

Certification Report

Certified Reference Material

ERM[®] -EB393a

CuZn21Si3P

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Summary

This report describes preparation, analysis and certification of copper based reference material ERM[®]-EB393a, CuZn21Si3P (Ecobrass).

The certified reference material (CRM) is available in the form of discs (40 mm diameter and 30 mm height). It is intended for establishing and checking the calibration of spark optical emission and X-ray fluorescence spectrometers for the analysis of samples of similar materials. It is also suitable for wet chemical analysis.

The following mass fractions and uncertainties have been certified:

Element	Mass fraction in %	
	Certified value ¹⁾	Uncertainty ²⁾
Cu	75.8	0.3
Si	3.35	0.06
P	0.0454	0.0012
	Mass fraction in mg/kg	
Pb	104	4
Fe	143	5
Sn	39.2	1.0
Al	2.1	0.4
Cr	1.6	0.3
Mn	18.5	0.6
Ni	29.7	1.5
As	1.34	0.16
Cd	0.61	0.17
<p>¹⁾ Unweighted mean value of the means of accepted sets of data, each set being obtained by at least 5 laboratories and/or with different methods of measurement. The values are traceable to the SI (Système International d'Unités) by the use of pure substances of known stoichiometry for calibration.</p> <p>²⁾ Estimated expanded uncertainty U with a coverage factor of $k = 2$, corresponding to a level of confidence of about 95 %, as defined in the ISO/IEC Guide 98-3:2008 [Uncertainty of measurement -- Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)].</p>		

The certified values are based on the results of 13 laboratories which participated in the certification interlaboratory comparison.

The mass fractions of Bi, Sb and Se are given as indicative values.

Content

	Page
List of abbreviations	5
1. Introduction.....	6
2. Companies/laboratories involved	6
3. Candidate material	7
4. Homogeneity testing.....	7
5. Characterisation study.....	9
5.1 Analytical methods	9
5.2 Analytical results and statistical evaluation.....	11
6. Instructions for users and stability statement.....	35
7. References	36
8. Information on and purchase of the CRM.....	36
Annex 1: Calculation of uncertainty contribution of potential inhomogeneity (length)	37
Annex 2: Calculation of uncertainty contribution of potential inhomogeneity (area)	53

List of abbreviations

(if not explained elsewhere)

CRM	certified reference material
ERM	European reference material
ETAAS	electrothermal atomic absorption spectrometry
FAAS	flame atomic absorption spectrometry
ICP-OES	inductively coupled plasma optical emission spectrometry
ICP-MS	inductively coupled plasma mass spectrometry
GD-MS	glow discharge mass spectrometry
SOES	spark optical emission spectrometry
XRF	X-ray fluorescence spectrometry
M	mean value
n	number of accepted data sets
s	standard deviation of an individual data set
s_M	standard deviation of laboratory means
s_{rel}	relative standard deviation
\bar{s}_i	square root of mean of variances of data sets under repeatability conditions
M_i	single result
I	ICP-OES (Tables 3 – 17)
I(R)	ICP-OES, revised value (Tables 3 – 17)
IMS	ICP-MS (Tables 3 – 17)
IMS(R)	ICP-MS, revised value (Tables 3 – 17)
A	FAAS (Tables 3 – 17)
EA	ETAAS (Tables 3 – 17)
EA(R)	ETAAS, revised value (Tables 3 – 17)
EG	electrogravimetry (Tables 3 – 17)
EG(R)	electrogravimetry, revised value (Tables 3 – 17)
P	spectrophotometry (Tables 3 – 17)
G	gravimetry (Tables 3 – 17)
G(R)	gravimetry, revised value (Tables 3 – 17)
GD	GD-MS (Tables 3 – 17)
GD(R)	GD-MS, revised value (Tables 3 – 17)

1. Introduction

In the metal-producing and metal-working industry mainly spark optical emission spectrometry (SOES) and X-ray fluorescence spectrometry (XRF) are used for reception inspection of raw materials, e.g. scrap, for quality control of end products and production control. These time-saving analytical techniques require suitable reference materials for calibration and recalibration.

ECOBASS is foreseen as a material which could replace lead containing brasses in the automotive industry as well as in drinking water applications. The idea to produce an ECOBRASS reference material was the outcome of discussions within CEN TC 133 Copper and Copper Alloys and within the German Gesellschaft der Metallurgen und Bergleute e.V. (GDMB), especially of the working group „Copper“ of the Committee of Chemists within GDMB. The needs are defined by this working group, since the members are potential users of the prepared CRMs. Participating laboratories were recruited from this group. Since all of these laboratories are highly experienced with copper and brass analysis and had participated in earlier interlaboratory comparisons, there was no preceding round for qualification.

Certification of reference material ERM[®]-EB393a was carried out on the basis of the relevant ISO-Guides [1-3], the „Guidelines for the development and production of BAM Reference Materials“ [4] and the “Technical Guidelines for the Production and Acceptance of a European Reference Material” [5].

2. Companies/laboratories involved

Manufacturing of the material

- Wieland-Werke AG, Vöhringen, Germany

Test for homogeneity

- Bundesanstalt für Materialforschung und -prüfung (BAM), Berlin, Germany

Participants in the certification inter-laboratory comparison

- Allgemeine Gold- und Silberscheideanstalt AG, Pforzheim, Germany
- Aurubis AG, Hamburg, Germany
- Bundesanstalt für Materialforschung und -prüfung (BAM), Berlin, Germany
- Diehl Metall Stiftung & Co KG, Röthenbach, Germany
- Heraeus Precious Metals, Hanau, Germany
- Institut für Materialprüfung Glörfeld GmbH, Willich, Germany
- Institute of Non-Ferrous Metals, Gliwice, Poland
- KM Europa Metal AG, Osnabrück, Germany
- KME Brass Germany GmbH, Berlin, Germany
- TU Bergakademie Freiberg, Freiberg, Germany
- Umicore AG & Co KG., Hanau, Germany
- VDM-Metals GmbH, Werdohl, Germany
- Wieland-Werke AG, Vöhringen, Germany

Statistical evaluation of the data

- Bundesanstalt für Materialforschung und -prüfung (BAM), Berlin, Germany

3. Candidate material

CuZn21Si3P was taken from the normal production process within Wieland-Werke AG, Vöhringen. From the raw material rods were cast by Wieland-Werke. After solidification the material was pressed to rods with a diameter of ca. 40 mm which were cut into fourteen rods of 2 m length each. From these rods four samples per rod were cut for homogeneity testing and chemical analysis, see Figure 1.

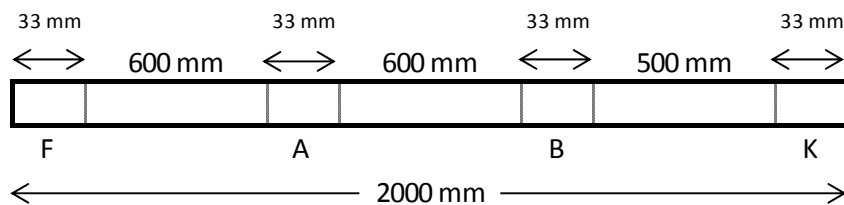


Figure 1: Cutting plan of CuZn21Si3P reference materials

About 800 discs with a diameter of ca. 40 mm and 30 mm were received from the total batch.

4. Homogeneity testing

Possible reasons for an inhomogeneous distribution of elements in the raw material may be a change of the composition of the melt during the casting procedure because some elements may volatilise or segregate during the solidification of the material. Since the raw material was produced by casting of a rod, concentration gradients can occur over the length of the rod (axial) as well as over the area of the rod (radial, see Figures 1 and 2):

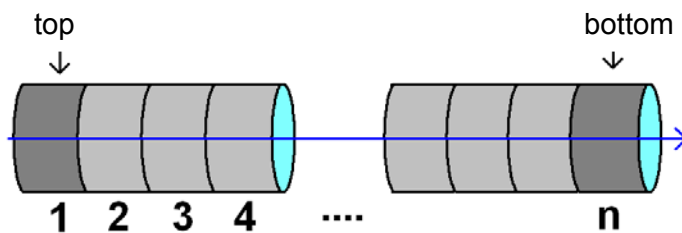


Figure 2: Axial composition gradient

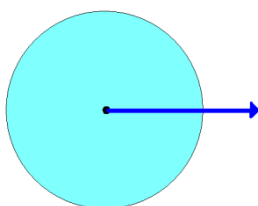


Figure 3: Radial composition gradient

Therefore it is necessary to investigate the raw material for both axial and radial inhomogeneities. Axial homogeneity testing of the candidate material was performed on the discs listed in Table 1 using spark emission spectrometry. At BAM ca. 5 % of the total number of discs (40 discs) were tested. All tests were carried out with a SpectroLab spectrometer. Each disc was analysed five times.

Tab. 1: Discs analysed for homogeneity testing of ERM[®]-EB393a

A1	A5	A6	A7	A8	A10	A11	A12	A13	A14	
B2	B3	B4	B8	B9	B10	B11	B12	B14		
F1	F2	F3	F4	F6	F7	F9	F11	F12	F13	
K2	K3	K4	K5	K6	K7	K8	K9	K10	K13	K14

The estimate of analyte-specific inhomogeneity contribution u_{bb} to be included into the total uncertainty budget was calculated according to ISO Guide 35 [4] using Eq. (1) and Eq. (2):

$$s_{bb} = \sqrt{\frac{MS_{among} - MS_{within}}{n}} \quad (1)$$

$$u_{bb}^* = \sqrt{\frac{MS_{within}}{n}} \sqrt[4]{\frac{2}{N(n-1)}} \quad (2)$$

where:

- MS_{among} mean of squared deviations between discs (from 1-way ANOVA, see Annex 1)
- MS_{within} mean of squared deviations within one disc (from 1-way ANOVA)
- n number of replicate measurements per disc
- N number of discs selected for homogeneity study

s_{bb} signifies the between-discs standard deviation, whereas u_{bb}^* denotes the maximum heterogeneity that can potentially be hidden by an insufficient repeatability of the applied measurement method (which has to be considered as the minimum uncertainty contribution). In any case the larger of the two values was used as u_{bb} .(1) Eq. (1) does not apply if MS_{within} is larger than MS_{among} .

