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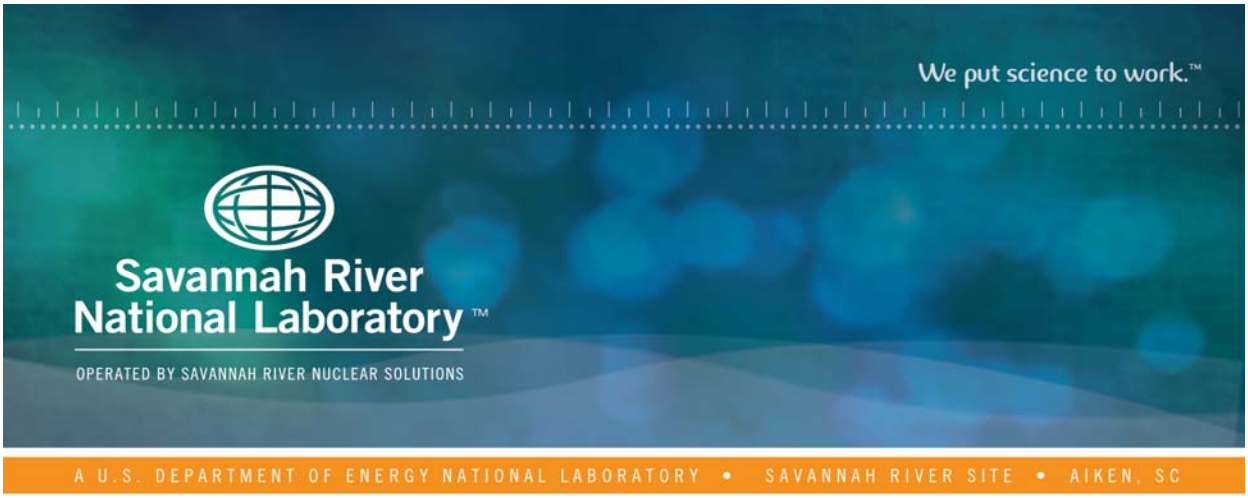

Testing of the Defense Waste Processing Facility Cold Chemical Dissolution Method in Sludge Batch 9 Qualification

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REVIEWS AND APPROVALS

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EXECUTIVE SUMMARY

For each sludge batch that is processed in the Defense Waste Processing Facility (DWPF), the Savannah River National Laboratory (SRNL) tests the applicability of the digestion methods used by the DWPF Laboratory for elemental analysis of Sludge Receipt and Adjustment Tank (SRAT) Receipt samples and SRAT Product process control samples. DWPF SRAT samples are typically dissolved using a method referred to as the DWPF Cold Chemical or Cold Chem Method (CC), (see DWPF Procedure SW4-15.201).

Testing indicates that the CC method produced mixed results. The CC method did not result in complete dissolution of either the SRAT Receipt or SRAT Product with some fine, dark solids remaining. However, elemental analyses did not reveal extreme biases for the major elements in the sludge when compared with analyses obtained following dissolution by hot aqua regia (AR) or sodium peroxide fusion (PF) methods. The CC elemental analyses agreed with the AR and PF methods well enough that it should be adequate for routine process control analyses in the DWPF after much more extensive side-by-side tests of the CC method and the PF method are performed on the first 10 SRAT cycles of the Sludge Batch 9 (SB9) campaign. The DWPF Laboratory should continue with their plans for further tests of the CC method during these 10 SRAT cycles.

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LIST OF ABBREVIATIONS

AAS	Atomic Absorption Spectroscopy
AD	Analytical Development
ANOVA	Analysis of Variance
AR	Aqua Regia
ARG	Analytical Reference Glass
CC	Cold Chem
DWPF	Defense Waste Processing Facility
ICP-OES	Inductively Coupled Plasma – Optical Emission Spectroscopy
LOD	Limit Of Detection
PF	Sodium Peroxide Fusion
SB	Sludge Batch
SRS	Savannah River Site
SRAT	Sludge Receipt and Adjustment Tank
SRNL	Savannah River National Laboratory
SRR	Savannah River Remediation
UOM	Unit of Measure
wt. %	Weight Percent
% RSD	Percent Relative Standard Deviation

1.0 Introduction and Summary

For each sludge batch that is processed in the Defense Waste Processing Facility (DWPF), the Savannah River National Laboratory (SRNL) tests the applicability of the digestion methods used by the DWPF Laboratory for elemental analysis of Sludge Receipt and Adjustment Tank (SRAT) Receipt samples and SRAT Product process control samples ([1] and [2]). DWPF SRAT samples are typically dissolved using high concentrations of HF-HNO_3 acid at room temperatures (usually referred to as the DWPF Cold Chemical or Cold Chem Method (CC), see DWPF Procedure SW4-15.201). The CC method is a faster and more convenient sample preparation method for elemental analysis by inductively coupled plasma – optical emission spectroscopy (ICP-OES) than the tandem sample preparation methods of hot (115 °C) aqua regia (AR) [3] and sodium peroxide fusion (PF) [4] melted at 675 °C used for many years at SRNL to analyze sludge. Since no heating is employed in the CC method, it is considered to be less rigorous than the methods based on heating. However, historically ([5]-[10]) the CC method has been shown to be effective for routine process control elemental analyses after samples from the first 10 SRAT cycles of a new sludge batch have been dissolved concurrently with the PF and CC methods to verify that the CC method has no unacceptable biases.

This report contains the statistical analysis and comparison of elemental analysis data of SRAT Receipt and SRAT Product samples generated during the Sludge Batch 9 (SB9) demonstration in the SRNL Shielded Cell Facility following dissolutions by the CC, AR, and PF methods. JMP® Pro Version 11.2.1 was used to conduct the statistical analyses [11]. In addition to elemental analyses obtained from ICP-OES, mercury determinations were obtained from Atomic Absorption Spectroscopy (AAS) from the CC and AR preps (concern about volatilization of mercury from the open crucible at 675 °C precludes mercury determinations from the PF dissolution under normal circumstances). The DWPF Laboratory does not use the CC method for Hg determinations. However, the results of Hg determinations from the CC method are included in this report to determine the efficacy of the CC method for Hg in SB9 sludge. Determinations were made for a total of 35 elements. Of these, only 18 elements comprised at least 0.1 wt. % on a dry solids basis and only 10 elements comprised at least 0.5 wt. % on a dry solids basis.

The CC method did not completely dissolve either the SRAT Receipt or the SRAT Product sludge. Fine, dark solids remained which slowly dissolved over a matter of a few days. However, elemental analyses were performed on dilutions of the initial CC dissolution that still contained solids. Of the 10 elements that comprise at least 0.5 wt. % of SB9 sludge on a dry solids basis, the CC method produced statistically equivalent results to either the AR or PF methods for Ca, Mn, Na, and Ni on both SRAT Receipt and SRAT Product. Only for Th was the CC method biased low compared with the AR and PF methods for both the SRAT Receipt and SRAT Product. The CC method was clearly biased low for SRAT Receipt Hg determinations but not for SRAT Product Hg determinations after Hg(II) compounds have been chemically reduced to acid-soluble elemental Hg. The CC method produced U determinations that were lower than those from the AR method for both SRAT Receipt and SRAT Product. Results were mixed for Al and Fe determinations with the CC method agreeing with one of the methods for either the SRAT Receipt or SRAT Product. Determinations of Si, which comprised a significant concentration in SRAT Receipt at approximately 1.4 wt. %, are precluded in the CC method because strong attack of HF on the quartz components of the SRNL ICP-OES sample introduction system leads to high Si bias. However, it is to be noted that an HF-resistant sample introduction system is used with the DWPF Laboratory ICP-OES that enables Si to be measured in solutions with high HF concentration.

Despite incomplete dissolution and slightly low biases for a few elements, the CC method should be adequate to provide DWPF process control analyses after performing side-by-side tests of the CC and PF methods for the first 10 SRAT batches with SB9 sludge. During these tests, the DWPF Laboratory will be able to accumulate enough data over a long time period to determine if the CC method produces biases

and, if so, if these biases are acceptable. As much as anything, this study demonstrated there is no single method that is perfect for determining all of the elements of interest in Savannah River Site (SRS) high level sludge.

Discussions of the results and statistical analysis from dissolving the SRAT Receipt and SRAT Product sludge using the CC, the AR, and the PF methods are provided below:

1.1 SRAT Receipt[f]

- Differences in the means were observed for Al determinations with the CC Al determinations ~10% higher than from the AR method and ~5% lower than from the PF method. Al concentration is ~7.5 wt. % in the SRAT Receipt as measured using the PF dissolution method.
- Differences in both the variances and the means were observed for B determinations with the CC B determinations slightly above the detection limit at 0.19 wt. % in the SRAT Receipt whereas no B was measured in either the PF or AR methods. Since B was not measured by either the PF or AR methods, a false high reading from the CC method due to possible interaction of high concentrations of HF with the ICP-OES sample introduction system cannot be ruled out. This possibility is supported by the fact that B was measured in the blank of the CC method but not in either the AR or PF methods.
- Differences in the variances were observed for Ca determinations. The mean of the CC Ca determinations were ~1% lower than from the AR method and ~15% lower than PF Ca determinations. This discrepancy is due to Ca contamination in sodium peroxide used in the PF method as shown in the blank analysis. Therefore, the CC method provided reliable Ca determinations. Ca concentration is ~1 wt. % in the SRAT Receipt.
- Differences in both the variances and the means were observed for Ce determinations. The CC Ce determinations were ~500% higher than AR Ce determinations and ~11% higher than the PF Ce determinations. Ce concentration is ~0.2 wt. % in the SRAT Receipt.
- Differences in both the variances and the means were observed for Cr determinations. The CC Cr determinations were ~7% lower than the AR Cr determinations and ~35% lower than the PF Cr determinations. Cr concentration is ~0.1 wt. % in the SRAT Receipt.
- Differences in the variances were observed for Fe determinations. The CC Fe determinations were ~3% lower than AR Fe determinations and ~5% lower than the PF Fe determinations. Fe concentration is ~17.5 wt. % in the SRAT Receipt as determined from the PF dissolutions.
- There was no difference in the variances of Hg determinations performed after CC and AR dissolutions. (As mentioned previously, the PF is not used for Hg measurements because of the high temperature of the fusion in an open vessel and concern that volatile Hg compounds would be lost.) However, there was a large difference in the means as the CC Hg determinations were ~64% lower than AR Hg determinations. Hg concentration is ~2 wt. % in the SRAT Receipt.
- Differences in both the variances and the means were observed for K determinations. The CC K determinations were ~8% higher than AR K determinations and ~77% lower than PF K determinations. The nature of the large difference in K determinations from the PF method versus the CC and AR methods is likely due to trace K impurity in the sodium peroxide. Although K was not detected in the blanks (Table 3-1), PF K determinations in the Analytical Reference Glass (ARG) were biased high versus CC and AR K determinations (Table 3-2). K concentration is ~0.1 wt. % in the Sludge Receipt per the CC and AR dissolutions.

[f] The discussions of the elemental wt. % SRAT Receipt measurements are on a dry solids basis. All of the statistically significant results are at the 5% significance level. See Table 3-7 for this information in tabular form.

- Differences in both the variances and the means were observed for Mg determinations. The CC Mg determinations were ~2% higher than AR Mg determinations and ~16% higher than PF Mg determinations. Mg is ~0.2 wt. % in the SRAT Receipt.
- Differences in the variances were observed for Mn determinations. The means of Mn determinations from all three dissolution methods were ~5.7 wt. % in the SRAT Receipt.
- There was no difference in either the variances or the means of Na determinations from the CC and AR methods. Na cannot be determined from the PF method because of the large amount of Na introduced as the fusion reagent. Na concentration is 13.7 wt. % in the SRAT Receipt.
- There was no difference in either the variances or the means of Ni determinations from the three sample preparation methods. Ni concentration is ~1.3 wt. % in the SRAT Receipt.
- Differences in both the variances and the means were observed for P determinations. The CC P determinations were ~43% higher than the AR P determinations and ~7% higher than PF P determinations. The means of the CC and PF determinations of P were in statistical agreement. P concentration is ~0.2 wt. % in the SRAT Receipt.
- There was no difference in the variances of S determinations from the CC and AR methods. The CC S determinations were ~19% higher than AR S determinations. It is believed that the unreliable PF S determinations (which were eliminated from statistical consideration) were due to deleterious effects of the high alkali on the ICP-OES performance on the analytical line for S. S concentration is ~0.3 wt. % in the SRAT Receipt.
- Si determinations are only considered reliable from the PF method. The AR method may not dissolve all forms of Si in SRS sludge. The CC method is generally effective for Si compounds, but the high concentration of HF reacts with the quartz ICP-OES sample introduction system resulting in a very high Si bias. Si concentration is ~1.4 wt. % in the SRAT Receipt.
- There was no difference in the variances of the Th determinations from the three methods. There was a difference in the means with the CC Th determinations ~8% lower than AR Th determinations and ~4% lower than PF Th determinations. Th concentration is ~0.9 wt. %. in the SRAT Receipt.
- There was no difference in the variances of the U determinations from the three methods. Differences in the means were observed with the CC U determinations ~9% lower than the AR U determinations and ~12% higher than the PF U determinations. U concentration is ~3.4 wt. % in the SRAT Receipt as determined from the AR dissolutions.
- Differences in both the variances and the means were observed for Zr determinations. The CC Zr determinations were ~260% higher than the AR determinations. The PF method cannot be used to determine Zr because a Zr crucible is used in the fusion. Since HF is an effective dissolution reagent for Zr compounds, CC Zr determinations are considered to be more accurate and conservative for Zr determinations in SRS sludge. Zr concentration is ~0.2 wt. % in the SRAT Receipt as determined with the CC dissolution method.

1.2 SRAT Product[f]

- Differences in the variances and means of Al determinations were observed. The CC Al determinations were ~4% higher than AR Al determinations and ~3% lower than PF Al determinations. Al concentration is ~5.9 wt. % in the SRAT Product as determined by the PF dissolution method.

[f] Note that the discussions of the elemental wt. % SRAT Product measurements are on a dry solids basis. All of the statistically significant results are at the 5% significance level. See Table 3-7 for this information presented in tabular form.

- Differences in both the variances and the means were observed for B determinations. The CC B determinations were slightly above the detection limit at ~0.24 wt. % in the SRAT Product whereas no B was measured in either the PF or AR methods. Since B was not measured by either the PF or AR methods, a false high reading from the CC method due to possible interaction of high concentrations of HF with the ICP-OES sample introduction system cannot be ruled out. This possibility is supported by the fact that B was measured in the blank of the CC method but not in either the AR or PF methods.
- There was no difference in the variances of Ca determinations as a function of the three dissolution methods. There was a difference in the means with the CC Ca determinations ~3% higher than the AR Ca determinations and ~17% lower than the PF Ca determinations. The higher Ca determinations from the PF method is attributed to Ca impurity in the sodium peroxide reagent as manifested by Ca being measured in the blank analysis of the sodium peroxide reagent. Therefore, the CC method provided a reliable determination of Ca in the SRAT Product. Ca concentration is ~0.9 wt. % in the SRAT Product.
- There was no difference in the variances of Ce determinations from the three dissolution methods. The CC Ce determinations were less than 1% higher than AR Ce determinations and ~9% higher than PF Ce determinations. Ce concentration is ~0.16 wt. % in the SRAT Product.
- There was no difference in the variances of Cr determinations from the three dissolution methods. The CC Cr determinations and the AR Cr determinations agreed and were ~4% lower than PF Cr determinations Cr concentration is ~0.12 wt. % in the SRAT Product.
- There was no difference in the variances of Fe determinations from the three dissolution methods. The CC Fe determinations were ~5% less than the AR Fe determinations and less than 1% lower than the PF Fe determinations. Fe concentration is ~14.3 wt. % in the SRAT Product.
- There was no difference in the variances of Hg determinations performed after CC and AR dissolutions. In reverse of the case for the SRAT Receipt, the CC method yielded Hg determinations ~11% higher than AR determinations for the SRAT Product (in the SRAT Product, Hg (II) compounds have been chemically reduced to elemental Hg to likely account for difference). Hg concentration is ~0.5 wt. % of the SRAT Product.
- Differences in both the variances and the means were observed for K determinations with the means of the CC and AR methods statistically agreeing but at only ~30% of the PF K determinations. The nature of the large difference in K determinations from the PF method versus the CC and AR methods is likely due to trace K impurity in the sodium peroxide. Although K was not detected in the blanks (Table 3-1), PF K determinations in the ARG standard were biased high versus CC and AR K determinations (Table 3-2). K concentration is ~0.1 wt. % in the SRAT Product per the CC and AR dissolutions.
- There was no difference in the variances of Mg determinations from the three dissolution methods. The CC Mg determinations were ~4% higher than AR Mg determinations and ~3% higher than PF Mg determinations. Mg concentration is ~0.2 wt. % in the SRAT Product.
- There was no difference in either the variances or the means for Mn determinations from the three dissolution methods. Mn concentration in the SRAT Product is ~5.5 wt. %.
- There was no difference in the variances of the CC and AR methods for Na. (Na is precluded from the PF method because Na is introduced at high levels from the sodium peroxide fusion reagent). The CC Na determinations were 3% higher than those from the AR method. Na is ~14.3 wt. % in the SRAT Product.

- There were differences in both the variances and the means of Ni determinations from the three dissolution methods. The CC Ni determinations were ~4% higher than AR Ni determinations and agreed with the PF Ni determinations. Ni concentration is ~1 wt. % in the SRAT Product.
- There was no difference in the variances of P determinations but the means were not in agreement. The CC P determinations that were ~66% higher than AR P determinations and ~27% higher than PF P determinations. P concentration is ~0.2% in the SRAT Product.
- There was no indication of a difference in variances or the means in the AR and CC methods for S determinations. S concentration is ~0.27 wt. % in the SRAT Product. (S determinations from the PF method were precluded because the high alkali content produced spurious ICP-OES results).
- Si determinations can be accurately made only with the PF method at SRNL. The AR method may not completely dissolve all Si compounds in SRS sludge. The CC method is precluded from Si determinations by ICP-OES because the high HF concentration in the CC method vigorously attacks the ICP-OES sample introduction system. Si as determined from PF dissolutions is ~1.2 wt. % in the SRAT Product.
- There was no difference in variances in Th determinations. The CC Th determinations were ~6% lower than AR Th determinations and ~5% lower than PF Th determinations. Th concentration is ~0.7 wt. % in the SRAT Product.
- There was a difference in the variances and means in U determinations. The CC U determinations were ~9% lower than AR U determinations and 6% lower than PF U determinations. U concentration is ~2.7 wt. % in the SRAT Product as determined from AR dissolutions.
- There was a difference in the variances and the means of the CC and AR methods for Zr determinations. The CC Zr determinations were ~330% higher than AR Zr determinations. (Zr determinations from the PF method are precluded by use of Zr crucibles in the fusion.) Since HF is an effective dissolution reagent for Zr compounds, CC Zr determinations are considered to be more accurate and conservative for Zr determinations in SRS sludge. Zr concentration as measured by the CC method is ~0.13 wt. % in the SRAT Product.

2.0 Experimental Procedure

The radioactive sludge slurry used in tests of the DWPF CC method is from the three liter qualification sample of Tank 51 sludge, HTF-51-15-81 (with subsequent washing at SRNL), and HTF-40-13-119 blended at a ratio of 44% Tank 51 to 56% Tank 40 on an insoluble solids basis.

2.1 DWPF Cold Chem Process Digestion Method Testing

The sludge samples were dissolved in quadruplicate in the SRNL Shielded Cells facility in a manner similar to the DWPF CC method, and by PF and AR digestion methods. The CC method digestion (see DWPF Procedure SW4-15.201) consisted of adding 25 mL of concentrated HF to 2.7-3.0 g of the sludge and stirring this mixture for 1 hour. This step was followed by addition of 25 mL of concentrated HNO_3 and this mixture was stirred for an additional 30 minutes. Fine, dark, slow-settling solids remained in each digestion bottle after the acid additions and stirring. The dissolution mixture was diluted with de-ionized water to 250 mL in a plastic volumetric flask. The mixture was suspended just prior to taking a 15 mL aliquot for removal from the shielded cells and transport to the Analytical Development (AD) ICP-OES and AAS laboratories. A blank and an ARG standard were prepared concurrently the SRAT samples.

2.2 PF Method

The PF method consisted of weighing ~1.5 g of sludge into a Zr crucible followed by evaporation of the water at 115 °C in a drying oven. 2.5 g of sodium peroxide were added to the dry sample inside the

crucible and placed inside a muffle furnace pre-heated to 675 °C. The crucible was heated for 15 minutes after the temperature equilibrated to 675 °C. The crucible was removed from the furnace and allowed to cool for 10 minutes before dissolving the fusion residue with de-ionized water and concentrated HNO_3. The solution was diluted to 100 mL in a plastic volumetric flask. No solids were apparent after the PF method. A 15 mL aliquot was removed from the shielded cells and transferred to the ICP-OES laboratory (AAS determinations for Hg were not performed on PF sample dissolutions because of concern that the high temperature in an open vessel would result in loss of volatile Hg compounds). A blank and an ARG standard were prepared concurrently the SRAT samples.

2.3 AR Method

The AR method consisted of weighing ~1.5 g of sludge into a thick-walled Teflon pressure vessel and adding 9 mL of concentrated HCl and 3 mL of concentrated HNO_3. The Teflon pressure vessel was capped and sealed with a mechanical capping station. After all the SRAT samples, the blank, and the standard glass sample had been prepared, the vessels were placed in a drying oven pre-heated to 115 °C. The vessels were heated for two hours after the oven temperature equilibrated to 115 °C. After cooling for 30 minutes, the Teflon pressure vessel was opened and the solution inside completely transferred to a 100 mL plastic volumetric flask. The flask was filled to the mark with de-ionized water to achieve the dissolution volume of 100 mL. The AR dissolutions appeared clear when observed through the shielded cell window. A 15 mL aliquot of the solution was removed from the shielded cells for transport to the ICP-OES and AAS instrumental laboratories. A blank and an ARG standard were prepared concurrently the SRAT samples.

2.4 Other Analytical Information

Dissolution blanks for each of the methods were created by concurrently performing each of the dissolutions methods with only the reagents. Results of the blank analyses associated with each set of SRAT sludge elemental analyses are shown in Table 3-1.

The ARG standard was dissolved concurrently with the SRAT samples and the blanks. Glass is by no means a perfect standard to validate a dissolution method for sludge since glass and sludge have much different physical properties. However, the ARG analysis does provide information on the overall process of weighing samples in the cells, carrying out the dissolution, and elemental analysis by ICP-OES of a material with similar elemental composition to sludge. Results of the ARG analyses associated with each set of SRAT sludge elemental analyses are shown in Table 3-2.

A multi-element standard solution that did not go through the dissolution process was also analyzed concurrently with each set of SRAT elemental analyses. These analyses were used strictly as a check on ICP-OES accuracy and are shown in Table 3-3.

2.5 Quality Assurance

Requirements for performing reviews of technical reports and the extent of review are established in Manual E7 Procedure 2.60. SRNL documents the extent and type of review using the SRNL Technical Report Design Checklist contained in WSRC-IM-2002-00011, Rev. 2.

3.0 Results and Discussion

The unit of measure (UOM) of the digestion results was microgram of element per gram of slurry of SRAT material. To get the results to the dry solids wt. % basis for comparison, the results were divided by the appropriate weight percent total solids: 18.5 wt. % [12] for the SRAT Receipt and 21.5 wt. % [13] for the SRAT Product.

Table 3-1 provides the measurements of the blanks that were included in all of this analytical work. Note the very high detection limit of S for PF preparations and the very high Si values for CC preparation that are indicative of difficulty with the measurements for these elements and the associated preparations.

The measurements for the blanks were handled in the same manner as the SRAT samples. For example, even though no sample was used, a sample weight close to that of the actual samples was supplied to the ICP-OES and AAS laboratories so that blank concentrations could be reported on a μg/g basis and then converted to wt. % on a dry solids basis.

Only one CC blank was done because the CC method was performed on both the SRAT Receipt and SRAT Product on the same day during one dissolution evolution and then analyzed in the instrumental laboratories on the same day. In contrast, the AR and PF methods were performed on SRAT Receipt and SRAT Product samples on separate days and subsequently analyzed in the instrumental laboratories on separate days, necessitating separate blanks.

Table 3-1. Measurements of Blanks

(Detection Limits were used to Represent Values below Detection as the Wt. % Values were Computed)

Type - Prep	SB9 SRAT Receipt and Product CC	SB9 SRAT Receipt PF	SB9 SRAT Receipt AR	SB9 SRAT Product AR	SB9 SRAT Product PF	SB9 SRAT Receipt and Product CC	SB9 SRAT Receipt PF	SB9 SRAT Receipt AR	SB9 SRAT Product AR	SB9 SRAT Product PF
LIMS	300319990	300319988	300319909	300320472	300320487	300319990	300319988	300319909	300320472	300320487
UOM	µg/g	µg/g	µg/g	µg/g	µg/g	wt. %	wt. %	wt. %	wt. %	wt. %
Ag	< 20.4	< 35.2	< 3.91	< 5.5	< 29.3	<0.011	<0.019	<0.0021	<0.0026	<0.0136
Al	< 97.8	537	< 35.2	< 26.4	200	<0.0529	0.2903	<0.019	<0.0123	0.093
B	148	< 54.9	< 20.5	< 8.57	< 45.7	0.08	<0.0297	<0.0111	0.004	<0.0213
Ba	< 4.54	< 7.85	< 1.63	0.45	19.6	<0.0025	<0.0042	<0.0009	0.0002	0.0091
Be	< 0.981	< 1.69	< 0.422	< 0.265	< 1.41	<0.0005	<0.0009	<0.0002	<0.0001	<0.0007
Ca	< 17.8	618	< 6.39	6.08	283	<0.0096	0.3341	<0.0035	0.0028	0.1316
Cd	< 14.8	< 25.6	7.23	9.15	< 21.3	<0.008	<0.0138	0.0039	0.0043	<0.0099
Ce	< 121	< 210	< 15.4	< 32.8	< 175	<0.0654	<0.1135	<0.0083	<0.0153	<0.0814
Co	< 11.6	< 20.1	< 4.18	< 3.14	< 16.7	<0.0063	<0.0109	<0.0023	<0.0015	<0.0078
Cr	< 16.9	< 16.8	< 6.1	< 2.63	< 14	<0.0091	<0.0091	<0.0033	<0.0012	<0.0065
Cu	< 10.8	< 18.6	< 3.88	< 2.91	< 15.5	<0.0058	<0.0101	<0.0021	<0.0014	<0.0072
Fe	45	70.9	2.57	7.63	34.4	0.0243	0.0383	0.0014	0.0035	0.016
Gd	< 13.3	< 23	< 4.79	< 3.59	< 19.2	<0.0072	<0.0124	<0.0026	<0.0017	<0.0089
K	< 228	< 395	< 218	< 61.7	< 329	<0.1232	<0.2135	<0.1178	<0.0287	<0.153
La	< 6.65	< 11.5	< 2.39	< 1.8	< 9.58	<0.0036	<0.0062	<0.0013	<0.0008	<0.0045
Li	< 82.1	261	39.7	< 22.2	< 118	<0.0444	0.1411	0.0215	<0.0103	<0.0549
Mg	4.54	< 205	< 0.429	0.625	1.87	<0.0025	<0.1108	<0.0002	0.0003	0.0009
Mn	< 1.33	3.36	< 0.478	< 1.05	< 5.59	0.0007	0.0018	<0.0003	<0.0005	<0.0026
Mo	< 32.9	< 56.8	< 11.8	< 8.87	< 47.3	<0.0178	<0.0307	<0.0064	<0.0041	<0.022
Na	< 322	Note 1	34.2	100	Note 1	<0.1741	Note 1	0.0185	0.0465	Note 1
Ni	< 103	< 202	< 42	< 27.9	< 149	<0.0557	<0.1092	<0.0227	<0.013	<0.0693
P	< 157	< 272	< 56.6	< 42.4	< 226	<0.0849	<0.147	<0.0306	<0.0197	<0.1051
Pb	< 159	< 274	< 57.1	< 42.8	< 228	<0.0859	<0.1481	<0.0309	<0.0199	<0.106
S	< 565	< 27300	< 288	< 540	< 22200	<0.3054	<14.7568	<0.1557	<0.2512	<10.3256
Sb	< 322	< 557	< 116	< 87	< 464	<0.1741	<0.3011	<0.0627	<0.0405	<0.2158
Si	30200 Note 2	< 225	< 22.4	< 16.8	< 89.5	16.3243 Note 2	<0.1216	<0.0121	<0.0078	<0.0416
Sn	< 204	< 353	< 73.5	< 55.1	< 294	<0.1103	<0.1908	<0.0397	<0.0256	<0.1367
Sr	< 0.873	4.16	< 0.314	< 0.236	2	<0.0005	0.0022	<0.0002	<0.0001	0.0009
Th	< 58	< 70.8	< 20.9	< 15.7	< 59	<0.0314	<0.0383	<0.0113	<0.0073	<0.0274
Ti	< 39	< 150	< 31.2	< 23.4	< 56.2	<0.0211	<0.0811	<0.0169	<0.0109	<0.0261
U	< 475	< 821	< 171	< 128	< 684	<0.2568	<0.4438	<0.0924	<0.0595	<0.3181
V	< 6.58	16.2	< 2.53	< 1.78	< 9.47	<0.0036	0.0088	<0.0014	<0.0008	<0.0044
Zn	< 20	11.4	< 2.03	1.93	< 8.1	<0.0108	0.0062	<0.0011	0.0009	<0.0038
Zr	8.43	Note 3	64.5	< 1.03	Note 3	0.0046	Note 3	0.0349	<0.0005	Note 3

Note 1: Na is not measured by ICP-OES in sodium peroxide fusion because of Na introduction in the reagent.
Note 2: Si blank levels are extremely high because the high HF concentration of the CC method attacks the quartz ICP-OES sample introduction system.
Note 3: Zr is not measured by ICP-OES in sodium peroxide fusion because a Zr crucible is used.

Table 3-2 provides the measurements of the ARG-1 samples that were included as part of this analytical work. The elemental reference values for the standard glass are also given in this table. Note that in contrast to having only a single blank performed during the CC dissolutions, two ARG-1 standards were dissolved concurrently with the SRAT samples and analyzed concurrently in the ICP-OES laboratory.

