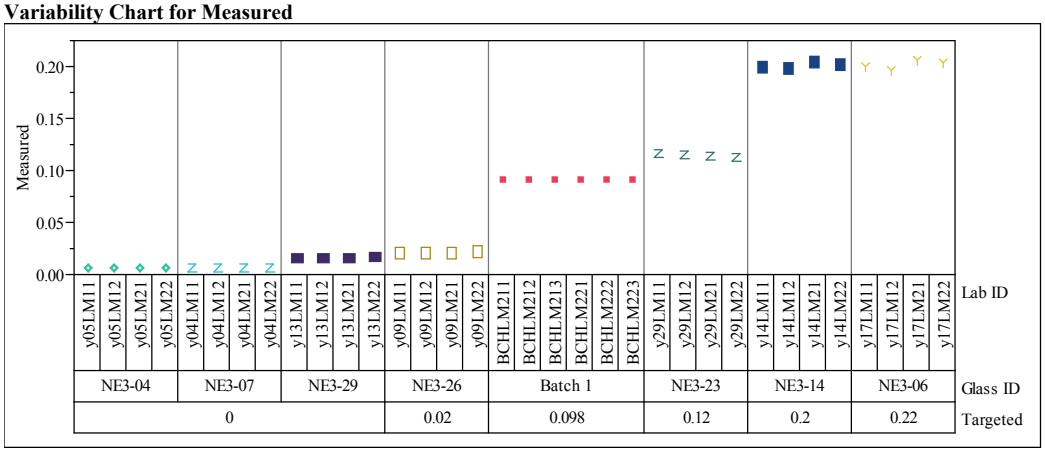
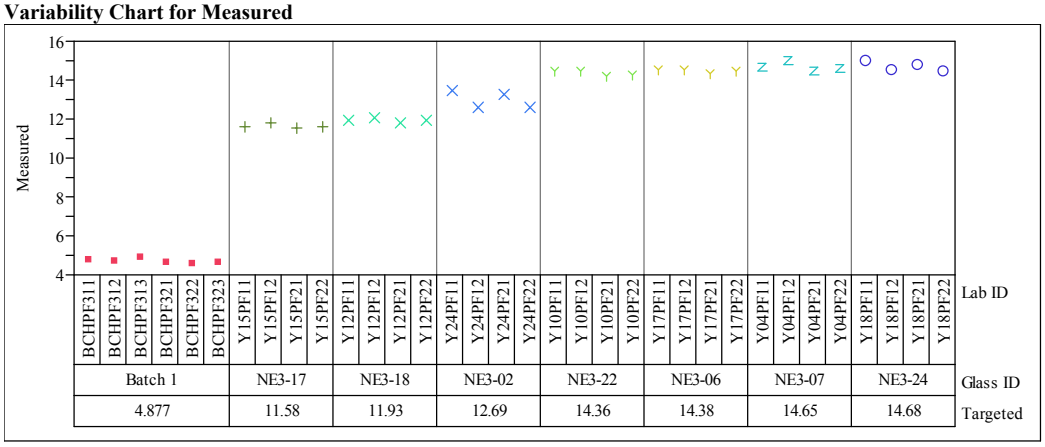
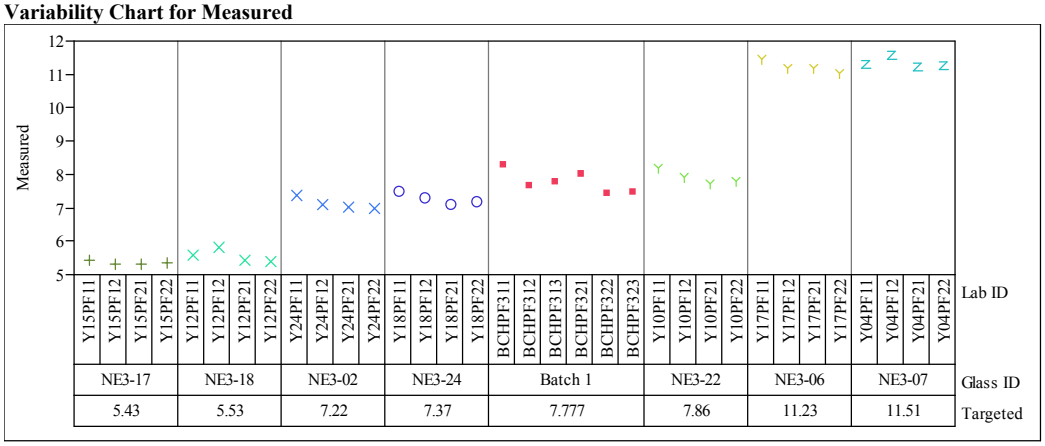


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=3, Oxide=Al_2O_3 (wt %)
Variability Chart for Measured



Block=3, Oxide=B_2O_3 (wt %)
Variability Chart for Measured



Block=3, Oxide=BaO (wt %)
Variability Chart for Measured

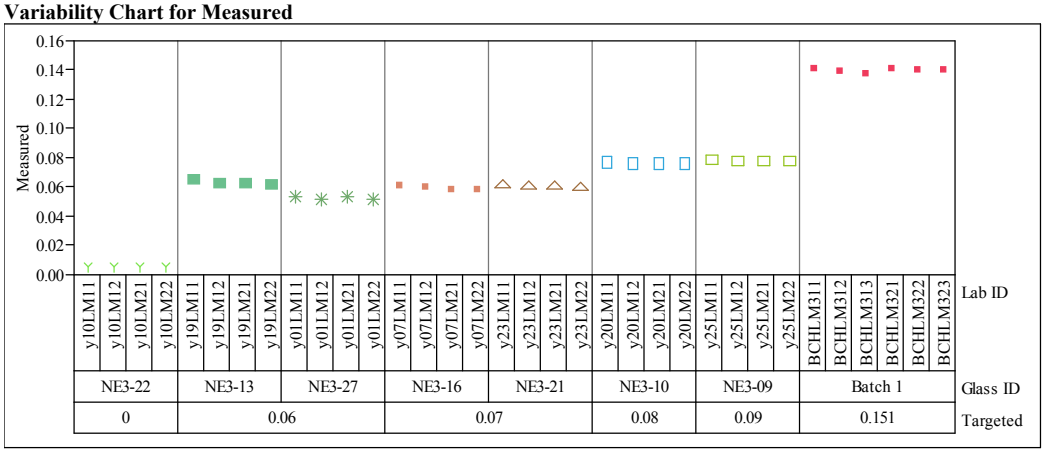
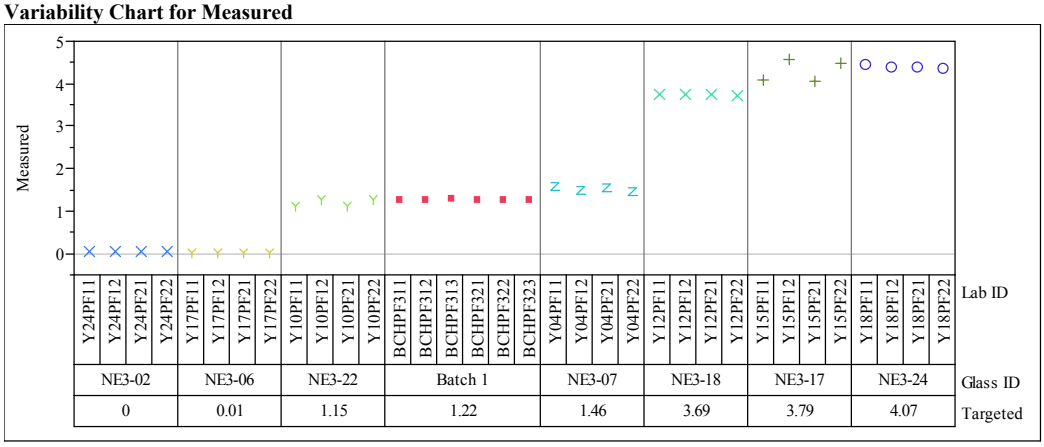
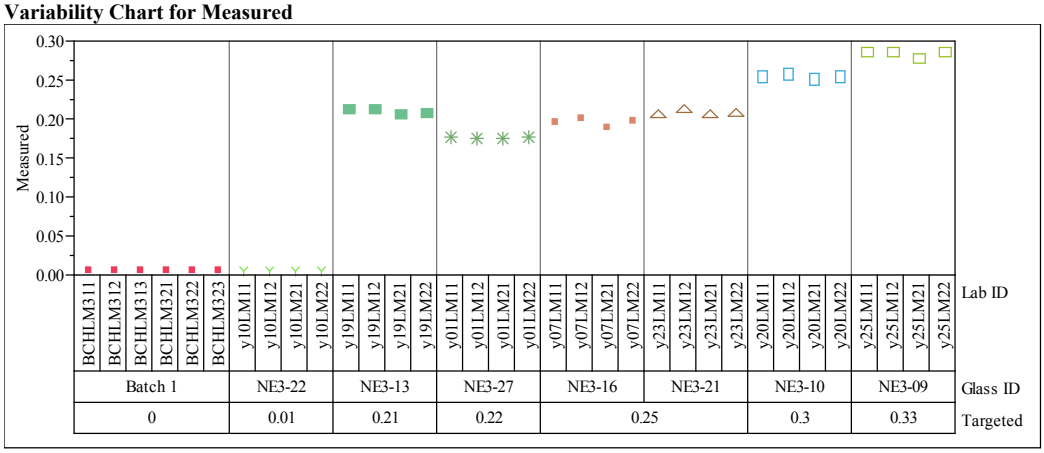


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=3, Oxide=CaO (wt %)
Variability Chart for Measured



Block=3, Oxide=CdO (wt %)
Variability Chart for Measured



Block=3, Oxide=Ce_2O_3 (wt %)
Variability Chart for Measured

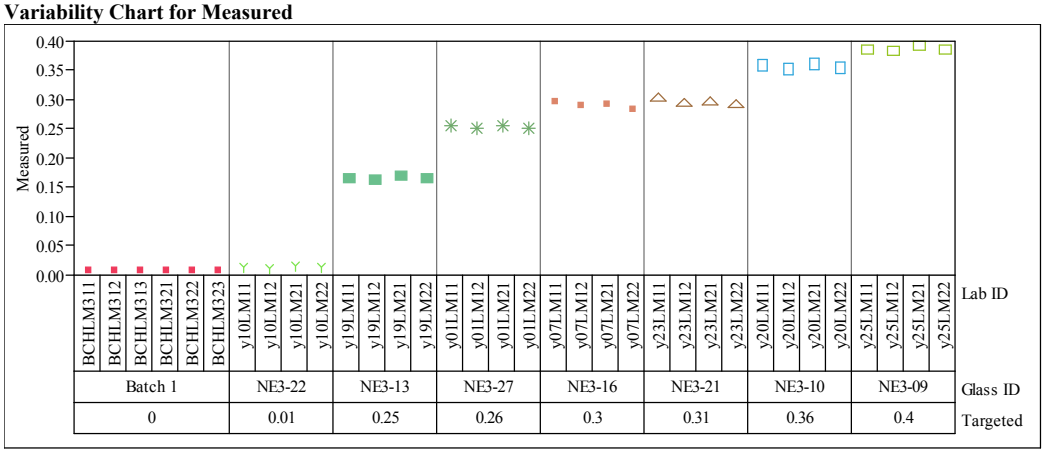
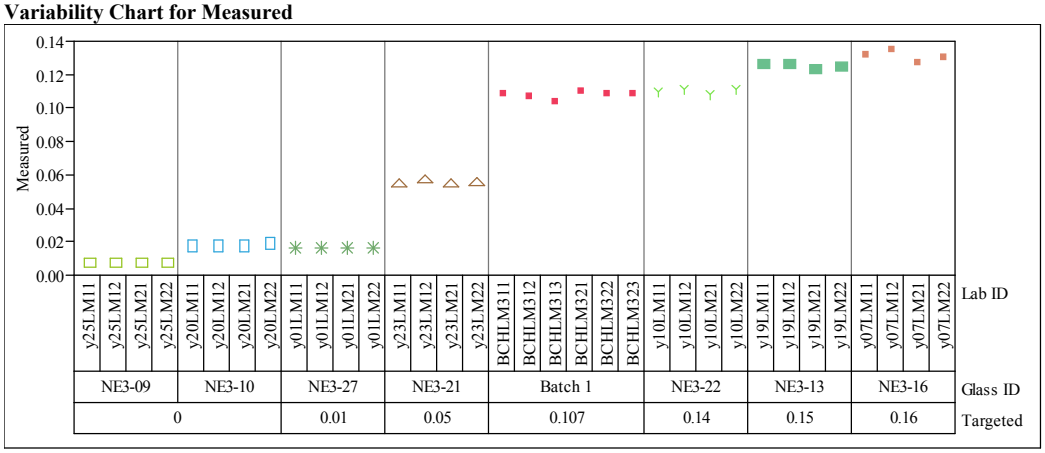
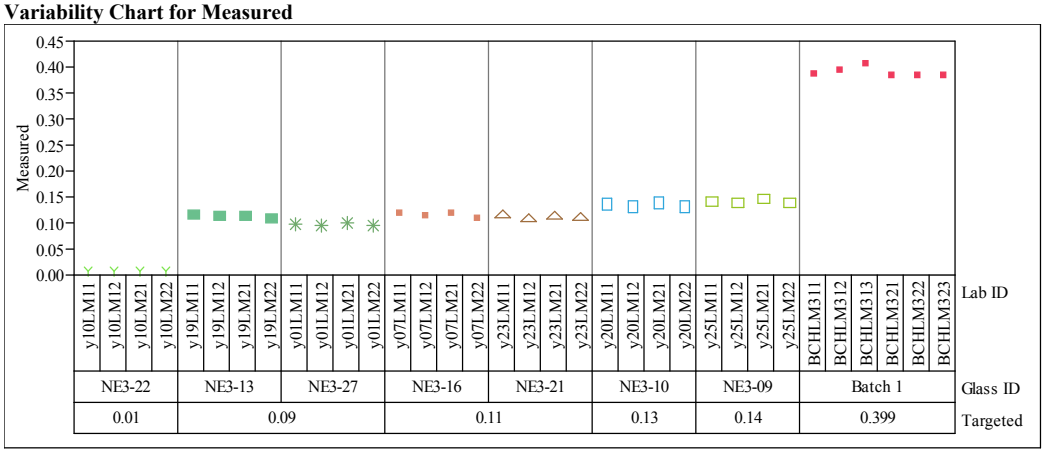


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=3, Oxide=Cr_2O_3 (wt %)
Variability Chart for Measured



Block=3, Oxide=CuO (wt %)
Variability Chart for Measured



Block=3, Oxide=Fe_2O_3 (wt %)
Variability Chart for Measured

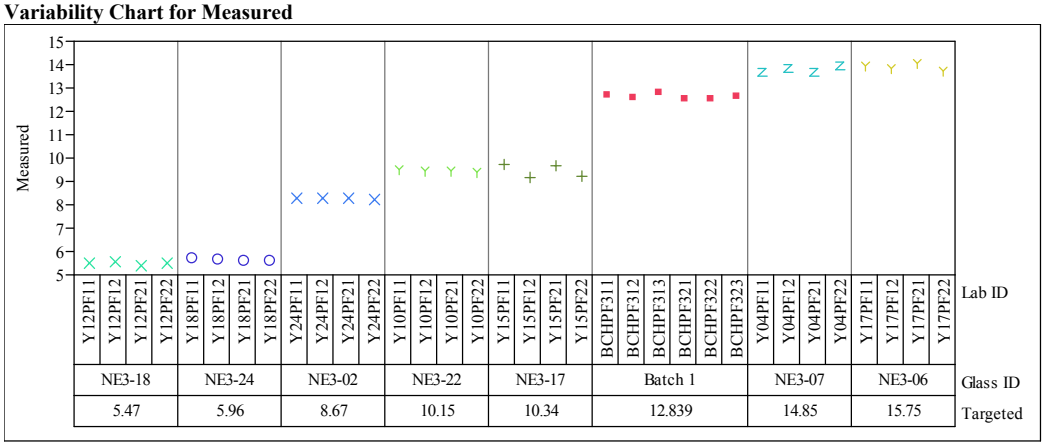
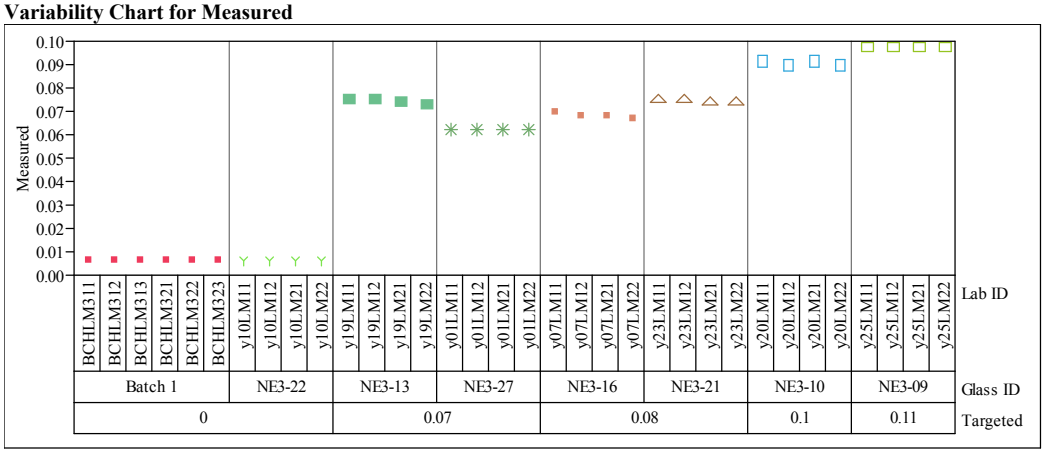
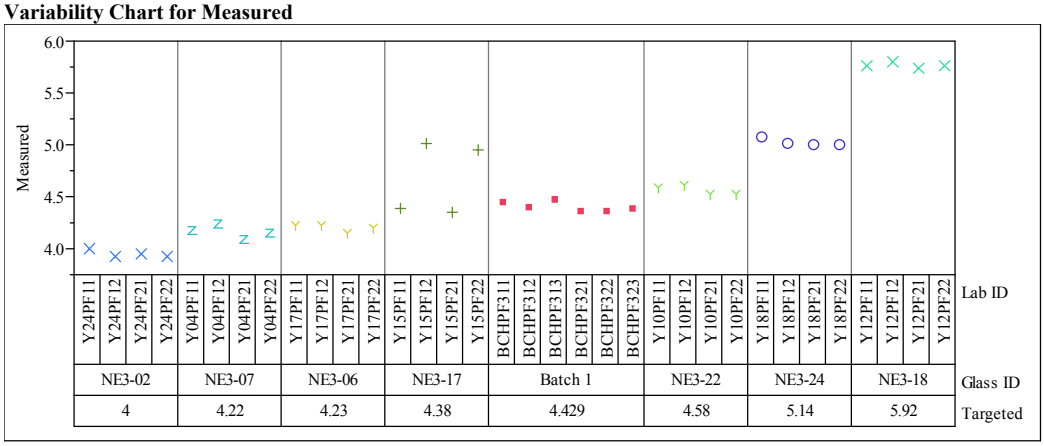


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=3, Oxide=La_2O_3 (wt %)
Variability Chart for Measured



Block=3, Oxide=Li_2O (wt %)
Variability Chart for Measured



Block=3, Oxide=MgO (wt %)
Variability Chart for Measured

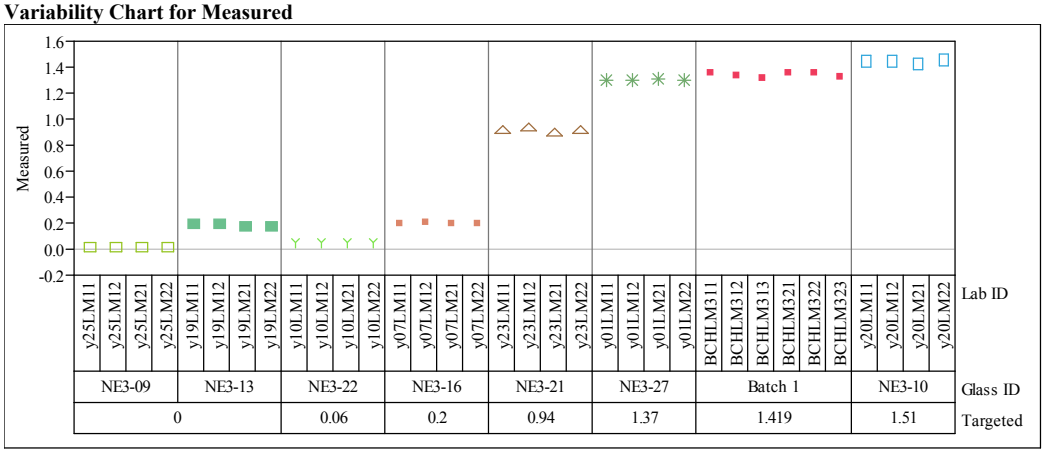
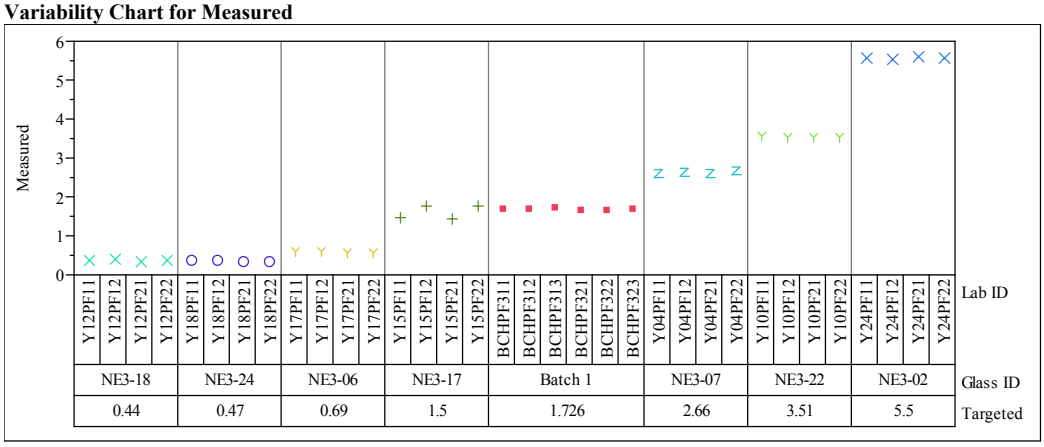
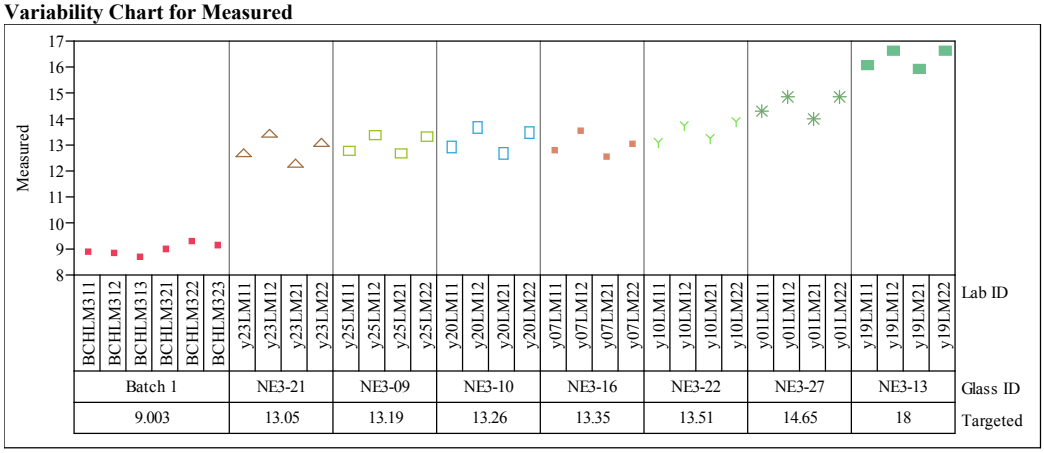


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=3, Oxide=MnO (wt %)
Variability Chart for Measured



Block=3, Oxide=Na_2O (wt %)
Variability Chart for Measured



Block=3, Oxide=NiO (wt %)
Variability Chart for Measured

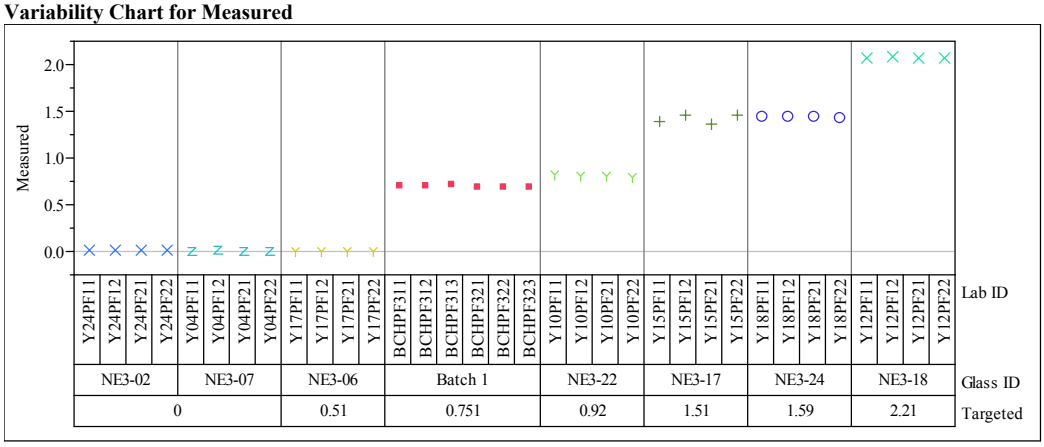
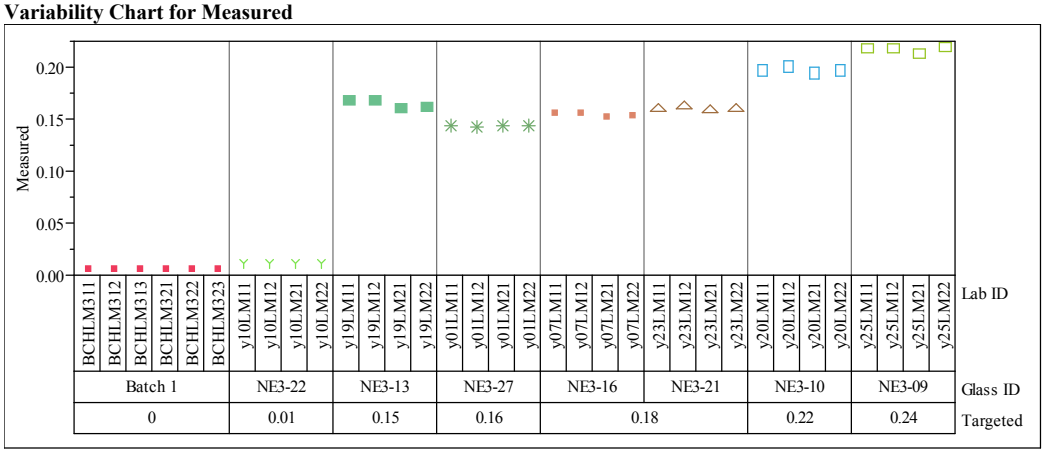
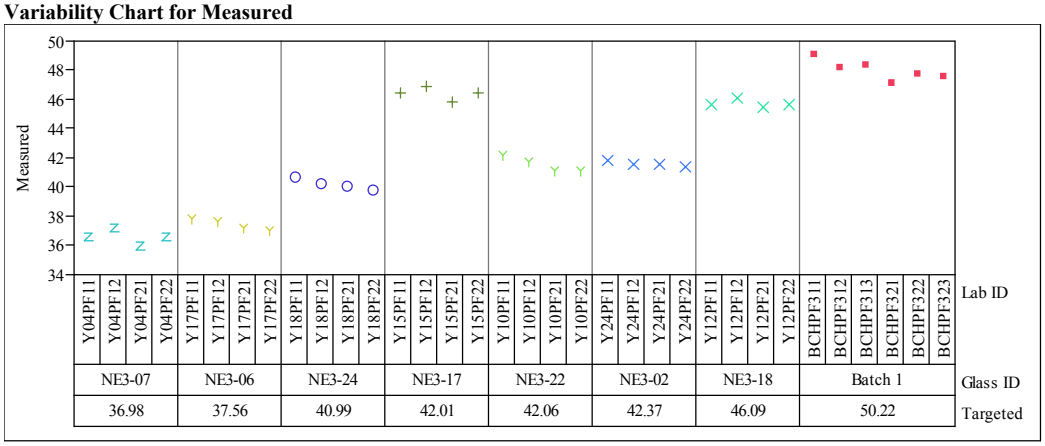


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=3, Oxide=PbO (wt %)
Variability Chart for Measured



Block=3, Oxide=SiO_2 (wt %)
Variability Chart for Measured



Block=3, Oxide=SO_4^{2-} (wt %)
Variability Chart for Measured

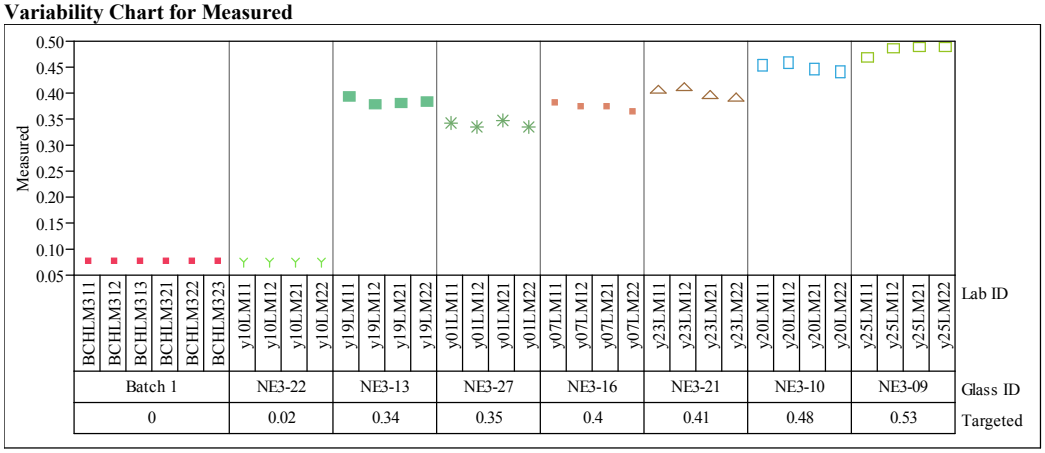
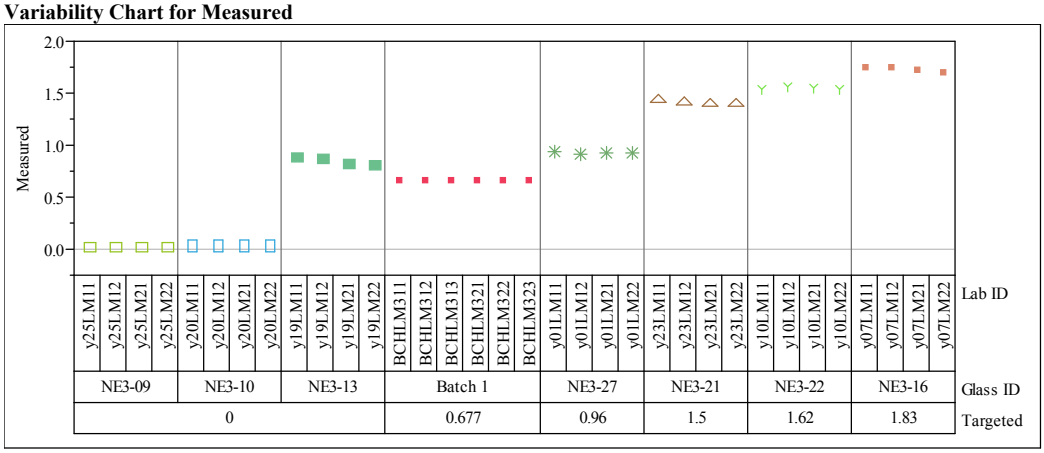
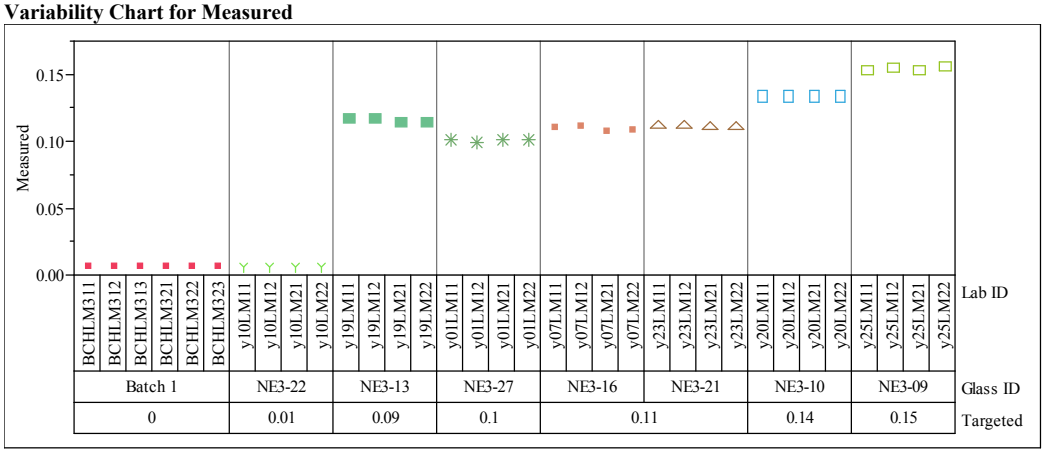


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=3, Oxide=TiO_2 (wt %)
Variability Chart for Measured



Block=3, Oxide=ZnO (wt %)
Variability Chart for Measured



Block=3, Oxide=ZrO_2 (wt %)
Variability Chart for Measured

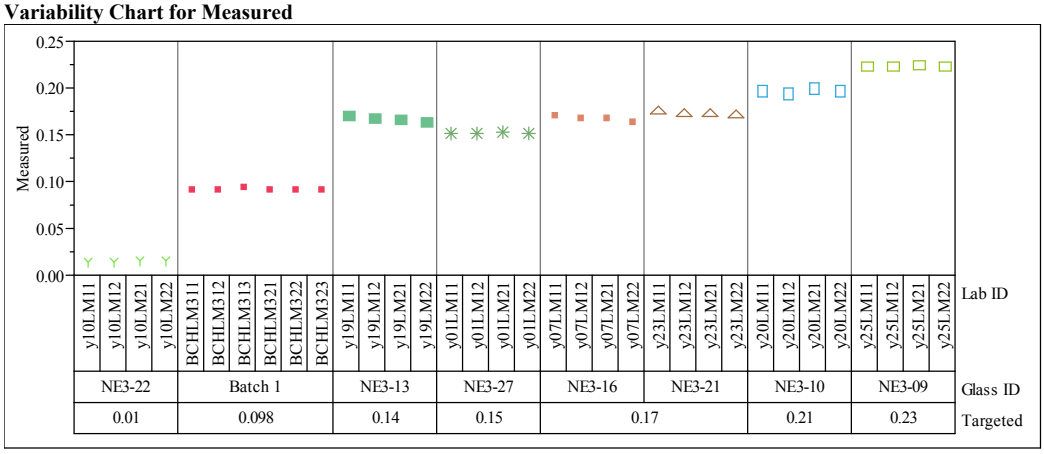
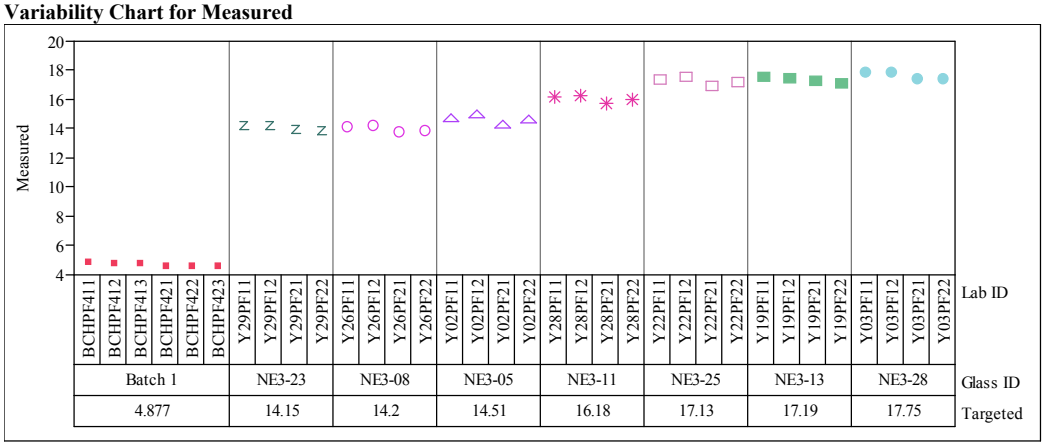
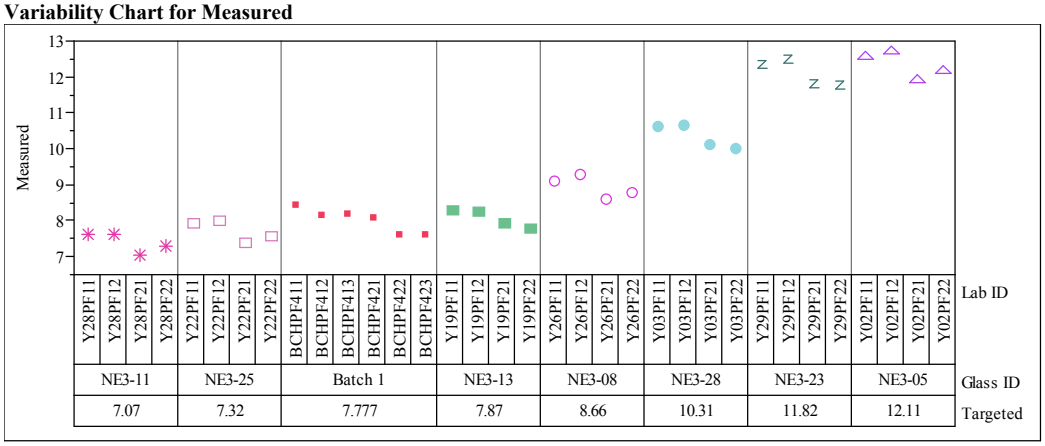


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=4, Oxide=Al_2O_3 (wt %)
Variability Chart for Measured



Block=4, Oxide=B_2O_3 (wt %)
Variability Chart for Measured



Block=4, Oxide=BaO (wt %)
Variability Chart for Measured

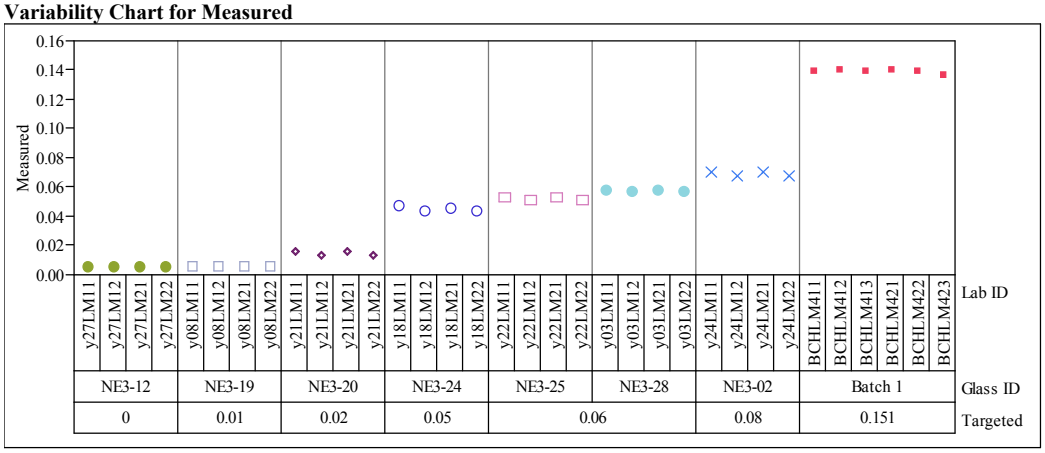
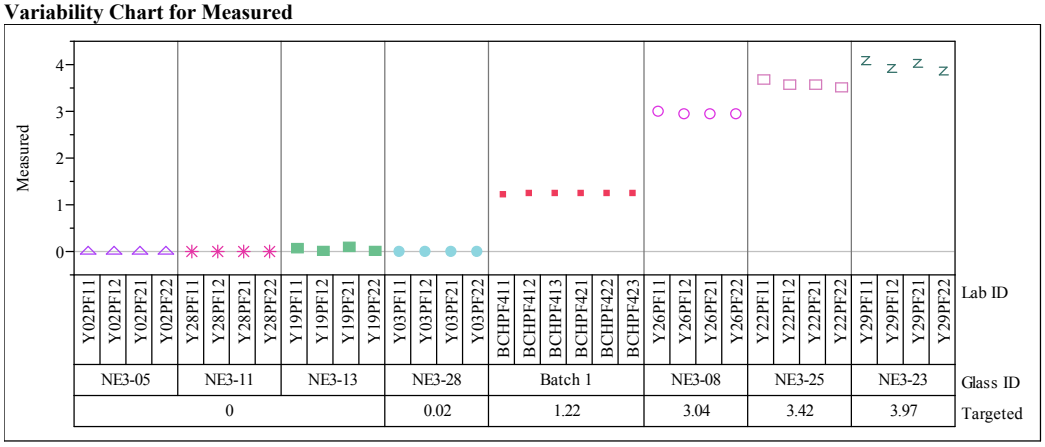
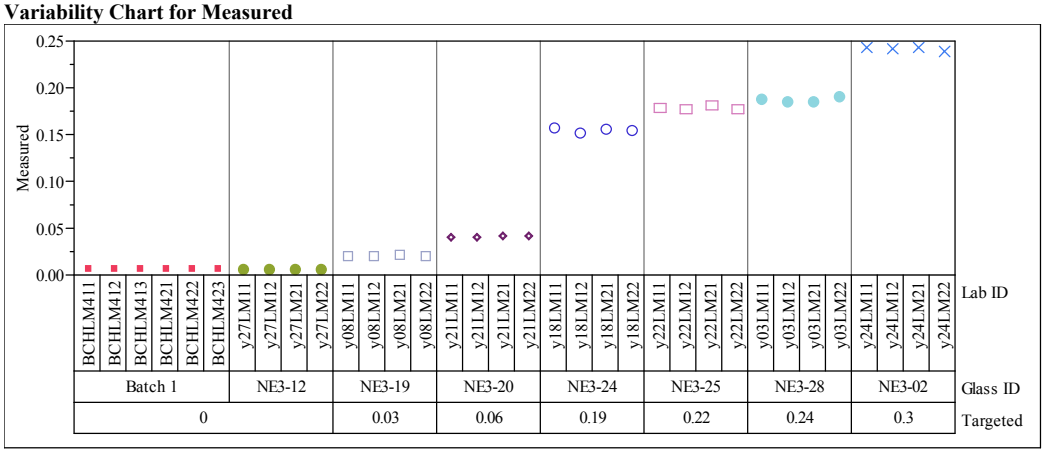


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=4, Oxide=CaO (wt %)
Variability Chart for Measured



Block=4, Oxide=CdO (wt %)
Variability Chart for Measured



Block=4, Oxide=Ce_2O_3 (wt %)
Variability Chart for Measured

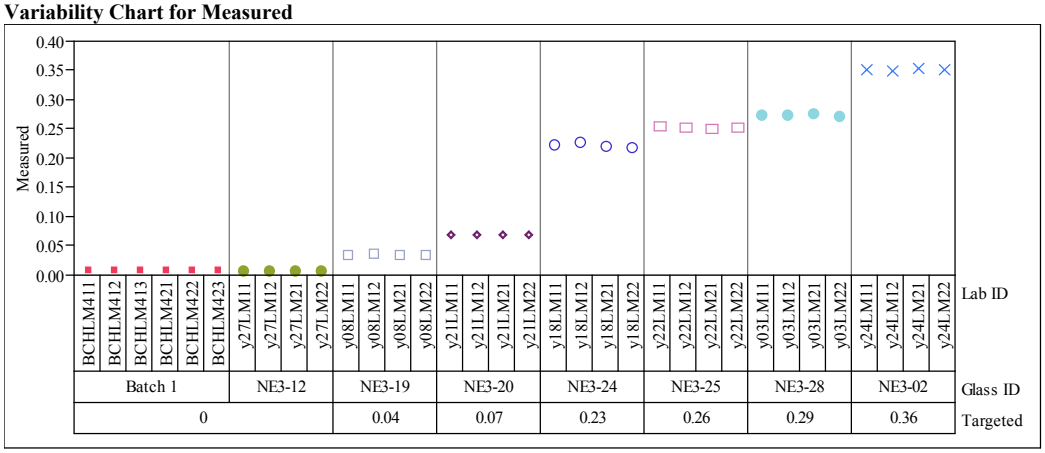
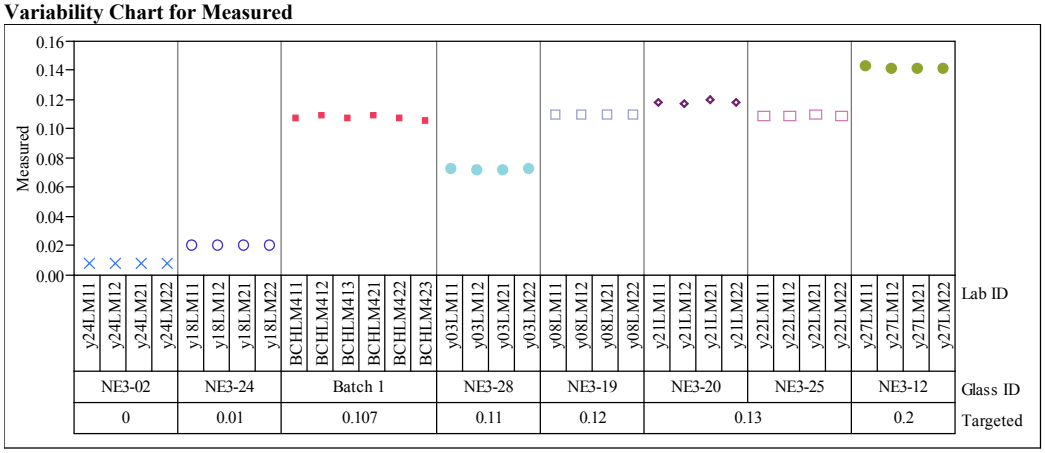
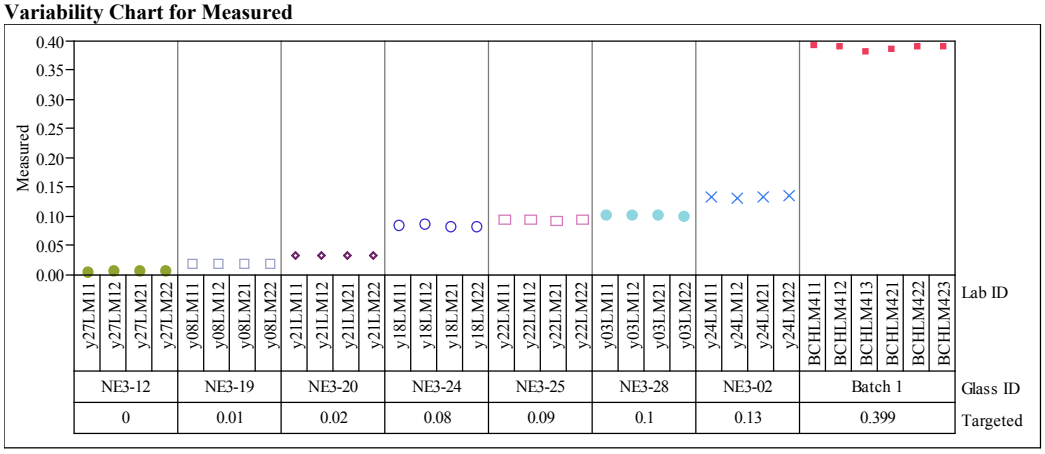


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=4, Oxide=Cr_2O_3 (wt %)
Variability Chart for Measured



Block=4, Oxide=CuO (wt %)
Variability Chart for Measured



Block=4, Oxide=Fe_2O_3 (wt %)
Variability Chart for Measured

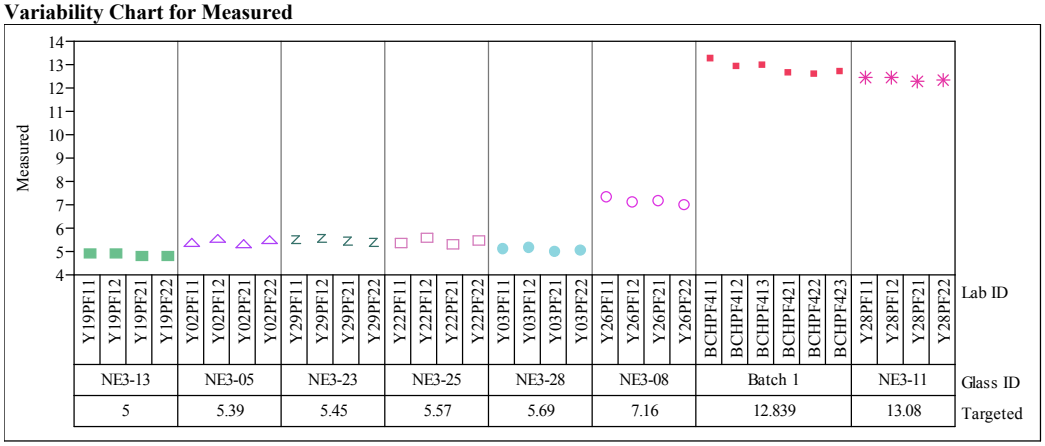
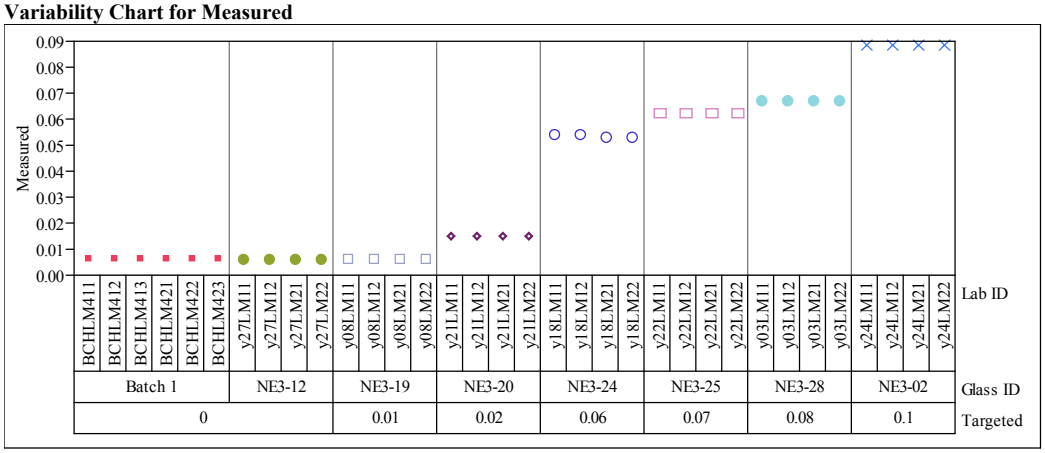
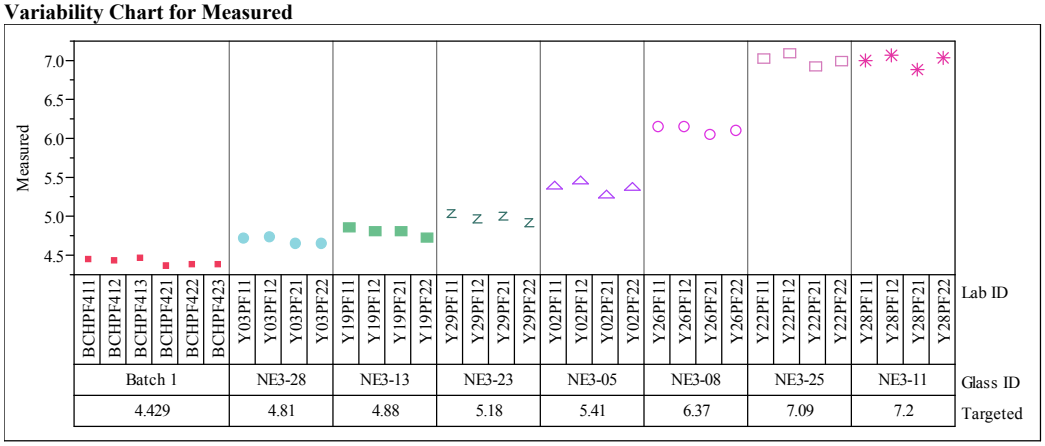


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=4, Oxide=La_2O_3 (wt %)
Variability Chart for Measured



Block=4, Oxide=Li_2O (wt %)
Variability Chart for Measured



Block=4, Oxide=MgO (wt %)
Variability Chart for Measured

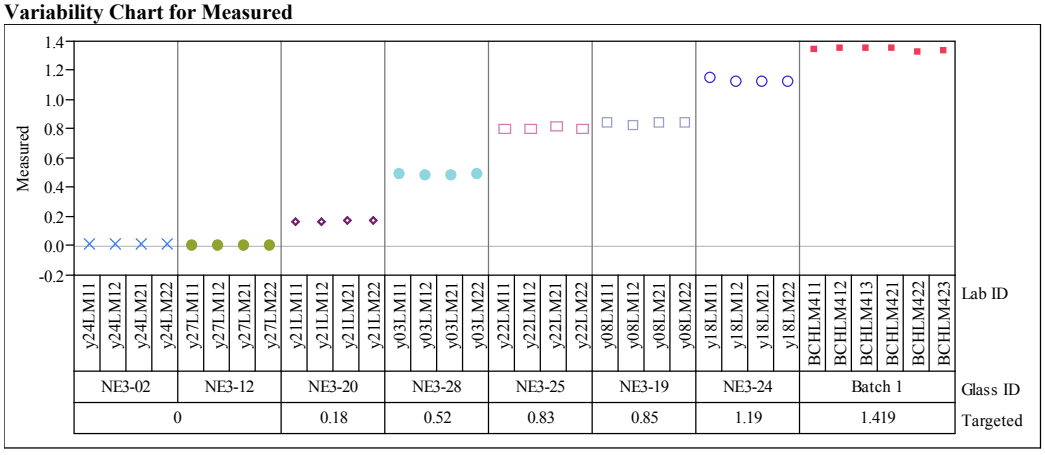
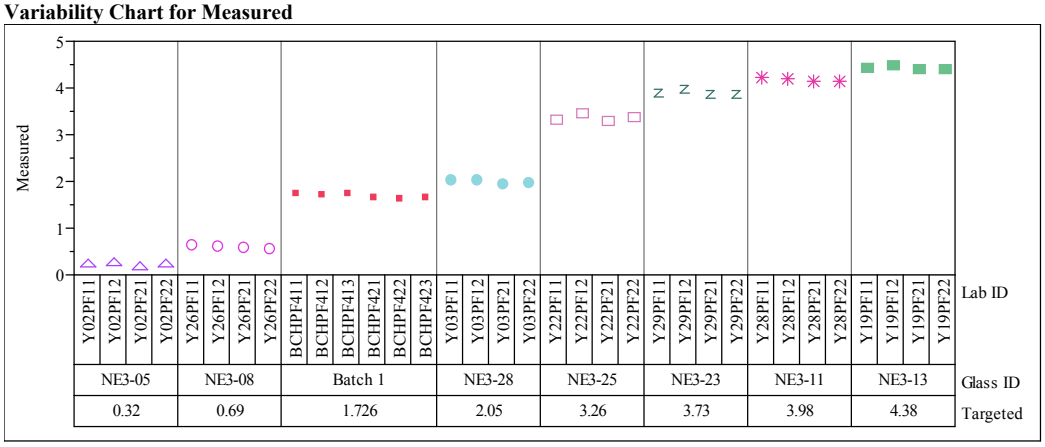
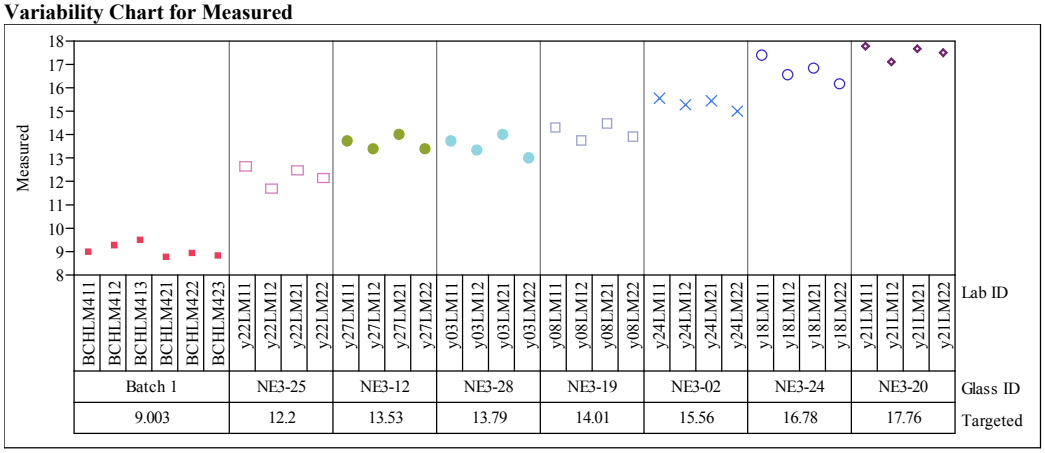