In addition to the tests performed over the length of the rods, three discs (A1, A6, A7) were tested for homogeneity over the area (possible segregation from the outer part to the centre). To perform this test, SOES analysis was carried out in circles (outer circle: 12 sparks, inner circle: 6 sparks; centre: 1 spark).

The analyte-specific within-disc uncertainty component $u_{bb}(2)$ was calculated in the same way as for the total batch. To calculate the necessary data an unbalanced ANOVA was carried out taking into account that the number of single measurements is different for the centre, the inner and the outer circle. For technical reasons, at r_0 (centre) only one measurement is possible. An ANOVA requires a minimum of two measurements per factor value. Thus, the value for r_0 should be replaced by a dummy. This dummy is defined as follows:

The two values replacing the one measured have a mean equal to the value measured, and a standard deviation equal to the average within-variation. This resembles the situation were one could take two independent measurements at the same place, with values deviating by the average standard deviation (non-destructive testing method). A first guess for the average standard deviation may be calculated from the data for r_in (inner circle) and r_out (outer circle). As results

from these calculations an inhomogeneity factor for the radius and one for the height of the disc is obtained. From these values a combined inhomogeneity factor is calculated. This factor is compared with the within standard deviation calculated from the ANOVA-data. The higher factor is used for uncertainty calculation. Annex 2 shows the results of the calculations.

5. Characterisation study

5.1 Analytical methods

13 laboratories participated in the certification inter-laboratory comparison. For some elements part of the laboratories used more than one analytical method reporting more than one data set.

The laboratories were asked to analyse six subsamples. They were free to choose any suitable analytical method for their determinations. Table 2 shows the analytical methods used by the participating laboratories.

Table 2: Analytical procedures used by the participating laboratories

Lab-No.	Element.	Sample mass	Sample pretreatment	Analytical method
1	Cd, Cr, Fe, Mn, Ni, P, Pb, Sn	1 g	Dissolution with HCl, HNO ₃ , H ₃ BO ₃ , HF	ICP-OES, calibration with commercial solutions (Merck)
	Cu			Electrogravimetry
	Si	0.25 g	Dissolution with HCl, HNO ₃ , H ₃ BO ₃ , HF	ICP-OES (DIN EN 15605)
	As, Sb	1 g	Dissolution with HCl, HNO ₃ , H ₃ BO ₃ , HF	ETAAS
2	Al, As, Bi, Cd, Cr, Mn, Sb, Se			GD-MS, calibration with pressed powder pellets, prepared from pure powders doped with monoelemental solutions
	Si	1 g	Dissolution with HNO ₃ /HCl	Gravimetry, dehydration with hydrochloric acid
	Cu	2.5 g	Dissolution with HNO ₃ , H ₃ BO ₃ , HF	Electrogravimetry (DIN EN 16117-1), determination of residue with FAAS
	P, Pb, Fe, Sn, Mn, Ni	1 g	Dissolution with HNO ₃ , HCl	ICP-OES, calibration with monoelemental solutions prepared from pure chemicals or metals (Mn, Ni: Merck)
	P	0.4 g		Spectrophotometry
	Al, Cr, Se, Mn, Fe, Ni, As, Cd, Sn, Sb, Pb, Bi	0.25 g	Dissolution with HNO ₃ , HCl	ICP-MS
3	Cu	1 g	Dissolution with HNO ₃	Electrogravimetry,
	Mn, P, Fe, Cr, Ni	1 g	Dissolution with HNO ₃	ICP-OES, calibration with monoelemental solutions prepared from pure metals or with commercial standard solutions
4	Cu	0.5 g	Dissolution with HNO ₃ /HF	Electrogravimetry, determination of residue with FAAS
	Si	1 g	Dissolution with HNO ₃ /HClO ₄	Gravimetry
	P	1 g	Dissolution with HNO ₃ , H ₃ BO ₃ , HF	Spectrophotometry
	Fe, Mn, Sn, Ni, Pb	1 g	Dissolution with HNO ₃ /HF	ICP-OES with matrix matched standards (Cu, Zn), commercial mono-element solutions
	Cr, Mn, Pb, Sn, Sb, Cd	1 g	Dissolution with HNO ₃ /HF	ICP-MS with matrix matched standards (Cu, Zn), commercial mono-element solutions

Table 2 (cont.): Analytical procedures used by the participating laboratories

Lab-No.	Element.	Sample mass	Sample pretreatment	Analytical method
5	Cu, Si, Zn	0.75 g	Dissolution with HNO ₃	ICP-OES, mono-element solutions prepared from pure metals
	Pb, Fe, Sn, Al, Cr, Mn, Ni, As, Cd, Se, Sb, Bi	0.25 g	Dissolution with HNO ₃	ICP-OES, mono-element solutions prepared from pure metals (matrix-matched)
6	Mn, Ni, As, Bi			GD-MS, calibration with pressed powder pellets, prepared from pure powders doped with monoelemental solutions
	Si		Dissolution with Aqua regia/HF	Gravimetry
	Cu			Electrogravimetry
	Pb, Mn, Sn, Ni, As, Cd		Dissolution with Aqua regia/HF	ICP-OES
7	Si	0.28 - 0.42 g	Dissolution with HNO ₃ /decomposition with Na ₂ O ₂	ICP-OES, calibration with pure metals and matrix matching
	Cu, Fe, Al, Cr, P, Sn	0.28 - 0.42 g	Dissolution with HNO ₃	ICP-OES, calibration with pure metals and matrix matching
	Al, Mn, Ni, Cd, Se, Sb, Bi	0.28 - 0.42 g	Dissolution with HNO ₃	ICP-MS, calibration with pure metals and matrix matching
8	Si	1 g	Dissolution with HNO ₃	Gravimetry, dehydration with perchloric acid
	P, Pb, Fe, Sn, Al, Cr, Mn, Ni	0.4 g	Dissolution with HCl/ HNO ₃ /HF	ICP-OES with matrix matched standards (Cu), commercial mono-element solutions (NIST)
	As, Cd, Se, Sb, Bi	0.4 g	Dissolution with HCl/ HNO ₃ /HF	ETAAS with matrix matched standards (Cu), commercial mono-element solutions (NIST)
	Cu	1 g	Dissolution with HNO ₃	Electrogravimetry
9	Cu	1 g	Dissolution with HNO ₃ , addition of NH ₄ NO ₃	Electrogravimetry
	P, Mn,	1 g	Dissolution with HNO ₃	ICP-OES, calibration with pure metals and matrix matching
	Si	0.1 g	Dissolution with HNO ₃	ICP-OES, calibration with pure metals and matrix matching
10	Cu	1 g	Dissolution with HNO ₃ /HF	Electrogravimetry
	Si	1 g	Dissolution with HCl/HNO ₃ fuming with H ₂ SO ₄	Gravimetry
	Si, P, Pb, Fe, Sn, Al, Cr, Mn, Ni, As, Cd	0.025 g	Dissolution with HNO ₃ /HF	ICP-OES, calibration with commercial mono-element solution, matrix matching
11	Cu	1 g	Dissolution with HNO ₃ /HF	Electrogravimetry
	Si	0.2 g	Dissolution with HNO ₃ /HF	Spectrophotometry
	Pb, P, Ni, Fe, Sn, Cr, Mn, Ni	1 g	Dissolution with HCl/ H ₂ O ₂ /HF	ICP-OES, calibration with commercial mono-element solution, matrix matching (Cu)
12	Cu	2 g	Dissolution with HNO ₃ /HF	Electrogravimetry
	P, Pb, Fe, Sn, Al, Cr, Mn, Ni, Cd	2 g	Dissolution with HNO ₃ /HF	ICP-OES, calibration with commercial mono-element solution, matrix matching
	Si	2 g	Dissolution with HNO ₃ /HF	ICP-OES, calibration with commercial mono-element solution
13	Cu	0.5 g	Dissolution with HNO ₃	Electrogravimetry
	Cu, Si	0.2 g	Dissolution with Aqua regia/HF	ICP-OES, calibration with commercial (Si) or self prepared (pure Cu) mono-element solution

For all analytical methods where a calibration was necessary this was performed using liquid standard solutions. All participating laboratories were asked to use only standard solutions prepared from pure metals or stoichiometric compounds or well checked commercial calibration solutions.

5.2 Analytical results and statistical evaluation

The analytical results of the certification inter-laboratory comparison are listed in Tables 3 to 17. These tables show the single results (M_i) of each laboratory, the respective laboratories' mean values (M), absolute and relative intra-laboratory standard deviation (s and s_{rel} , respectively), the standard deviation of laboratory means (s_M), and in addition the square root of mean of variances of data sets under repeatability conditions (\bar{s}_i). n is the number of accepted data sets. The continuous line marks the certified value (mean of the laboratories' means), the broken lines mark the standard deviation, calculated from the laboratories' means.

In the related figures for each laboratory its mean value and single standard deviation is given. Outliers which have been excluded are highlighted.