Table 3-2. Measurements (wt. %) for the ARG-1 Samples

Element	Reference Value for ARG-1	SB9 SRAT Receipt AR	SB9 SRAT Receipt CC	SB9 SRAT Receipt PF	SB9 SRAT Product AR	SB9 SRAT Product CC	SB9 SRAT Product PF
Ag	0	0.0020	0.0111	0.0167	0.0037	0.0098	0.0164
Al	2.5	2.3900	2.3900	2.6600	2.4200	2.4400	2.6600
B	2.69	2.6700	2.7000	2.5900	2.5900	2.9300	2.5300
Ba	0	0.0788	0.0781	0.0823	0.0847	0.0796	0.0982
Be	0	0.0035	0.0030	0.0032	0.0031	0.0030	0.0031
Ca	1.02	1.0600	0.9260	1.2700	1.0500	1.0600	1.3100
Cd	0	0.0029	0.0081	0.0121	0.0047	0.0072	0.0119
Ce	0	0.0079	0.0659	0.0993	0.0220	0.0585	0.0975
Co	0	0.0076	0.0078	0.0095	0.0072	0.0088	0.0093
Cr	0.064	0.0627	0.0623	0.0730	0.0651	0.0628	0.0665
Cu	0.003	0.0020	0.0059	0.0088	0.0026	0.0052	0.0087
Fe	9.79	9.9200	9.6200	9.9800	10.0000	9.7100	9.7000
Gd	0	0.0049	0.0072	0.0109	0.0040	0.0064	0.0107
K	2.26	2.1500	2.0700	2.5700	2.1600	2.1000	2.3900
La	0	0.0012	0.0036	0.0054	0.0012	0.0032	0.0053
Li	1.49	1.5700	1.5000	1.5500	1.5300	1.5200	1.6400
Mg	0.52	0.5270	0.5270	0.5360	0.5190	0.5320	0.5250
Mn	1.46	1.4900	1.4600	1.4600	1.4800	1.4600	1.4200
Mo	0	0.0061	0.0178	0.0269	0.0084	0.0158	0.0264
Na	8.52	8.8800	8.5300	Note 1	8.5200	8.5100	Note 1
Ni	0.827	0.8470	0.8200	0.8400	0.8120	0.8260	0.8330
P	0	0.1150	0.1130	0.1290	0.1030	0.1200	0.1260
Pb	0	0.0294	0.0862	0.1300	0.0288	0.0765	0.1270
S	0	0.1480	0.3070	Note 2	0.4170	0.2720	Note 2
Sb	0	0.0598	0.1750	0.2640	0.0585	0.1550	0.2590
Si	22.4	Note 3	Note 4	22.6000	Note 3	Note 4	21.8000
Sn	0	0.0379	0.1110	0.1670	0.0371	0.0984	0.1640
Sr	0	0.0032	0.0032	0.0053	0.0030	0.0032	0.0050
Th	0	0.0116	0.0315	0.0544	0.0119	0.0280	0.0329
Ti	0.69	0.5810	0.6800	0.6970	0.5810	0.6810	0.6800
U	0	0.0881	0.2580	0.3890	0.0862	0.2290	0.3810
V	0	0.0013	0.0108	0.0092	0.0120	0.0109	0.0134
Zn	0	0.0181	0.0171	0.0217	0.0181	0.0169	0.0186
Zr	0.096	0.0968	0.0985	Note 5	0.0642	0.0979	Note 5

Note 1: Na is not measured by ICP-OES in sodium peroxide fusion because of Na introduction in the reagent.
Note 2: S is not measured by ICP-OES from the sodium peroxide because the high alkali content affects ICP-OES performance for S.
Note 3. Si is not measured by ICP-OES from AR because Si in glass is not soluble in aqua regia.
Note 4: Si is not measured by ICP-OES from the CC method because the high HF concentration attacks the quartz sample introduction system of ICP-OES.
Note 5: Zr is not measured by ICP-OES from the PF method because a Zr crucible is used in the fusion.

Table 3-3 provides the measurements (in mg/L) of the solution standards that were included in all of this analytical work. A single analysis of the solution standard was performed concurrently with the CC dissolutions of SRAT Receipt and Product samples. The high detection limit for S observed for the PF dissolutions is another of example of the difficulty that the high alkali presented for S determinations. Exhibit A1 in Appendix A provides a plot of these mg/L measurements on a log scale.

Table 3-3. Measurements of the Solution Standard

Type - Prep	SB9 SRAT Receipt PF	SB9 SRAT Receipt AR	SB9 SRAT Product AR	SB9 SRAT Product PF	SB9 SRAT Receipt and Product CC
Sample ID	SM744_063	SM744_063	SM744_063	SM744_063	SM744_063
LIMS	300319990	300319911	300320474	300320489	300320912
UOM	mg/L	mg/L	mg/L	mg/L	mg/L
Al (50)	55.2	50.5	51.8	52.6	52.4
Fe (50)	52	49.7	52.2	50.7	49.8
Mn (20)	20.8	20.3	21	21.5	20.7
Na (150)	Note 1	153	150	Note 1	150
Ni (10)	10.7	10.4	10.2	9.99	9.91
S (10)	< 341	10.3	10.3	< 333	9.32
Note 1: Na in the multielement standard is not relevant for sodium peroxide fusions because of Na introduction in the reagent.					

The tables (Table 3-4 - Table 3-6) provide the measurements of the SRAT Receipt and Product samples: first as elemental concentrations in μg/g of slurry and then in wt. % on a dry solids basis. Exhibit A2 in Appendix A provides plots of the elemental wt. % values for the SRAT Product and SRAT Receipt samples by element. The elements Ag through Mg appear on the first pair of plots and Mn through Zr on the second pair. The y-axes of each pair of plots are in a linear and log scale, respectively. Exhibit A3 in Appendix A provides a plot for each element that overlays the wt. % values from the preparation methods for each element for the SRAT Receipt and Product samples. The y-axes on the first pair of plots are on a log-scale while the y-axes on the second pair of plots are on a linear scale.

Table 3-4. Measurements of the SB9 SRAT Receipt and Product Samples (Ag-Fe)

Type	Prep	Sample ID	LIMS	UOM	Ag	Al	B	Ba	Be	Ca	Cd	Ce	Co	Cr	Cu	Fe
SB9 SRAT Receipt	PF	TS190_15_A_00340	300319991	µg/g	< 32	13600	< 49.9	141	3.64	2350	< 23.3	374	< 18.3	190	74.4	31800
SB9 SRAT Receipt	PF	TS190_15_A_00341	300319992	µg/g	< 34.2	13600	< 53.4	140	3.27	2290	< 24.9	365	< 19.5	291	77.8	31800
SB9 SRAT Receipt	PF	TS190_15_A_00342	300319993	µg/g	< 35.1	14600	< 54.6	155	3.51	1970	28.2	316	< 20	203	80.8	34400
SB9 SRAT Receipt	PF	TS190_15_A_00343	300319994	µg/g	< 34.6	13700	< 54	142	3.46	2040	< 25.2	301	20.6	181	75.1	32100
SB9 SRAT Receipt	AR	TS190_15_A_00307	300319912	µg/g	< 3.73	11700	< 19.6	134	2.19	1840	33.5	66.1	18.1	150	60.1	31700
SB9 SRAT Receipt	AR	TS190_15_A_00308	300319913	µg/g	< 3.6	12100	< 18.8	135	2.24	1850	33.4	69.1	19.6	151	59	31700
SB9 SRAT Receipt	AR	TS190_15_A_00309	300319914	µg/g	< 3.6	12100	< 18.9	134	2.18	1850	32.2	64.2	17.9	150	58.7	31600
SB9 SRAT Receipt	AR	TS190_15_A_00310	300319915	µg/g	< 3.7	12100	< 19.4	135	2.21	1860	32.7	66.2	17.7	152	60	31500
SB9 SRAT Receipt	CC	TS190_15_A_00565	300320903	µg/g	< 19.7	13300	283	127	2.42	1820	24.9	369	19.5	145	67.9	30900
SB9 SRAT Receipt	CC	TS190_15_A_00568	300320904	µg/g	< 20.1	13400	361	130	2.55	1880	27.5	393	19.2	143	69.8	31400
SB9 SRAT Receipt	CC	TS190_15_A_00571	300320905	µg/g	< 18.6	12800	362	126	2.36	1810	28	365	17.4	135	66.3	30100
SB9 SRAT Receipt	CC	TS190_15_A_00574	300320906	µg/g	< 20.5	13100	403	129	2.52	1850	27.3	383	19.2	138	66.5	30800
SB9 SRAT Product	CC	TS190_15_A_00577	300320908	µg/g	< 18.9	12500	466	128	2.32	1950	29.9	370	20.9	261	64.4	29800
SB9 SRAT Product	CC	TS190_15_A_00580	300320909	µg/g	< 20.7	12000	497	123	2.16	1880	26.1	332	18.1	252	61.3	28900
SB9 SRAT Product	CC	TS190_15_A_00583	300320910	µg/g	< 19.9	12100	548	126	2.27	1930	29	353	19.4	254	62.3	29200
SB9 SRAT Product	CC	TS190_15_A_00586	300320911	µg/g	< 20.3	12100	511	126	2.49	1920	26	359	18.2	254	63.1	29300
SB9 SRAT Product	AR	TS190_15_A_00440	300320479	µg/g	< 5.5	13300	81.5	138	2.88	1860	33.4	353	20.1	255	65.7	30600
SB9 SRAT Product	AR	TS190_15_A_00441	300320480	µg/g	< 5.38	11100	76.5	139	2.91	1860	32.8	351	18.9	256	65.1	30500
SB9 SRAT Product	AR	TS190_15_A_00442	300320481	µg/g	< 5.19	11200	72.8	140	2.95	1870	31.5	349	19.4	257	66.6	31000
SB9 SRAT Product	AR	TS190_15_A_00443	300320482	µg/g	< 5.14	11400	71.5	138	2.92	1860	31.2	351	19.2	254	65.5	30700
SB9 SRAT Product	PF	TS190_15_A_00452	300320490	µg/g	< 30.6	12500	59.3	160	3.06	2250	26.9	303	< 17.5	263	69.2	29100
SB9 SRAT Product	PF	TS190_15_A_00453	300320491	µg/g	< 31.4	12600	51.7	164	3	2410	28.3	320	19.8	265	70.7	29400
SB9 SRAT Product	PF	TS190_15_A_00454	300320492	µg/g	< 28.4	12600	55.5	157	3.23	2300	25.7	335	18.1	267	70.4	29300
SB9 SRAT Product	PF	TS190_15_A_00455	300320493	µg/g	< 29.9	12700	51.6	156	3.12	2290	30.8	331	21.6	269	71.3	29700
SB9 SRAT Receipt	PF	TS190_15_A_00340	300319991	wt. %	0.0173	7.3514	0.027	0.0762	0.002	1.2703	0.0126	0.2022	0.0099	0.1027	0.0402	17.1892
SB9 SRAT Receipt	PF	TS190_15_A_00341	300319992	wt. %	0.0185	7.3514	0.0289	0.0757	0.0018	1.2378	0.0135	0.1973	0.0105	0.1573	0.0421	17.1892
SB9 SRAT Receipt	PF	TS190_15_A_00342	300319993	wt. %	0.019	7.8919	0.0295	0.0838	0.0019	1.0649	0.0152	0.1708	0.0108	0.1097	0.0437	18.5946
SB9 SRAT Receipt	PF	TS190_15_A_00343	300319994	wt. %	0.0187	7.4054	0.0292	0.0768	0.0019	1.1027	0.0136	0.1627	0.0111	0.0978	0.0406	17.3514
SB9 SRAT Receipt	AR	TS190_15_A_00307	300319912	wt. %	0.002	6.3243	0.0106	0.0724	0.0012	0.9946	0.0181	0.0357	0.0098	0.0811	0.0325	17.1351
SB9 SRAT Receipt	AR	TS190_15_A_00308	300319913	wt. %	0.0019	6.5405	0.0102	0.073	0.0012	1	0.0181	0.0374	0.0106	0.0816	0.0319	17.1351
SB9 SRAT Receipt	AR	TS190_15_A_00309	300319914	wt. %	0.0019	6.5405	0.0102	0.0724	0.0012	1	0.0174	0.0347	0.0097	0.0811	0.0317	17.0811
SB9 SRAT Receipt	AR	TS190_15_A_00310	300319915	wt. %	0.002	6.5405	0.0105	0.073	0.0012	1.0054	0.0177	0.0358	0.0096	0.0822	0.0324	17.027
SB9 SRAT Receipt	CC	TS190_15_A_00565	300320903	wt. %	0.0106	7.1892	0.153	0.0686	0.0013	0.9838	0.0135	0.1995	0.0105	0.0784	0.0367	16.7027
SB9 SRAT Receipt	CC	TS190_15_A_00568	300320904	wt. %	0.0109	7.2432	0.1951	0.0703	0.0014	1.0162	0.0149	0.2124	0.0104	0.0773	0.0377	16.973
SB9 SRAT Receipt	CC	TS190_15_A_00571	300320905	wt. %	0.0101	6.9189	0.1957	0.0681	0.0013	0.9784	0.0151	0.1973	0.0094	0.073	0.0358	16.2703
SB9 SRAT Receipt	CC	TS190_15_A_00574	300320906	wt. %	0.0111	7.0811	0.2178	0.0697	0.0014	1	0.0148	0.207	0.0104	0.0746	0.0359	16.6486

Table 3-4. Measurements of the SB9 SRAT Receipt and Product Samples (Ag-Fe) (continued)

Type	Prep	Sample ID	LIMS	UOM	Ag	Al	B	Ba	Be	Ca	Cd	Ce	Co	Cr	Cu	Fe
SB9 SRAT Product	CC	TS190_15_A_00577	300320908	wt. %	0.0088	5.814	0.2167	0.0595	0.0011	0.907	0.0139	0.1721	0.0097	0.1214	0.03	13.8605
SB9 SRAT Product	CC	TS190_15_A_00580	300320909	wt. %	0.0096	5.5814	0.2312	0.0572	0.001	0.8744	0.0121	0.1544	0.0084	0.1172	0.0285	13.4419
SB9 SRAT Product	CC	TS190_15_A_00583	300320910	wt. %	0.0093	5.6279	0.2549	0.0586	0.0011	0.8977	0.0135	0.1642	0.009	0.1181	0.029	13.5814
SB9 SRAT Product	CC	TS190_15_A_00586	300320911	wt. %	0.0094	5.6279	0.2377	0.0586	0.0012	0.893	0.0121	0.167	0.0085	0.1181	0.0293	13.6279
SB9 SRAT Product	AR	TS190_15_A_00440	300320479	wt. %	0.0026	6.186	0.0379	0.0642	0.0013	0.8651	0.0155	0.1642	0.0093	0.1186	0.0306	14.2326
SB9 SRAT Product	AR	TS190_15_A_00441	300320480	wt. %	0.0025	5.1628	0.0356	0.0647	0.0014	0.8651	0.0153	0.1633	0.0088	0.1191	0.0303	14.186
SB9 SRAT Product	AR	TS190_15_A_00442	300320481	wt. %	0.0024	5.2093	0.0339	0.0651	0.0014	0.8698	0.0147	0.1623	0.009	0.1195	0.031	14.4186
SB9 SRAT Product	AR	TS190_15_A_00443	300320482	wt. %	0.0024	5.3023	0.0333	0.0642	0.0014	0.8651	0.0145	0.1633	0.0089	0.1181	0.0305	14.2791
SB9 SRAT Product	PF	TS190_15_A_00452	300320490	wt. %	0.0142	5.814	0.0276	0.0744	0.0014	1.0465	0.0125	0.1409	0.0081	0.1223	0.0322	13.5349
SB9 SRAT Product	PF	TS190_15_A_00453	300320491	wt. %	0.0146	5.8605	0.024	0.0763	0.0014	1.1209	0.0132	0.1488	0.0092	0.1233	0.0329	13.6744
SB9 SRAT Product	PF	TS190_15_A_00454	300320492	wt. %	0.0132	5.8605	0.0258	0.073	0.0015	1.0698	0.012	0.1558	0.0084	0.1242	0.0327	13.6279
SB9 SRAT Product	PF	TS190_15_A_00455	300320493	wt. %	0.0139	5.907	0.024	0.0726	0.0015	1.0651	0.0143	0.154	0.01	0.1251	0.0332	13.814

Table 3-5. Measurements of the SB9 SRAT Receipt and Product Samples (Gd-Pb)

Type	Prep	Sample ID	LIMS	UOM	Gd	K	La	Li	Mg	Mn	Mo	Na	Ni	P	Pb
SB9 SRAT Receipt	PF	TS190_15_A_00340	300319991	µg/g	149	862	< 10.5	< 129	392	10500	< 51.7	Note 1	2410	315	< 249
SB9 SRAT Receipt	PF	TS190_15_A_00341	300319992	µg/g	142	1030	< 11.2	214	385	10400	< 55.2	Note 1	2300	367	< 267
SB9 SRAT Receipt	PF	TS190_15_A_00342	300319993	µg/g	149	682	< 11.4	247	384	11300	< 56.5	Note 1	2630	518	< 273
SB9 SRAT Receipt	PF	TS190_15_A_00343	300319994	µg/g	132	972	< 11.3	246	334	10500	< 55.8	Note 1	2420	426	< 270
SB9 SRAT Receipt	AR	TS190_15_A_00307	300319912	µg/g	165	< 208	80.5	97.6	423	10600	11.3	25400	2370	310	69.5
SB9 SRAT Receipt	AR	TS190_15_A_00308	300319913	µg/g	165	< 200	80.6	98.7	423	10600	12.5	25600	2350	291	66.8
SB9 SRAT Receipt	AR	TS190_15_A_00309	300319914	µg/g	165	< 200	80.5	96.6	424	10600	13.4	25400	2370	290	67.3
SB9 SRAT Receipt	AR	TS190_15_A_00310	300319915	µg/g	166	< 206	80.7	104	426	10500	12.5	25300	2380	319	72.2
SB9 SRAT Receipt	CC	TS190_15_A_00565	300320903	µg/g	137	< 221	34.9	< 79.4	432	10500	< 31.8	25200	2350	438	< 153
SB9 SRAT Receipt	CC	TS190_15_A_00568	300320904	µg/g	140	< 225	36.9	< 80.8	442	10800	< 32.4	25700	2420	438	< 156
SB9 SRAT Receipt	CC	TS190_15_A_00571	300320905	µg/g	130	< 208	34.7	< 74.8	425	10400	< 30	24600	2280	404	< 145
SB9 SRAT Receipt	CC	TS190_15_A_00574	300320906	µg/g	135	< 230	34.8	< 82.7	434	10600	< 33.1	25000	2370	459	< 160
SB9 SRAT Product	CC	TS190_15_A_00577	300320908	µg/g	136	< 212	46.5	78.5	467	12100	< 30.5	31600	2310	437	< 148
SB9 SRAT Product	CC	TS190_15_A_00580	300320909	µg/g	131	< 232	46.2	< 83.4	453	11800	< 33.4	30500	2230	404	< 161
SB9 SRAT Product	CC	TS190_15_A_00583	300320910	µg/g	134	< 224	44.9	< 80.3	458	11900	< 32.2	31100	2300	453	< 155
SB9 SRAT Product	CC	TS190_15_A_00586	300320911	µg/g	134	< 227	47.5	< 81.7	457	11900	< 32.7	30900	2260	401	< 158
SB9 SRAT Product	AR	TS190_15_A_00440	300320479	µg/g	133	198	34.1	84.6	440	11900	19.4	30100	2180	270	81.1
SB9 SRAT Product	AR	TS190_15_A_00441	300320480	µg/g	132	202	33.8	85.2	441	12000	20.7	30000	2190	238	75.5
SB9 SRAT Product	AR	TS190_15_A_00442	300320481	µg/g	134	214	33.6	85.4	441	11900	20.6	30400	2180	267	76.4
SB9 SRAT Product	AR	TS190_15_A_00443	300320482	µg/g	132	190	33.5	85	438	11500	21.6	30300	2170	247	73.7
SB9 SRAT Product	PF	TS190_15_A_00452	300320490	µg/g	94	588	< 10	< 123	437	11700	< 49.4	Note 1	2230	316	< 239
SB9 SRAT Product	PF	TS190_15_A_00453	300320491	µg/g	96.1	783	< 10.3	< 127	449	11900	< 50.7	Note 1	2270	348	< 245
SB9 SRAT Product	PF	TS190_15_A_00454	300320492	µg/g	101	774	< 9.28	< 114	444	11800	< 45.8	Note 1	2280	341	< 221
SB9 SRAT Product	PF	TS190_15_A_00455	300320493	µg/g	107	758	< 9.75	< 120	446	12000	< 48.2	Note 1	2290	331	< 233
SB9 SRAT Receipt	PF	TS190_15_A_00340	300319991	wt. %	0.0805	0.4659	0.0057	0.0697	0.2119	5.6757	0.0279	Note 1	1.3027	0.1703	0.1346
SB9 SRAT Receipt	PF	TS190_15_A_00341	300319992	wt. %	0.0768	0.5568	0.0061	0.1157	0.2081	5.6216	0.0298	Note 1	1.2432	0.1984	0.1443
SB9 SRAT Receipt	PF	TS190_15_A_00342	300319993	wt. %	0.0805	0.3686	0.0062	0.1335	0.2076	6.1081	0.0305	Note 1	1.4216	0.28	0.1476
SB9 SRAT Receipt	PF	TS190_15_A_00343	300319994	wt. %	0.0714	0.5254	0.0061	0.133	0.1805	5.6757	0.0302	Note 1	1.3081	0.2303	0.1459
SB9 SRAT Receipt	AR	TS190_15_A_00307	300319912	wt. %	0.0892	0.1124	0.0435	0.0528	0.2286	5.7297	0.0061	13.7297	1.2811	0.1676	0.0376
SB9 SRAT Receipt	AR	TS190_15_A_00308	300319913	wt. %	0.0892	0.1081	0.0436	0.0534	0.2286	5.7297	0.0068	13.8378	1.2703	0.1573	0.0361
SB9 SRAT Receipt	AR	TS190_15_A_00309	300319914	wt. %	0.0892	0.1081	0.0435	0.0522	0.2292	5.7297	0.0072	13.7297	1.2811	0.1568	0.0364
SB9 SRAT Receipt	AR	TS190_15_A_00310	300319915	wt. %	0.0897	0.1114	0.0436	0.0562	0.2303	5.6757	0.0068	13.6757	1.2865	0.1724	0.039
SB9 SRAT Receipt	CC	TS190_15_A_00565	300320903	wt. %	0.0741	0.1195	0.0189	0.0429	0.2335	5.6757	0.0172	13.6216	1.2703	0.2368	0.0827
SB9 SRAT Receipt	CC	TS190_15_A_00568	300320904	wt. %	0.0757	0.1216	0.0199	0.0437	0.2389	5.8378	0.0175	13.8919	1.3081	0.2368	0.0843
SB9 SRAT Receipt	CC	TS190_15_A_00571	300320905	wt. %	0.0703	0.1124	0.0188	0.0404	0.2297	5.6216	0.0162	13.2973	1.2324	0.2184	0.0784
SB9 SRAT Receipt	CC	TS190_15_A_00574	300320906	wt. %	0.073	0.1243	0.0188	0.0447	0.2346	5.7297	0.0179	13.5135	1.2811	0.2481	0.0865
Note 1: Na is not measured by ICP-OES from the PF method because of Na introduction from the reagent.															

Table 3-5. Measurements of the SB9 SRAT Receipt and Product Samples (Gd-Pb) (continued)

Type	Prep	Sample ID	LIMS	UOM	Gd	K	La	Li	Mg	Mn	Mo	Na	Ni	P	Pb
SB9 SRAT Product	CC	TS190_15_A_00577	300320908	wt. %	0.0633	0.0986	0.0216	0.0365	0.2172	5.6279	0.0142	14.6977	1.0744	0.2033	0.0688
SB9 SRAT Product	CC	TS190_15_A_00580	300320909	wt. %	0.0609	0.1079	0.0215	0.0388	0.2107	5.4884	0.0155	14.186	1.0372	0.1879	0.0749
SB9 SRAT Product	CC	TS190_15_A_00583	300320910	wt. %	0.0623	0.1042	0.0209	0.0373	0.213	5.5349	0.015	14.4651	1.0698	0.2107	0.0721
SB9 SRAT Product	CC	TS190_15_A_00586	300320911	wt. %	0.0623	0.1056	0.0221	0.038	0.2126	5.5349	0.0152	14.3721	1.0512	0.1865	0.0735
SB9 SRAT Product	AR	TS190_15_A_00440	300320479	wt. %	0.0619	0.0921	0.0159	0.0393	0.2047	5.5349	0.009	14	1.014	0.1256	0.0377
SB9 SRAT Product	AR	TS190_15_A_00441	300320480	wt. %	0.0614	0.094	0.0157	0.0396	0.2051	5.5814	0.0096	13.9535	1.0186	0.1107	0.0351
SB9 SRAT Product	AR	TS190_15_A_00442	300320481	wt. %	0.0623	0.0995	0.0156	0.0397	0.2051	5.5349	0.0096	14.1395	1.014	0.1242	0.0355
SB9 SRAT Product	AR	TS190_15_A_00443	300320482	wt. %	0.0614	0.0884	0.0156	0.0395	0.2037	5.3488	0.01	14.093	1.0093	0.1149	0.0343
SB9 SRAT Product	PF	TS190_15_A_00452	300320490	wt. %	0.0437	0.2735	0.0047	0.0572	0.2033	5.4419	0.023	Note 1	1.0372	0.147	0.1112
SB9 SRAT Product	PF	TS190_15_A_00453	300320491	wt. %	0.0447	0.3642	0.0048	0.0591	0.2088	5.5349	0.0236	Note 1	1.0558	0.1619	0.114
SB9 SRAT Product	PF	TS190_15_A_00454	300320492	wt. %	0.047	0.36	0.0043	0.053	0.2065	5.4884	0.0213	Note 1	1.0605	0.1586	0.1028
SB9 SRAT Product	PF	TS190_15_A_00455	300320493	wt. %	0.0498	0.3526	0.0045	0.0558	0.2074	5.5814	0.0224	Note 1	1.0651	0.154	0.1084
Note 1: Na is not measured by ICP-OES from the PF method because of Na introduction from the reagent.															

Table 3-6. Measurements of the SB9 SRAT Receipt and Product Samples (S-Zr)

Type	Prep	Sample ID	LIMS	UOM	S	Sb	Si	Sn	Sr	Th	Ti	U	V	Zn	Zr
SB9 SRAT Receipt	PF	TS190_15_A_00340	300319991	µg/g	< 24900	< 506	2540	< 321	54.4	1600	< 136	5300	< 11	52	Note 1
SB9 SRAT Receipt	PF	TS190_15_A_00341	300319992	µg/g	< 26600	< 542	2480	< 343	53.5	1600	< 146	5170	< 11.8	49.3	Note 1
SB9 SRAT Receipt	PF	TS190_15_A_00342	300319993	µg/g	< 27200	< 554	2710	< 351	49.2	1590	< 149	5180	< 12.1	55.5	Note 1
SB9 SRAT Receipt	PF	TS190_15_A_00343	300319994	µg/g	< 26900	< 548	2540	< 347	50.2	1540	< 147	4950	< 11.9	55.5	Note 1
SB9 SRAT Receipt	AR	TS190_15_A_00307	300319912	µg/g	431	< 111	1090	< 70.1	51.7	1650	41.1	6300	< 2.41	58.1	127
SB9 SRAT Receipt	AR	TS190_15_A_00308	300319913	µg/g	475	< 107	616	< 67.5	51.9	1640	41.1	6330	< 2.32	57	91.4
SB9 SRAT Receipt	AR	TS190_15_A_00309	300319914	µg/g	467	< 107	564	< 67.6	51.9	1650	40.9	6360	< 2.33	56.5	100
SB9 SRAT Receipt	AR	TS190_15_A_00310	300319915	µg/g	457	< 110	768	< 69.6	51.8	1660	41.2	6340	< 2.39	57.5	146
SB9 SRAT Receipt	CC	TS190_15_A_00565	300320903	µg/g	< 546	< 312	32700	< 197	47.6	1530	40.8	5840	< 6.36	50.7	305
SB9 SRAT Receipt	CC	TS190_15_A_00568	300320904	µg/g	< 556	< 317	35600	< 201	48.6	1560	41.7	6020	< 6.48	51.7	309
SB9 SRAT Receipt	CC	TS190_15_A_00571	300320905	µg/g	< 515	< 294	33000	< 186	46.3	1490	39.3	5620	< 6	44.7	296
SB9 SRAT Receipt	CC	TS190_15_A_00574	300320906	µg/g	< 569	< 325	37400	< 206	47.2	1490	< 39.3	5650	< 6.63	47.7	300
SB9 SRAT Product	CC	TS190_15_A_00577	300320908	µg/g	< 525	< 300	26600	< 190	52.3	1520	37.8	5310	< 6.12	53.1	289
SB9 SRAT Product	CC	TS190_15_A_00580	300320909	µg/g	< 725	< 327	33200	< 207	49.8	1430	< 39.7	5200	< 6.68	49	280
SB9 SRAT Product	CC	TS190_15_A_00583	300320910	µg/g	< 553	< 315	37600	< 200	51.1	1510	< 38.2	5330	< 6.44	50.1	286
SB9 SRAT Product	CC	TS190_15_A_00586	300320911	µg/g	< 562	< 321	38800	< 203	51.2	1500	< 38.9	5340	< 6.55	51	285
SB9 SRAT Product	AR	TS190_15_A_00440	300320479	µg/g	564	< 87	1100	< 55.1	53.2	1590	37.7	5820	< 1.78	52.8	100
SB9 SRAT Product	AR	TS190_15_A_00441	300320480	µg/g	541	< 85.1	818	< 53.9	53.4	1580	37.5	5830	< 1.74	53.2	71.4
SB9 SRAT Product	AR	TS190_15_A_00442	300320481	µg/g	582	< 82.2	1030	< 52.1	53.4	1590	37.6	5860	< 1.68	53.9	92.7
SB9 SRAT Product	AR	TS190_15_A_00443	300320482	µg/g	551	< 81.2	590	< 51.5	53.1	1590	37.1	5840	< 1.66	52.7	79.3
SB9 SRAT Product	PF	TS190_15_A_00452	300320490	µg/g	< 23200	< 485	2610	< 307	54	1520	< 58.7	5420	< 9.89	60.6	Note 1
SB9 SRAT Product	PF	TS190_15_A_00453	300320491	µg/g	< 23800	< 497	2780	< 315	56.5	1600	< 60.2	5880	< 10.1	55.2	Note 1
SB9 SRAT Product	PF	TS190_15_A_00454	300320492	µg/g	< 21500	< 449	2600	< 285	55.8	1600	< 54.4	5740	< 9.17	55.6	Note 1
SB9 SRAT Product	PF	TS190_15_A_00455	300320493	µg/g	< 22600	< 472	2670	< 299	55.3	1580	< 57.3	5590	< 9.64	61	Note 1
SB9 SRAT Receipt	PF	TS190_15_A_00340	300319991	wt. %	13.4595	0.2735	1.373	0.1735	0.0294	0.8649	0.0735	2.8649	0.0059	0.0281	Note 1
SB9 SRAT Receipt	PF	TS190_15_A_00341	300319992	wt. %	14.3784	0.293	1.3405	0.1854	0.0289	0.8649	0.0789	2.7946	0.0064	0.0266	Note 1
SB9 SRAT Receipt	PF	TS190_15_A_00342	300319993	wt. %	14.7027	0.2995	1.4649	0.1897	0.0266	0.8595	0.0805	2.8	0.0065	0.03	Note 1
SB9 SRAT Receipt	PF	TS190_15_A_00343	300319994	wt. %	14.5405	0.2962	1.373	0.1876	0.0271	0.8324	0.0795	2.6757	0.0064	0.03	Note 1
SB9 SRAT Receipt	AR	TS190_15_A_00307	300319912	wt. %	0.233	0.06	0.5892	0.0379	0.0279	0.8919	0.0222	3.4054	0.0013	0.0314	0.0686
SB9 SRAT Receipt	AR	TS190_15_A_00308	300319913	wt. %	0.2568	0.0578	0.333	0.0365	0.0281	0.8865	0.0222	3.4216	0.0013	0.0308	0.0494
SB9 SRAT Receipt	AR	TS190_15_A_00309	300319914	wt. %	0.2524	0.0578	0.3049	0.0365	0.0281	0.8919	0.0221	3.4378	0.0013	0.0305	0.0541
SB9 SRAT Receipt	AR	TS190_15_A_00310	300319915	wt. %	0.247	0.0595	0.4151	0.0376	0.028	0.8973	0.0223	3.427	0.0013	0.0311	0.0789
SB9 SRAT Receipt	CC	TS190_15_A_00565	300320903	wt. %	0.2951	0.1686	17.6757	0.1065	0.0257	0.827	0.0221	3.1568	0.0034	0.0274	0.1649
SB9 SRAT Receipt	CC	TS190_15_A_00568	300320904	wt. %	0.3005	0.1714	19.2432	0.1086	0.0263	0.8432	0.0225	3.2541	0.0035	0.0279	0.167
SB9 SRAT Receipt	CC	TS190_15_A_00571	300320905	wt. %	0.2784	0.1589	17.8378	0.1005	0.025	0.8054	0.0212	3.0378	0.0032	0.0242	0.16
SB9 SRAT Receipt	CC	TS190_15_A_00574	300320906	wt. %	0.3076	0.1757	20.2162	0.1114	0.0255	0.8054	0.0212	3.0541	0.0036	0.0258	0.1622
Note 1: Zr is not measured by ICP-OES from the PF method because a Zr crucible is used in the fusion.															