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=4, Oxide=MnO (wt %)
Variability Chart for Measured



Block=4, Oxide=Na_2O (wt %)
Variability Chart for Measured



Block=4, Oxide=NiO (wt %)
Variability Chart for Measured

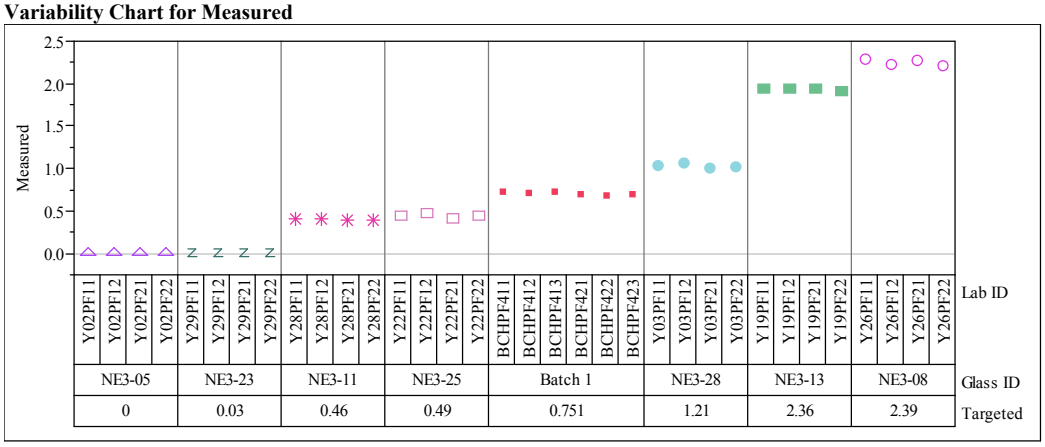
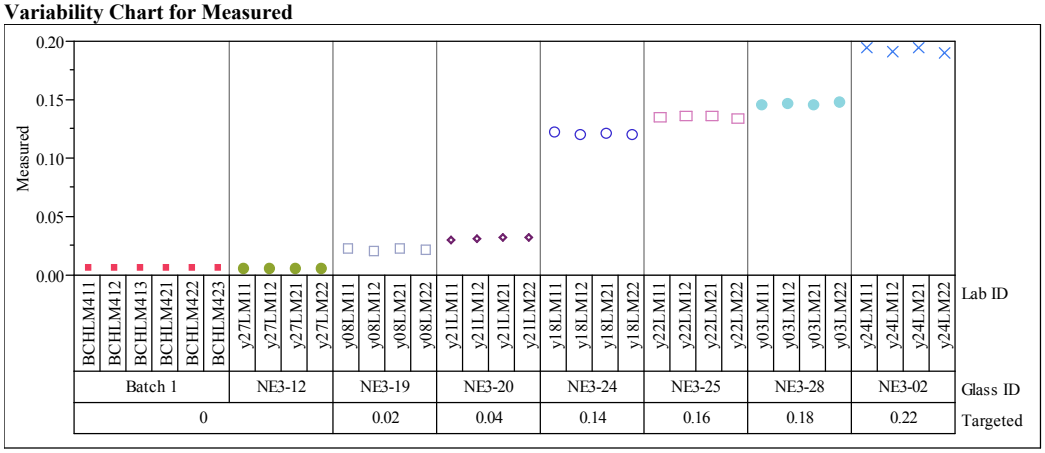
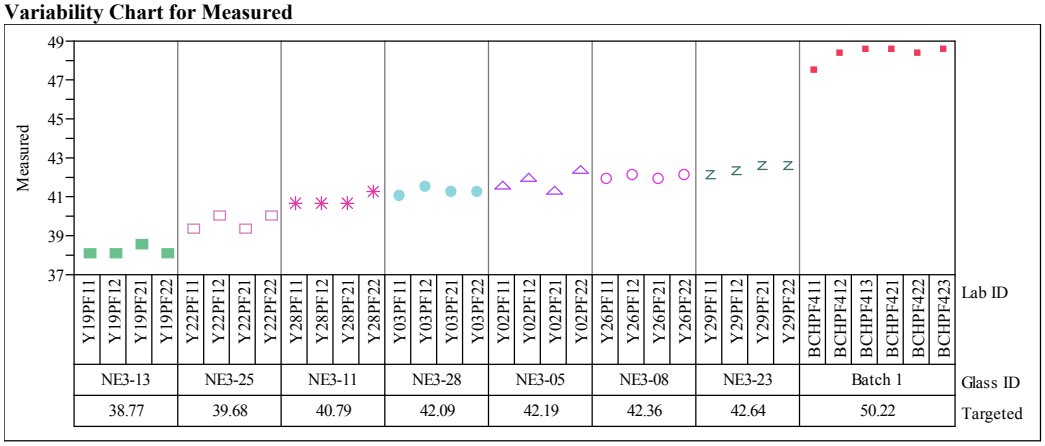


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=4, Oxide=PbO (wt %)
Variability Chart for Measured



Block=4, Oxide=SiO_2 (wt %)
Variability Chart for Measured



Block=4, Oxide=SO_4^{2-} (wt %)
Variability Chart for Measured

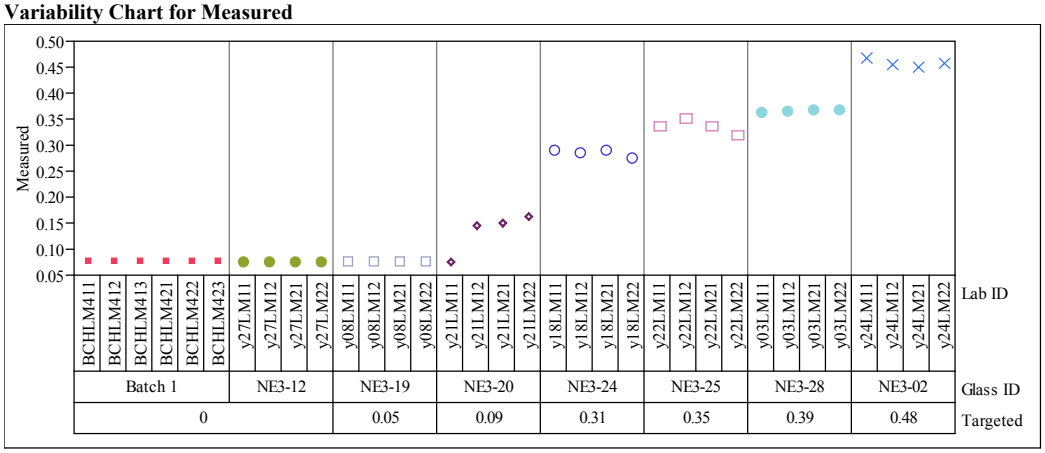
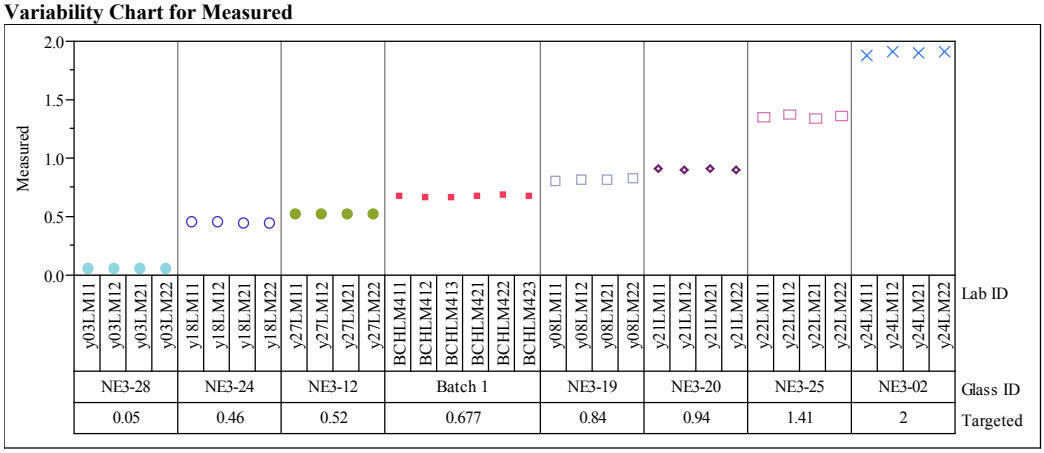
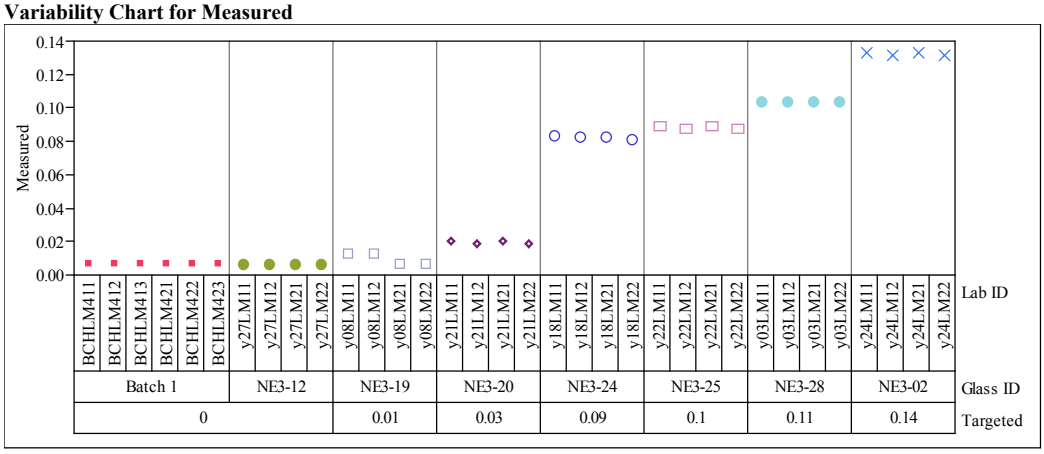


Exhibit A2. Sample Measurements by Lab ID within Glass ID by Oxide by Analytical Block (continued)

Block=4, Oxide=TiO_2 (wt %)
Variability Chart for Measured



Block=4, Oxide=ZnO (wt %)
Variability Chart for Measured



Block=4, Oxide=ZrO_2 (wt %)
Variability Chart for Measured

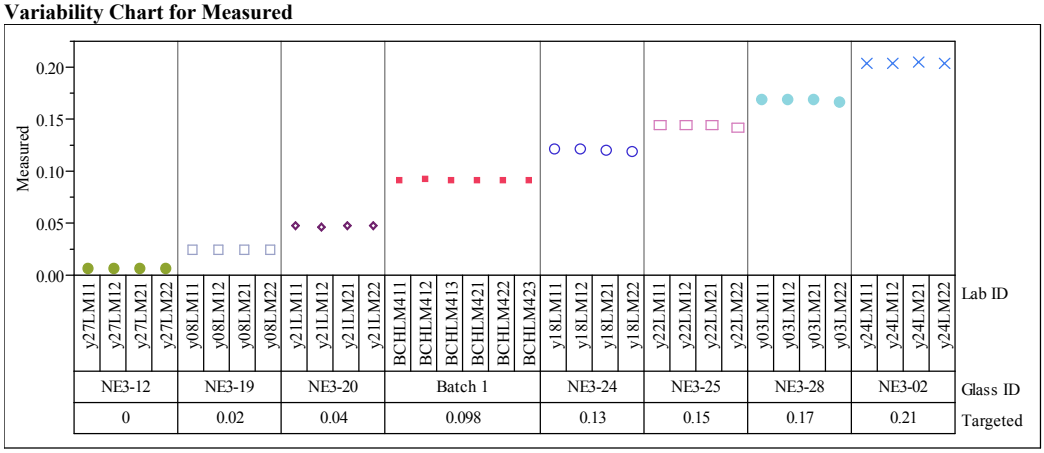
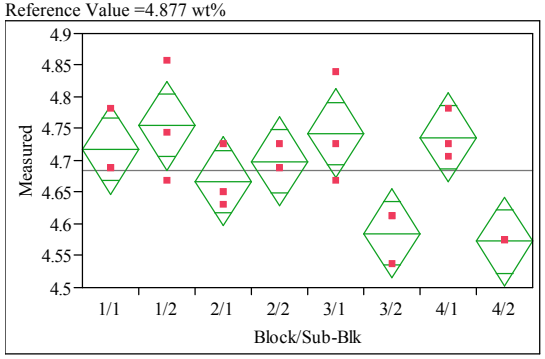


Exhibit A3. Batch 1 Sample Measurements by Block and Sub-Block by Oxide for Both Preparation Methods

One-way Analysis of Measured By Block/Sub-Blk Oxide=Al2O3 (wt%)

Reference Value =4.877 wt%



One-way Anova
Summary of Fit

Rsquare	0.669572
Adj Rsquare	0.525009
Root Mean Square Error	0.056947
Mean of Response	4.684385
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Blk	7	0.10514269	0.015020	4.6317	0.0053
Error	16	0.05188706	0.003243		
C. Total	23	0.15702975			

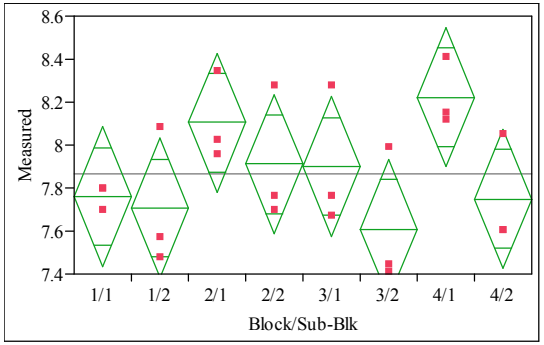
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	4.71745	0.03288	4.6478	4.7872
1/2	3	4.75524	0.03288	4.6855	4.8249
2/1	3	4.66707	0.03288	4.5974	4.7368
2/2	3	4.69856	0.03288	4.6289	4.7683
3/1	3	4.74265	0.03288	4.6729	4.8123
3/2	3	4.58519	0.03288	4.5155	4.6549
4/1	3	4.73635	0.03288	4.6666	4.8060
4/2	3	4.57259	0.03288	4.5029	4.6423

Std Error uses a pooled estimate of error variance

One-way Analysis of Measured By Block/Sub-Blk Oxide=B2O3 (wt%)

Reference Value = 7.777 wt%



One-way Anova
Summary of Fit

Rsquare	0.445986
Adj Rsquare	0.203605
Root Mean Square Error	0.265113
Mean of Response	7.869972
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Blk	7	0.9052779	0.129325	1.8400	0.1479
Error	16	1.1245559	0.070285		
C. Total	23	2.0298338			

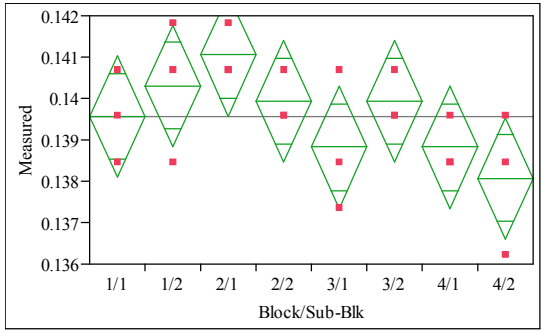
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	7.75996	0.15306	7.4355	8.0844
1/2	3	7.70629	0.15306	7.3818	8.0308
2/1	3	8.10342	0.15306	7.7789	8.4279
2/2	3	7.91022	0.15306	7.5857	8.2347
3/1	3	7.89949	0.15306	7.5750	8.2240
3/2	3	7.60970	0.15306	7.2852	7.9342
4/1	3	8.22148	0.15306	7.8970	8.5460
4/2	3	7.74923	0.15306	7.4247	8.0737

Std Error uses a pooled estimate of error variance

One-way Analysis of Measured By Block/Sub-Blk Oxide=BaO (wt%)

Reference Value = 0.151 wt%



One-way Anova
Summary of Fit

Rsquare	0.45098
Adj Rsquare	0.210784
Root Mean Square Error	0.001206
Mean of Response	0.139563
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Blk	7	0.00001911	2.7306e-6	1.8776	0.1405
Error	16	0.00002327	1.4543e-6		
C. Total	23	0.00004238			

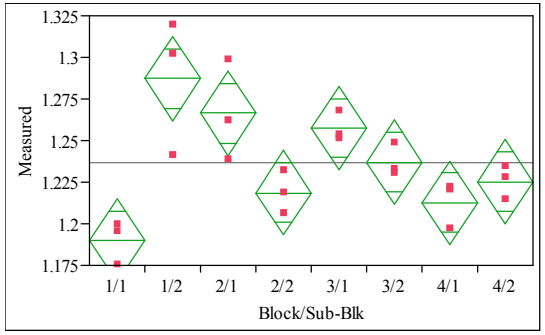
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.139563	0.00070	0.13809	0.14104
1/2	3	0.140307	0.00070	0.13883	0.14178
2/1	3	0.141051	0.00070	0.13958	0.14253
2/2	3	0.139935	0.00070	0.13846	0.14141
3/1	3	0.138818	0.00070	0.13734	0.14029
3/2	3	0.139935	0.00070	0.13846	0.14141
4/1	3	0.138818	0.00070	0.13734	0.14029
4/2	3	0.138074	0.00070	0.13660	0.13955

Std Error uses a pooled estimate of error variance

Exhibit A3. Batch 1 Sample Measurements by Block and Sub-Block by Oxide for Both Preparation Methods (continued)

One-way Analysis of Measured By Block/Sub-Blk Oxide=CaO (wt%)
Reference Value = 1.220 wt%



One-way Anova
Summary of Fit

Rsquare	0.758143
Adj Rsquare	0.652331
Root Mean Square Error	0.020602
Mean of Response	1.236776
Observations (or Sum Wgts)	24

Analysis of Variance

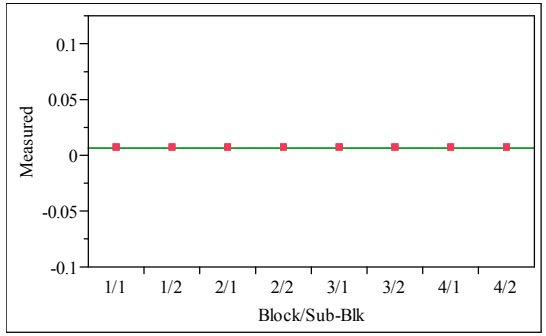
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Blk	7	0.02128706	0.003041	7.1650	0.0006
Error	16	0.00679082	0.000424		
C. Total	23	0.02807788			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	1.18979	0.01189	1.1646	1.2150
1/2	3	1.28726	0.01189	1.2620	1.3125
2/1	3	1.26628	0.01189	1.2411	1.2915
2/2	3	1.21870	0.01189	1.1935	1.2439
3/1	3	1.25741	0.01189	1.2322	1.2826
3/2	3	1.23689	0.01189	1.2117	1.2621
4/1	3	1.21264	0.01189	1.1874	1.2379
4/2	3	1.22523	0.01189	1.2000	1.2504

Std Error uses a pooled estimate of error variance

One-way Analysis of Measured By Block/Sub-Blk Oxide=CdO (wt%)
Reference Value = 0.0 wt%



One-way Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.005712
Observations (or Sum Wgts)	24

Analysis of Variance

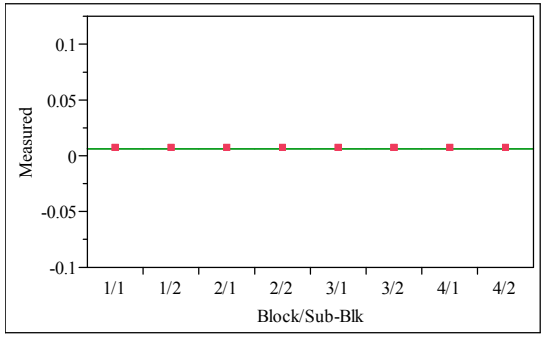
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Blk	7	0	0	.	.
Error	16	0	0		
C. Total	23	0			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.005712	0	0.00571	0.00571
1/2	3	0.005712	0	0.00571	0.00571
2/1	3	0.005712	0	0.00571	0.00571
2/2	3	0.005712	0	0.00571	0.00571
3/1	3	0.005712	0	0.00571	0.00571
3/2	3	0.005712	0	0.00571	0.00571
4/1	3	0.005712	0	0.00571	0.00571
4/2	3	0.005712	0	0.00571	0.00571

Std Error uses a pooled estimate of error variance

One-way Analysis of Measured By Block/Sub-Blk Oxide=Ce2O3 (wt%)
Reference Value = 0.0 wt%



One-way Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.005857
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Blk	7	0	0	.	.
Error	16	0	0		
C. Total	23	0			

Means for One-way Anova

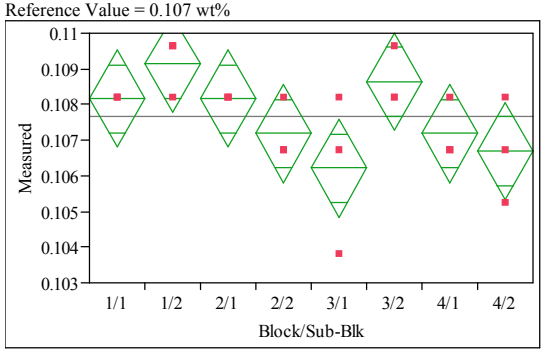
Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.005857	0	0.00586	0.00586
1/2	3	0.005857	0	0.00586	0.00586
2/1	3	0.005857	0	0.00586	0.00586
2/2	3	0.005857	0	0.00586	0.00586
3/1	3	0.005857	0	0.00586	0.00586
3/2	3	0.005857	0	0.00586	0.00586
4/1	3	0.005857	0	0.00586	0.00586
4/2	3	0.005857	0	0.00586	0.00586

Std Error uses a pooled estimate of error variance

Exhibit A3. Batch 1 Sample Measurements by Block and Sub-Block by Oxide for Both Preparation Methods (continued)

One-way Analysis of Measured By Block/Sub-Blk Oxide=Cr2O3 (wt%)

Reference Value = 0.107 wt%



One-way Anova
Summary of Fit

Rsquare	0.517241
Adj Rsquare	0.306034
Root Mean Square Error	0.001116
Mean of Response	0.107671
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Blk	7	0.00002136	3.0518e-6	2.4490	0.0654
Error	16	0.00001994	1.2462e-6		
C. Total	23	0.00004130			

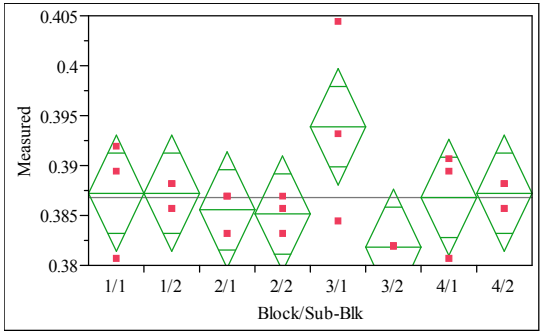
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.108158	0.00064	0.10679	0.10952
1/2	3	0.109133	0.00064	0.10777	0.11050
2/1	3	0.108158	0.00064	0.10679	0.10952
2/2	3	0.107184	0.00064	0.10582	0.10855
3/1	3	0.106210	0.00064	0.10484	0.10758
3/2	3	0.108646	0.00064	0.10728	0.11001
4/1	3	0.107184	0.00064	0.10582	0.10855
4/2	3	0.106697	0.00064	0.10533	0.10806

Std Error uses a pooled estimate of error variance

One-way Analysis of Measured By Block/Sub-Blk Oxide=CuO (wt%)

Reference Value = 0.399 wt%



One-way Anova
Summary of Fit

Rsquare	0.403259
Adj Rsquare	0.142185
Root Mean Square Error	0.004719
Mean of Response	0.386858
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Blk	7	0.00024073	0.000034	1.5446	0.2224
Error	16	0.00035623	0.000022		
C. Total	23	0.00059696			

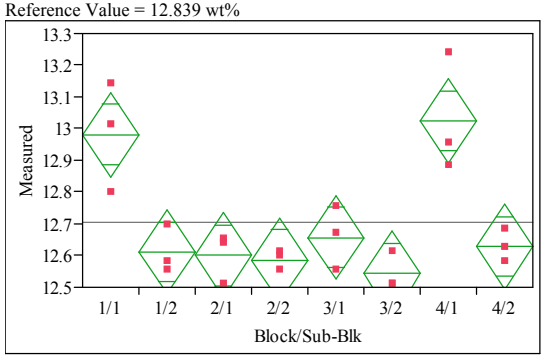
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.387223	0.00272	0.38145	0.39300
1/2	3	0.387223	0.00272	0.38145	0.39300
2/1	3	0.385554	0.00272	0.37978	0.39133
2/2	3	0.385137	0.00272	0.37936	0.39091
3/1	3	0.393900	0.00272	0.38812	0.39967
3/2	3	0.381799	0.00272	0.37602	0.38757
4/1	3	0.386806	0.00272	0.38103	0.39258
4/2	3	0.387223	0.00272	0.38145	0.39300

Std Error uses a pooled estimate of error variance

One-way Analysis of Measured By Block/Sub-Blk Oxide=Fe2O3 (wt%)

Reference Value = 12.839 wt%



One-way Anova
Summary of Fit

Rsquare	0.796623
Adj Rsquare	0.707645
Root Mean Square Error	0.108726
Mean of Response	12.70408
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Blk	7	0.74086306	0.105838	8.9531	0.0002
Error	16	0.18914203	0.011821		
C. Total	23	0.93000508			

Means for One-way Anova

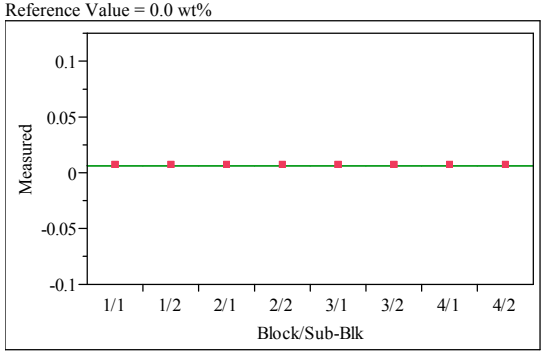
Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	12.9817	0.06277	12.849	13.115
1/2	3	12.6100	0.06277	12.477	12.743
2/1	3	12.6004	0.06277	12.467	12.733
2/2	3	12.5861	0.06277	12.453	12.719
3/1	3	12.6576	0.06277	12.525	12.791
3/2	3	12.5432	0.06277	12.410	12.676
4/1	3	13.0246	0.06277	12.891	13.158
4/2	3	12.6290	0.06277	12.496	12.762

Std Error uses a pooled estimate of error variance

Exhibit A3. Batch 1 Sample Measurements by Block and Sub-Block by Oxide for Both Preparation Methods (continued)

One-way Analysis of Measured By Block/Sub-Blk Oxide=La2O3 (wt%)

Reference Value = 0.0 wt%



One-way Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.005864
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Blk	7	0	0	.	.
Error	16	0	0		
C. Total	23	0			

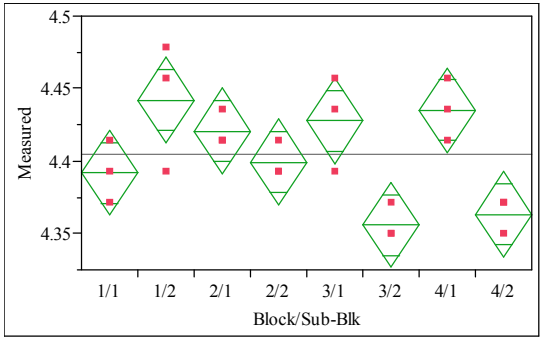
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.005864	0	0.00586	0.00586
1/2	3	0.005864	0	0.00586	0.00586
2/1	3	0.005864	0	0.00586	0.00586
2/2	3	0.005864	0	0.00586	0.00586
3/1	3	0.005864	0	0.00586	0.00586
3/2	3	0.005864	0	0.00586	0.00586
4/1	3	0.005864	0	0.00586	0.00586
4/2	3	0.005864	0	0.00586	0.00586

Std Error uses a pooled estimate of error variance

One-way Analysis of Measured By Block/Sub-Blk Oxide=Li2O (wt%)

Reference Value = 4.429 wt%



One-way Anova
Summary of Fit

Rsquare	0.70516
Adj Rsquare	0.576167
Root Mean Square Error	0.02407
Mean of Response	4.404475
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Blk	7	0.02217065	0.003167	5.4667	0.0024
Error	16	0.00926996	0.000579		
C. Total	23	0.03144060			

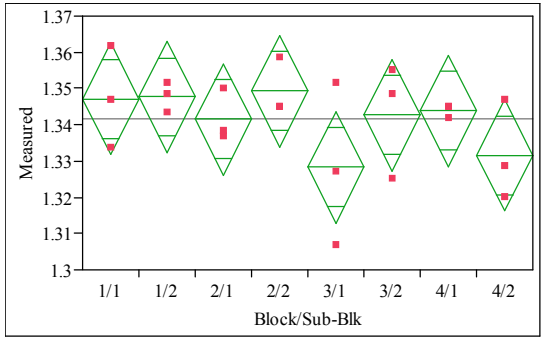
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	4.39192	0.01390	4.3625	4.4214
1/2	3	4.44215	0.01390	4.4127	4.4716
2/1	3	4.42062	0.01390	4.3912	4.4501
2/2	3	4.39909	0.01390	4.3696	4.4286
3/1	3	4.42780	0.01390	4.3983	4.4573
3/2	3	4.35603	0.01390	4.3266	4.3855
4/1	3	4.43497	0.01390	4.4055	4.4644
4/2	3	4.36321	0.01390	4.3338	4.3927

Std Error uses a pooled estimate of error variance

One-way Analysis of Measured By Block/Sub-Blk Oxide=MgO (wt%)

Reference Value = 1.419 wt%



One-way Anova
Summary of Fit

Rsquare	0.326475
Adj Rsquare	0.031808
Root Mean Square Error	0.01257
Mean of Response	1.341496
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Blk	7	0.00122545	0.000175	1.1079	0.4044
Error	16	0.00252813	0.000158		
C. Total	23	0.00375358			

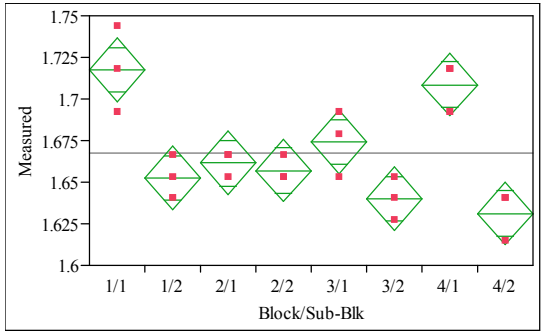
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	1.34709	0.00726	1.3317	1.3625
1/2	3	1.34765	0.00726	1.3323	1.3630
2/1	3	1.34156	0.00726	1.3262	1.3569
2/2	3	1.34930	0.00726	1.3339	1.3647
3/1	3	1.32830	0.00726	1.3129	1.3437
3/2	3	1.34267	0.00726	1.3273	1.3581
4/1	3	1.34378	0.00726	1.3284	1.3592
4/2	3	1.33161	0.00726	1.3162	1.3470

Std Error uses a pooled estimate of error variance

Exhibit A3. Batch 1 Sample Measurements by Block and Sub-Block by Oxide for Both Preparation Methods (continued)

One-way Analysis of Measured By Block/Sub-Blk Oxide=MnO (wt%)
Reference Value = 1.726 wt%



One-way Anova
Summary of Fit

Rsquare	0.837209
Adj Rsquare	0.765988
Root Mean Square Error	0.015593
Mean of Response	1.6678
Observations (or Sum Wgts)	24

Analysis of Variance

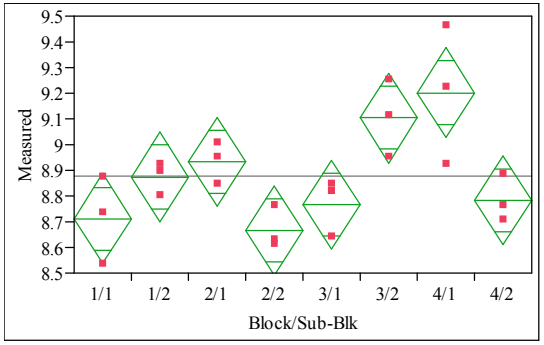
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Blk	7	0.02000637	0.002858	11.7551	<.0001
Error	16	0.00389013	0.000243		
C. Total	23	0.02389650			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	1.71730	0.00900	1.6982	1.7364
1/2	3	1.65274	0.00900	1.6337	1.6718
2/1	3	1.66134	0.00900	1.6423	1.6804
2/2	3	1.65704	0.00900	1.6380	1.6761
3/1	3	1.67426	0.00900	1.6552	1.6933
3/2	3	1.63982	0.00900	1.6207	1.6589
4/1	3	1.70869	0.00900	1.6896	1.7278
4/2	3	1.63122	0.00900	1.6121	1.6503

Std Error uses a pooled estimate of error variance

One-way Analysis of Measured By Block/Sub-Blk Oxide=Na2O (wt%)
Reference Value = 9.003 wt%



One-way Anova
Summary of Fit

Rsquare	0.700593
Adj Rsquare	0.569603
Root Mean Square Error	0.142047
Mean of Response	8.880512
Observations (or Sum Wgts)	24

Analysis of Variance

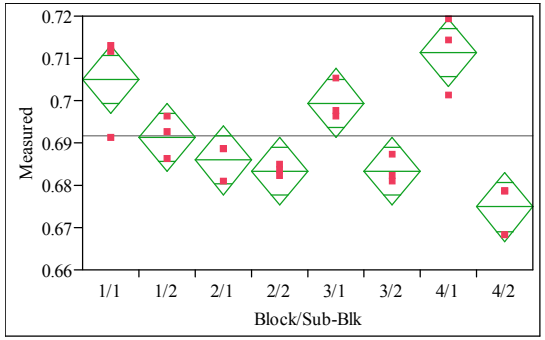
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Blk	7	0.7554231	0.107918	5.3484	0.0027
Error	16	0.3228388	0.020177		
C. Total	23	1.0782619			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	8.71257	0.08201	8.5387	8.8864
1/2	3	8.87433	0.08201	8.7005	9.0482
2/1	3	8.93275	0.08201	8.7589	9.1066
2/2	3	8.66764	0.08201	8.4938	8.8415
3/1	3	8.76649	0.08201	8.5926	8.9403
3/2	3	9.10349	0.08201	8.9296	9.2773
4/1	3	9.20235	0.08201	9.0285	9.3762
4/2	3	8.78447	0.08201	8.6106	8.9583

Std Error uses a pooled estimate of error variance

One-way Analysis of Measured By Block/Sub-Blk Oxide=NiO (wt%)
Reference Value = 0.751 wt%



One-way Anova
Summary of Fit

Rsquare	0.822997
Adj Rsquare	0.745558
Root Mean Square Error	0.006597
Mean of Response	0.691816
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Blk	7	0.00323743	0.000462	10.6277	<.0001
Error	16	0.00069628	0.000044		
C. Total	23	0.00393371			

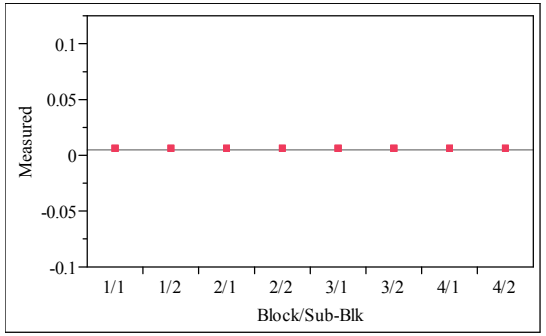
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.704965	0.00381	0.69689	0.71304
1/2	3	0.691392	0.00381	0.68332	0.69947
2/1	3	0.685878	0.00381	0.67780	0.69395
2/2	3	0.683333	0.00381	0.67526	0.69141
3/1	3	0.699451	0.00381	0.69138	0.70752
3/2	3	0.683333	0.00381	0.67526	0.69141
4/1	3	0.711328	0.00381	0.70325	0.71940
4/2	3	0.674849	0.00381	0.66678	0.68292

Std Error uses a pooled estimate of error variance

Exhibit A3. Batch 1 Sample Measurements by Block and Sub-Block by Oxide for Both Preparation Methods (continued)

One-way Analysis of Measured By Block/Sub-Blk Oxide=PbO (wt%)
Reference Value = 0.0 wt%



One-way Anova
Summary of Fit

Rsquare	4
Adj Rsquare	5.3125
Root Mean Square Error	.
Mean of Response	0.005386
Observations (or Sum Wgts)	24

Analysis of Variance

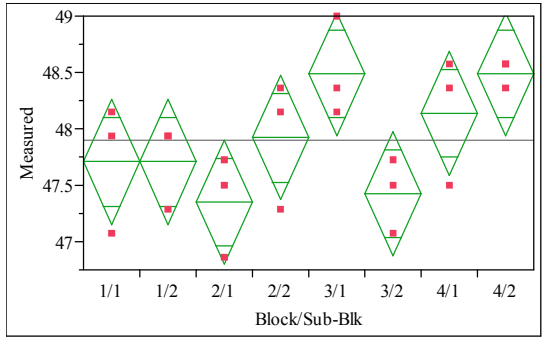
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Blk	7	7.2222e-35	1.032e-35	-3.0476	0.0000
Error	16	-5.417e-35	-3.39e-36		
C. Total	23	1.8056e-35			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.005386	.	.	.
1/2	3	0.005386	.	.	.
2/1	3	0.005386	.	.	.
2/2	3	0.005386	.	.	.
3/1	3	0.005386	.	.	.
3/2	3	0.005386	.	.	.
4/1	3	0.005386	.	.	.
4/2	3	0.005386	.	.	.

Std Error uses a pooled estimate of error variance

One-way Analysis of Measured By Block/Sub-Blk Oxide=SiO2 (wt%)
Reference Value = 50.22 wt%



One-way Anova
Summary of Fit

Rsquare	0.557873
Adj Rsquare	0.364442
Root Mean Square Error	0.449592
Mean of Response	47.90249
Observations (or Sum Wgts)	24

Analysis of Variance

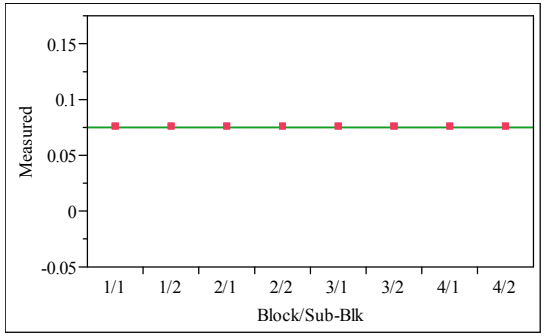
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Blk	7	4.0808057	0.582972	2.8841	0.0376
Error	16	3.2341338	0.202133		
C. Total	23	7.3149395			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	47.7064	0.25957	47.156	48.257
1/2	3	47.7064	0.25957	47.156	48.257
2/1	3	47.3498	0.25957	46.800	47.900
2/2	3	47.9203	0.25957	47.370	48.471
3/1	3	48.4908	0.25957	47.941	49.041
3/2	3	47.4212	0.25957	46.871	47.971
4/1	3	48.1343	0.25957	47.584	48.685
4/2	3	48.4908	0.25957	47.941	49.041

Std Error uses a pooled estimate of error variance

One-way Analysis of Measured By Block/Sub-Blk Oxide=SO4 (wt%)
Reference Value = 0.0 wt%



One-way Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.074898
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Blk	7	0	0	.	.
Error	16	0	0		
C. Total	23	0			

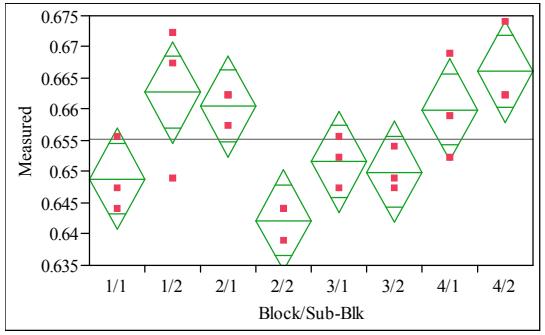
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.074898	0	0.07490	0.07490
1/2	3	0.074898	0	0.07490	0.07490
2/1	3	0.074898	0	0.07490	0.07490
2/2	3	0.074898	0	0.07490	0.07490
3/1	3	0.074898	0	0.07490	0.07490
3/2	3	0.074898	0	0.07490	0.07490
4/1	3	0.074898	0	0.07490	0.07490
4/2	3	0.074898	0	0.07490	0.07490

Std Error uses a pooled estimate of error variance

Exhibit A3. Batch 1 Sample Measurements by Block and Sub-Block by Oxide for Both Preparation Methods (continued)

One-way Analysis of Measured By Block/Sub-Blk Oxide=TiO2 (wt%)
Reference Value = 0.677 wt%



One-way Anova
Summary of Fit

Rsquare	0.671603
Adj Rsquare	0.527929
Root Mean Square Error	0.006611
Mean of Response	0.655246
Observations (or Sum Wgts)	24

Analysis of Variance

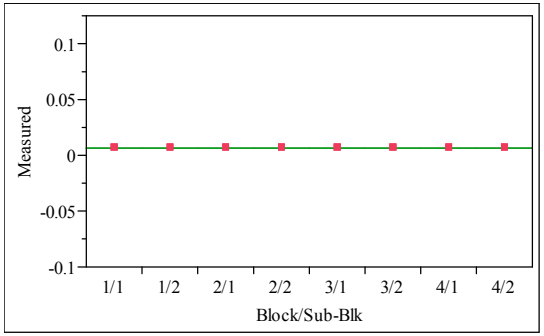
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Blk	7	0.00143006	0.000204	4.6745	0.0051
Error	16	0.00069927	0.000044		
C. Total	23	0.00212933			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.648852	0.00382	0.64076	0.65694
1/2	3	0.662752	0.00382	0.65466	0.67084
2/1	3	0.660528	0.00382	0.65244	0.66862
2/2	3	0.642180	0.00382	0.63409	0.65027
3/1	3	0.651632	0.00382	0.64354	0.65972
3/2	3	0.649964	0.00382	0.64187	0.65806
4/1	3	0.659972	0.00382	0.65188	0.66806
4/2	3	0.666088	0.00382	0.65800	0.67418

Std Error uses a pooled estimate of error variance

One-way Analysis of Measured By Block/Sub-Blk Oxide=ZnO (wt%)
Reference Value = 0.0 wt%



One-way Anova
Summary of Fit

Rsquare	.
Adj Rsquare	.
Root Mean Square Error	0
Mean of Response	0.006224
Observations (or Sum Wgts)	24

Analysis of Variance

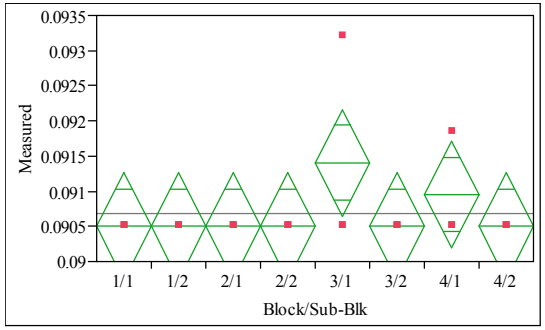
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Blk	7	0	0	.	.
Error	16	0	0		
C. Total	23	0			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.006224	0	0.00622	0.00622
1/2	3	0.006224	0	0.00622	0.00622
2/1	3	0.006224	0	0.00622	0.00622
2/2	3	0.006224	0	0.00622	0.00622
3/1	3	0.006224	0	0.00622	0.00622
3/2	3	0.006224	0	0.00622	0.00622
4/1	3	0.006224	0	0.00622	0.00622
4/2	3	0.006224	0	0.00622	0.00622

Std Error uses a pooled estimate of error variance

One-way Analysis of Measured By Block/Sub-Blk Oxide=ZrO2 (wt%)
Reference Value = 0.098 wt%



One-way Anova
Summary of Fit

Rsquare	0.279279
Adj Rsquare	-0.03604
Root Mean Square Error	0.000617
Mean of Response	0.090672
Observations (or Sum Wgts)	24

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Block/Sub-Blk	7	2.35685e-6	3.3669e-7	0.8857	0.5394
Error	16	6.0822e-6	3.8014e-7		
C. Total	23	8.43906e-6			

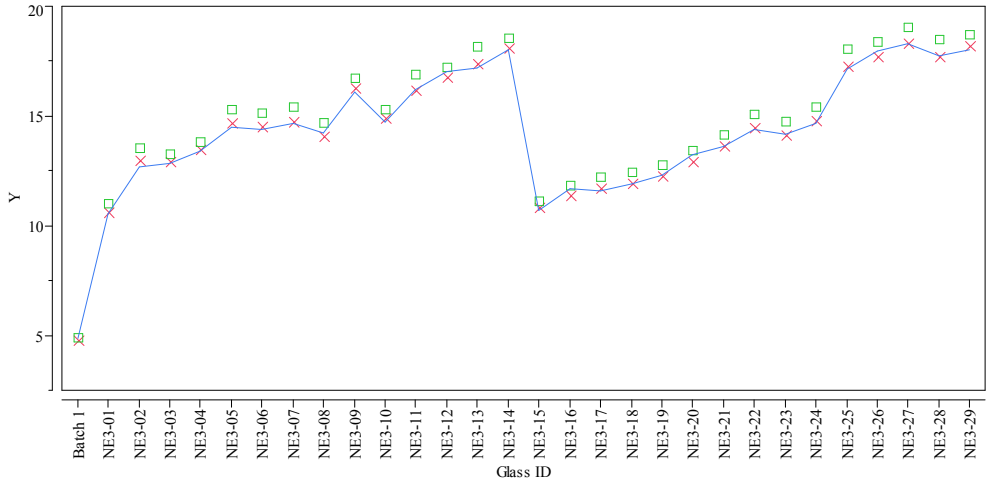
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	0.090504	0.00036	0.08975	0.09126
1/2	3	0.090504	0.00036	0.08975	0.09126
2/1	3	0.090504	0.00036	0.08975	0.09126
2/2	3	0.090504	0.00036	0.08975	0.09126
3/1	3	0.091404	0.00036	0.09065	0.09216
3/2	3	0.090504	0.00036	0.08975	0.09126
4/1	3	0.090954	0.00036	0.09020	0.09171
4/2	3	0.090504	0.00036	0.08975	0.09126

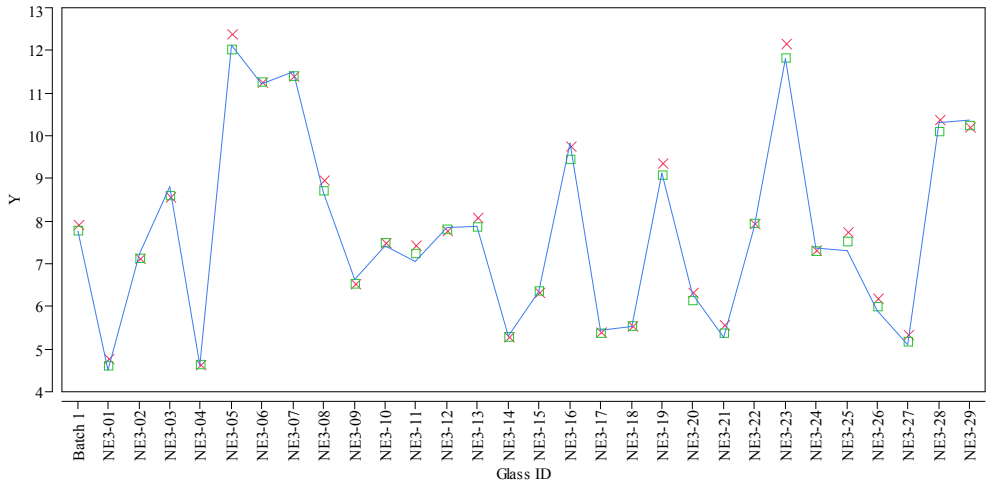
Std Error uses a pooled estimate of error variance

Exhibit A4. Average Measured and Bias-Corrected (bc) Versus Targeted Compositions by Glass ID by Oxide

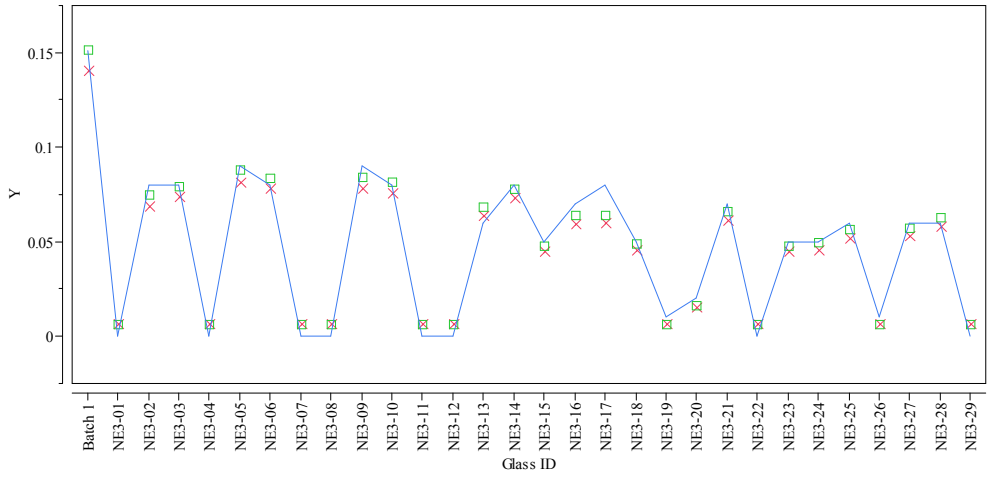
Overlay Plot Oxide=Al_2O_3 (wt %)



Overlay Plot Oxide=B_2O (wt %)



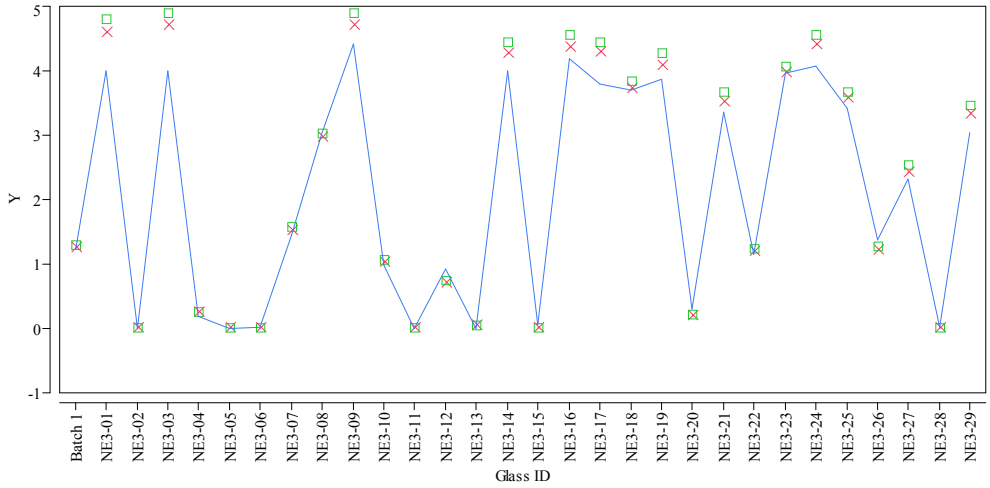
Overlay Plot Oxide=BaO (wt %)



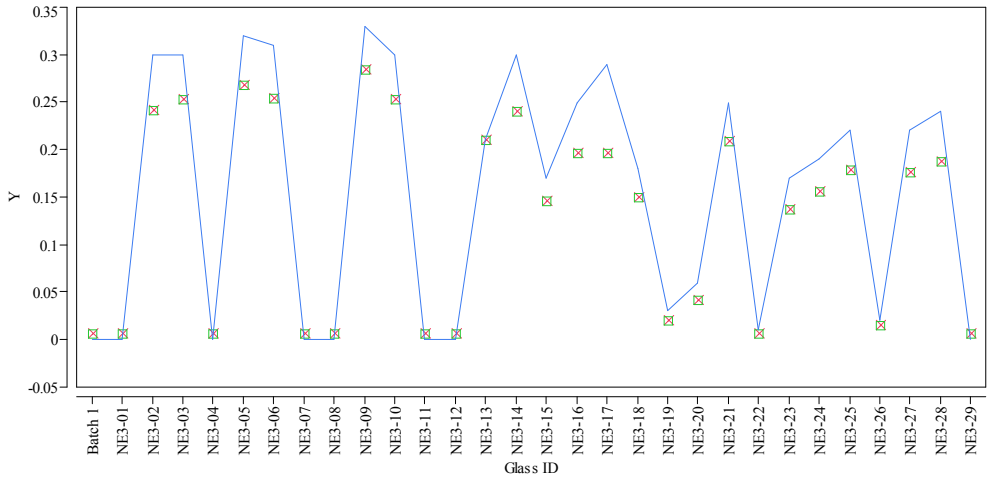
Y × Measured □ Measured bc — Targeted

Exhibit A4. Average Measured and Bias-Corrected (bc) Versus Targeted Compositions by Glass ID by Oxide (continued)

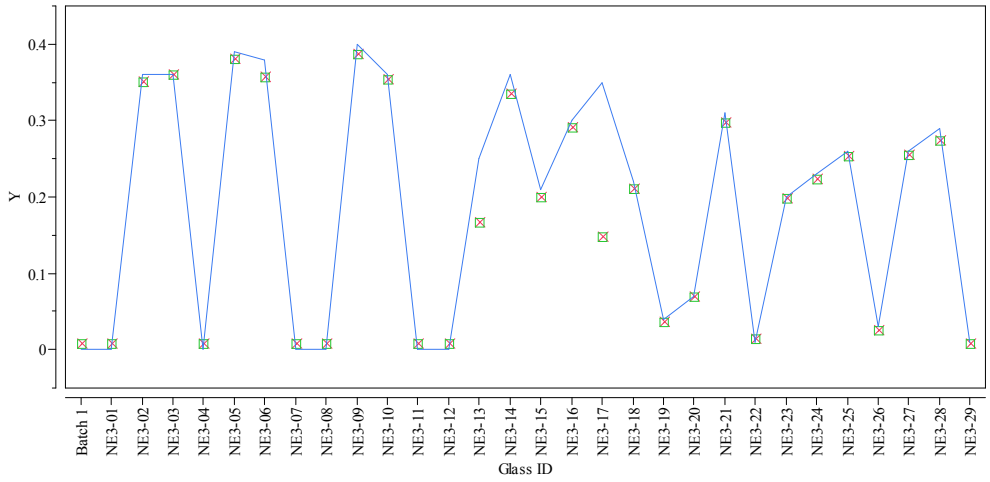
Overlay Plot Oxide=CaO (wt %)



Overlay Plot Oxide=CdO (wt %)



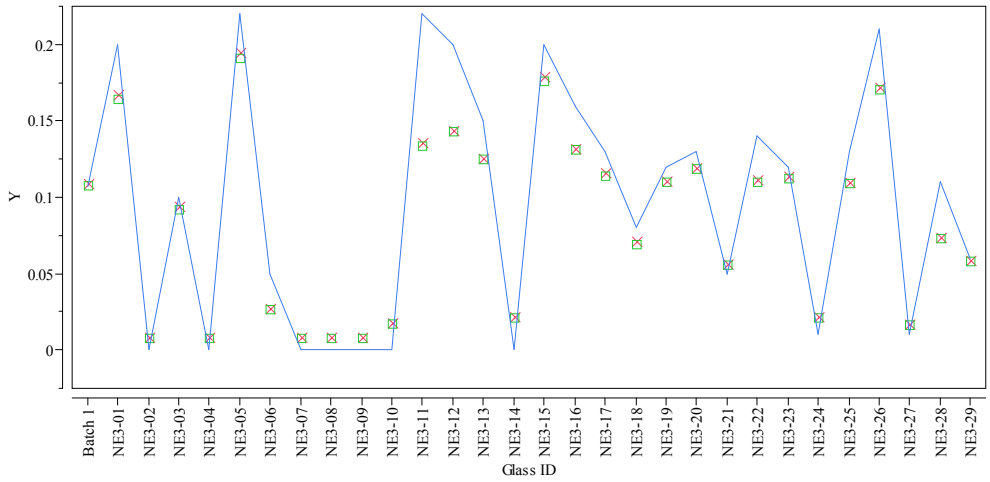
Overlay Plot Oxide=Ce_2O_3 (wt %)