Lab./Meth.	3/EG	9/EG(R)	11/EG	12/EG	10/EG	8/EG	1/EG	6/EG	4/EG	7/I	13/I	2/EG	13/EG	5/I(R)		
M_i [%]	75.43	75.63	75.69	75.66	75.71	75.73	75.75	75.73	75.77	75.78	75.79	75.81	75.81	75.83		n 14
	75.80	75.59	75.68	75.68	75.73	75.73	75.73	75.83	75.79	75.82	75.85	75.79	75.81	75.88		
	75.49	75.70	75.68	75.65	75.70	75.74	75.74	75.69	75.76	75.85	75.86	75.83	75.82	75.83		
	[76.58]	75.67	75.69	75.69	75.69	75.71	75.71	75.66	75.76	75.70	75.81	75.78	75.83	75.91		
	75.66	75.63	75.67	75.72	75.71	75.70	75.71	75.62	75.70	75.86	75.80	75.88	75.84	75.92		
	75.71	75.65	75.67	75.69	75.73	75.72	75.70	75.86	75.80	75.88	75.79	75.81		75.94		
M [%]	75.62	75.65	75.68	75.68	75.71	75.72	75.72	75.73	75.76	75.82	75.82	75.82	75.82	75.89		75.75
s [%]	0.1542	0.0378	0.0089	0.0248	0.0160	0.0147	0.0197	0.0954	0.0350	0.0663	0.0308	0.0356	0.0130	0.0468	s_M [%]	0.0773
s_{rel}	0.00204	0.00050	0.00012	0.00033	0.00021	0.00019	0.00026	0.00126	0.00046	0.00087	0.00041	0.00047	0.00017	0.00062	\bar{s}_i [%]	0.0573
																0.00102

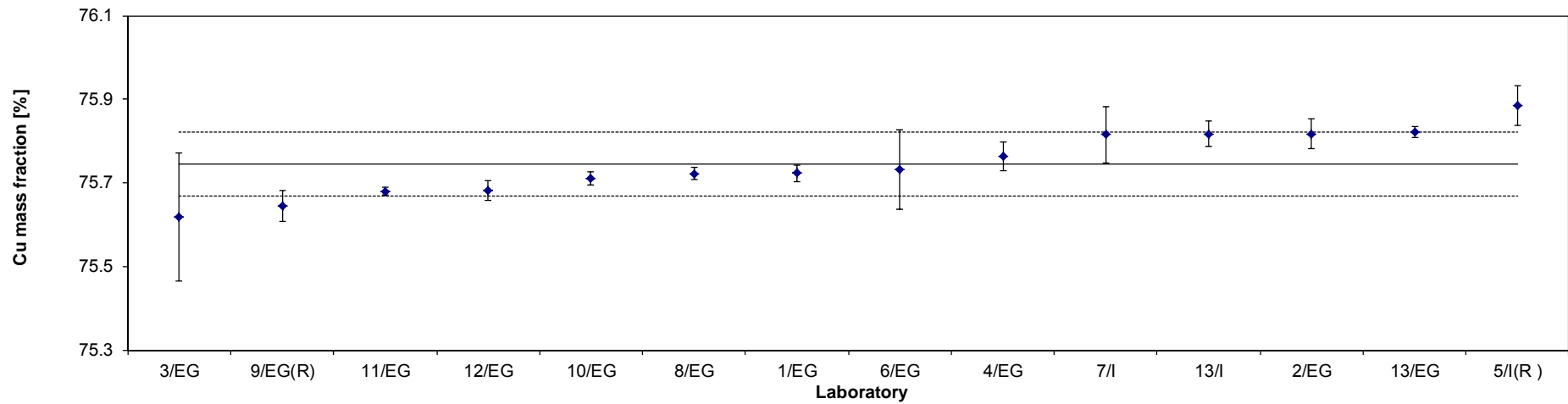


Table 3: Results for Cu

Lab./Meth.	10/G	5/I(R)	7/I	10/I	9/I (R)	13/I	2/G	2/I	6/G	4/G(R)	8/G (R)	11/P	1/I	12/I		
M_i [%]	3.260	3.340	3.290	3.320	3.330	3.290	3.332	3.350	3.388	3.368	3.399	3.419	3.410	3.420		n 14
	3.220	3.300	3.300	3.300	3.331	3.300	3.337	3.380	3.376	3.381	3.405	3.398	3.410	3.420		
	3.290	3.330	3.320	3.300	3.348	3.360	3.333	3.380	3.393	3.379	3.395	3.405	3.440	3.440		
	3.220	3.290	3.320	3.310	3.285	3.340	3.318	3.380	3.367	3.380	3.403	3.393	3.450	3.420		
	3.270	3.240	3.310	3.310	3.386	3.300	3.331	3.370	3.406	3.372	3.394	3.396	3.440	3.450		
	3.220	3.210	3.300	3.330	3.286	3.380	3.337	3.370	3.324	3.417	3.408	3.406	3.410	3.460		
M [%]	3.247	3.285	3.307	3.312	3.328	3.328	3.332	3.372	3.376	3.383	3.401	3.403	3.427	3.435		3.352
s [%]	0.0308	0.0509	0.0121	0.0117	0.0384	0.0371	0.0066	0.0117	0.0287	0.0175	0.0055	0.0094	0.0186	0.0176	s_M [%]	0.056
s_{rel}	0.0095	0.0155	0.0037	0.0035	0.0116	0.0111	0.0020	0.0035	0.0085	0.0052	0.0016	0.0028	0.0054	0.0051	\bar{s}_i [%]	0.018
																0.017

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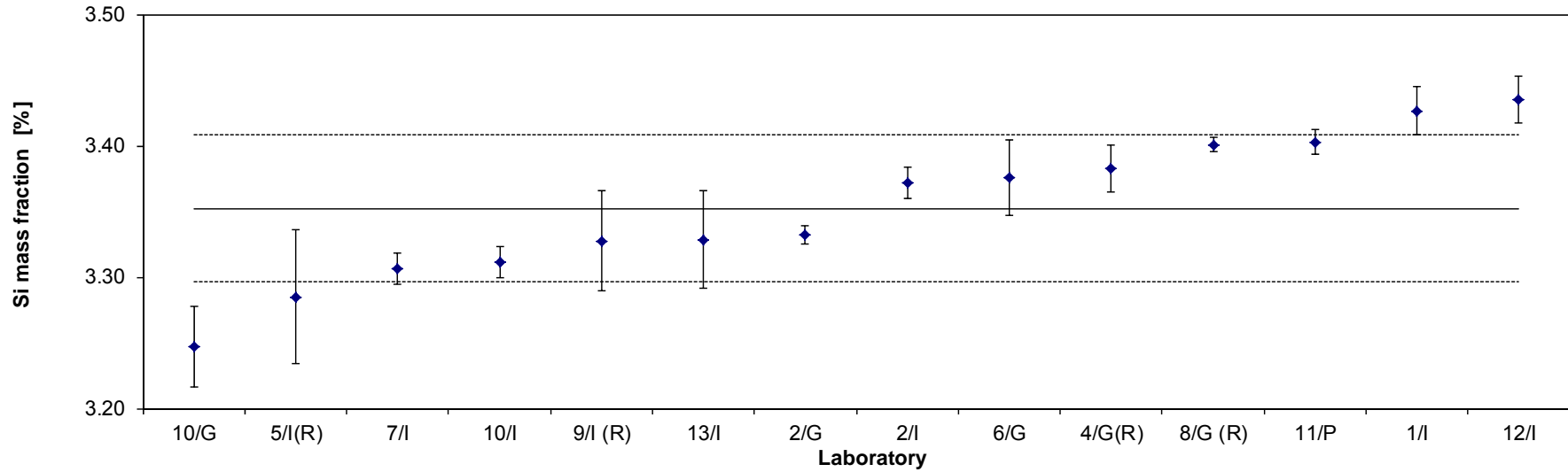


Table 4: Results for Si

Lab./Meth.	12/I	1/I	2/I	4/P	11/I	10/I	3/I	2/P	8/I	9/I		
M_i [%]	0.0445	0.0445	0.0441	0.0452	0.0454	0.0453	0.0448	0.0459	0.0463	0.0463		n 10
	0.0445	0.0445	0.0449	0.0442	0.0455	0.0451	0.0453	0.0471	0.0465	0.0467		
	0.0443	0.0442	0.0445	0.0452	0.0448	0.0454	0.0462	0.0457	0.0465	0.0469		
	0.0443	0.0443	0.0444	0.0450	0.0454	0.0453	0.0457	0.0456	0.0466	0.0482		
	0.0444	0.0444	0.0452	0.0454	0.0452	0.0452	0.0455	0.0461	0.0468	0.0483		
	0.0445	0.0450	0.0445	0.0449	0.0446	0.0449	0.0453	0.0466	0.0472	0.0461		
M [%]	0.0444	0.0445	0.0446	0.0450	0.0451	0.0452	0.0455	0.0462	0.0467	0.0471		0.0454
s [%]	0.00012	0.00028	0.00039	0.00042	0.00037	0.00018	0.00047	0.00058	0.00031	0.00095	s_M [%]	0.00093
s_{rel}	0.00263	0.00626	0.00874	0.00937	0.00819	0.00396	0.01028	0.01247	0.00674	0.02012	\bar{s}_i [%]	0.00041
												0.02037