Table 3-6. Measurements of the SB9 SRAT Receipt and Product Samples (S-Zr) (continued)

Type	Prep	Sample ID	LIMS	UOM	S	Sb	Si	Sn	Sr	Th	Ti	U	V	Zn	Zr
SB9 SRAT Product	CC	TS190_15_A_00577	300320908	wt. %	0.2442	0.1395	12.3721	0.0884	0.0243	0.707	0.0176	2.4698	0.0028	0.0247	0.1344
SB9 SRAT Product	CC	TS190_15_A_00580	300320909	wt. %	0.3372	0.1521	15.4419	0.0963	0.0232	0.6651	0.0185	2.4186	0.0031	0.0228	0.1302
SB9 SRAT Product	CC	TS190_15_A_00583	300320910	wt. %	0.2572	0.1465	17.4884	0.093	0.0238	0.7023	0.0178	2.4791	0.003	0.0233	0.133
SB9 SRAT Product	CC	TS190_15_A_00586	300320911	wt. %	0.2614	0.1493	18.0465	0.0944	0.0238	0.6977	0.0181	2.4837	0.003	0.0237	0.1326
SB9 SRAT Product	AR	TS190_15_A_00440	300320479	wt. %	0.2623	0.0405	0.5116	0.0256	0.0247	0.7395	0.0175	2.707	0.0008	0.0246	0.0465
SB9 SRAT Product	AR	TS190_15_A_00441	300320480	wt. %	0.2516	0.0396	0.3805	0.0251	0.0248	0.7349	0.0174	2.7116	0.0008	0.0247	0.0332
SB9 SRAT Product	AR	TS190_15_A_00442	300320481	wt. %	0.2707	0.0382	0.4791	0.0242	0.0248	0.7395	0.0175	2.7256	0.0008	0.0251	0.0431
SB9 SRAT Product	AR	TS190_15_A_00443	300320482	wt. %	0.2563	0.0378	0.2744	0.024	0.0247	0.7395	0.0173	2.7163	0.0008	0.0245	0.0369
SB9 SRAT Product	PF	TS190_15_A_00452	300320490	wt. %	10.7907	0.2256	1.214	0.1428	0.0251	0.707	0.0273	2.5209	0.0046	0.0282	Note 1
SB9 SRAT Product	PF	TS190_15_A_00453	300320491	wt. %	11.0698	0.2312	1.293	0.1465	0.0263	0.7442	0.028	2.7349	0.0047	0.0257	Note 1
SB9 SRAT Product	PF	TS190_15_A_00454	300320492	wt. %	10	0.2088	1.2093	0.1326	0.026	0.7442	0.0253	2.6698	0.0043	0.0259	Note 1
SB9 SRAT Product	PF	TS190_15_A_00455	300320493	wt. %	10.5116	0.2195	1.2419	0.1391	0.0257	0.7349	0.0267	2.6	0.0045	0.0284	Note 1
Note 1: Zr is not measured by ICP-OES from the PF method because a Zr crucible is used in the fusion.															

Exhibit A4 in Appendix A provides a more detailed and thorough statistical evaluation of the SRAT measurements. This exhibit provides a statistical review of the elemental measurements (as wt. % on a dry solids basis) of the SRAT Receipt and Product samples. Comparisons are made across all of the preparation methods that were utilized to provide the available data for the element in question. In each case, the results from a statistical test for the equality of the variances across the preparation methods for each set of measurements are provided. JMP® includes several tests as part of this output. The conclusions made as part of this study are taken from the results of the Levene test. A p-value from this test that is less than or equal to 0.05 (given by the Prob>F value for this test in the exhibit) indicates a statistically significant difference in the variances of the measurements from the preparation methods (at the 5% significance level). If the p-value is greater than 0.5, then the hypothesis of equality for the variances cannot be rejected at the 5% significance level. As an example, consider the results for Al for the SRAT Receipt samples. Measurements from all three preparation methods were available for this element. The p-value for the Levene test is 0.2370, indicating that the hypothesis of equal variances across the three preparation methods cannot be rejected at the 5% significance level for the SRAT Receipt Al results.

Comparisons of the average values across the preparation methods is another important comparison provided for each element as part of the JMP® output of Exhibit A4. There are two approaches for making comparisons of the means across the preparation methods: (1) one approach is based on an assumption of equal variances for the measurements across the preparation methods and (2) the second approach is based on an assumption of unequal variances. JMP® provides the appropriate statistical tests for each of these situations: the results from an analysis of variance (ANOVA) for the equal variance case and the results from Welch's test for the unequal variance case. The selection of the appropriate set of results is made by relying on the outcome of the Levene test for the element. As an example, consider once again the results for SRAT Receipt Al. Since the results from the Levene test did not indicate that the measurement variances were different across the preparation methods, an assumption of equal variance can be made and the ANOVA results used for the comparison of the means. The p-value for this analysis, indicated by the Prob>F value, is given as <0.0001 (a value much less than the 0.05 for a 5% significance level). This leads to the conclusion that the means of the measurements for the SRAT Receipt Al differ across the three preparation methods. If Levene's test had suggested that the variances were unequal, Welch's test would have been used. The p-value for this test is indicated by the value for Prob>F, which would be interpreted in the same manner as the ANOVA's p-value. To aid in the interpretation of these results in the exhibit, the Levene information is enhanced (i.e., bolded and shown in a larger font) as is the appropriate p-value result from the testing for the means.

The JMP® output in this exhibit provides the results from one additional comparison of the means for those elements measured by all three preparations. This statistical evaluation assumes that the variances of the methods are equal and makes comparisons across all pairs of means and highlights those that are statistically different at the 5% significance level. Consider the Al results for the SRAT Receipt samples. The exhibit shows:

Level				**Mean**
PF	A			7.5000000
CC		B		7.1081081
AR			C	6.4864865

The means of the measurements for the three preparations are given in descending order (top to bottom). They are also labeled from the largest to the smallest average values with an "A", "B", and "C." As indicated in the exhibit, "levels not connected by same letter are significantly different." Thus, in this case all of the means are statistically different from each other, with the labels being used such that A > B > C.

Table 3-7 summarizes the results from Exhibit A4. It should be noted that to avoid unnecessary discussions of elements that are basically at trace or noise levels in the sludge, Table 3-7 and all further discussions only include those elements that are at least 0.1 wt. % on a dry solids basis. Table 3-7 provides the average of the elemental wt. % measurements for each preparation method along with the relative standard deviation (%RSD), i.e., the standard deviation as a percentage of the average. Also, the table contains a column with the results of the Levene test for a difference in the variances of the measurements across the preparation methods for each element. (A "yes" entry designates a statistically significant, at the 5% level, difference in the variances for the measurements of the indicated element.) The results of the statistical comparisons across the means of the measurements from the preparation methods are highlighted in the last three columns of Table 3-7. The use of the letters "A", "B", and "C" in labeling the average values in this table is as described above.

Table 3-7. SRAT Receipt and SRAT Product Results for Elements ≥ 0.1 wt. % in the Dry Sludge

Type SB9 SRAT	Element	Avg AR (%RSD)	Avg CC (%RSD)	Avg PF (%RSD)	Significant Difference in Variances	Connecting Letters for Means (equal std devs)		
						AR	CC	PF
Receipt	Al	6.486 (1.67%)	7.108 (2.01%)	7.500 (3.50%)		C	B	A
Receipt	B	0.010 (2.01%)	0.190 (14.23%)	0.029 (3.98%)	yes	B	A	B
Receipt	Ca	1.000 (0.44%)	0.995 (1.72%)	1.169 (8.59%)	yes	B	B	A
Receipt	Ce	0.036 (3.04%)	0.204 (3.42%)	0.183 (10.60%)	yes	B	A	A
Receipt	Cr	0.081 (0.64%)	0.076 (3.26%)	0.117 (23.42%)	yes	B	B	A
Receipt	Fe	17.095 (0.30%)	16.649 (1.74%)	17.581 (3.87%)	yes	AB	B	A
Receipt	Hg	1.97 (6.73%)	0.71 (11.55%)	Note 1	yes	A	B	Note 1
Receipt	K	0.110 (2.03%)	0.119 (4.26%)	0.479 (17.27%)	yes	B	B	A
Receipt	Mg	0.229 (0.33%)	0.234 (1.61%)	0.202 (7.15%)	yes	A	A	B
Receipt	Mn	5.716 (0.47%)	5.716 (1.61%)	5.770 (3.93%)	yes	A	A	A
Receipt	Na	13.743 (0.49%)	13.581 (1.82%)	Note 2		A	A	Note 2
Receipt	Ni	1.280 (0.53%)	1.273 (2.46%)	1.319 (5.65%)		A	A	A
Receipt	P	0.164 (4.74%)	0.235 (5.24%)	0.220 (21.42%)	yes	B	A	A
Receipt	S	0.247 (4.18%)	0.295 (4.21%)	Note 3		B	A	Note 3
Receipt	Si	0.411 (31.17%)	Note 4	1.388 (3.86%)		B	Note 4	A
Receipt	Th	0.892 (0.49%)	0.820 (2.24%)	0.855 (1.82%)		A	C	B
Receipt	U	3.423 (0.39%)	3.126 (3.21%)	2.784 (2.83%)		A	B	C
Receipt	Zr	0.063 (21.57%)	0.164 (1.88%)	Note 5	yes	B	A	Note 5
Product	Al	5.465 (8.86%)	5.663 (1.82%)	5.860 (0.65%)	yes	A	A	A
Product	B	0.035 (5.93%)	0.235 (6.73%)	0.025 (6.72%)	yes	B	A	B
Product	Ca	0.866 (0.27%)	0.893 (1.53%)	1.076 (2.96%)		B	B	A
Product	Ce	0.163 (0.47%)	0.164 (4.52%)	0.150 (4.44%)		A	A	B
Product	Cr	0.119 (0.51%)	0.119 (1.55%)	0.124 (0.97%)		B	B	A
Product	Fe	14.279 (0.70%)	13.628 (1.28%)	13.663 (0.85%)		A	B	B
Product	Hg	0.487 (0.88%)	0.543 (2.57%)	Note 1		B	A	N/A
Product	K	0.093 (4.98%)	0.104 (3.80%)	0.338 (12.73%)	yes	B	B	A
Product	Mg	0.205 (0.32%)	0.213 (1.29%)	0.207 (1.15%)		B	A	B
Product	Mn	5.500 (1.88%)	5.547 (1.06%)	5.512 (1.09%)		A	A	A
Product	Na	14.047 (0.60%)	14.430 (1.47%)	Note 2		B	A	-
Product	Ni	1.014 (0.37%)	1.058 (1.62%)	1.055 (1.16%)	yes	B	A	A
Product	P	0.119 (6.07%)	0.197 (6.00%)	0.155 (4.16%)		C	A	B
Product	S	0.260 (3.17%)	0.275 (15.31%)	Note 3		A	A	Note 3
Product	Si	0.411 (26.01%)	Note 4	1.240 (3.10%)		B	Note 4	A
Product	Th	0.738 (0.31%)	0.693 (2.74%)	0.733 (2.40%)		A	B	A
Product	U	2.715 (0.29%)	2.463 (1.22%)	2.631 (3.49%)	yes	A	B	A
Product	Zr	0.040 (15.02%)	0.133 (1.31%)	Note 5	yes	B	A	Note 5

Note 1: Hg is not measured by AAS in the PF because the 675 °C temperature of the fusion could volatilize Hg. See Exhibit A5 of Appendix A.
Note 2: Na is not measured by ICP-OES in sodium peroxide fusion because of Na introduction in the reagent.
Note 3: S is not measured by ICP-OES from the sodium peroxide because the high alkali content affects ICP-OES performance. Exhibit A4 has results for S with and without the PF results. The S results without PF are shown here.
Note 4: Si is not measured by ICP-OES from the CC method because the high HF concentration attacks the quartz sample introduction system of ICP-OES. Exhibit A4 has results for Si with and without the CC results. The Si results without CC are shown here.
Note 5: Zr is not measured by ICP-OES from the PF method because a Zr crucible is used in the fusion.

Table 3-8 provides the Hg measurements generated by AAS as part of these analyses. The measurements of the blanks are included in this table. Exhibit A5 in Appendix A provides the detailed statistical evaluation of these data using the same methods described above.

Table 3-8. Hg Measurements by AAS

Type Sample	Prep	Sample Desc	Sample ID	Hg (µg/g)	Hg (wt. %)
SRAT Receipt	AR	SB9	300319916	3950	2.135
SRAT Receipt	AR	SB9	300319917	3390	1.832
SRAT Receipt	AR	SB9	300319918	3530	1.908
SRAT Receipt	AR	SB9	300319919	3740	2.022
SRAT Receipt	CC	SB9	300320903	1550	0.838
SRAT Receipt	CC	SB9	300320904	1220	0.659
SRAT Receipt	CC	SB9	300320905	1230	0.665
SRAT Receipt	CC	SB9	300320906	1230	0.665
SRAT Product	AR	SB9	300320475	1030	0.479
SRAT Product	AR	SB9	300320476	1050	0.488
SRAT Product	AR	SB9	300320477	1050	0.488
SRAT Product	AR	SB9	300320478	1040	0.484
SRAT Product	CC	SB9	300320908	1140	0.530
SRAT Product	CC	SB9	300320909	1210	0.563
SRAT Product	CC	SB9	300320910	1160	0.540
SRAT Product	CC	SB9	300320911	1160	0.540
SRAT Receipt	AR	blank	300319909	<7.33	0.004
SRAT Receipt	CC	blank	300320901	<10.2	0.006
SRAT Product	AR	blank	300320472	<6.88	0.003

Here is a summary of these results:

Type Sample	Prep	Mean (Hg (wt. %))	%RSD
SRAT Receipt	AR	1.9743	6.71
SRAT Receipt	CC	0.7068	12.37
SRAT Product	AR	0.4849	0.92
SRAT Product	CC	0.5430	2.56

There is no indication of a statistically significant (at the 5% level) difference in the variances of the AR and CC measurements. This is true for both the SRAT Receipt and SRAT Product. However, the AR Hg results for the SRAT Receipt are statistically higher than those from the CC prep, while the opposite is true for the SRAT Product: the CC Hg results are higher than those of the AR prep.

4.0 Conclusions and Recommendations

This limited (four replicate dissolutions and elemental analysis of the SRAT Receipt and SRAT Product) test of the DWPF CC method did not reveal extreme biases in the method versus the AR and PF methods for determining the major elements in the sludge. As typical, random errors and variances of both the dissolutions and ICP-OES and AAS methods resulted in elemental determinations matching for some elements as a function of dissolution method but not for others. The CC method produced elemental analyses of SB9 SRAT Receipt and SRAT Product that should be adequate for routine process control analyses in the DWPF after side-by-side tests of the CC method and PF method are performed on the first 10 SRAT cycles of the SB9 campaign. This much larger data set produced in the DWPF Laboratory will provide more opportunity to assess whether the CC method meets the data quality objectives needed for

DWPF process control. The DWPF Laboratory should continue with their plans for further tests, including statistical analysis, of the CC method during these 10 SRAT cycles.

5.0 References

[1] A. Samadi-Dezfouli, "Technical Task Request: Sludge Batch 9 Qualification, Confirmatory, and Waste Acceptance Product Specification Samples", U-TTR-S-00009, Rev. 1, 11/30/2015.

[2] J.M. Pareizs, "Task Technical and Quality Assurance Plan for Sludge Batch 9 Qualification, Confirmatory, and Waste Acceptance Product Specification Samples", SRNL-RP-2015-00120, Rev. 1, 12/29/2015.

[3] C.J. Coleman, "Aqua Regia Dissolution of Sludge for Elemental Analysis", ADS Procedure ADS-2226, Rev. 10.

[4] C.J. Coleman, "Alkali Fusion Dissolutions of Sludge and Glass for Elemental and Anion Analysis", ADS Procedure ADS-2502, Rev. 7.

[5] C.J. Coleman, F.M. Pennebaker, B.H. Burch and D.R. Click, "Evaluation of the DWPF Cold Chem Dissolution Method with DWPF Sludge Batch 3 Simulant," WSRC-TR-02-00496, Rev. 0.

[6] D.R. Click, "Evaluation of the DWPF Cold Chem Dissolution Method with Tank 7 and Tank 51 Radioactive Sludges," WSRC-TR-2003-00580, Rev. 0.

[7] D.R. Click, C.J. Coleman, K.E. Zeigler and T.B. Edwards, "Sludge Batch Four (4) Defense Waste Processing Facility (DWPF) Process Analytical Method Verification", WSRC-STI-2006-00025, Rev. 0.

[8] D.R. Click, T.B. Edwards, and M. A. Jones, "Verification of the Defense Waste Processing Facility's (DWPF) Process Digestion Method for the Sludge Batch 6 Qualification Sample," WSRC-STI-2010-00259, Rev. 0.

[9] D.R. Click, T.B. Edwards, and B.J. Weidenman and L.W. Brown, "Verification of the Defense Waste Processing Facility's (DWPF) Process Digestion Method for the Sludge Batch 7A Qualification Sample," SRNL-STI-2011-00158, Rev. 0.

[10] D.R. Click, T.B. Edwards, B.J. Wiedenman, and L.W. Brown, "Verification of the Defense Waste Processing Facilities's (DWPF) Process Digestion Methods for the Sludge Batch 8 Qualification Sample", SRNL-STI-2013-00096, Rev.0.

[11] SAS Institute, Inc., **JMP® Pro Version 11.2.1**, SAS Institute, Inc., Cary, North Carolina, 1989-2014.

[12] J. M. Pareizs, ELN L3293-00022-21.

[13] J.M. Pareizs, ELN L3293-00022-23.

Appendix A. Supporting Exhibits

Exhibit A1. Plots of the Measurements of the Solution Standard
(LOD – limit of detection)

Exhibit A2. Variability Chart for SRAT Product and Receipt Measurements of Elementals
(Ag-Mg)

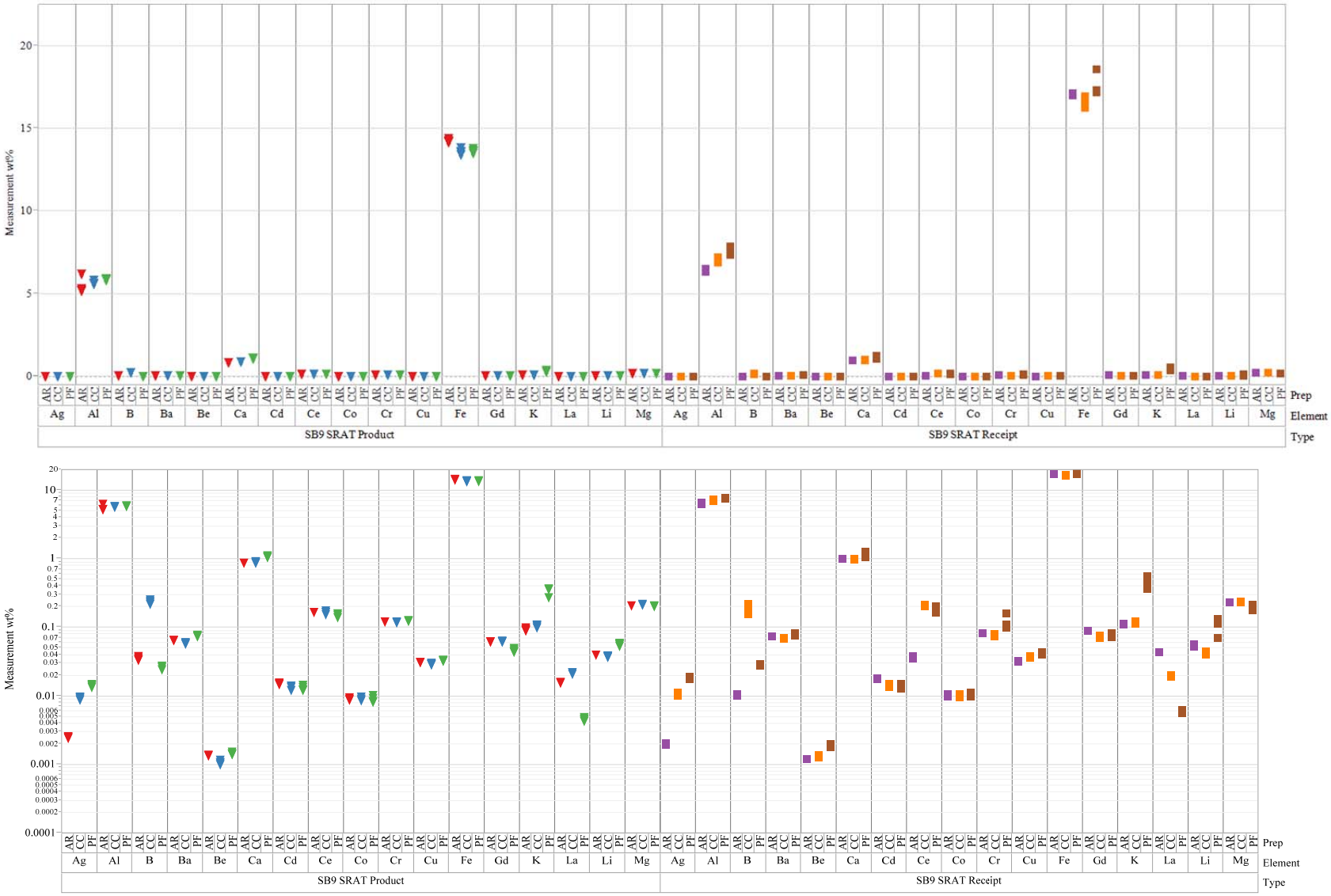


Exhibit A2. Variability Chart for SRAT Product and Receipt Measurements of Elementals (Mn-Zr)

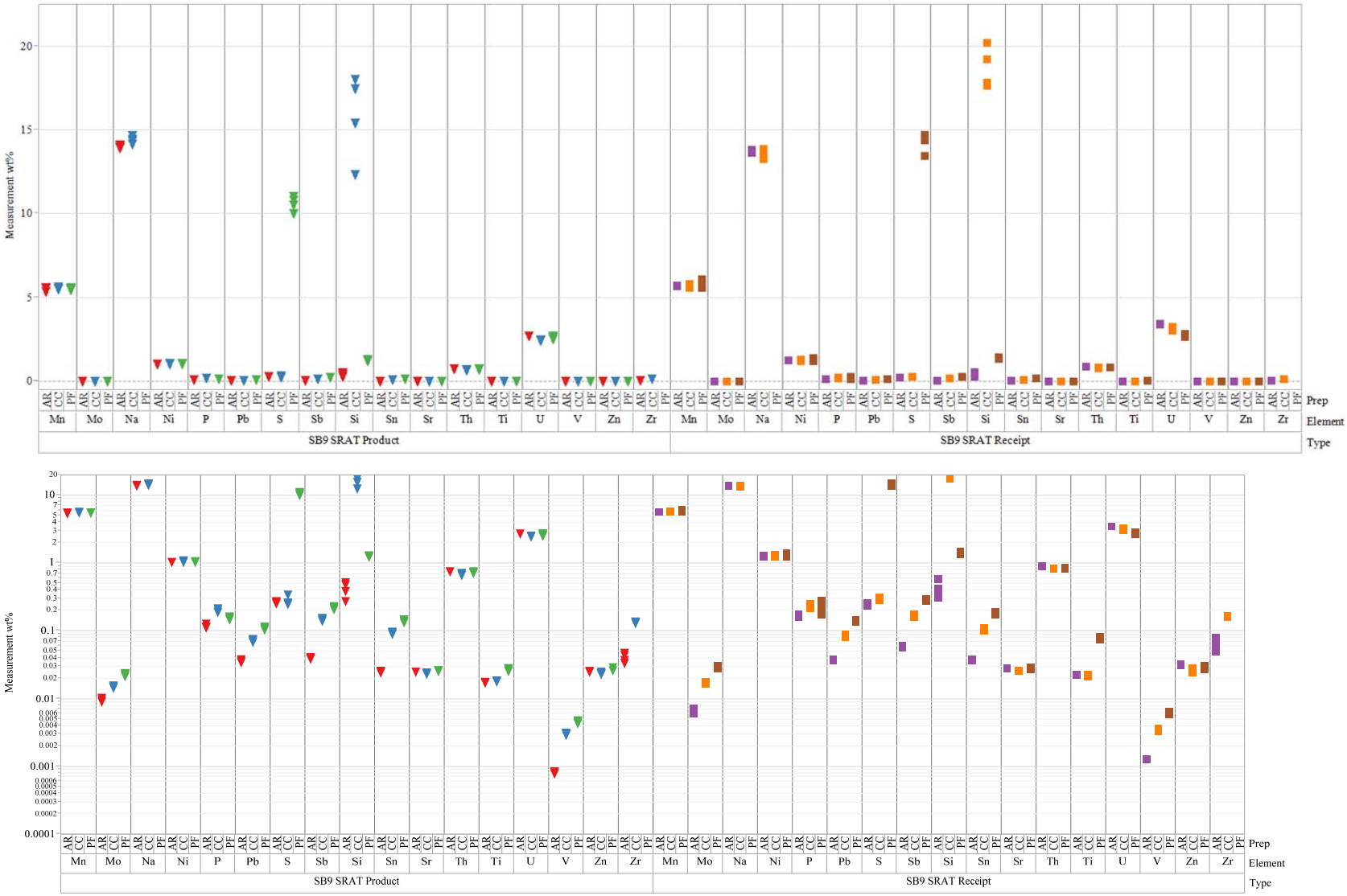


Exhibit A3. Graphical Comparison (Needle Plot) of Elemenal wt. % Measurement Across Preparation Methods
(log scale)

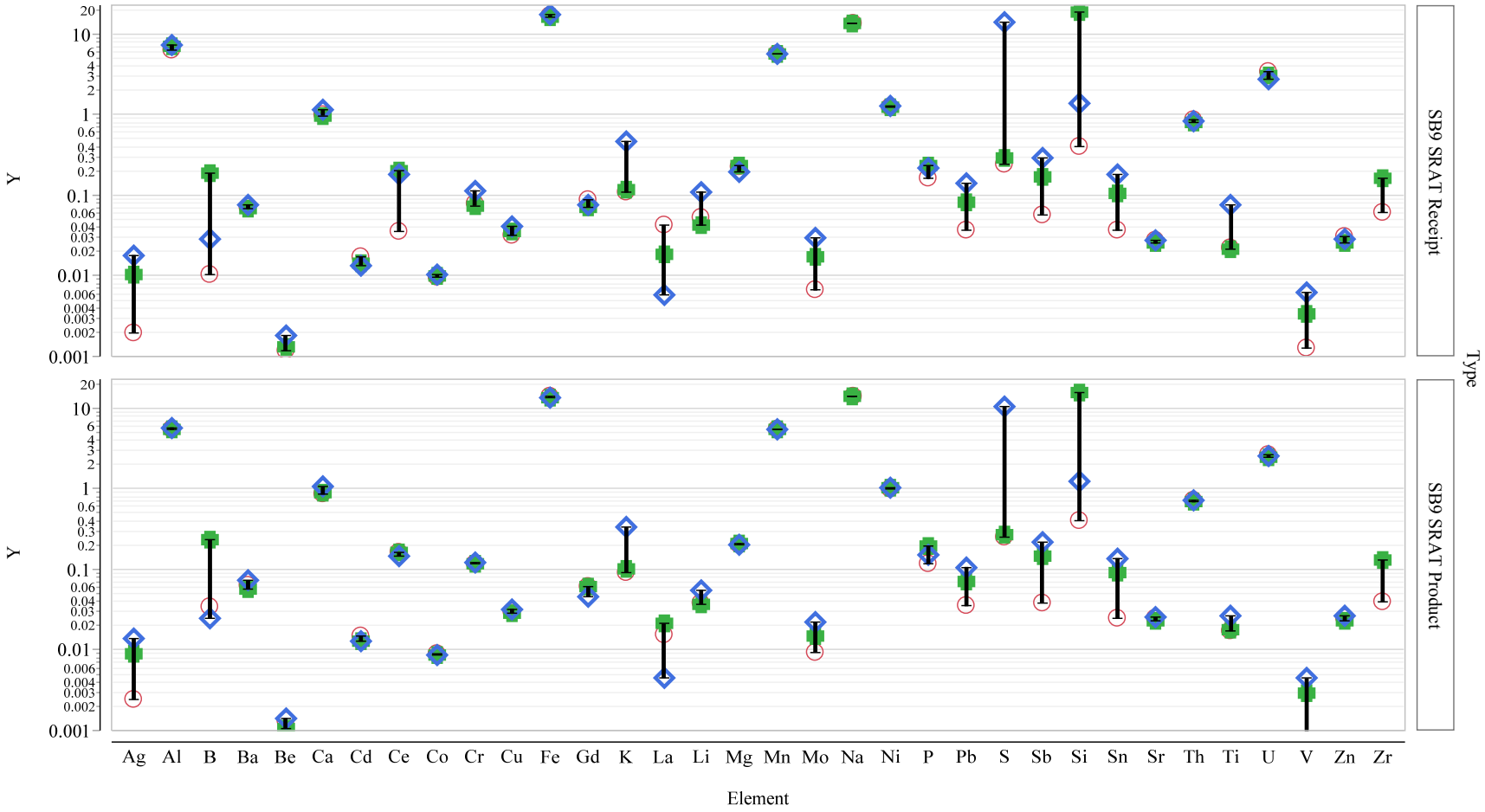


Exhibit A3. Graphical Comparison (Needle Plot) of Elemenal wt. % Measurement Across Preparation Methods (continued)