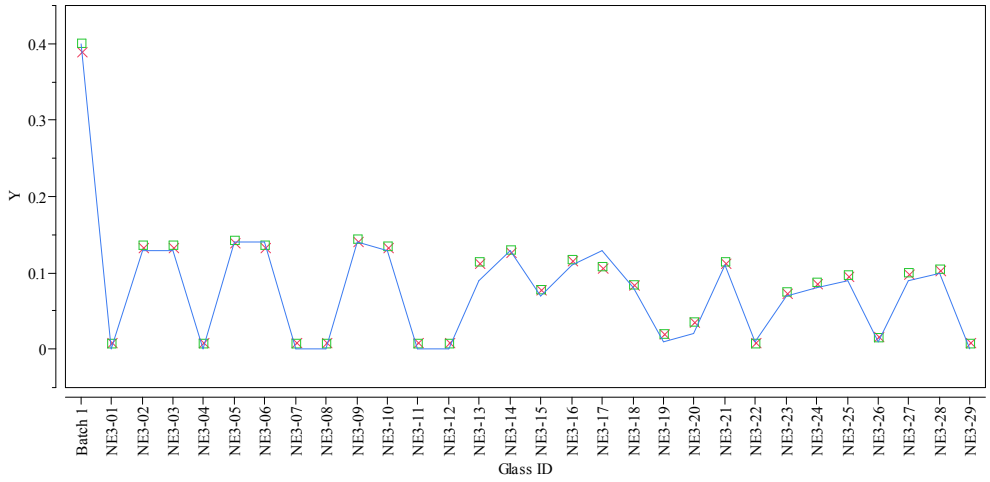
Y × Measured ▫ Measured bc — Targeted

Exhibit A4. Average Measured and Bias-Corrected (bc) Versus Targeted Compositions by Glass ID by Oxide (continued)

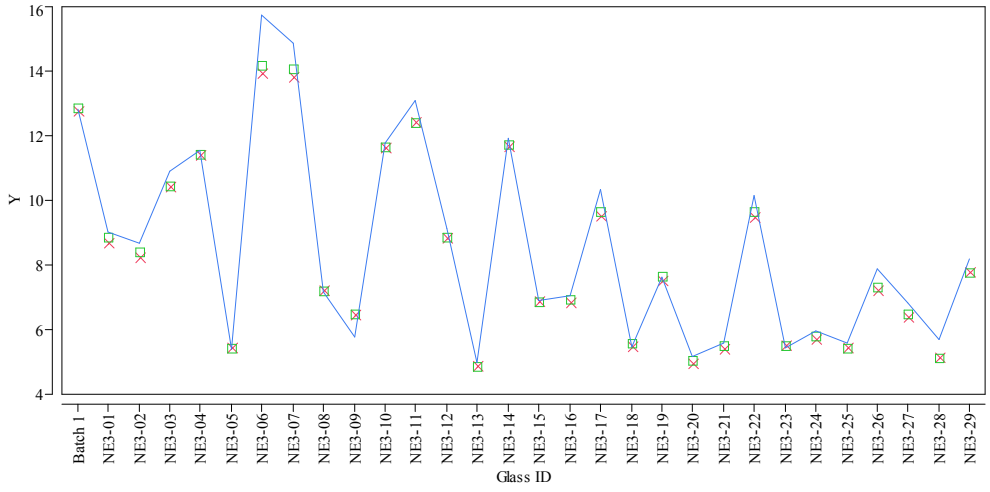
Overlay Plot Oxide=Cr_2O_3 (wt %)



Overlay Plot Oxide=CuO (wt %)



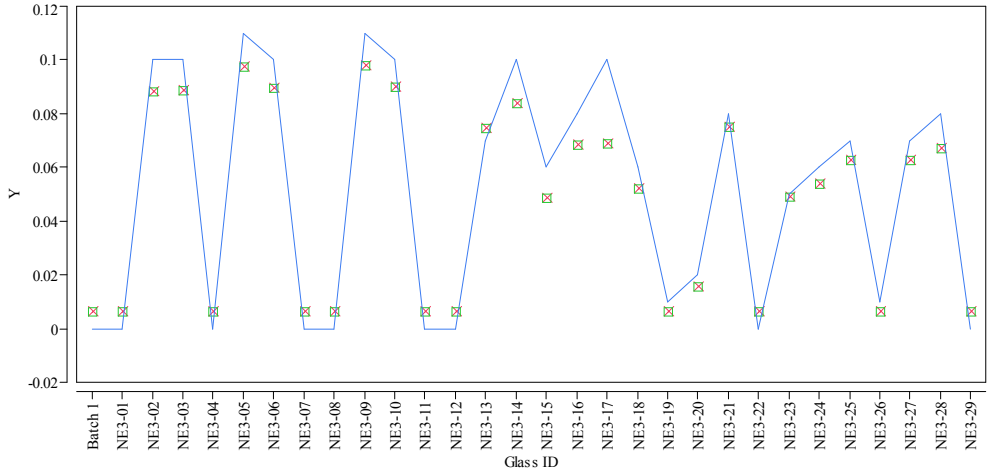
Overlay Plot Oxide=Fe_2O_3 (wt %)



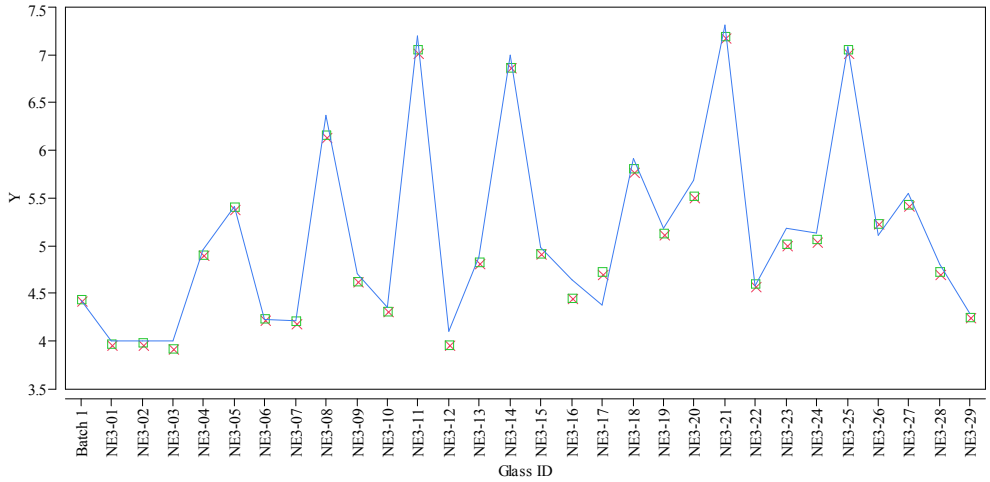
Y × Measured ▫ Measured bc — Targeted

Exhibit A4. Average Measured and Bias-Corrected (bc) Versus Targeted Compositions by Glass ID by Oxide (continued)

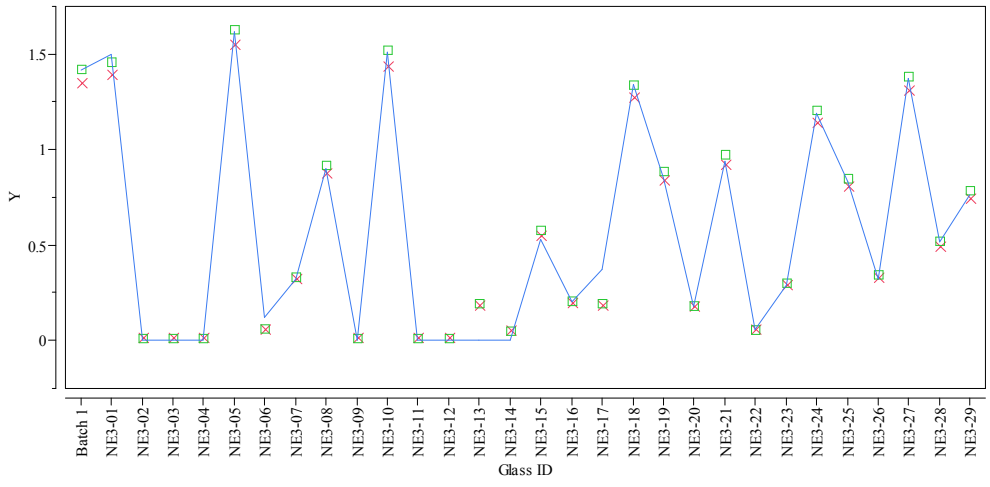
Overlay Plot Oxide=La_2O_3 (wt %)



Overlay Plot Oxide=Li_2O (wt %)



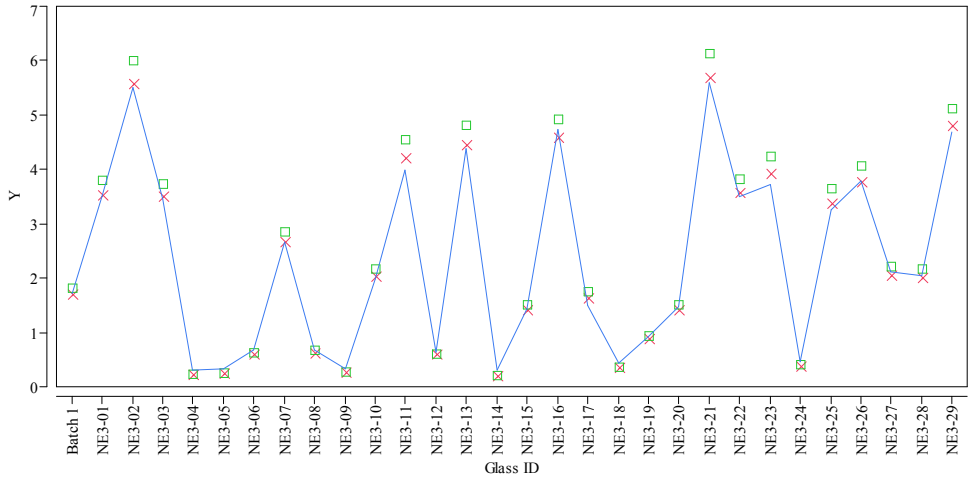
Overlay Plot Oxide=MgO (wt %)



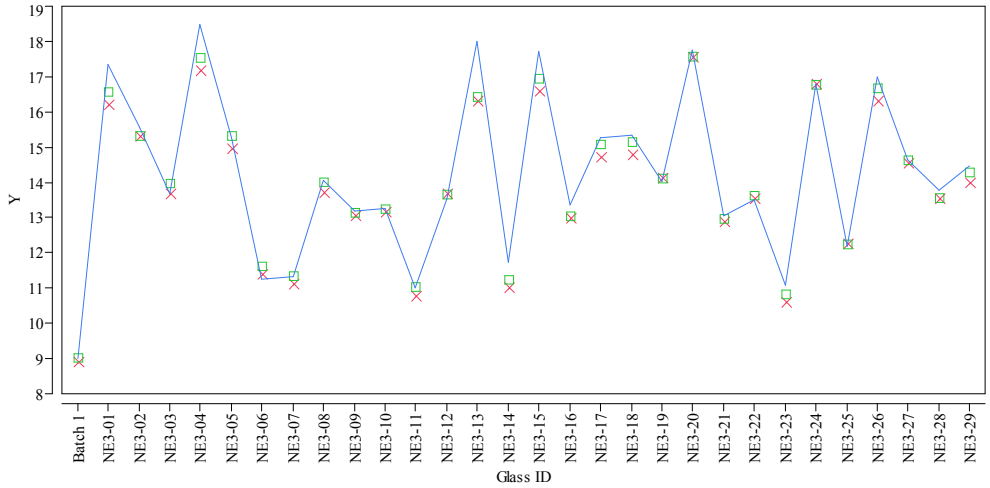
Y × Measured Measured bc Targeted

Exhibit A4. Average Measured and Bias-Corrected (bc) Versus Targeted Compositions by Glass ID by Oxide (continued)

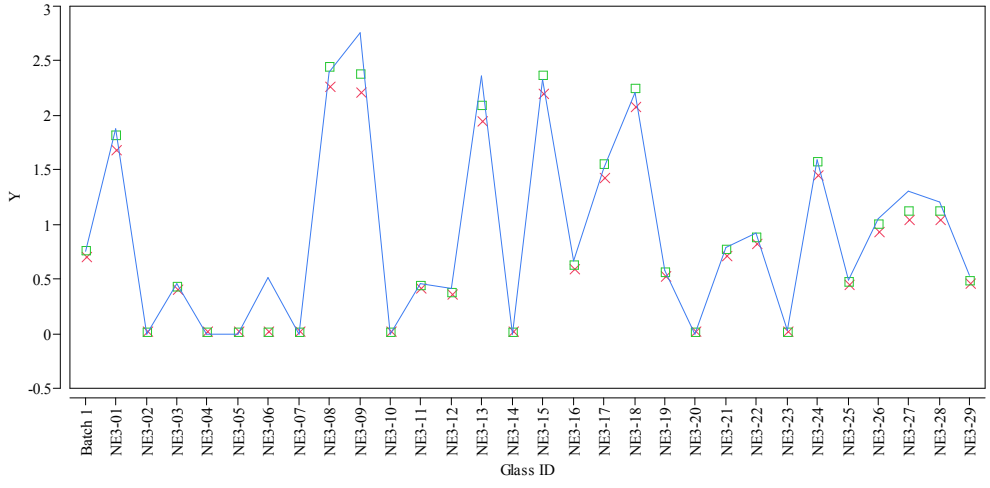
Overlay Plot Oxide=MnO (wt %)



Overlay Plot Oxide=Na_2O (wt %)



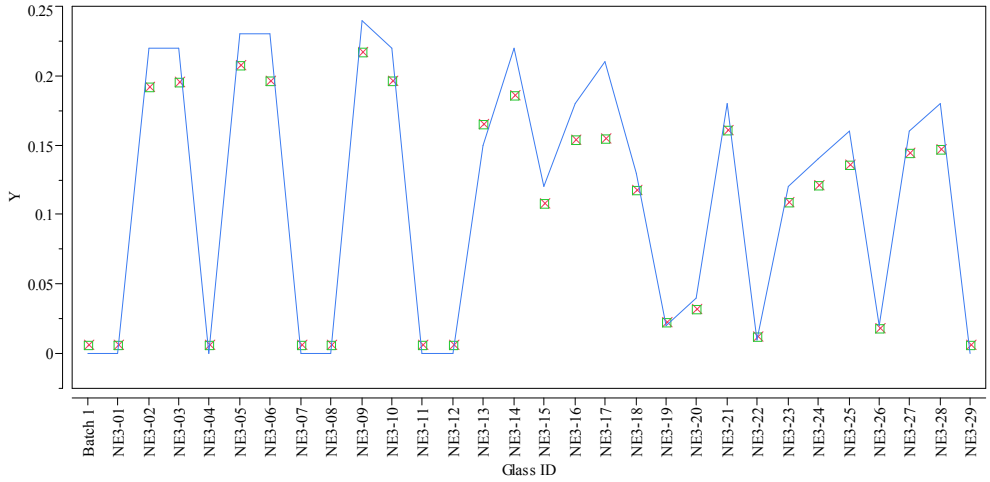
Overlay Plot Oxide=NiO (wt %)



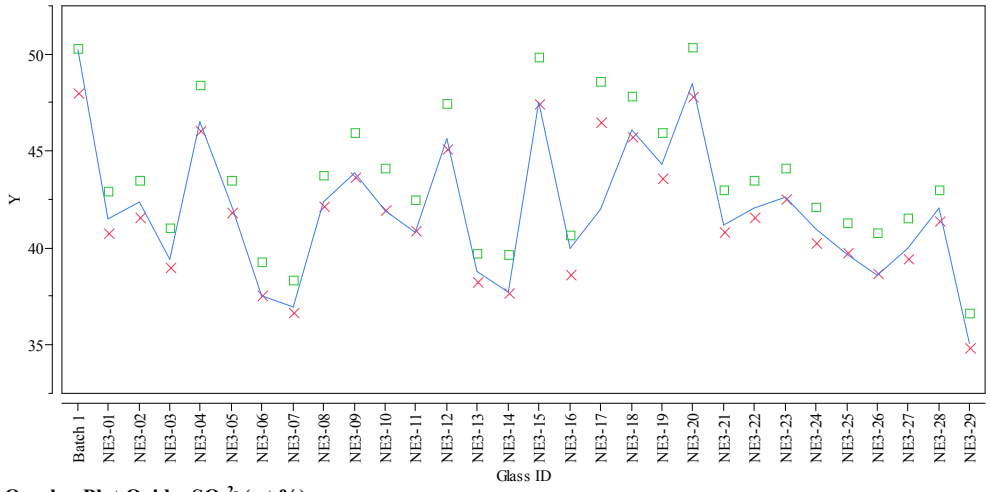
Y × Measured □ Measured bc — Targeted

Exhibit A4. Average Measured and Bias-Corrected (bc) Versus Targeted Compositions by Glass ID by Oxide (continued)

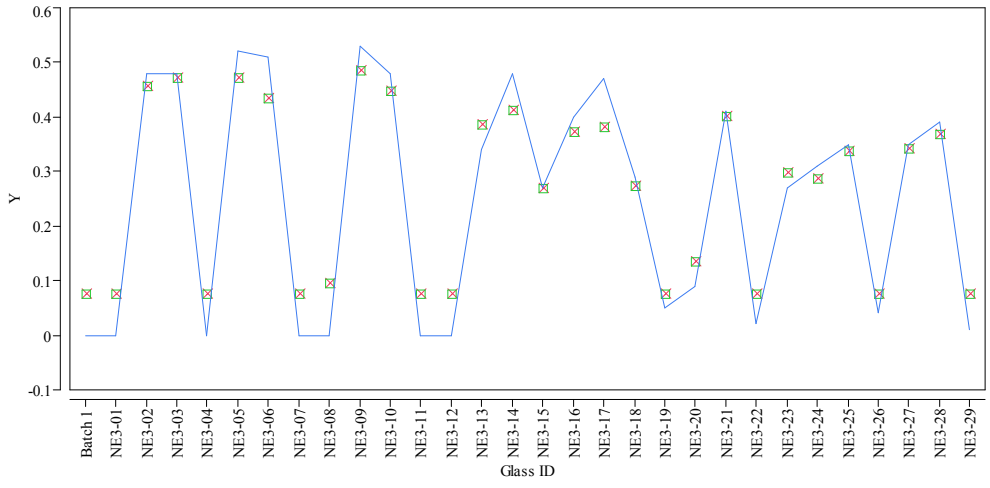
Overlay Plot Oxide=PbO (wt %)



Overlay Plot Oxide=SiO_2 (wt %)



Overlay Plot Oxide=SO_4^{2-} (wt %)



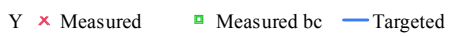
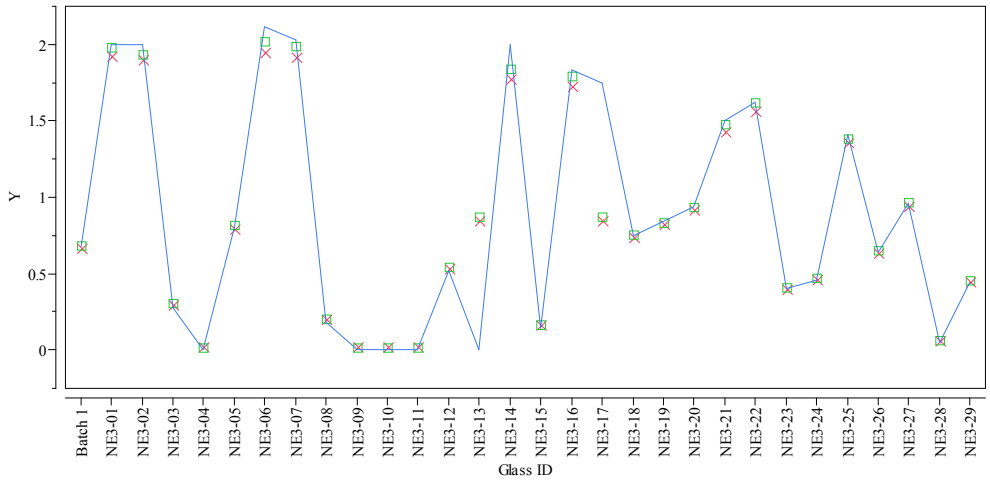
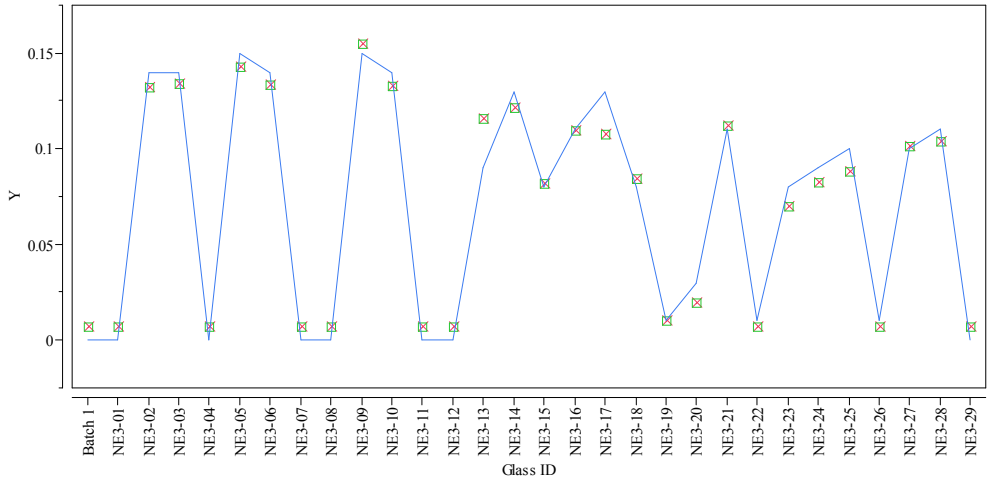


Exhibit A4. Average Measured and Bias-Corrected (bc) Versus Targeted Compositions by Glass ID by Oxide (continued)

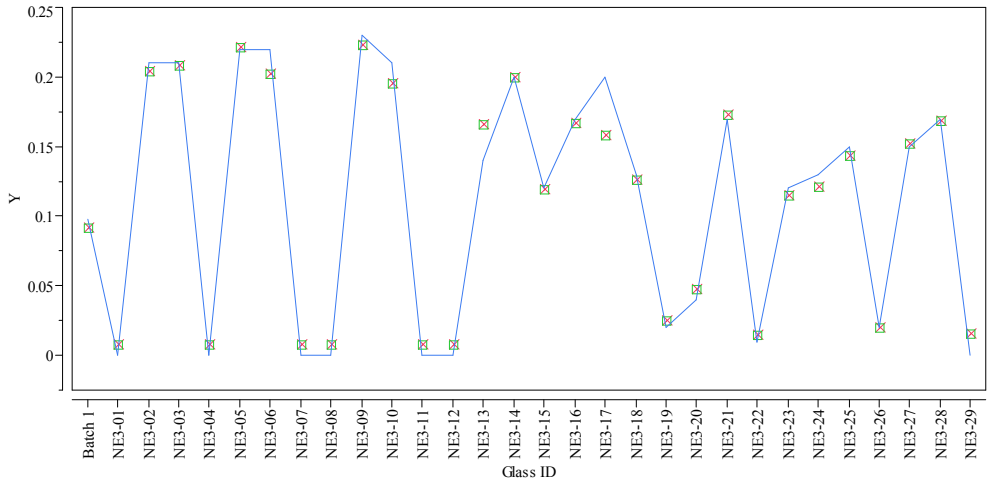
Overlay Plot Oxide=TiO_2 (wt %)



Overlay Plot Oxide=ZnO (wt %)

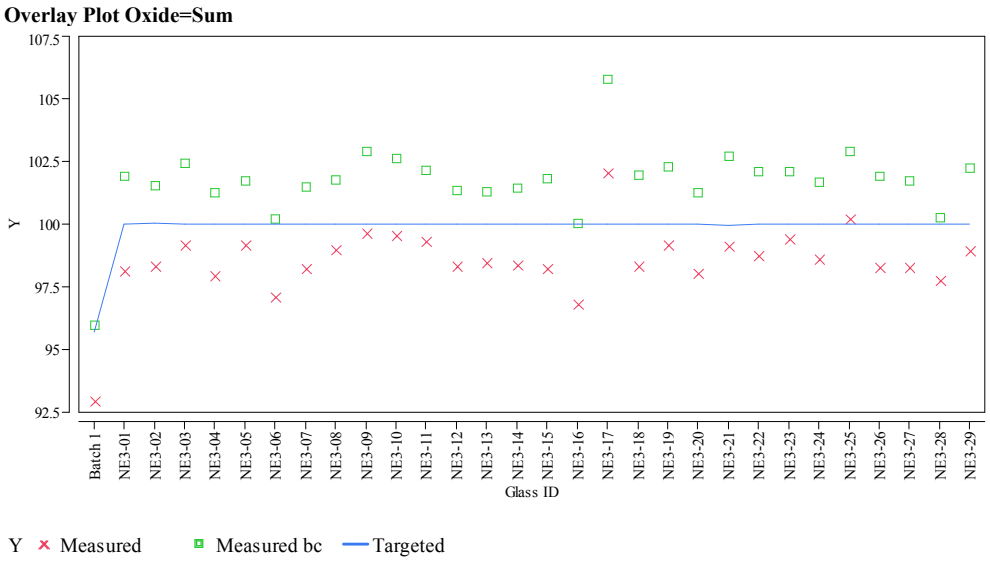


Overlay Plot Oxide=ZrO_2 (wt %)



Y × Measured Measured bc Targeted

Exhibit A4. Average Measured and Bias-Corrected (bc) Versus Targeted Compositions by Glass ID by Oxide (continued)



Appendix B

Tables and Exhibits Supporting the Analysis of the PCT Results for the Study Glasses

Table B1. Measurements of the PCT Solutions As-Received (ar) and After Appropriate Adjustments (ppm)

Set	Glass ID	Heat Treatment	Block	Seq	Lab ID	B ar	Li ar	Na ar	Si ar	B (ppm)	Li (ppm)	Na (ppm)	Si (ppm)
1	Soln Std	ref	1	1	std-11-1	20.5	9.62	82.2	50.0	20.5	9.62	82.2	50
1	NE3-06	ccc	1	2	V16	42.9	19.3	44.2	48.7	71.50143	32.16731	73.66814	81.16829
1	NE3-07	ccc	1	3	V21	75.4	34.6	71.2	53.6	125.66918	57.66782	118.66904	89.33512
1	NE3-01	ccc	1	4	V17	8.33	14.8	120	66.3	13.883611	24.66716	200.004	110.50221
1	NE3-10	ccc	1	5	V34	555	254	619	160	925.0185	423.3418	1031.6873	266.672
1	NE3-05	quenched	1	6	V31	26.9	12.1	57.8	52.2	44.83423	20.16707	96.33526	87.00174
1	NE3-06	quenched	1	7	V13	13.7	9.06	31.4	44.8	22.83379	15.100302	52.33438	74.66816
1	blank	ref	1	8	V51	<1.00	<1.00	5.95	<1.00	0.83335	0.83335	9.916865	0.83335
1	NE3-03	quenched	1	9	V60	13.4	9.11	52.6	40.2	22.33378	15.183637	87.66842	67.00134
1	NE3-08	ccc	1	10	V37	23.8	28.7	69.8	62.3	39.66746	47.83429	116.33566	103.83541
1	NE3-08	quenched	1	11	V25	11.0	12.2	53.1	45.0	18.3337	20.33374	88.50177	75.0015
1	NE3-03	ccc	1	12	V63	32.6	21.1	80.0	52.0	54.33442	35.16737	133.336	86.6684
1	ARM-1	ref	1	13	V01	10.4	7.82	21.6	35.1	17.33368	13.033594	36.00072	58.50117
1	Soln Std	ref	1	14	std-11-2	20.5	9.69	82.8	50.1	20.5	9.69	82.8	50.1
1	NE3-09	quenched	1	15	V29	4.27	5.06	25.1	22.2	7.116809	8.433502	41.83417	37.00074
1	NE3-10	quenched	1	16	V10	9.55	8.07	39.1	47.1	15.916985	13.450269	65.16797	78.50157
1	NE3-05	ccc	1	17	V65	20.5	11.5	51.9	48.5	34.16735	19.16705	86.50173	80.83495
1	EA	ref	1	18	V68	35.2	10.1	96.5	49.8	586.66784	168.33367	1608.33655	830.00166
1	NE3-01	quenched	1	19	V07	9.88	12.7	119	67.0	16.466996	21.16709	198.3373	111.6689
1	NE3-04	ccc	1	20	V64	41.0	50.8	165	182	68.3347	84.66836	275.0055	303.3394
1	NE3-02	ccc	1	21	V12	8.91	7.32	45.8	52.2	14.850297	12.200244	76.33486	87.00174
1	NE3-07	quenched	1	22	V22	14.7	8.56	28.9	34.7	24.50049	14.266952	48.16763	57.83449
1	NE3-04	quenched	1	23	V41	5.93	8.27	97.0	72.8	9.883531	13.783609	161.6699	121.33576
1	NE3-09	ccc	1	24	V48	5.54	6.79	26.2	23.1	9.233518	11.316893	43.66754	38.50077
1	NE3-02	quenched	1	25	V14	7.96	6.39	49.6	50.5	13.266932	10.650213	82.66832	84.16835
1	Soln Std	ref	1	26	std-11-3	20.5	9.66	83.7	50.2	20.5	9.66	83.7	50.2
1	Soln Std	ref	2	1	std-12-1	20.9	10.1	83.1	50.7	20.9	10.1	83.1	50.7
1	NE3-08	ccc	2	2	V53	22.4	27.0	69.7	59.4	37.33408	45.0009	116.16899	99.00198
1	NE3-05	quenched	2	3	V19	21.8	12.1	55.3	50.9	36.33406	20.16707	92.16851	84.83503
1	NE3-02	ccc	2	4	V43	8.80	7.77	47.7	53.1	14.66696	12.950259	79.50159	88.50177
1	NE3-03	quenched	2	5	V58	13.1	9.39	51.6	40.5	21.83377	15.650313	86.00172	67.50135
1	NE3-09	quenched	2	6	V09	3.99	5.60	28.8	23.5	6.650133	9.33352	48.00096	39.16745
1	NE3-01	quenched	2	7	V67	8.97	12.8	116	64.5	14.950299	21.33376	193.3372	107.50215
1	NE3-10	quenched	2	8	V42	9.44	8.50	39.1	48.1	15.733648	14.16695	65.16797	80.16827
1	NE3-08	quenched	2	9	V08	10.2	11.8	50.7	43.3	17.00034	19.66706	84.50169	72.16811
1	NE3-07	ccc	2	10	V61	70.9	32.8	69.8	50.9	118.16903	54.66776	116.33566	84.83503
1	NE3-04	ccc	2	11	V56	40.6	50.4	159	160	67.66802	84.00168	265.0053	266.672
1	ARM-1	ref	2	12	V27	10.4	8.04	22.2	35.5	17.33368	13.400268	37.00074	59.16785
1	NE3-09	ccc	2	13	V11	5.49	7.16	26.3	23.3	9.150183	11.933572	43.83421	38.83411
1	Soln Std	ref	2	14	std-12-2	20.1	9.80	89.7	49.6	20.1	9.8	89.7	49.6
1	NE3-06	ccc	2	15	V05	41.3	18.8	42.7	47.1	68.83471	31.33396	71.16809	78.50157
1	NE3-02	quenched	2	16	V57	8.41	7.03	52.0	52.0	14.016947	11.716901	86.6684	86.6684
1	NE3-07	quenched	2	17	V40	15.0	9.32	30.6	37.5	25.0005	15.533644	51.00102	62.50125
1	NE3-04	quenched	2	18	V38	5.80	8.65	96.6	72.9	9.66686	14.416955	161.00322	121.50243
1	NE3-05	ccc	2	19	V59	21.6	12.5	54.8	51.9	36.00072	20.83375	91.33516	86.50173
1	NE3-03	ccc	2	20	V62	31.8	20.5	77.2	50.3	53.00106	34.16735	128.66924	83.83501
1	NE3-06	quenched	2	21	V04	12.8	9.25	24.9	43.8	21.33376	15.416975	41.50083	73.00146
1	EA	ref	2	22	V36	35.5	11.3	100	54.4	591.66785	188.33371	1666.67	906.66848
1	NE3-10	ccc	2	23	V02	551	259	629	176	918.3517	431.6753	1048.3543	293.3392
1	NE3-01	ccc	2	24	V15	11.9	14.7	118	63.6	19.83373	24.50049	196.6706	106.00212
1	Soln Std	ref	2	25	std-12-3	21.8	10.0	84.7	50.1	21.8	10	84.7	50.1
1	Soln Std	ref	3	1	std-13-1	20.2	9.82	83.3	49.5	20.2	9.82	83.3	49.5
1	blank	ref	3	2	V47	<1.00	<1.00	<1.00	<1.00	0.83335	0.83335	0.83335	0.83335
1	NE3-08	quenched	3	3	V50	9.89	12.2	55.9	44.4	16.483663	20.33374	93.16853	74.00148
1	NE3-02	ccc	3	4	V28	7.81	7.68	48.5	51.2	13.016927	12.800256	80.83495	85.33504
1	NE3-10	ccc	3	5	V20	539	251	681	176	898.3513	418.3417	1135.0227	293.3392
1	NE3-06	ccc	3	6	V33	44.6	18.7	45.1	47.0	74.33482	31.16729	75.16817	78.3349
1	NE3-01	ccc	3	7	V49	8.48	14.1	115	60.8	14.133616	23.50047	191.6705	101.33536
1	NE3-04	ccc	3	8	V55	41.5	51.3	168	159	69.16805	85.50171	280.0056	265.0053
1	NE3-05	ccc	3	9	V18	21.3	12.3	56.9	49.6	35.50071	20.50041	94.83523	82.66832
1	NE3-03	ccc	3	10	V32	32.3	20.9	81.4	50.0	53.83441	34.83403	135.66938	83.335
1	NE3-04	quenched	3	11	V45	5.44	8.31	93.0	69.5	9.066848	13.850277	155.0031	115.83565
1	NE3-09	quenched	3	12	V46	3.48	5.36	26.6	22.7	5.800116	8.933512	44.33422	37.83409
1	NE3-06	quenched	3	13	V39	12.2	9.09	24.9	43.3	20.33374	15.150303	41.50083	72.16811
1	Soln Std	ref	3	14	std-13-2	19.5	9.72	82.3	48.8	19.5	9.72	82.3	48.8
1	NE3-08	ccc	3	15	V66	21.7	26.9	67.7	57.3	36.16739	44.83423	112.83559	95.50191
1	NE3-01	quenched	3	16	V52	8.71	12.9	119	65.1	14.516957	21.50043	198.3373	108.50217
1	EA	ref	3	17	V35	34.3	11.1	99.1	53.6	571.66781	185.00037	1651.66997	893.33512

Table B1. Measurements of the PCT Solutions As-Received (ar) and After Appropriate Adjustments (ppm) (continued)

Set	Glass ID	Heat Treatment	Block	Seq	Lab ID	B ar	Li ar	Na ar	Si ar	B (ppm)	Li (ppm)	Na (ppm)	Si (ppm)
1	NE3-10	quenched	3	18	V44	9.17	8.50	43.8	48.4	15.283639	14.16695	73.00146	80.66828
1	NE3-05	quenched	3	19	V23	21.5	12.2	58.0	50.7	35.83405	20.33374	96.6686	84.50169
1	NE3-07	quenched	3	20	V54	14.3	9.26	31.4	36.8	23.83381	15.433642	52.33438	61.33456
1	NE3-09	ccc	3	21	V06	4.71	7.12	27.9	23.2	7.850157	11.866904	46.50093	38.66744
1	NE3-07	ccc	3	22	V26	69.6	32.3	69.7	50.4	116.00232	53.83441	116.16899	84.00168
1	ARM-1	ref	3	23	V24	10.0	8.25	23.5	35.8	16.667	13.750275	39.16745	59.66786
1	NE3-02	quenched	3	24	V03	7.40	7.00	51.0	51.3	12.33358	11.6669	85.0017	85.50171
1	NE3-03	quenched	3	25	V30	12.4	9.41	54.9	40.0	20.66708	15.683647	91.50183	66.668
1	Soln Std	ref	3	26	std-13-3	19.3	9.93	84.7	49.0	19.3	9.93	84.7	49
2	Soln Std	ref	1	1	std-21-1	20.4	9.90	83.5	50.0	20.4	9.9	83.5	50
2	NE3-16	ccc	1	2	W14	16.0	11.8	51.1	45.2	26.6672	19.66706	85.16837	75.33484
2	NE3-18	quenched	1	3	W40	7.36	13.6	77.3	54.5	12.266912	22.66712	128.83591	90.83515
2	NE3-20	ccc	1	4	W65	7.87	11.2	79.3	71.6	13.116929	18.66704	132.16931	119.33572
2	NE3-13	ccc	1	5	W05	1310	235	2410	369	2183.377	391.6745	4016.747	615.0123
2	NE3-15	ccc	1	6	W29	22.5	10.7	82.8	74.0	37.50075	17.83369	138.00276	123.3358
2	NE3-11	ccc	1	7	W22	180	113	120	130	300.006	188.3371	200.004	216.671
2	NE3-12	quenched	1	8	W64	11.5	6.91	28.4	52.1	19.16705	11.516897	47.33428	86.83507
2	NE3-14	quenched	1	9	W06	11.5	19.4	50.0	48.1	19.16705	32.33398	83.335	80.16827
2	NE3-12	ccc	1	10	W04	25.9	16.2	42.9	62.7	43.16753	27.00054	71.50143	104.50209
2	NE3-15	quenched	1	11	W15	10.8	9.82	89.7	76.1	18.00036	16.366994	149.50299	126.83587
2	NE3-19	quenched	1	12	W30	10.7	9.24	44.0	40.7	17.83369	15.400308	73.3348	67.83469
2	NE3-18	ccc	1	13	W02	7.78	13.9	62.9	49.8	12.966926	23.16713	104.83543	83.00166
2	Soln Std	ref	1	14	std-21-2	20.6	9.70	79.8	49.8	20.6	9.7	79.8	49.8
2	NE3-17	quenched	1	15	W21	9.66	10.4	76.4	53.7	16.100322	17.33368	127.33588	89.50179
2	EA	ref	1	16	W17	28.1	9.18	85.3	46.6	468.33427	153.000306	1421.66951	776.66822
2	NE3-11	quenched	1	17	W37	12.3	17.8	39.5	71.4	20.50041	29.66726	65.83465	119.00238
2	NE3-19	ccc	1	18	W10	9.61	9.02	40.3	39.2	16.016987	15.033634	67.16801	65.33464
2	NE3-13	quenched	1	19	W23	13.1	8.72	81.6	54.2	21.83377	14.533624	136.00272	90.33514
2	blank	ref	1	20	W35	<1.00	<1.00	<1.00	<1.00	0.83335	0.83335	0.83335	0.83335
2	ARM-1	ref	1	21	W27	9.72	7.47	17.6	33.7	16.200324	12.450249	29.33392	56.16779
2	NE3-20	quenched	1	22	W31	8.10	10.3	88.5	75.3	13.50027	17.16701	147.50295	125.50251
2	NE3-16	quenched	1	23	W66	16.2	11.5	55.5	45.9	27.00054	19.16705	92.50185	76.50153
2	NE3-17	ccc	1	24	W28	6.73	10.0	60.4	47.5	11.216891	16.667	100.66868	79.16825
2	NE3-14	ccc	1	25	W50	30.4	59.9	20.0	91.1	50.66768	99.83533	33.334	151.83637
2	Soln Std	ref	1	26	std-21-3	19.7	9.44	76.0	48.6	19.7	9.44	76	48.6
2	Soln Std	ref	2	1	std-22-1	20.4	9.68	79.8	49.1	20.4	9.68	79.8	49.1
2	ARM-1	ref	2	2	W62	10.5	8.03	19.4	36.0	17.50035	13.383601	32.33398	60.0012
2	NE3-16	ccc	2	3	W67	15.9	11.9	54.0	45.2	26.50053	19.83373	90.0018	75.33484
2	NE3-13	quenched	2	4	W43	13.4	9.08	83.6	54.8	22.33378	15.133636	139.33612	91.33516
2	NE3-15	quenched	2	5	W36	9.36	9.74	89.5	76.4	15.600312	16.233658	149.16965	127.33588
2	NE3-16	quenched	2	6	W09	16.1	11.8	57.1	46.0	26.83387	19.66706	95.16857	76.6682
2	EA	ref	2	7	W38	25.2	8.77	74.6	43.8	420.00084	146.166959	1243.33582	730.00146
2	NE3-15	ccc	2	8	W54	9.66	10.8	81.7	77.1	16.100322	18.00036	136.16939	128.50257
2	NE3-14	ccc	2	9	W11	32.2	64.2	22.7	94.9	53.66774	107.00214	37.83409	158.16983
2	NE3-17	ccc	2	10	W32	6.85	10.8	70.7	49.2	11.416895	18.00036	117.83569	82.00164
2	NE3-12	quenched	2	11	W53	6.80	7.09	32.7	52.2	11.33356	11.816903	54.50109	87.00174
2	NE3-18	ccc	2	12	W08	6.64	14.2	67.8	49.8	11.066888	23.66714	113.00226	83.00166
2	NE3-11	ccc	2	13	W52	24.0	18.8	84.0	57.6	40.0008	31.33396	140.0028	96.00192
2	Soln Std	ref	2	14	std-22-2	21.3	10.0	84.6	49.3	21.3	10	84.6	49.3
2	NE3-20	quenched	2	15	W13	8.40	10.8	93.6	74.0	14.00028	18.00036	156.00312	123.3358
2	NE3-19	ccc	2	16	W03	9.38	9.31	42.2	39.5	15.633646	15.516977	70.33474	65.83465
2	NE3-20	ccc	2	17	W18	8.21	11.7	81.3	74.0	13.683607	19.50039	135.50271	123.3358
2	NE3-19	quenched	2	18	W20	9.69	9.70	50.2	41.4	16.150323	16.16699	83.66834	69.00138
2	NE3-18	quenched	2	19	W25	6.91	13.4	79.2	52.9	11.516897	22.33378	132.00264	88.16843
2	NE3-13	ccc	2	20	W19	1350	245	2530	368	2250.045	408.3415	4216.751	613.3456
2	NE3-12	ccc	2	21	W60	38.2	17.0	48.8	63.2	63.66794	28.3339	81.33496	105.33544
2	NE3-14	quenched	2	22	W55	14.6	19.4	52.4	46.8	24.33382	32.33398	87.33508	78.00156
2	NE3-17	quenched	2	23	W48	11.5	10.8	79.2	54.1	19.16705	18.00036	132.00264	90.16847
2	NE3-11	quenched	2	24	W51	13.9	18.4	41.7	71.2	23.16713	30.66728	69.50139	118.66904
2	Soln Std	ref	2	25	std-22-3	21.4	10.0	82.8	49.6	21.4	10	82.8	49.6
2	Soln Std	ref	3	1	std-23-1	21.1	10.1	83.1	51.1	21.1	10.1	83.1	51.1
2	NE3-15	quenched	3	2	W26	9.79	10.2	94.6	75.5	16.316993	17.00034	157.66982	125.83585
2	NE3-20	quenched	3	3	W59	8.02	10.7	94.5	74.7	13.366934	17.83369	157.50315	124.50249
2	NE3-13	quenched	3	4	W63	13.5	9.41	88.3	55.6	22.50045	15.683647	147.16961	92.66852
2	NE3-12	quenched	3	5	W07	7.05	7.12	30.0	53.3	11.750235	11.866904	50.001	88.83511
2	NE3-17	ccc	3	6	W46	6.77	10.8	68.2	50.5	11.283559	18.00036	113.66894	84.16835
2	EA	ref	3	7	W45	25.3	8.85	75.2	45.7	421.66751	147.500295	1253.33584	761.66819
2	NE3-12	ccc	3	8	W16	23.7	15.7	44.0	61.3	39.50079	26.16719	73.3348	102.16871
2	NE3-19	ccc	3	9	W47	9.46	9.56	45.4	41.2	15.766982	15.933652	75.66818	68.66804
2	blank	ref	3	10	W24	<1.00	<1.00	<1.00	<1.00	0.83335	0.83335	0.83335	0.83335

Table B1. Measurements of the PCT Solutions As-Received (ar) and After Appropriate Adjustments (ppm) (continued)

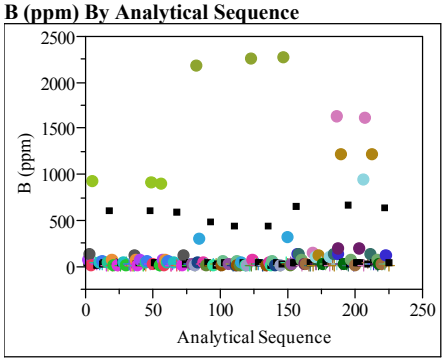
Set	Glass ID	Heat Treatment	Block	Seq	Lab ID	B ar	Li ar	Na ar	Si ar	B (ppm)	Li (ppm)	Na (ppm)	Si (ppm)
2	NE3-14	ccc	3	11	W42	32.8	65.4	22.6	97.9	54.66776	109.00218	37.66742	163.16993
2	NE3-11	quenched	3	12	W41	11.4	17.8	39.7	69.0	19.00038	29.66726	66.16799	115.0023
2	NE3-15	ccc	3	13	W57	9.22	10.5	80.1	75.6	15.366974	17.50035	133.50267	126.00252
2	Soln Std	ref	3	14	std-23-2	21.0	9.85	82.8	50.4	21	9.85	82.8	50.4
2	NE3-14	quenched	3	15	W68	8.86	19.7	51.9	47.6	14.766962	32.83399	86.50173	79.33492
2	NE3-18	quenched	3	16	W49	6.90	13.3	76.5	52.5	11.50023	22.16711	127.50255	87.50175
2	NE3-20	ccc	3	17	W33	7.90	11.5	80.6	73.6	13.16693	19.16705	134.33602	122.66912
2	ARM-1	ref	3	18	W34	10.3	8.50	23.8	37.4	17.16701	14.16695	39.66746	62.33458
2	NE3-13	ccc	3	19	W56	1360	247	2500	364	2266.712	411.6749	4166.75	606.6788
2	NE3-19	quenched	3	20	W12	24.8	9.57	48.7	42.1	41.33416	15.950319	81.16829	70.16807
2	NE3-17	quenched	3	21	W39	13.8	10.5	77.6	54.1	23.00046	17.50035	129.33592	90.16847
2	NE3-11	ccc	3	22	W58	187	116	121	132	311.6729	193.3372	201.6707	220.0044
2	NE3-16	quenched	3	23	W61	19.7	11.8	57.6	45.8	32.83399	19.66706	96.00192	76.33486
2	NE3-18	ccc	3	24	W01	8.87	13.7	63.9	49.4	14.783629	22.83379	106.50213	82.33498
2	NE3-16	ccc	3	25	W44	17.3	12.1	54.7	45.9	28.83391	20.16707	91.16849	76.50153
2	Soln Std	ref	3	26	std-23-3	21.2	9.91	82.8	50.5	21.2	9.91	82.8	50.5
3	Soln Std	ref	1	1	std-31-1	20.1	9.64	85.0	49.7	20.1	9.64	85	49.7
3	EA	ref	1	2	X12	37.9	11.4	102	54.9	631.66793	190.00038	1700.0034	915.00183
3	NE3-25	ccc	1	3	X31	74.6	105	66.5	127	124.33582	175.0035	110.83555	211.6709
3	NE3-24	ccc	1	4	X44	76.3	69.5	190	117	127.16921	115.83565	316.673	195.0039
3	NE3-26	quenched	1	5	X50	9.01	10.5	84.7	58.5	15.016967	17.50035	141.16949	97.50195
3	NE3-28	ccc	1	6	X58	46.8	25.4	63.6	58.6	78.00156	42.33418	106.00212	97.66862
3	ARM-1	ref	1	7	X56	10.0	7.78	20.0	34.6	16.667	12.966926	33.334	57.66782
3	blank	ref	1	8	X18	<1.00	<1.00	<1.00	<1.00	0.83335	0.83335	0.83335	0.83335
3	NE3-21	ccc	1	9	X27	11.5	15.2	27.7	22.2	19.16705	25.33384	46.16759	37.00074
3	NE3-22	ccc	1	10	X16	11.3	9.89	40.5	53.9	18.83371	16.483663	67.50135	89.83513
3	NE3-22	quenched	1	11	X26	9.18	8.38	38.7	49.9	15.300306	13.966946	64.50129	83.16833
3	NE3-24	quenched	1	12	X01	8.14	9.42	74.0	40.4	13.566938	15.700314	123.3358	67.33468
3	Soln Std	ref	1	13	std-31-2	19.4	9.75	80.9	49.3	19.4	9.75	80.9	49.3
3	NE3-27	quenched	1	14	X13	6.79	10.8	58.4	46.4	11.316893	18.00036	97.33528	77.33488
3	NE3-26	ccc	1	15	X61	91.3	21.1	185	26.8	152.16971	35.16737	308.3395	44.66756
3	NE3-21	quenched	1	16	X43	18.4	21.5	66.1	61.4	30.66728	35.83405	110.16887	102.33538
3	NE3-29	ccc	1	17	X06	57.2	30.9	51.5	11.6	95.33524	51.50103	85.83505	19.33372
3	NE3-23	quenched	1	18	X53	17.4	8.10	22.9	31.0	29.00058	13.50027	38.16743	51.6677
3	NE3-27	ccc	1	19	X24	71.6	27.6	107	16.5	119.33572	46.00092	178.3369	27.50055
3	NE3-29	quenched	1	20	X47	25.4	9.60	57.4	37.4	42.33418	16.00032	95.66858	62.33458
3	NE3-25	quenched	1	21	X14	14.5	16.7	48.3	48.0	24.16715	27.83389	80.50161	80.0016
3	NE3-23	ccc	1	22	X28	12.4	7.81	22.2	30.0	20.66708	13.016927	37.00074	50.001
3	NE3-28	quenched	1	23	X23	13.6	8.53	36.4	50.5	22.66712	14.216951	60.66788	84.16835
3	Soln Std	ref	1	24	std-31-3	21.0	9.70	80.9	49.7	21	9.7	80.9	49.7
3	Soln Std	ref	2	1	std-32-1	19.6	9.61	79.5	48.9	19.6	9.61	79.5	48.9
3	NE3-26	quenched	2	2	X60	8.35	10.9	85.6	59.9	13.916945	18.16703	142.66952	99.83533
3	NE3-29	ccc	2	3	X36	56.5	30.6	50.4	11.9	94.16855	51.00102	84.00168	19.83373
3	NE3-22	quenched	2	4	X42	14.4	8.56	39.8	50.5	24.00048	14.266952	66.33466	84.16835
3	NE3-27	quenched	2	5	X05	8.48	10.5	56.4	46.2	14.133616	17.50035	94.00188	77.00154
3	NE3-24	ccc	2	6	X03	78.3	70.2	189	119	130.50261	117.00234	315.0063	198.3373
3	NE3-29	quenched	2	7	X57	16.7	9.67	58.8	37.1	27.83389	16.116989	98.00196	61.83457
3	NE3-26	ccc	2	8	X25	978	219	1900	268	1630.0326	365.0073	3166.73	446.6756
3	NE3-25	ccc	2	9	X20	79.3	99.1	61.6	120.7	132.16931	165.16997	102.66872	201.17069
3	NE3-21	ccc	2	10	X39	116	161	236	227	193.3372	268.3387	393.3412	378.3409
3	NE3-21	quenched	2	11	X33	12.9	21.1	62.7	61.1	21.50043	35.16737	104.50209	101.83537
3	NE3-27	ccc	2	12	X59	729	280	1090	166	1215.0243	466.676	1816.703	276.6722
3	Soln Std	ref	2	13	std-32-2	28.2	9.66	78.9	49.3	28.2	9.66	78.9	49.3
3	NE3-23	ccc	2	14	X09	12.8	8.28	23.6	32.3	21.33376	13.800276	39.33412	53.83441
3	NE3-23	quenched	2	15	X15	11.6	8.29	23.5	31.7	19.33372	13.816943	39.16745	52.83439
3	NE3-24	quenched	2	16	X62	9.26	9.45	75.4	40.7	15.433642	15.750315	125.66918	67.83469
3	EA	ref	2	17	X41	38.9	11.6	104	55.3	648.33463	193.33372	1733.3368	921.66851
3	ARM-1	ref	2	18	X02	10.4	7.96	22.7	35.5	17.33368	13.266932	37.83409	59.16785
3	NE3-28	ccc	2	19	X51	45.9	24.9	61.7	59.0	76.50153	41.50083	102.83539	98.3353
3	NE3-25	quenched	2	20	X10	10.4	16.8	50.8	46.9	17.33368	28.00056	84.66836	78.16823
3	NE3-28	quenched	2	21	X32	11.7	8.68	36.0	50.4	19.50039	14.466956	60.0012	84.00168
3	NE3-22	ccc	2	22	X38	10.2	9.75	40.1	53.7	17.00034	16.250325	66.83467	89.50179
3	Soln Std	ref	2	23	std-32-3	19.0	9.59	79.2	48.5	19	9.59	79.2	48.5
3	Soln Std	ref	3	1	std-33-1	19.9	9.42	78.5	49.0	19.9	9.42	78.5	49
3	NE3-21	ccc	3	2	X45	119	151	273	222	198.3373	251.6717	455.0091	370.0074
3	ARM-1	ref	3	3	X48	10.7	7.78	19.9	35.2	17.83369	12.966926	33.16733	58.66784
3	NE3-26	quenched	3	4	X17	8.82	11.1	88.3	61.9	14.700294	18.50037	147.16961	103.16873
3	NE3-29	ccc	3	5	X21	565	309	516	118	941.6855	515.0103	860.0172	196.6706
3	NE3-26	ccc	3	6	X35	971	217	1920	273	1618.3657	361.6739	3200.064	455.0091
3	NE3-22	quenched	3	7	X30	21.8	8.52	42.2	51.0	36.33406	14.200284	70.33474	85.0017

Table B1. Measurements of the PCT Solutions As-Received (ar) and After Appropriate Adjustments (ppm) (continued)

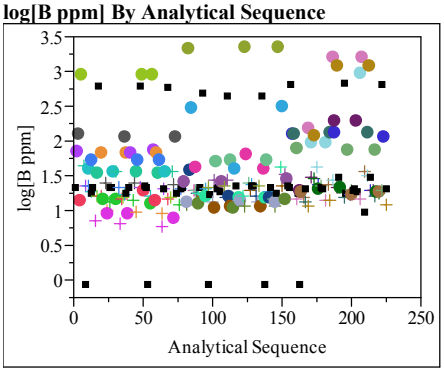
Set	Glass ID	Heat Treatment	Block	Seq	Lab ID	B ar	Li ar	Na ar	Si ar	B (ppm)	Li (ppm)	Na (ppm)	Si (ppm)
3	blank	ref	3	8	X46	5.53	<1.00	<1.00	<1.00	9.216851	0.83335	0.83335	0.83335
3	NE3-29	quenched	3	9	X37	18.7	9.52	58.4	37.5	31.16729	15.866984	97.33528	62.50125
3	NE3-24	ccc	3	10	X11	80.8	74.3	198	125	134.66936	123.83581	330.0066	208.3375
3	NE3-25	quenched	3	11	X22	11.7	16.5	49.6	46.7	19.50039	27.50055	82.66832	77.83489
3	NE3-27	ccc	3	12	X55	726	276	1090	164	1210.0242	460.0092	1816.703	273.3388
3	Soln Std	ref	3	13	std-33-2	28.5	9.65	82.5	49.4	28.5	9.65	82.5	49.4
3	NE3-21	quenched	3	14	X07	12.0	21.5	66.5	61.2	20.0004	35.83405	110.83555	102.00204
3	NE3-24	quenched	3	15	X49	9.87	9.34	77.1	40.5	16.450329	15.566978	128.50257	67.50135
3	NE3-28	ccc	3	16	X52	45.5	24.3	60.7	59.1	75.83485	40.50081	101.16869	98.50197
3	NE3-23	ccc	3	17	X08	11.0	8.02	23.9	31.1	18.3337	13.366934	39.83413	51.83437
3	NE3-23	quenched	3	18	X29	10.5	7.89	23.3	30.8	17.50035	13.150263	38.83411	51.33436
3	NE3-22	ccc	3	19	X19	11.4	10.1	41.8	56.2	19.00038	16.83367	69.66806	93.66854
3	NE3-28	quenched	3	20	X54	11.8	8.42	35.3	50.1	19.66706	14.033614	58.83451	83.50167
3	EA	ref	3	21	X40	37.3	11.2	103	53.8	621.66791	186.66704	1716.6701	896.66846
3	NE3-25	ccc	3	22	X34	68.8	98.6	61.3	119	114.66896	164.33662	102.16871	198.3373
3	NE3-27	quenched	3	23	X04	7.14	10.1	56.3	44.9	11.900238	16.83367	93.83521	74.83483
3	Soln Std	ref	3	24	std-33-3	19.6	9.59	83.5	48.8	19.6	9.59	83.5	48.8