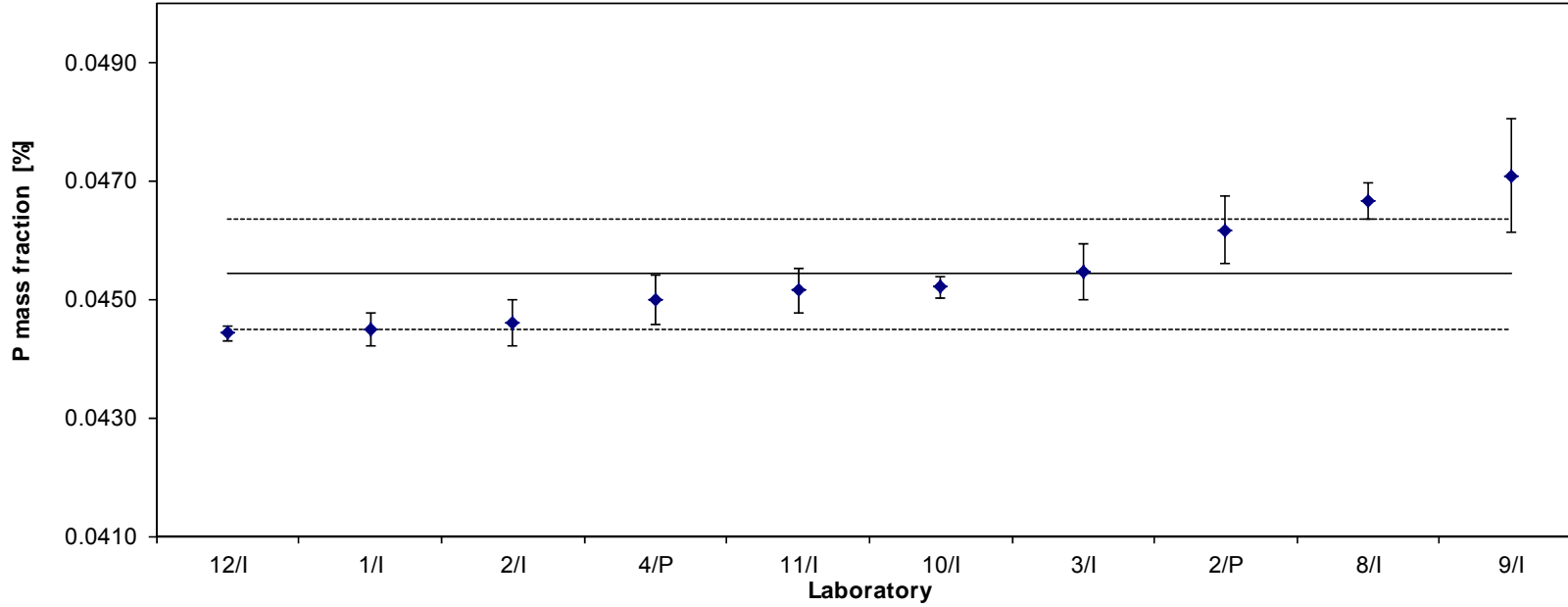


Table 5: Results for P

Lab./Meth.	1/l	8/l	12/l	2/IMS	11/l	4/IMS	2/l	10/l	4/l	5/l	6/l		
M_i [mg/kg]	100.0	101.0	100.1	102.4	103.0	100.7	103.0	103.0	116.0	109.0	112.0		n 11
	100.0	101.0	100.9	102.7	103.7	101.5	103.0	100.0	106.0	110.0	109.0		
	100.0	101.0	103.5	102.1	101.3	104.2	100.0	101.0	105.0	111.0	112.0		
	102.0	101.0	104.0	102.5	101.4	103.5	103.0	106.0	113.0	107.0	104.0		
	101.0	100.0	102.1	101.4	101.2	100.0	104.0	104.0	104.0	107.0	107.0		
	101.0	100.0	100.8	102.4	101.7	103.5	103.0	105.0	101.0	107.0	117.0		
			101.8	100.8									
M [mg/kg]	100.7	100.7	101.9	102.0	102.1	102.2	102.7	103.2	107.5	108.5	110.2		103.78
s [mg/kg]	0.816	0.516	1.588	0.634	1.035	1.729	1.366	2.317	5.753	1.761	4.535	s_M [mg/kg]	3.315
s_{rel}	0.008	0.005	0.016	0.006	0.010	0.017	0.013	0.022	0.054	0.016	0.041	\bar{s}_i [mg/kg]	2.5570
													0.032

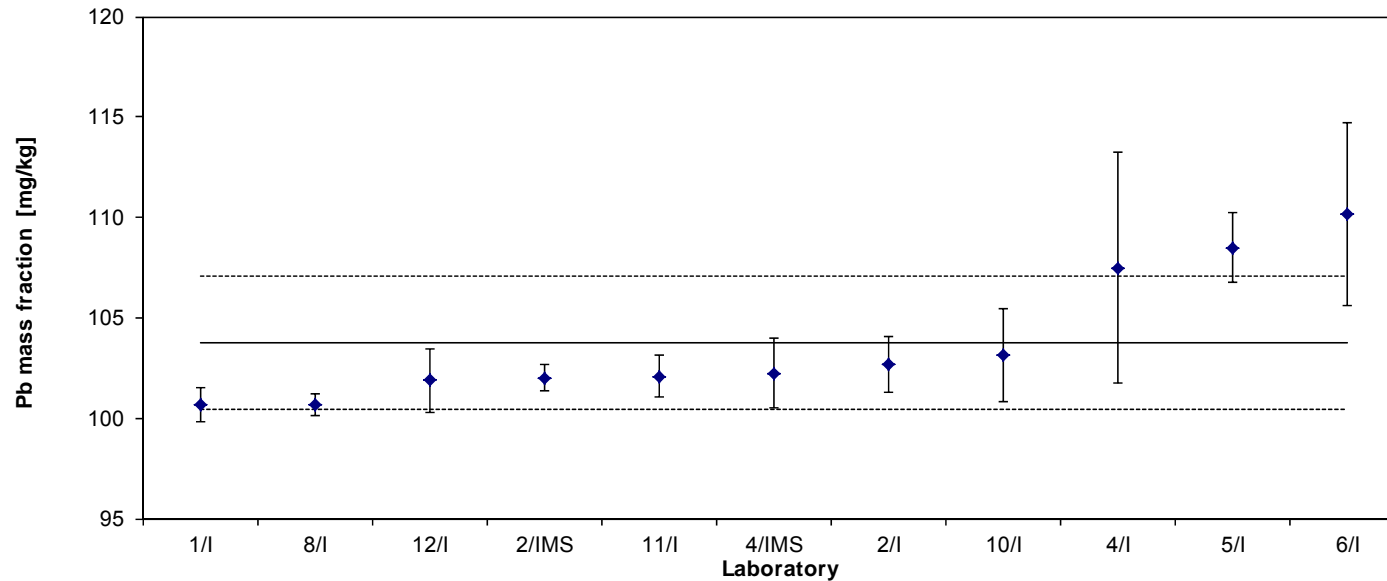


Table 6: Results for Pb

Lab./Meth.	7/l	8/l(R)	3/l	1/l	4/l	10/l(R)	12/l	2/lMS	2/l	11/l(R)	5/l		
M_i [mg/kg]	132.00	141.0	140.40	140.0	149.0	143.40	142.4	140.0	143.0	147.6	156.0		n 11
	132.00	137.0	139.20	138.0	146.0	141.20	143.5	141.8	145.0	149.8	155.0		
	136.00	141.0	138.90	148.0	140.0	140.20	143.6	144.3	143.0	147.5	156.0		
	132.00	132.0	142.20	137.0	137.0	140.20	141.2	145.8	144.0	151.9	154.0		
	131.00	132.0	140.10	138.0	140.0	142.30	141.0	143.1	145.0	152.2	154.0		
	132.00	140.0	140.70	141.0	136.0	141.20	142.1	144.6	145.0	149.3	155.0		
								145.0					
								144.8					
M [mg/kg]	132.50	137.17	140.25	140.33	141.33	141.42	142.30	143.67	144.17	149.72	155.00		142.5320
s [mg/kg]	1.7607	4.2622	1.1811	4.0332	5.1251	1.2465	1.1027	1.9361	0.9832	2.0253	0.8944	s_M [mg/kg]	5.9434
s_{rel}	0.01329	0.03107	0.00842	0.02874	0.03626	0.00881	0.00775	0.01348	0.00682	0.01353	0.00577	\bar{s}_i [mg/kg]	2.6557
													0.042

16

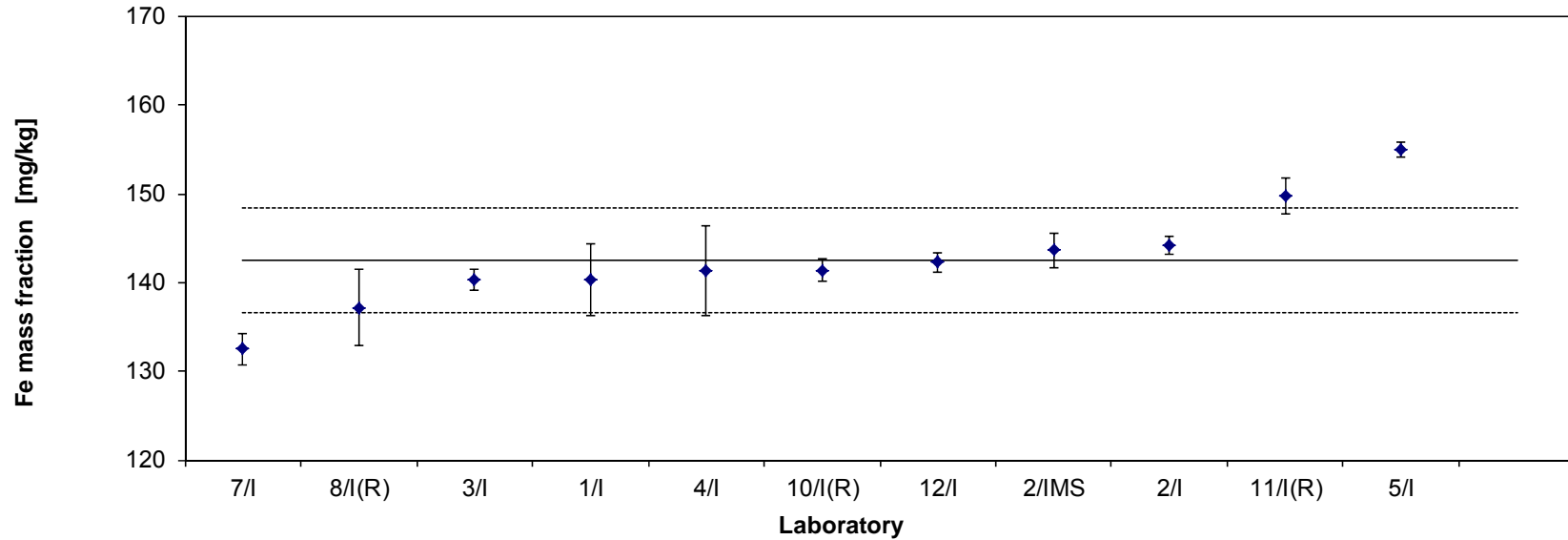


Table 7: Results for Fe

Lab./Meth.	12/I	2/I	1/I	4/IMS	10/I	2/IMS	11/I	6/I	5/I	8/I	4/I(R)		
M_i [mg/kg]	36.4	36.0	38.0	38.1	39.0	39.2	40.0	39.0	39.0	39.0	41.2		n 11
	36.6	38.0	37.0	38.6	40.0	40.1	39.4	40.0	40.0	39.0	40.5		
	36.4	38.0	38.0	38.5	39.0	39.6	39.2	[49]	39.0	40.0	40.5		
	36.4	37.0	40.0	38.2	39.0	39.6	39.2	41.0	40.0	40.0	40.6		
	37.0	38.0	37.0	38.5	40.0	38.8	39.8	40.0	40.0	40.0	40.4		
	36.4	39.0	38.0	39.8	39.0	39.5	39.3	39.3	38.0	40.0	41.0		
						39.3							
						38.7							
M [mg/kg]	36.53	37.67	38.00	38.62	39.33	39.35	39.48	39.60	39.67	39.83	40.50		38.96
s [mg/kg]	0.242	1.033	1.095	0.611	0.516	0.462	0.334	1.140	0.516	0.753	0.447	s_M [mg/kg]	1.149
s_{rel}	0.007	0.027	0.029	0.016	0.013	0.012	0.008	0.029	0.013	0.019	0.011	\bar{s}_i [mg/kg]	0.0184
													0.029