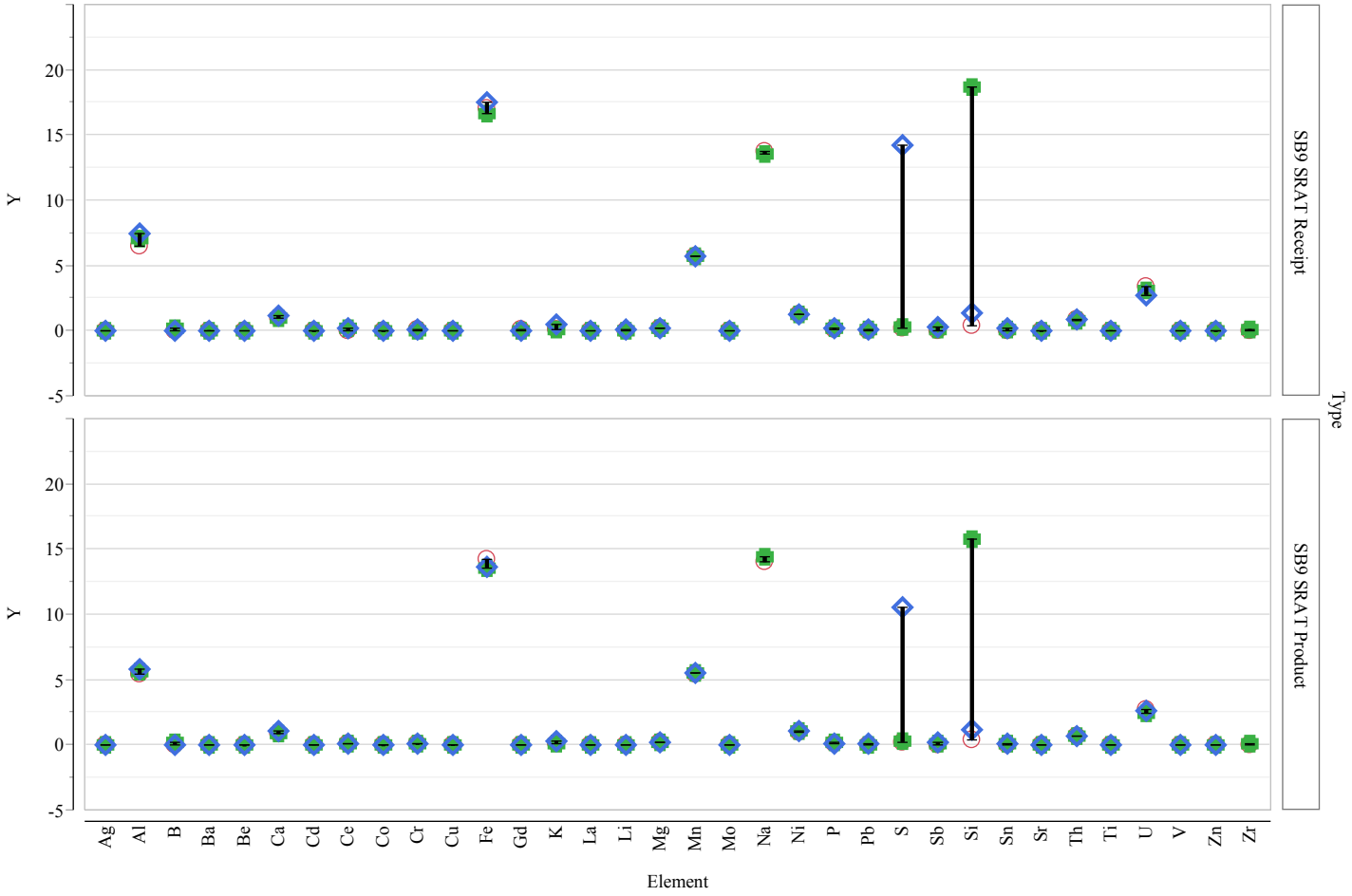
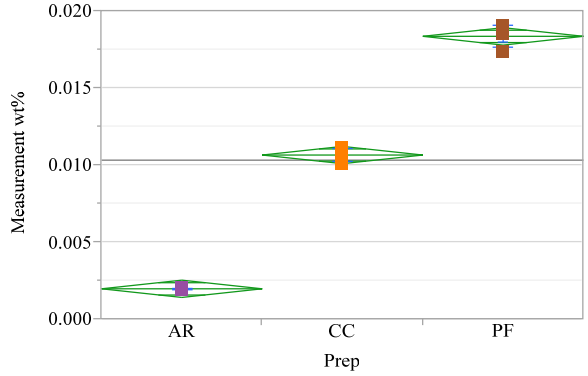


Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Ag



Oneway Anova
Summary of Fit

Rsquare	0.995872
Adj Rsquare	0.994955
Root Mean Square Error	0.000498
Mean of Response	0.010335
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00053777	0.000269	1085.676	**<.0001***
Error	9	0.00000223	2.477e-7		
C. Total	11	0.00053999			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.001977	0.00025	0.00141	0.00254
CC	4	0.010662	0.00025	0.01010	0.01123
PF	4	0.018365	0.00025	0.01780	0.01893

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.001977	0.000036	1.82e-5	0.00192	0.00204
CC	4	0.010662	0.000442	0.00022	0.00996	0.01137
PF	4	0.018365	0.000739	0.00037	0.01719	0.01954

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0000365	0.0000311	0.0000311
CC	4	0.0004422	0.0003108	0.0003108
PF	4	0.0007390	0.0005338	0.0004730

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.1476	2	9	0.3598
Brown-Forsythe	1.5106	2	9	0.2718
Levene	**3.2676**	**2**	**9**	**0.0857**
Bartlett	6.1026	2	.	0.0022

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

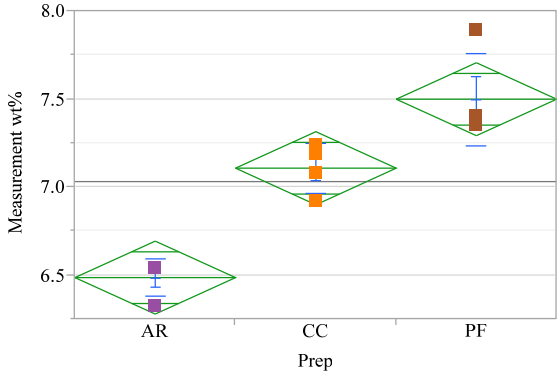
F Ratio	DFNum	DFDen	Prob > F
1493.7704	2	4.0367	<.0001*

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.01836486
CC	B	0.01066216
AR	C	0.00197703

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Al



Oneway Anova
Summary of Fit

Rsquare	0.873308
Adj Rsquare	0.845155
Root Mean Square Error	0.183527
Mean of Response	7.031532
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	2.0896031	1.04480	31.0193	**<.0001***
Error	9	0.3031410	0.03368		
C. Total	11	2.3927441			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	6.48649	0.09176	6.2789	6.6941
CC	4	7.10811	0.09176	6.9005	7.3157
PF	4	7.50000	0.09176	7.2924	7.7076

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	6.48649	0.108108	0.05405	6.3145	6.6585
CC	4	7.10811	0.143014	0.07151	6.8805	7.3357
PF	4	7.50000	0.262501	0.13125	7.0823	7.9177

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.1081081	0.0810811	0.0540541
CC	4	0.1430136	0.1081081	0.1081081
PF	4	0.2625009	0.1959459	0.1486486

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	0.8159	2	9	0.4725
Brown-Forsythe	0.3524	2	9	0.7123
Levene	**1.6969**	**2**	**9**	**0.2370**
Bartlett	1.0994	2	.	0.3331

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
35.9546	2	5.5282	0.0007*

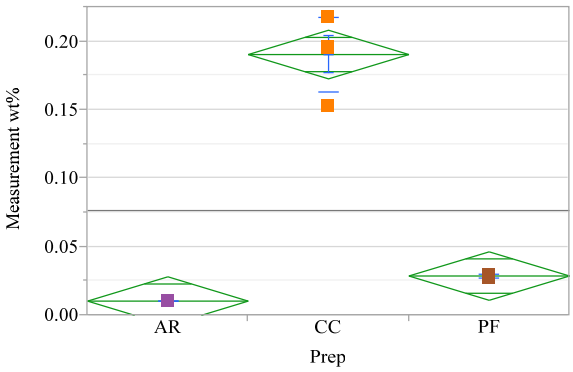
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	7.5000000
CC	B	7.1081081
AR	C	6.4864865

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=B



Oneway Anova
Summary of Fit

Rsquare	0.972663
Adj Rsquare	0.966588
Root Mean Square Error	0.015663
Mean of Response	0.076468
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.07855736	0.039279	160.1108	<.0001*
Error	9	0.00220790	0.000245		
C. Total	11	0.08076526			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.010365	0.00783	-0.0074	0.02808
CC	4	0.190405	0.00783	0.1727	0.20812
PF	4	0.028635	0.00783	0.0109	0.04635

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.010365	0.000209	0.00010	0.01003	0.01070
CC	4	0.190405	0.027104	0.01355	0.14728	0.23353
PF	4	0.028635	0.001139	0.00057	0.02682	0.03045

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0002088	0.0001757	0.0001757
CC	4	0.0271039	0.0187162	0.0163514
PF	4	0.0011393	0.0008311	0.0007162

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.7675	2	9	0.2252
Brown-Forsythe	2.4565	2	9	0.1408
Levene	**4.9568**	**2**	**9**	**0.0354**
Bartlett	16.6972	2	.	0.0000

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

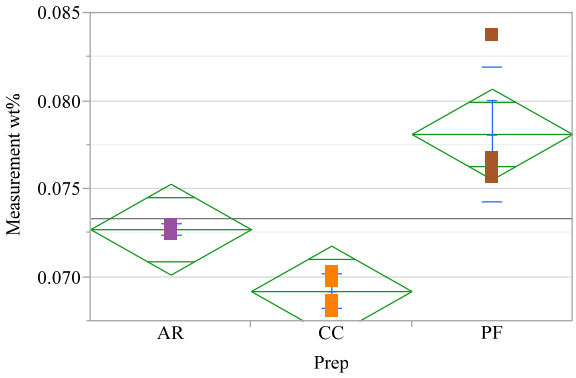
F Ratio	DFNum	DFDen	Prob > F
503.9324	2	4.13	**<.0001***

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
CC	A	0.19040541
PF	B	0.02863514
AR	B	0.01036486

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Ba



Oneway Anova
Summary of Fit

Rsquare	0.775491
Adj Rsquare	0.7256
Root Mean Square Error	0.002279
Mean of Response	0.073333
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00016148	0.000081	15.5438	0.0012*
Error	9	0.00004675	5.194e-6		
C. Total	11	0.00020823			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.072703	0.00114	0.07012	0.07528
CC	4	0.069189	0.00114	0.06661	0.07177
PF	4	0.078108	0.00114	0.07553	0.08069

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.072703	0.000312	0.00016	0.07221	0.07320
CC	4	0.069189	0.000987	0.00049	0.06762	0.07076
PF	4	0.078108	0.003809	0.00190	0.07205	0.08417

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0003121	0.0002703	0.0002703
CC	4	0.0009869	0.0008108	0.0008108
PF	4	0.0038094	0.0028378	0.0021622

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.3744	2	9	0.3014
Brown-Forsythe	0.9590	2	9	0.4192
Levene	**5.6792**	**2**	**9**	**0.0254**
Bartlett	6.0399	2	.	0.0024

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
23.9007	2	4.3844	**0.0044***

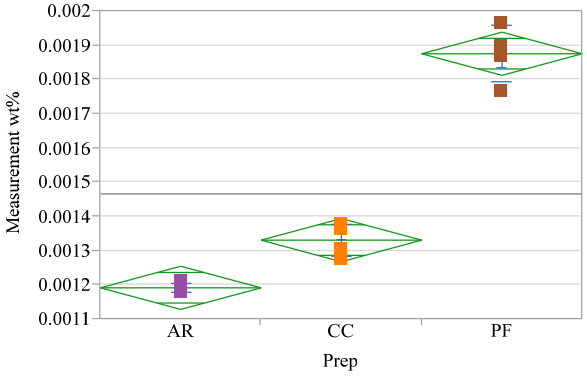
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.07810811
AR	B	0.07270270
CC	B	0.06918919

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Be



Oneway Anova
Summary of Fit

Rsquare	0.973859
Adj Rsquare	0.96805
Root Mean Square Error	5.582e-5
Mean of Response	0.001466
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	1.04469e-6	5.2234e-7	167.6429	**<.0001***
Error	9	2.80424e-8	3.1158e-9		
C. Total	11	1.07273e-6			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.001192	2.79e-5	0.00113	0.00126
CC	4	0.001331	2.79e-5	0.00127	0.00139
PF	4	0.001876	2.79e-5	0.00181	0.00194

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.001192	0.000014	7.15e-6	0.00117	0.00121
CC	4	0.001331	0.000048	2.38e-5	0.00126	0.00141
PF	4	0.001876	0.000083	4.15e-5	0.00174	0.00201

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0000143	0.0000108	0.0000108
CC	4	0.0000476	0.0000392	0.0000392
PF	4	0.0000829	0.0000568	0.0000568

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.4281	2	9	0.2893
Brown-Forsythe	2.1731	2	9	0.1698
Levene	**2.2641**	**2**	**9**	**0.1598**
Bartlett	2.9396	2	.	0.0529

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

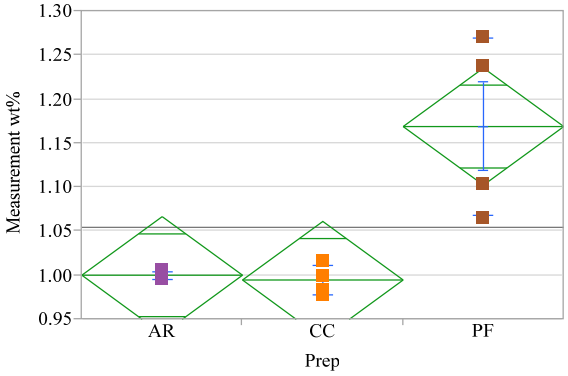
F Ratio	DFNum	DFDen	Prob > F
124.8644	2	4.4335	0.0001*

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.00187568
CC	B	0.00133108
AR	C	0.00119189

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Ca



Oneway Anova
Summary of Fit

Rsquare	0.716057
Adj Rsquare	0.652959
Root Mean Square Error	0.058849
Mean of Response	1.054505
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.07860239	0.039301	11.3483	0.0035*
Error	9	0.03116874	0.003463		
C. Total	11	0.10977112			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	1.00000	0.02942	0.9334	1.0666
CC	4	0.99459	0.02942	0.9280	1.0612
PF	4	1.16892	0.02942	1.1024	1.2355

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	1.00000	0.004413	0.00221	0.9930	1.0070
CC	4	0.99459	0.017093	0.00855	0.9674	1.0218
PF	4	1.16892	0.100389	0.05019	1.0092	1.3287

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0044135	0.0027027	0.0027027
CC	4	0.0170934	0.0135135	0.0135135
PF	4	0.1003888	0.0851351	0.0851351

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	11.7806	2	9	0.0031
Brown-Forsythe	49.7035	2	9	0.0000
Levene	**50.9845**	**2**	**9**	**0.0000**
Bartlett	8.6030	2	.	0.0002

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
5.0686	2	4.2562	**0.0748**

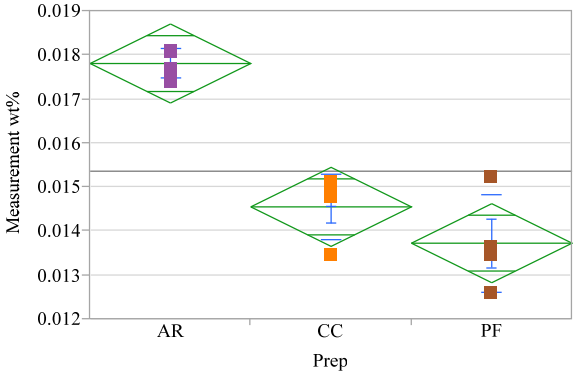
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	1.1689189
AR	B	1.0000000
CC	B	0.9945946

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Cd



Oneway Anova
Summary of Fit

Rsquare	0.867957
Adj Rsquare	0.838614
Root Mean Square Error	0.000794
Mean of Response	0.015365
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00003725	0.000019	29.5797	**0.0001***
Error	9	0.00000567	6.297e-7		
C. Total	11	0.00004292			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.017811	0.00040	0.01691	0.01871
CC	4	0.014554	0.00040	0.01366	0.01545
PF	4	0.013730	0.00040	0.01283	0.01463

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.017811	0.000332	0.00017	0.01728	0.01834
CC	4	0.014554	0.000747	0.00037	0.01337	0.01574
PF	4	0.013730	0.001105	0.00055	0.01197	0.01549

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0003317	0.0002703	0.0002703
CC	4	0.0007469	0.0005473	0.0004459
PF	4	0.0011051	0.0007568	0.0007027

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	0.9148	2	9	0.4349
Brown-Forsythe	0.5632	2	9	0.5882
Levene	**1.1363**	**2**	**9**	**0.3631**
Bartlett	1.5719	2	.	0.2077

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

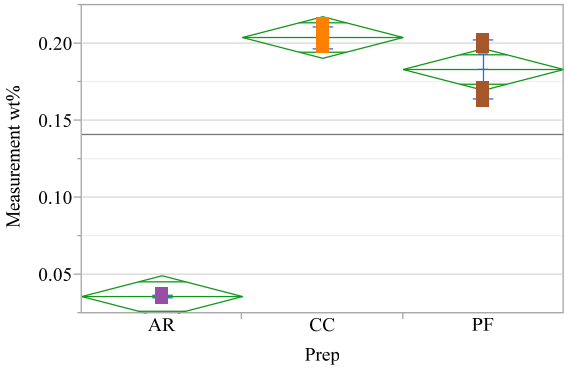
F Ratio	DFNum	DFDen	Prob > F
44.8019	2	4.9028	0.0007*

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
AR	A	0.01781081
CC	B	0.01455405
PF	B	0.01372973

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Ce



Oneway Anova
Summary of Fit

Rsquare	0.981298
Adj Rsquare	0.977143
Root Mean Square Error	0.011932
Mean of Response	0.141063
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.06723203	0.033616	236.1222	<.0001*
Error	9	0.00128130	0.000142		
C. Total	11	0.06851333			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.035892	0.00597	0.02240	0.04939
CC	4	0.204054	0.00597	0.19056	0.21755
PF	4	0.183243	0.00597	0.16975	0.19674

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.035892	0.001093	0.00055	0.03415	0.03763
CC	4	0.204054	0.006971	0.00349	0.19296	0.21515
PF	4	0.183243	0.019424	0.00971	0.15233	0.21415

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0010927	0.0007297	0.0006757
CC	4	0.0069714	0.0056757	0.0056757
PF	4	0.0194244	0.0164865	0.0164865

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	10.6755	2	9	0.0042
Brown-Forsythe	34.2036	2	9	0.0001
Levene	**37.0453**	**2**	**9**	**0.0000**
Bartlett	6.3770	2	.	0.0017

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
1070.6240	2	4.1082	**<.0001***

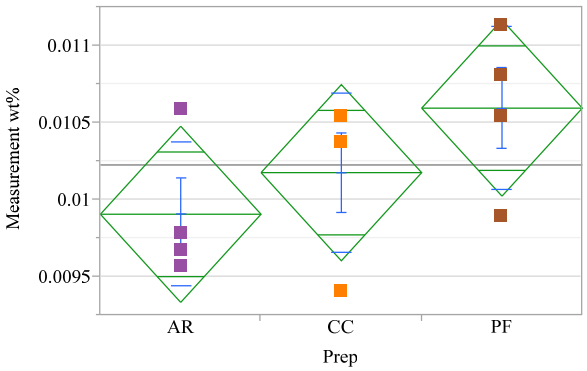
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
CC	A	0.20405405
PF	A	0.18324324
AR	B	0.03589189

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Co



Oneway Anova
Summary of Fit

Rsquare	0.295407
Adj Rsquare	0.138831
Root Mean Square Error	0.000506
Mean of Response	0.010225
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	9.64694e-7	4.8235e-7	1.8867	**0.2069**
Error	9	2.30095e-6	2.5566e-7		
C. Total	11	3.26564e-6			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.009905	0.00025	0.00933	0.01048
CC	4	0.010176	0.00025	0.00960	0.01075
PF	4	0.010595	0.00025	0.01002	0.01117

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.009905	0.000468	0.00023	0.00916	0.01065
CC	4	0.010176	0.000519	0.00026	0.00935	0.01100
PF	4	0.010595	0.000528	0.00026	0.00975	0.01143

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0004679	0.0003446	0.0002838
CC	4	0.0005192	0.0003851	0.0002838
PF	4	0.0005278	0.0003784	0.0003784

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	0.0268	2	9	0.9736
Brown-Forsythe	0.0768	2	9	0.9267
Levene	**0.0257**	**2**	**9**	**0.9747**
Bartlett	0.0218	2	.	0.9785

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

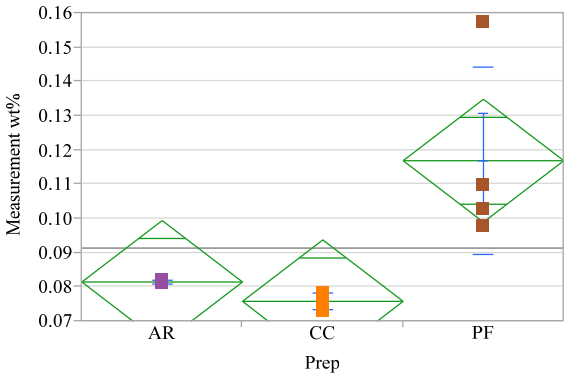
F Ratio	DFNum	DFDen	Prob > F
1.7232	2	5.9819	0.2565

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.01059459
CC	A	0.01017568
AR	A	0.00990541

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Cr



Oneway Anova
Summary of Fit

Rsquare	0.636163
Adj Rsquare	0.55531
Root Mean Square Error	0.015872
Mean of Response	0.091396
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00396455	0.001982	7.8682	0.0106*
Error	9	0.00226742	0.000252		
C. Total	11	0.00623197			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.081486	0.00794	0.06353	0.09944
CC	4	0.075811	0.00794	0.05786	0.09376
PF	4	0.116892	0.00794	0.09894	0.13484

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.081486	0.000518	0.00026	0.08066	0.08231
CC	4	0.075811	0.002472	0.00124	0.07188	0.07974
PF	4	0.116892	0.027376	0.01369	0.07333	0.16045

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0005175	0.0004054	0.0004054
CC	4	0.0024721	0.0020270	0.0020270
PF	4	0.0273757	0.0202027	0.0166216

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.5259	2	9	0.2688
Brown-Forsythe	1.7933	2	9	0.2210
Levene	**7.0411**	**2**	**9**	**0.0144**
Bartlett	12.3792	2	.	0.0000

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
11.6290	2	4.169	**0.0197***

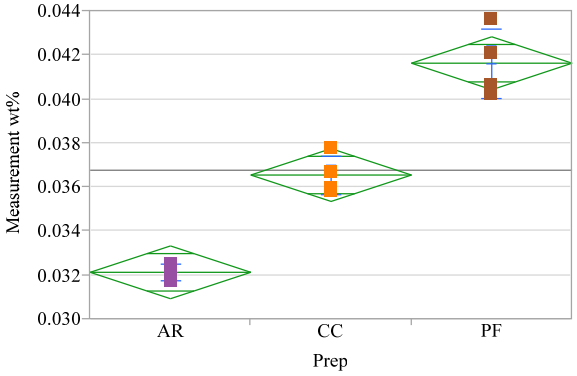
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.11689189
AR	B	0.08148649
CC	B	0.07581081

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Cu



Oneway Anova
Summary of Fit

Rsquare	0.946804
Adj Rsquare	0.934983
Root Mean Square Error	0.001062
Mean of Response	0.036775
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00018079	0.000090	80.0928	**<.0001***
Error	9	0.00001016	1.129e-6		
C. Total	11	0.00019095			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.032135	0.00053	0.03093	0.03334
CC	4	0.036554	0.00053	0.03535	0.03776
PF	4	0.041635	0.00053	0.04043	0.04284

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.032135	0.000381	0.00019	0.03153	0.03274
CC	4	0.036554	0.000873	0.00044	0.03516	0.03794
PF	4	0.041635	0.001574	0.00079	0.03913	0.04414

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0003809	0.0003243	0.0003243
CC	4	0.0008731	0.0006622	0.0006622
PF	4	0.0015743	0.0012297	0.0012297

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.9366	2	9	0.1998
Brown-Forsythe	2.9732	2	9	0.1020
Levene	**3.8961**	**2**	**9**	**0.0604**
Bartlett	2.1647	2	.	0.1148

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

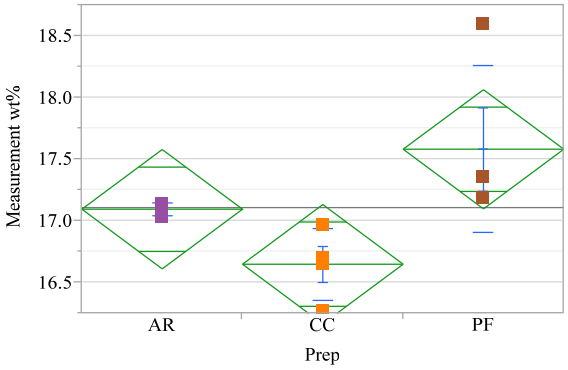
F Ratio	DFNum	DFDen	Prob > F
90.0065	2	4.8003	0.0002*

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.04163514
CC	B	0.03655405
AR	C	0.03213514

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Fe



Oneway Anova
Summary of Fit

Rsquare	0.513805
Adj Rsquare	0.405762
Root Mean Square Error	0.427715
Mean of Response	17.10811
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	1.7399562	0.869978	4.7555	0.0390*
Error	9	1.6464573	0.182940		
C. Total	11	3.3864134			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	17.0946	0.21386	16.611	17.578
CC	4	16.6486	0.21386	16.165	17.132
PF	4	17.5811	0.21386	17.097	18.065

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	17.0946	0.051753	0.02588	17.012	17.177
CC	4	16.6486	0.289412	0.14471	16.188	17.109
PF	4	17.5811	0.679986	0.33999	16.499	18.663

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0517528	0.0405405	0.0405405
CC	4	0.2894122	0.1891892	0.1891892
PF	4	0.6799863	0.5067568	0.3918919

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.2195	2	9	0.3399
Brown-Forsythe	0.8800	2	9	0.4476
Levene	**4.3489**	**2**	**9**	**0.0477**
Bartlett	5.3276	2	.	0.0049

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
4.8915	2	4.1461	**0.0811**

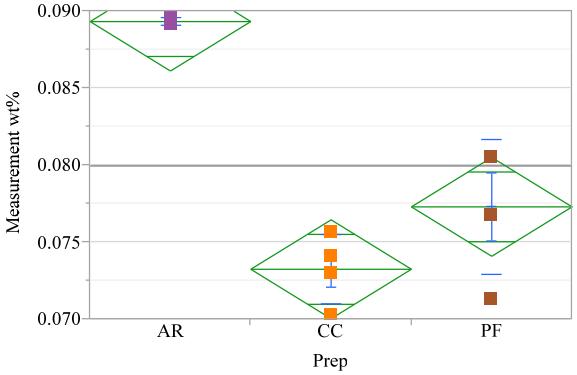
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	17.581081
AR	A B	17.094595
CC	B	16.648649

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Gd



Oneway Anova
Summary of Fit

Rsquare	0.885456
Adj Rsquare	0.860001
Root Mean Square Error	0.002836
Mean of Response	0.079955
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00055958	0.000280	34.7861	**<.0001***
Error	9	0.00007239	8.043e-6		
C. Total	11	0.00063197			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.089324	0.00142	0.08612	0.09253
CC	4	0.073243	0.00142	0.07004	0.07645
PF	4	0.077297	0.00142	0.07409	0.08051

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.089324	0.000270	0.00014	0.08889	0.08975
CC	4	0.073243	0.002272	0.00114	0.06963	0.07686
PF	4	0.077297	0.004347	0.00217	0.07038	0.08421

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0002703	0.0002027	0.0001351
CC	4	0.0022720	0.0016216	0.0016216
PF	4	0.0043468	0.0032432	0.0032432

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.7023	2	9	0.2360
Brown-Forsythe	3.1760	2	9	0.0904
Levene	**4.2447**	**2**	**9**	**0.0503**
Bartlett	5.6059	2	.	0.0037