Exhibit B1. PCT Measurements in Analytical Sequence over All of the Analytical Plans

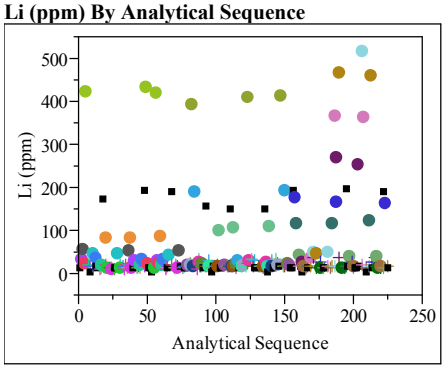
B (ppm) By Analytical Sequence



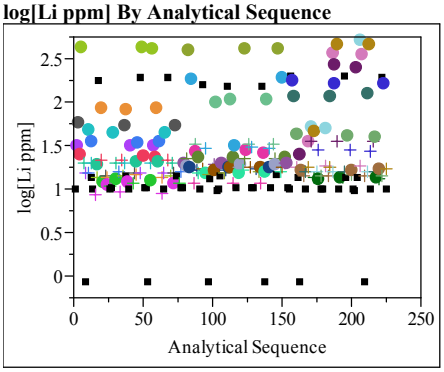
log[B ppm] By Analytical Sequence



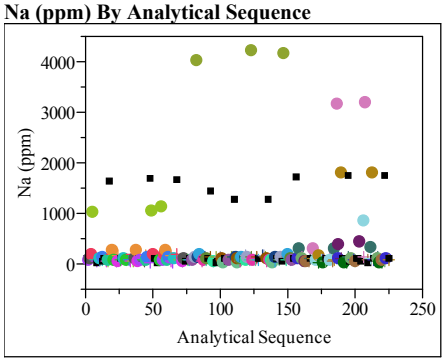
Li (ppm) By Analytical Sequence



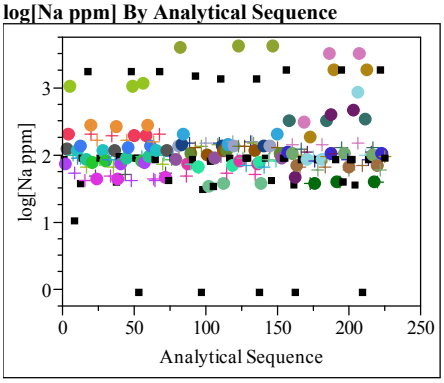
log[Li ppm] By Analytical Sequence



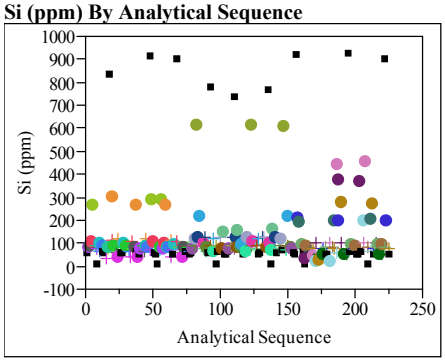
Na (ppm) By Analytical Sequence



log[Na ppm] By Analytical Sequence



Si (ppm) By Analytical Sequence



log[Si ppm] By Analytical Sequence

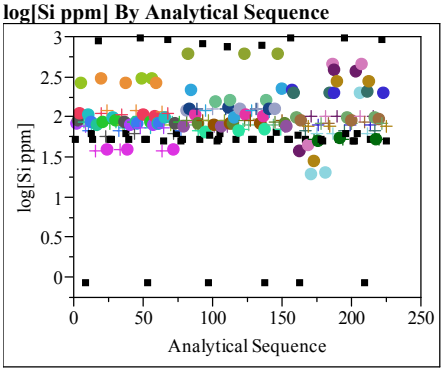
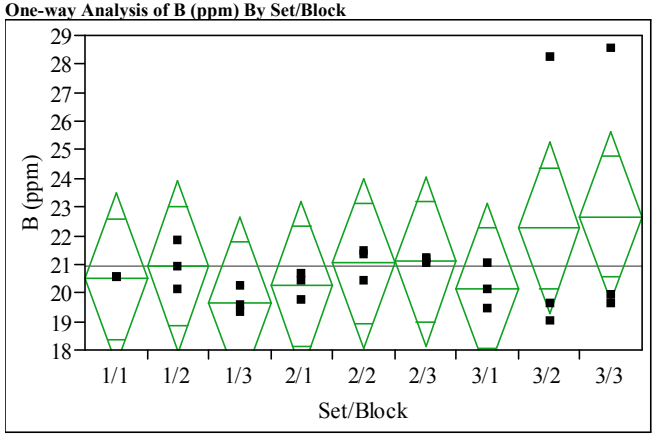


Exhibit B2. Measurements of the Multi-Element Solution Standard by ICP Block

One-way Analysis of B (ppm) By Set/Block



One-way Anova
Summary of Fit

Rsquare	0.175517
Adj Rsquare	-0.19092
Root Mean Square Error	2.453191
Mean of Response	20.95185
Observations (or Sum Wgts)	27

Analysis of Variance

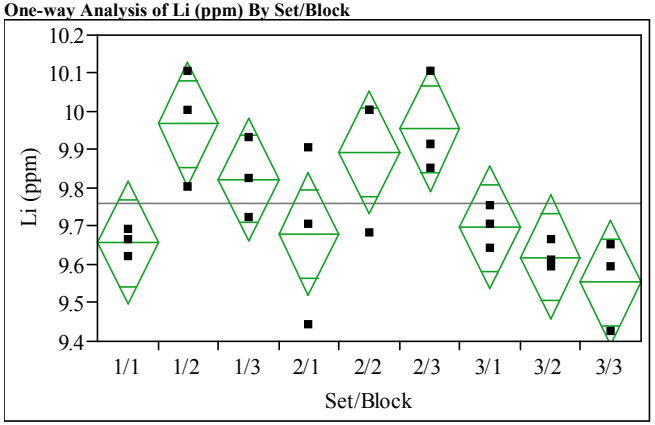
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Set/Block	8	23.06074	2.88259	0.4790	0.8553
Error	18	108.32667	6.01815		
C. Total	26	131.38741			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	20.5000	1.4164	17.524	23.476
1/2	3	20.9333	1.4164	17.958	23.909
1/3	3	19.6667	1.4164	16.691	22.642
2/1	3	20.2333	1.4164	17.258	23.209
2/2	3	21.0333	1.4164	18.058	24.009
2/3	3	21.1000	1.4164	18.124	24.076
3/1	3	20.1667	1.4164	17.191	23.142
3/2	3	22.2667	1.4164	19.291	25.242
3/3	3	22.6667	1.4164	19.691	25.642

Std Error uses a pooled estimate of error variance

One-way Analysis of Li (ppm) By Set/Block



One-way Anova
Summary of Fit

Rsquare	0.636765
Adj Rsquare	0.475327
Root Mean Square Error	0.132721
Mean of Response	9.76037
Observations (or Sum Wgts)	27

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Set/Block	8	0.55582963	0.069479	3.9443	0.0074
Error	18	0.31706667	0.017615		
C. Total	26	0.87289630			

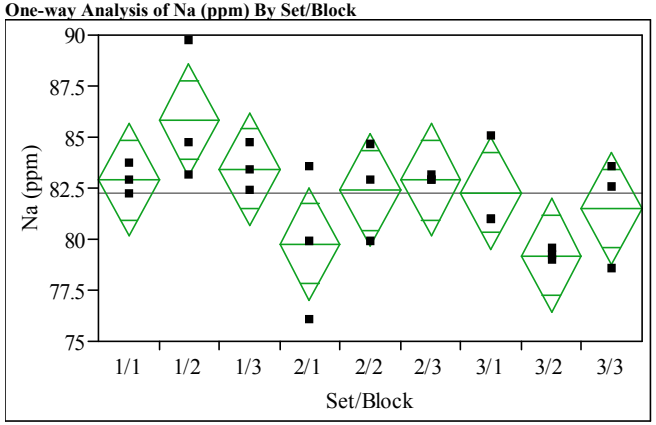
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	9.65667	0.07663	9.4957	9.818
1/2	3	9.96667	0.07663	9.8057	10.128
1/3	3	9.82333	0.07663	9.6623	9.984
2/1	3	9.68000	0.07663	9.5190	9.841
2/2	3	9.89333	0.07663	9.7323	10.054
2/3	3	9.95333	0.07663	9.7923	10.114
3/1	3	9.69667	0.07663	9.5357	9.858
3/2	3	9.62000	0.07663	9.4590	9.781
3/3	3	9.55333	0.07663	9.3923	9.714

Std Error uses a pooled estimate of error variance

Exhibit B2. Measurements of the Multi-Element Solution Standard by ICP Block (continued)

One-way Analysis of Na (ppm) By Set/Block



One-way Anova
Summary of Fit

Rsquare	0.500894
Adj Rsquare	0.279069
Root Mean Square Error	2.274089
Mean of Response	82.24444
Observations (or Sum Wgts)	27

Analysis of Variance

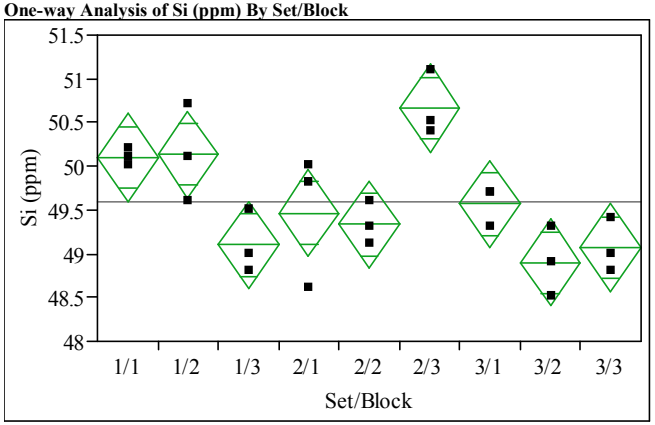
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Set/Block	8	93.42000	11.6775	2.2581	0.0721
Error	18	93.08667	5.1715		
C. Total	26	186.50667			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	82.9000	1.3129	80.142	85.658
1/2	3	85.8333	1.3129	83.075	88.592
1/3	3	83.4333	1.3129	80.675	86.192
2/1	3	79.7667	1.3129	77.008	82.525
2/2	3	82.4000	1.3129	79.642	85.158
2/3	3	82.9000	1.3129	80.142	85.658
3/1	3	82.2667	1.3129	79.508	85.025
3/2	3	79.2000	1.3129	76.442	81.958
3/3	3	81.5000	1.3129	78.742	84.258

Std Error uses a pooled estimate of error variance

One-way Analysis of Si (ppm) By Set/Block



One-way Anova
Summary of Fit

Rsquare	0.732014
Adj Rsquare	0.61291
Root Mean Square Error	0.412311
Mean of Response	49.59259
Observations (or Sum Wgts)	27

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Set/Block	8	8.358519	1.04481	6.1460	0.0007
Error	18	3.060000	0.17000		
C. Total	26	11.418519			

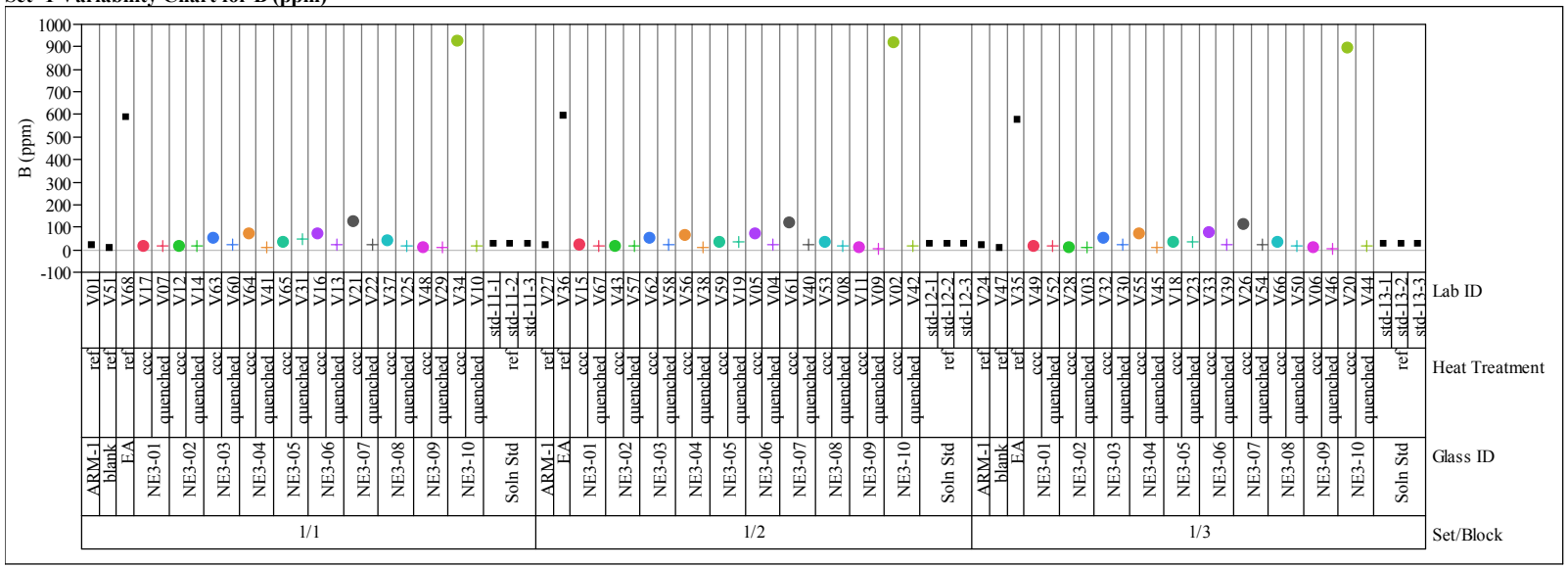
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1/1	3	50.1000	0.23805	49.600	50.600
1/2	3	50.1333	0.23805	49.633	50.633
1/3	3	49.1000	0.23805	48.600	49.600
2/1	3	49.4667	0.23805	48.967	49.967
2/2	3	49.3333	0.23805	48.833	49.833
2/3	3	50.6667	0.23805	50.167	51.167
3/1	3	49.5667	0.23805	49.067	50.067
3/2	3	48.9000	0.23805	48.400	49.400
3/3	3	49.0667	0.23805	48.567	49.567

Std Error uses a pooled estimate of error variance

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

Set=1 Variability Chart for B (ppm)



Set=1 Variability Chart for Li (ppm)

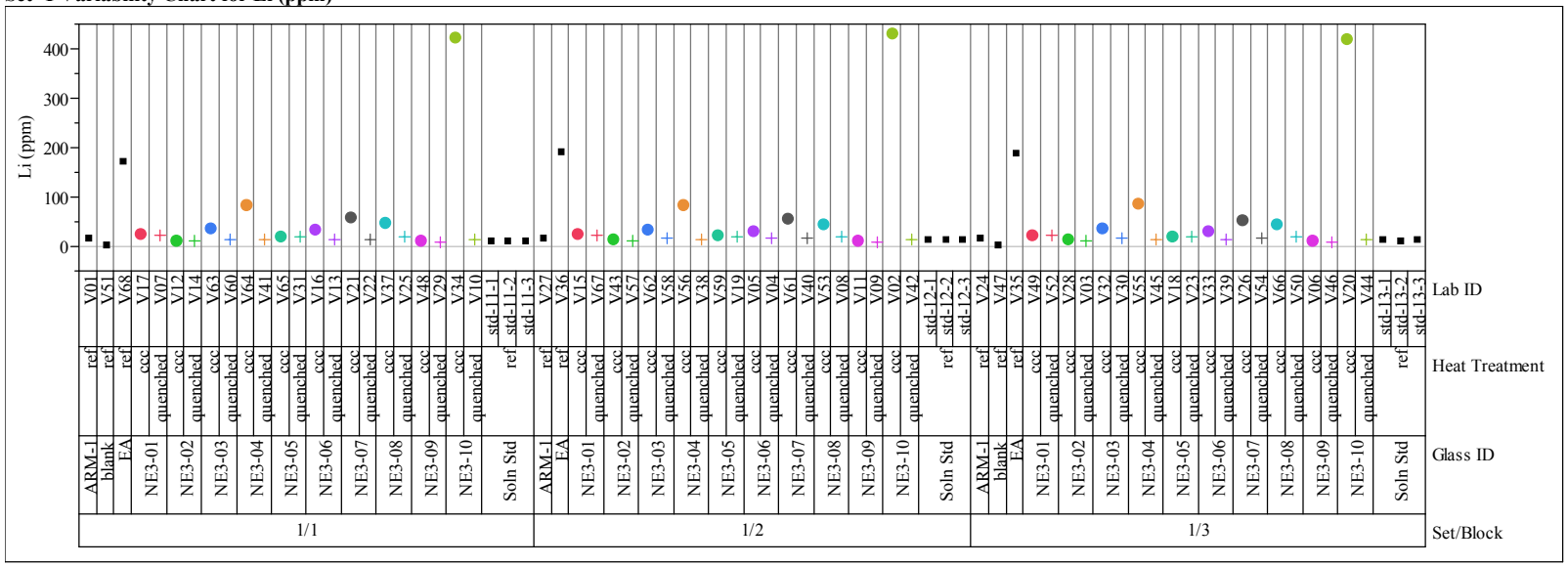
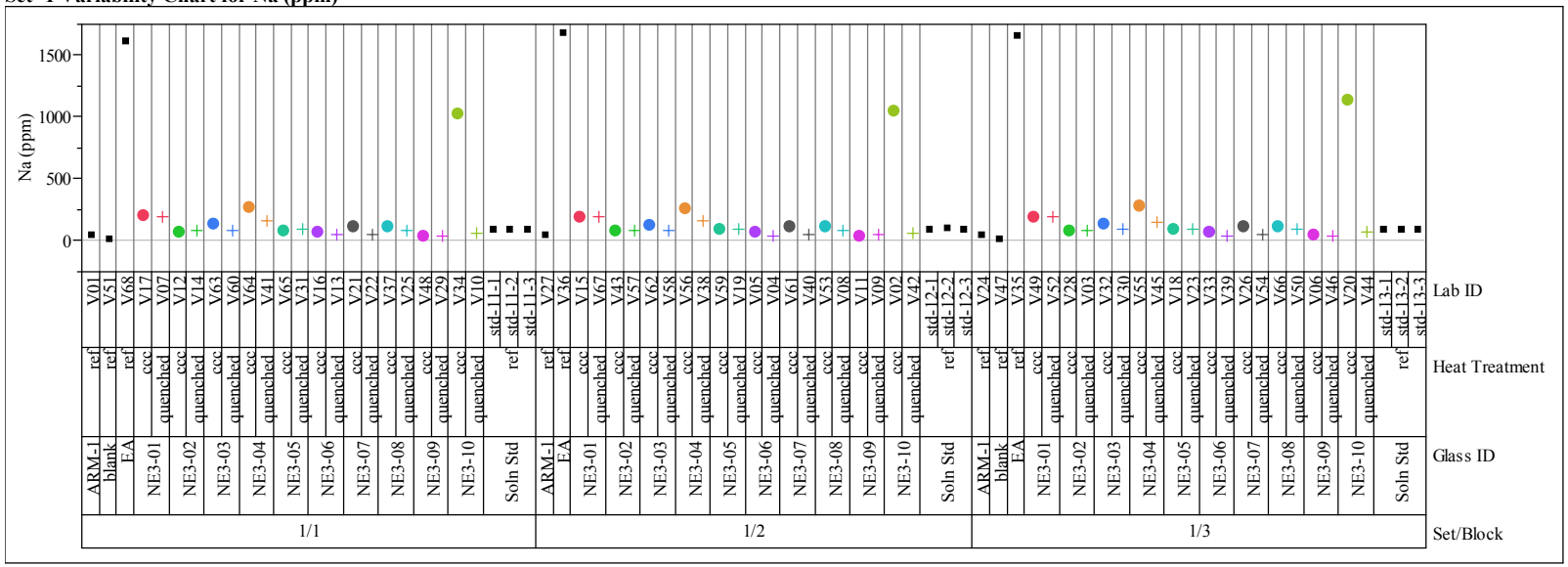


Exhibit B3. Laboratory PCT Measurements by Glass Identifier for Study Glasses and Standards (continued)

Set=1 Variability Chart for Na (ppm)



Set=1 Variability Chart for Si (ppm)

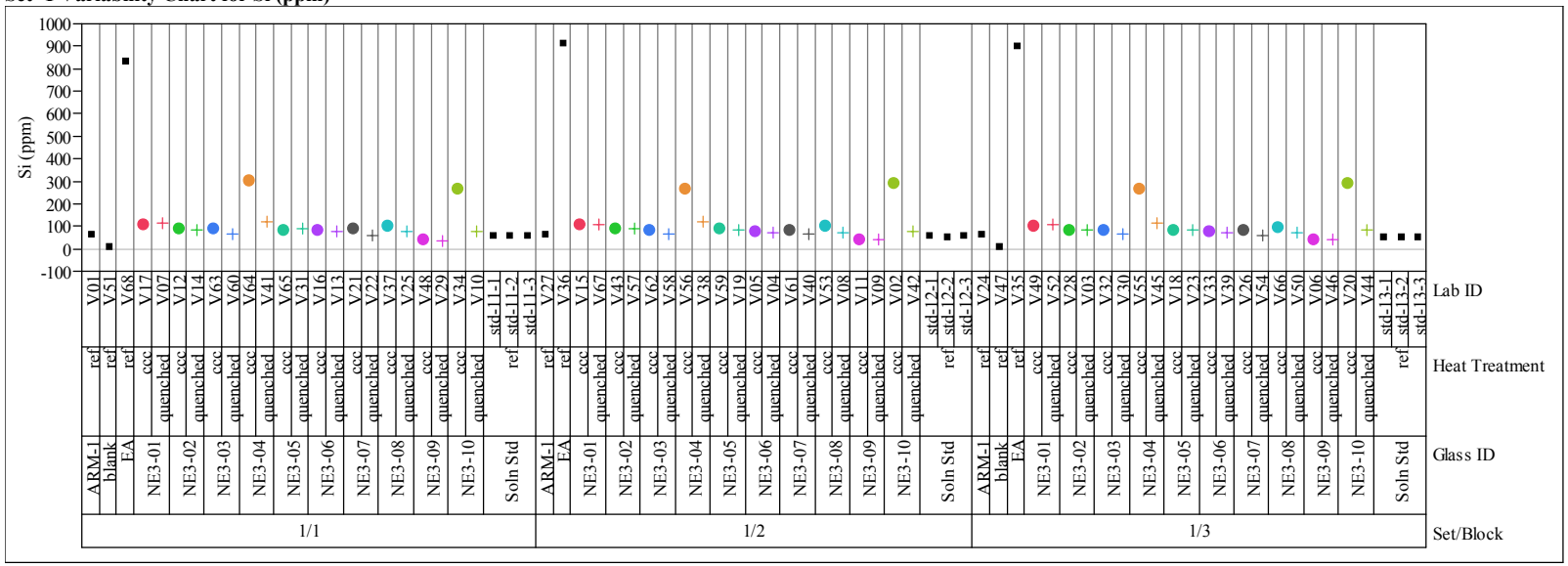
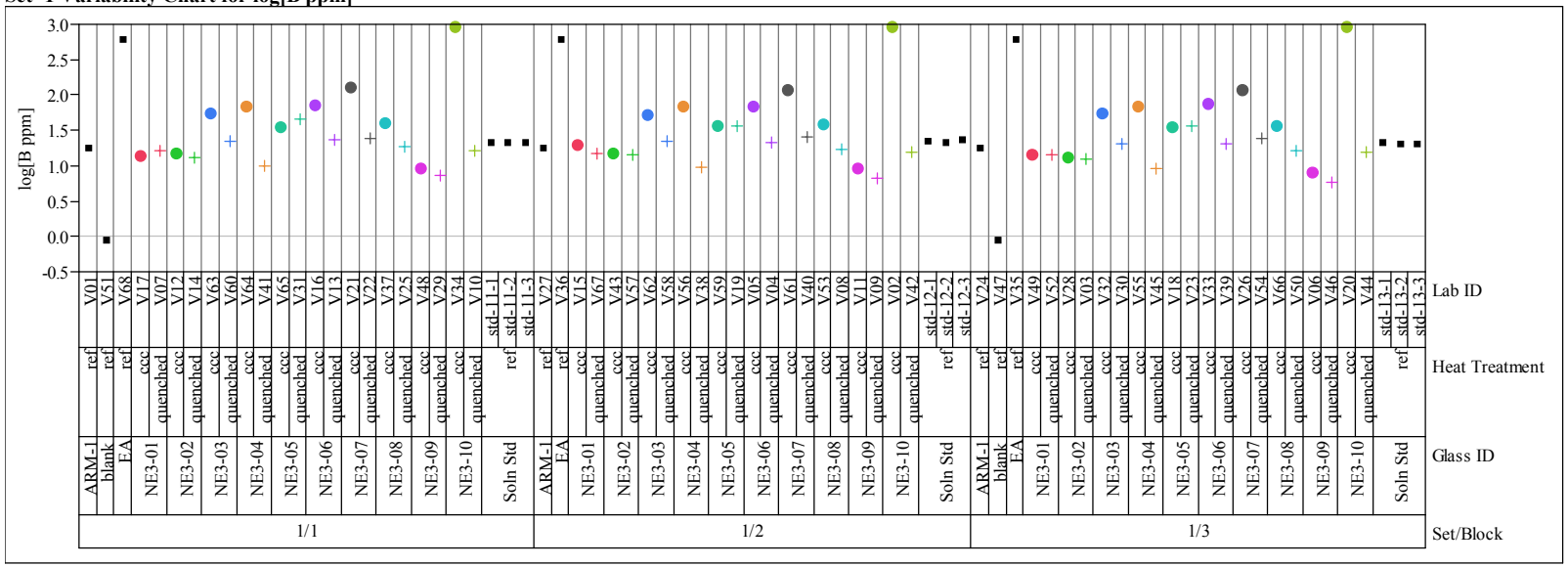


Exhibit B3. Laboratory PCT Measurements by Glass Identifier for Study Glasses and Standards (continued)

Set=1 Variability Chart for log[B ppm]



Set=1 Variability Chart for log[Li ppm]

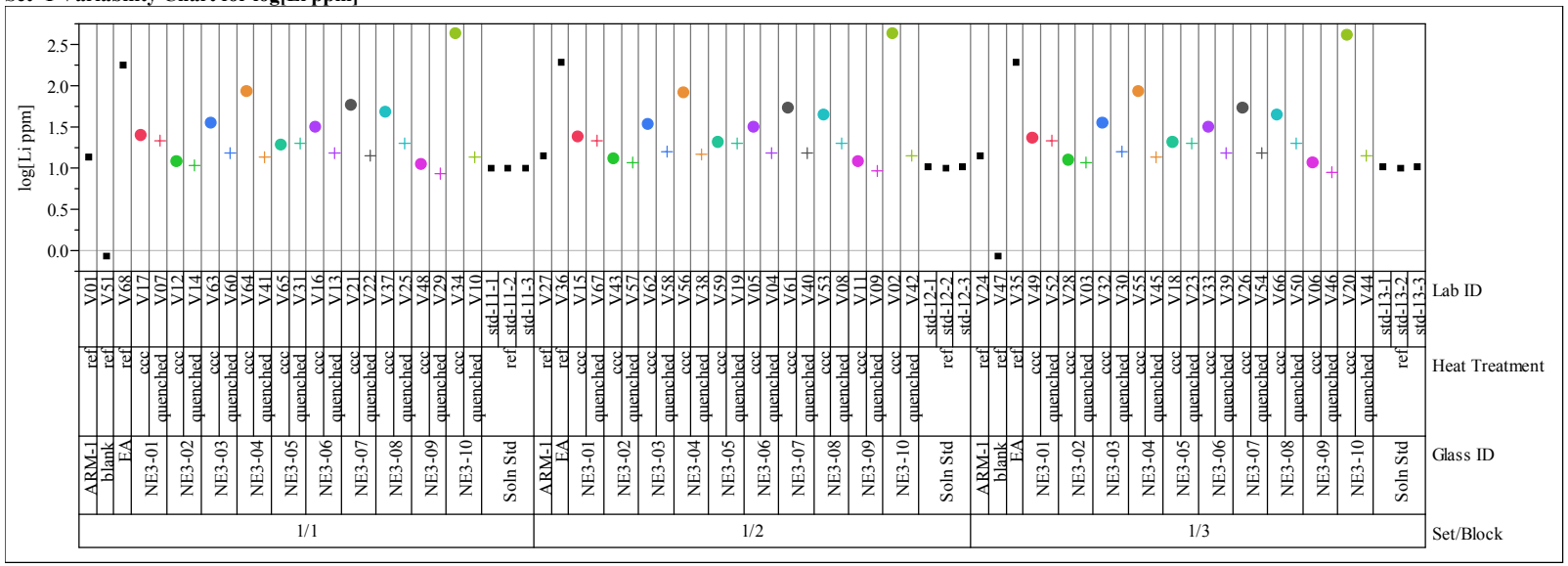
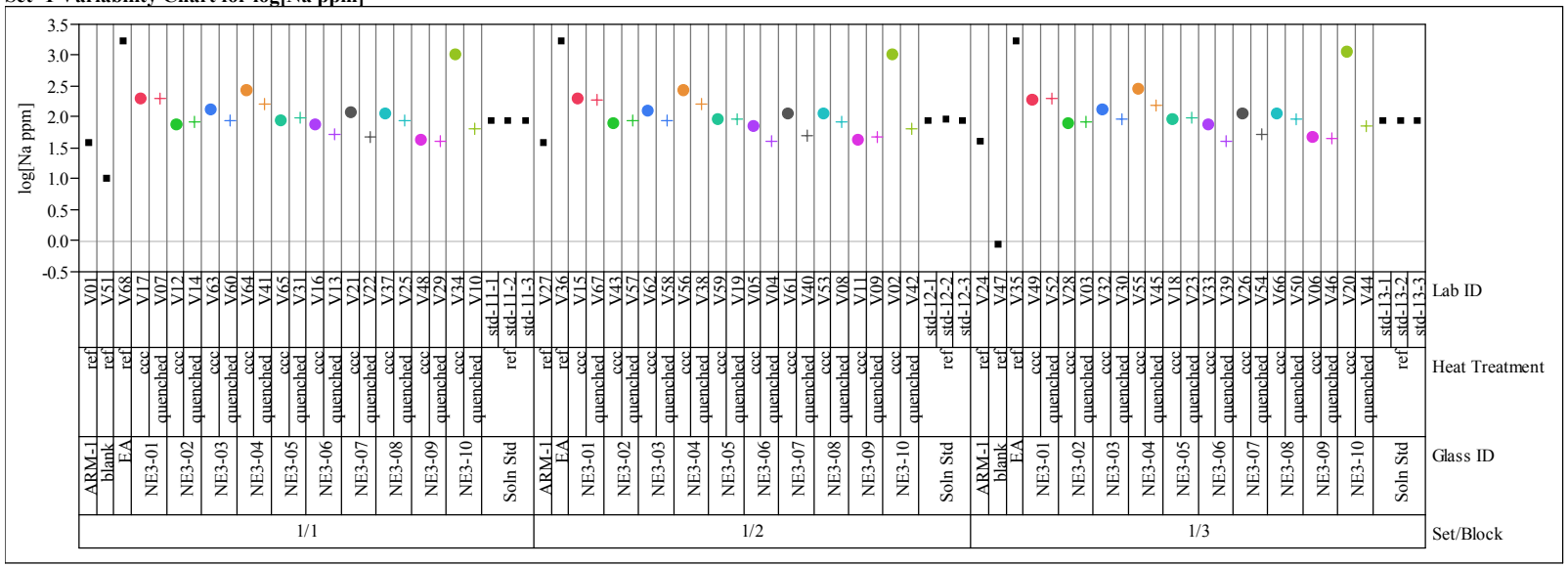


Exhibit B3. Laboratory PCT Measurements by Glass Identifier for Study Glasses and Standards (continued)

Set=1 Variability Chart for log[Na ppm]



Set=1 Variability Chart for log[Si ppm]

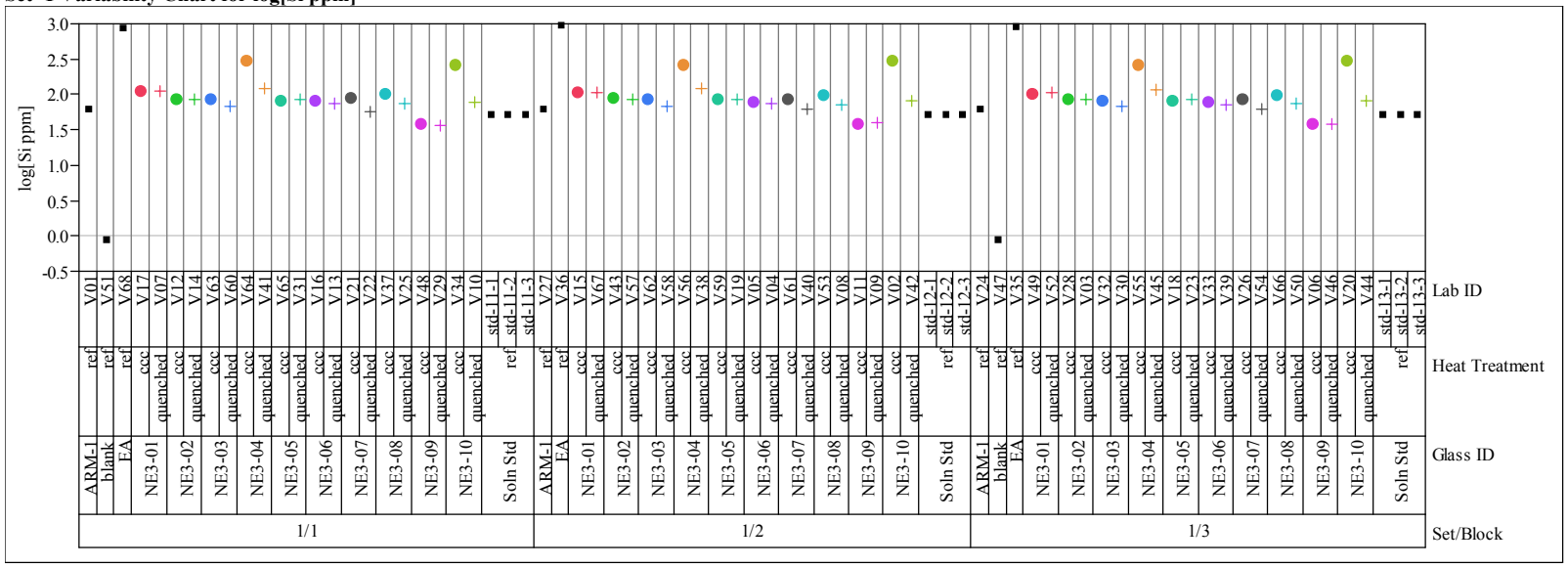
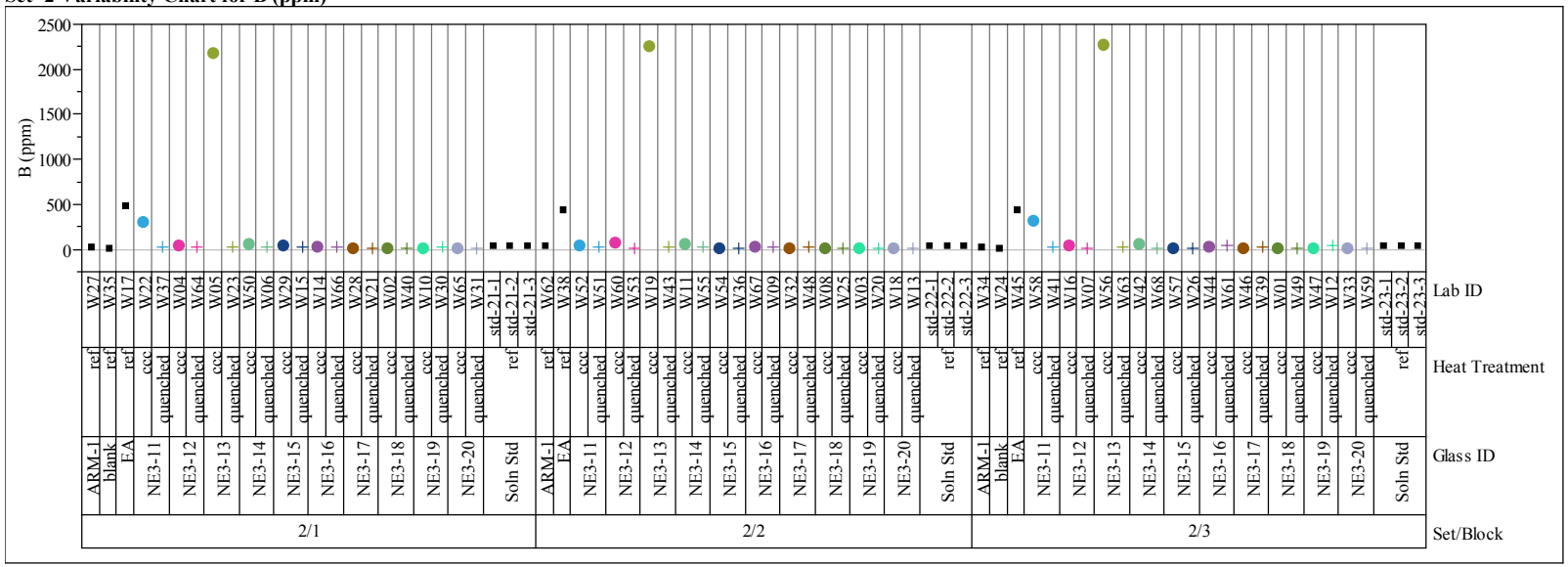


Exhibit B3. Laboratory PCT Measurements by Glass Identifier for Study Glasses and Standards (continued)

Set=2 Variability Chart for B (ppm)



Set=2 Variability Chart for Li (ppm)

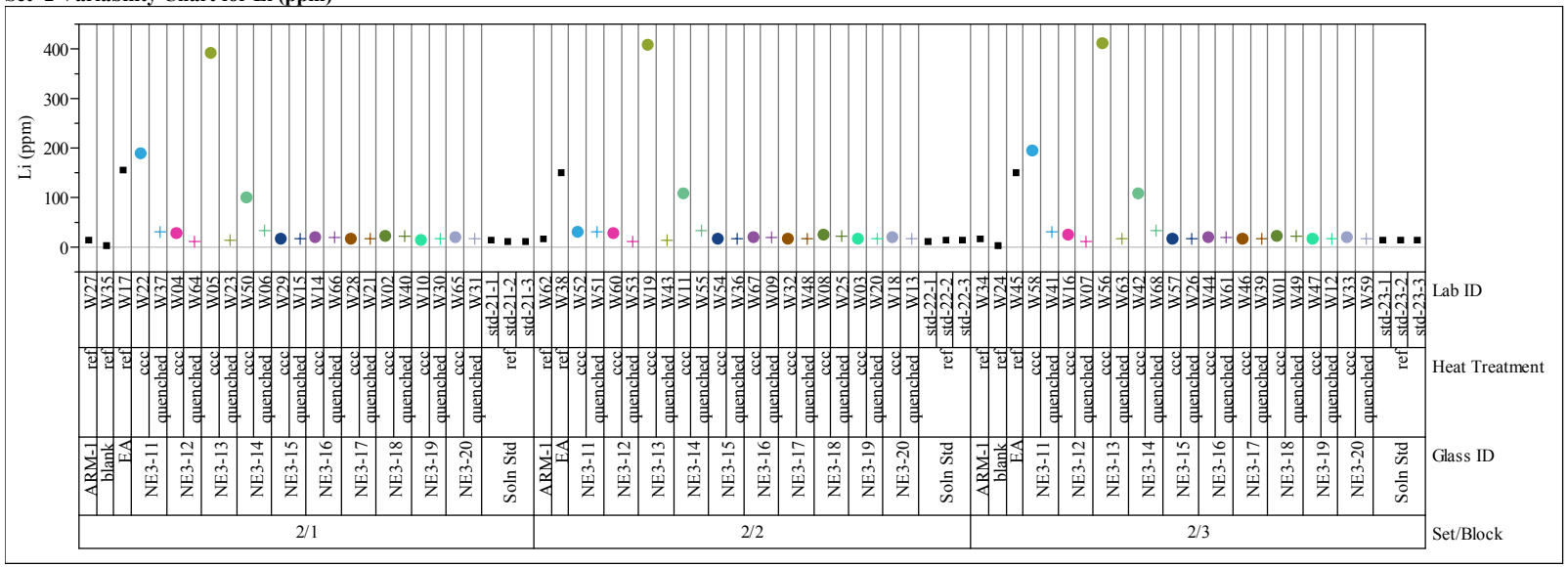
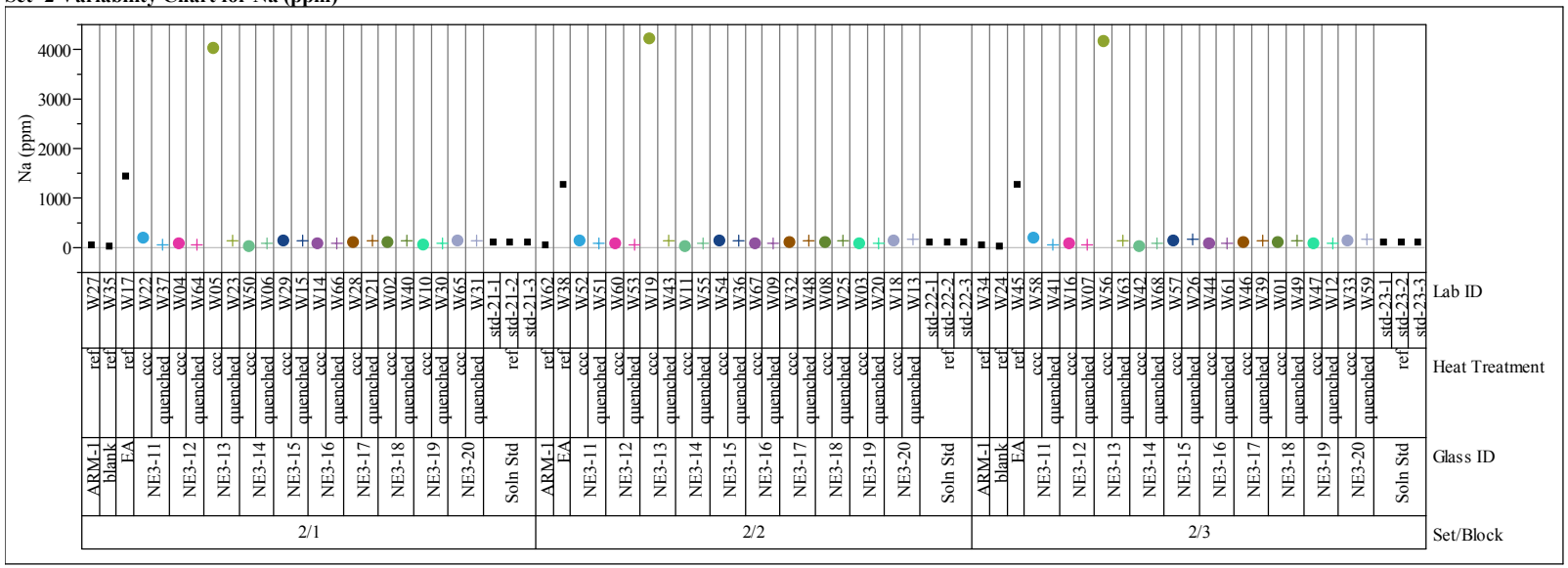


Exhibit B3. Laboratory PCT Measurements by Glass Identifier for Study Glasses and Standards (continued)

Set=2 Variability Chart for Na (ppm)



Set=2 Variability Chart for Si (ppm)

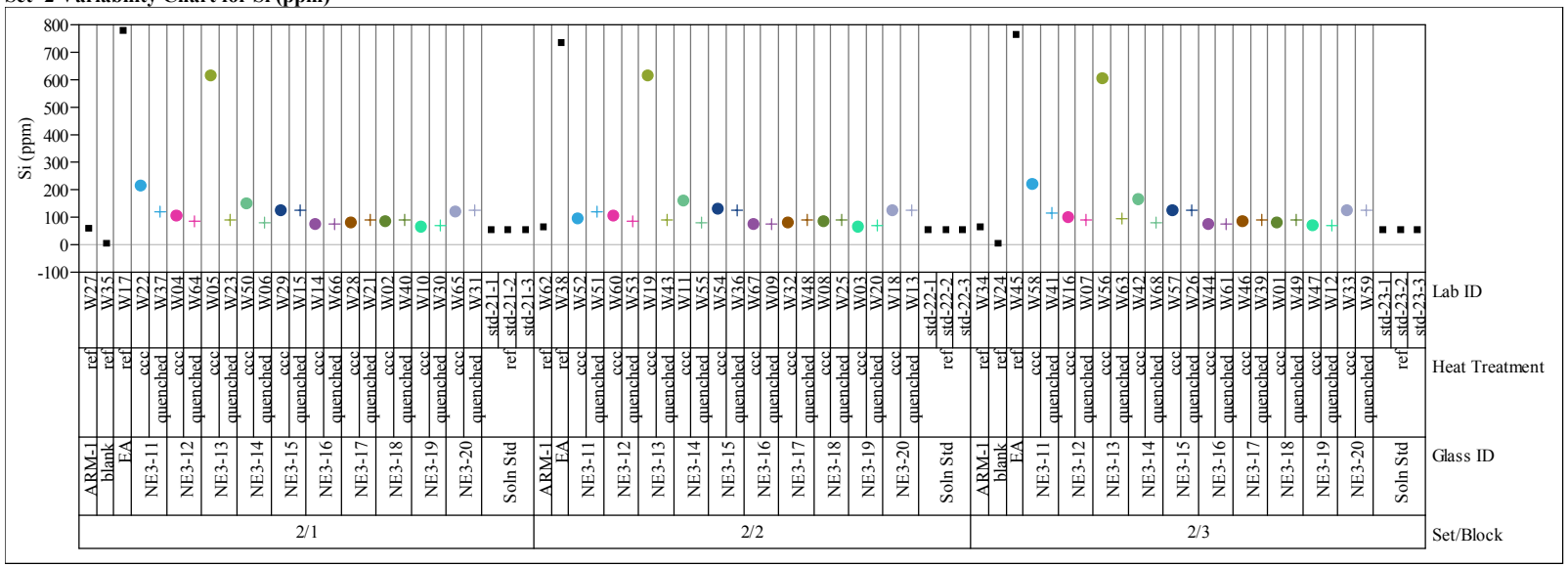
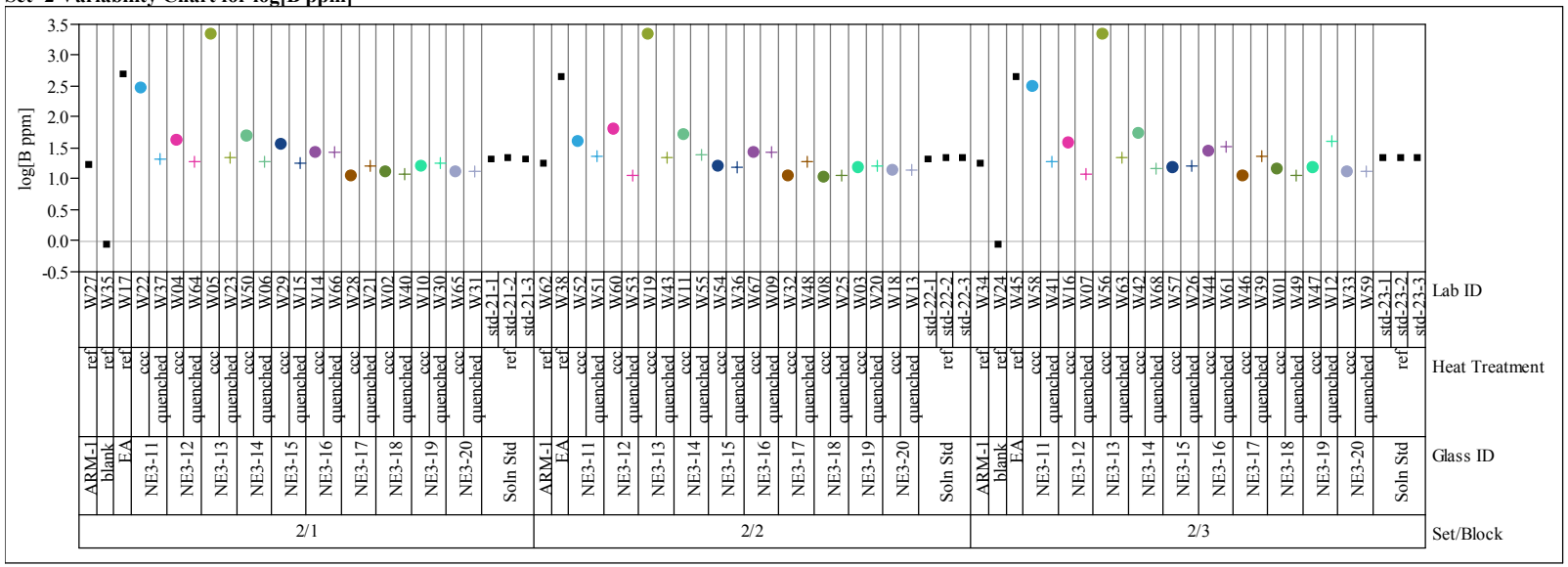


Exhibit B3. Laboratory PCT Measurements by Glass Identifier for Study Glasses and Standards (continued)

Set=2 Variability Chart for log[B ppm]



Set=2 Variability Chart for log[Li ppm]

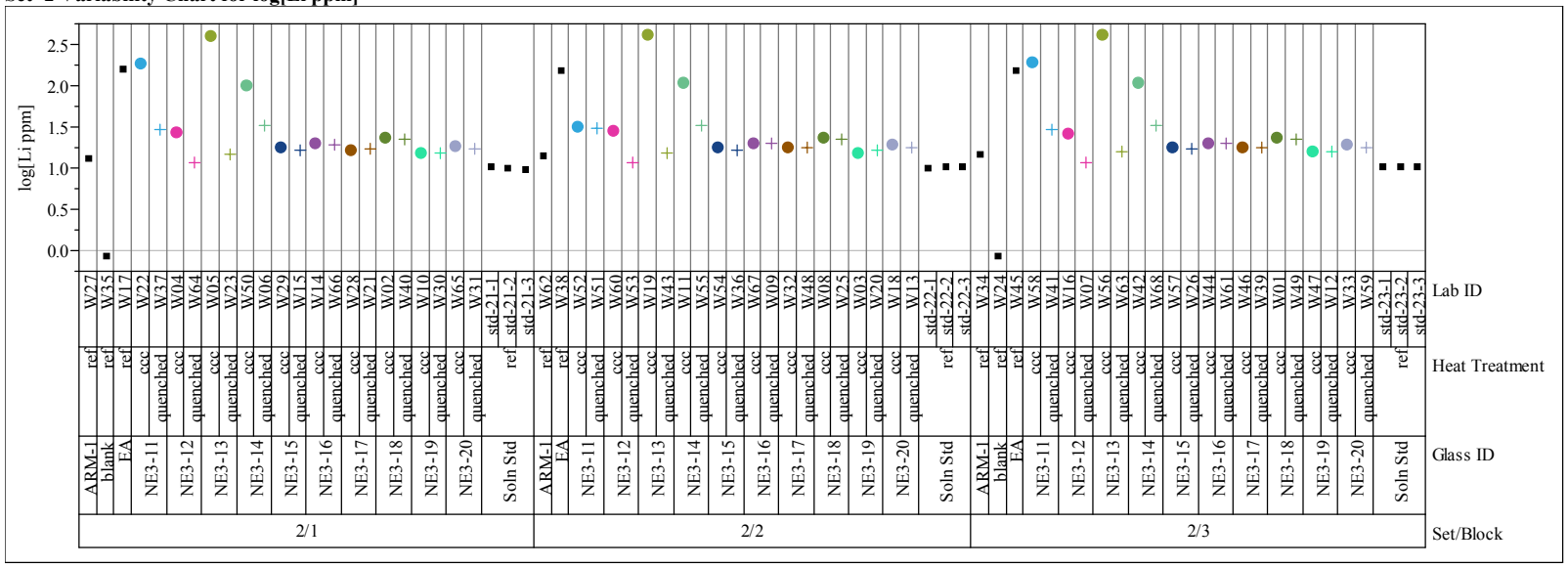
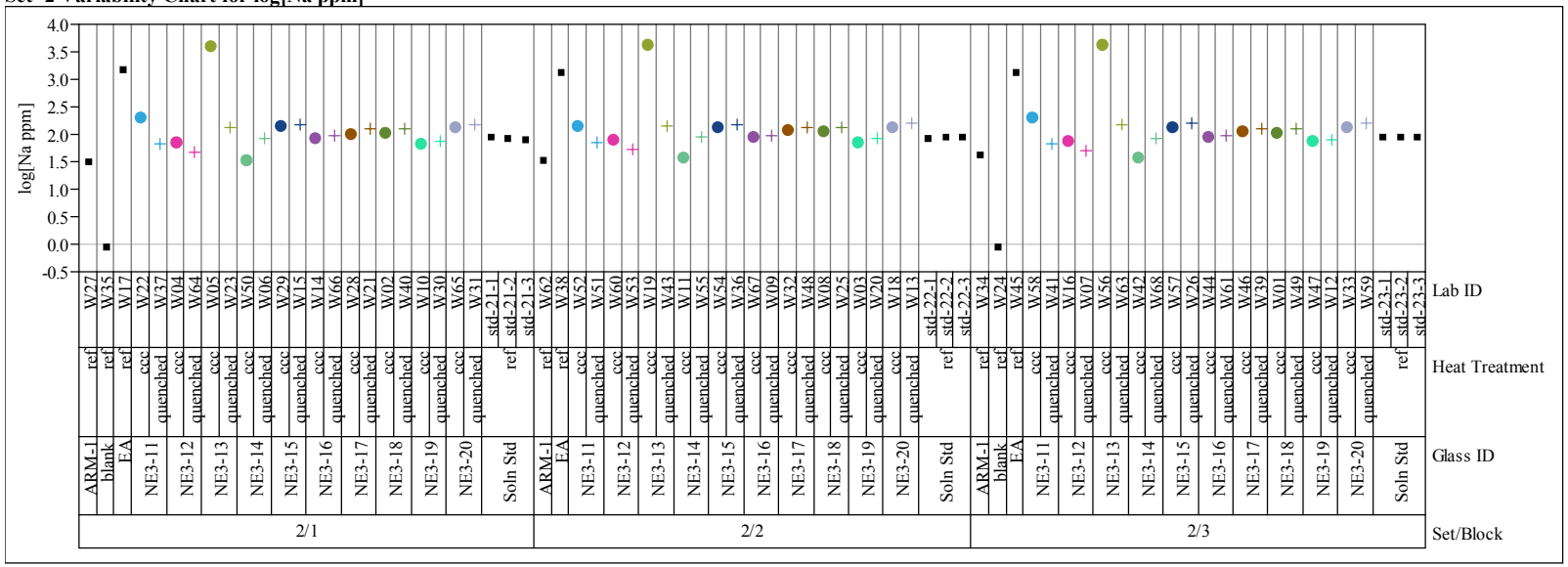


Exhibit B3. Laboratory PCT Measurements by Glass Identifier for Study Glasses and Standards (continued)

Set=2 Variability Chart for log[Na ppm]



Set=2 Variability Chart for log[Si ppm]