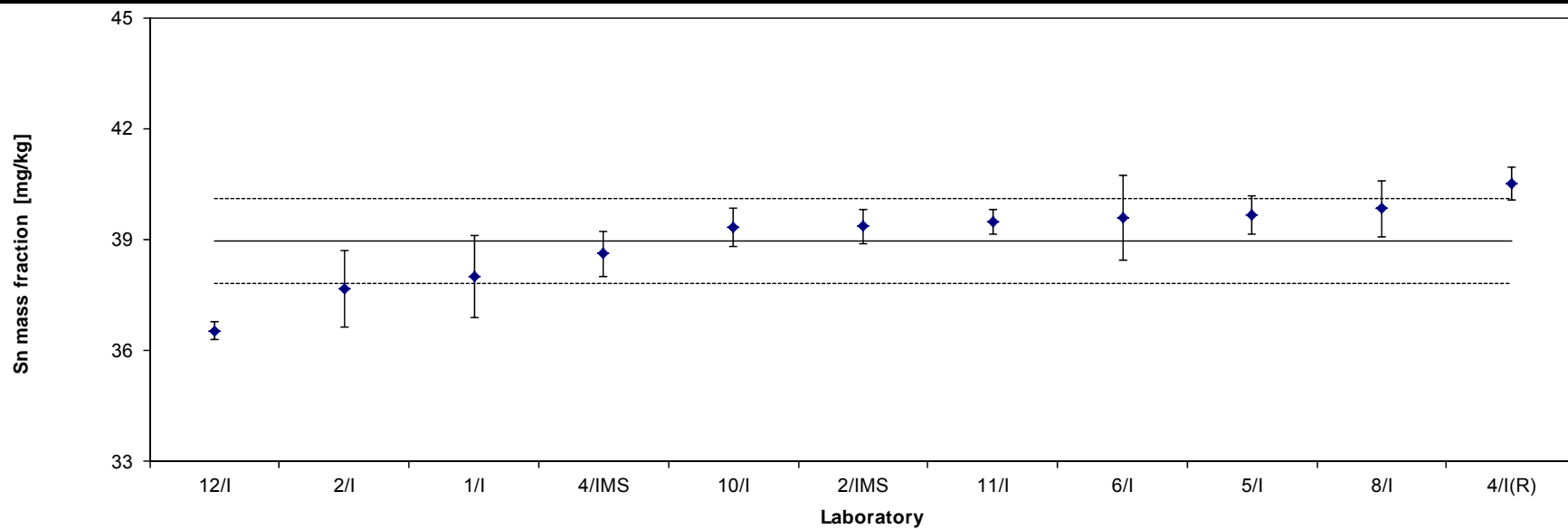


Table 8: Results for Sn

Lab./Meth.	12/I	2/GD	10/I	8/I	2/IMS	5/I	7/IMS(R)		
M_i [mg/kg]	1.59	2.07	2.00	1.90	2.55	2.40	4.00		n
	1.65	1.96	1.00	1.90	2.23	2.40	3.00		7
	1.45	1.74	4.00	2.00	2.38	2.30	2.00		
	1.35	1.64	1.00	2.00	2.22	2.40	2.00		
	1.58	1.74	3.00	2.50	2.59	2.20	3.00		
	1.37	1.66	1.00	1.80	1.98	2.10			
					2.07				
					2.15				
M [mg/kg]	1.50	1.80	2.00	2.02	2.27	2.30	2.80		2.10
s [mg/kg]	0.126	0.174	1.265	0.248	0.219	0.126	0.837	s_M [mg/kg]	0.414
								\bar{s}_i [mg/kg]	0.2760
s_{rel}	0.084	0.097	0.632	0.123	0.096	0.055	0.299		0.197

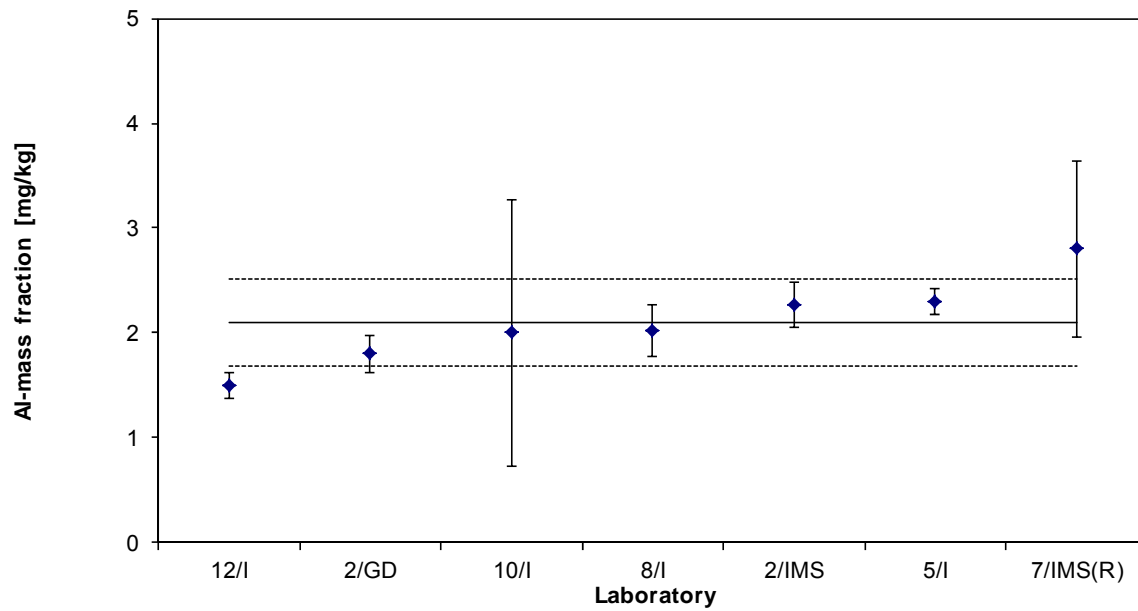


Table 9: Results for Al

Lab./Meth.	5/I	4/IMS	12/I	2/IMS	7/I	8/I	2/GD	11/I	3/I	1/I		
M_i [mg/kg]	1.2	1.2	1.24	1.23	1.4	2	1.64	1.89	1.9	3		n
	1.0	1.2	1.26	1.36	1.2	1	1.60	1.85	1.8	2		10
	1.0	1.2	1.24	1.49	1.7	1	1.53	1.90	1.8	4		
	1.0	1.3	1.22	1.29	1.6	2	1.50	1.81	2.1	2		
	1.0	1.1	1.24	1.45	1.4	1	1.79	1.74	1.9	2		
	1.0	1.2	1.26	1.18	1.5	2	1.73	1.71	1.7	2		
				1.26								
				1.22								
M [mg/kg]	1.03	1.20	1.24	1.31	1.47	1.50	1.63	1.82	1.87	2.50		1.5567
s [mg/kg]	0.0816	0.0632	0.0151	0.1118	0.1751	0.5477	0.1107	0.0784	0.1366	0.8367	s_M [mg/kg]	0.4256
s_{rel}	0.07902	0.05270	0.01211	0.08534	0.11940	0.36515	0.06786	0.04316	0.07319	0.33466	\bar{s}_i [mg/kg]	0.3303
												0.273

19

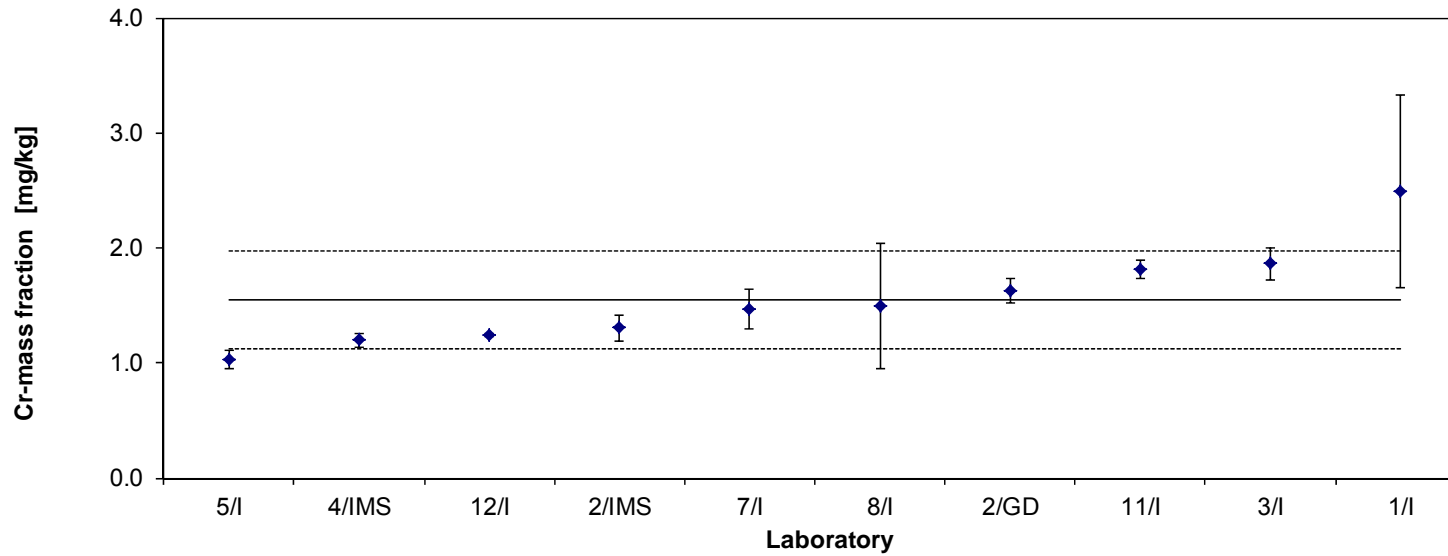


Table 10: Results for Cr

Lab./Meth.	7/IMS(R)	4/I	10/I	12/I	3/(R)	2/I	4/IMS	9/I	11/I	1/I	2/GD	8/(R)	2/IMS	5/I		
M_i [mg/kg]	20.0	18.0	18.0	17.9	17.8	18.0	18.7	18.0	19.4	19.0	21.2	19.0	18.8	20.0		n 14
	17.0	17.5	17.0	17.9	17.8	18.0	17.9	18.0	19.0	19.0	20.4	20.0	18.9	20.0		
	17.0	18.6	18.0	17.9	18.0	18.0	18.6	18.0	18.8	19.0	19.0	19.0	19.2	19.0		
	16.0	17.3	18.0	17.7	18.0	18.0	17.7	19.0	18.6	19.0	18.5	19.0	19.5	19.0		
	18.0	18.0	19.0	17.7	18.0	18.0	18.2	19.0	18.7	19.0	18.3	19.0	19.2	19.0		
			17.1	17.0	17.9	18.3	18.0		18.0	18.7	19.0	17.4	19.0	19.4		
M [mg/kg]	17.60	17.75	17.83	17.86	17.98	18.00	18.22	18.33	18.87	19.00	19.13	19.17	19.22	19.33		18.45
s [mg/kg]	1.5166	0.5541	0.7528	0.0958	0.1835	0.0000	0.4324	0.5164	0.2952	0.0000	1.4137	0.4082	0.2711	0.5164	s_M [mg/kg]	0.6364
s_{rel}	0.08617	0.03122	0.04221	0.00537	0.01020	0.00000	0.02373	0.02817	0.01564	0.00000	0.07389	0.02130	0.01410	0.02671	\bar{s}_i [mg/kg]	0.6688
																0.034