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

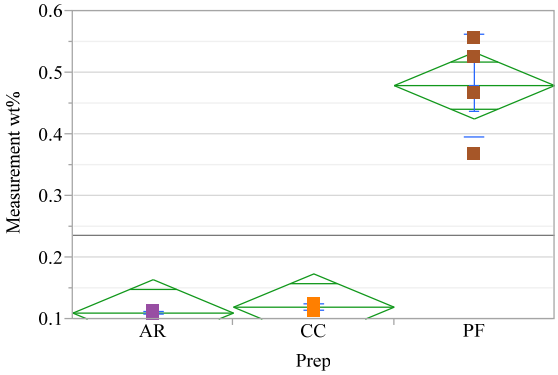
F Ratio	DFNum	DFDen	Prob > F
97.5174	2	4.071	0.0004*

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
AR	A	0.08932432
PF	B	0.07729730
CC	B	0.07324324

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=K



Oneway Anova
Summary of Fit

Rsquare	0.944965
Adj Rsquare	0.932735
Root Mean Square Error	0.047889
Mean of Response	0.236216
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.35439416	0.177197	77.2666	<.0001*
Error	9	0.02063988	0.002293		
C. Total	11	0.37503404			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.110000	0.02394	0.05583	0.16417
CC	4	0.119459	0.02394	0.06529	0.17363
PF	4	0.479189	0.02394	0.42502	0.53335

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.110000	0.002229	0.00111	0.10645	0.11355
CC	4	0.119459	0.005090	0.00254	0.11136	0.12756
PF	4	0.479189	0.082759	0.04138	0.34750	0.61088

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0022287	0.0018919	0.0018919
CC	4	0.0050899	0.0035135	0.0035135
PF	4	0.0827592	0.0618919	0.0618919

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	2.3858	2	9	0.1475
Brown-Forsythe	6.6285	2	9	0.0170
Levene	**8.0065**	**2**	**9**	**0.0101**
Bartlett	12.4427	2	.	0.0000

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
39.5477	2	4.6266	**0.0012***

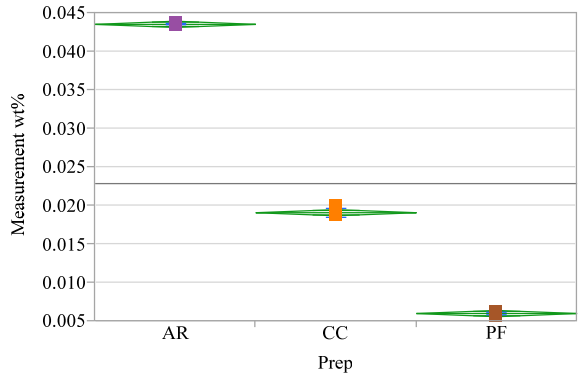
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.47918919
CC	B	0.11945946
AR	B	0.11000000

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=La



Oneway Anova
Summary of Fit

Rsquare	0.999613
Adj Rsquare	0.999527
Root Mean Square Error	0.000354
Mean of Response	0.022883
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00290672	0.001453	11612.75	<.0001*
Error	9	0.00000113	1.252e-7		
C. Total	11	0.00290785			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.043554	0.00018	0.04315	0.04395
CC	4	0.019095	0.00018	0.01869	0.01949
PF	4	0.006000	0.00018	0.00560	0.00640

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.043554	0.000052	2.59e-5	0.04347	0.04364
CC	4	0.019095	0.000569	0.00028	0.01819	0.02000
PF	4	0.006000	0.000221	0.00011	0.00565	0.00635

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0000518	0.0000405	0.0000405
CC	4	0.0005693	0.0004257	0.0003108
PF	4	0.0002207	0.0001622	0.0001351

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.2316	2	9	0.3367
Brown-Forsythe	0.7120	2	9	0.5163
Levene	**4.8147**	**2**	**9**	**0.0379**
Bartlett	5.0126	2	.	0.0067

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

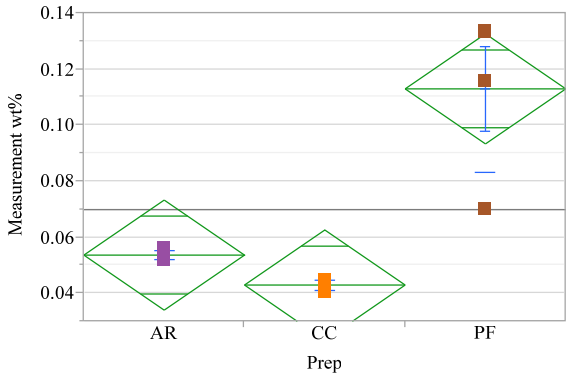
F Ratio	DFNum	DFDen	Prob > F
50119.642	2	4.2389	**<.0001***

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
AR	A	0.04355405
CC	B	0.01909459
PF	C	0.00600000

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Li



Oneway Anova
Summary of Fit

Rsquare	0.807282
Adj Rsquare	0.764456
Root Mean Square Error	0.01738
Mean of Response	0.069847
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.01138827	0.005694	18.8502	0.0006*
Error	9	0.00271866	0.000302		
C. Total	11	0.01410693			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.053635	0.00869	0.03398	0.07329
CC	4	0.042932	0.00869	0.02327	0.06259
PF	4	0.112973	0.00869	0.09331	0.13263

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.053635	0.001782	0.00089	0.05080	0.05647
CC	4	0.042932	0.001820	0.00091	0.04004	0.04583
PF	4	0.112973	0.029996	0.01500	0.06524	0.16070

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0017821	0.0012905	0.0011486
CC	4	0.0018199	0.0012568	0.0012568
PF	4	0.0299955	0.0216216	0.0202703

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.7243	2	9	0.2323
Brown-Forsythe	2.7599	2	9	0.1162
Levene	**5.9453**	**2**	**9**	**0.0226**
Bartlett	10.4212	2	.	0.0000

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
39.6171	2	5.3389	**0.0006***

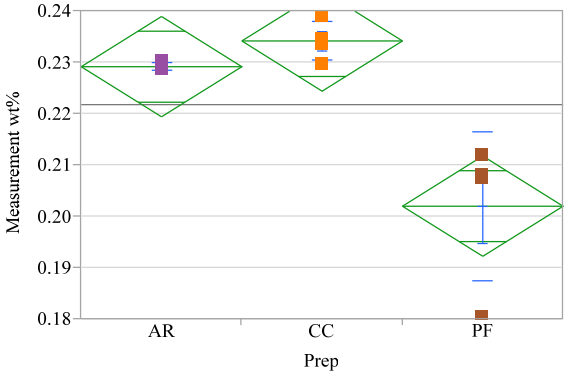
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.11297297
AR	B	0.05363514
CC	B	0.04293243

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Mg



Oneway Anova
Summary of Fit

Rsquare	0.781163
Adj Rsquare	0.732532
Root Mean Square Error	0.008636
Mean of Response	0.221802
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00239625	0.001198	16.0632	0.0011*
Error	9	0.00067129	0.000075		
C. Total	11	0.00306754			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.229189	0.00432	0.21942	0.23896
CC	4	0.234189	0.00432	0.22442	0.24396
PF	4	0.202027	0.00432	0.19226	0.21180

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.229189	0.000764	0.00038	0.22797	0.23041
CC	4	0.234189	0.003781	0.00189	0.22817	0.24020
PF	4	0.202027	0.014453	0.00723	0.17903	0.22502

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0007644	0.0005405	0.0005405
CC	4	0.0037806	0.0025676	0.0025676
PF	4	0.0144529	0.0107432	0.0079730

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.3833	2	9	0.2993
Brown-Forsythe	1.0124	2	9	0.4013
Levene	**5.7680**	**2**	**9**	**0.0244**
Bartlett	7.1484	2	.	0.0008

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

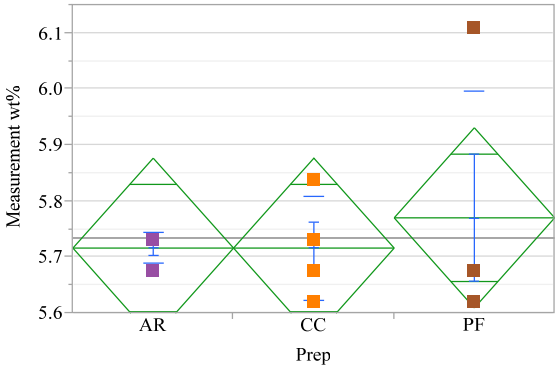
F Ratio	DFNum	DFDen	Prob > F
9.0590	2	4.1676	**0.0304***

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
CC	A	0.23418919
AR	A	0.22918919
PF	B	0.20202703

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Mn



Oneway Anova
Summary of Fit

Rsquare	0.041078
Adj Rsquare	-0.17202
Root Mean Square Error	0.14216
Mean of Response	5.734234
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00779158	0.003896	0.1928	0.8280
Error	9	0.18188459	0.020209		
C. Total	11	0.18967616			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	5.71622	0.07108	5.5554	5.8770
CC	4	5.71622	0.07108	5.5554	5.8770
PF	4	5.77027	0.07108	5.6095	5.9311

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	5.71622	0.027027	0.01351	5.6732	5.7592
CC	4	5.71622	0.092315	0.04616	5.5693	5.8631
PF	4	5.77027	0.226662	0.11333	5.4096	6.1309

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0270270	0.0202703	0.0135135
CC	4	0.0923149	0.0675676	0.0675676
PF	4	0.2266621	0.1689189	0.1216216

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.2237	2	9	0.3388
Brown-Forsythe	0.7461	2	9	0.5014
Levene	**4.3397**	**2**	**9**	**0.0479**
Bartlett	4.2469	2	.	0.0143

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
0.0974	2	4.3649	**0.9091**

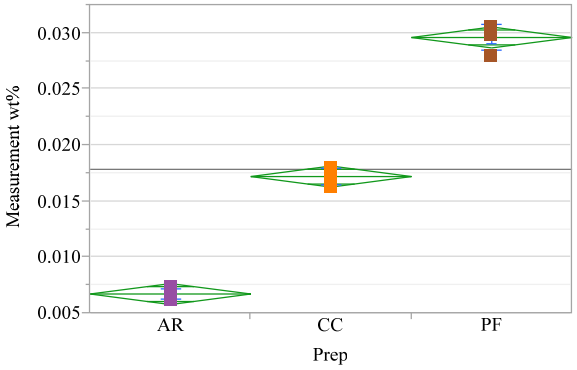
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	5.7702703
AR	A	5.7162162
CC	A	5.7162162

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Mo



Oneway Anova
Summary of Fit

Rsquare	0.994152
Adj Rsquare	0.992853
Root Mean Square Error	0.000829
Mean of Response	0.017847
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00105180	0.000526	765.0110	<.0001*
Error	9	0.00000619	6.874e-7		
C. Total	11	0.00105799			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.006716	0.00041	0.00578	0.00765
CC	4	0.017203	0.00041	0.01626	0.01814
PF	4	0.029622	0.00041	0.02868	0.03056

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.006716	0.000466	0.00023	0.00598	0.00746
CC	4	0.017203	0.000718	0.00036	0.01606	0.01834
PF	4	0.029622	0.001153	0.00058	0.02779	0.03146

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0004658	0.0003041	0.0002838
CC	4	0.0007176	0.0005000	0.0005000
PF	4	0.0011534	0.0008378	0.0007297

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	0.7981	2	9	0.4797
Brown-Forsythe	0.5262	2	9	0.6080
Levene	**1.3063**	**2**	**9**	**0.3176**
Bartlett	1.0216	2	.	0.3600

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

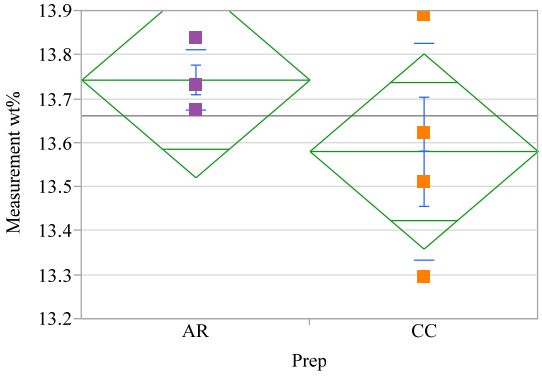
F Ratio	DFNum	DFDen	Prob > F
738.0238	2	5.4066	<.0001*

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.02962162
CC	B	0.01720270
AR	C	0.00671622

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Na



Missing Rows 4

Oneway Anova
Summary of Fit

Rsquare	0.210526
Adj Rsquare	0.078947
Root Mean Square Error	0.181303
Mean of Response	13.66216
Observations (or Sum Wgts)	8

t Test

CC-AR

Assuming equal variances

Difference	-0.16216	t Ratio	-1.26491
Std Err Dif	0.12820	DF	6
Upper CL Dif	0.15153	Prob > |t|	0.2528
Lower CL Dif	-0.47586	Prob > t	0.8736
Confidence	0.95	Prob < t	0.1264

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	1	0.05259313	0.052593	1.6000	**0.2528**
Error	6	0.19722425	0.032871		
C. Total	7	0.24981738			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	13.7432	0.09065	13.521	13.965
CC	4	13.5811	0.09065	13.359	13.803

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	13.7432	0.068017	0.03401	13.635	13.851
CC	4	13.5811	0.247215	0.12361	13.188	13.974

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0680165	0.0472973	0.0405405
CC	4	0.2472148	0.1756757	0.1756757

Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	1.8404	1	6	0.2237
Brown-Forsythe	3.1915	1	6	0.1243
Levene	**3.0507**	**1**	**6**	**0.1313**
Bartlett	3.4474	1	.	0.0634
F Test 2-sided	13.2105	3	3	0.0620

Warning: Small sample sizes. Use Caution.

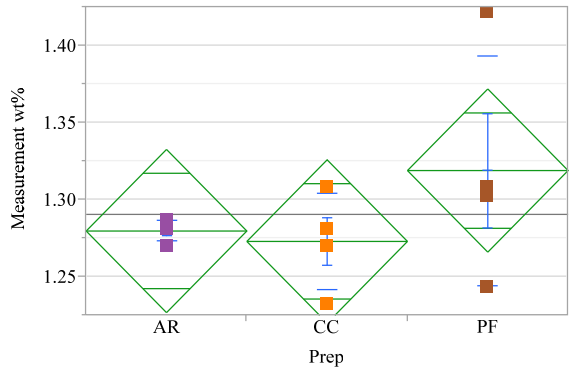
Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
1.6000	1	3.4516	0.2846

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Ni



Oneway Anova
Summary of Fit

Rsquare	0.199585
Adj Rsquare	0.021716
Root Mean Square Error	0.046838
Mean of Response	1.290541
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00492330	0.002462	1.1221	**0.3672**
Error	9	0.01974434	0.002194		
C. Total	11	0.02466764			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	1.27973	0.02342	1.2268	1.3327
CC	4	1.27297	0.02342	1.2200	1.3260
PF	4	1.31892	0.02342	1.2659	1.3719

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	1.27973	0.006802	0.00340	1.2689	1.2906
CC	4	1.27297	0.031364	0.01568	1.2231	1.3229
PF	4	1.31892	0.074508	0.03725	1.2004	1.4375

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0068017	0.0047297	0.0040541
CC	4	0.0313638	0.0216216	0.0216216
PF	4	0.0745084	0.0513514	0.0459459

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.4630	2	9	0.2818
Brown-Forsythe	1.5725	2	9	0.2596
Levene	**2.7714**	**2**	**9**	**0.1154**
Bartlett	4.8766	2	.	0.0076

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

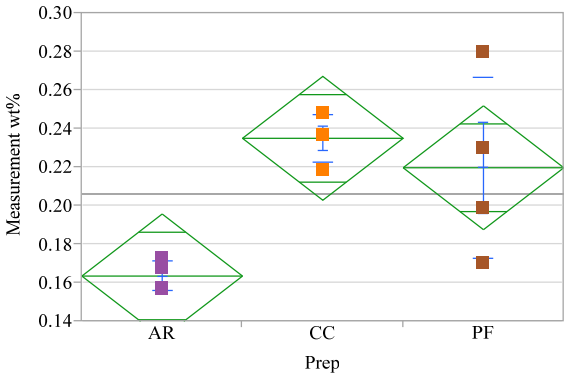
F Ratio	DFNum	DFDen	Prob > F
0.5578	2	4.2108	0.6097

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	1.3189189
AR	A	1.2797297
CC	A	1.2729730

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=P



Oneway Anova
Summary of Fit

Rsquare	0.608979
Adj Rsquare	0.522085
Root Mean Square Error	0.028442
Mean of Response	0.206081
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.01133835	0.005669	7.0083	0.0146*
Error	9	0.00728028	0.000809		
C. Total	11	0.01861863			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.163514	0.01422	0.13134	0.19568
CC	4	0.235000	0.01422	0.20283	0.26717
PF	4	0.219730	0.01422	0.18756	0.25190

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.163514	0.007752	0.00388	0.15118	0.17585
CC	4	0.235000	0.012305	0.00615	0.21542	0.25458
PF	4	0.219730	0.047066	0.02353	0.14484	0.29462

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0077519	0.0064865	0.0064865
CC	4	0.0123055	0.0083108	0.0074324
PF	4	0.0470664	0.0354054	0.0354054

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	2.2879	2	9	0.1573
Brown-Forsythe	4.8331	2	9	0.0375
Levene	**5.1838**	**2**	**9**	**0.0318**
Bartlett	4.2695	2	.	0.0140

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
43.7360	2	5.0917	**0.0006***

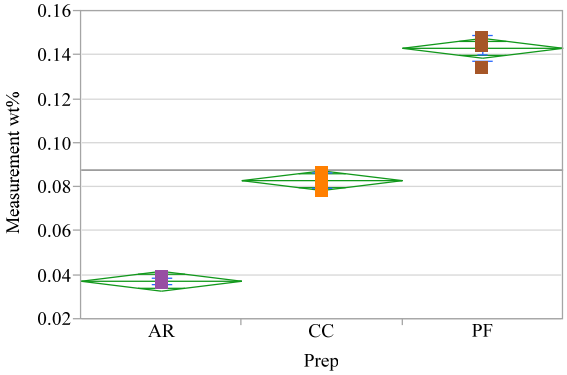
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
CC	A	0.23500000
PF	A	0.21972973
AR	B	0.16351351

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Pb



Oneway Anova
Summary of Fit

Rsquare	0.993715
Adj Rsquare	0.992318
Root Mean Square Error	0.00398
Mean of Response	0.087784
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.02254216	0.011271	711.4875	**<.0001***
Error	9	0.00014257	0.000016		
C. Total	11	0.02268473			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.037270	0.00199	0.03277	0.04177
CC	4	0.082973	0.00199	0.07847	0.08747
PF	4	0.143108	0.00199	0.13861	0.14761

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.037270	0.001332	0.00067	0.03515	0.03939
CC	4	0.082973	0.003433	0.00172	0.07751	0.08844
PF	4	0.143108	0.005828	0.00291	0.13383	0.15238

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0013317	0.0010270	0.0010270
CC	4	0.0034329	0.0024324	0.0024324
PF	4	0.0058281	0.0042568	0.0036486

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.0305	2	9	0.3954
Brown-Forsythe	0.7804	2	9	0.4869
Levene	**2.2367**	**2**	**9**	**0.1627**
Bartlett	2.2507	2	.	0.1053

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

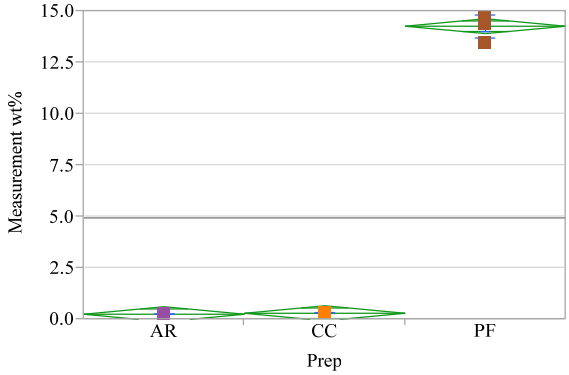
F Ratio	DFNum	DFDen	Prob > F
761.3621	2	4.6815	<.0001*

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.14310811
CC	B	0.08297297
AR	C	0.03727027

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=S



Oneway Anova
Summary of Fit

Rsquare	0.998224
Adj Rsquare	0.997829
Root Mean Square Error	0.321443
Mean of Response	4.937658
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	522.59058	261.295	2528.852	<.0001*
Error	9	0.92993	0.103		
C. Total	11	523.52051			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.2473	0.16072	-0.12	0.611
CC	4	0.2954	0.16072	-0.0682	0.659
PF	4	14.2703	0.16072	13.91	14.634

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.2473	0.010346	0.00517	0.231	0.264
CC	4	0.2954	0.012440	0.00622	0.276	0.315
PF	4	14.2703	0.556521	0.27826	13.385	15.156

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0103459	0.0072973	0.0072973
CC	4	0.0124403	0.0086486	0.0086486
PF	4	0.5565205	0.4054054	0.3513514

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.6123	2	9	0.2521
Brown-Forsythe	2.4444	2	9	0.1419
Levene	**6.9684**	**2**	**9**	**0.0148**
Bartlett	16.0412	2	.	0.0000

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
1139.6808	2	5.2756	**<.0001***

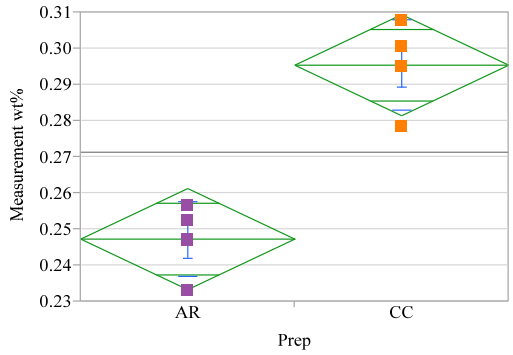
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	14.270270
CC	B	0.295405
AR	B	0.247297

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=S



Oneway Anova
Summary of Fit

Rsquare	0.854938
Adj Rsquare	0.830761
Root Mean Square Error	0.011441
Mean of Response	0.271351
Observations (or Sum Wgts)	8

t Test
CC-AR
Assuming equal variances

Difference	0.048108	t Ratio	5.946563
Std Err Dif	0.008090	DF	6
Upper CL Dif	0.067904	Prob > |t|	0.0010*
Lower CL Dif	0.028312	Prob > t	0.0005*
Confidence	0.95	Prob < t	0.9995

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	1	0.00462878	0.004629	35.3616	0.0010*
Error	6	0.00078539	0.000131		
C. Total	7	0.00541417			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.247297	0.00572	0.23330	0.26129
CC	4	0.295405	0.00572	0.28141	0.30940

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.247297	0.010346	0.00517	0.23083	0.26376
CC	4	0.295405	0.012440	0.00622	0.27561	0.31520

t Test
CC-AR
Assuming unequal variances

Difference	0.048108	t Ratio	5.946563
Std Err Dif	0.008090	DF	5.807031
Upper CL Dif	0.068064	Prob > |t|	0.0011*
Lower CL Dif	0.028152	Prob > t	0.0006*
Confidence	0.95	Prob < t	0.9994

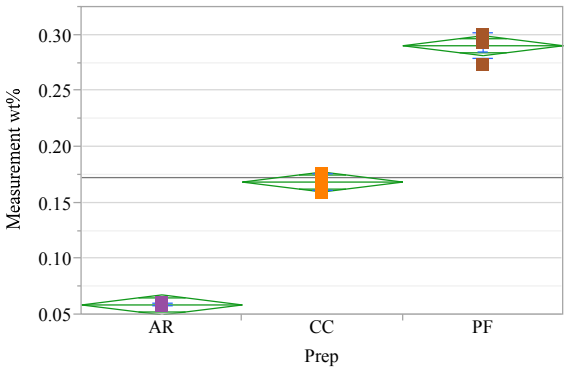
Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0103459	0.0072973	0.0072973
CC	4	0.0124403	0.0086486	0.0086486

Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	0.1265	1	6	0.7342
Brown-Forsythe	0.0684	1	6	0.8025
Levene	**0.0802**	**1**	**6**	**0.7865**
Bartlett	0.0869	1	.	0.7682
F Test 2-sided	1.4459	3	3	0.7692

Warning: Small sample sizes. Use Caution.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Sb



Oneway Anova
Summary of Fit

Rsquare	0.994794
Adj Rsquare	0.993637
Root Mean Square Error	0.007907
Mean of Response	0.172658
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.10751882	0.053759	859.8854	**<.0001***
Error	9	0.00056267	0.000063		
C. Total	11	0.10808150			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.058784	0.00395	0.04984	0.06773
CC	4	0.168649	0.00395	0.15971	0.17759
PF	4	0.290541	0.00395	0.28160	0.29948

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.058784	0.001114	0.00056	0.05701	0.06056
CC	4	0.168649	0.007103	0.00355	0.15735	0.17995
PF	4	0.290541	0.011656	0.00583	0.27199	0.30909

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0011144	0.0009459	0.0009459
CC	4	0.0071028	0.0048649	0.0048649
PF	4	0.0116561	0.0085135	0.0072973

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.0807	2	9	0.3796
Brown-Forsythe	1.1391	2	9	0.3623
Levene	**2.9548**	**2**	**9**	**0.1032**
Bartlett	4.3860	2	.	0.0124

Warning: Small sample sizes. Use Caution.
Welch's Test
Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
1061.6110	2	4.1314	<.0001*

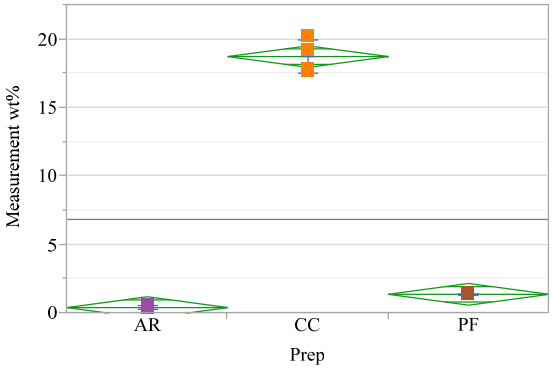
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.29054054
CC	B	0.16864865
AR	C	0.05878378

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Si



Oneway Anova
Summary of Fit

Rsquare	0.994813
Adj Rsquare	0.993661
Root Mean Square Error	0.702127
Mean of Response	6.847207
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	851.00426	425.502	863.1183	<.0001*
Error	9	4.43684	0.493		
C. Total	11	855.44110			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.4105	0.35106	-0.38	1.205
CC	4	18.7432	0.35106	17.95	19.537
PF	4	1.3878	0.35106	0.59	2.182

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.4105	0.12796	0.06398	0.207	0.614
CC	4	18.7432	1.20818	0.60409	16.821	20.666
PF	4	1.3878	0.05358	0.02679	1.303	1.473

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.127959	0.0916216	0.0916216
CC	4	1.208182	0.9864865	0.9864865
PF	4	0.053579	0.0385135	0.0310811

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	4.6652	2	9	0.0407
Brown-Forsythe	15.2117	2	9	0.0013
Levene	**20.2365**	**2**	**9**	**0.0005**
Bartlett	9.7529	2	.	0.0001

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

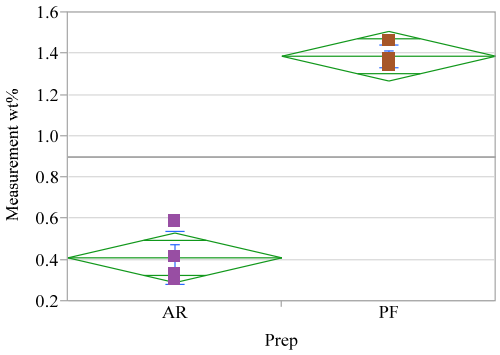
F Ratio	DFNum	DFDen	Prob > F
452.4765	2	4.588	**<.0001***

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
CC	A	18.743243
PF	B	1.387838
AR	B	0.410541

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Si



Oneway Anova
Summary of Fit

Rsquare	0.970664
Adj Rsquare	0.965774
Root Mean Square Error	0.098092
Mean of Response	0.899189
Observations (or Sum Wgts)	8

t Test

PF-AR

Assuming equal variances

Difference	0.97730	t Ratio	14.08986
Std Err Dif	0.06936	DF	6
Upper CL Dif	1.14702	Prob > |t|	<.0001*
Lower CL Dif	0.80758	Prob > t	<.0001*
Confidence	0.95	Prob < t	1.0000

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	1	1.9102200	1.91022	198.5241	<.0001*
Error	6	0.0577327	0.00962		
C. Total	7	1.9679527			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.41054	0.04905	0.2905	0.5306
PF	4	1.38784	0.04905	1.2678	1.5078

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.41054	0.127959	0.06398	0.2069	0.6142
PF	4	1.38784	0.053579	0.02679	1.3026	1.4731

t Test

PF-AR

Assuming unequal variances

Difference	0.97730	t Ratio	14.08986
Std Err Dif	0.06936	DF	4.020586
Upper CL Dif	1.16949	Prob > |t|	0.0001*
Lower CL Dif	0.78511	Prob > t	<.0001*
Confidence	0.95	Prob < t	0.9999

Tests that the Variances are Equal

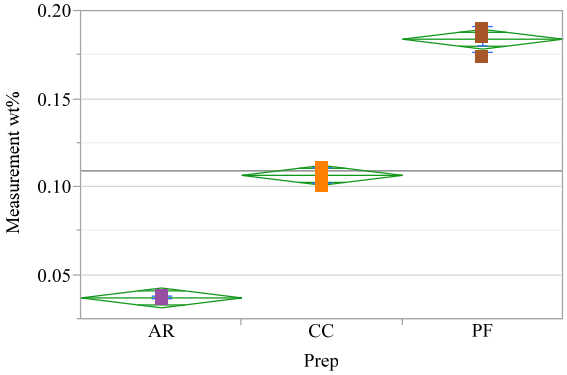
Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.1279590	0.0916216	0.0916216
PF	4	0.0535790	0.0385135	0.0310811

Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	1.3170	1	6	0.2948
Brown-Forsythe	1.6597	1	6	0.2451
Levene	**1.8575**	**1**	**6**	**0.2218**
Bartlett	1.7432	1	.	0.1867
F Test 2-sided	5.7036	3	3	0.1866

Warning: Small sample sizes. Use Caution.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Sn



Oneway Anova
Summary of Fit

Rsquare	0.994878
Adj Rsquare	0.993739
Root Mean Square Error	0.004972
Mean of Response	0.109315
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.04320961	0.021605	874.0013	**<.0001***
Error	9	0.00022247	0.000025		
C. Total	11	0.04343209			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.037135	0.00249	0.03151	0.04276
CC	4	0.106757	0.00249	0.10113	0.11238
PF	4	0.184054	0.00249	0.17843	0.18968