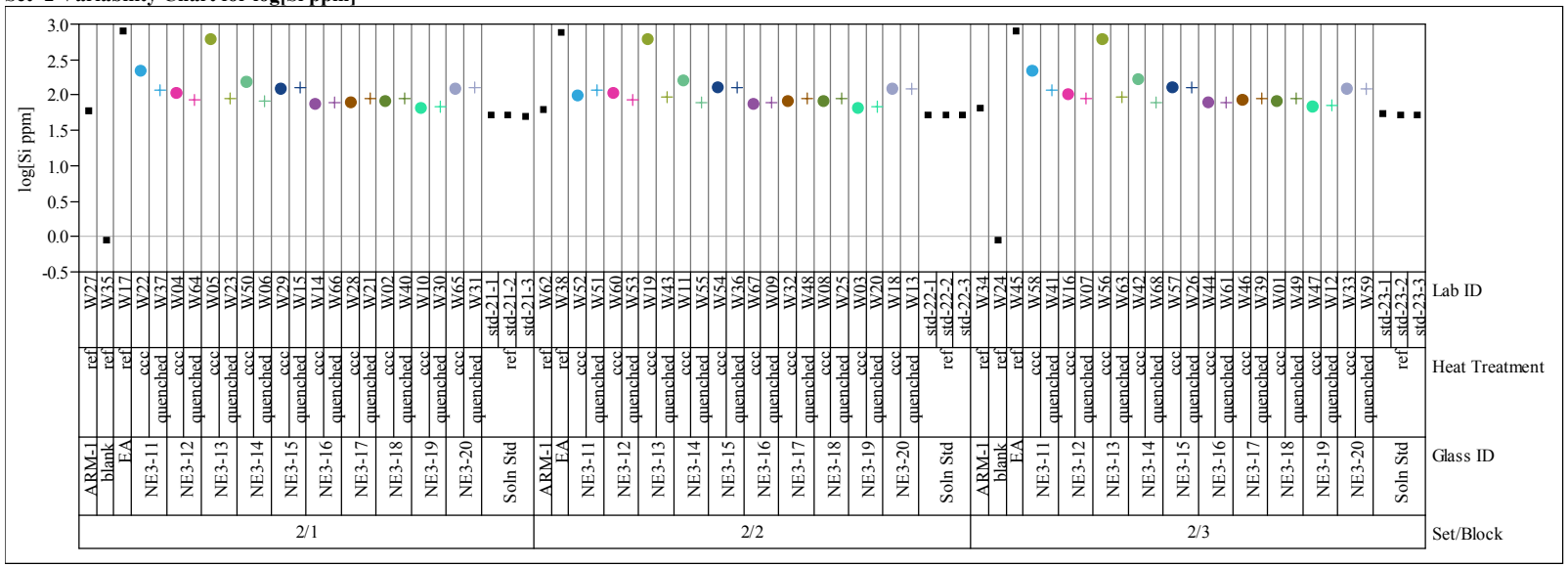
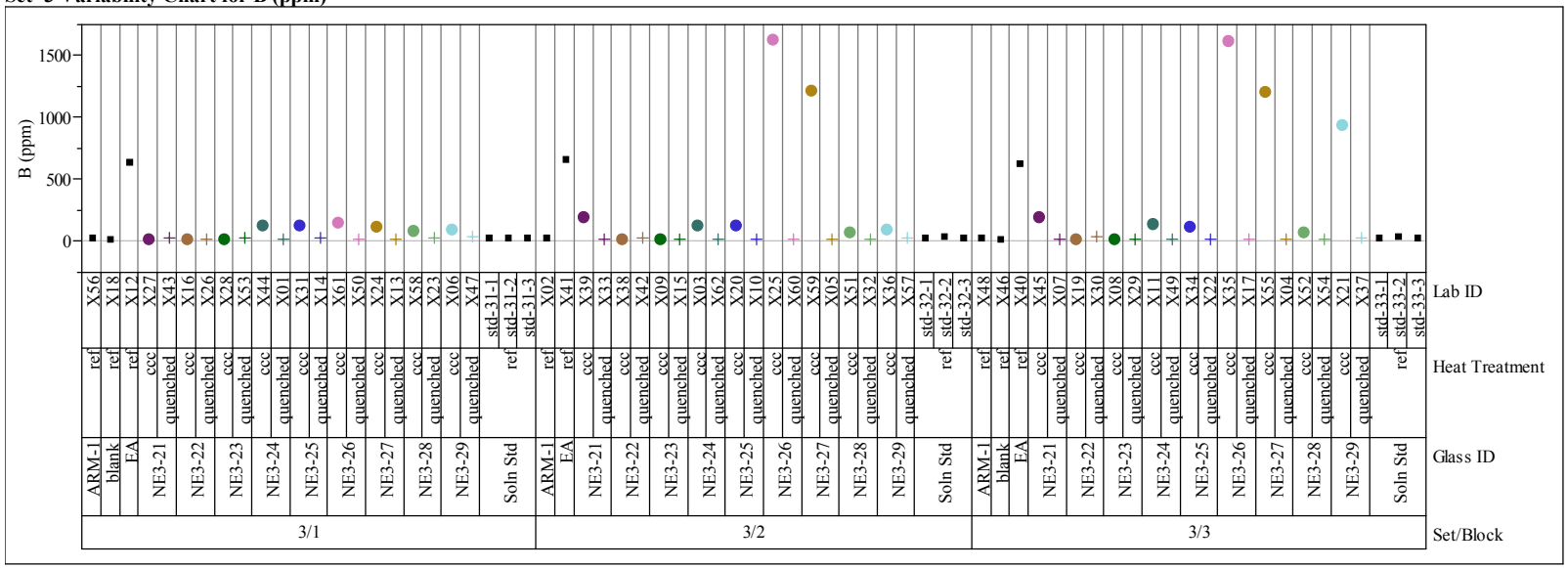


Exhibit B3. Laboratory PCT Measurements by Glass Identifier for Study Glasses and Standards (continued)

Set=3 Variability Chart for B (ppm)



Set=3 Variability Chart for Li (ppm)

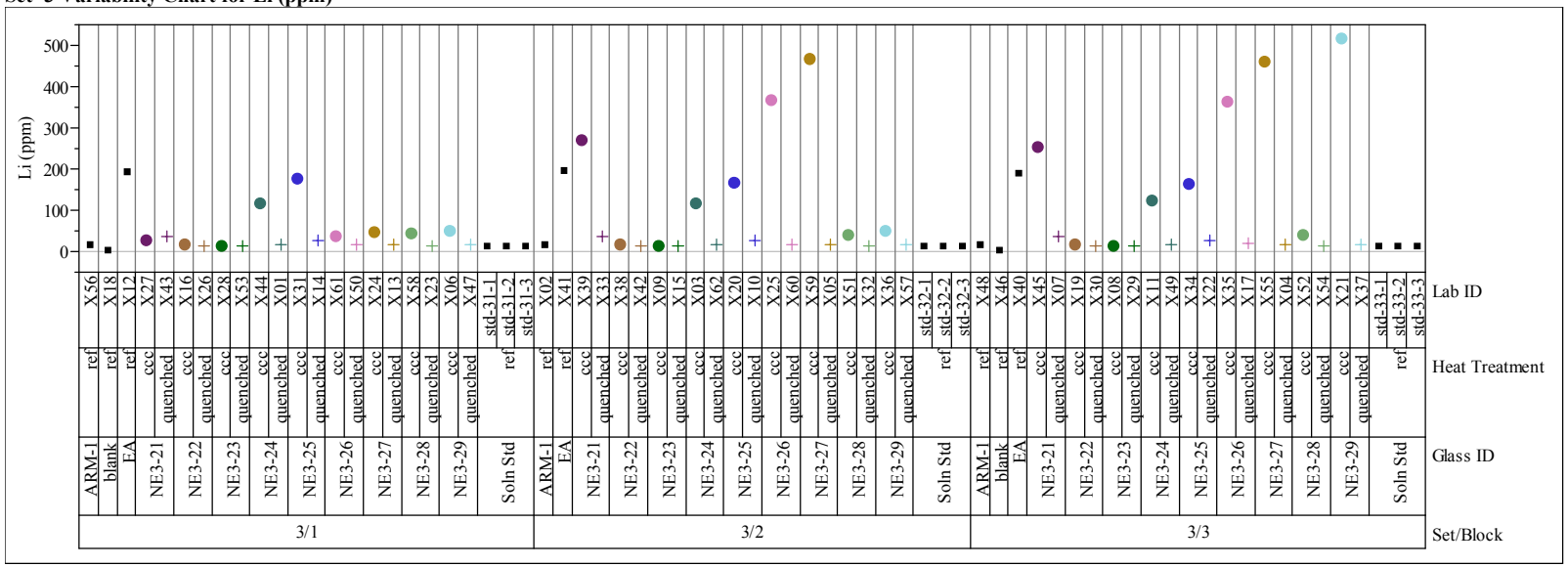
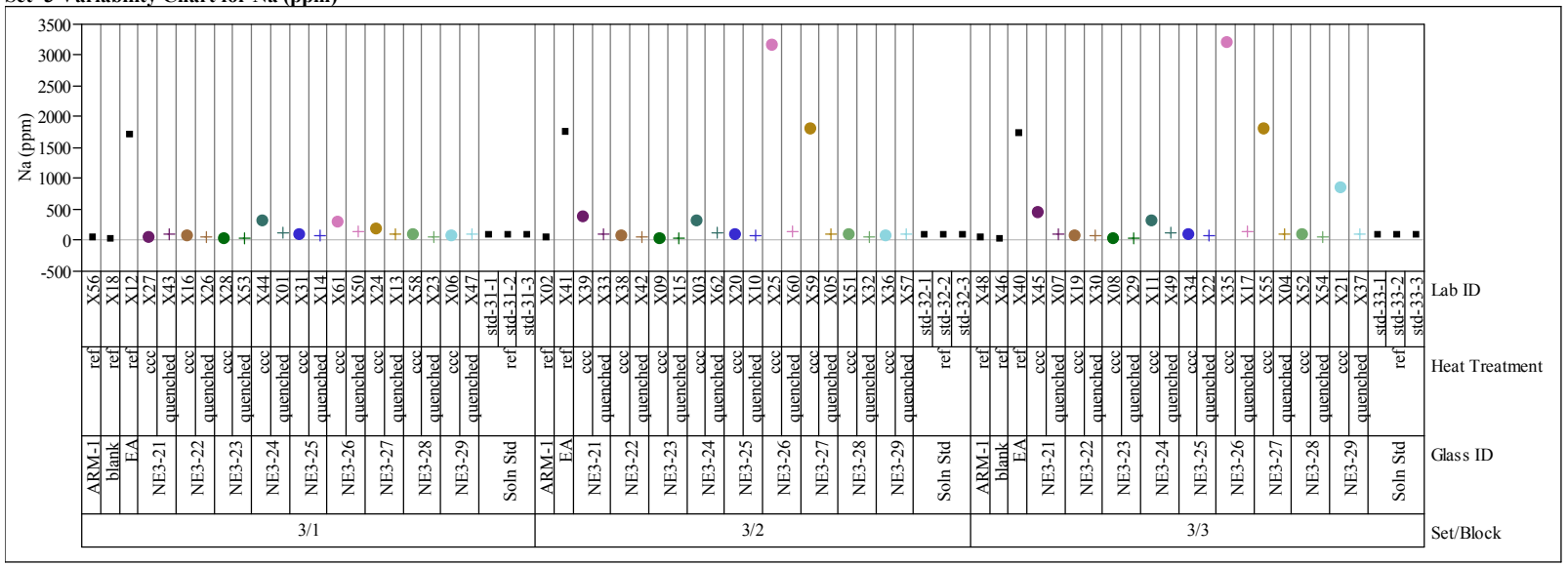


Exhibit B3. Laboratory PCT Measurements by Glass Identifier for Study Glasses and Standards (continued)

Set=3 Variability Chart for Na (ppm)



Set=3 Variability Chart for Si (ppm)

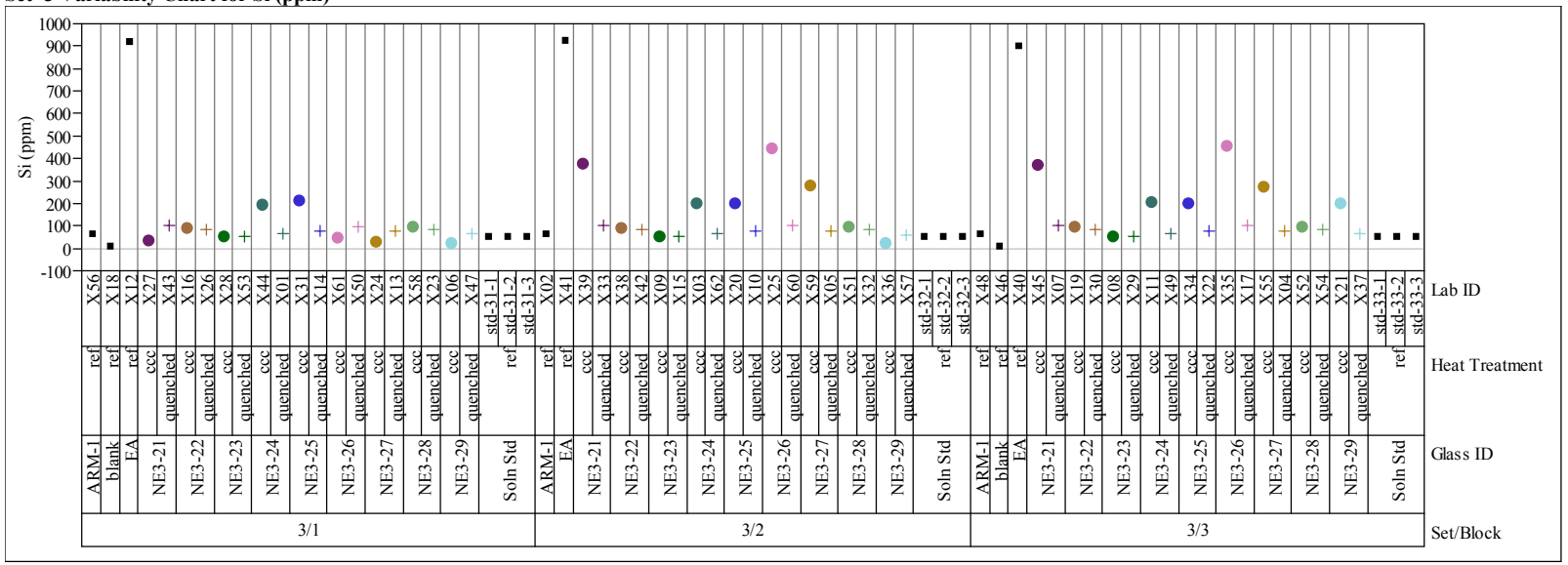
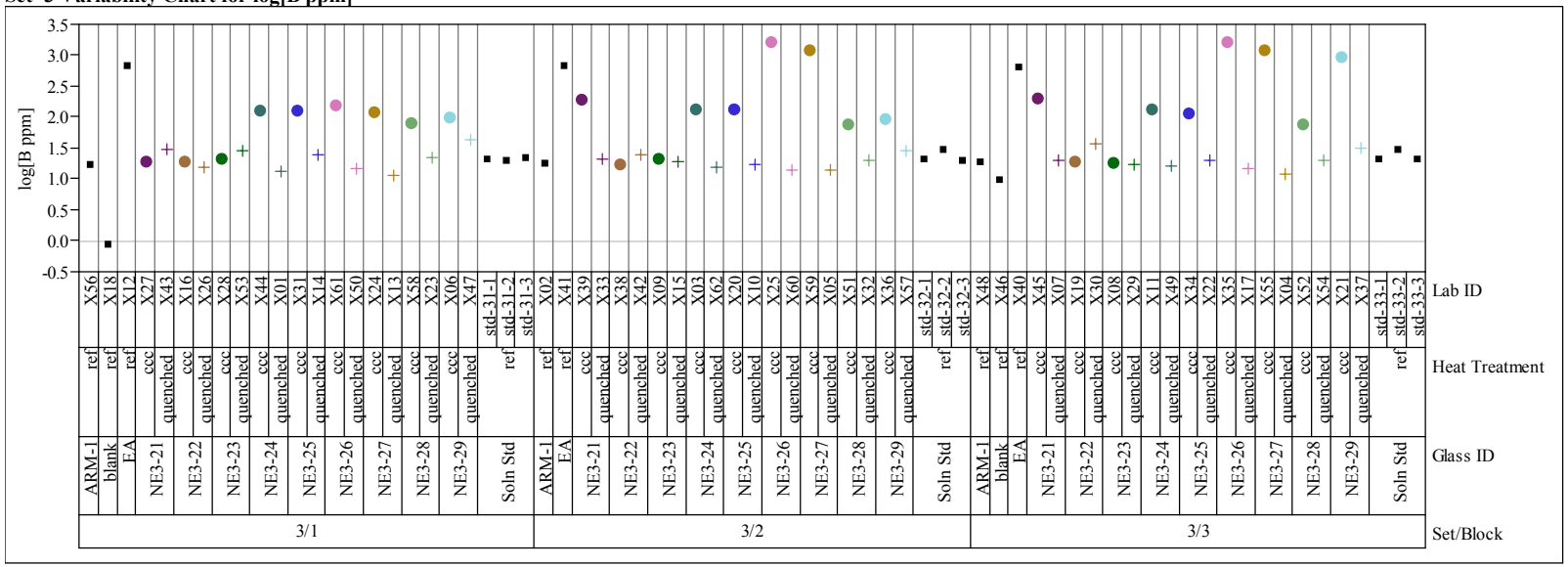


Exhibit B3. Laboratory PCT Measurements by Glass Identifier for Study Glasses and Standards (continued)

Set=3 Variability Chart for log[B ppm]



Set=3 Variability Chart for log[Li ppm]

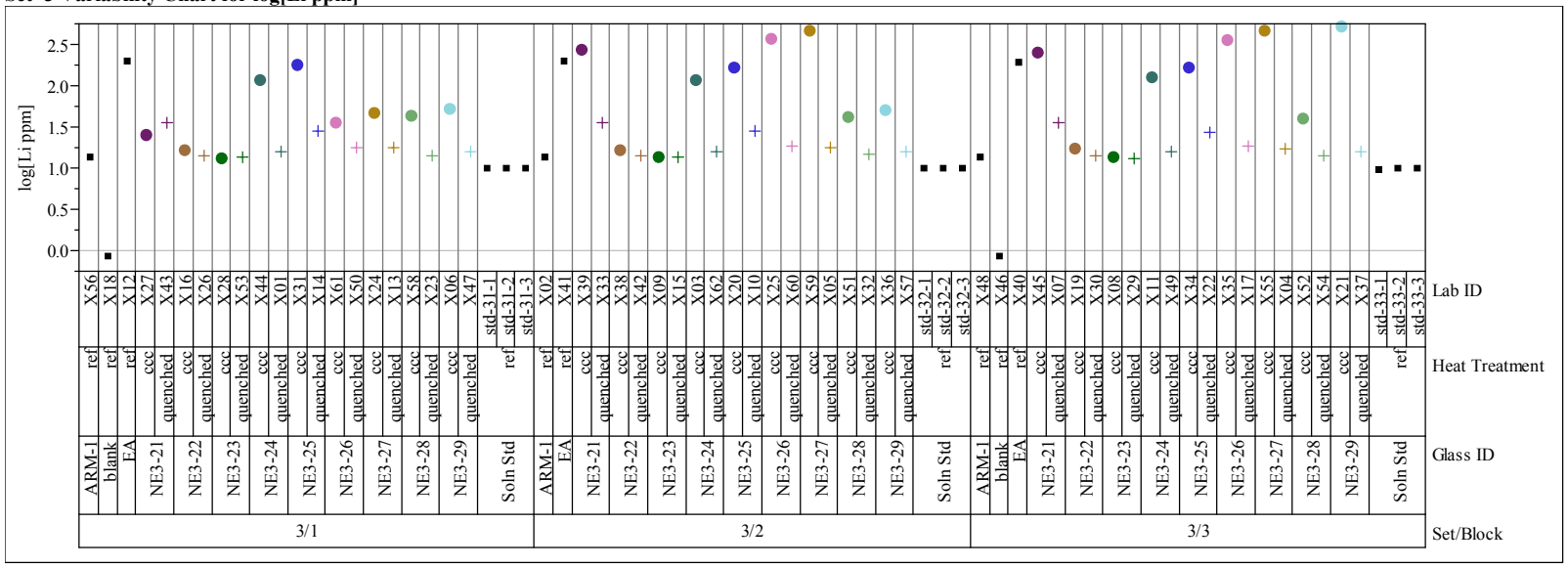
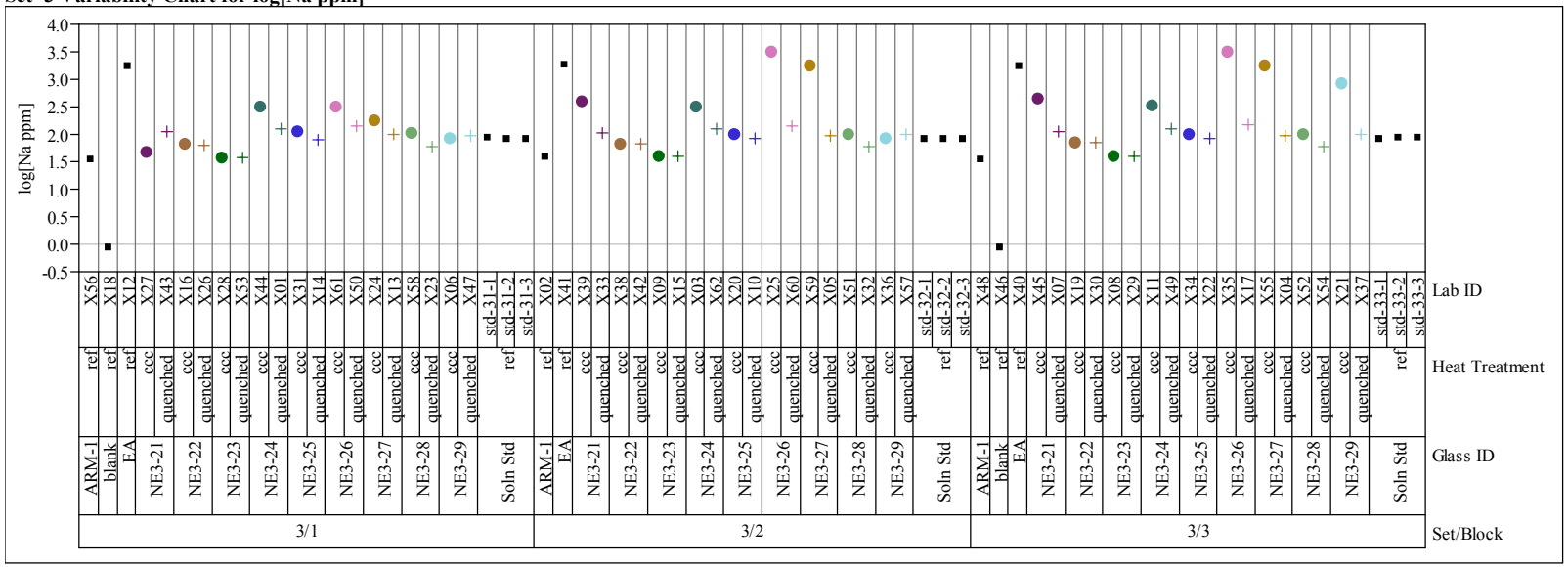


Exhibit B3. Laboratory PCT Measurements by Glass Identifier for Study Glasses and Standards (continued)

Set=3 Variability Chart for log[Na ppm]



Set=3 Variability Chart for log[Si ppm]

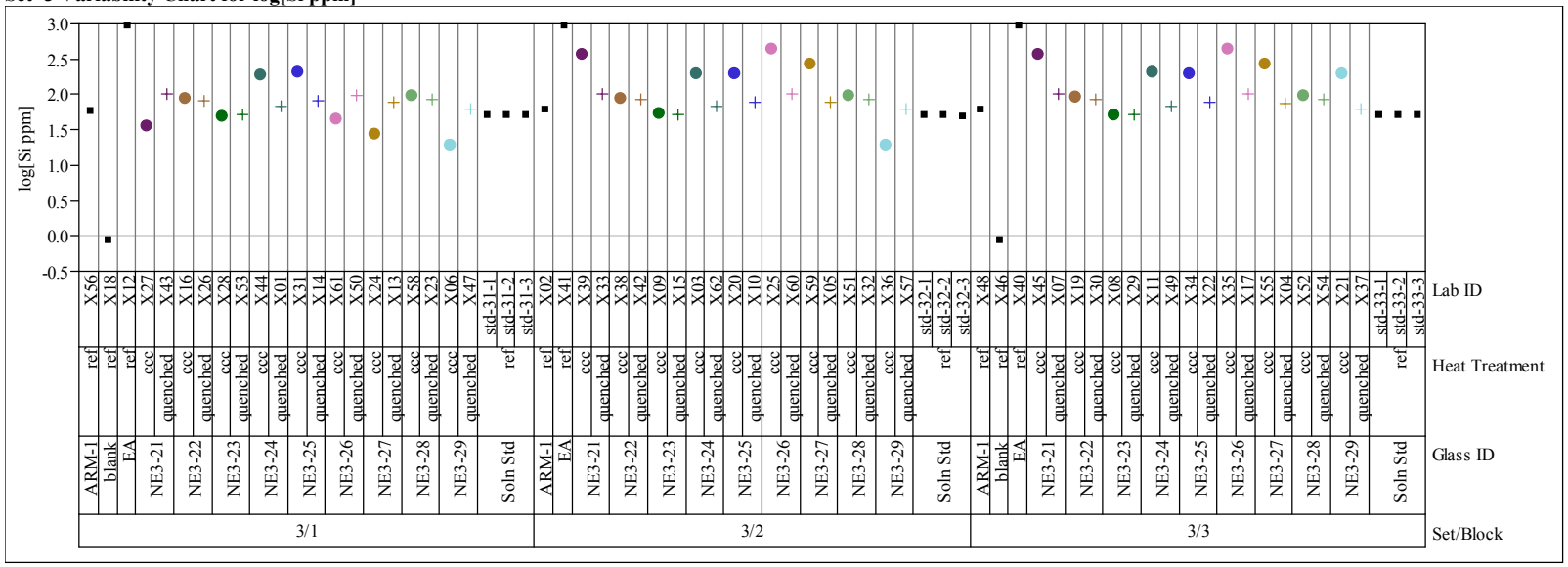


Exhibit B4. Correlations and Scatter Plots of Normalized PCTs Over All Compositional Views and Heat Treatments

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	0.9768	0.9040	0.8243
log NL[Li(g/L)]	0.9768	1.0000	0.8564	0.8098
log NL[Na (g/L)]	0.9040	0.8564	1.0000	0.8403
log NL[Si (g/L)]	0.8243	0.8098	0.8403	1.0000

Scatter plot Matrix

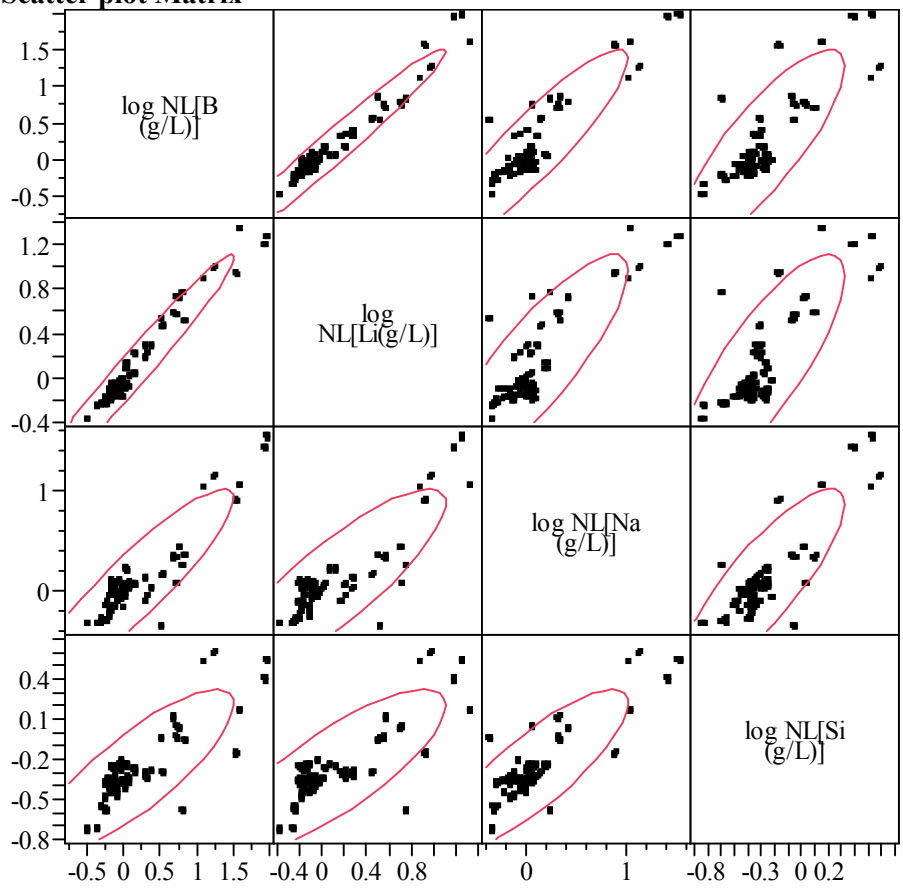
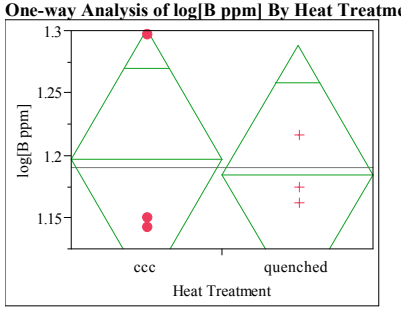


Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-01



One-way Anova
Summary of Fit

Rsquare	0.013354
Adj Rsquare	-0.23331
Root Mean Square Error	0.064954
Mean of Response	1.19055
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.01234	t Ratio	-0.23268
Std Err Dif	0.05303	DF	4
Upper CL Dif	0.13491	Prob > |t|	0.8274
Lower CL Dif	-0.15959	Prob > t	0.5863
Confidence	0.95	Prob < t	0.4137

Analysis of Variance

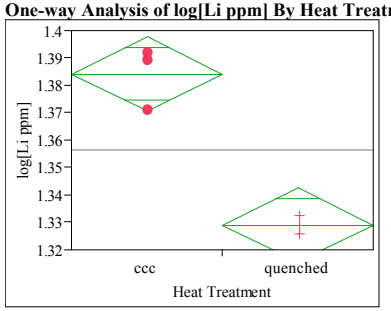
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00022842	0.000228	0.0541	0.8274
Error	4	0.01687623	0.004219		
C. Total	5	0.01710464			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.19672	0.03750	1.0926	1.3008
quenched	3	1.18438	0.03750	1.0803	1.2885

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-01



One-way Anova
Summary of Fit

Rsquare	0.941482
Adj Rsquare	0.926853
Root Mean Square Error	0.008407
Mean of Response	1.356591
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.05506	t Ratio	-8.02218
Std Err Dif	0.00686	DF	4
Upper CL Dif	-0.03601	Prob > |t|	0.0013
Lower CL Dif	-0.07412	Prob > t	0.9993
Confidence	0.95	Prob < t	0.0007

Analysis of Variance

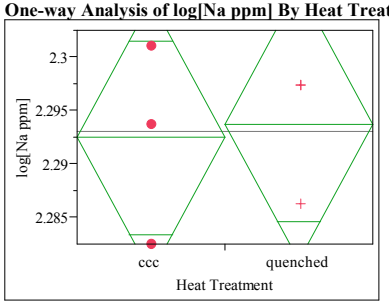
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00454822	0.004548	64.3554	0.0013
Error	4	0.00028269	0.000071		
C. Total	5	0.00483091			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.38412	0.00485	1.3706	1.3976
quenched	3	1.32906	0.00485	1.3156	1.3425

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-01



One-way Anova
Summary of Fit

Rsquare	0.009294
Adj Rsquare	-0.23838
Root Mean Square Error	0.007989
Mean of Response	2.293076
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.00126	t Ratio	0.19371
Std Err Dif	0.00652	DF	4
Upper CL Dif	0.01937	Prob > |t|	0.8558
Lower CL Dif	-0.01685	Prob > t	0.4279
Confidence	0.95	Prob < t	0.5721

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00000240	2.395e-6	0.0375	0.8558
Error	4	0.00025531	0.000064		
C. Total	5	0.00025771			

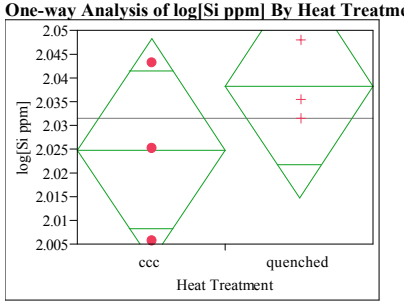
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.29244	0.00461	2.2796	2.3053
quenched	3	2.29371	0.00461	2.2809	2.3065

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-01



One-way Anova
Summary of Fit

Rsquare	0.240628
Adj Rsquare	0.050785
Root Mean Square Error	0.014628
Mean of Response	2.031539
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.01345	t Ratio	1.125838
Std Err Dif	0.01194	DF	4
Upper CL Dif	0.04661	Prob > |t|	0.3232
Lower CL Dif	-0.01971	Prob > t	0.1616
Confidence	0.95	Prob < t	0.8384

Analysis of Variance

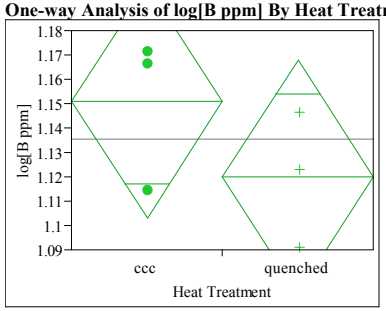
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00027124	0.000271	1.2675	0.3232
Error	4	0.00085597	0.000214		
C. Total	5	0.00112720			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.02482	0.00845	2.0014	2.0483
quenched	3	2.03826	0.00845	2.0148	2.0617

Std Error uses a pooled estimate of error variance

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-02



One-way Anova
Summary of Fit

Rsquare	0.284644
Adj Rsquare	0.105806
Root Mean Square Error	0.029794
Mean of Response	1.135516
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.03069	t Ratio	-1.2616
Std Err Dif	0.02433	DF	4
Upper CL Dif	0.03685	Prob > |t|	0.2757
Lower CL Dif	-0.09823	Prob > t	0.8622
Confidence	0.95	Prob < t	0.1378

Analysis of Variance

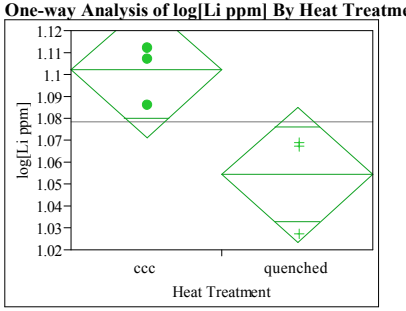
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00141283	0.001413	1.5916	0.2757
Error	4	0.00355067	0.000888		
C. Total	5	0.00496350			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.15086	0.01720	1.1031	1.1986
quenched	3	1.12017	0.01720	1.0724	1.1679

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-02



One-way Anova
Summary of Fit

Rsquare	0.697338
Adj Rsquare	0.621672
Root Mean Square Error	0.019195
Mean of Response	1.078165
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.04758	t Ratio	-3.0358
Std Err Dif	0.01567	DF	4
Upper CL Dif	-0.00406	Prob > |t|	0.0386
Lower CL Dif	-0.09109	Prob > t	0.9807
Confidence	0.95	Prob < t	0.0193

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00339574	0.003396	9.2161	0.0386
Error	4	0.00147384	0.000368		
C. Total	5	0.00486958			

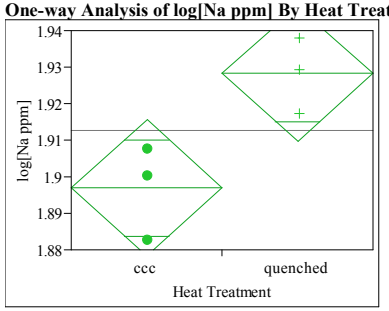
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.10196	0.01108	1.0712	1.1327
quenched	3	1.05438	0.01108	1.0236	1.0851

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-02



One-way Anova
Summary of Fit

Rsquare	0.731281
Adj Rsquare	0.664102
Root Mean Square Error	0.011623
Mean of Response	1.912554
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.031310	t Ratio	3.299312
Std Err Dif	0.009490	DF	4
Upper CL Dif	0.057658	Prob > |t|	0.0300
Lower CL Dif	0.004962	Prob > t	0.0150
Confidence	0.95	Prob < t	0.9850

Analysis of Variance

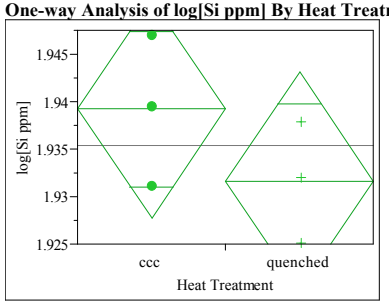
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00147046	0.001470	10.8855	0.0300
Error	4	0.00054034	0.000135		
C. Total	5	0.00201080			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.89690	0.00671	1.8783	1.9155
quenched	3	1.92821	0.00671	1.9096	1.9468

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-02



One-way Anova
Summary of Fit

Rsquare	0.292511
Adj Rsquare	0.115638
Root Mean Square Error	0.007182
Mean of Response	1.935432
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.00754	t Ratio	-1.286
Std Err Dif	0.00586	DF	4
Upper CL Dif	0.00874	Prob > |t|	0.2678
Lower CL Dif	-0.02382	Prob > t	0.8661
Confidence	0.95	Prob < t	0.1339

Analysis of Variance

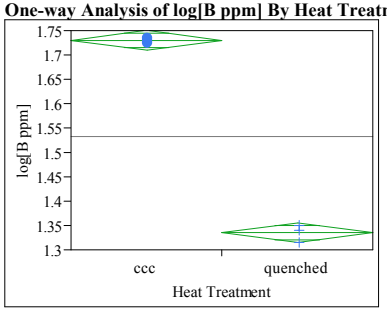
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00008530	0.000085	1.6538	0.2678
Error	4	0.00020631	0.000052		
C. Total	5	0.00029161			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.93920	0.00415	1.9277	1.9507
quenched	3	1.93166	0.00415	1.9201	1.9432

Std Error uses a pooled estimate of error variance

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-03



One-way Anova
Summary of Fit

Rsquare	0.9972
Adj Rsquare	0.9965
Root Mean Square Error	0.01284
Mean of Response	1.532298
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.39568	t Ratio	-37.7411
Std Err Dif	0.01048	DF	4
Upper CL Dif	-0.36657	Prob > |t|	<.0001
Lower CL Dif	-0.42479	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.23484774	0.234848	1424.388	<.0001
Error	4	0.00065951	0.000165		
C. Total	5	0.23550724			

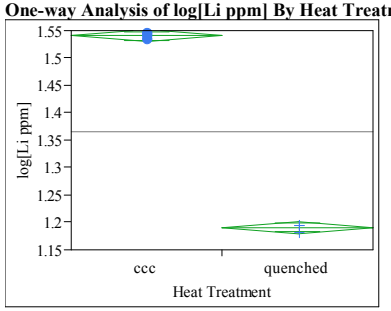
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.73014	0.00741	1.7096	1.7507
quenched	3	1.33446	0.00741	1.3139	1.3550

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-03



One-way Anova
Summary of Fit

Rsquare	0.998884
Adj Rsquare	0.998605
Root Mean Square Error	0.007166
Mean of Response	1.365517
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.35014	t Ratio	-59.8424
Std Err Dif	0.00585	DF	4
Upper CL Dif	-0.33389	Prob > |t|	<.0001
Lower CL Dif	-0.36638	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

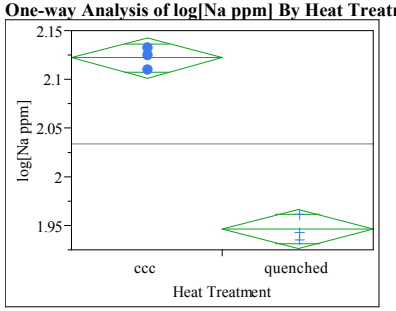
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.18389318	0.183893	3581.117	<.0001
Error	4	0.00020540	0.000051		
C. Total	5	0.18409858			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.54058	0.00414	1.5291	1.5521
quenched	3	1.19045	0.00414	1.1790	1.2019

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-03



One-way Anova
Summary of Fit

Rsquare	0.986104
Adj Rsquare	0.982629
Root Mean Square Error	0.012797
Mean of Response	2.034281
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.17604	t Ratio	-16.8476
Std Err Dif	0.01045	DF	4
Upper CL Dif	-0.14703	Prob > |t|	<.0001
Lower CL Dif	-0.20505	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

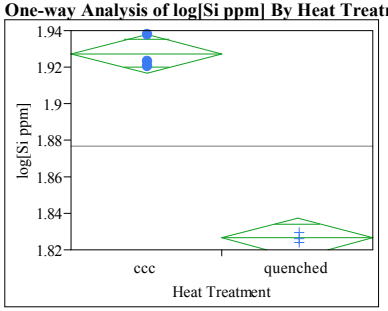
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.04648581	0.046486	283.8426	<.0001
Error	4	0.00065509	0.000164		
C. Total	5	0.04714090			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.12230	0.00739	2.1018	2.1428
quenched	3	1.94626	0.00739	1.9257	1.9668

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-03



One-way Anova
Summary of Fit

Rsquare	0.988156
Adj Rsquare	0.985195
Root Mean Square Error	0.006767
Mean of Response	1.876905
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.10093	t Ratio	-18.268
Std Err Dif	0.00553	DF	4
Upper CL Dif	-0.08559	Prob > |t|	<.0001
Lower CL Dif	-0.11627	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.01528133	0.015281	333.7215	<.0001
Error	4	0.00018316	0.000046		
C. Total	5	0.01546450			

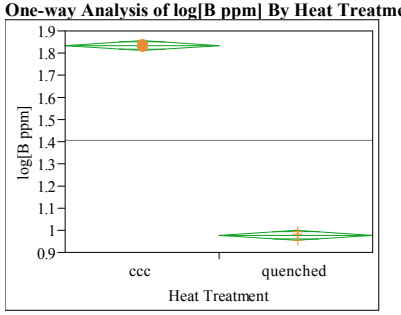
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.92737	0.00391	1.9165	1.9382
quenched	3	1.82644	0.00391	1.8156	1.8373

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-04



One-way Anova
Summary of Fit

Rsquare	0.99927
Adj Rsquare	0.999088
Root Mean Square Error	0.014162
Mean of Response	1.407097
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.85576	t Ratio	-74.0095
Std Err Dif	0.01156	DF	4
Upper CL Dif	-0.82366	Prob > |t|	<.0001
Lower CL Dif	-0.88786	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

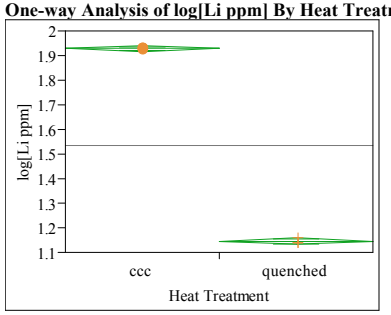
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	1.0984847	1.09848	5477.408	<.0001
Error	4	0.0008022	0.00020		
C. Total	5	1.0992869			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.83498	0.00818	1.8123	1.8577
quenched	3	0.97922	0.00818	0.9565	1.0019

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-04



One-way Anova
Summary of Fit

Rsquare	0.999717
Adj Rsquare	0.999647
Root Mean Square Error	0.008048
Mean of Response	1.53728
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.78143	t Ratio	-118.913
Std Err Dif	0.00657	DF	4
Upper CL Dif	-0.76318	Prob > |t|	<.0001
Lower CL Dif	-0.79967	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

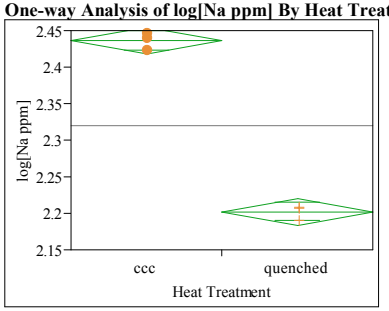
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.91594846	0.915948	14140.33	<.0001
Error	4	0.00025910	0.000065		
C. Total	5	0.91620757			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.92799	0.00465	1.9151	1.9409
quenched	3	1.14656	0.00465	1.1337	1.1595

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-04



One-way Anova
Summary of Fit

Rsquare	0.993976
Adj Rsquare	0.99247
Root Mean Square Error	0.011186
Mean of Response	2.319261
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.23465	t Ratio	-25.6915
Std Err Dif	0.00913	DF	4
Upper CL Dif	-0.20929	Prob > |t|	<.0001
Lower CL Dif	-0.26001	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.08259294	0.082593	660.0521	<.0001
Error	4	0.00050052	0.000125		
C. Total	5	0.08309346			

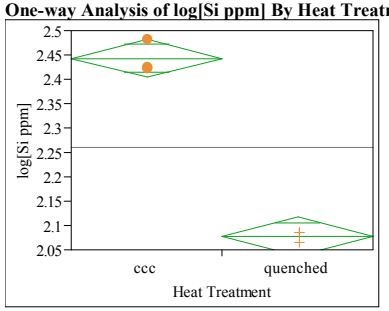
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.43659	0.00646	2.4187	2.4545
quenched	3	2.20193	0.00646	2.1840	2.2199

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-04



One-way Anova
Summary of Fit

Rsquare	0.987861
Adj Rsquare	0.984827
Root Mean Square Error	0.024862
Mean of Response	2.260596
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.36625	t Ratio	-18.0424
Std Err Dif	0.02030	DF	4
Upper CL Dif	-0.30989	Prob > |t|	<.0001
Lower CL Dif	-0.42261	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

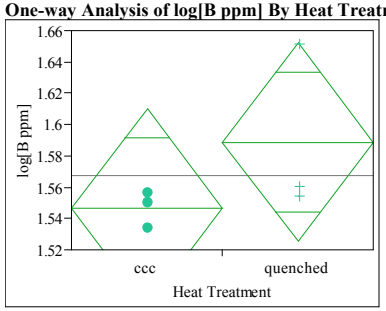
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.20120668	0.201207	325.5270	<.0001
Error	4	0.00247238	0.000618		
C. Total	5	0.20367906			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.44372	0.01435	2.4039	2.4836
quenched	3	2.07747	0.01435	2.0376	2.1173

Std Error uses a pooled estimate of error variance

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-05



One-way Anova
Summary of Fit

Rsquare	0.298534
Adj Rsquare	0.123167
Root Mean Square Error	0.039444
Mean of Response	1.56773
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.04202	t Ratio	1.304739
Std Err Dif	0.03221	DF	4
Upper CL Dif	0.13144	Prob > |t|	0.2620
Lower CL Dif	-0.04740	Prob > t	0.1310
Confidence	0.95	Prob < t	0.8690

Analysis of Variance

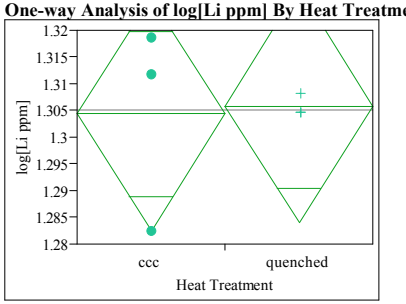
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00264852	0.002649	1.7023	0.2620
Error	4	0.00622324	0.001556		
C. Total	5	0.00887176			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.54672	0.02277	1.4835	1.6099
quenched	3	1.58874	0.02277	1.5255	1.6520

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-05



One-way Anova
Summary of Fit

Rsquare	0.004339
Adj Rsquare	-0.24458
Root Mean Square Error	0.01366
Mean of Response	1.305098
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.00147	t Ratio	0.13203
Std Err Dif	0.01115	DF	4
Upper CL Dif	0.03244	Prob > |t|	0.9013
Lower CL Dif	-0.02949	Prob > t	0.4507
Confidence	0.95	Prob < t	0.5493

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00000325	3.253e-6	0.0174	0.9013
Error	4	0.00074634	0.000187		
C. Total	5	0.00074959			

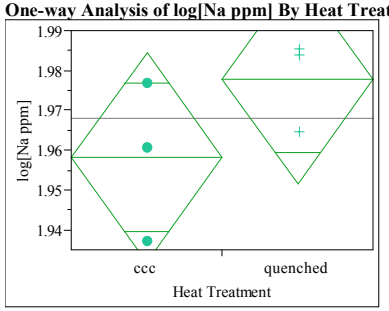
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.30436	0.00789	1.2825	1.3263
quenched	3	1.30583	0.00789	1.2839	1.3277

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-05



One-way Anova
Summary of Fit

Rsquare	0.351067
Adj Rsquare	0.188834
Root Mean Square Error	0.01638
Mean of Response	1.968048
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.01967	t Ratio	1.471043
Std Err Dif	0.01337	DF	4
Upper CL Dif	0.05681	Prob > |t|	0.2152
Lower CL Dif	-0.01746	Prob > t	0.1076
Confidence	0.95	Prob < t	0.8924

Analysis of Variance

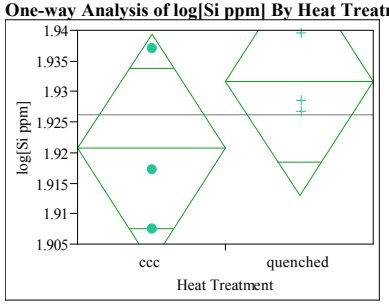
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00058058	0.000581	2.1640	0.2152
Error	4	0.00107317	0.000268		
C. Total	5	0.00165374			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.95821	0.00946	1.9320	1.9845
quenched	3	1.97788	0.00946	1.9516	2.0041

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-05



One-way Anova
Summary of Fit

Rsquare	0.250294
Adj Rsquare	0.062867
Root Mean Square Error	0.01166
Mean of Response	1.926155
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.01100	t Ratio	1.155605
Std Err Dif	0.00952	DF	4
Upper CL Dif	0.03743	Prob > |t|	0.3122
Lower CL Dif	-0.01543	Prob > t	0.1561
Confidence	0.95	Prob < t	0.8439

Analysis of Variance

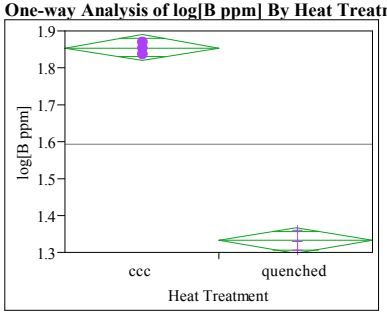
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00018156	0.000182	1.3354	0.3122
Error	4	0.00054383	0.000136		
C. Total	5	0.00072539			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.92065	0.00673	1.9020	1.9393
quenched	3	1.93166	0.00673	1.9130	1.9503

Std Error uses a pooled estimate of error variance

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-06



One-way Anova
Summary of Fit

Rsquare	0.995532
Adj Rsquare	0.994415
Root Mean Square Error	0.021435
Mean of Response	1.593196
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.52248	t Ratio	-29.853
Std Err Dif	0.01750	DF	4
Upper CL Dif	-0.47389	Prob > |t|	<.0001
Lower CL Dif	-0.57108	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.40948421	0.409484	891.2012	<.0001
Error	4	0.00183790	0.000459		
C. Total	5	0.41132211			

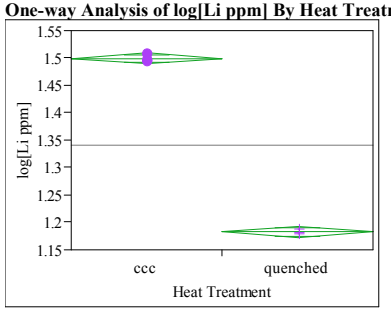
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.85444	0.01238	1.8201	1.8888
quenched	3	1.33195	0.01238	1.2976	1.3663

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-06



One-way Anova
Summary of Fit

Rsquare	0.998972
Adj Rsquare	0.998715
Root Mean Square Error	0.006219
Mean of Response	1.340756
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.31657	t Ratio	-62.3415
Std Err Dif	0.00508	DF	4
Upper CL Dif	-0.30248	Prob > |t|	<.0001
Lower CL Dif	-0.33067	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

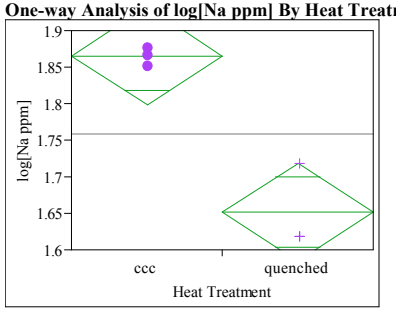
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.15032895	0.150329	3886.461	<.0001
Error	4	0.00015472	0.000039		
C. Total	5	0.15048367			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.49904	0.00359	1.4891	1.5090
quenched	3	1.18247	0.00359	1.1725	1.1924

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-06



One-way Anova
Summary of Fit

Rsquare	0.906545
Adj Rsquare	0.883182
Root Mean Square Error	0.041991
Mean of Response	1.758417
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.21357	t Ratio	-6.22909
Std Err Dif	0.03429	DF	4
Upper CL Dif	-0.11837	Prob > |t|	0.0034
Lower CL Dif	-0.30876	Prob > t	0.9983
Confidence	0.95	Prob < t	0.0017

Analysis of Variance

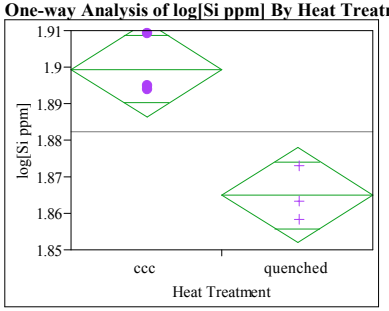
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.06841573	0.068416	38.8016	0.0034
Error	4	0.00705289	0.001763		
C. Total	5	0.07546861			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.86520	0.02424	1.7979	1.9325
quenched	3	1.65163	0.02424	1.5843	1.7189

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-06



One-way Anova
Summary of Fit

Rsquare	0.87138
Adj Rsquare	0.839225
Root Mean Square Error	0.00811
Mean of Response	1.882172
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.03447	t Ratio	-5.20571
Std Err Dif	0.00662	DF	4
Upper CL Dif	-0.01609	Prob > |t|	0.0065
Lower CL Dif	-0.05285	Prob > t	0.9968
Confidence	0.95	Prob < t	0.0032

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00178219	0.001782	27.0994	0.0065
Error	4	0.00026306	0.000066		
C. Total	5	0.00204525			

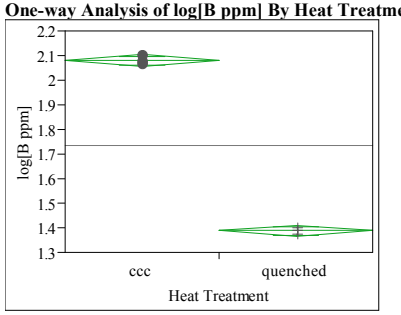
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.89941	0.00468	1.8864	1.9124
quenched	3	1.86494	0.00468	1.8519	1.8779

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-07



One-way Anova
Summary of Fit

Rsquare	0.998772
Adj Rsquare	0.998465
Root Mean Square Error	0.014828
Mean of Response	1.733419
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.69063	t Ratio	-57.0424
Std Err Dif	0.01211	DF	4
Upper CL Dif	-0.65701	Prob > |t|	<.0001
Lower CL Dif	-0.72424	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

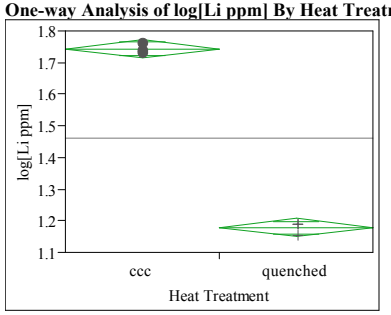
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.71544930	0.715449	3253.840	<.0001
Error	4	0.00087951	0.000220		
C. Total	5	0.71632881			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.07873	0.00856	2.0550	2.1025
quenched	3	1.38811	0.00856	1.3643	1.4119

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-07



One-way Anova
Summary of Fit

Rsquare	0.997216
Adj Rsquare	0.99652
Root Mean Square Error	0.018288
Mean of Response	1.460633
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.56522	t Ratio	-37.8534
Std Err Dif	0.01493	DF	4
Upper CL Dif	-0.52376	Prob > |t|	<.0001
Lower CL Dif	-0.60667	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