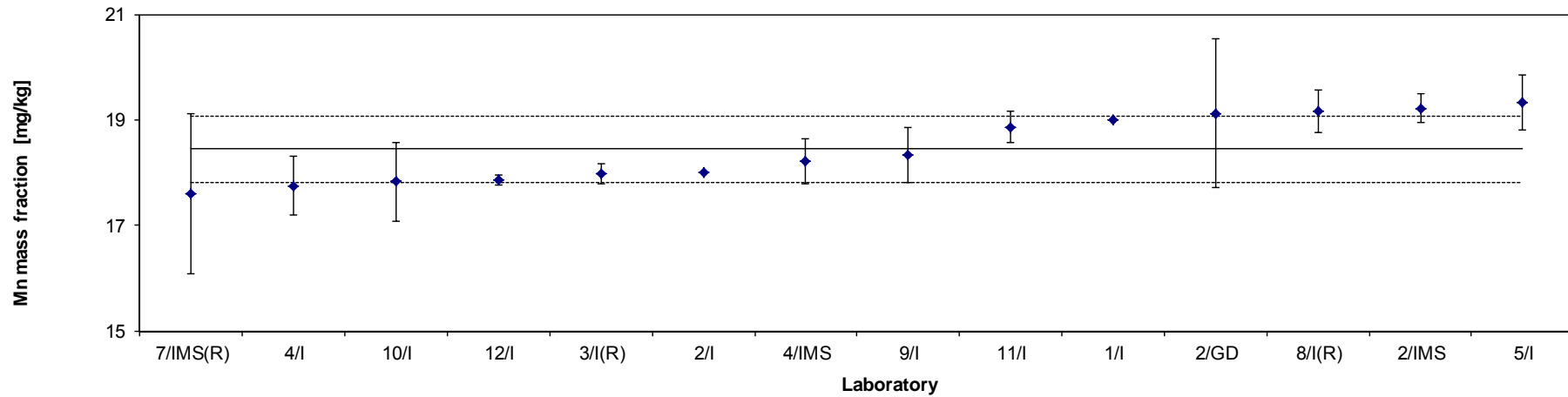


Table 11: Results for Mn

Lab./Meth.	7/IMS(R)	12/I	4/I	3/I	10/I	2/IMS	11/I(R)	8/I(R)	5/I	2/I	1/I	6/GD		
M_i [mg/kg]	30.0	28.2	29.4	29.0	30.0	29.9	29.1	29.0	30.0	30.0	31.0	30.0		n
	26.0	28.4	29.4	28.0	30.0	30.0	29.4	30.0	30.0	30.0	31.0	33.0		12
	27.0	28.1	28.9	30.0	29.0	29.9	29.4	30.0	31.0	30.0	31.0	33.0		
	26.0	28.0	27.7	29.0	29.0	30.0	32.8	29.0	30.0	29.0	31.0	33.0		
	26.0	28.1	28.7	30.0	30.0	28.8	29.8	30.0	30.0	33.0	31.0			
	28.0	28.3	28.9	29.0	29.0	29.9	28.8	32.0	30.0	30.0	31.0			
						29.0								
						29.2								
M [mg/kg]	27.17	28.16	28.83	29.17	29.50	29.57	29.90	30.00	30.17	30.33	31.00	32.25		29.6707
s [mg/kg]	1.6021	0.1556	0.6250	0.7528	0.5477	0.5114	1.4744	1.0954	0.4082	1.3663	0.0000	1.5000	s_M [mg/kg]	1.3075
s_{rel}	0.05897	0.00553	0.02168	0.02581	0.01857	0.01729	0.04932	0.03651	0.01353	0.04504	0.00000	0.04651	\bar{s}_i [mg/kg]	0.9902
														0.044

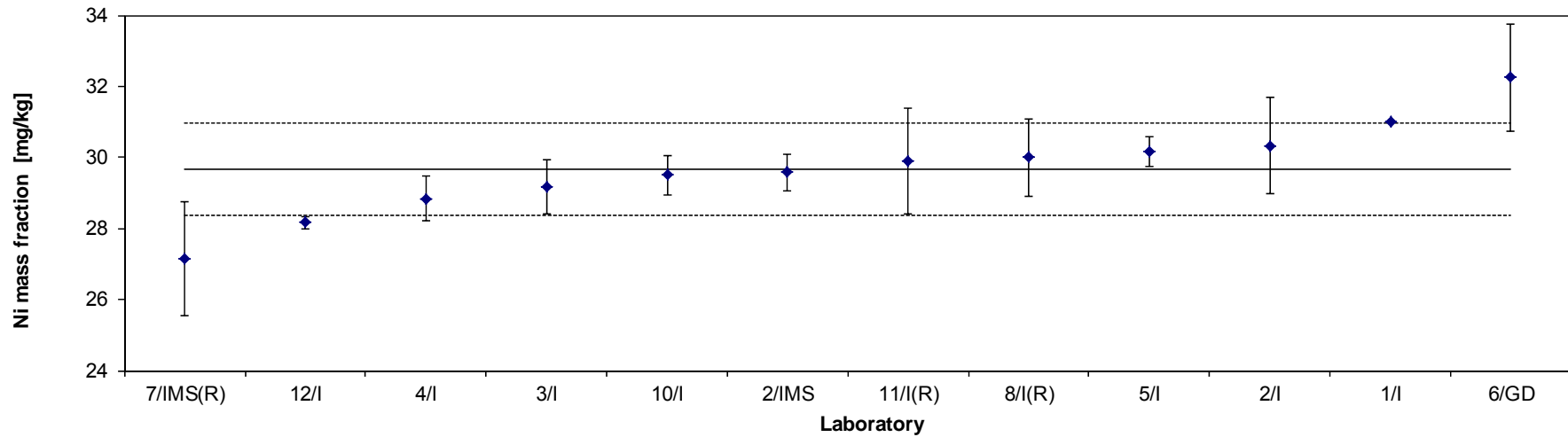


Table 12: Results for Ni

Lab./Meth.	1/EA	2/IMS	8/EA	5/I	2/GD	7/IMS	10/I	6/GD(R)		
M_i [mg/kg]	0.35	1.12	1.2	1.80	1.5	1.4	0.90	1.4		n 7
	0.34	1.10	1.1	1.50	1.4	1.4	1.60	1.4		
	0.28	1.10	1.2	1.30	1.4	1.4	1.30	1.5		
	0.30	1.09	1.3	1.00	1.4	1.4	1.80	1.5		
	0.23	1.07	1.2	1.30	1.3	1.5	1.10	1.7		
	0.37	1.08	1.0	1.20	1.2	1.4	2.20	1.6		
		1.07								
	1.09									
M [mg/kg]	0.31	1.09	1.17	1.35	1.36	1.42	1.48	1.52		1.34
s [mg/kg]	0.052	0.018	0.103	0.274	0.087	0.041	0.479	0.117	s_M [mg/kg]	0.158
s_{rel}	0.167	0.016	0.089	0.203	0.064	0.029	0.323	0.077	\bar{s}_i [mg/kg]	0.2199
										0.118