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.037135	0.000727	0.00036	0.03598	0.03829
CC	4	0.106757	0.004597	0.00230	0.09944	0.11407
PF	4	0.184054	0.007245	0.00362	0.17253	0.19558

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0007266	0.0006216	0.0006216
CC	4	0.0045972	0.0032432	0.0032432
PF	4	0.0072454	0.0052703	0.0045946

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.0714	2	9	0.3825
Brown-Forsythe	1.2169	2	9	0.3406
Levene	**2.8863**	**2**	**9**	**0.1075**
Bartlett	4.2460	2	.	0.0143

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

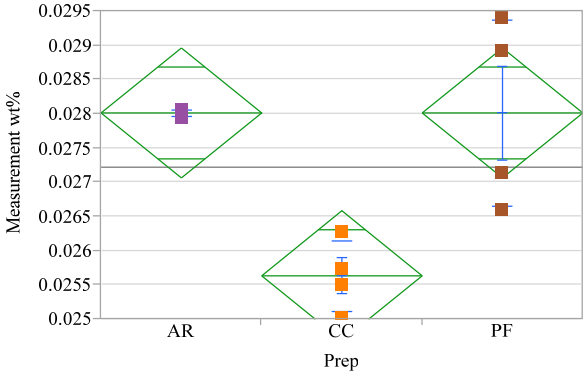
F Ratio	DFNum	DFDen	Prob > F
1070.6259	2	4.1362	<.0001*

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.18405405
CC	B	0.10675676
AR	C	0.03713514

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Sr



Oneway Anova
Summary of Fit

Rsquare	0.703848
Adj Rsquare	0.638036
Root Mean Square Error	0.00084
Mean of Response	0.027221
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00001508	7.5422e-6	10.6949	0.0042*
Error	9	0.00000635	7.0522e-7		
C. Total	11	0.00002143			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.028014	0.00042	0.02706	0.02896
CC	4	0.025635	0.00042	0.02469	0.02658
PF	4	0.028014	0.00042	0.02706	0.02896

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.028014	0.000052	2.59e-5	0.02793	0.02810
CC	4	0.025635	0.000515	0.00026	0.02482	0.02646
PF	4	0.028014	0.001359	0.00068	0.02585	0.03018

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0000518	0.0000405	0.0000405
CC	4	0.0005154	0.0003649	0.0003649
PF	4	0.0013592	0.0011486	0.0011486

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	8.3964	2	9	0.0088
Brown-Forsythe	21.9424	2	9	0.0003
Levene	**22.0331**	**2**	**9**	**0.0003**
Bartlett	7.2987	2	.	0.0007

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
36.1989	2	4.0457	**0.0026***

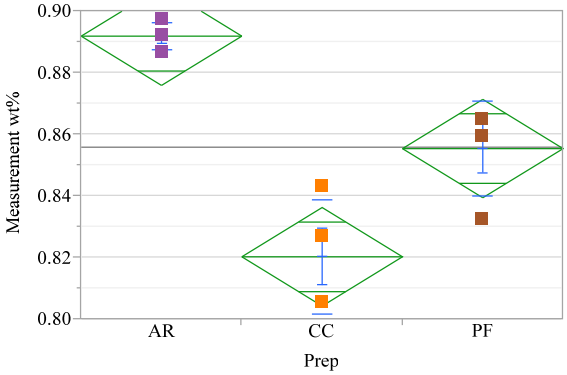
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
AR	A	0.02801351
PF	A	0.02801351
CC	B	0.02563514

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Th



Oneway Anova
Summary of Fit

Rsquare	0.850969
Adj Rsquare	0.817851
Root Mean Square Error	0.01413
Mean of Response	0.855856
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.01026053	0.005130	25.6951	**0.0002***
Error	9	0.00179693	0.000200		
C. Total	11	0.01205746			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.891892	0.00707	0.87591	0.90787
CC	4	0.820270	0.00707	0.80429	0.83625
PF	4	0.855405	0.00707	0.83942	0.87139

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.891892	0.004413	0.00221	0.88487	0.89891
CC	4	0.820270	0.018397	0.00920	0.79100	0.84954
PF	4	0.855405	0.015526	0.00776	0.83070	0.88011

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0044135	0.0027027	0.0027027
CC	4	0.0183969	0.0148649	0.0148649
PF	4	0.0155258	0.0114865	0.0094595

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.2131	2	9	0.3416
Brown-Forsythe	1.7264	2	9	0.2319
Levene	**3.9846**	**2**	**9**	**0.0576**
Bartlett	2.1049	2	.	0.1219

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

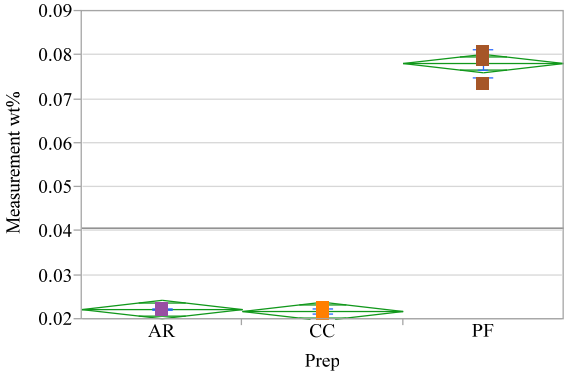
F Ratio	DFNum	DFDen	Prob > F
32.0911	2	4.4962	0.0022*

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
AR	A	0.89189189
PF	B	0.85540541
CC	C	0.82027027

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Ti



Oneway Anova
Summary of Fit

Rsquare	0.996352
Adj Rsquare	0.995541
Root Mean Square Error	0.001849
Mean of Response	0.040694
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00839940	0.004200	1229.028	<.0001*
Error	9	0.00003075	3.417e-6		
C. Total	11	0.00843016			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.022203	0.00092	0.02011	0.02429
CC	4	0.021770	0.00092	0.01968	0.02386
PF	4	0.078108	0.00092	0.07602	0.08020

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.022203	0.000068	3.4e-5	0.02209	0.02231
CC	4	0.021770	0.000640	0.00032	0.02075	0.02279
PF	4	0.078108	0.003136	0.00157	0.07312	0.08310

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0000680	0.0000473	0.0000405
CC	4	0.0006401	0.0005270	0.0005270
PF	4	0.0031364	0.0022973	0.0018919

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.5033	2	9	0.2733
Brown-Forsythe	1.6536	2	9	0.2445
Levene	**5.9317**	**2**	**9**	**0.0227**
Bartlett	10.0183	2	.	0.0000

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
546.1820	2	4.0465	**<.0001***

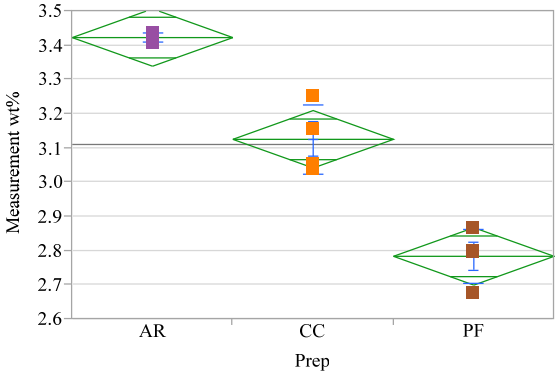
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.07810811
AR	B	0.02220270
CC	B	0.02177027

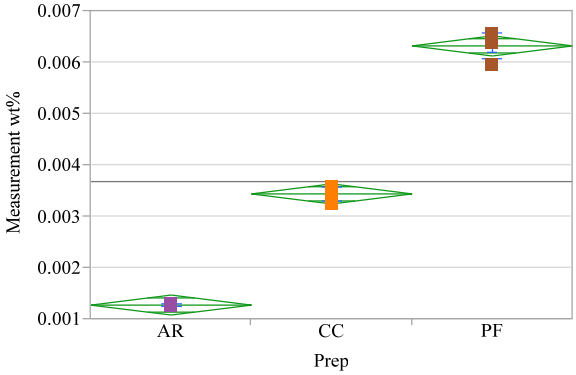
Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=U



Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=V



Oneway Anova
Summary of Fit

Rsquare	0.942989
Adj Rsquare	0.93032
Root Mean Square Error	0.074148
Mean of Response	3.110811
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.81845142	0.409226	74.4327	**<.0001***
Error	9	0.04948137	0.005498		
C. Total	11	0.86793280			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	3.42297	0.03707	3.3391	3.5068
CC	4	3.12568	0.03707	3.0418	3.2095
PF	4	2.78378	0.03707	2.6999	2.8677

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	3.42297	0.013514	0.00676	3.4015	3.4445
CC	4	3.12568	0.100486	0.05024	2.9658	3.2856
PF	4	2.78378	0.078828	0.03941	2.6584	2.9092

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0135135	0.0094595	0.0094595
CC	4	0.1004858	0.0797297	0.0797297
PF	4	0.0788275	0.0540541	0.0486486

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.4566	2	9	0.2831
Brown-Forsythe	2.6873	2	9	0.1216
Levene	**3.7901**	**2**	**9**	**0.0640**
Bartlett	3.4940	2	.	0.0304

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
123.2604	2	4.183	0.0002*

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
AR	A	3.4229730
CC	B	3.1256757
PF	C	2.7837838

Levels not connected by same letter are significantly different.

Oneway Anova
Summary of Fit

Rsquare	0.994772
Adj Rsquare	0.993611
Root Mean Square Error	0.000173
Mean of Response	0.003681
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00005129	0.000026	856.3080	**<.0001***
Error	9	0.00000027	2.995e-8		
C. Total	11	0.00005156			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.001277	8.65e-5	0.00108	0.00147
CC	4	0.003442	8.65e-5	0.00325	0.00364
PF	4	0.006324	8.65e-5	0.00613	0.00652

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.001277	0.000024	1.2e-5	0.00124	0.00132
CC	4	0.003442	0.000145	7.26e-5	0.00321	0.00367
PF	4	0.006324	0.000261	0.00013	0.00591	0.00674

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0000239	0.0000203	0.0000203
CC	4	0.0001453	0.0001014	0.0001014
PF	4	0.0002611	0.0001892	0.0001622

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.1667	2	9	0.3544
Brown-Forsythe	1.2069	2	9	0.3433
Levene	**3.0715**	**2**	**9**	**0.0962**
Bartlett	4.5535	2	.	0.0105

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
996.4820	2	4.1379	<.0001*

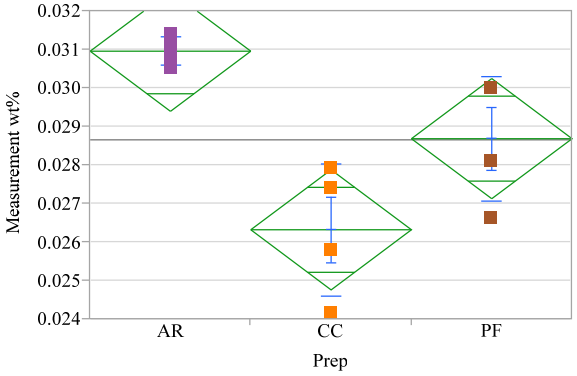
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.00632432
CC	B	0.00344189
AR	C	0.00127703

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Zn



Oneway Anova
Summary of Fit

Rsquare	0.715181
Adj Rsquare	0.651887
Root Mean Square Error	0.001379
Mean of Response	0.028658
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00004297	0.000021	11.2995	0.0035*
Error	9	0.00001711	1.902e-6		
C. Total	11	0.00006009			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.030959	0.00069	0.02940	0.03252
CC	4	0.026324	0.00069	0.02476	0.02788
PF	4	0.028689	0.00069	0.02713	0.03025

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.030959	0.000370	0.00019	0.03037	0.03155
CC	4	0.026324	0.001709	0.00085	0.02360	0.02904
PF	4	0.028689	0.001627	0.00081	0.02610	0.03128

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0003702	0.0002838	0.0002838
CC	4	0.0017093	0.0013514	0.0013514
PF	4	0.0016266	0.0013108	0.0013108

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.6364	2	9	0.2476
Brown-Forsythe	3.8299	2	9	0.0626
Levene	**5.0388**	**2**	**9**	**0.0340**
Bartlett	2.4431	2	.	0.0869

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

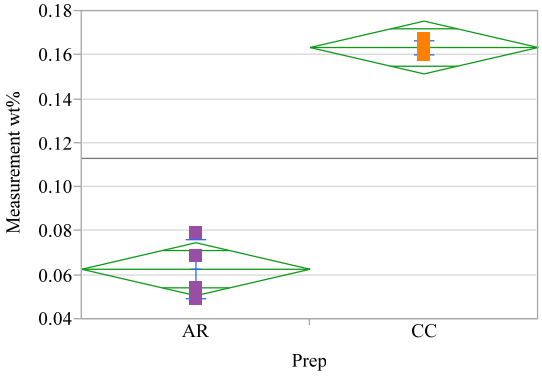
F Ratio	DFNum	DFDen	Prob > F
14.8443	2	4.3658	**0.0113***

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
AR	A	0.03095946
PF	A B	0.02868919
CC	B	0.02632432

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Receipt, Element=Zr



Missing Rows 4

Oneway Anova
Summary of Fit

Rsquare	0.972308
Adj Rsquare	0.967693
Root Mean Square Error	0.009817
Mean of Response	0.113135
Observations (or Sum Wgts)	8

t Test

CC-AR

Assuming equal variances

Difference	0.100757	t Ratio	14.51445
Std Err Dif	0.006942	DF	6
Upper CL Dif	0.117743	Prob > |t|	<.0001*
Lower CL Dif	0.083771	Prob > t	<.0001*
Confidence	0.95	Prob < t	1.0000

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	1	0.02030385	0.020304	210.6691	<.0001*
Error	6	0.00057827	0.000096		
C. Total	7	0.02088212			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.062757	0.00491	0.05075	0.07477
CC	4	0.163514	0.00491	0.15150	0.17552

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.062757	0.013539	0.00677	0.04121	0.08430
CC	4	0.163514	0.003074	0.00154	0.15862	0.16840

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0135391	0.0110270	0.0110270
CC	4	0.0030736	0.0024324	0.0024324

Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	4.1512	1	6	0.0878
Brown-Forsythe	11.6449	1	6	0.0143
Levene	**12.9935**	**1**	**6**	**0.0113**
Bartlett	4.3191	1	.	0.0377
F Test 2-sided	19.4033	3	3	0.0363

Warning: Small sample sizes. Use Caution.

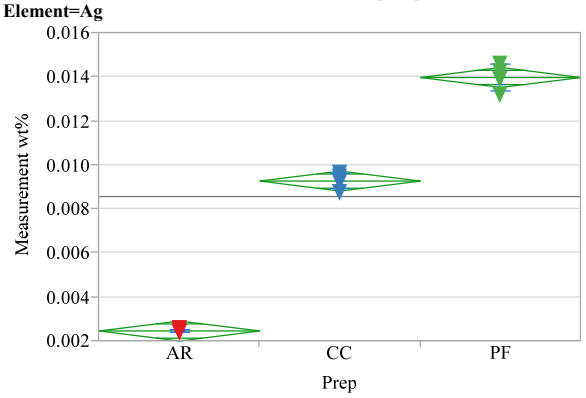
Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
210.6691	1	3.3084	**0.0004***

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Ag



Oneway Anova
Summary of Fit

Rsquare	0.994597
Adj Rsquare	0.993396
Root Mean Square Error	0.000403
Mean of Response	0.008578
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00026847	0.000134	828.3598	**<.0001***
Error	9	0.00000146	1.62e-7		
C. Total	11	0.00026993			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.002466	0.00020	0.00201	0.00292
CC	4	0.009279	0.00020	0.00882	0.00973
PF	4	0.013988	0.00020	0.01353	0.01444

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.002466	0.000078	3.89e-5	0.00234	0.00259
CC	4	0.009279	0.000359	0.00018	0.00871	0.00985
PF	4	0.013988	0.000592	0.00030	0.01305	0.01493

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0000779	0.0000640	0.0000640
CC	4	0.0003593	0.0002558	0.0002558
PF	4	0.0005925	0.0004302	0.0004302

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.4457	2	9	0.2855
Brown-Forsythe	2.4856	2	9	0.1382
Levene	**2.7469**	**2**	**9**	**0.1172**
Bartlett	3.5801	2	.	0.0279

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

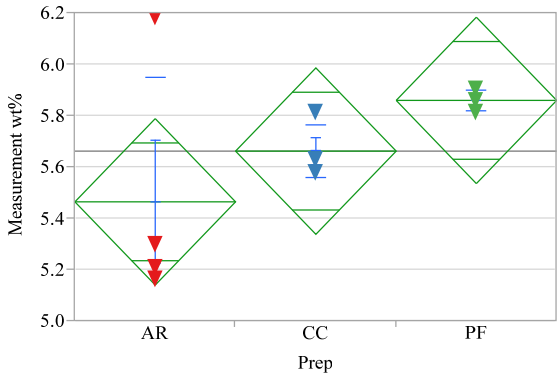
F Ratio	DFNum	DFDen	Prob > F
1203.1180	2	4.2437	<.0001*

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.01398837
CC	B	0.00927907
AR	C	0.00246628

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Al



Oneway Anova
Summary of Fit

Rsquare	0.297172
Adj Rsquare	0.140988
Root Mean Square Error	0.286612
Mean of Response	5.662791
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.3126014	0.156301	1.9027	0.2046
Error	9	0.7393186	0.082147		
C. Total	11	1.0519200			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	5.46512	0.14331	5.1409	5.7893
CC	4	5.66279	0.14331	5.3386	5.9870
PF	4	5.86047	0.14331	5.5363	6.1846

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	5.46512	0.484108	0.24205	4.6948	6.2354
CC	4	5.66279	0.103133	0.05157	5.4987	5.8269
PF	4	5.86047	0.037977	0.01899	5.8000	5.9209

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.4841084	0.3604651	0.2790698
CC	4	0.1031328	0.0755814	0.0581395
PF	4	0.0379766	0.0232558	0.0232558

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.4074	2	9	0.2939
Brown-Forsythe	1.1699	2	9	0.3535
Levene	**6.0938**	**2**	**9**	**0.0212**
Bartlett	6.5821	2	.	0.0014

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
6.6552	2	4.4912	**0.0454***

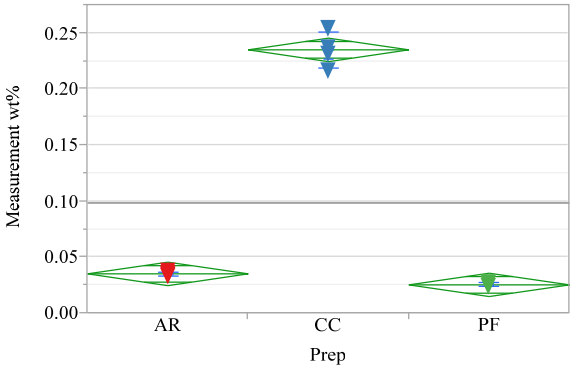
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	5.8604651
CC	A	5.6627907
AR	A	5.4651163

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=B



Oneway Anova
Summary of Fit

Rsquare	0.993159
Adj Rsquare	0.991639
Root Mean Square Error	0.009263
Mean of Response	0.098543
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.11210588	0.056053	653.2866	<.0001*
Error	9	0.00077221	0.000086		
C. Total	11	0.11287809			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.035151	0.00463	0.02467	0.04563
CC	4	0.235116	0.00463	0.22464	0.24559
PF	4	0.025360	0.00463	0.01488	0.03584

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.035151	0.002085	0.00104	0.03183	0.03847
CC	4	0.235116	0.015816	0.00791	0.20995	0.26028
PF	4	0.025360	0.001704	0.00085	0.02265	0.02807

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0020847	0.0015930	0.0015930
CC	4	0.0158162	0.0111628	0.0111628
PF	4	0.0017045	0.0013372	0.0013372

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	2.0813	2	9	0.1807
Brown-Forsythe	4.3444	2	9	0.0478
Levene	**4.4024**	**2**	**9**	**0.0464**
Bartlett	6.9220	2	.	0.0010

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

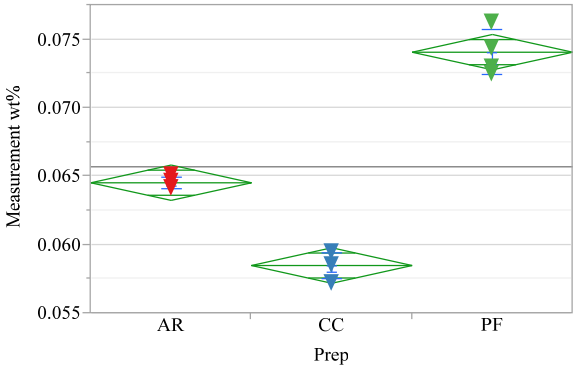
F Ratio	DFNum	DFDen	Prob > F
322.2130	2	5.2888	**<.0001***

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
CC	A	0.23511628
AR	B	0.03515116
PF	B	0.02536047

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Ba



Oneway Anova
Summary of Fit

Rsquare	0.976779
Adj Rsquare	0.971619
Root Mean Square Error	0.001142
Mean of Response	0.065698
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00049367	0.000247	189.2903	**<.0001***
Error	9	0.00001174	1.304e-6		
C. Total	11	0.00050541			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.064535	0.00057	0.06324	0.06583
CC	4	0.058488	0.00057	0.05720	0.05978
PF	4	0.074070	0.00057	0.07278	0.07536

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.064535	0.000445	0.00022	0.06383	0.06524
CC	4	0.058488	0.000959	0.00048	0.05696	0.06001
PF	4	0.074070	0.001672	0.00084	0.07141	0.07673

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0004453	0.0003488	0.0003488
CC	4	0.0009589	0.0006395	0.0005814
PF	4	0.0016716	0.0012791	0.0012791

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.5809	2	9	0.2580
Brown-Forsythe	2.1370	2	9	0.1740
Levene	**2.6564**	**2**	**9**	**0.1240**
Bartlett	1.9214	2	.	0.1464

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
124.5431	2	4.8924	<.0001*

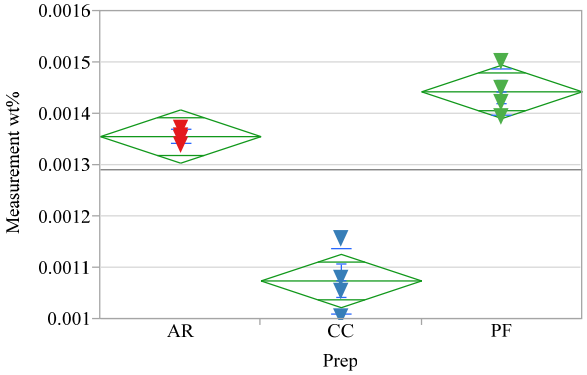
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.07406977
AR	B	0.06453488
CC	C	0.05848837

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Be



Oneway Anova
Summary of Fit

Rsquare	0.939755
Adj Rsquare	0.926367
Root Mean Square Error	0.000046
Mean of Response	0.001291
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	2.96878e-7	1.4844e-7	70.1952	**<.0001***
Error	9	1.90319e-8	2.1147e-9		
C. Total	11	3.1591e-7			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.001356	2.3e-5	0.00130	0.00141
CC	4	0.001074	2.3e-5	0.00102	0.00113
PF	4	0.001443	2.3e-5	0.00139	0.00150

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.001356	0.000013	6.71e-6	0.00133	0.00138
CC	4	0.001074	0.000064	3.19e-5	0.00097	0.00118
PF	4	0.001443	0.000046	2.28e-5	0.00137	0.00152

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0000134	0.0000093	0.0000093
CC	4	0.0000639	0.0000442	0.0000442
PF	4	0.0000456	0.0000337	0.0000337

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.1348	2	9	0.3635
Brown-Forsythe	1.7327	2	9	0.2309
Levene	**1.8231**	**2**	**9**	**0.2164**
Bartlett	2.3778	2	.	0.0928

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

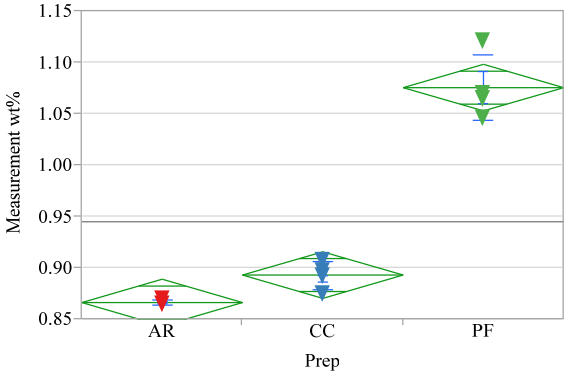
F Ratio	DFNum	DFDen	Prob > F
39.9199	2	4.4705	0.0014*

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.00144302
AR	A	0.00135581
CC	B	0.00107442

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Ca



Oneway Anova
Summary of Fit

Rsquare	0.966268
Adj Rsquare	0.958772
Root Mean Square Error	0.020065
Mean of Response	0.944961
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.10380025	0.051900	128.9060	**<.0001***
Error	9	0.00362358	0.000403		
C. Total	11	0.10742383			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.86628	0.01003	0.8436	0.8890
CC	4	0.89302	0.01003	0.8703	0.9157
PF	4	1.07558	0.01003	1.0529	1.0983

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.86628	0.002326	0.00116	0.8626	0.8700
CC	4	0.89302	0.013693	0.00685	0.8712	0.9148
PF	4	1.07558	0.031858	0.01593	1.0249	1.1263

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0023256	0.0017442	0.0011628
CC	4	0.0136927	0.0093023	0.0093023
PF	4	0.0318585	0.0226744	0.0197674

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.3805	2	9	0.3000
Brown-Forsythe	1.5649	2	9	0.2611
Levene	**3.3456**	**2**	**9**	**0.0820**
Bartlett	5.4214	2	.	0.0044

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
79.8061	2	4.1326	0.0005*

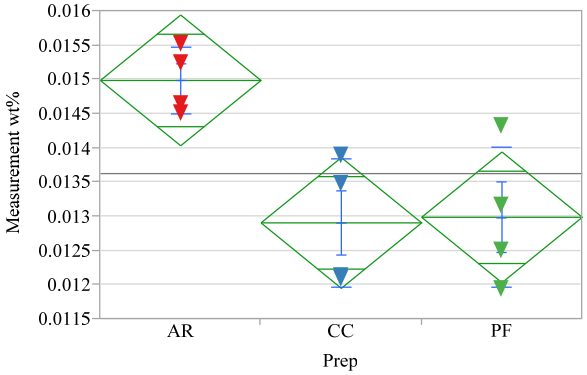
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	1.0755814
CC	B	0.8930233
AR	B	0.8662791

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Cd



Oneway Anova
Summary of Fit

Rsquare	0.634037
Adj Rsquare	0.552711
Root Mean Square Error	0.000844
Mean of Response	0.013628
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00001112	5.5592e-6	7.7963	**0.0109***
Error	9	0.00000642	7.1306e-7		
C. Total	11	0.00001754			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.014988	0.00042	0.01403	0.01594
CC	4	0.012907	0.00042	0.01195	0.01386
PF	4	0.012988	0.00042	0.01203	0.01394

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.014988	0.000487	0.00024	0.01421	0.01576
CC	4	0.012907	0.000929	0.00046	0.01143	0.01439
PF	4	0.012988	0.001019	0.00051	0.01137	0.01461

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0004869	0.0004070	0.0004070
CC	4	0.0009291	0.0007907	0.0007907
PF	4	0.0010193	0.0007558	0.0007558

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.0350	2	9	0.3939
Brown-Forsythe	1.4735	2	9	0.2795
Levene	**1.6724**	**2**	**9**	**0.2412**
Bartlett	0.6974	2	.	0.4979

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

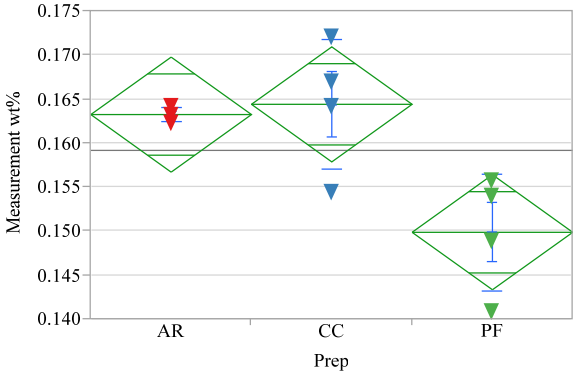
F Ratio	DFNum	DFDen	Prob > F
10.4944	2	5.3361	0.0141*

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
AR	A	0.01498837
PF	B	0.01298837
CC	B	0.01290698

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Ce



Oneway Anova
Summary of Fit

Rsquare	0.634827
Adj Rsquare	0.553677
Root Mean Square Error	0.005776
Mean of Response	0.159186
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00052190	0.000261	7.8229	**0.0107***
Error	9	0.00030022	0.000033		
C. Total	11	0.00082212			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.163256	0.00289	0.15672	0.16979
CC	4	0.164419	0.00289	0.15789	0.17095
PF	4	0.149884	0.00289	0.14335	0.15642

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.163256	0.000760	0.00038	0.16205	0.16446
CC	4	0.164419	0.007427	0.00371	0.15260	0.17624
PF	4	0.149884	0.006658	0.00333	0.13929	0.16048

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0007595	0.0004651	0.0004651
CC	4	0.0074273	0.0051163	0.0051163
PF	4	0.0066581	0.0050000	0.0050000

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.0631	2	9	0.3851
Brown-Forsythe	2.3195	2	9	0.1540
Levene	**2.6760**	**2**	**9**	**0.1225**
Bartlett	4.2720	2	.	0.0140

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
6.9030	2	4.0922	0.0488*

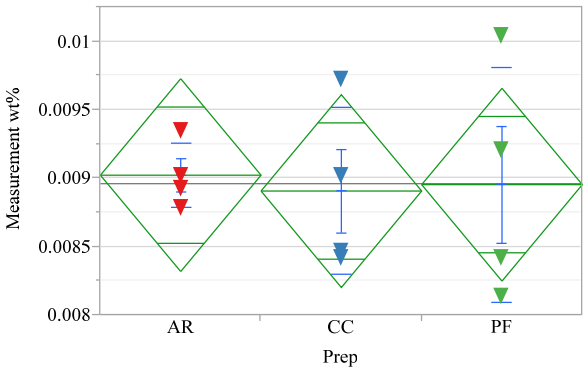
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
CC	A	0.16441860
AR	A	0.16325581
PF	B	0.14988372