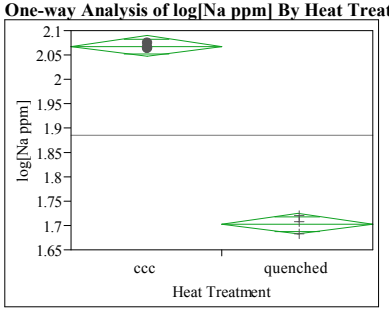
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.47920584	0.479206	1432.881	<.0001
Error	4	0.00133774	0.000334		
C. Total	5	0.48054358			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.74324	0.01056	1.7139	1.7726
quenched	3	1.17802	0.01056	1.1487	1.2073

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-07



One-way Anova
Summary of Fit

Rsquare	0.99635
Adj Rsquare	0.995437
Root Mean Square Error	0.013541
Mean of Response	1.88571
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.36534	t Ratio	-33.0432
Std Err Dif	0.01106	DF	4
Upper CL Dif	-0.33464	Prob > |t|	<.0001
Lower CL Dif	-0.39604	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.20020971	0.200210	1091.851	<.0001
Error	4	0.00073347	0.000183		
C. Total	5	0.20094318			

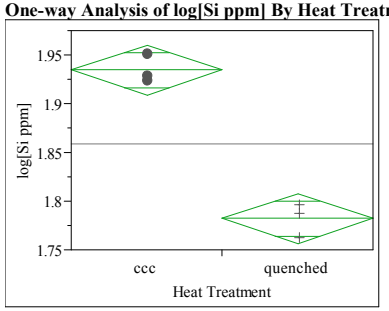
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.06838	0.00782	2.0467	2.0901
quenched	3	1.70304	0.00782	1.6813	1.7247

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-07



One-way Anova
Summary of Fit

Rsquare	0.971386
Adj Rsquare	0.964232
Root Mean Square Error	0.016049
Mean of Response	1.858278
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.15270	t Ratio	-11.6529
Std Err Dif	0.01310	DF	4
Upper CL Dif	-0.11632	Prob > |t|	0.0003
Lower CL Dif	-0.18908	Prob > t	0.9998
Confidence	0.95	Prob < t	0.0002

Analysis of Variance

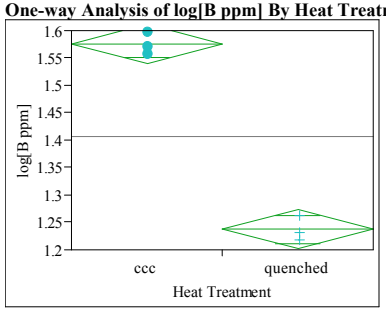
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.03497663	0.034977	135.7905	0.0003
Error	4	0.00103031	0.000258		
C. Total	5	0.03600694			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.93463	0.00927	1.9089	1.9604
quenched	3	1.78193	0.00927	1.7562	1.8077

Std Error uses a pooled estimate of error variance

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-08



One-way Anova
Summary of Fit

Rsquare	0.988778
Adj Rsquare	0.985973
Root Mean Square Error	0.022139
Mean of Response	1.406603
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.33937	t Ratio	-18.7736
Std Err Dif	0.01808	DF	4
Upper CL Dif	-0.28918	Prob > |t|	<.0001
Lower CL Dif	-0.38955	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

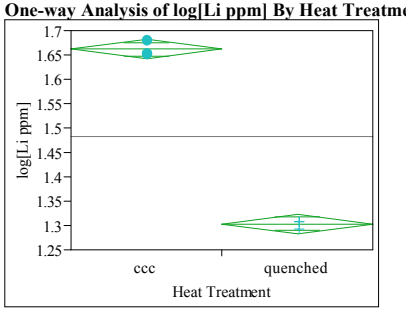
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.17275310	0.172753	352.4470	<.0001
Error	4	0.00196061	0.000490		
C. Total	5	0.17471371			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.57629	0.01278	1.5408	1.6118
quenched	3	1.23692	0.01278	1.2014	1.2724

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-08



One-way Anova
Summary of Fit

Rsquare	0.996691
Adj Rsquare	0.995863
Root Mean Square Error	0.012637
Mean of Response	1.482457
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.35813	t Ratio	-34.7095
Std Err Dif	0.01032	DF	4
Upper CL Dif	-0.32948	Prob > |t|	<.0001
Lower CL Dif	-0.38678	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.19238789	0.192388	1204.747	<.0001
Error	4	0.00063877	0.000160		
C. Total	5	0.19302666			

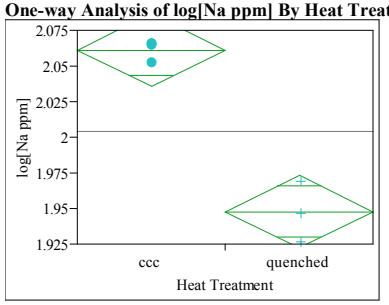
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.66152	0.00730	1.6413	1.6818
quenched	3	1.30339	0.00730	1.2831	1.3236

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-08



One-way Anova
Summary of Fit

Rsquare	0.950142
Adj Rsquare	0.937678
Root Mean Square Error	0.015906
Mean of Response	2.004389
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.11339	t Ratio	-8.7309
Std Err Dif	0.01299	DF	4
Upper CL Dif	-0.07733	Prob > |t|	0.0009
Lower CL Dif	-0.14945	Prob > t	0.9995
Confidence	0.95	Prob < t	0.0005

Analysis of Variance

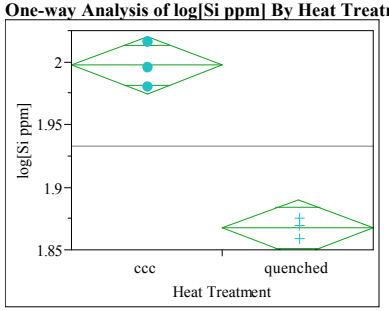
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.01928510	0.019285	76.2286	0.0009
Error	4	0.00101196	0.000253		
C. Total	5	0.02029706			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.06108	0.00918	2.0356	2.0866
quenched	3	1.94770	0.00918	1.9222	1.9732

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-08



One-way Anova
Summary of Fit

Rsquare	0.968992
Adj Rsquare	0.961241
Root Mean Square Error	0.014217
Mean of Response	1.932443
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.12978	t Ratio	-11.1804
Std Err Dif	0.01161	DF	4
Upper CL Dif	-0.09755	Prob > |t|	0.0004
Lower CL Dif	-0.16201	Prob > t	0.9998
Confidence	0.95	Prob < t	0.0002

Analysis of Variance

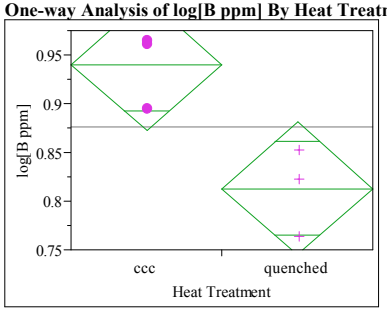
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.02526502	0.025265	125.0008	0.0004
Error	4	0.00080848	0.000202		
C. Total	5	0.02607349			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.99733	0.00821	1.9745	2.0201
quenched	3	1.86755	0.00821	1.8448	1.8903

Std Error uses a pooled estimate of error variance

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-09



One-way Anova
Summary of Fit

Rsquare	0.771778
Adj Rsquare	0.714723
Root Mean Square Error	0.042527
Mean of Response	0.876705
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.12771	t Ratio	-3.67788
Std Err Dif	0.03472	DF	4
Upper CL Dif	-0.03130	Prob > |t|	0.0212
Lower CL Dif	-0.22411	Prob > t	0.9894
Confidence	0.95	Prob < t	0.0106

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.02446387	0.024464	13.5268	0.0212
Error	4	0.00723419	0.001809		
C. Total	5	0.03169806			

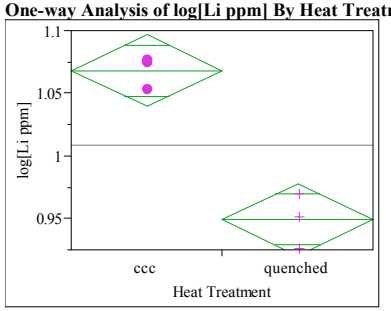
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	0.940558	0.02455	0.87239	1.0087
quenched	3	0.812851	0.02455	0.74468	0.8810

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-09



One-way Anova
Summary of Fit

Rsquare	0.942718
Adj Rsquare	0.928397
Root Mean Square Error	0.018001
Mean of Response	1.008652
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.11925	t Ratio	-8.11353
Std Err Dif	0.01470	DF	4
Upper CL Dif	-0.07844	Prob > |t|	0.0013
Lower CL Dif	-0.16006	Prob > t	0.9994
Confidence	0.95	Prob < t	0.0006

Analysis of Variance

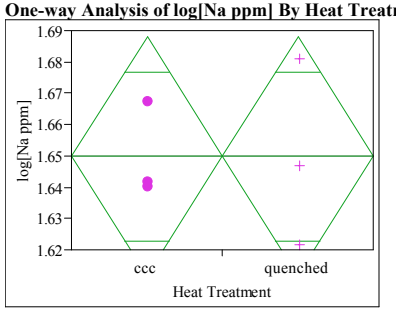
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.02133197	0.021332	65.8294	0.0013
Error	4	0.00129620	0.000324		
C. Total	5	0.02262817			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.06828	0.01039	1.0394	1.0971
quenched	3	0.94903	0.01039	0.9202	0.9779

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-09



One-way Anova
Summary of Fit

Rsquare	5.516e-7
Adj Rsquare	-0.25
Root Mean Square Error	0.023803
Mean of Response	1.649826
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	2.887e-5	t Ratio	0.001485
Std Err Dif	0.01943	DF	4
Upper CL Dif	0.05399	Prob > |t|	0.9989
Lower CL Dif	-0.05393	Prob > t	0.4994
Confidence	0.95	Prob < t	0.5006

Analysis of Variance

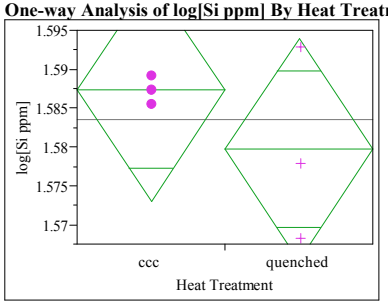
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	1.25001e-9	1.25e-9	0.0000	0.9989
Error	4	0.00226627	0.000567		
C. Total	5	0.00226627			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.64981	0.01374	1.6117	1.6880
quenched	3	1.64984	0.01374	1.6117	1.6880

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-09



One-way Anova
Summary of Fit

Rsquare	0.217621
Adj Rsquare	0.022026
Root Mean Square Error	0.008905
Mean of Response	1.583508
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.00767	t Ratio	-1.0548
Std Err Dif	0.00727	DF	4
Upper CL Dif	0.01252	Prob > |t|	0.3510
Lower CL Dif	-0.02786	Prob > t	0.8245
Confidence	0.95	Prob < t	0.1755

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00008824	0.000088	1.1126	0.3510
Error	4	0.00031723	0.000079		
C. Total	5	0.00040546			

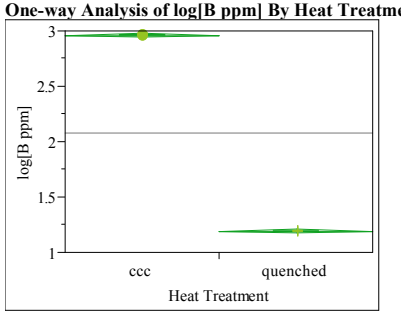
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.58734	0.00514	1.5731	1.6016
quenched	3	1.57967	0.00514	1.5654	1.5939

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-10



One-way Anova
Summary of Fit

Rsquare	0.999946
Adj Rsquare	0.999933
Root Mean Square Error	0.007947
Mean of Response	2.077587
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-1.7666	t Ratio	-272.26
Std Err Dif	0.0065	DF	4
Upper CL Dif	-1.7485	Prob > |t|	<.0001
Lower CL Dif	-1.7846	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

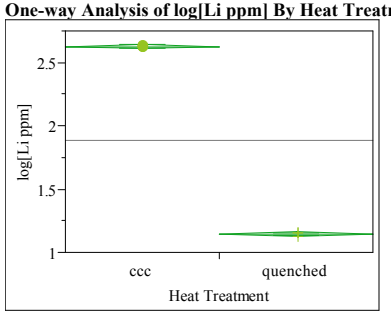
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	4.6811166	4.68112	74125.55	<.0001
Error	4	0.0002526	6.315e-5		
C. Total	5	4.6813692			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.96087	0.00459	2.9481	2.9736
quenched	3	1.19431	0.00459	1.1816	1.2070

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-10



One-way Anova
Summary of Fit

Rsquare	0.999869
Adj Rsquare	0.999836
Root Mean Square Error	0.010411
Mean of Response	1.885777
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-1.4840	t Ratio	-174.588
Std Err Dif	0.0085	DF	4
Upper CL Dif	-1.4604	Prob > |t|	<.0001
Lower CL Dif	-1.5076	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

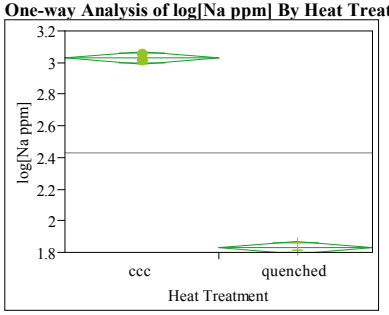
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	3.3035262	3.30353	30481.01	<.0001
Error	4	0.0004335	0.00011		
C. Total	5	3.3039597			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.62779	0.00601	2.6111	2.6445
quenched	3	1.14376	0.00601	1.1271	1.1604

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-10



One-way Anova
Summary of Fit

Rsquare	0.998793
Adj Rsquare	0.998492
Root Mean Square Error	0.025524
Mean of Response	2.430077
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-1.1992	t Ratio	-57.544
Std Err Dif	0.0208	DF	4
Upper CL Dif	-1.1414	Prob > |t|	<.0001
Lower CL Dif	-1.2571	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	2.1571938	2.15719	3311.312	<.0001
Error	4	0.0026058	0.00065		
C. Total	5	2.1597997			

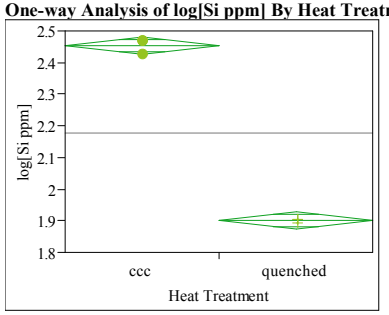
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	3.02969	0.01474	2.9888	3.0706
quenched	3	1.83047	0.01474	1.7896	1.8714

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-10



One-way Anova
Summary of Fit

Rsquare	0.997337
Adj Rsquare	0.996671
Root Mean Square Error	0.017457
Mean of Response	2.177717
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.55171	t Ratio	-38.7063
Std Err Dif	0.01425	DF	4
Upper CL Dif	-0.51214	Prob > |t|	<.0001
Lower CL Dif	-0.59129	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

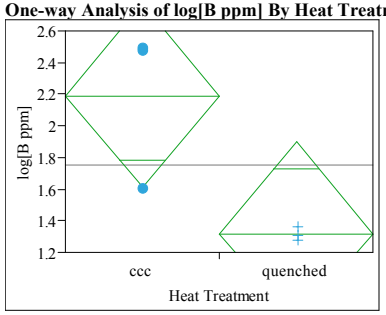
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.45657808	0.456578	1498.177	<.0001
Error	4	0.00121902	0.000305		
C. Total	5	0.45779710			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.45357	0.01008	2.4256	2.4816
quenched	3	1.90186	0.01008	1.8739	1.9298

Std Error uses a pooled estimate of error variance

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-11



One-way Anova
Summary of Fit

Rsquare	0.685406
Adj Rsquare	0.606758
Root Mean Square Error	0.361978
Mean of Response	1.754716
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.8725	t Ratio	-2.95209
Std Err Dif	0.2956	DF	4
Upper CL Dif	-0.0519	Prob > |t|	0.0419
Lower CL Dif	-1.6931	Prob > t	0.9791
Confidence	0.95	Prob < t	0.0209

Analysis of Variance

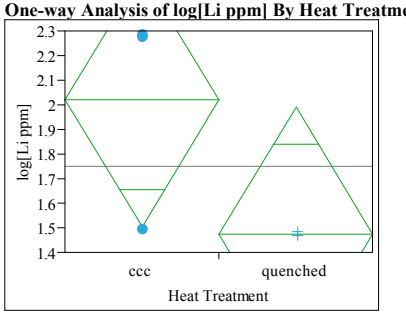
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	1.1418849	1.14188	8.7148	0.0419
Error	4	0.5241120	0.13103		
C. Total	5	1.6659969			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.19097	0.20899	1.6107	2.7712
quenched	3	1.31847	0.20899	0.7382	1.8987

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-11



One-way Anova
Summary of Fit

Rsquare	0.517652
Adj Rsquare	0.397065
Root Mean Square Error	0.320395
Mean of Response	1.748083
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.5420	t Ratio	-2.0719
Std Err Dif	0.2616	DF	4
Upper CL Dif	0.1843	Prob > |t|	0.1070
Lower CL Dif	-1.2683	Prob > t	0.9465
Confidence	0.95	Prob < t	0.0535

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.44066576	0.440666	4.2928	0.1070
Error	4	0.41061190	0.102653		
C. Total	5	0.85127766			

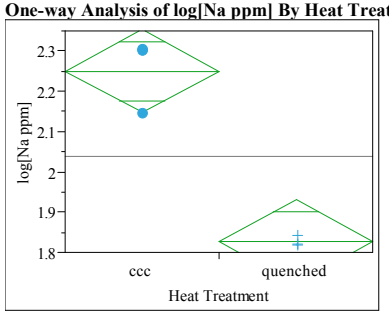
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.01909	0.18498	1.5055	2.5327
quenched	3	1.47708	0.18498	0.9635	1.9907

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-11



One-way Anova
Summary of Fit

Rsquare	0.941521
Adj Rsquare	0.926902
Root Mean Square Error	0.064644
Mean of Response	2.038819
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.42357	t Ratio	-8.02502
Std Err Dif	0.05278	DF	4
Upper CL Dif	-0.27703	Prob > |t|	0.0013
Lower CL Dif	-0.57012	Prob > t	0.9993
Confidence	0.95	Prob < t	0.0007

Analysis of Variance

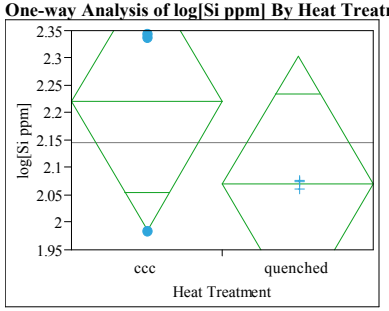
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.26912250	0.269123	64.4009	0.0013
Error	4	0.01671544	0.004179		
C. Total	5	0.28583794			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.25061	0.03732	2.1470	2.3542
quenched	3	1.82703	0.03732	1.7234	1.9307

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-11



One-way Anova
Summary of Fit

Rsquare	0.284021
Adj Rsquare	0.105027
Root Mean Square Error	0.145813
Mean of Response	2.145185
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.14997	t Ratio	-1.25967
Std Err Dif	0.11906	DF	4
Upper CL Dif	0.18058	Prob > |t|	0.2763
Lower CL Dif	-0.48052	Prob > t	0.8619
Confidence	0.95	Prob < t	0.1381

Analysis of Variance

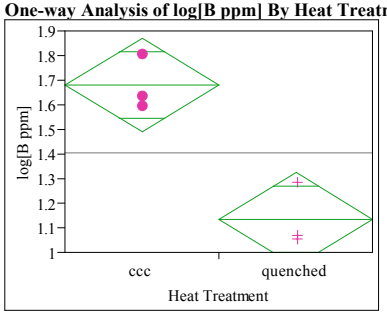
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.03373687	0.033737	1.5868	0.2763
Error	4	0.08504594	0.021261		
C. Total	5	0.11878281			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.22017	0.08419	1.9864	2.4539
quenched	3	2.07020	0.08419	1.8365	2.3039

Std Error uses a pooled estimate of error variance

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-12



One-way Anova
Summary of Fit

Rsquare	0.88614
Adj Rsquare	0.857675
Root Mean Square Error	0.119172
Mean of Response	1.407109
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.54291	t Ratio	-5.57951
Std Err Dif	0.09730	DF	4
Upper CL Dif	-0.27275	Prob > |t|	0.0051
Lower CL Dif	-0.81306	Prob > t	0.9975
Confidence	0.95	Prob < t	0.0025

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.44211909	0.442119	31.1310	0.0051
Error	4	0.05680763	0.014202		
C. Total	5	0.49892672			

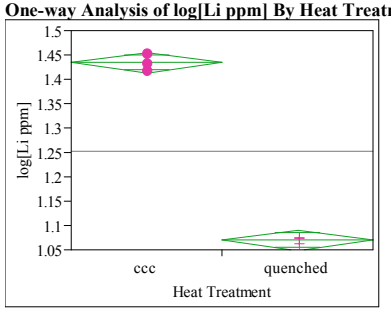
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.67856	0.06880	1.4875	1.8696
quenched	3	1.13566	0.06880	0.9446	1.3267

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-12



One-way Anova
Summary of Fit

Rsquare	0.996474
Adj Rsquare	0.995593
Root Mean Square Error	0.013274
Mean of Response	1.251602
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.36442	t Ratio	-33.6236
Std Err Dif	0.01084	DF	4
Upper CL Dif	-0.33433	Prob > |t|	<.0001
Lower CL Dif	-0.39451	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

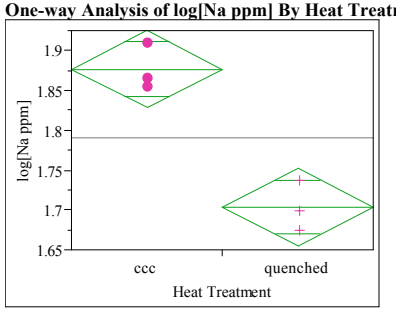
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.19920265	0.199203	1130.548	<.0001
Error	4	0.00070480	0.000176		
C. Total	5	0.19990745			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.43381	0.00766	1.4125	1.4551
quenched	3	1.06939	0.00766	1.0481	1.0907

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-12



One-way Anova
Summary of Fit

Rsquare	0.924641
Adj Rsquare	0.905801
Root Mean Square Error	0.030264
Mean of Response	1.790077
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.17311	t Ratio	-7.00564
Std Err Dif	0.02471	DF	4
Upper CL Dif	-0.10451	Prob > |t|	0.0022
Lower CL Dif	-0.24172	Prob > t	0.9989
Confidence	0.95	Prob < t	0.0011

Analysis of Variance

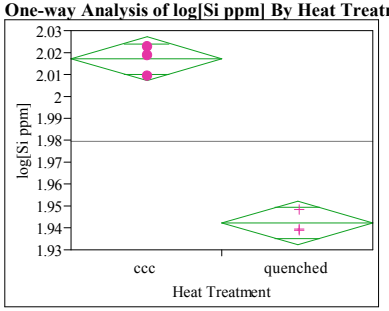
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.04495276	0.044953	49.0790	0.0022
Error	4	0.00366370	0.000916		
C. Total	5	0.04861647			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.87663	0.01747	1.8281	1.9251
quenched	3	1.70352	0.01747	1.6550	1.7520

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-12



One-way Anova
Summary of Fit

Rsquare	0.981861
Adj Rsquare	0.977327
Root Mean Square Error	0.00622
Mean of Response	1.979638
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.07474	t Ratio	-14.7148
Std Err Dif	0.00508	DF	4
Upper CL Dif	-0.06063	Prob > |t|	0.0001
Lower CL Dif	-0.08884	Prob > t	0.9999
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00837833	0.008378	216.5247	0.0001
Error	4	0.00015478	0.000039		
C. Total	5	0.00853311			

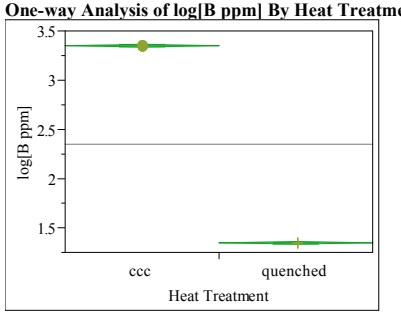
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.01701	0.00359	2.0070	2.0270
quenched	3	1.94227	0.00359	1.9323	1.9522

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-13



One-way Anova
Summary of Fit

Rsquare	0.99996
Adj Rsquare	0.99995
Root Mean Square Error	0.007764
Mean of Response	2.347833
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-2.0021	t Ratio	-315.846
Std Err Dif	0.0063	DF	4
Upper CL Dif	-1.9845	Prob > |t|	<.0001
Lower CL Dif	-2.0197	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

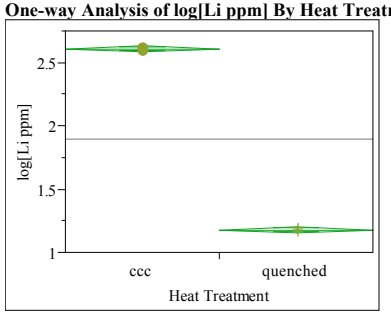
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	6.0128751	6.01288	99758.94	<.0001
Error	4	0.0002411	6.027e-5		
C. Total	5	6.0131162			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	3.34891	0.00448	3.3365	3.3614
quenched	3	1.34676	0.00448	1.3343	1.3592

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-13



One-way Anova
Summary of Fit

Rsquare	0.999733
Adj Rsquare	0.999666
Root Mean Square Error	0.014291
Mean of Response	1.892711
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-1.4269	t Ratio	-122.289
Std Err Dif	0.0117	DF	4
Upper CL Dif	-1.3945	Prob > |t|	<.0001
Lower CL Dif	-1.4593	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

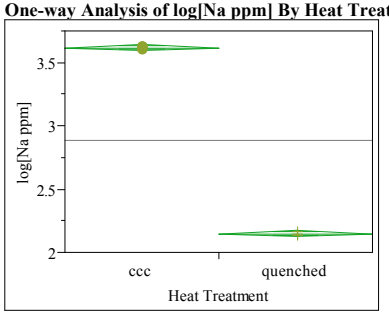
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	3.0541210	3.05412	14954.61	<.0001
Error	4	0.0008169	0.00020		
C. Total	5	3.0549379			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.60617	0.00825	2.5833	2.6291
quenched	3	1.17925	0.00825	1.1563	1.2022

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-13



One-way Anova
Summary of Fit

Rsquare	0.999734
Adj Rsquare	0.999668
Root Mean Square Error	0.014649
Mean of Response	2.882347
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-1.4677	t Ratio	-122.713
Std Err Dif	0.0120	DF	4
Upper CL Dif	-1.4345	Prob > |t|	<.0001
Lower CL Dif	-1.5009	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	3.2313917	3.23139	15058.52	<.0001
Error	4	0.0008584	0.00021		
C. Total	5	3.2322501			

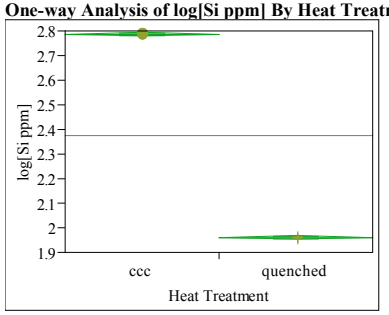
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	3.61622	0.00846	3.5927	3.6397
quenched	3	2.14848	0.00846	2.1250	2.1720

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-13



One-way Anova
Summary of Fit

Rsquare	0.99992
Adj Rsquare	0.9999
Root Mean Square Error	0.004511
Mean of Response	2.373829
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.82537	t Ratio	-224.1
Std Err Dif	0.00368	DF	4
Upper CL Dif	-0.81515	Prob > |t|	<.0001
Lower CL Dif	-0.83560	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

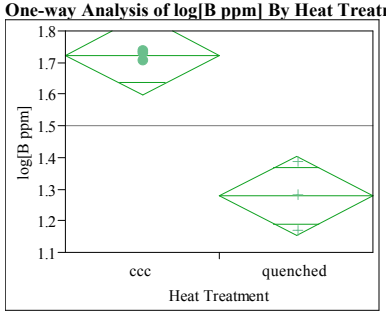
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	1.0218625	1.02186	50221.00	<.0001
Error	4	0.0000814	2.035e-5		
C. Total	5	1.0219439			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.78652	0.00260	2.7793	2.7937
quenched	3	1.96114	0.00260	1.9539	1.9684

Std Error uses a pooled estimate of error variance

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-14



One-way Anova
Summary of Fit

Rsquare	0.924762
Adj Rsquare	0.905953
Root Mean Square Error	0.077677
Mean of Response	1.501705
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.44471	t Ratio	-7.01176
Std Err Dif	0.06342	DF	4
Upper CL Dif	-0.26862	Prob > |t|	0.0022
Lower CL Dif	-0.62080	Prob > t	0.9989
Confidence	0.95	Prob < t	0.0011

Analysis of Variance

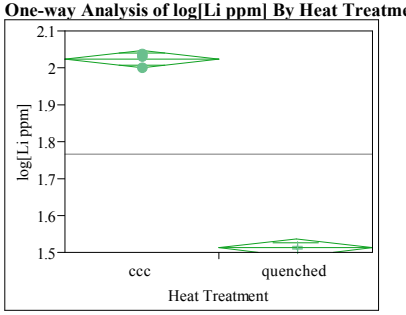
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.29664553	0.296646	49.1647	0.0022
Error	4	0.02413482	0.006034		
C. Total	5	0.32078035			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.72406	0.04485	1.5995	1.8486
quenched	3	1.27935	0.04485	1.1548	1.4039

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-14



One-way Anova
Summary of Fit

Rsquare	0.997857
Adj Rsquare	0.997321
Root Mean Square Error	0.014478
Mean of Response	1.766959
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.51016	t Ratio	-43.1545
Std Err Dif	0.01182	DF	4
Upper CL Dif	-0.47733	Prob > |t|	<.0001
Lower CL Dif	-0.54298	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.39038969	0.390390	1862.314	<.0001
Error	4	0.00083850	0.000210		
C. Total	5	0.39122820			

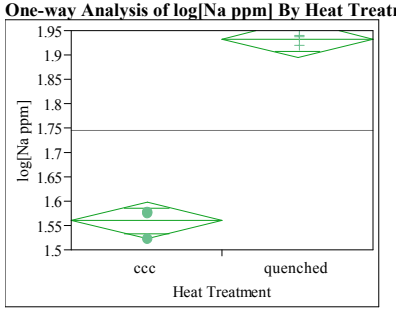
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.02204	0.00836	1.9988	2.0452
quenched	3	1.51188	0.00836	1.4887	1.5351

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-14



One-way Anova
Summary of Fit

Rsquare	0.989722
Adj Rsquare	0.987153
Root Mean Square Error	0.023345
Mean of Response	1.745963
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.374101	t Ratio	19.6265
Std Err Dif	0.019061	DF	4
Upper CL Dif	0.427023	Prob > |t|	<.0001
Lower CL Dif	0.321180	Prob > t	<.0001
Confidence	0.95	Prob < t	1.0000

Analysis of Variance

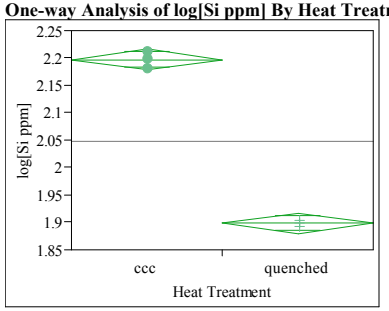
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.20992785	0.209928	385.1995	<.0001
Error	4	0.00217994	0.000545		
C. Total	5	0.21210778			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.55891	0.01348	1.5215	1.5963
quenched	3	1.93301	0.01348	1.8956	1.9704

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-14



One-way Anova
Summary of Fit

Rsquare	0.995818
Adj Rsquare	0.994773
Root Mean Square Error	0.011873
Mean of Response	2.048118
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.29919	t Ratio	-30.8635
Std Err Dif	0.00969	DF	4
Upper CL Dif	-0.27228	Prob > |t|	<.0001
Lower CL Dif	-0.32610	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

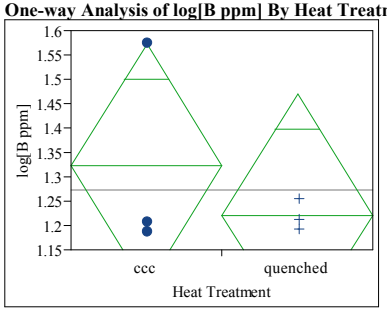
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.13427180	0.134272	952.5581	<.0001
Error	4	0.00056384	0.000141		
C. Total	5	0.13483564			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.19771	0.00685	2.1787	2.2167
quenched	3	1.89852	0.00685	1.8795	1.9176

Std Error uses a pooled estimate of error variance

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-15



One-way Anova
Summary of Fit

Rsquare	0.138732
Adj Rsquare	-0.07659
Root Mean Square Error	0.155839
Mean of Response	1.27142
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.10214	t Ratio	-0.80269
Std Err Dif	0.12724	DF	4
Upper CL Dif	0.25114	Prob > |t|	0.4671
Lower CL Dif	-0.45542	Prob > t	0.7664
Confidence	0.95	Prob < t	0.2336

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.01564767	0.015648	0.6443	0.4671
Error	4	0.09714320	0.024286		
C. Total	5	0.11279087			

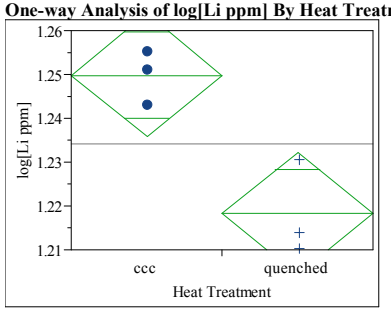
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.32249	0.08997	1.0727	1.5723
quenched	3	1.22035	0.08997	0.9705	1.4702

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-15



One-way Anova
Summary of Fit

Rsquare	0.829943
Adj Rsquare	0.787428
Root Mean Square Error	0.008753
Mean of Response	1.234069
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.03158	t Ratio	-4.41831
Std Err Dif	0.00715	DF	4
Upper CL Dif	-0.01173	Prob > |t|	0.0115
Lower CL Dif	-0.05142	Prob > t	0.9942
Confidence	0.95	Prob < t	0.0058

Analysis of Variance

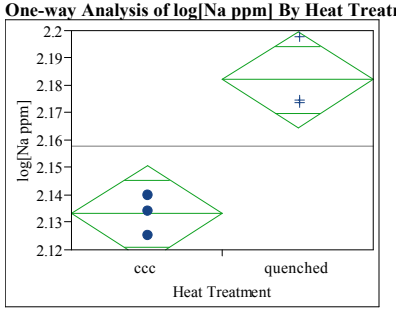
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00149551	0.001496	19.5215	0.0115
Error	4	0.00030643	0.000077		
C. Total	5	0.00180194			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.24986	0.00505	1.2358	1.2639
quenched	3	1.21828	0.00505	1.2043	1.2323

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-15



One-way Anova
Summary of Fit

Rsquare	0.882688
Adj Rsquare	0.853359
Root Mean Square Error	0.010911
Mean of Response	2.157589
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.048874	t Ratio	5.486072
Std Err Dif	0.008909	DF	4
Upper CL Dif	0.073608	Prob > |t|	0.0054
Lower CL Dif	0.024139	Prob > t	0.0027
Confidence	0.95	Prob < t	0.9973

Analysis of Variance

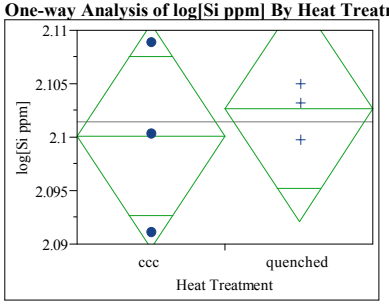
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00358299	0.003583	30.0970	0.0054
Error	4	0.00047619	0.000119		
C. Total	5	0.00405918			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.13315	0.00630	2.1157	2.1506
quenched	3	2.18203	0.00630	2.1645	2.1995

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-15



One-way Anova
Summary of Fit

Rsquare	0.053035
Adj Rsquare	-0.18371
Root Mean Square Error	0.00657
Mean of Response	2.101396
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.00254	t Ratio	0.473311
Std Err Dif	0.00536	DF	4
Upper CL Dif	0.01743	Prob > |t|	0.6607
Lower CL Dif	-0.01235	Prob > t	0.3303
Confidence	0.95	Prob < t	0.6697

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00000967	9.67e-6	0.2240	0.6607
Error	4	0.00017266	0.000043		
C. Total	5	0.00018233			

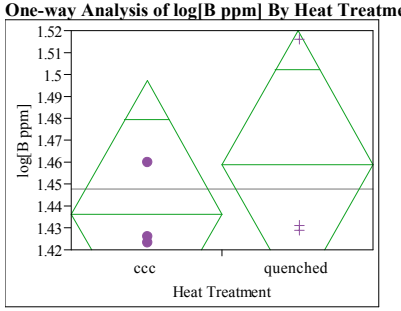
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.10013	0.00379	2.0896	2.1107
quenched	3	2.10267	0.00379	2.0921	2.1132

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-16



One-way Anova
Summary of Fit

Rsquare	0.114957
Adj Rsquare	-0.1063
Root Mean Square Error	0.038086
Mean of Response	1.447586
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.02241	t Ratio	0.7208
Std Err Dif	0.03110	DF	4
Upper CL Dif	0.10875	Prob > |t|	0.5109
Lower CL Dif	-0.06392	Prob > t	0.2555
Confidence	0.95	Prob < t	0.7445

Analysis of Variance

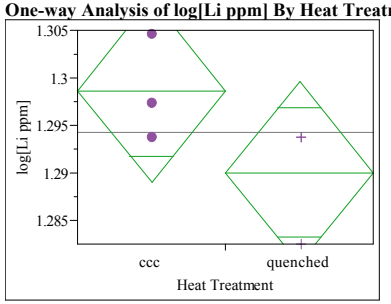
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00075362	0.000754	0.5196	0.5109
Error	4	0.00580210	0.001451		
C. Total	5	0.00655573			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.43638	0.02199	1.3753	1.4974
quenched	3	1.45879	0.02199	1.3977	1.5198

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-16



One-way Anova
Summary of Fit

Rsquare	0.432623
Adj Rsquare	0.290779
Root Mean Square Error	0.00602
Mean of Response	1.294303
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.00858	t Ratio	-1.74642
Std Err Dif	0.00492	DF	4
Upper CL Dif	0.00506	Prob > |t|	0.1557
Lower CL Dif	-0.02223	Prob > t	0.9222
Confidence	0.95	Prob < t	0.0778

Analysis of Variance

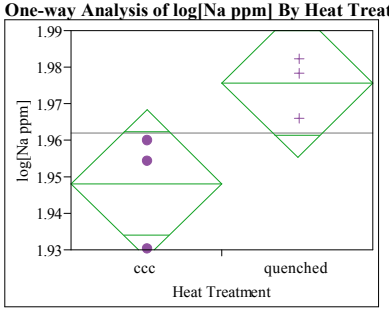
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00011053	0.000111	3.0500	0.1557
Error	4	0.00014496	0.000036		
C. Total	5	0.00025549			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.29860	0.00348	1.2889	1.3082
quenched	3	1.29001	0.00348	1.2804	1.2997

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-16



One-way Anova
Summary of Fit

Rsquare	0.64115
Adj Rsquare	0.551438
Root Mean Square Error	0.012606
Mean of Response	1.961883
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.02752	t Ratio	2.673335
Std Err Dif	0.01029	DF	4
Upper CL Dif	0.05609	Prob > |t|	0.0556
Lower CL Dif	-0.00106	Prob > t	0.0278
Confidence	0.95	Prob < t	0.9722

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00113574	0.001136	7.1467	0.0556
Error	4	0.00063567	0.000159		
C. Total	5	0.00177141			

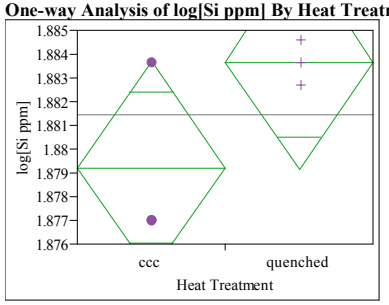
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.94812	0.00728	1.9279	1.9683
quenched	3	1.97564	0.00728	1.9554	1.9958

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-16



One-way Anova
Summary of Fit

Rsquare	0.485291
Adj Rsquare	0.356614
Root Mean Square Error	0.002806
Mean of Response	1.881445
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.00445	t Ratio	1.942004
Std Err Dif	0.00229	DF	4
Upper CL Dif	0.01081	Prob > |t|	0.1241
Lower CL Dif	-0.00191	Prob > t	0.0620
Confidence	0.95	Prob < t	0.9380

Analysis of Variance

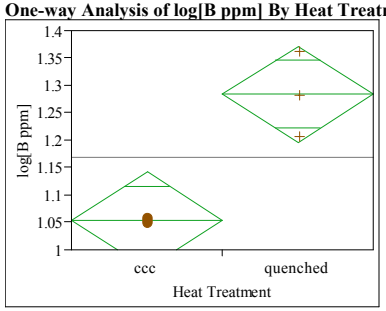
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00002969	0.000030	3.7714	0.1241
Error	4	0.00003149	7.872e-6		
C. Total	5	0.00006118			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.87922	0.00162	1.8747	1.8837
quenched	3	1.88367	0.00162	1.8792	1.8882

Std Error uses a pooled estimate of error variance

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-17



One-way Anova
Summary of Fit

Rsquare	0.86877
Adj Rsquare	0.835963
Root Mean Square Error	0.05484
Mean of Response	1.168499
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.230420	t Ratio	5.145955
Std Err Dif	0.044777	DF	4
Upper CL Dif	0.354741	Prob > |t|	0.0068
Lower CL Dif	0.106099	Prob > t	0.0034
Confidence	0.95	Prob < t	0.9966

Analysis of Variance

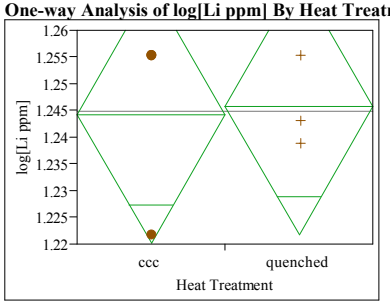
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.07964001	0.079640	26.4808	0.0068
Error	4	0.01202983	0.003007		
C. Total	5	0.09166983			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.05329	0.03166	0.9654	1.1412
quenched	3	1.28371	0.03166	1.1958	1.3716

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-17



One-way Anova
Summary of Fit

Rsquare	0.004294
Adj Rsquare	-0.24463
Root Mean Square Error	0.014916
Mean of Response	1.24494
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.00160	t Ratio	0.131343
Std Err Dif	0.01218	DF	4
Upper CL Dif	0.03541	Prob > |t|	0.9018
Lower CL Dif	-0.03221	Prob > t	0.4509
Confidence	0.95	Prob < t	0.5491

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00000384	3.838e-6	0.0173	0.9018
Error	4	0.00088996	0.000222		
C. Total	5	0.00089380			

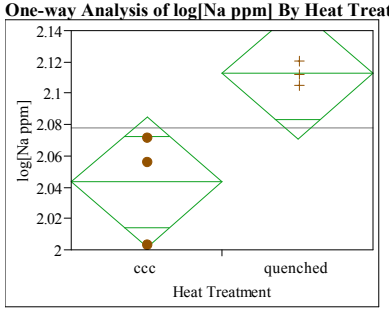
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.24414	0.00861	1.2202	1.2681
quenched	3	1.24574	0.00861	1.2218	1.2696

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-17



One-way Anova
Summary of Fit

Rsquare	0.727192
Adj Rsquare	0.65899
Root Mean Square Error	0.025935
Mean of Response	2.077844
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.069147	t Ratio	3.26532
Std Err Dif	0.021176	DF	4
Upper CL Dif	0.127941	Prob > |t|	0.0309
Lower CL Dif	0.010352	Prob > t	0.0155
Confidence	0.95	Prob < t	0.9845

Analysis of Variance

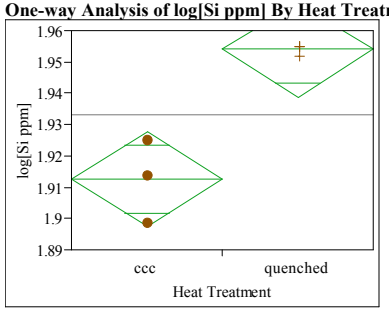
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00717186	0.007172	10.6623	0.0309
Error	4	0.00269054	0.000673		
C. Total	5	0.00986241			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.04327	0.01497	2.0017	2.0848
quenched	3	2.11242	0.01497	2.0708	2.1540

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-17



One-way Anova
Summary of Fit

Rsquare	0.876585
Adj Rsquare	0.845731
Root Mean Square Error	0.009529
Mean of Response	1.933244
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.041473	t Ratio	5.330199
Std Err Dif	0.007781	DF	4
Upper CL Dif	0.063076	Prob > |t|	0.0060
Lower CL Dif	0.019870	Prob > t	0.0030
Confidence	0.95	Prob < t	0.9970

Analysis of Variance

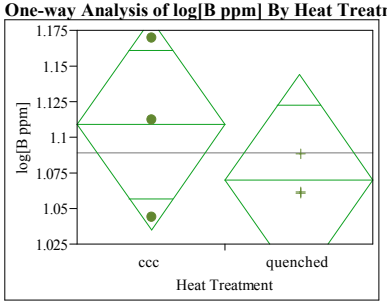
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00258000	0.002580	28.4110	0.0060
Error	4	0.00036324	0.000091		
C. Total	5	0.00294324			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.91251	0.00550	1.8972	1.9278
quenched	3	1.95398	0.00550	1.9387	1.9693

Std Error uses a pooled estimate of error variance

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-18



One-way Anova
Summary of Fit

Rsquare	0.209495
Adj Rsquare	0.011869
Root Mean Square Error	0.045943
Mean of Response	1.08957
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.03862	t Ratio	-1.02959
Std Err Dif	0.03751	DF	4
Upper CL Dif	0.06553	Prob > |t|	0.3614
Lower CL Dif	-0.14277	Prob > t	0.8193
Confidence	0.95	Prob < t	0.1807

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00223750	0.002238	1.0601	0.3614
Error	4	0.00844295	0.002111		
C. Total	5	0.01068045			

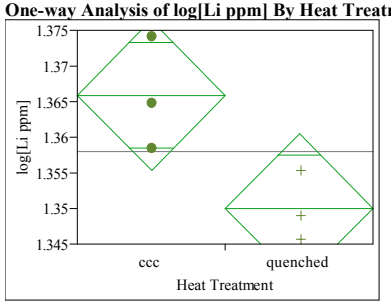
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.10888	0.02653	1.0352	1.1825
quenched	3	1.07026	0.02653	0.9966	1.1439

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-18



One-way Anova
Summary of Fit

Rsquare	0.687333
Adj Rsquare	0.609166
Root Mean Square Error	0.006543
Mean of Response	1.357944
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.01584	t Ratio	-2.96533
Std Err Dif	0.00534	DF	4
Upper CL Dif	-0.00101	Prob > |t|	0.0413
Lower CL Dif	-0.03068	Prob > t	0.9793
Confidence	0.95	Prob < t	0.0207

Analysis of Variance

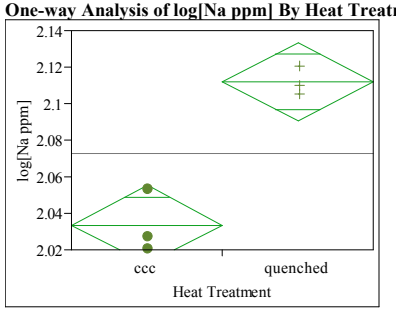
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00037649	0.000376	8.7932	0.0413
Error	4	0.00017127	0.000043		
C. Total	5	0.00054776			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.36587	0.00378	1.3554	1.3764
quenched	3	1.35002	0.00378	1.3395	1.3605

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-18



One-way Anova
Summary of Fit

Rsquare	0.928526
Adj Rsquare	0.910658
Root Mean Square Error	0.013319
Mean of Response	2.072849
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.078395	t Ratio	7.208644
Std Err Dif	0.010875	DF	4
Upper CL Dif	0.108589	Prob > |t|	0.0020
Lower CL Dif	0.048201	Prob > t	0.0010
Confidence	0.95	Prob < t	0.9990

Analysis of Variance

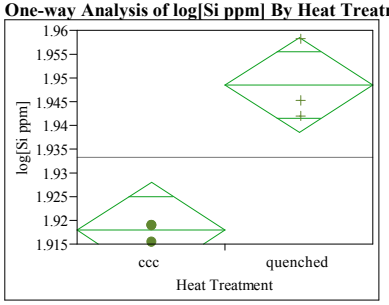
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00921866	0.009219	51.9646	0.0020
Error	4	0.00070961	0.000177		
C. Total	5	0.00992827			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.03365	0.00769	2.0123	2.0550
quenched	3	2.11205	0.00769	2.0907	2.1334

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-18



One-way Anova
Summary of Fit

Rsquare	0.900371
Adj Rsquare	0.875464
Root Mean Square Error	0.006235
Mean of Response	1.933224
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.030609	t Ratio	6.012414
Std Err Dif	0.005091	DF	4
Upper CL Dif	0.044743	Prob > |t|	0.0039
Lower CL Dif	0.016474	Prob > t	0.0019
Confidence	0.95	Prob < t	0.9981

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00140533	0.001405	36.1491	0.0039
Error	4	0.00015550	0.000039		
C. Total	5	0.00156083			

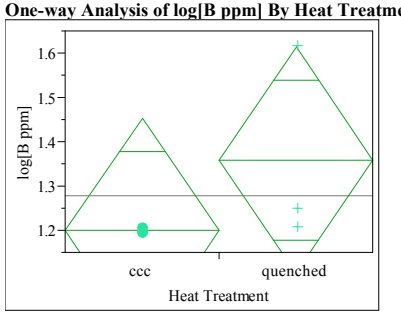
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.91792	0.00360	1.9079	1.9279
quenched	3	1.94853	0.00360	1.9385	1.9585

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-19



One-way Anova
Summary of Fit

Rsquare	0.275666
Adj Rsquare	0.094582
Root Mean Square Error	0.158605
Mean of Response	1.278687
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.15978	t Ratio	1.23382
Std Err Dif	0.12950	DF	4
Upper CL Dif	0.51933	Prob > |t|	0.2848
Lower CL Dif	-0.19977	Prob > t	0.1424
Confidence	0.95	Prob < t	0.8576

Analysis of Variance

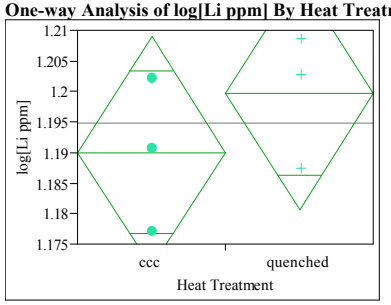
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.03829477	0.038295	1.5223	0.2848
Error	4	0.10062270	0.025156		
C. Total	5	0.13891747			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.19880	0.09157	0.9446	1.4530
quenched	3	1.35858	0.09157	1.1043	1.6128

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-19



One-way Anova
Summary of Fit

Rsquare	0.198216
Adj Rsquare	-0.00223
Root Mean Square Error	0.011799
Mean of Response	1.194852
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.00958	t Ratio	0.994422
Std Err Dif	0.00963	DF	4
Upper CL Dif	0.03633	Prob > |t|	0.3763
Lower CL Dif	-0.01717	Prob > t	0.1882
Confidence	0.95	Prob < t	0.8118

Analysis of Variance

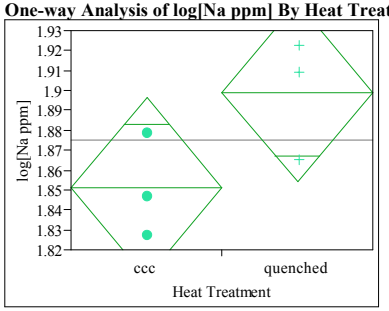
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00013768	0.000138	0.9889	0.3763
Error	4	0.00055691	0.000139		
C. Total	5	0.00069459			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.19006	0.00681	1.1711	1.2090
quenched	3	1.19964	0.00681	1.1807	1.2186

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-19



One-way Anova
Summary of Fit

Rsquare	0.52241
Adj Rsquare	0.403013
Root Mean Square Error	0.028107
Mean of Response	1.875084
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.04800	t Ratio	2.091742
Std Err Dif	0.02295	DF	4
Upper CL Dif	0.11172	Prob > |t|	0.1046
Lower CL Dif	-0.01571	Prob > t	0.0523
Confidence	0.95	Prob < t	0.9477

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00345658	0.003457	4.3754	0.1046
Error	4	0.00316002	0.000790		
C. Total	5	0.00661660			

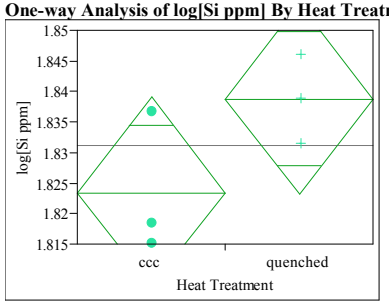
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.85108	0.01623	1.8060	1.8961
quenched	3	1.89909	0.01623	1.8540	1.9441

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-19



One-way Anova
Summary of Fit

Rsquare	0.483161
Adj Rsquare	0.353951
Root Mean Square Error	0.009732
Mean of Response	1.831134
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.01537	t Ratio	1.93374
Std Err Dif	0.00795	DF	4
Upper CL Dif	0.03743	Prob > |t|	0.1253
Lower CL Dif	-0.00670	Prob > t	0.0626
Confidence	0.95	Prob < t	0.9374

Analysis of Variance

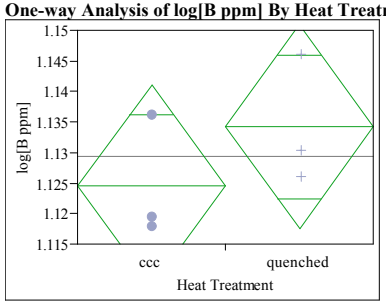
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00035415	0.000354	3.7394	0.1253
Error	4	0.00037883	0.000095		
C. Total	5	0.00073298			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.82345	0.00562	1.8079	1.8391
quenched	3	1.83882	0.00562	1.8232	1.8544

Std Error uses a pooled estimate of error variance

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-20



One-way Anova
Summary of Fit

Rsquare	0.245495
Adj Rsquare	0.056869
Root Mean Square Error	0.010375
Mean of Response	1.129338
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.00966	t Ratio	1.140828
Std Err Dif	0.00847	DF	4
Upper CL Dif	0.03319	Prob > |t|	0.3176
Lower CL Dif	-0.01386	Prob > t	0.1588
Confidence	0.95	Prob < t	0.8412

Analysis of Variance

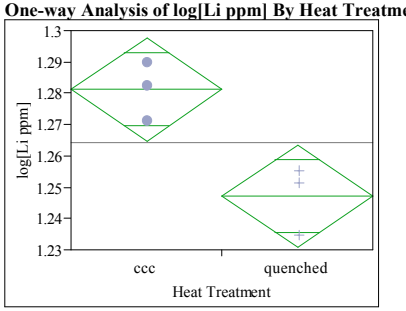
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00014011	0.000140	1.3015	0.3176
Error	4	0.00043060	0.000108		
C. Total	5	0.00057071			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.12451	0.00599	1.1079	1.1411
quenched	3	1.13417	0.00599	1.1175	1.1508

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-20



One-way Anova
Summary of Fit

Rsquare	0.806221
Adj Rsquare	0.757777
Root Mean Square Error	0.010253
Mean of Response	1.264149
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.03415	t Ratio	-4.07947
Std Err Dif	0.00837	DF	4
Upper CL Dif	-0.01091	Prob > |t|	0.0151
Lower CL Dif	-0.05740	Prob > t	0.9924
Confidence	0.95	Prob < t	0.0076

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00174957	0.001750	16.6421	0.0151
Error	4	0.00042052	0.000105		
C. Total	5	0.00217009			

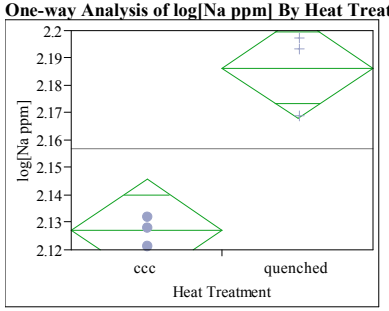
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.28122	0.00592	1.2648	1.2977
quenched	3	1.24707	0.00592	1.2306	1.2635