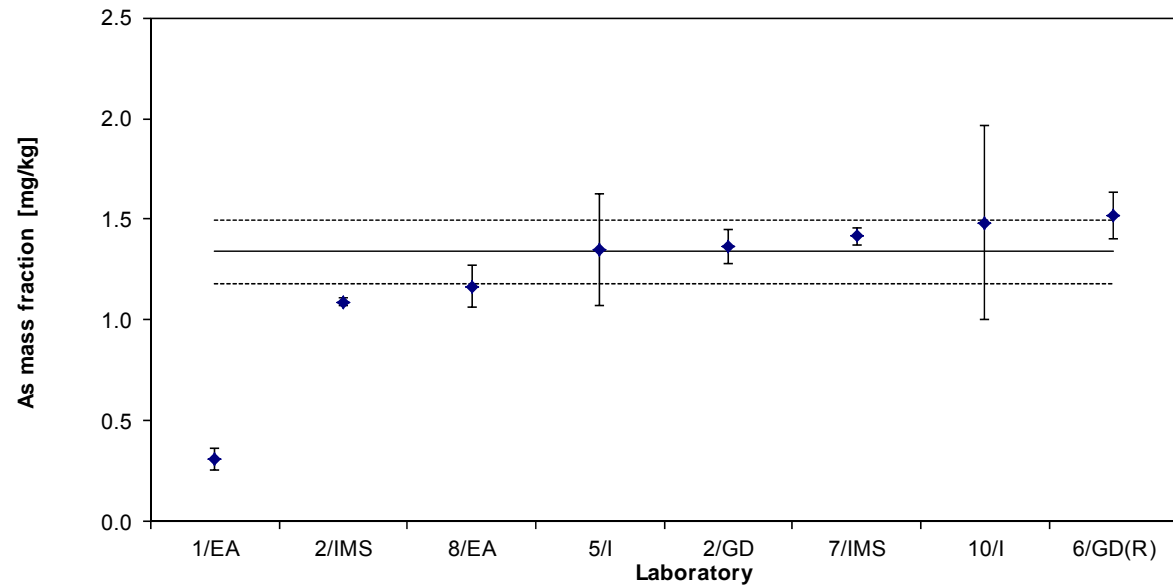


Table 13: Results for As

Lab./Meth.	6/I	12/I	5/I	4/IMS	2/IMS	7/IMS	10/I	1/I	8/EA	2/GD		
M_i [mg/kg]	0.3	0.49	0.5	0.57	0.60	0.6	0.7	0.7	0.7	1.01		n
	0.4	0.44	0.4	0.56	0.59	0.6	0.6	0.7	0.7	0.97		10
	0.4	0.42	0.4	0.58	0.60	0.6	0.7	0.6	0.9	0.93		
	0.4	0.48	0.5	0.58	0.60	0.6	0.5	0.7	0.8	0.87		
	0.3	0.41	0.5	0.60	0.57	0.6	0.7	0.7	0.8	0.92		
	0.3	0.43	0.5	0.65	0.59	0.6	0.6	0.7	0.9	0.93		
					0.61							
					0.58							
M [mg/kg]	0.35	0.45	0.47	0.59	0.59	0.60	0.63	0.68	0.80	0.94		0.61
s [mg/kg]	0.0548	0.0328	0.0516	0.0322	0.0119	0.0000	0.0816	0.0408	0.0894	0.0470	s_M [mg/kg]	0.1717
s_{rel}	0.15649	0.07359	0.11066	0.05466	0.02009	0.00000	0.12892	0.05974	0.11180	0.05011	\bar{s}_i [mg/kg]	0.0514
												0.281

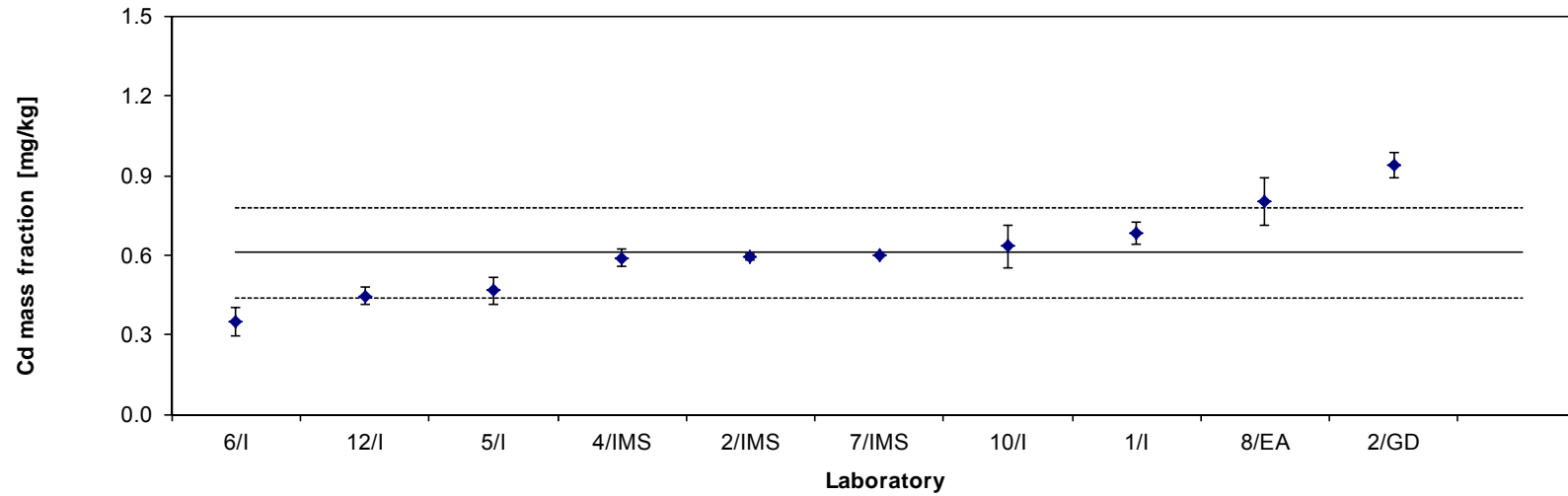


Table 14: Results for Cd

Lab./Meth.	2/IMS	7/IMS	4/IMS	1/EA	2/GD	5/I	8/EA		
M_i [mg/kg]	0.45	0.7	0.89	0.88	1.1	1.6	1.3		n
	0.44	0.7	0.88	1.01	1.0	1.3	1.3		7
	0.44	0.7	0.91	0.93	1.0	1.3	1.4		
	0.45	0.7	0.86	0.85	1.0	1.0	1.4		
	0.43	0.7	0.86	1.12	1.2	0.9	1.1		
	0.42	0.7	0.94	1.06	1.1	1.0	1.2		
	0.44								
	0.41								
M [mg/kg]	0.44	0.70	0.89	0.98	1.07	1.16	1.28		0.93
s [mg/kg]	0.013	0.000	0.031	0.106	0.077	0.256	0.117	s_M [mg/kg]	0.288
s_{rel}	0.030	0.000	0.035	0.109	0.072	0.221	0.091	\bar{s}_i [mg/kg]	0.1180
									0.310

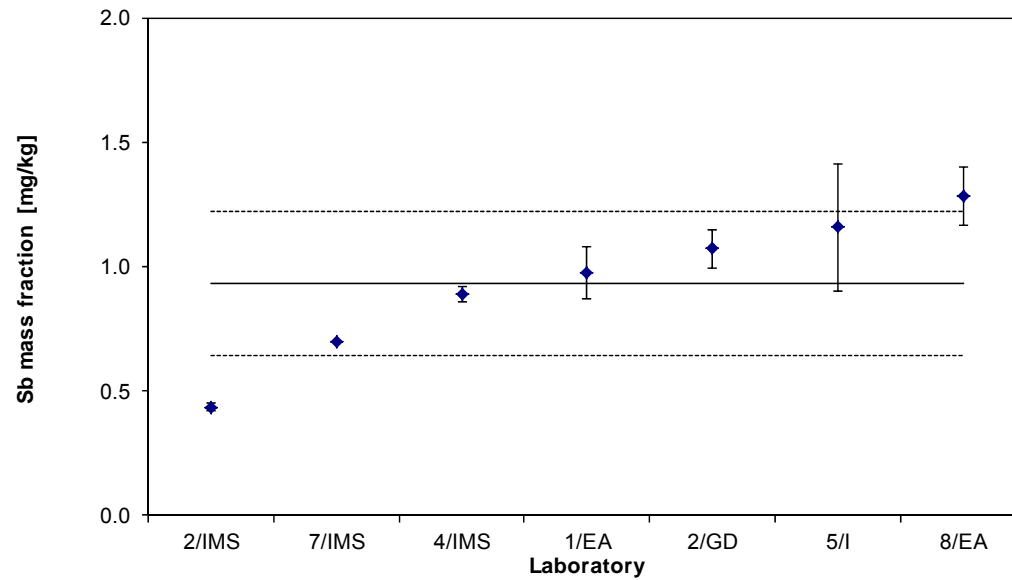


Table 16: Results for Sb

Lab./Meth.	2/IMS	2/GD	7/IMS	8/EA	10/I		
M_i [mg/kg]	0.173	0.20	0.2	0.9	< 1		n
	0.169	0.18	0.2	0.8	< 1		4
	0.169	0.18	0.2	0.8	< 1		
	0.165	0.18	0.2	0.9	< 1		
	0.165	0.23	0.2	0.9	< 1		
	0.165	0.21	0.2	0.8	< 1		
	0.167						
	0.161						
M [mg/kg]	0.17	0.20	0.20	0.85	< 1		0.19
s [mg/kg]	0.003	0.019	0.000	0.055		s_M [mg/kg]	0.018
						\bar{s}_i [mg/kg]	0.0290
s_{rel}	0.020	0.094	0.000	0.064			0.098

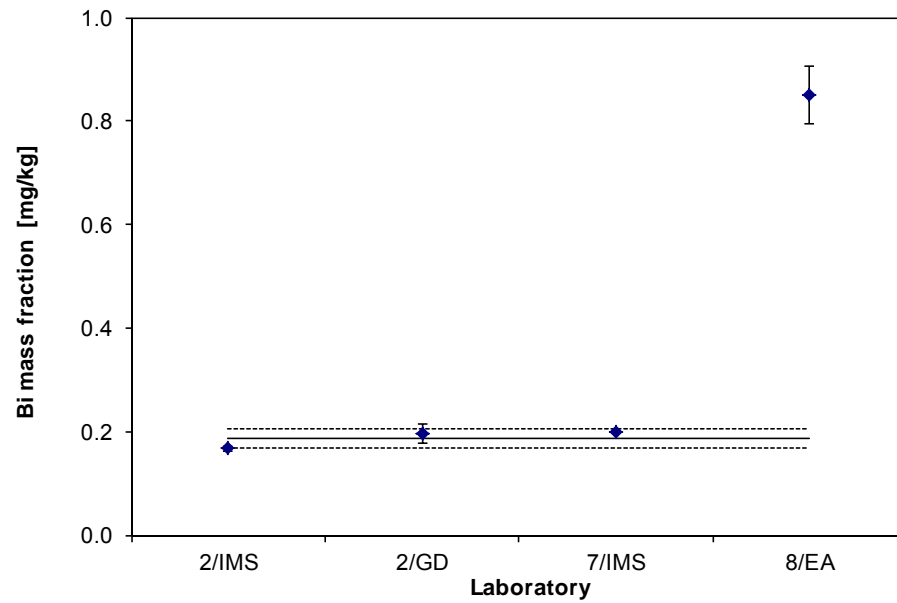


Table 17: Results for Bi

Lab./Meth.	2/IMS	8/EA(R)	7/IMS	2/GD	10/I		
M_i [mg/kg]	0.40	0.5	0.4	0.66	< 2		n
	0.36	0.5	0.5	0.63	< 2		4
	0.41	0.4	0.5	0.59	< 2		
	0.38	0.3	0.5	0.55	< 2		
	0.36	0.5	0.4	0.55	< 2		
	0.40	0.5	0.5	0.51	< 2		
	0.38						
	0.38						
M [mg/kg]	0.38	0.45	0.47	0.58	< 2		0.47
s [mg/kg]	0.019	0.084	0.052	0.056		s_M [mg/kg]	0.082
						\bar{s}_i [mg/kg]	0.0513
s_{rel}	0.050	0.186	0.111	0.096			0.174