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Co



Oneway Anova
Summary of Fit

Rsquare	0.007796
Adj Rsquare	-0.21269
Root Mean Square Error	0.000622
Mean of Response	0.008961
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	2.74022e-8	1.3701e-8	0.0354	**0.9654**
Error	9	3.48729e-6	3.8748e-7		
C. Total	11	3.51469e-6			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.009023	0.00031	0.00832	0.00973
CC	4	0.008907	0.00031	0.00820	0.00961
PF	4	0.008953	0.00031	0.00825	0.00966

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.009023	0.000237	0.00012	0.00865	0.00940
CC	4	0.008907	0.000608	0.00030	0.00794	0.00987
PF	4	0.008953	0.000858	0.00043	0.00759	0.01032

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0002372	0.0001628	0.0001628
CC	4	0.0006082	0.0004651	0.0004651
PF	4	0.0008581	0.0006744	0.0006744

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.5540	2	9	0.2632
Brown-Forsythe	2.6788	2	9	0.1222
Levene	**3.4193**	**2**	**9**	**0.0786**
Bartlett	1.7432	2	.	0.1750

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

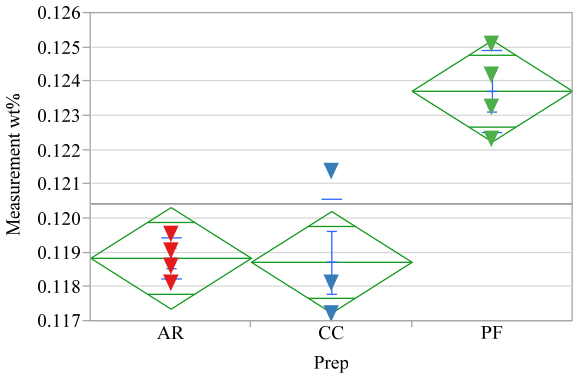
F Ratio	DFNum	DFDen	Prob > F
0.0623	2	4.7567	0.9404

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
AR	A	0.00902326
PF	A	0.00895349
CC	A	0.00890698

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Cr



Oneway Anova
Summary of Fit

Rsquare	0.807598
Adj Rsquare	0.764842
Root Mean Square Error	0.001313
Mean of Response	0.120426
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00006515	0.000033	18.8885	**0.0006***
Error	9	0.00001552	1.725e-6		
C. Total	11	0.00008067			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.118837	0.00066	0.11735	0.12032
CC	4	0.118721	0.00066	0.11724	0.12021
PF	4	0.123721	0.00066	0.12224	0.12521

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.118837	0.000600	0.00030	0.11788	0.11979
CC	4	0.118721	0.001836	0.00092	0.11580	0.12164
PF	4	0.123721	0.001201	0.00060	0.12181	0.12563

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0006005	0.0004651	0.0004651
CC	4	0.0018361	0.0013372	0.0010465
PF	4	0.0012009	0.0009302	0.0009302

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	0.8809	2	9	0.4473
Brown-Forsythe	0.4172	2	9	0.6710
Levene	**1.6957**	**2**	**9**	**0.2372**
Bartlett	1.4028	2	.	0.2459

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
23.9527	2	5.0529	0.0026*

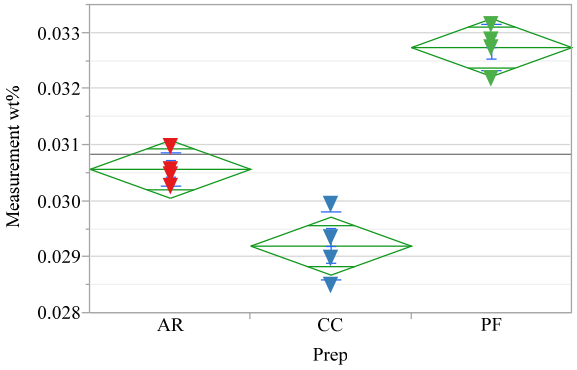
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.12372093
AR	B	0.11883721
CC	B	0.11872093

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Cu



Oneway Anova
Summary of Fit

Rsquare	0.931514
Adj Rsquare	0.916295
Root Mean Square Error	0.000457
Mean of Response	0.030837
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00002558	0.000013	61.2067	**<.0001***
Error	9	0.00000188	2.09e-7		
C. Total	11	0.00002747			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.030570	0.00023	0.03005	0.03109
CC	4	0.029198	0.00023	0.02868	0.02971
PF	4	0.032744	0.00023	0.03223	0.03326

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.030570	0.000295	0.00015	0.03010	0.03104
CC	4	0.029198	0.000609	0.00030	0.02823	0.03017
PF	4	0.032744	0.000411	0.00021	0.03209	0.03340

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0002951	0.0002035	0.0001977
CC	4	0.0006093	0.0004535	0.0004535
PF	4	0.0004108	0.0002791	0.0002791

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	0.8600	2	9	0.4552
Brown-Forsythe	0.9785	2	9	0.4126
Levene	**1.0181**	**2**	**9**	**0.3994**
Bartlett	0.6731	2	.	0.5101

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

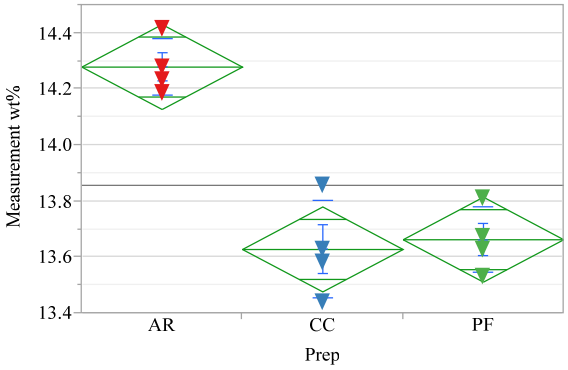
F Ratio	DFNum	DFDen	Prob > F
51.6257	2	5.5899	0.0002*

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.03274419
AR	B	0.03056977
CC	C	0.02919767

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Fe



Oneway Anova
Summary of Fit

Rsquare	0.86907
Adj Rsquare	0.839975
Root Mean Square Error	0.134044
Mean of Response	13.85659
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	1.0733730	0.536686	29.8696	**0.0001***
Error	9	0.1617090	0.017968		
C. Total	11	1.2350820			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	14.2791	0.06702	14.127	14.431
CC	4	13.6279	0.06702	13.476	13.780
PF	4	13.6628	0.06702	13.511	13.814

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	14.2791	0.100477	0.05024	14.119	14.439
CC	4	13.6279	0.174031	0.08702	13.351	13.905
PF	4	13.6628	0.116279	0.05814	13.478	13.848

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.1004766	0.0697674	0.0697674
CC	4	0.1740306	0.1162791	0.1162791
PF	4	0.1162791	0.0813953	0.0813953

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	0.5660	2	9	0.5867
Brown-Forsythe	0.3171	2	9	0.7361
Levene	**0.3421**	**2**	**9**	**0.7191**
Bartlett	0.4425	2	.	0.6424

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
36.3074	2	5.7733	0.0005*

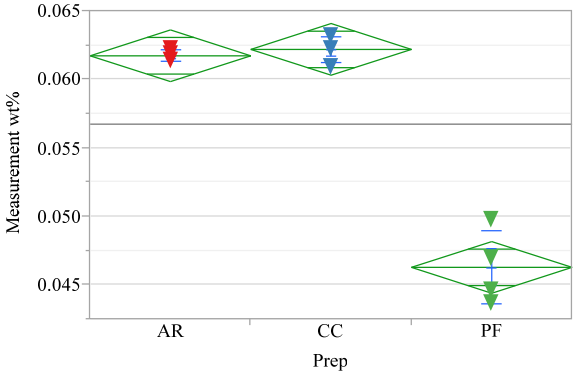
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
AR	A	14.279070
PF	B	13.662791
CC	B	13.627907

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Gd



Oneway Anova
Summary of Fit

Rsquare	0.963245
Adj Rsquare	0.955077
Root Mean Square Error	0.001668
Mean of Response	0.056748
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00065657	0.000328	117.9328	<.0001*
Error	9	0.00002505	2.784e-6		
C. Total	11	0.00068162			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.061744	0.00083	0.05986	0.06363
CC	4	0.062209	0.00083	0.06032	0.06410
PF	4	0.046291	0.00083	0.04440	0.04818

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.061744	0.000445	0.00022	0.06104	0.06245
CC	4	0.062209	0.000959	0.00048	0.06068	0.06374
PF	4	0.046291	0.002689	0.00134	0.04201	0.05057

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0004453	0.0003488	0.0003488
CC	4	0.0009589	0.0006395	0.0005814
PF	4	0.0026895	0.0020814	0.0020814

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	2.4058	2	9	0.1455
Brown-Forsythe	4.6706	2	9	0.0406
Levene	**5.5328**	**2**	**9**	**0.0271**
Bartlett	3.6510	2	.	0.0260

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

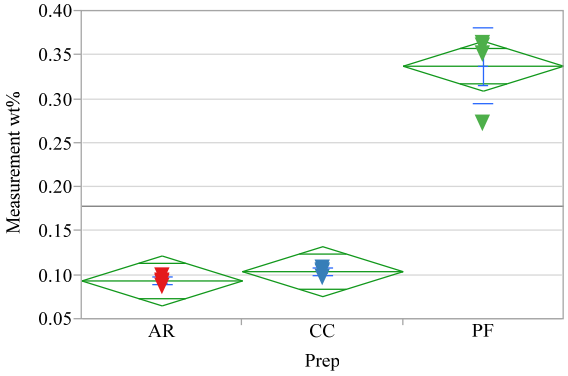
F Ratio	DFNum	DFDen	Prob > F
57.6003	2	4.7684	**0.0005***

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
CC	A	0.06220930
AR	A	0.06174419
PF	B	0.04629070

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=K



Oneway Anova
Summary of Fit

Rsquare	0.964194
Adj Rsquare	0.956238
Root Mean Square Error	0.025065
Mean of Response	0.178372
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.15226512	0.076133	121.1786	<.0001*
Error	9	0.00565441	0.000628		
C. Total	11	0.15791952			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.093488	0.01253	0.06514	0.12184
CC	4	0.104070	0.01253	0.07572	0.13242
PF	4	0.337558	0.01253	0.30921	0.36591

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.093488	0.004651	0.00233	0.08609	0.10089
CC	4	0.104070	0.003953	0.00198	0.09778	0.11036
PF	4	0.337558	0.042983	0.02149	0.26916	0.40595

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0046512	0.0032558	0.0032558
CC	4	0.0039535	0.0027326	0.0026744
PF	4	0.0429830	0.0320349	0.0245349

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.4481	2	9	0.2849
Brown-Forsythe	1.2194	2	9	0.3399
Levene	**6.8527**	**2**	**9**	**0.0155**
Bartlett	7.8176	2	.	0.0004

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
59.5118	2	5.305	**0.0002***

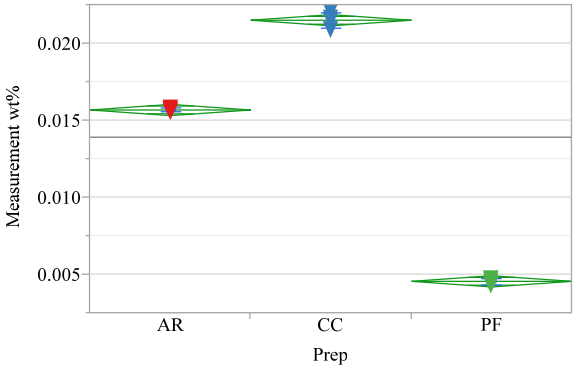
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.33755814
CC	B	0.10406977
AR	B	0.09348837

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=La



Oneway Anova
Summary of Fit

Rsquare	0.998465
Adj Rsquare	0.998124
Root Mean Square Error	0.000318
Mean of Response	0.013931
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00059332	0.000297	2927.267	**<.0001***
Error	9	0.00000091	1.013e-7		
C. Total	11	0.00059424			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.015698	0.00016	0.01534	0.01606
CC	4	0.021523	0.00016	0.02116	0.02188
PF	4	0.004573	0.00016	0.00421	0.00493

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.015698	0.000123	6.15e-5	0.01550	0.01589
CC	4	0.021523	0.000499	0.00025	0.02073	0.02232
PF	4	0.004573	0.000201	0.00010	0.00425	0.00489

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0001231	0.0000930	0.0000930
CC	4	0.0004986	0.0003372	0.0003372
PF	4	0.0002007	0.0001477	0.0001477

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.5522	2	9	0.2635
Brown-Forsythe	1.7186	2	9	0.2333
Levene	**1.7627**	**2**	**9**	**0.2260**
Bartlett	2.5164	2	.	0.0807

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

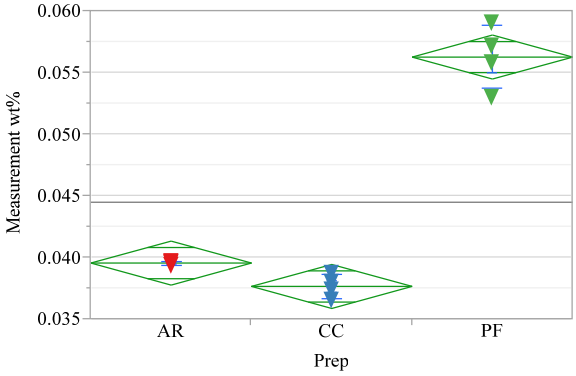
F Ratio	DFNum	DFDen	Prob > F
4489.0229	2	5.1459	<.0001*

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
CC	A	0.02152326
AR	B	0.01569767
PF	C	0.00457326

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Li



Oneway Anova
Summary of Fit

Rsquare	0.974066
Adj Rsquare	0.968303
Root Mean Square Error	0.001576
Mean of Response	0.0445
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00083966	0.000420	169.0195	<.0001*
Error	9	0.00002236	2.484e-6		
C. Total	11	0.00086202			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.039558	0.00079	0.03778	0.04134
CC	4	0.037663	0.00079	0.03588	0.03945
PF	4	0.056279	0.00079	0.05450	0.05806

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.039558	0.000159	0.00008	0.03931	0.03981
CC	4	0.037663	0.000968	0.00048	0.03612	0.03920
PF	4	0.056279	0.002548	0.00127	0.05223	0.06033

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0001589	0.0001163	0.0001163
CC	4	0.0009678	0.0007326	0.0007326
PF	4	0.0025475	0.0018605	0.0018605

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.9719	2	9	0.1949
Brown-Forsythe	4.3142	2	9	0.0485
Levene	**4.4640**	**2**	**9**	**0.0450**
Bartlett	6.0152	2	.	0.0024

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
80.7502	2	4.12	**0.0005***

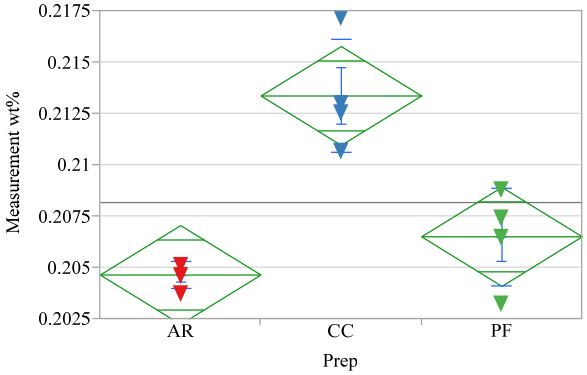
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.05627907
AR	B	0.03955814
CC	B	0.03766279

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Mg



Oneway Anova
Summary of Fit

Rsquare	0.805195
Adj Rsquare	0.761905
Root Mean Square Error	0.00213
Mean of Response	0.208178
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00016878	0.000084	18.6000	**0.0006***
Error	9	0.00004083	4.537e-6		
C. Total	11	0.00020961			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.204651	0.00107	0.20224	0.20706
CC	4	0.213372	0.00107	0.21096	0.21578
PF	4	0.206512	0.00107	0.20410	0.20892

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.204651	0.000658	0.00033	0.20360	0.20570
CC	4	0.213372	0.002748	0.00137	0.20900	0.21775
PF	4	0.206512	0.002372	0.00119	0.20274	0.21029

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0006578	0.0004651	0.0004651
CC	4	0.0027484	0.0019186	0.0017442
PF	4	0.0023716	0.0016279	0.0016279

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	0.8306	2	9	0.4666
Brown-Forsythe	0.9174	2	9	0.4339
Levene	**1.4543**	**2**	**9**	**0.2836**
Bartlett	2.1235	2	.	0.1196

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

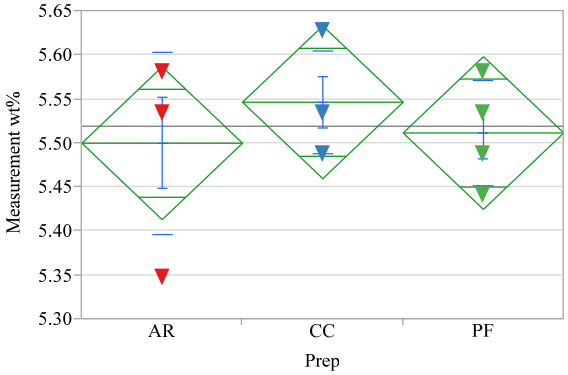
F Ratio	DFNum	DFDen	Prob > F
17.1365	2	4.483	0.0079*

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
CC	A	0.21337209
PF	B	0.20651163
AR	B	0.20465116

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Mn



Oneway Anova
Summary of Fit

Rsquare	0.08125
Adj Rsquare	-0.12292
Root Mean Square Error	0.07674
Mean of Response	5.51938
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00468722	0.002344	0.3980	**0.6829**
Error	9	0.05300162	0.005889		
C. Total	11	0.05768884			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	5.50000	0.03837	5.4132	5.5868
CC	4	5.54651	0.03837	5.4597	5.6333
PF	4	5.51163	0.03837	5.4248	5.5984

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	5.50000	0.103133	0.05157	5.3359	5.6641
CC	4	5.54651	0.058526	0.02926	5.4534	5.6396
PF	4	5.51163	0.060046	0.03002	5.4161	5.6072

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.1031328	0.0755814	0.0581395
CC	4	0.0585258	0.0406977	0.0348837
PF	4	0.0600463	0.0465116	0.0465116

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	0.6052	2	9	0.5667
Brown-Forsythe	0.1552	2	9	0.8585
Levene	**0.8455**	**2**	**9**	**0.4608**
Bartlett	0.5766	2	.	0.5618

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
0.4363	2	5.761	0.6662

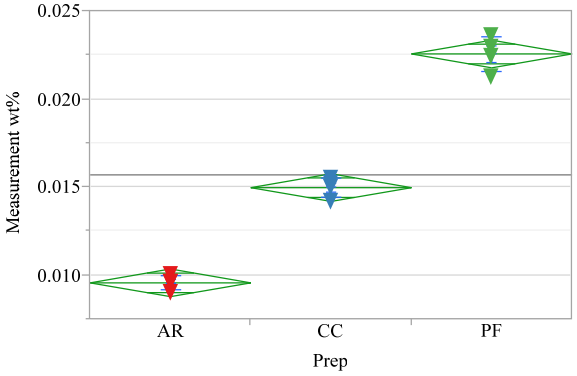
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
CC	A	5.5465116
PF	A	5.5116279
AR	A	5.5000000

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Mo



Oneway Anova
Summary of Fit

Rsquare	0.987444
Adj Rsquare	0.984653
Root Mean Square Error	0.000694
Mean of Response	0.015705
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00034119	0.000171	353.8815	**<.0001***
Error	9	0.00000434	4.821e-7		
C. Total	11	0.00034552			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.009570	0.00035	0.00878	0.01036
CC	4	0.014977	0.00035	0.01419	0.01576
PF	4	0.022570	0.00035	0.02178	0.02336

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.009570	0.000420	0.00021	0.00890	0.01024
CC	4	0.014977	0.000575	0.00029	0.01406	0.01589
PF	4	0.022570	0.000969	0.00048	0.02103	0.02411

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0004201	0.0002733	0.0002674
CC	4	0.0005747	0.0003953	0.0003953
PF	4	0.0009692	0.0007093	0.0007093

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.0622	2	9	0.3854
Brown-Forsythe	1.2091	2	9	0.3427
Levene	**1.2991**	**2**	**9**	**0.3194**
Bartlett	0.9351	2	.	0.3925

Warning: Small sample sizes. Use Caution.
Welch's Test
Welch Anova testing Means Equal, allowing Std Devs Not Equal

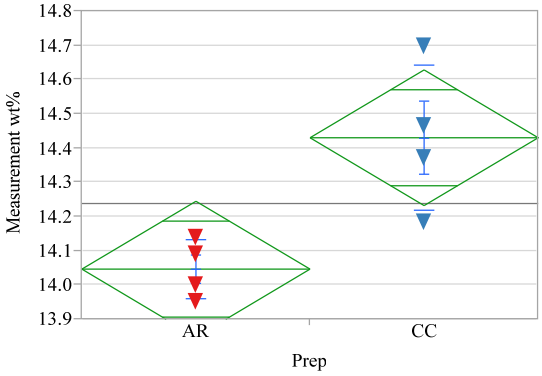
F Ratio	DFNum	DFDen	Prob > F
312.1876	2	5.5351	<.0001*

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.02256977
CC	B	0.01497674
AR	C	0.00956977

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Na



Missing Rows 4
Oneway Anova
Summary of Fit

Rsquare	0.651706
Adj Rsquare	0.593656
Root Mean Square Error	0.161958
Mean of Response	14.23837
Observations (or Sum Wgts)	8

t Test
CC-AR
Assuming equal variances

Difference	0.383721	t Ratio	3.350642
Std Err Dif	0.114522	DF	6
Upper CL Dif	0.663945	Prob > |t|	0.0154*
Lower CL Dif	0.103497	Prob > t	0.0077*
Confidence	0.95	Prob < t	0.9923

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	1	0.29448350	0.294484	11.2268	**0.0154***
Error	6	0.15738237	0.026230		
C. Total	7	0.45186587			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	14.0465	0.08098	13.848	14.245
CC	4	14.4302	0.08098	14.232	14.628

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	14.0465	0.084918	0.04246	13.911	14.182
CC	4	14.4302	0.212720	0.10636	14.092	14.769

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0849182	0.0697674	0.0697674
CC	4	0.2127197	0.1511628	0.1511628

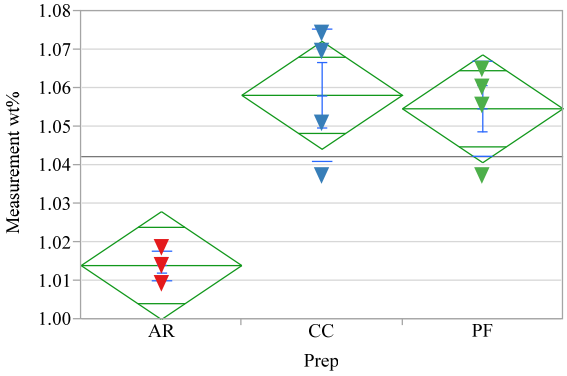
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	1.5174	1	6	0.2641
Brown-Forsythe	1.6897	1	6	0.2413
Levene	**1.7093**	**1**	**6**	**0.2389**
Bartlett	1.9183	1	.	0.1660
F Test 2-sided	6.2750	3	3	0.1657

Warning: Small sample sizes. Use Caution.
Welch's Test
Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
11.2268	1	3.9325	0.0293*

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Ni



Oneway Anova
Summary of Fit

Rsquare	0.77781
Adj Rsquare	0.728435
Root Mean Square Error	0.012379
Mean of Response	1.042248
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00482783	0.002414	15.7529	0.0011*
Error	9	0.00137912	0.000153		
C. Total	11	0.00620696			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	1.01395	0.00619	1.0000	1.0280
CC	4	1.05814	0.00619	1.0441	1.0721
PF	4	1.05465	0.00619	1.0406	1.0687

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	1.01395	0.003798	0.00190	1.0079	1.0200
CC	4	1.05814	0.017195	0.00860	1.0308	1.0855
PF	4	1.05465	0.012232	0.00612	1.0352	1.0741

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0037977	0.0023256	0.0023256
CC	4	0.0171946	0.0139535	0.0139535
PF	4	0.0122324	0.0087209	0.0081395

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.8069	2	9	0.2189
Brown-Forsythe	3.1690	2	9	0.0908
Levene	**4.4483**	**2**	**9**	**0.0454**
Bartlett	2.2599	2	.	0.1044

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

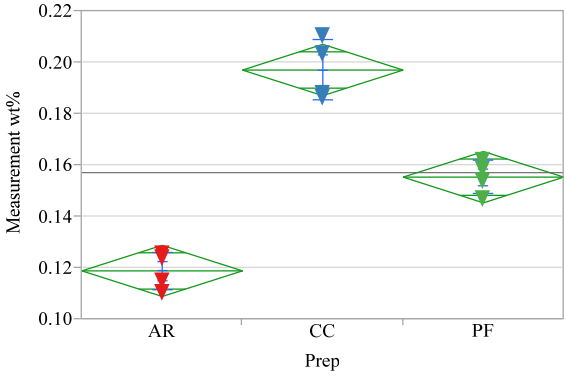
F Ratio	DFNum	DFDen	Prob > F
26.9011	2	4.5161	**0.0031***

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
CC	A	1.0581395
PF	A	1.0546512
AR	B	1.0139535

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=P



Oneway Anova
Summary of Fit

Rsquare	0.945982
Adj Rsquare	0.933978
Root Mean Square Error	0.008822
Mean of Response	0.157093
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.01226620	0.006133	78.8054	**<.0001***
Error	9	0.00070043	0.000078		
C. Total	11	0.01296663			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.118837	0.00441	0.10886	0.12882
CC	4	0.197093	0.00441	0.18711	0.20707
PF	4	0.155349	0.00441	0.14537	0.16533

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.118837	0.007211	0.00361	0.10736	0.13031
CC	4	0.197093	0.011824	0.00591	0.17828	0.21591
PF	4	0.155349	0.006456	0.00323	0.14508	0.16562

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0072106	0.0060465	0.0060465
CC	4	0.0118239	0.0098837	0.0098837
PF	4	0.0064560	0.0048837	0.0048837

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	2.3947	2	9	0.1466
Brown-Forsythe	2.9843	2	9	0.1013
Levene	**3.6224**	**2**	**9**	**0.0701**
Bartlett	0.5775	2	.	0.5613

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
62.4883	2	5.7442	0.0001*

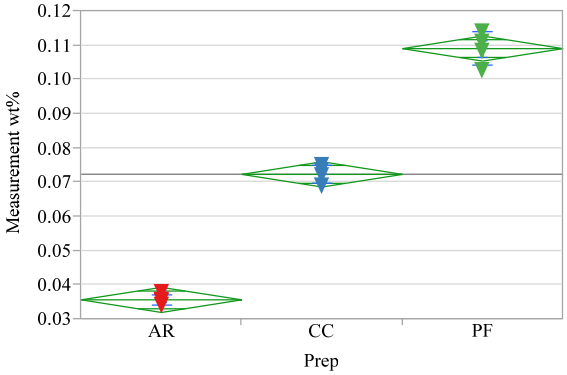
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
CC	A	0.19709302
PF	B	0.15534884
AR	C	0.11883721

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Pb



Oneway Anova
Summary of Fit

Rsquare	0.991287
Adj Rsquare	0.98935
Root Mean Square Error	0.003244
Mean of Response	0.072353
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.01077717	0.005389	511.9549	**<.0001***
Error	9	0.00009473	0.000011		
C. Total	11	0.01087190			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.035663	0.00162	0.03199	0.03933
CC	4	0.072326	0.00162	0.06866	0.07600
PF	4	0.109070	0.00162	0.10540	0.11274

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.035663	0.001468	0.00073	0.03333	0.03800
CC	4	0.072326	0.002590	0.00129	0.06820	0.07645
PF	4	0.109070	0.004766	0.00238	0.10149	0.11665

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0014681	0.0010291	0.0009651
CC	4	0.0025897	0.0018605	0.0018605
PF	4	0.0047660	0.0034884	0.0034884

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.3934	2	9	0.2970
Brown-Forsythe	1.8554	2	9	0.2115
Levene	**2.0139**	**2**	**9**	**0.1893**
Bartlett	1.6558	2	.	0.1909

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

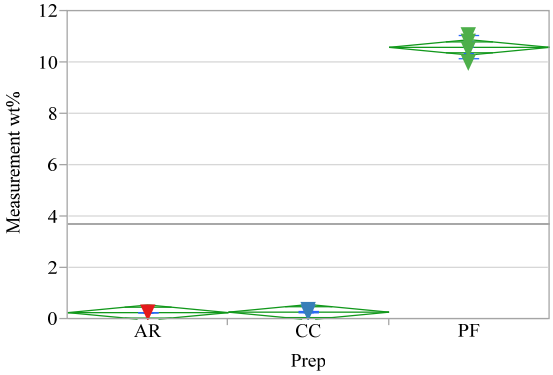
F Ratio	DFNum	DFDen	Prob > F
571.0489	2	5.1462	<.0001*

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.10906977
CC	B	0.07232558
AR	C	0.03566279

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=S



Oneway Anova
Summary of Fit

Rsquare	0.997788
Adj Rsquare	0.997297
Root Mean Square Error	0.264614
Mean of Response	3.709419
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	284.30451	142.152	2030.145	<.0001*
Error	9	0.63019	0.070		
C. Total	11	284.93470			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.2602	0.13231	-0.0391	0.560
CC	4	0.2750	0.13231	-0.0243	0.574
PF	4	10.5930	0.13231	10.29	10.892

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.2602	0.008238	0.00412	0.2471	0.273
CC	4	0.2750	0.042115	0.02106	0.2080	0.342
PF	4	10.5930	0.456312	0.22816	9.8669	11.319

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0082375	0.0062791	0.0062791
CC	4	0.0421153	0.0311047	0.0243023
PF	4	0.4563120	0.3372093	0.3372093

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	2.3393	2	9	0.1520
Brown-Forsythe	6.6538	2	9	0.0168
Levene	**7.1387**	**2**	**9**	**0.0139**
Bartlett	12.4440	2	.	0.0000

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
883.3617	2	4.1484	**<.0001***

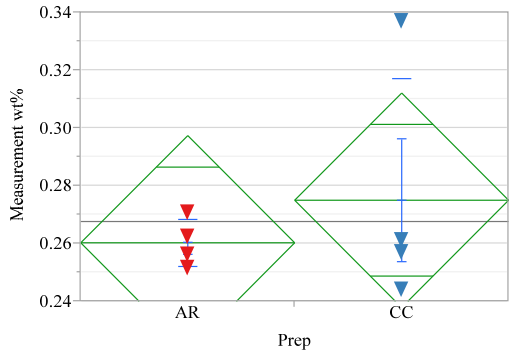
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	10.593023
CC	B	0.275000
AR	B	0.260233

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=S



Oneway Anova
Summary of Fit

Rsquare	0.07317
Adj Rsquare	-0.0813
Root Mean Square Error	0.030344
Mean of Response	0.267616
Observations (or Sum Wgts)	8

t Test
CC-AR
Assuming equal variances

Difference	0.01477	t Ratio	0.688245
Std Err Dif	0.02146	DF	6
Upper CL Dif	0.06727	Prob > |t|	0.5170
Lower CL Dif	-0.03774	Prob > t	0.2585
Confidence	0.95	Prob < t	0.7415

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	1	0.00043615	0.000436	0.4737	0.5170
Error	6	0.00552466	0.000921		
C. Total	7	0.00596082			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.260233	0.01517	0.22311	0.29736
CC	4	0.275000	0.01517	0.23788	0.31212

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.260233	0.008238	0.00412	0.24712	0.27334
CC	4	0.275000	0.042115	0.02106	0.20799	0.34201

t Test
CC-AR
Assuming unequal variances

Difference	0.01477	t Ratio	0.688245
Std Err Dif	0.02146	DF	3.229207
Upper CL Dif	0.08039	Prob > |t|	0.5375
Lower CL Dif	-0.05086	Prob > t	0.2687
Confidence	0.95	Prob < t	0.7313

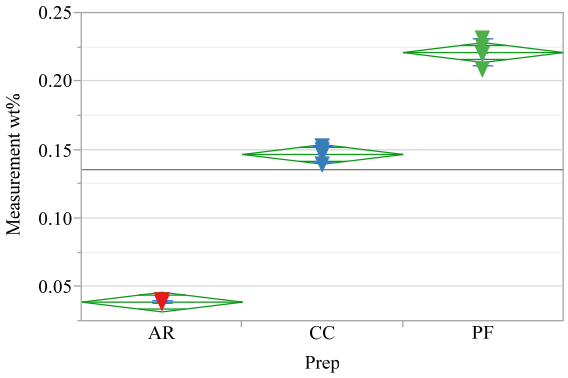
Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0082375	0.0062791	0.0062791
CC	4	0.0421153	0.0311047	0.0243023

Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	1.4058	1	6	0.2806
Brown-Forsythe	0.9761	1	6	0.3613
Levene	**4.9405**	**1**	**6**	**0.0679**
Bartlett	5.0200	1	.	0.0251
F Test 2-sided	26.1389	3	3	0.0237

Warning: Small sample sizes. Use Caution.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Sb



Oneway Anova
Summary of Fit

Rsquare	0.994586
Adj Rsquare	0.993382
Root Mean Square Error	0.006375
Mean of Response	0.135717
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.06718789	0.033594	826.6218	**<.0001***
Error	9	0.00036576	0.000041		
C. Total	11	0.06755365			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.039012	0.00319	0.03180	0.04622
CC	4	0.146860	0.00319	0.13965	0.15407
PF	4	0.221279	0.00319	0.21407	0.22849

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.039012	0.001237	0.00062	0.03704	0.04098
CC	4	0.146860	0.005389	0.00269	0.13829	0.15544
PF	4	0.221279	0.009558	0.00478	0.20607	0.23649

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0012372	0.0010116	0.0010116
CC	4	0.0053891	0.0038372	0.0038372
PF	4	0.0095575	0.0070930	0.0070930

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.6285	2	9	0.2491
Brown-Forsythe	2.9637	2	9	0.1026
Levene	**3.2839**	**2**	**9**	**0.0849**
Bartlett	3.6647	2	.	0.0256

Warning: Small sample sizes. Use Caution.