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-20



One-way Anova
Summary of Fit

Rsquare	0.908122
Adj Rsquare	0.885152
Root Mean Square Error	0.011554
Mean of Response	2.156749
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.059317	t Ratio	6.287764
Std Err Dif	0.009434	DF	4
Upper CL Dif	0.085510	Prob > |t|	0.0033
Lower CL Dif	0.033125	Prob > t	0.0016
Confidence	0.95	Prob < t	0.9984

Analysis of Variance

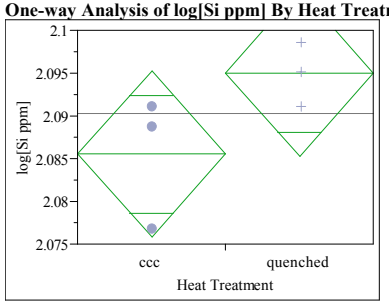
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00527783	0.005278	39.5360	0.0033
Error	4	0.00053398	0.000133		
C. Total	5	0.00581181			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.12709	0.00667	2.1086	2.1456
quenched	3	2.18641	0.00667	2.1679	2.2049

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-20



One-way Anova
Summary of Fit

Rsquare	0.477065
Adj Rsquare	0.346332
Root Mean Square Error	0.006053
Mean of Response	2.090252
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.00944	t Ratio	1.910272
Std Err Dif	0.00494	DF	4
Upper CL Dif	0.02316	Prob > |t|	0.1287
Lower CL Dif	-0.00428	Prob > t	0.0644
Confidence	0.95	Prob < t	0.9356

Analysis of Variance

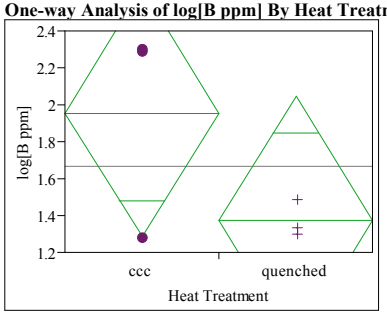
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00013372	0.000134	3.6491	0.1287
Error	4	0.00014657	0.000037		
C. Total	5	0.00028029			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.08553	0.00349	2.0758	2.0952
quenched	3	2.09497	0.00349	2.0853	2.1047

Std Error uses a pooled estimate of error variance

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-21



One-way Anova
Summary of Fit

Rsquare	0.420973
Adj Rsquare	0.276217
Root Mean Square Error	0.418012
Mean of Response	1.664406
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.5820	t Ratio	-1.70533
Std Err Dif	0.3413	DF	4
Upper CL Dif	0.3656	Prob > |t|	0.1633
Lower CL Dif	-1.5297	Prob > t	0.9183
Confidence	0.95	Prob < t	0.0817

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.5081524	0.508152	2.9081	0.1633
Error	4	0.6989366	0.174734		
C. Total	5	1.2070890			

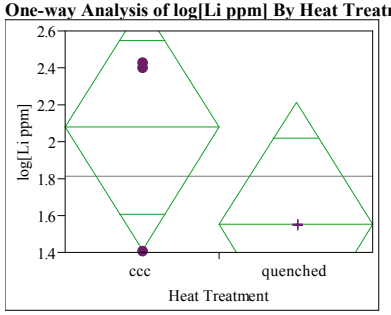
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.95543	0.24134	1.2854	2.6255
quenched	3	1.37339	0.24134	0.7033	2.0435

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-21



One-way Anova
Summary of Fit

Rsquare	0.378484
Adj Rsquare	0.223105
Root Mean Square Error	0.412893
Mean of Response	1.814658
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.5262	t Ratio	-1.56073
Std Err Dif	0.3371	DF	4
Upper CL Dif	0.4098	Prob > |t|	0.1936
Lower CL Dif	-1.4622	Prob > t	0.9032
Confidence	0.95	Prob < t	0.0968

Analysis of Variance

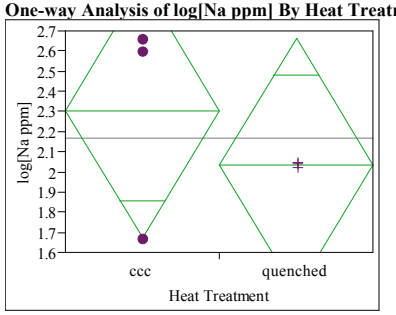
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.4152702	0.415270	2.4359	0.1936
Error	4	0.6819241	0.170481		
C. Total	5	1.0971943			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.07774	0.23838	1.4159	2.7396
quenched	3	1.55158	0.23838	0.8897	2.2134

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-21



One-way Anova
Summary of Fit

Rsquare	0.150443
Adj Rsquare	-0.06195
Root Mean Square Error	0.39352
Mean of Response	2.170498
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.2704	t Ratio	-0.84163
Std Err Dif	0.3213	DF	4
Upper CL Dif	0.6217	Prob > |t|	0.4474
Lower CL Dif	-1.1625	Prob > t	0.7763
Confidence	0.95	Prob < t	0.2237

Analysis of Variance

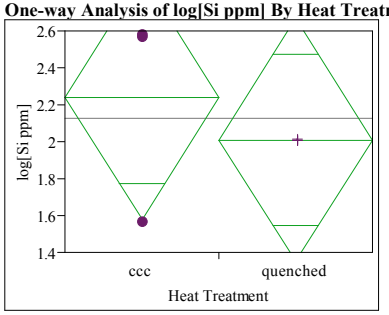
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.10969149	0.109691	0.7083	0.4474
Error	4	0.61943210	0.154858		
C. Total	5	0.72912358			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.30571	0.22720	1.6749	2.9365
quenched	3	2.03529	0.22720	1.4045	2.6661

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-21



One-way Anova
Summary of Fit

Rsquare	0.104835
Adj Rsquare	-0.11896
Root Mean Square Error	0.410238
Mean of Response	2.123473
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.2293	t Ratio	-0.68444
Std Err Dif	0.3350	DF	4
Upper CL Dif	0.7007	Prob > |t|	0.5313
Lower CL Dif	-1.1592	Prob > t	0.7344
Confidence	0.95	Prob < t	0.2656

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.07883811	0.078838	0.4685	0.5313
Error	4	0.67317998	0.168295		
C. Total	5	0.75201809			

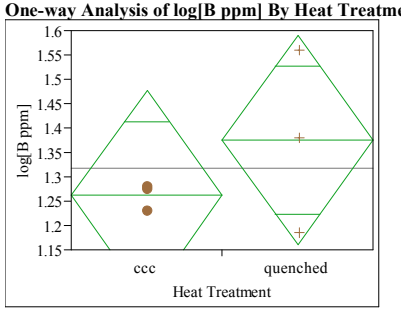
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.23810	0.23685	1.5805	2.8957
quenched	3	2.00884	0.23685	1.3512	2.6664

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-22



One-way Anova
Summary of Fit

Rsquare	0.212102
Adj Rsquare	0.015128
Root Mean Square Error	0.134187
Mean of Response	1.318232
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.11369	t Ratio	1.03769
Std Err Dif	0.10956	DF	4
Upper CL Dif	0.41789	Prob > |t|	0.3580
Lower CL Dif	-0.19050	Prob > t	0.1790
Confidence	0.95	Prob < t	0.8210

Analysis of Variance

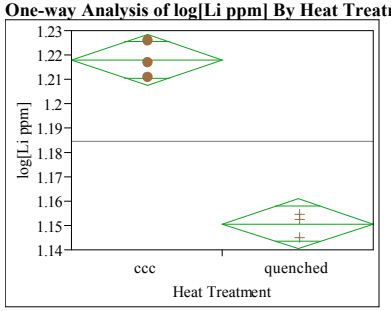
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.01938906	0.019389	1.0768	0.3580
Error	4	0.07202463	0.018006		
C. Total	5	0.09141368			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.26139	0.07747	1.0463	1.4765
quenched	3	1.37508	0.07747	1.1600	1.5902

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-22



One-way Anova
Summary of Fit

Rsquare	0.976288
Adj Rsquare	0.97036
Root Mean Square Error	0.006438
Mean of Response	1.184304
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.06745	t Ratio	-12.8333
Std Err Dif	0.00526	DF	4
Upper CL Dif	-0.05286	Prob > |t|	0.0002
Lower CL Dif	-0.08205	Prob > t	0.9999
Confidence	0.95	Prob < t	0.0001

Analysis of Variance

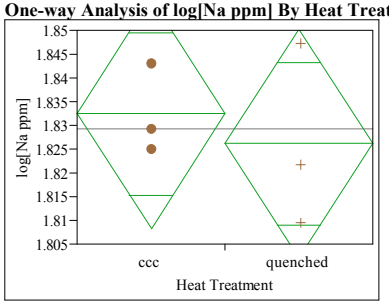
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00682526	0.006825	164.6924	0.0002
Error	4	0.00016577	0.000041		
C. Total	5	0.00699103			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.21803	0.00372	1.2077	1.2284
quenched	3	1.15058	0.00372	1.1403	1.1609

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-22



One-way Anova
Summary of Fit

Rsquare	0.060994
Adj Rsquare	-0.17376
Root Mean Square Error	0.015113
Mean of Response	1.829304
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.00629	t Ratio	-0.50973
Std Err Dif	0.01234	DF	4
Upper CL Dif	0.02797	Prob > |t|	0.6371
Lower CL Dif	-0.04055	Prob > t	0.6815
Confidence	0.95	Prob < t	0.3185

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00005934	0.000059	0.2598	0.6371
Error	4	0.00091356	0.000228		
C. Total	5	0.00097290			

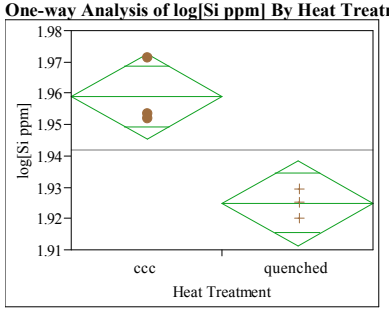
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.83245	0.00873	1.8082	1.8567
quenched	3	1.82616	0.00873	1.8019	1.8504

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-22



One-way Anova
Summary of Fit

Rsquare	0.8593
Adj Rsquare	0.824125
Root Mean Square Error	0.008453
Mean of Response	1.941901
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.03411	t Ratio	-4.9426
Std Err Dif	0.00690	DF	4
Upper CL Dif	-0.01495	Prob > |t|	0.0078
Lower CL Dif	-0.05327	Prob > t	0.9961
Confidence	0.95	Prob < t	0.0039

Analysis of Variance

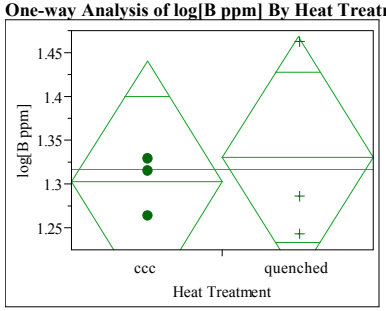
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00174549	0.001745	24.4293	0.0078
Error	4	0.00028580	0.000071		
C. Total	5	0.00203129			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.95896	0.00488	1.9454	1.9725
quenched	3	1.92484	0.00488	1.9113	1.9384

Std Error uses a pooled estimate of error variance

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-23



One-way Anova
Summary of Fit

Rsquare	0.038601
Adj Rsquare	-0.20175
Root Mean Square Error	0.085746
Mean of Response	1.316561
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.02806	t Ratio	0.400756
Std Err Dif	0.07001	DF	4
Upper CL Dif	0.22244	Prob > |t|	0.7091
Lower CL Dif	-0.16632	Prob > t	0.3545
Confidence	0.95	Prob < t	0.6455

Analysis of Variance

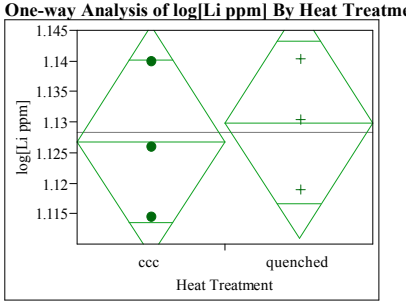
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00118083	0.001181	0.1606	0.7091
Error	4	0.02940938	0.007352		
C. Total	5	0.03059021			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.30253	0.04951	1.1651	1.4400
quenched	3	1.33059	0.04951	1.1931	1.4680

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-23



One-way Anova
Summary of Fit

Rsquare	0.025156
Adj Rsquare	-0.21855
Root Mean Square Error	0.011768
Mean of Response	1.128353
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.00309	t Ratio	0.321282
Std Err Dif	0.00961	DF	4
Upper CL Dif	0.02976	Prob > |t|	0.7641
Lower CL Dif	-0.02359	Prob > t	0.3820
Confidence	0.95	Prob < t	0.6180

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00001429	0.000014	0.1032	0.7641
Error	4	0.00055390	0.000138		
C. Total	5	0.00056820			

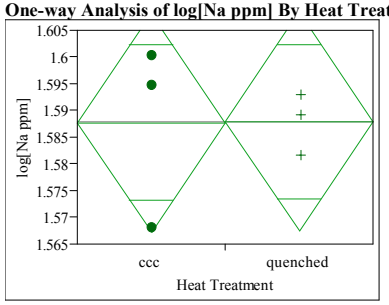
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.12681	0.00679	1.1079	1.1457
quenched	3	1.12990	0.00679	1.1110	1.1488

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-23



One-way Anova
Summary of Fit

Rsquare	9.078e-5
Adj Rsquare	-0.24989
Root Mean Square Error	0.012776
Mean of Response	1.587844
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.00020	t Ratio	0.019056
Std Err Dif	0.01043	DF	4
Upper CL Dif	0.02916	Prob > |t|	0.9857
Lower CL Dif	-0.02876	Prob > t	0.4929
Confidence	0.95	Prob < t	0.5071

Analysis of Variance

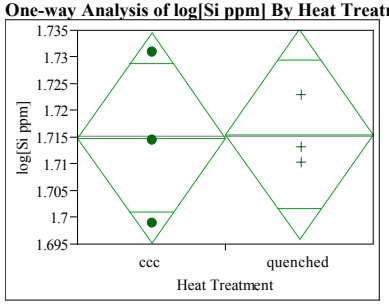
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	5.92796e-8	5.928e-8	0.0004	0.9857
Error	4	0.00065295	0.000163		
C. Total	5	0.00065301			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.58775	0.00738	1.5673	1.6082
quenched	3	1.58794	0.00738	1.5675	1.6084

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-23



One-way Anova
Summary of Fit

Rsquare	0.000987
Adj Rsquare	-0.24877
Root Mean Square Error	0.012256
Mean of Response	1.7152
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.00063	t Ratio	0.062873
Std Err Dif	0.01001	DF	4
Upper CL Dif	0.02841	Prob > |t|	0.9529
Lower CL Dif	-0.02715	Prob > t	0.4764
Confidence	0.95	Prob < t	0.5236

Analysis of Variance

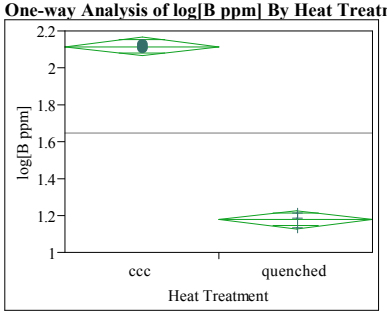
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00000059	5.938e-7	0.0040	0.9529
Error	4	0.00060085	0.000150		
C. Total	5	0.00060144			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.71489	0.00708	1.6952	1.7345
quenched	3	1.71551	0.00708	1.6959	1.7352

Std Error uses a pooled estimate of error variance

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-24



One-way Anova
Summary of Fit

Rsquare	0.997015
Adj Rsquare	0.996269
Root Mean Square Error	0.031409
Mean of Response	1.647732
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.9374	t Ratio	-36.5514
Std Err Dif	0.0256	DF	4
Upper CL Dif	-0.8662	Prob > |t|	<.0001
Lower CL Dif	-1.0086	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	1.3180267	1.31803	1336.002	<.0001
Error	4	0.0039462	0.00099		
C. Total	5	1.3219729			

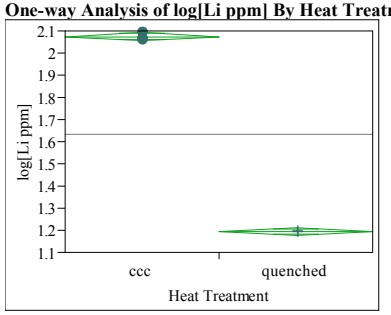
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.11642	0.01813	2.0661	2.1668
quenched	3	1.17904	0.01813	1.1287	1.2294

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-24



One-way Anova
Summary of Fit

Rsquare	0.999567
Adj Rsquare	0.999459
Root Mean Square Error	0.011215
Mean of Response	1.635047
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.87983	t Ratio	-96.0808
Std Err Dif	0.00916	DF	4
Upper CL Dif	-0.85440	Prob > |t|	<.0001
Lower CL Dif	-0.90525	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

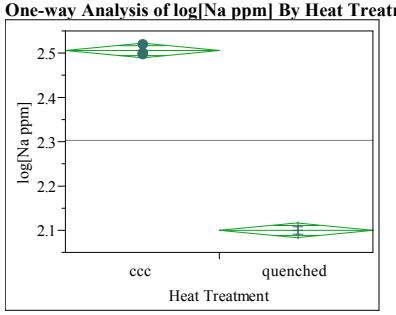
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	1.1611435	1.16114	9231.514	<.0001
Error	4	0.0005031	0.00013		
C. Total	5	1.1616466			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.07496	0.00648	2.0570	2.0929
quenched	3	1.19513	0.00648	1.1772	1.2131

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-24



One-way Anova
Summary of Fit

Rsquare	0.998369
Adj Rsquare	0.997962
Root Mean Square Error	0.01005
Mean of Response	2.30278
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.40607	t Ratio	-49.4886
Std Err Dif	0.00821	DF	4
Upper CL Dif	-0.38329	Prob > |t|	<.0001
Lower CL Dif	-0.42886	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

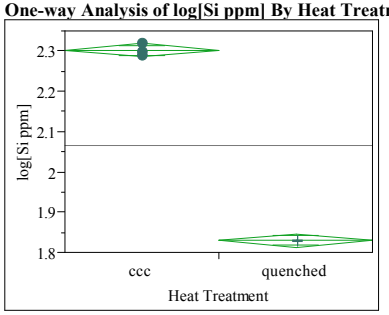
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.24734461	0.247345	2449.126	<.0001
Error	4	0.00040397	0.000101		
C. Total	5	0.24774858			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.50582	0.00580	2.4897	2.5219
quenched	3	2.09974	0.00580	2.0836	2.1159

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-24



One-way Anova
Summary of Fit

Rsquare	0.998656
Adj Rsquare	0.99832
Root Mean Square Error	0.010613
Mean of Response	2.06587
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.47240	t Ratio	-54.5143
Std Err Dif	0.00867	DF	4
Upper CL Dif	-0.44834	Prob > |t|	<.0001
Lower CL Dif	-0.49646	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.33474833	0.334748	2971.807	<.0001
Error	4	0.00045057	0.000113		
C. Total	5	0.33519889			

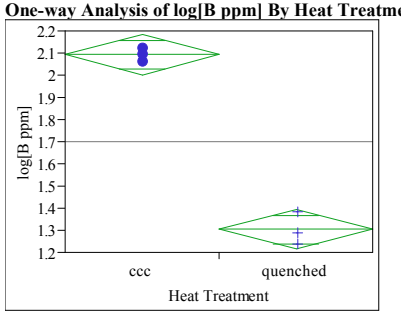
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.30207	0.00613	2.2851	2.3191
quenched	3	1.82967	0.00613	1.8127	1.8467

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-25



One-way Anova
Summary of Fit

Rsquare	0.986615
Adj Rsquare	0.983269
Root Mean Square Error	0.056182
Mean of Response	1.697889
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.78767	t Ratio	-17.171
Std Err Dif	0.04587	DF	4
Upper CL Dif	-0.66031	Prob > |t|	<.0001
Lower CL Dif	-0.91503	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

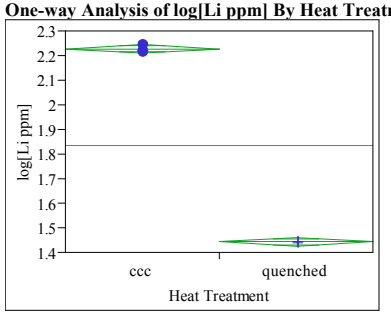
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.93063860	0.930639	294.8432	<.0001
Error	4	0.01262554	0.003156		
C. Total	5	0.94326414			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.09172	0.03244	2.0017	2.1818
quenched	3	1.30405	0.03244	1.2140	1.3941

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-25



One-way Anova
Summary of Fit

Rsquare	0.999463
Adj Rsquare	0.999329
Root Mean Square Error	0.011094
Mean of Response	1.834632
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.78188	t Ratio	-86.3168
Std Err Dif	0.00906	DF	4
Upper CL Dif	-0.75673	Prob > |t|	<.0001
Lower CL Dif	-0.80703	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

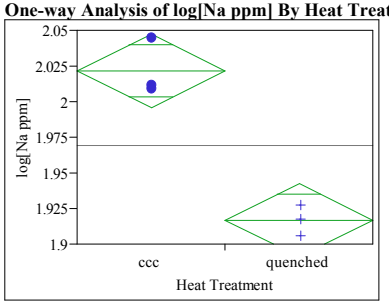
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.91699682	0.916997	7450.587	<.0001
Error	4	0.00049231	0.000123		
C. Total	5	0.91748913			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.22557	0.00641	2.2078	2.2434
quenched	3	1.44369	0.00641	1.4259	1.4615

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-25



One-way Anova
Summary of Fit

Rsquare	0.941379
Adj Rsquare	0.926723
Root Mean Square Error	0.016024
Mean of Response	1.969383
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.10486	t Ratio	-8.01465
Std Err Dif	0.01308	DF	4
Upper CL Dif	-0.06853	Prob > |t|	0.0013
Lower CL Dif	-0.14118	Prob > t	0.9993
Confidence	0.95	Prob < t	0.0007

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.01649241	0.016492	64.2345	0.0013
Error	4	0.00102701	0.000257		
C. Total	5	0.01751943			

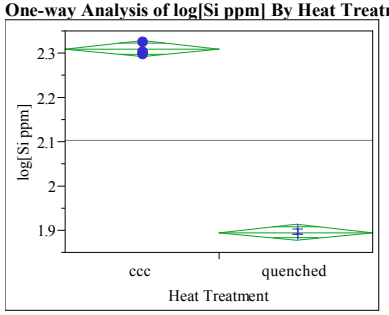
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.02181	0.00925	1.9961	2.0475
quenched	3	1.91695	0.00925	1.8913	1.9426

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-25



One-way Anova
Summary of Fit

Rsquare	0.997958
Adj Rsquare	0.997447
Root Mean Square Error	0.011444
Mean of Response	2.102322
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.41311	t Ratio	-44.2102
Std Err Dif	0.00934	DF	4
Upper CL Dif	-0.38717	Prob > |t|	<.0001
Lower CL Dif	-0.43905	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

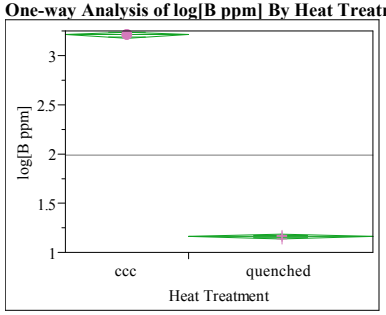
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.25598857	0.255989	1954.541	<.0001
Error	4	0.00052388	0.000131		
C. Total	5	0.25651245			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.30888	0.00661	2.2905	2.3272
quenched	3	1.89577	0.00661	1.8774	1.9141

Std Error uses a pooled estimate of error variance

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-26



Excluded Rows 1
One-way Anova
Summary of Fit

Rsquare	0.999884
Adj Rsquare	0.999845
Root Mean Square Error	0.013974
Mean of Response	1.981745
Observations (or Sum Wgts)	5

t Test
quenched-ccc

Assuming equal variances

Difference	-2.0482	t Ratio	-160.561
Std Err Dif	0.0128	DF	3
Upper CL Dif	-2.0076	Prob > |t|	<.0001
Lower CL Dif	-2.0887	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

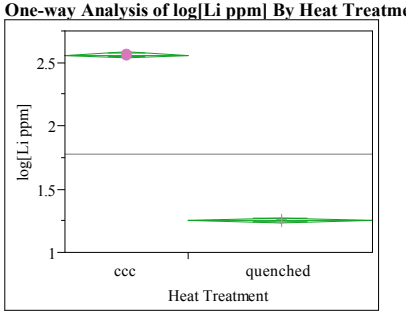
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	5.0339140	5.03391	25779.77	<.0001
Error	3	0.0005858	0.00020		
C. Total	4	5.0344998			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	2	3.21064	0.00988	3.1792	3.2421
quenched	3	1.16248	0.00807	1.1368	1.1882

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-26



Excluded Rows 1
One-way Anova
Summary of Fit

Rsquare	0.999848
Adj Rsquare	0.999797
Root Mean Square Error	0.010178
Mean of Response	1.778026
Observations (or Sum Wgts)	5

t Test
quenched-ccc

Assuming equal variances

Difference	-1.3038	t Ratio	-140.333
Std Err Dif	0.0093	DF	3
Upper CL Dif	-1.2742	Prob > |t|	<.0001
Lower CL Dif	-1.3334	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	2.0398911	2.03989	19693.27	<.0001
Error	3	0.0003107	0.00010		
C. Total	4	2.0402018			

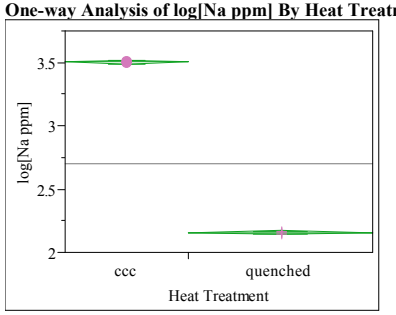
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	2	2.56031	0.00720	2.5374	2.5832
quenched	3	1.25650	0.00588	1.2378	1.2752

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-26



Excluded Rows 1

One-way Anova
Summary of Fit

Rsquare	0.999914
Adj Rsquare	0.999885
Root Mean Square Error	0.007894
Mean of Response	2.695532
Observations (or Sum Wgts)	5

t Test
quenched-ccc

Assuming equal variances

Difference	-1.3456	t Ratio	-186.736
Std Err Dif	0.0072	DF	3
Upper CL Dif	-1.3227	Prob > |t|	<.0001
Lower CL Dif	-1.3685	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

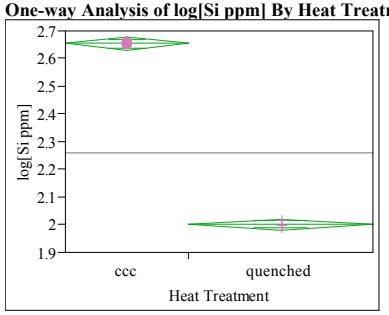
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	2.1727289	2.17273	34870.36	<.0001
Error	3	0.0001869	6.231e-5		
C. Total	4	2.1729158			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	2	3.50288	0.00558	3.4851	3.5206
quenched	3	2.15730	0.00456	2.1428	2.1718

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-26



Excluded Rows 1

One-way Anova
Summary of Fit

Rsquare	0.999345
Adj Rsquare	0.999126
Root Mean Square Error	0.010581
Mean of Response	2.261972
Observations (or Sum Wgts)	5

t Test
quenched-ccc

Assuming equal variances

Difference	-0.65339	t Ratio	-67.6467
Std Err Dif	0.00966	DF	3
Upper CL Dif	-0.62265	Prob > |t|	<.0001
Lower CL Dif	-0.68413	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

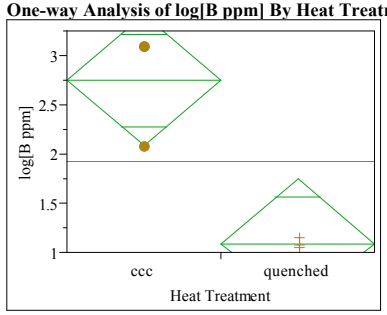
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.51230367	0.512304	4576.072	<.0001
Error	3	0.00033586	0.000112		
C. Total	4	0.51263952			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	2	2.65401	0.00748	2.6302	2.6778
quenched	3	2.00062	0.00611	1.9812	2.0201

Std Error uses a pooled estimate of error variance

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-27



One-way Anova
Summary of Fit

Rsquare	0.857787
Adj Rsquare	0.822234
Root Mean Square Error	0.412629
Mean of Response	1.920614
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-1.6549	t Ratio	-4.91191
Std Err Dif	0.3369	DF	4
Upper CL Dif	-0.7195	Prob > |t|	0.0080
Lower CL Dif	-2.5903	Prob > t	0.9960
Confidence	0.95	Prob < t	0.0040

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	4.1078976	4.10790	24.1268	0.0080
Error	4	0.6810501	0.17026		
C. Total	5	4.7889477			

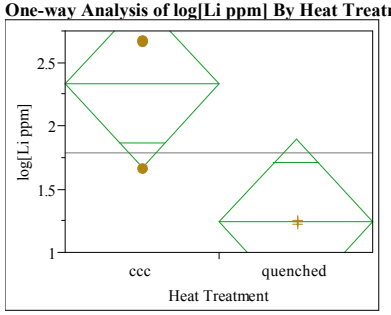
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.74805	0.23823	2.0866	3.4095
quenched	3	1.09318	0.23823	0.4317	1.7546

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-27



One-way Anova
Summary of Fit

Rsquare	0.726395
Adj Rsquare	0.657993
Root Mean Square Error	0.40966
Mean of Response	1.786509
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-1.0900	t Ratio	-3.25877
Std Err Dif	0.3345	DF	4
Upper CL Dif	-0.1613	Prob > |t|	0.0311
Lower CL Dif	-2.0187	Prob > t	0.9844
Confidence	0.95	Prob < t	0.0156

Analysis of Variance

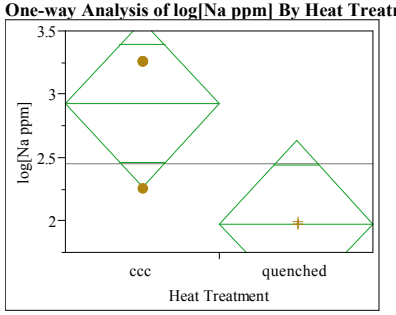
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	1.7821955	1.78220	10.6196	0.0311
Error	4	0.6712857	0.16782		
C. Total	5	2.4534812			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.33152	0.23652	1.6748	2.9882
quenched	3	1.24150	0.23652	0.5848	1.8982

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-27



One-way Anova
Summary of Fit

Rsquare	0.664243
Adj Rsquare	0.580304
Root Mean Square Error	0.411581
Mean of Response	2.450597
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.9453	t Ratio	-2.81307
Std Err Dif	0.3361	DF	4
Upper CL Dif	-0.0123	Prob > |t|	0.0482
Lower CL Dif	-1.8784	Prob > t	0.9759
Confidence	0.95	Prob < t	0.0241

Analysis of Variance

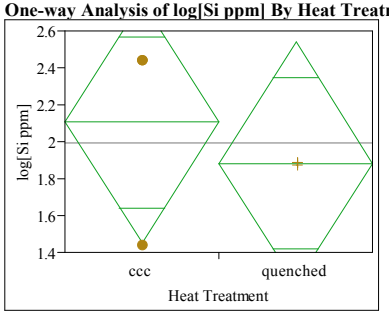
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	1.3405171	1.34052	7.9134	0.0482
Error	4	0.6775943	0.16940		
C. Total	5	2.0181114			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.92327	0.23763	2.2635	3.5830
quenched	3	1.97792	0.23763	1.3182	2.6377

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-27



One-way Anova
Summary of Fit

Rsquare	0.100622
Adj Rsquare	-0.12422
Root Mean Square Error	0.408286
Mean of Response	1.994498
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.2230	t Ratio	-0.66897
Std Err Dif	0.3334	DF	4
Upper CL Dif	0.7026	Prob > |t|	0.5401
Lower CL Dif	-1.1486	Prob > t	0.7299
Confidence	0.95	Prob < t	0.2701

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.07460010	0.074600	0.4475	0.5401
Error	4	0.66679017	0.166698		
C. Total	5	0.74139027			

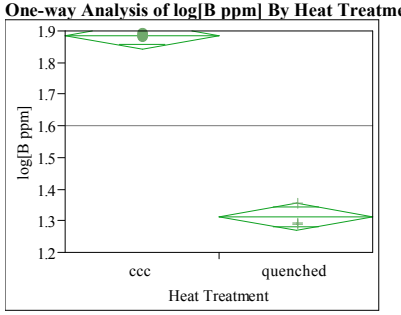
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.10600	0.23572	1.4515	2.7605
quenched	3	1.88299	0.23572	1.2285	2.5375

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-28



One-way Anova
Summary of Fit

Rsquare	0.994383
Adj Rsquare	0.992979
Root Mean Square Error	0.026334
Mean of Response	1.599137
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.57215	t Ratio	-26.6102
Std Err Dif	0.02150	DF	4
Upper CL Dif	-0.51246	Prob > |t|	<.0001
Lower CL Dif	-0.63185	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

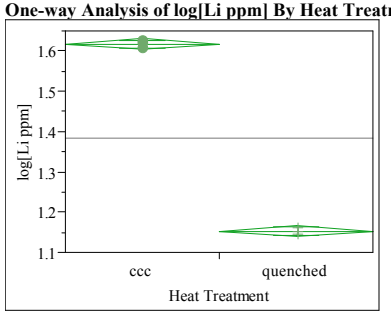
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.49104096	0.491041	708.1040	<.0001
Error	4	0.00277384	0.000693		
C. Total	5	0.49381480			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.88521	0.01520	1.8430	1.9274
quenched	3	1.31306	0.01520	1.2708	1.3553

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-28



One-way Anova
Summary of Fit

Rsquare	0.999154
Adj Rsquare	0.998943
Root Mean Square Error	0.008266
Mean of Response	1.385427
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.46395	t Ratio	-68.7393
Std Err Dif	0.00675	DF	4
Upper CL Dif	-0.44521	Prob > |t|	<.0001
Lower CL Dif	-0.48269	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

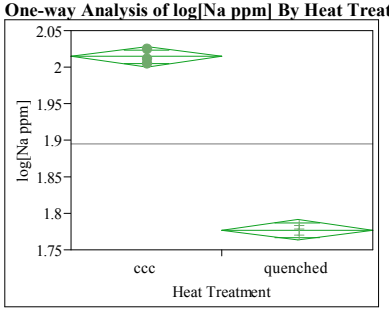
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.32287834	0.322878	4725.094	<.0001
Error	4	0.00027333	0.000068		
C. Total	5	0.32315167			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.61740	0.00477	1.6042	1.6307
quenched	3	1.15345	0.00477	1.1402	1.1667

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-28



One-way Anova
Summary of Fit

Rsquare	0.996428
Adj Rsquare	0.995535
Root Mean Square Error	0.008699
Mean of Response	1.895542
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.23725	t Ratio	-33.4038
Std Err Dif	0.00710	DF	4
Upper CL Dif	-0.21753	Prob > |t|	<.0001
Lower CL Dif	-0.25697	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.08443191	0.084432	1115.813	<.0001
Error	4	0.00030267	0.000076		
C. Total	5	0.08473458			

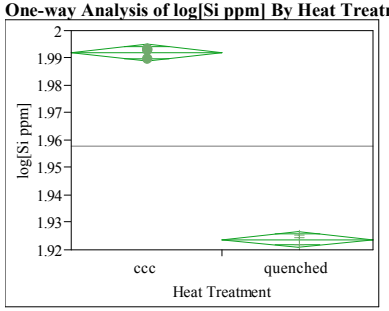
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.01417	0.00502	2.0002	2.0281
quenched	3	1.77692	0.00502	1.7630	1.7909

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-28



One-way Anova
Summary of Fit

Rsquare	0.997988
Adj Rsquare	0.997485
Root Mean Square Error	0.001877
Mean of Response	1.95784
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.06826	t Ratio	-44.5401
Std Err Dif	0.00153	DF	4
Upper CL Dif	-0.06400	Prob > |t|	<.0001
Lower CL Dif	-0.07251	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001

Analysis of Variance

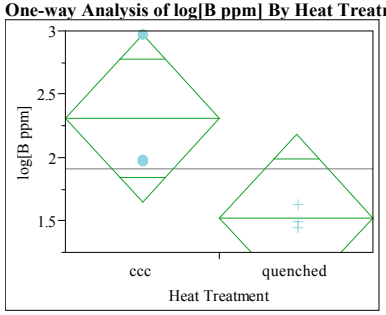
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.00698897	0.006989	1983.816	<.0001
Error	4	0.00001409	3.523e-6		
C. Total	5	0.00700306			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.99197	0.00108	1.9890	1.9950
quenched	3	1.92371	0.00108	1.9207	1.9267

Std Error uses a pooled estimate of error variance

One-way Analysis of log[B ppm] By Heat Treatment Glass ID=NE3-29



One-way Anova
Summary of Fit

Rsquare	0.577305
Adj Rsquare	0.471631
Root Mean Square Error	0.412576
Mean of Response	1.915338
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.7874	t Ratio	-2.33732
Std Err Dif	0.3369	DF	4
Upper CL Dif	0.1479	Prob > |t|	0.0796
Lower CL Dif	-1.7227	Prob > t	0.9602
Confidence	0.95	Prob < t	0.0398

Analysis of Variance

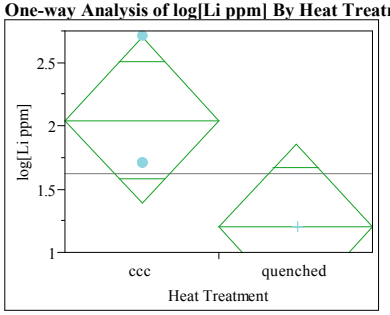
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.9299203	0.929920	5.4631	0.0796
Error	4	0.6808763	0.170219		
C. Total	5	1.6107966			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.30902	0.23820	1.6477	2.9704
quenched	3	1.52165	0.23820	0.8603	2.1830

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Li ppm] By Heat Treatment Glass ID=NE3-29



One-way Anova
Summary of Fit

Rsquare	0.612395
Adj Rsquare	0.515494
Root Mean Square Error	0.409123
Mean of Response	1.623853
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.8398	t Ratio	-2.51392
Std Err Dif	0.3340	DF	4
Upper CL Dif	0.0877	Prob > |t|	0.0658
Lower CL Dif	-1.7672	Prob > t	0.9671
Confidence	0.95	Prob < t	0.0329

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	1.0578152	1.05782	6.3198	0.0658
Error	4	0.6695264	0.16738		
C. Total	5	1.7273416			

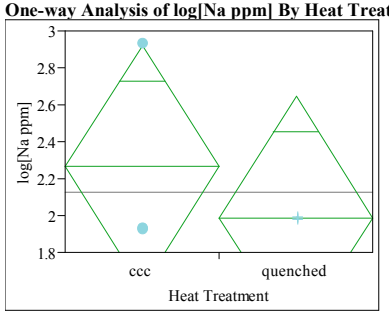
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.04374	0.23621	1.3879	2.6996
quenched	3	1.20397	0.23621	0.5482	1.8598

Std Error uses a pooled estimate of error variance

Exhibit B5. Effects of Heat Treatment (HT) on PCT log(ppm) Response of Study Glasses (continued)

One-way Analysis of log[Na ppm] By Heat Treatment Glass ID=NE3-29



One-way Anova
Summary of Fit

Rsquare	0.146181
Adj Rsquare	-0.06727
Root Mean Square Error	0.410537
Mean of Response	2.125456
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	-0.2774	t Ratio	-0.82755
Std Err Dif	0.3352	DF	4
Upper CL Dif	0.6533	Prob > |t|	0.4544
Lower CL Dif	-1.2081	Prob > t	0.7728
Confidence	0.95	Prob < t	0.2272

Analysis of Variance

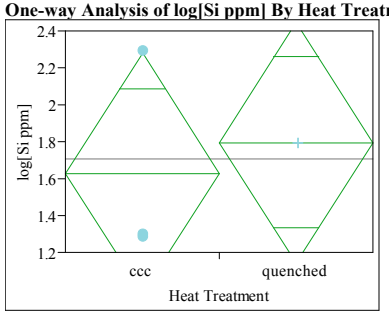
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.11542209	0.115422	0.6848	0.4544
Error	4	0.67416364	0.168541		
C. Total	5	0.78958573			

Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	2.26415	0.23702	1.6061	2.9222
quenched	3	1.98676	0.23702	1.3287	2.6448

Std Error uses a pooled estimate of error variance

One-way Analysis of log[Si ppm] By Heat Treatment Glass ID=NE3-29



One-way Anova
Summary of Fit

Rsquare	0.059582
Adj Rsquare	-0.17552
Root Mean Square Error	0.409038
Mean of Response	1.709885
Observations (or Sum Wgts)	6

t Test
quenched-ccc

Assuming equal variances

Difference	0.1681	t Ratio	0.503416
Std Err Dif	0.3340	DF	4
Upper CL Dif	1.0954	Prob > |t|	0.6411
Lower CL Dif	-0.7591	Prob > t	0.3206
Confidence	0.95	Prob < t	0.6794

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Heat Treatment	1	0.04240152	0.042402	0.2534	0.6411
Error	4	0.66924830	0.167312		
C. Total	5	0.71164982			

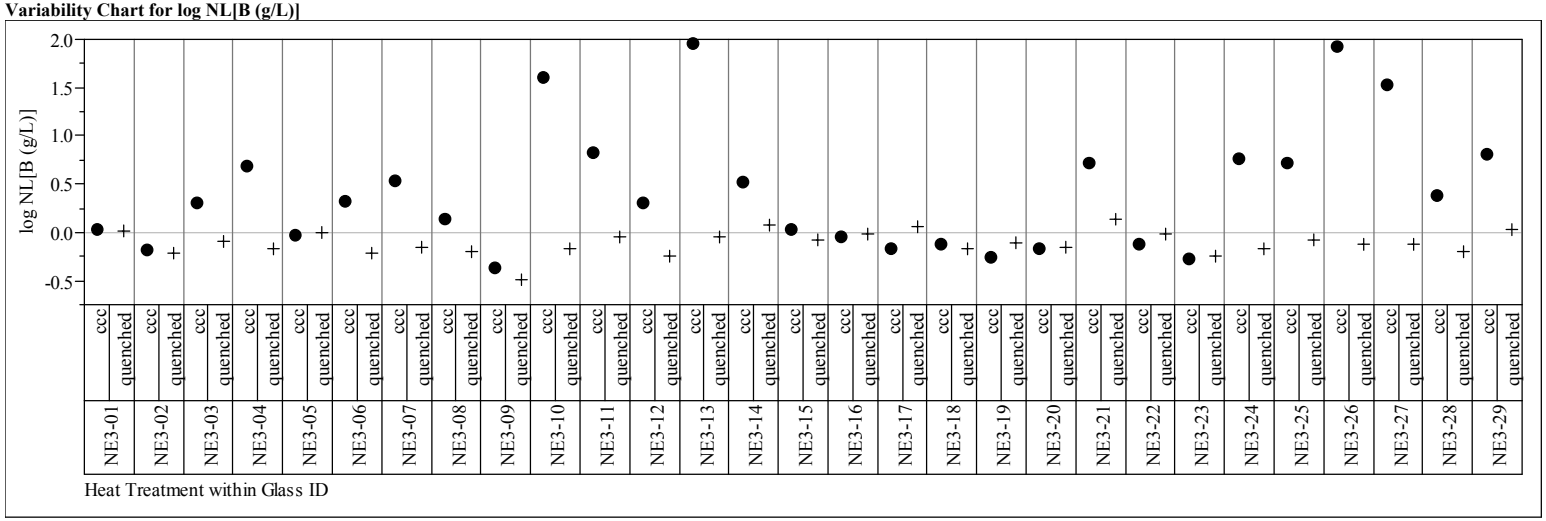
Means for One-way Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
ccc	3	1.62582	0.23616	0.9701	2.2815
quenched	3	1.79395	0.23616	1.1383	2.4496

Std Error uses a pooled estimate of error variance

Exhibit B6. Effects of Heat Treatment for Study Glasses by Compositional View

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



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

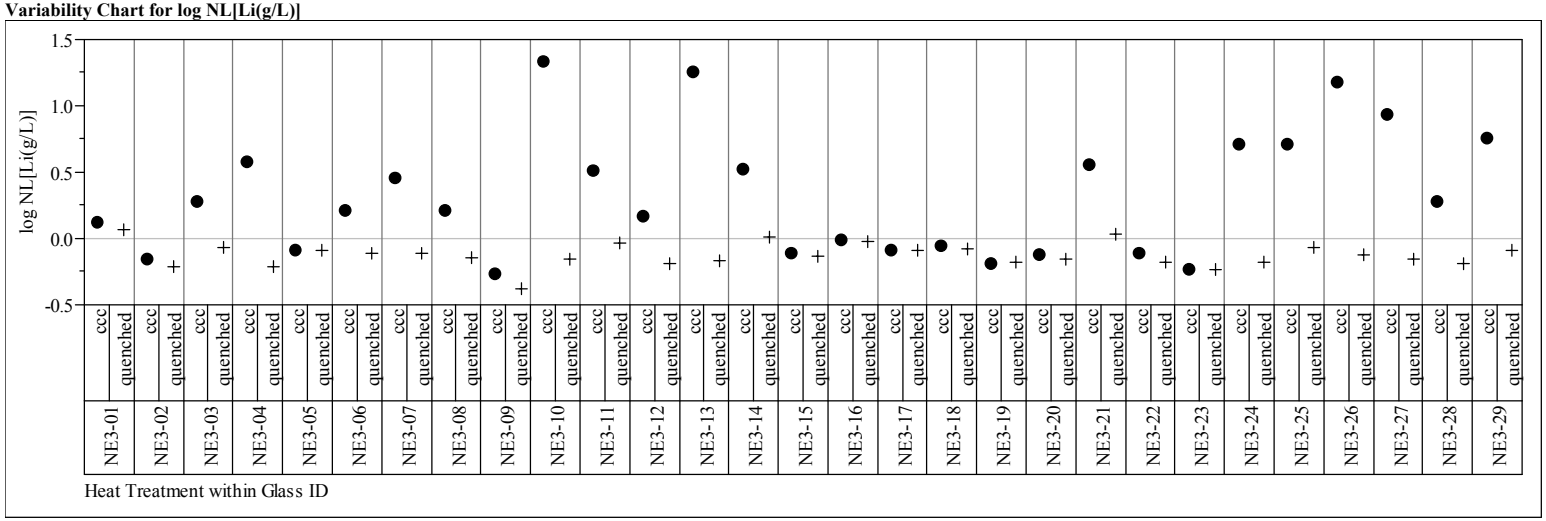
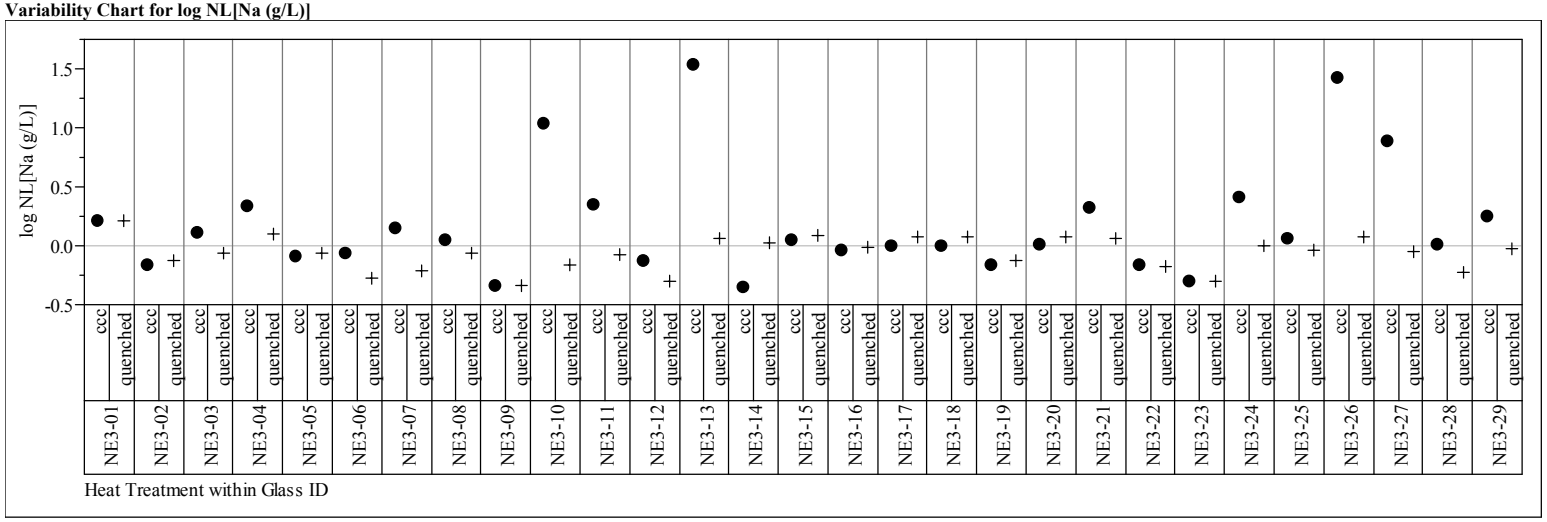


Exhibit B6. Effects of Heat Treatment for Study Glasses by Compositional View (continued)

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



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

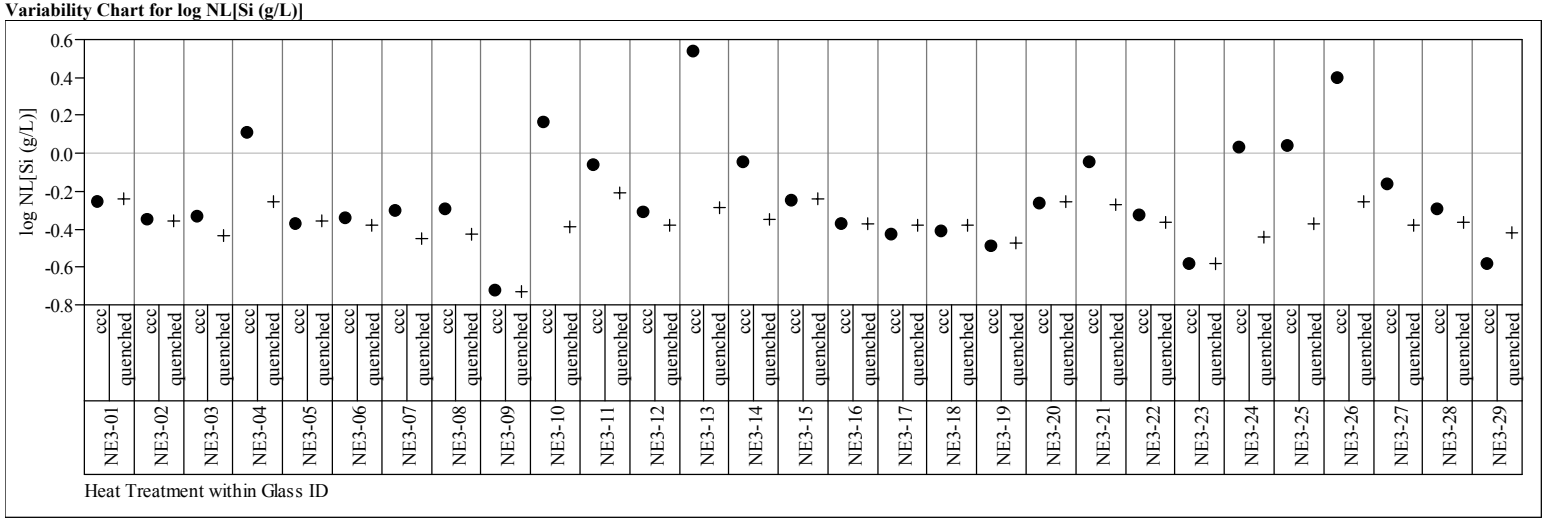
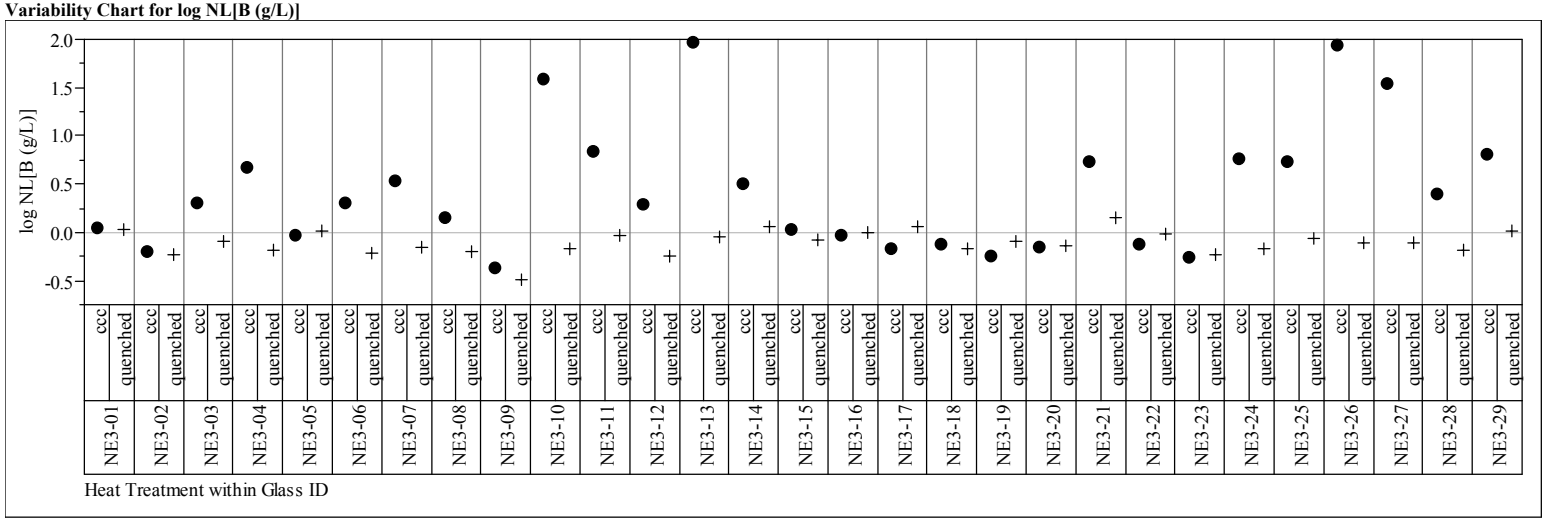


Exhibit B6. Effects of Heat Treatment for Study Glasses by Compositional View (continued)