Welch's Test
Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
1240.9549	2	4.2621	<.0001*

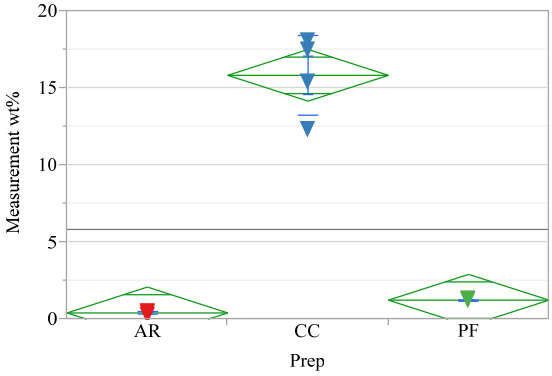
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.22127907
CC	B	0.14686047
AR	C	0.03901163

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Si



Oneway Anova
Summary of Fit

Rsquare	0.968158
Adj Rsquare	0.961082
Root Mean Square Error	1.483594
Mean of Response	5.82938
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	602.31153	301.156	136.8236	<.0001*
Error	9	19.80947	2.201		
C. Total	11	622.12100			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.4114	0.74180	-1.27	2.089
CC	4	15.8372	0.74180	14.16	17.515
PF	4	1.2395	0.74180	-0.44	2.918

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.4114	0.10700	0.0535	0.241	0.582
CC	4	15.8372	2.56714	1.2836	11.752	19.922
PF	4	1.2395	0.03845	0.0192	1.178	1.301

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.106998	0.083953	0.083953
CC	4	2.567144	1.930233	1.930233
PF	4	0.038448	0.027907	0.027907

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	2.4090	2	9	0.1452
Brown-Forsythe	6.5362	2	9	0.0177
Levene	**8.6533**	**2**	**9**	**0.0080**
Bartlett	14.9824	2	.	0.0000

Warning: Small sample sizes. Use Caution.

Welch's Test
Welch Anova testing Means Equal, allowing Std Devs Not Equal

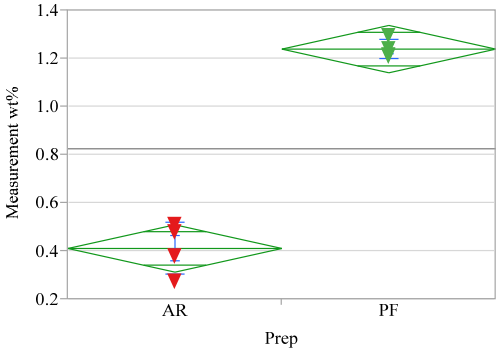
F Ratio	DFNum	DFDen	Prob > F
149.2529	2	4.4516	**<.0001***

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
CC	A	15.837209
PF	B	1.239535
AR	B	0.411395

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Si



Oneway Anova
Summary of Fit

Rsquare	0.972504
Adj Rsquare	0.967921
Root Mean Square Error	0.080395
Mean of Response	0.825465
Observations (or Sum Wgts)	8

t Test
PF-AR
Assuming equal variances

Difference	0.828140	t Ratio	14.56758
Std Err Dif	0.056848	DF	6
Upper CL Dif	0.967242	Prob > |t|	<.0001*
Lower CL Dif	0.689037	Prob > t	<.0001*
Confidence	0.95	Prob < t	1.0000

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	1	1.3716302	1.37163	212.2142	<.0001*
Error	6	0.0387805	0.00646		
C. Total	7	1.4104107			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.41140	0.04020	0.3130	0.5098
PF	4	1.23953	0.04020	1.1412	1.3379

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.41140	0.106998	0.05350	0.2411	0.5817
PF	4	1.23953	0.038448	0.01922	1.1784	1.3007

t Test
PF-AR
Assuming unequal variances

Difference	0.828140	t Ratio	14.56758
Std Err Dif	0.056848	DF	3.762034
Upper CL Dif	0.989992	Prob > |t|	0.0002*
Lower CL Dif	0.666287	Prob > t	<.0001*
Confidence	0.95	Prob < t	0.9999

Tests that the Variances are Equal

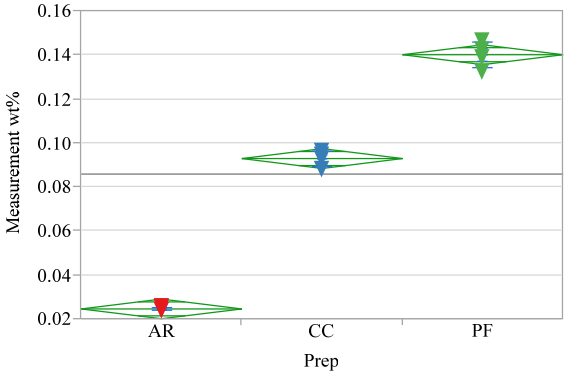
Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.1069980	0.0839535	0.0839535
PF	4	0.0384484	0.0279070	0.0279070

Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	2.3278	1	6	0.1779
Brown-Forsythe	4.0257	1	6	0.0916
Levene	**5.0444**	**1**	**6**	**0.0658**
Bartlett	2.3235	1	.	0.1274
F Test 2-sided	7.7445	3	3	0.1267

Warning: Small sample sizes. Use Caution.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Sn



Oneway Anova
Summary of Fit

Rsquare	0.994759
Adj Rsquare	0.993594
Root Mean Square Error	0.003975
Mean of Response	0.085992
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.02698248	0.013491	854.0443	**<.0001***
Error	9	0.00014217	0.000016		
C. Total	11	0.02712465			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.024721	0.00199	0.02023	0.02922
CC	4	0.093023	0.00199	0.08853	0.09752
PF	4	0.140233	0.00199	0.13574	0.14473

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.024721	0.000768	0.00038	0.02350	0.02594
CC	4	0.093023	0.003375	0.00169	0.08765	0.09839
PF	4	0.140233	0.005950	0.00298	0.13076	0.14970

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0007685	0.0006279	0.0006279
CC	4	0.0033754	0.0023256	0.0023256
PF	4	0.0059503	0.0044186	0.0044186

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.6206	2	9	0.2505
Brown-Forsythe	2.8985	2	9	0.1067
Levene	**3.1761**	**2**	**9**	**0.0904**
Bartlett	3.6661	2	.	0.0256

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

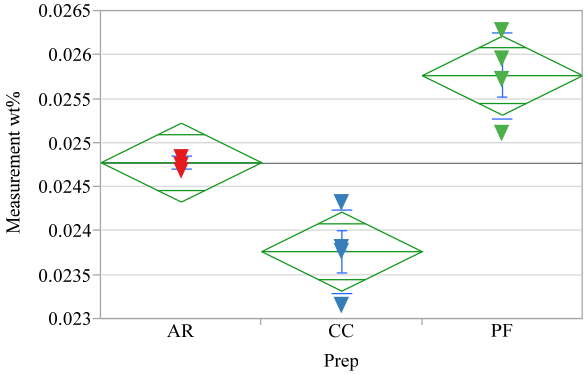
F Ratio	DFNum	DFDen	Prob > F
1277.8540	2	4.2588	<.0001*

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.14023256
CC	B	0.09302326
AR	C	0.02472093

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Sr



Oneway Anova
Summary of Fit

Rsquare	0.849584
Adj Rsquare	0.816158
Root Mean Square Error	0.000397
Mean of Response	0.024771
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	8.00036e-6	0.000004	25.4170	**0.0002***
Error	9	1.41644e-6	1.5738e-7		
C. Total	11	9.4168e-6			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.024779	0.00020	0.02433	0.02523
CC	4	0.023767	0.00020	0.02332	0.02422
PF	4	0.025767	0.00020	0.02532	0.02622

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.024779	0.000070	3.49e-5	0.02467	0.02489
CC	4	0.023767	0.000476	0.00024	0.02301	0.02452
PF	4	0.025767	0.000491	0.00025	0.02499	0.02655

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0000698	0.0000581	0.0000581
CC	4	0.0004758	0.0003023	0.0003023
PF	4	0.0004908	0.0003488	0.0003488

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	0.9676	2	9	0.4163
Brown-Forsythe	1.5326	2	9	0.2674
Levene	**1.5943**	**2**	**9**	**0.2554**
Bartlett	3.5102	2	.	0.0299

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
14.7821	2	4.1616	0.0129*

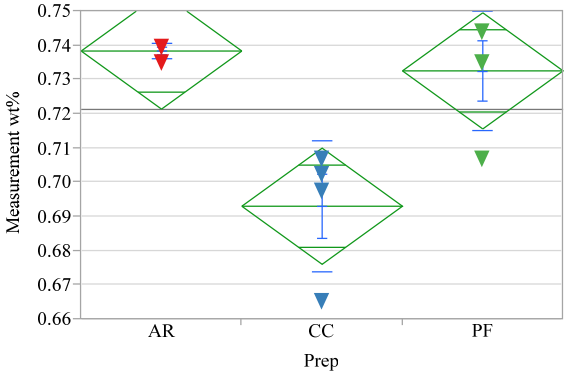
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.02576744
AR	B	0.02477907
CC	C	0.02376744

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Th



Oneway Anova
Summary of Fit

Rsquare	0.706036
Adj Rsquare	0.640711
Root Mean Square Error	0.015012
Mean of Response	0.721318
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00487110	0.002436	10.8080	**0.0040***
Error	9	0.00202812	0.000225		
C. Total	11	0.00689922			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.738372	0.00751	0.72139	0.75535
CC	4	0.693023	0.00751	0.67604	0.71000
PF	4	0.732558	0.00751	0.71558	0.74954

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.738372	0.002326	0.00116	0.73467	0.74207
CC	4	0.693023	0.018988	0.00949	0.66281	0.72324
PF	4	0.732558	0.017609	0.00880	0.70454	0.76058

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0023256	0.0017442	0.0011628
CC	4	0.0189883	0.0139535	0.0116279
PF	4	0.0176090	0.0127907	0.0116279

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	0.7863	2	9	0.4845
Brown-Forsythe	0.9838	2	9	0.4108
Levene	**2.8051**	**2**	**9**	**0.1130**
Bartlett	3.8416	2	.	0.0215

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

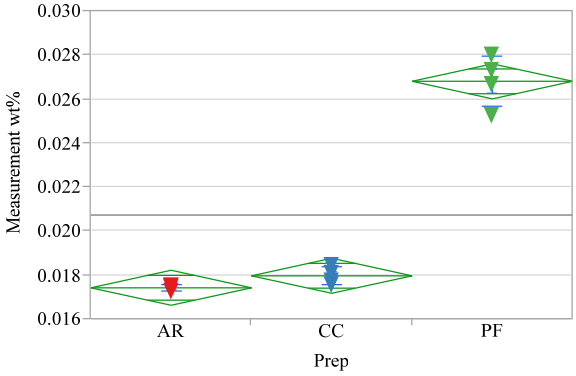
F Ratio	DFNum	DFDen	Prob > F
9.8202	2	4.1266	0.0270*

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
AR	A	0.73837209
PF	A	0.73255814
CC	B	0.69302326

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Ti



Oneway Anova
Summary of Fit

Rsquare	0.980327
Adj Rsquare	0.975955
Root Mean Square Error	0.000703
Mean of Response	0.02074
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00022193	0.000111	224.2364	<.0001*
Error	9	0.00000445	4.949e-7		
C. Total	11	0.00022639			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.017430	0.00035	0.01663	0.01823
CC	4	0.017977	0.00035	0.01718	0.01877
PF	4	0.026814	0.00035	0.02602	0.02761

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.017430	0.000122	6.12e-5	0.01724	0.01762
CC	4	0.017977	0.000388	0.00019	0.01736	0.01859
PF	4	0.026814	0.001148	0.00057	0.02499	0.02864

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0001223	0.0000872	0.0000814
CC	4	0.0003882	0.0003023	0.0003023
PF	4	0.0011484	0.0008372	0.0008372

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.9724	2	9	0.1948
Brown-Forsythe	3.9470	2	9	0.0588
Levene	**4.2815**	**2**	**9**	**0.0494**
Bartlett	4.8434	2	.	0.0079

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
116.6937	2	4.3985	**0.0002***

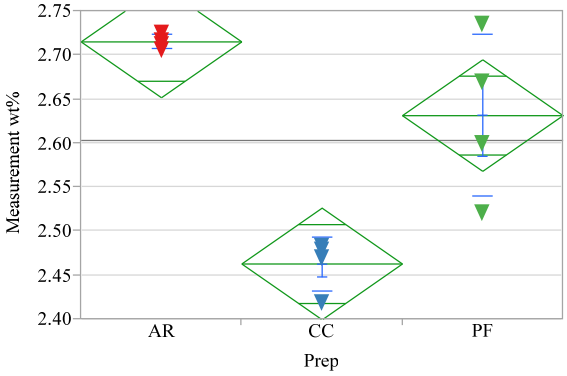
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.02681395
CC	B	0.01797674
AR	B	0.01743023

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=U



Oneway Anova
Summary of Fit

Rsquare	0.823795
Adj Rsquare	0.784639
Root Mean Square Error	0.05604
Mean of Response	2.603101
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.13213990	0.066070	21.0385	0.0004*
Error	9	0.02826393	0.003140		
C. Total	11	0.16040382			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	2.71512	0.02802	2.6517	2.7785
CC	4	2.46279	0.02802	2.3994	2.5262
PF	4	2.63140	0.02802	2.5680	2.6948

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	2.71512	0.007943	0.00397	2.7025	2.7278
CC	4	2.46279	0.030023	0.01501	2.4150	2.5106
PF	4	2.63140	0.091961	0.04598	2.4851	2.7777

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0079434	0.0058140	0.0058140
CC	4	0.0300231	0.0220930	0.0186047
PF	4	0.0919610	0.0709302	0.0709302

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	2.5629	2	9	0.1315
Brown-Forsythe	5.9393	2	9	0.0227
Levene	**6.8311**	**2**	**9**	**0.0157**
Bartlett	5.4414	2	.	0.0043

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

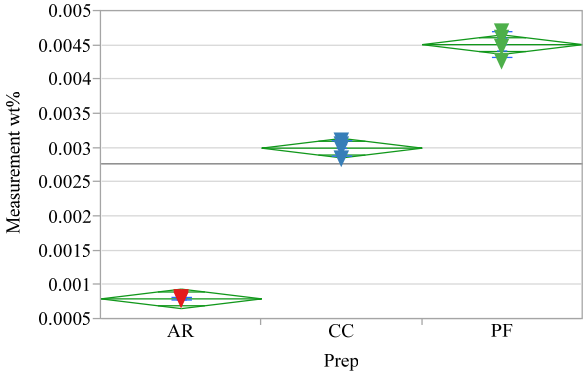
F Ratio	DFNum	DFDen	Prob > F
115.1792	2	4.288	**0.0002***

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
AR	A	2.7151163
PF	A	2.6313953
CC	B	2.4627907

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=V



Oneway Anova
Summary of Fit

Rsquare	0.994897
Adj Rsquare	0.993763
Root Mean Square Error	0.000126
Mean of Response	0.002769
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00002790	0.000014	877.3204	**<.0001***
Error	9	0.00000014	1.59e-8		
C. Total	11	0.00002805			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.000798	6.31e-5	0.00066	0.00094
CC	4	0.002999	6.31e-5	0.00286	0.00314
PF	4	0.004512	6.31e-5	0.00437	0.00465

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.000798	0.000026	1.28e-5	0.00076	0.00084
CC	4	0.002999	0.000111	5.57e-5	0.00282	0.00318
PF	4	0.004512	0.000186	9.31e-5	0.00422	0.00481

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0000256	0.0000209	0.0000209
CC	4	0.0001113	0.0000779	0.0000779
PF	4	0.0001862	0.0001372	0.0001372

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	1.4952	2	9	0.2750
Brown-Forsythe	2.5668	2	9	0.1312
Levene	**2.9126**	**2**	**9**	**0.1058**
Bartlett	3.4725	2	.	0.0310

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
1278.9308	2	4.2709	<.0001*

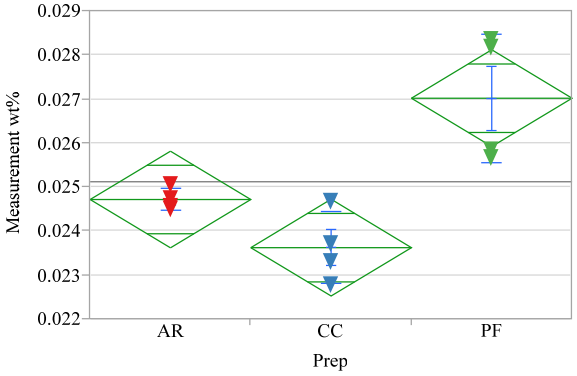
Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.00451163
CC	B	0.00299884
AR	C	0.00079767

Levels not connected by same letter are significantly different.

Exhibit A4. Analysis of Variance Investigating the Elemental Means and Variances of the Preparation Methods (continued)

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Zn



Oneway Anova
Summary of Fit

Rsquare	0.738821
Adj Rsquare	0.680781
Root Mean Square Error	0.000972
Mean of Response	0.025124
Observations (or Sum Wgts)	12

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	2	0.00002403	0.000012	12.7296	0.0024*
Error	9	0.00000850	9.439e-7		
C. Total	11	0.00003253			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.024721	0.00049	0.02362	0.02582
CC	4	0.023628	0.00049	0.02253	0.02473
PF	4	0.027023	0.00049	0.02592	0.02812

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.024721	0.000253	0.00013	0.02432	0.02512
CC	4	0.023628	0.000808	0.00040	0.02234	0.02491
PF	4	0.027023	0.001454	0.00073	0.02471	0.02934

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0002533	0.0001860	0.0001860
CC	4	0.0008083	0.0005814	0.0005814
PF	4	0.0014541	0.0012558	0.0012558

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	13.3890	2	9	0.0020
Brown-Forsythe	13.6770	2	9	0.0019
Levene	**15.1211**	**2**	**9**	**0.0013**
Bartlett	2.9394	2	.	0.0529

Warning: Small sample sizes. Use Caution.

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

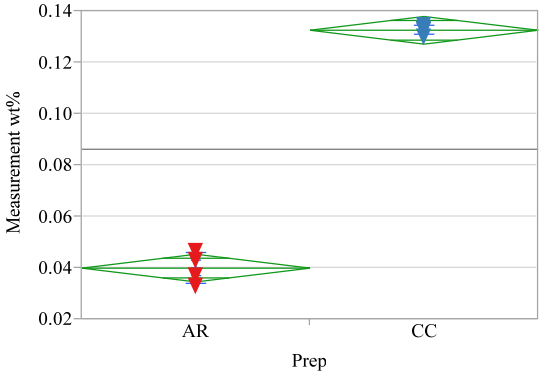
F Ratio	DFNum	DFDen	Prob > F
7.5102	2	4.4608	**0.0373***

Means Comparisons
Comparisons for all pairs using Tukey-Kramer HSD
Connecting Letters Report

Level		Mean
PF	A	0.02702326
AR	B	0.02472093
CC	B	0.02362791

Levels not connected by same letter are significantly different.

Oneway Analysis of Measurement wt% By Prep Type=SB9 SRAT Product, Element=Zr



Missing Rows 4

Oneway Anova
Summary of Fit

Rsquare	0.993228
Adj Rsquare	0.992099
Root Mean Square Error	0.004416
Mean of Response	0.086244
Observations (or Sum Wgts)	8

t Test

CC-AR

Assuming equal variances

Difference	0.092628	t Ratio	29.66419
Std Err Dif	0.003123	DF	6
Upper CL Dif	0.100269	Prob > |t|	<.0001*
Lower CL Dif	0.084987	Prob > t	<.0001*
Confidence	0.95	Prob < t	1.0000

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	1	0.01715986	0.017160	879.9643	<.0001*
Error	6	0.00011700	0.000020		
C. Total	7	0.01727686			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.039930	0.00221	0.03453	0.04533
CC	4	0.132558	0.00221	0.12716	0.13796

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.039930	0.005998	0.00300	0.03039	0.04947
CC	4	0.132558	0.001740	0.00087	0.12979	0.13533

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0059977	0.0048837	0.0048837
CC	4	0.0017403	0.0011628	0.0011628

Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	3.8594	1	6	0.0971
Brown-Forsythe	10.1132	1	6	0.0191
Levene	**10.2605**	**1**	**6**	**0.0185**
Bartlett	3.2143	1	.	0.0730
F Test 2-sided	11.8774	3	3	0.0717

Warning: Small sample sizes. Use Caution.

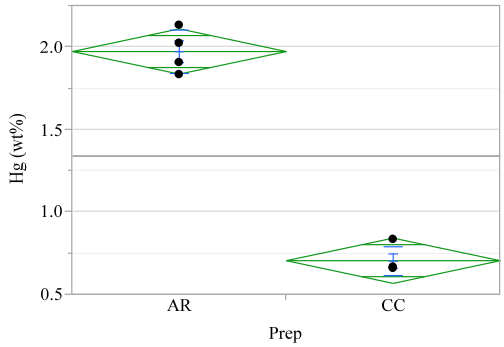
Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
879.9643	1	3.5016	**<.0001***

Exhibit A5. Analysis of Variance Investigating the Hg Means and Variances of the Preparation Methods

Oneway Analysis of Hg (wt%) By Prep Type Sample=SRAT Receipt



Oneway Anova
Summary of Fit

Rsquare	0.977031
Adj Rsquare	0.973203
Root Mean Square Error	0.112208
Mean of Response	1.340541
Observations (or Sum Wgts)	8

t Test
CC-AR
Assuming equal variances

Difference	-1.2676	t Ratio	-15.9757
Std Err Dif	0.0793	DF	6
Upper CL Dif	-1.0734	Prob > |t|	<.0001*
Lower CL Dif	-1.4617	Prob > t	1.0000
Confidence	0.95	Prob < t	<.0001*

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	1	3.2134551	3.21346	255.2245	<.0001*
Error	6	0.0755442	0.01259		
C. Total	7	3.2889993			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	1.97432	0.05610	1.8370	2.1116
CC	4	0.70676	0.05610	0.5695	0.8440

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	1.97432	0.132432	0.06622	1.7636	2.1851
CC	4	0.70676	0.087425	0.04371	0.5676	0.8459

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.1324324	0.1040541	0.1040541
CC	4	0.0874245	0.0655405	0.0445946

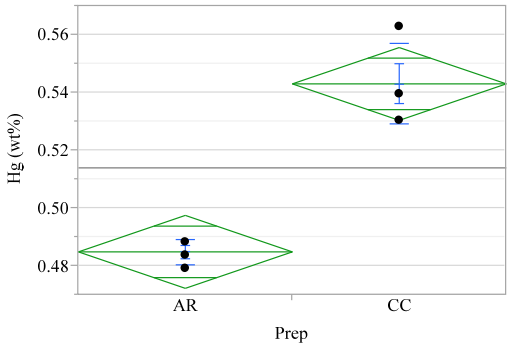
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	0.7278	1	6	0.4263
Brown-Forsythe	1.3401	1	6	0.2910
Levene	**1.1825**	**1**	**6**	**0.3186**
Bartlett	0.4313	1	.	0.5113
F Test 2-sided	2.2947	3	3	0.5129

Warning: Small sample sizes. Use Caution.

Welch's Test
Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
255.2245	1	5.1974	<.0001*

Oneway Analysis of Hg (wt%) By Prep Type Sample=SRAT Product



Oneway Anova
Summary of Fit

Rsquare	0.913743
Adj Rsquare	0.899366
Root Mean Square Error	0.010313
Mean of Response	0.513953
Observations (or Sum Wgts)	8

t Test
CC-AR
Assuming equal variances

Difference	0.058140	t Ratio	7.97241
Std Err Dif	0.007293	DF	6
Upper CL Dif	0.075984	Prob > |t|	0.0002*
Lower CL Dif	0.040295	Prob > t	0.0001*
Confidence	0.95	Prob < t	0.9999

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Prep	1	0.00676041	0.006760	63.5593	0.0002*
Error	6	0.00063818	0.000106		
C. Total	7	0.00739859			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
AR	4	0.484884	0.00516	0.47227	0.49750
CC	4	0.543023	0.00516	0.53041	0.55564

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
AR	4	0.484884	0.004453	0.00223	0.47780	0.49197
CC	4	0.543023	0.013889	0.00694	0.52092	0.56512

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
AR	4	0.0044531	0.0034884	0.0034884
CC	4	0.0138887	0.0098837	0.0081395

Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	1.3397	1	6	0.2911
Brown-Forsythe	0.6857	1	6	0.4393
Levene	**2.4694**	**1**	**6**	**0.1671**
Bartlett	2.7883	1	.	0.0950
F Test 2-sided	9.7273	3	3	0.0939

Warning: Small sample sizes. Use Caution.

Welch's Test
Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
63.5593	1	3.6104	0.0020*

Distribution:

Adam Samet/SRR/Srs
Alexander Choi/SRNL/Srs
Amanda Shafer/SRR/Srs
Azadeh Samadi-Dezfouli/SRR/Srs
Bill Holtzscheiter/SRR/Srs
Carol Jantzen/SRNL/Srs
Celia Aponte/SRR/Srs
Charles Crawford/SRNL/Srs
Charles02 Coleman/SRNL/Srs,
Chris Martino/SRNL/Srs
Christopher Dandeneau/SRNL/Srs
Cj Bannochie/SRNL/Srs
Clint Gregory/SRNL/Srs
Connie Herman/SRNL/Srs
Cory Trivelpiece/SRNL/Srs
Dan Lambert/SRNL/Srs
David Dooley/SRNL/Srs
David Newell/SRNL/Srs
Devon McClane/SRNL/Srs
Earl Brass/SRR/Srs
Elizabeth Hoffman/SRNL/Srs
Eric Freed/SRR/Srs
Fabienne Johnson/SRNL/Srs
Frank Pennebaker/SRNL/Srs
Hasmukh Shah/SRR/Srs
Helen Boyd/SRR/Srs
Jack Zamecnik/SRNL/Srs
Jake Amoroso/SRNS/Srs
Jeff Ray/SRR/Srs
Jeffrey Gillam/SRR/Srs
John Contardi/SRR/Srs
John Iaukea/SRR/Srs
John Pareizs/SRNL/Srs
John Young/SRNL/Srs
Jonathan Bricker/SRR/Srs
Kevin Fox/SRNL/Srs
Leigh Brown/SRNL/Srs
Lynette Connelly/SRNL/Srs
Maria Rios-Armstrong/SRR/Srs
Mark Barnes/SRNL/Srs
Mark02 Jones/SRNL/Srs
Michael Feller/SRR/Srs
Michael Hart/SRR/Srs
Michael Stone/SRNL/Srs
Richard Edwards/SRR/Srs
Roger Mahannah/SRR/Srs
Ryan McNew/SRR/Srs
Terri Fellinger/SRR/Srs
Timothy Brown/SRNL/Srs
Tommy Edwards/SRNL/Srs
Vijay Jain/SRR/Srs