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



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

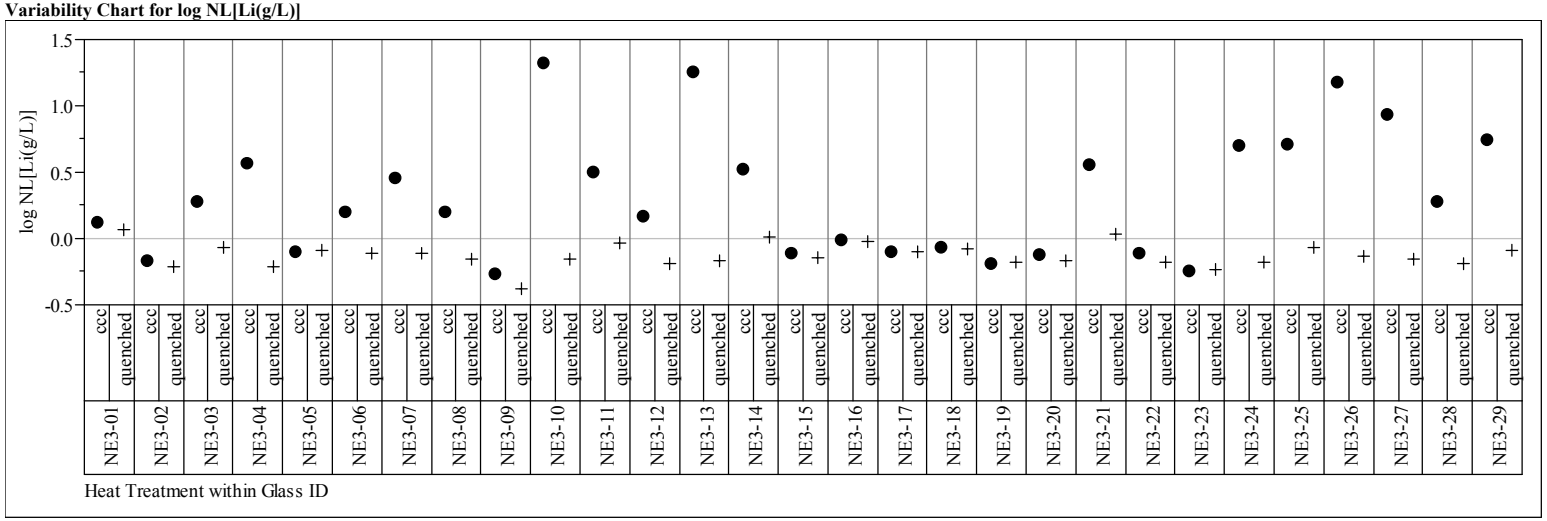
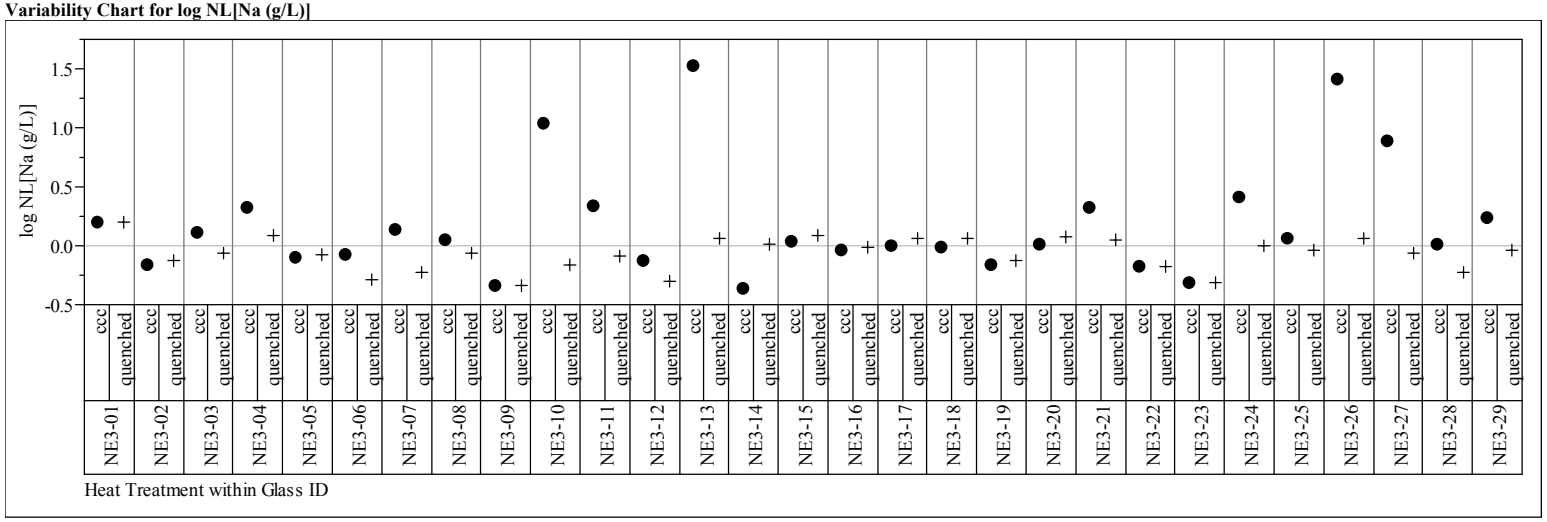


Exhibit B6. Effects of Heat Treatment for Study Glasses by Compositional View (continued)

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



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

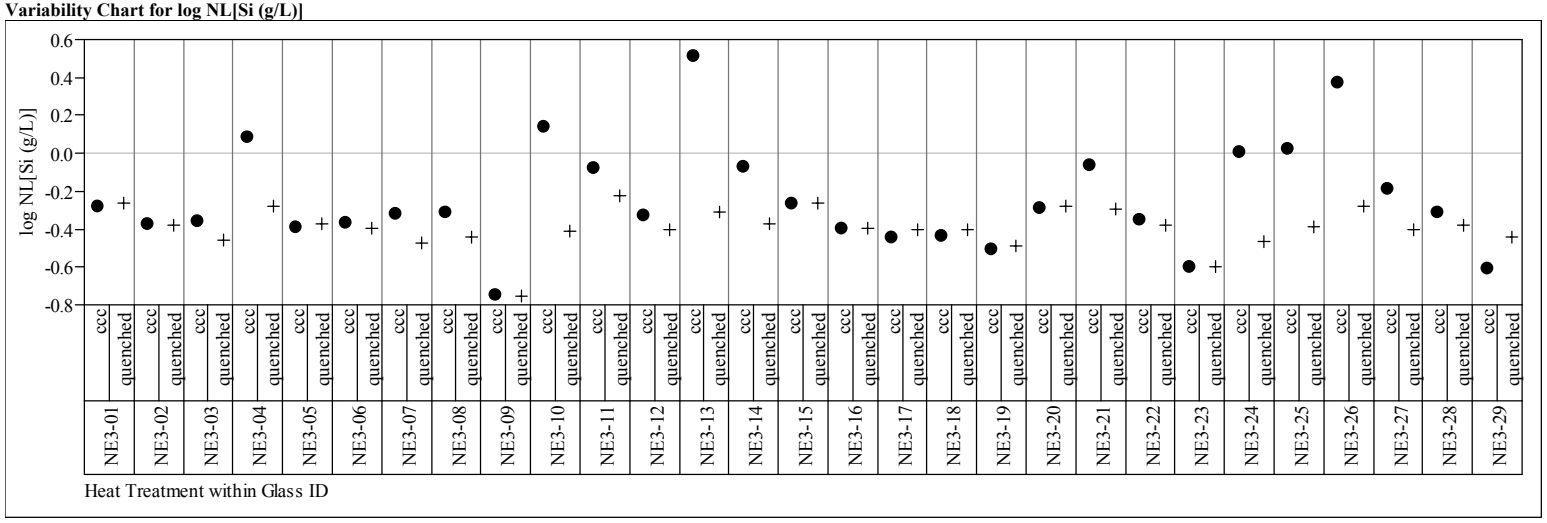
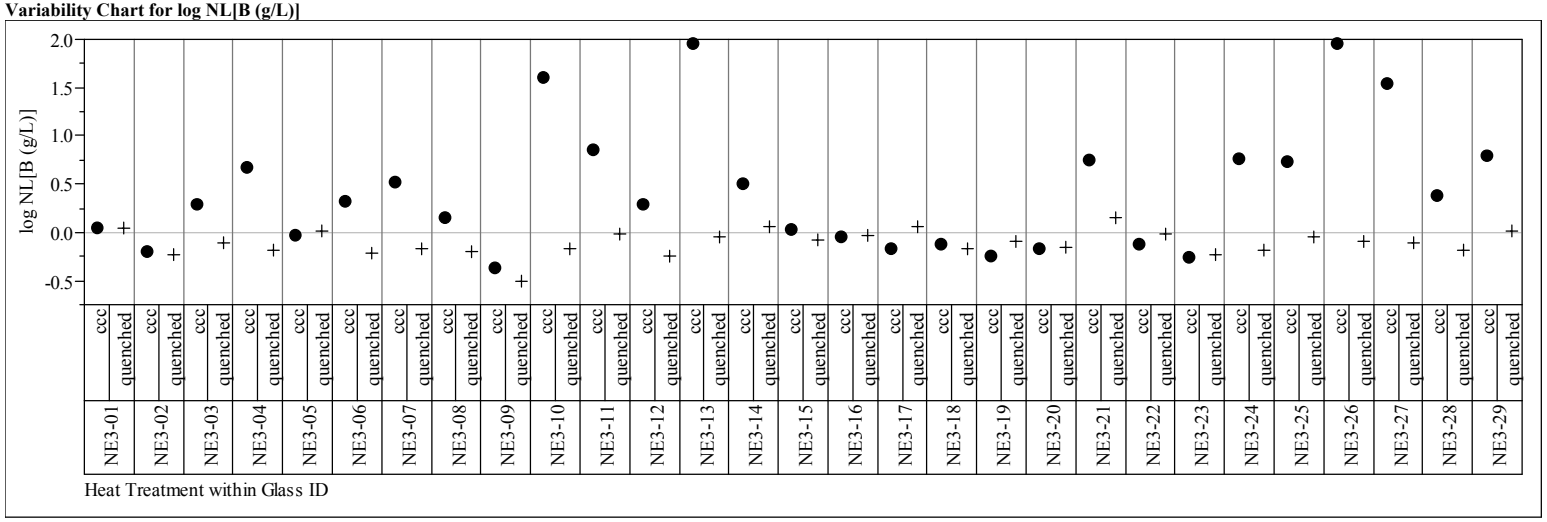


Exhibit B6. Effects of Heat Treatment for Study Glasses by Compositional View (continued)

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



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

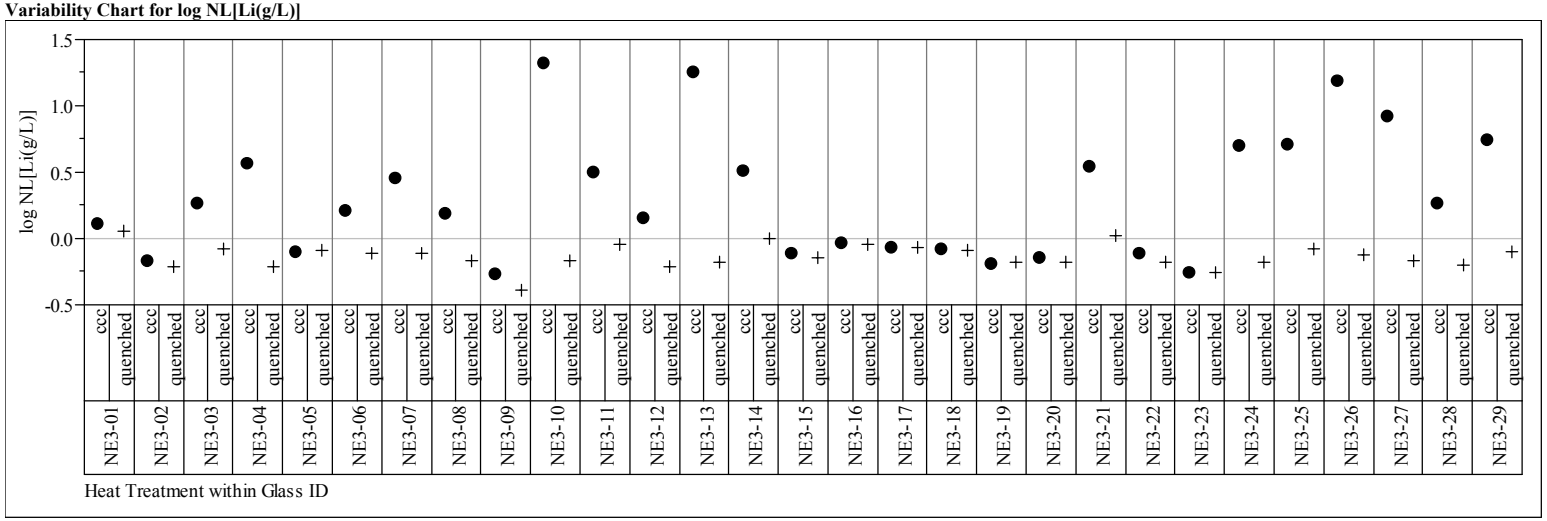
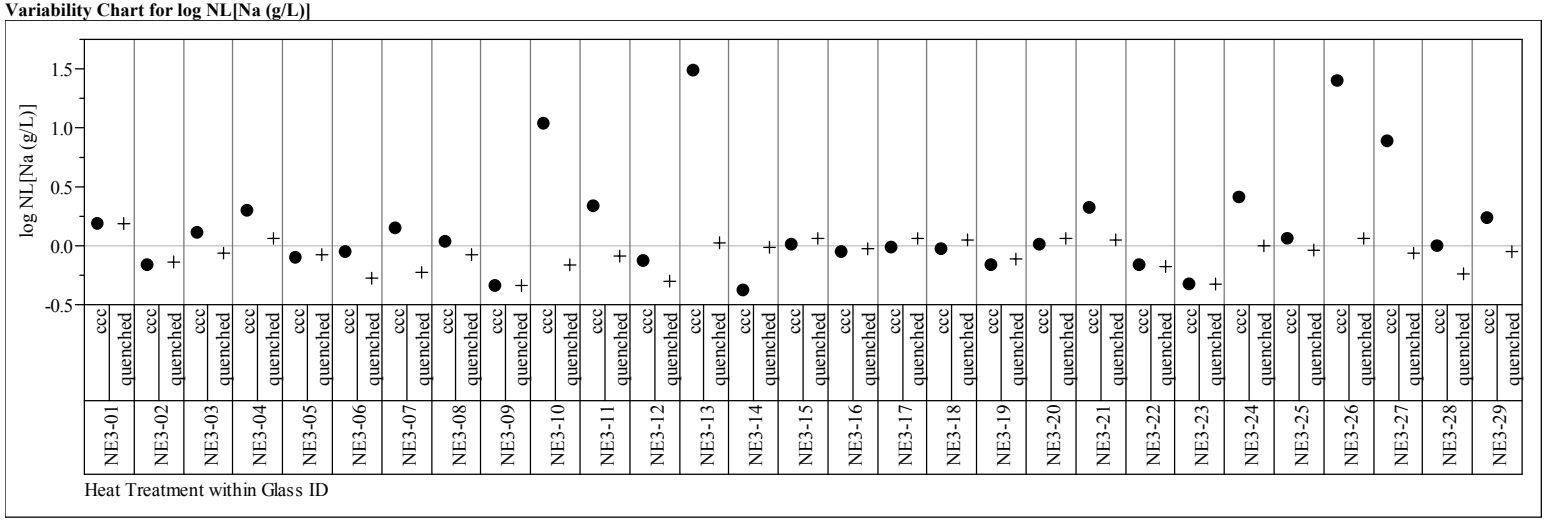


Exhibit B6. Effects of Heat Treatment for Study Glasses by Compositional View (continued)

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



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

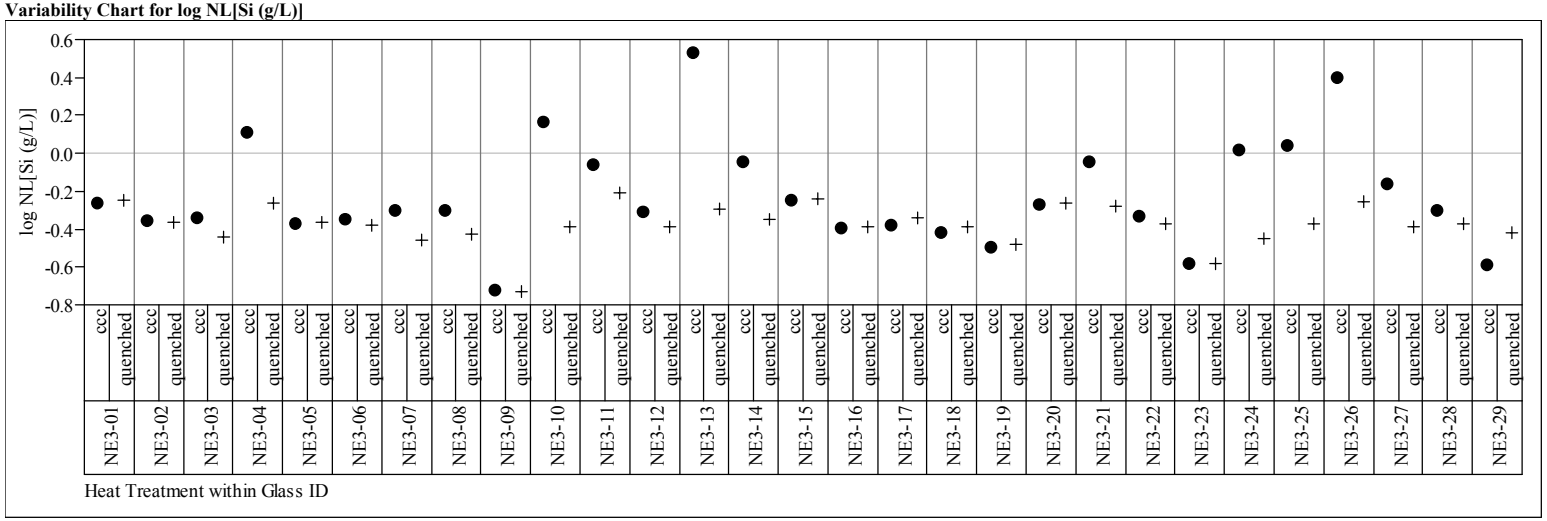


Exhibit B7. ΔG_p Predictions versus Common Logarithm Normalized Leachate for B over All Compositional Views and Heat Treatments for Study Glasses Whose XRD Results Did Not Identify the Presence of Nepheline

Legend

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

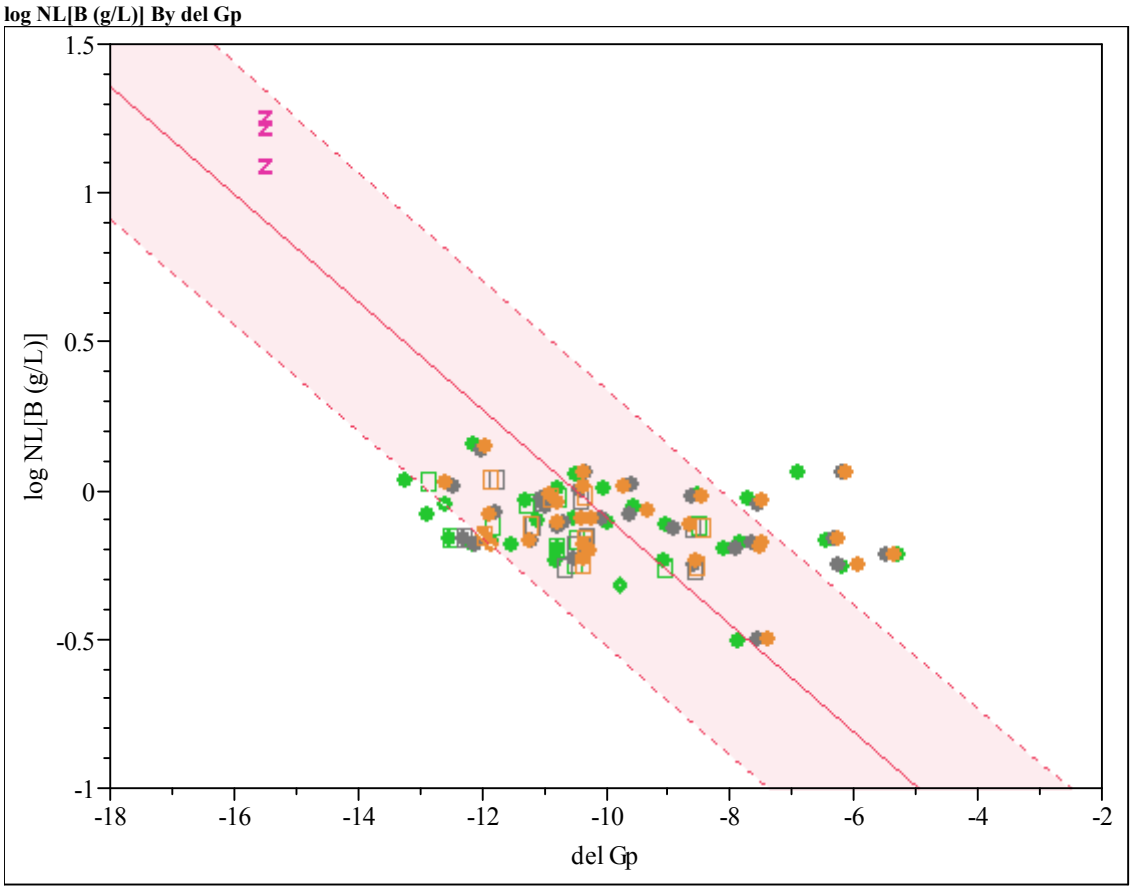


Exhibit B8. ΔG_p Predictions versus Common Logarithm Normalized Leachate for Li over All Compositional Views and Heat Treatments for Study Glasses Whose XRD Results Did Not Identify the Presence of Nepheline

Legend

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

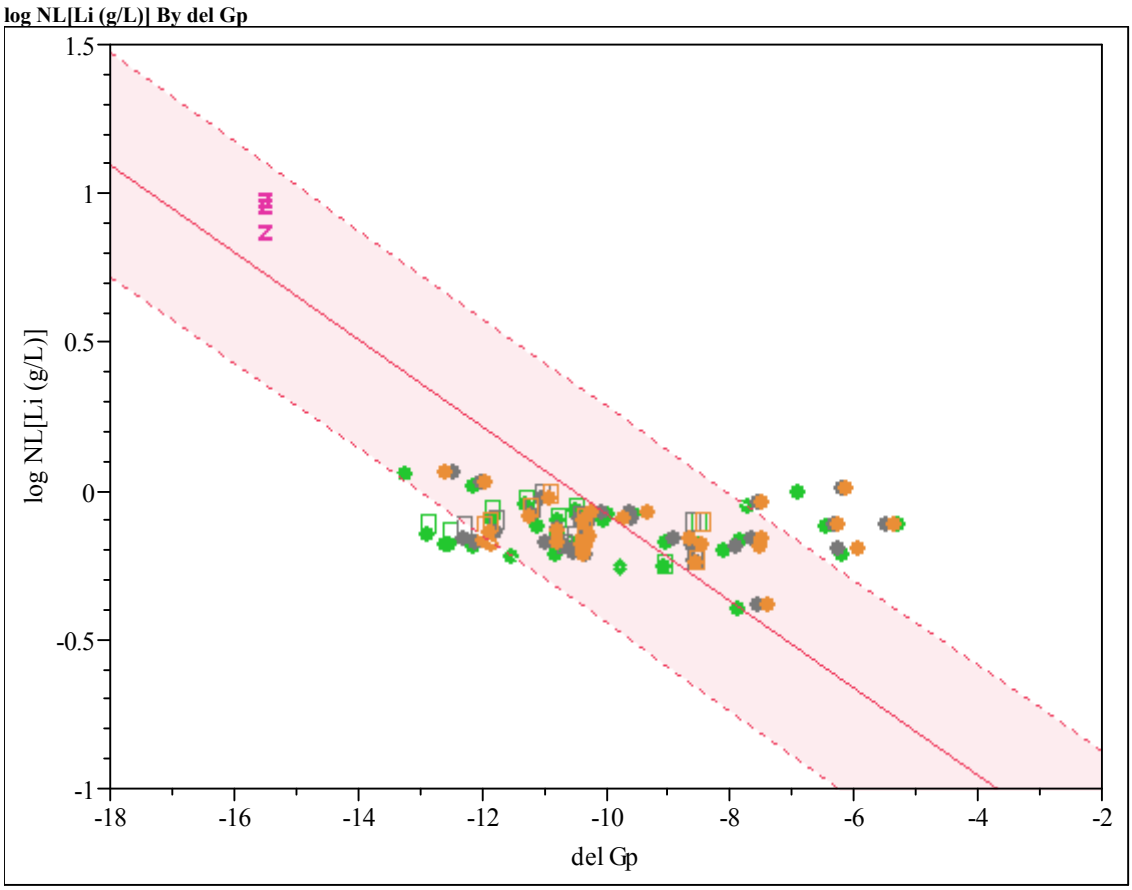


Exhibit B9. ΔG_p Predictions versus Common Logarithm Normalized Leachate for Na over All Compositional Views and Heat Treatments for Study Glasses Whose XRD Results Did Not Identify the Presence of Nepheline

Legend

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

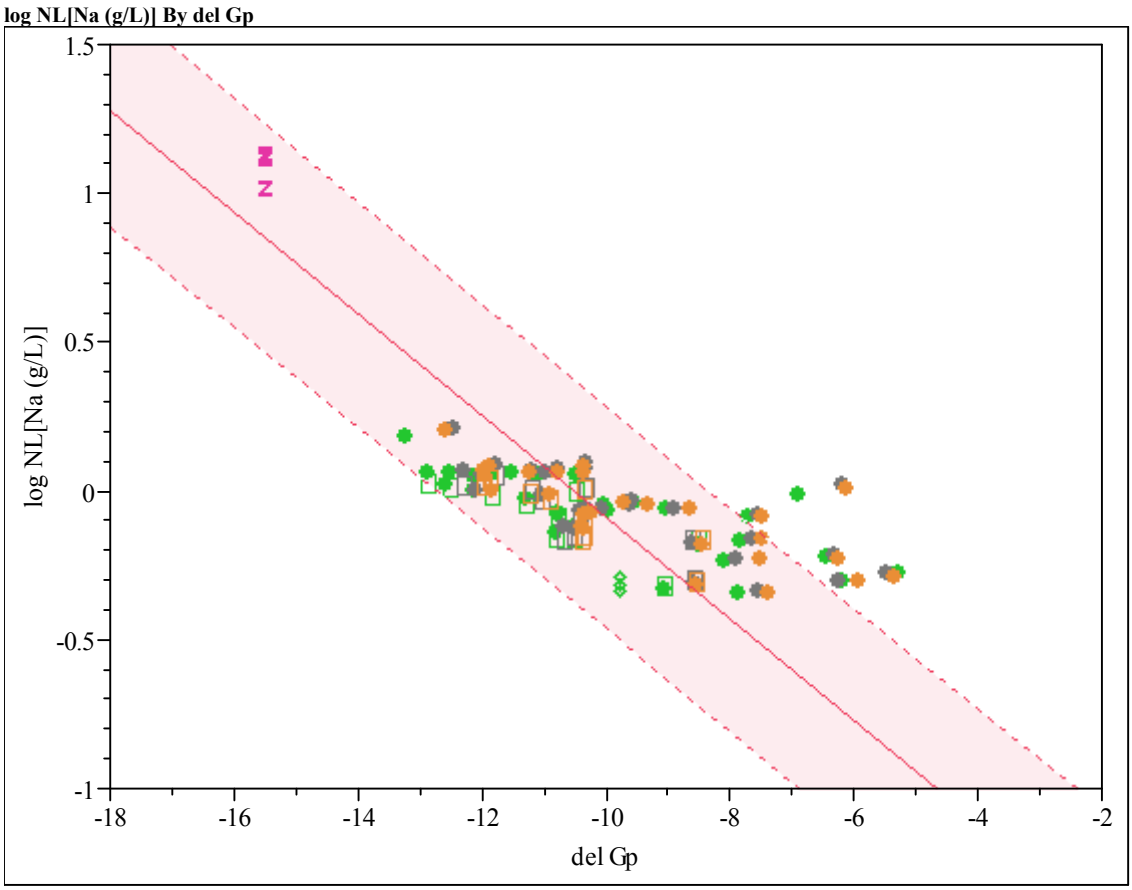


Exhibit B10. ΔG_p Predictions versus Common Logarithm Normalized Leachate for Si over All Compositional Views and Heat Treatments for Study Glasses Whose XRD Results Did Not Identify the Presence of Nepheline

Legend

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

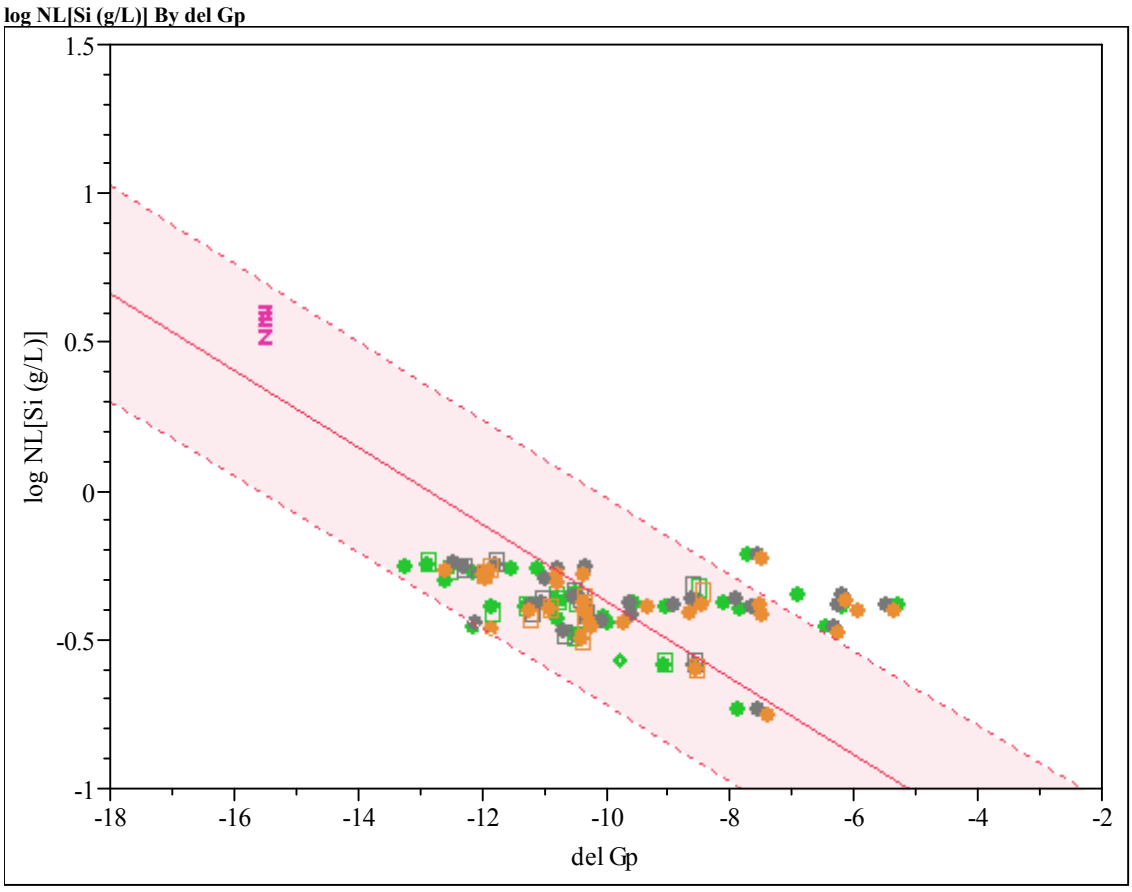
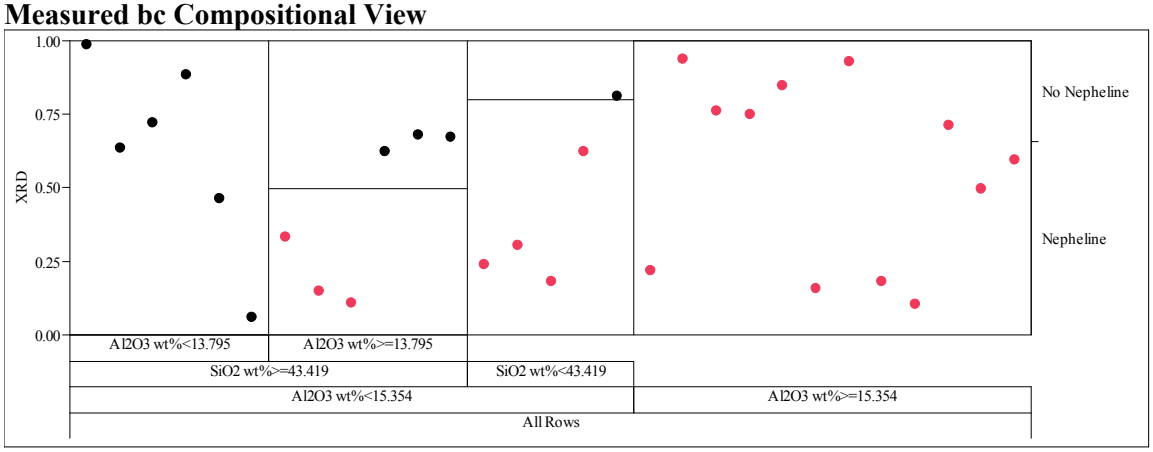


Exhibit B11. Nepheline Partitioning for the ccc Study Glasses Using Al_2O_3, B_2O_3, CaO, Na_2O, and SiO_2

Measured bc Compositional View



RSquare	N	Number of Splits
0.643	29	3

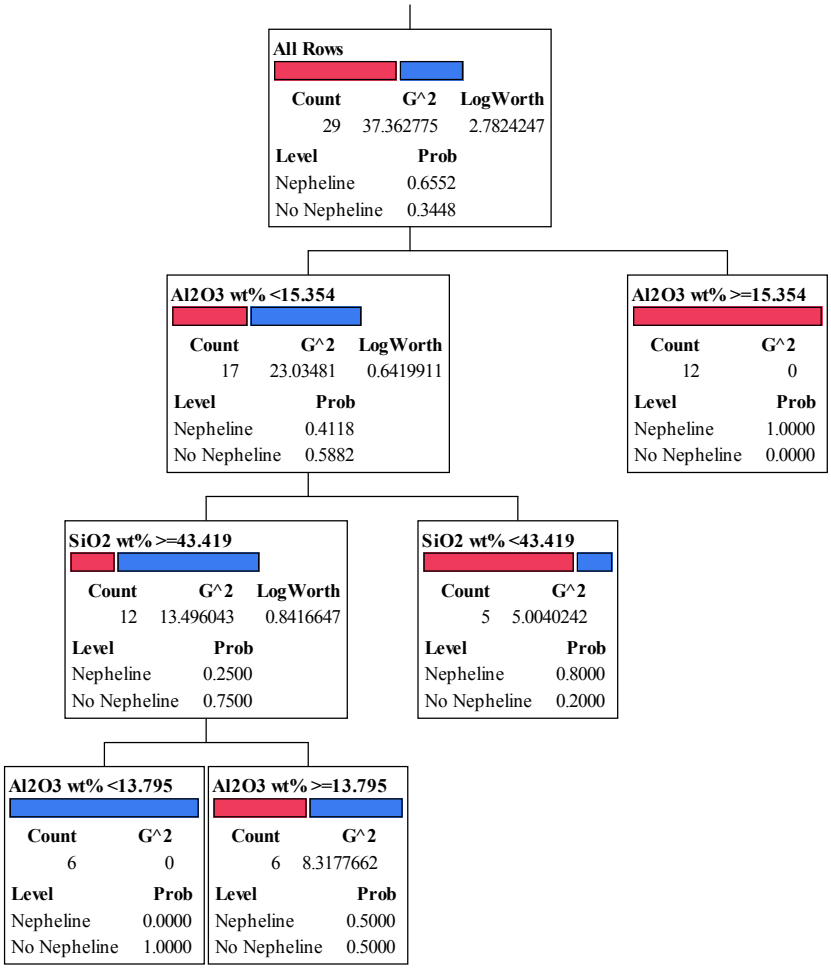
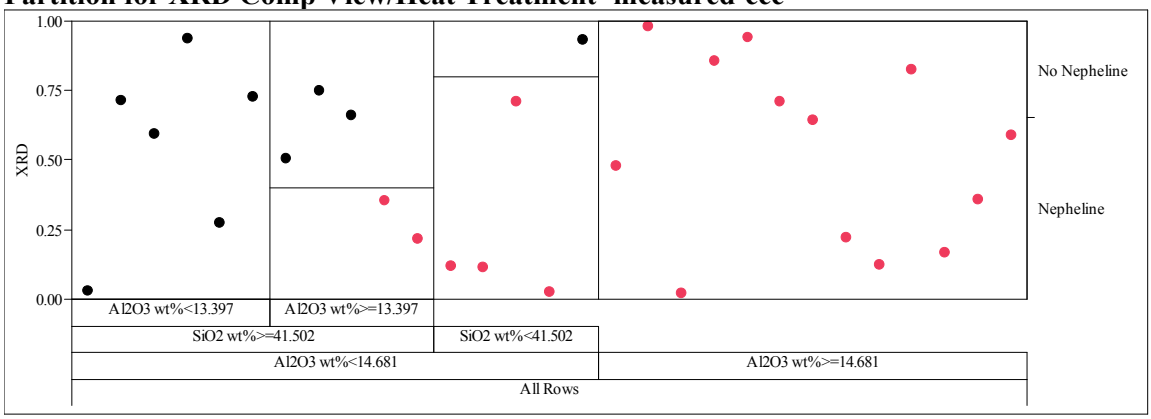


Exhibit B11. Nepheline Partitioning for the ccc Study Glasses Using Al_2O_3, B_2O_3, CaO, Na_2O, and SiO_2 (continued)

Partition for XRD Comp View/Heat Treatment=measured-ccc



RSquare	N	Number of Splits
0.686	29	3

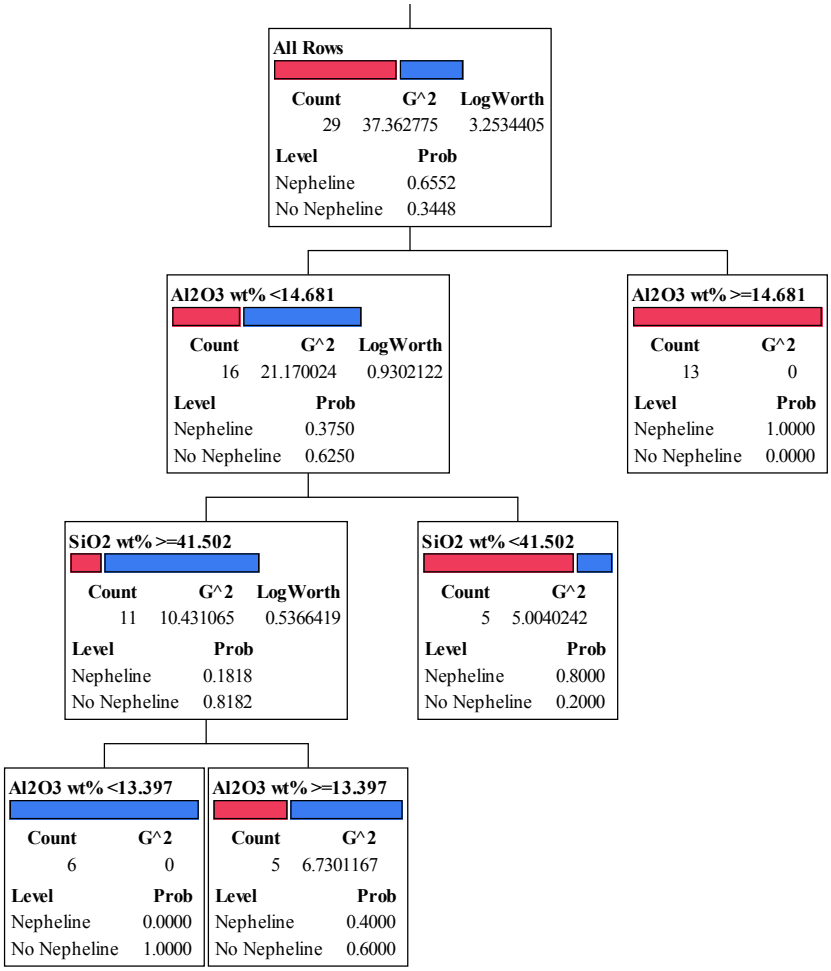
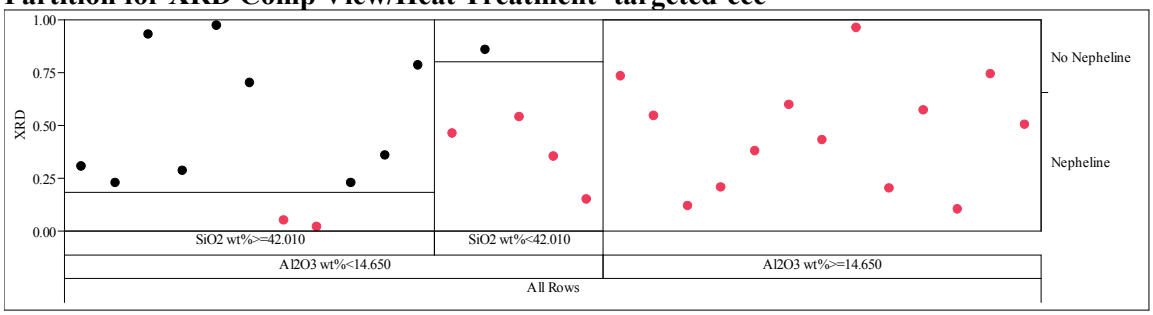


Exhibit B11. Nepheline Partitioning for the ccc Study Glasses Using Al_2O_3, B_2O_3, CaO, Na_2O, and SiO_2 (continued)

Partition for XRD Comp View/Heat Treatment=targeted-ccc



RSquare	N	Number of Splits
0.587	29	2

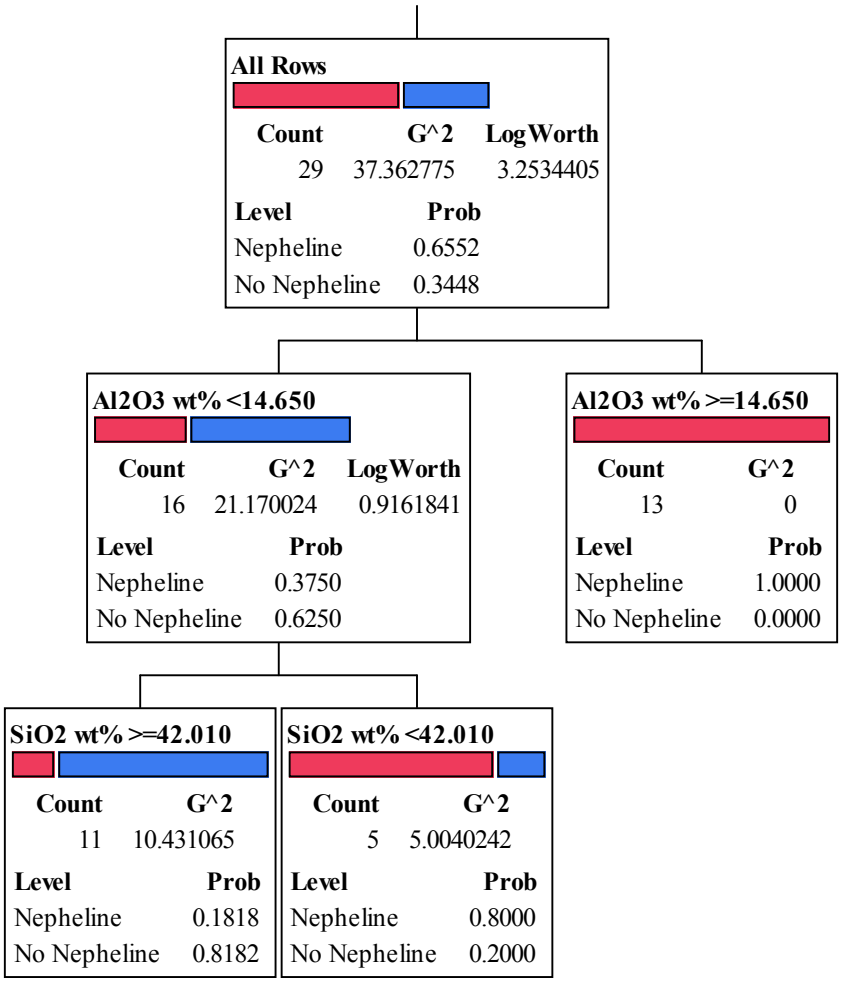
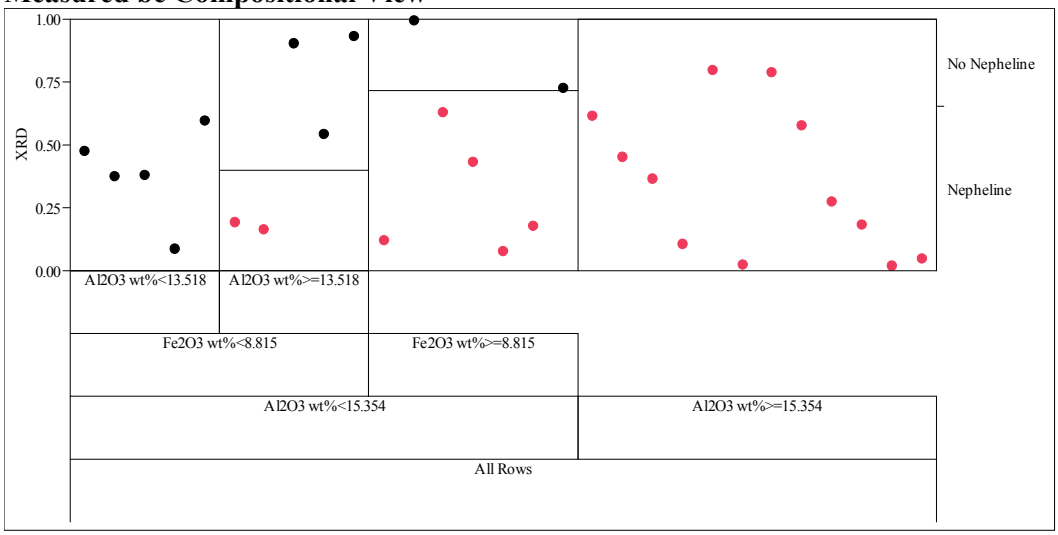


Exhibit B12. Nepheline Partitioning for the ccc Study Glasses Using All Major Oxides

Measured bc Compositional View



RSquare	N	Number of Splits
0.596	29	3

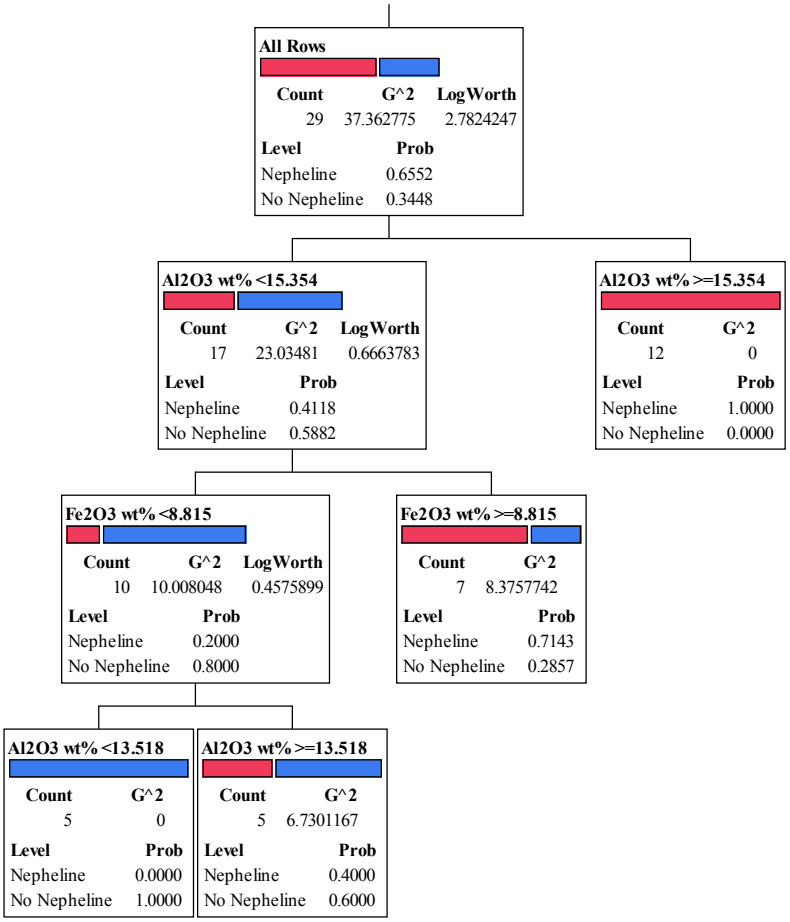
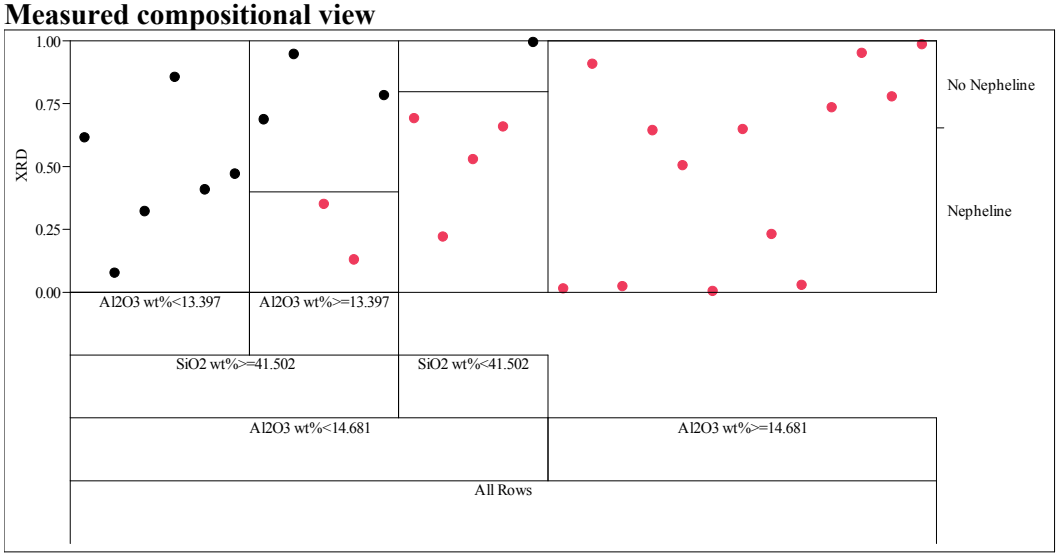


Exhibit B12. Nepheline Partitioning for the ccc Study Glasses Using All Major Oxides (continued)

Measured compositional view



RSquare	N	Number of Splits
0.686	29	3

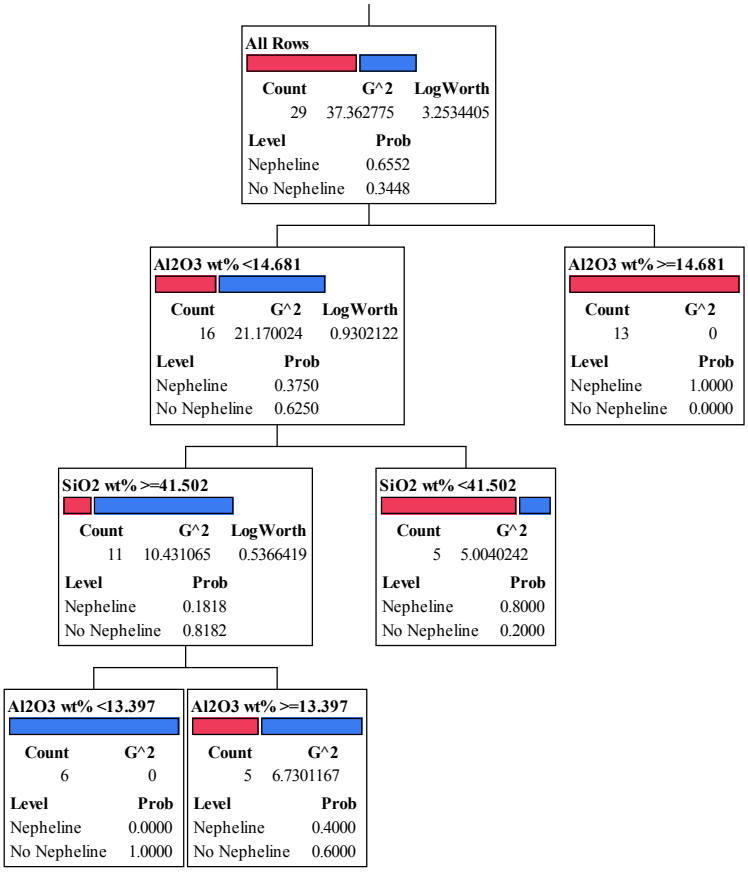
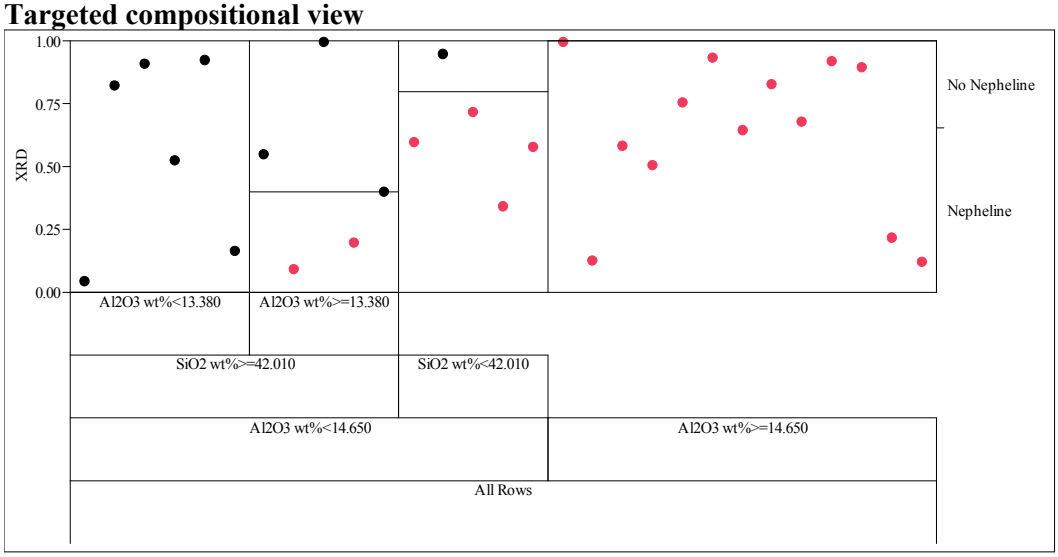
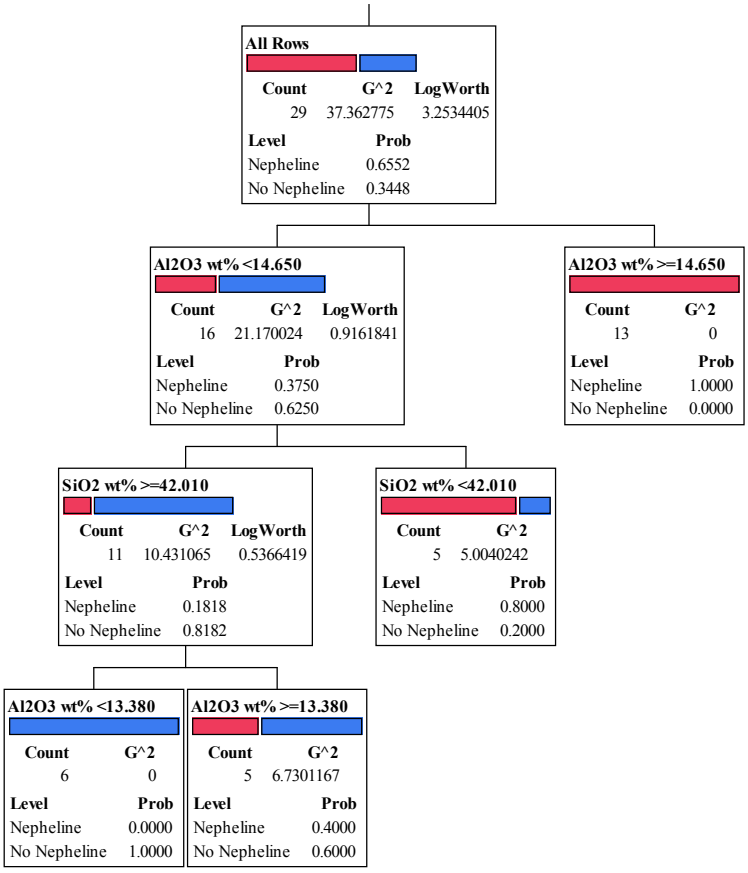


Exhibit B12. Nepheline Partitioning for the ccc Study Glasses Using All Major Oxides (continued)

Targeted compositional view



RSquare	N	Number of Splits
0.686	29	3



Distribution:

S. L. Marra, 773-A
A. B. Barnes, 999-W
D. A. Crowley, 773-43A
S. D. Fink, 773-A
J. H. Scogin, 773-A
B. J. Giddings, 786-5A
C. C. Herman, 999-W
F. M. Pennebaker, 773-42A
J. E. Occhipinti, 704-S
D. C. Sherburne, 704-S
R. T. McNew, 704-27S
J. F. Iaukea, 704-30S
J. W. Ray, 704-S
H. B. Shah, 766-H
J. M. Gillam, 766-H
B. A. Hamm, 766-H
D. D. Larsen, 766-H
C. J. Bannochie, 773-42A
D. K. Peeler, 999-W
M. E. Stone, 999-W
P. L. Lee, 773-42A
J. P. Vaughan, 773-41A
M. A. Broome, 704-29S
R. N. Hinds, 704-S
J. M. Bricker, 704-27S
T. L. Fellinger, 704-26S
E. W. Holtzscheiter, 704-15S
M. T. Keefer, 766-H
C. M. Jantzen, 773-A
F. C. Raszewski, 999-W
A. L. Billings, 999-W
T. B. Edwards, 999-W
J. C. Marra, 773-42A
A. S. Choi, 999-W
K. M. Fox, 999-W
D. H. Miller, 999-W