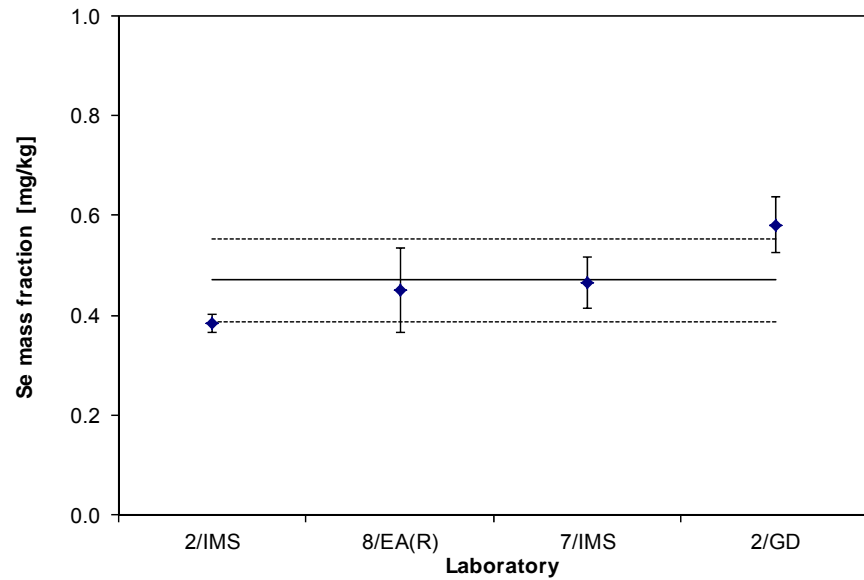


Table 15: Results for Se

The statistical evaluation of the data was performed using the software program SoftCRM 1.2.2. [6]. The following results were obtained:

Tab. 18: Outcome of statistical tests on the results obtained for Cu

Number of data sets	14
Scheffe's test (data compatible?)	yes
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon ($\alpha = 0.05$)	---
Dixon ($\alpha = 0.01$)	---
Nalimov ($\alpha = 0.05$)	---
Nalimov ($\alpha = 0.01$)	---
Grubbs ($\alpha = 0.05$)	---
Grubbs ($\alpha = 0.01$)	---
Grubbs Pair ($\alpha = 0.05$)	---
Grubbs Pair ($\alpha = 0.01$)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.05$)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.01$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.05$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.01$)	Distribution: normal

Tab. 19: Outcome of statistical tests on the results obtained for Si

Number of data sets	14
Scheffe's test (data compatible?)	yes
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon ($\alpha = 0.05$)	---
Dixon ($\alpha = 0.01$)	---
Nalimov ($\alpha = 0.05$)	Laboratory 10/G
Nalimov ($\alpha = 0.01$)	---
Grubbs ($\alpha = 0.05$)	---
Grubbs ($\alpha = 0.01$)	---
Grubbs Pair ($\alpha = 0.05$)	---
Grubbs Pair ($\alpha = 0.01$)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.05$)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.01$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.05$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.01$)	Distribution: normal

The straggler (Lab. 10/G) was not removed.

Tab. 20: Outcome of statistical tests on the results obtained for P

Number of data sets	10
Scheffe's test (data compatible?)	yes
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon ($\alpha = 0.05$)	---
Dixon ($\alpha = 0.01$)	---
Nalimov ($\alpha = 0.05$)	Laboratory 9
Nalimov ($\alpha = 0.01$)	---
Grubbs ($\alpha = 0.05$)	---
Grubbs ($\alpha = 0.01$)	---
Grubbs Pair ($\alpha = 0.05$)	---
Grubbs Pair ($\alpha = 0.01$)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.05$)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.01$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.05$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.01$)	Distribution: normal

The straggler (Lab. 9) was not removed.

Tab. 21: Outcome of statistical tests on the results obtained for Pb

Number of data sets	11
Scheffe's test (data compatible?)	yes
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon ($\alpha = 0.05$)	---
Dixon ($\alpha = 0.01$)	---
Nalimov ($\alpha = 0.05$)	Laboratory 6
Nalimov ($\alpha = 0.01$)	---
Grubbs ($\alpha = 0.05$)	---
Grubbs ($\alpha = 0.01$)	---
Grubbs Pair ($\alpha = 0.05$)	---
Grubbs Pair ($\alpha = 0.01$)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.05$)	Distribution: not normal
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.01$)	Distribution: not normal
Skewness & Kurtosis Test ($\alpha = 0.05$)	Distribution: not normal
Skewness & Kurtosis Test ($\alpha = 0.01$)	Distribution: normal

The straggler (Lab. 6) was not removed.

Tab. 22: Outcome of statistical tests on the results obtained for Fe

Number of data sets	11
Scheffe's test (data compatible?)	yes
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon ($\alpha = 0.05$)	Laboratory 5
Dixon ($\alpha = 0.01$)	---
Nalimov ($\alpha = 0.05$)	Laboratory 5
Nalimov ($\alpha = 0.01$)	---
Grubbs ($\alpha = 0.05$)	---
Grubbs ($\alpha = 0.01$)	---
Grubbs Pair ($\alpha = 0.05$)	---
Grubbs Pair ($\alpha = 0.01$)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.05$)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.01$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.05$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.01$)	Distribution: normal

The straggler (Lab. 5) was not removed.

Tab. 23: Outcome of statistical tests on the results obtained for Sn

Number of data sets	12
Scheffe's test (data compatible?)	yes
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon ($\alpha = 0.05$)	---
Dixon ($\alpha = 0.01$)	---
Nalimov ($\alpha = 0.05$)	Laboratory 12
Nalimov ($\alpha = 0.01$)	---
Grubbs ($\alpha = 0.05$)	---
Grubbs ($\alpha = 0.01$)	---
Grubbs Pair ($\alpha = 0.05$)	---
Grubbs Pair ($\alpha = 0.01$)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.05$)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.01$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.05$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.01$)	Distribution: normal

The straggler (Lab. 12) was not removed.

Tab. 24: Outcome of statistical tests on the results obtained for AI

Number of data sets	7
Scheffe's test (data compatible?)	yes
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon ($\alpha = 0.05$)	---
Dixon ($\alpha = 0.01$)	---
Nalimov ($\alpha = 0.05$)	---
Nalimov ($\alpha = 0.01$)	---
Grubbs ($\alpha = 0.05$)	---
Grubbs ($\alpha = 0.01$)	---
Grubbs Pair ($\alpha = 0.05$)	---
Grubbs Pair ($\alpha = 0.01$)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.05$)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.01$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.05$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.01$)	Distribution: normal

Tab. 25: Outcome of statistical tests on the results obtained for Cr

Number of data sets	10
Scheffe's test (data compatible?)	yes
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon ($\alpha = 0.05$)	---
Dixon ($\alpha = 0.01$)	---
Nalimov ($\alpha = 0.05$)	Laboratory 1
Nalimov ($\alpha = 0.01$)	Laboratory 1
Grubbs ($\alpha = 0.05$)	Laboratory 1
Grubbs ($\alpha = 0.01$)	---
Grubbs Pair ($\alpha = 0.05$)	---
Grubbs Pair ($\alpha = 0.01$)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.05$)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.01$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.05$)	Distribution: not normal
Skewness & Kurtosis Test ($\alpha = 0.01$)	Distribution: normal

The straggler (Lab. 1) was not removed.

Tab. 26: Outcome of statistical tests on the results obtained for Mn

Number of data sets	14
Scheffe's test (data compatible?)	yes
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon ($\alpha = 0.05$)	---
Dixon ($\alpha = 0.01$)	---
Nalimov ($\alpha = 0.05$)	---
Nalimov ($\alpha = 0.01$)	---
Grubbs ($\alpha = 0.05$)	---
Grubbs ($\alpha = 0.01$)	---
Grubbs Pair ($\alpha = 0.05$)	---
Grubbs Pair ($\alpha = 0.01$)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.05$)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.01$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.05$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.01$)	Distribution: normal

Tab. 27: Outcome of statistical tests on the results obtained for Ni

Number of data sets	12
Scheffe's test (data compatible?)	yes
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon ($\alpha = 0.05$)	---
Dixon ($\alpha = 0.01$)	---
Nalimov ($\alpha = 0.05$)	Laboratories 6/GD and 7
Nalimov ($\alpha = 0.01$)	---
Grubbs ($\alpha = 0.05$)	---
Grubbs ($\alpha = 0.01$)	---
Grubbs Pair ($\alpha = 0.05$)	---
Grubbs Pair ($\alpha = 0.01$)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.05$)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.01$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.05$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.01$)	Distribution: normal

The stragglers were not removed.

Tab. 28a: Outcome of statistical tests on the results obtained for As

Number of data sets	8
Scheffe's test (data compatible?)	yes
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon ($\alpha = 0.05$)	Laboratory 1
Dixon ($\alpha = 0.01$)	---
Nalimov ($\alpha = 0.05$)	Laboratory 1
Nalimov ($\alpha = 0.01$)	Laboratory 1
Grubbs ($\alpha = 0.05$)	Laboratory 1
Grubbs ($\alpha = 0.01$)	Laboratory 1
Grubbs Pair ($\alpha = 0.05$)	---
Grubbs Pair ($\alpha = 0.01$)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.05$)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.01$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.05$)	Distribution: not normal
Skewness & Kurtosis Test ($\alpha = 0.01$)	Distribution: not normal

The outlying data set (Lab. 1) was removed.

Tab. 28b: Outcome of statistical tests on the results obtained for As (after removal of outlier)

Number of data sets	7
Scheffe's test (data compatible?)	yes
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon ($\alpha = 0.05$)	---
Dixon ($\alpha = 0.01$)	---
Nalimov ($\alpha = 0.05$)	---
Nalimov ($\alpha = 0.01$)	---
Grubbs ($\alpha = 0.05$)	---
Grubbs ($\alpha = 0.01$)	---
Grubbs Pair ($\alpha = 0.05$)	---
Grubbs Pair ($\alpha = 0.01$)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.05$)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.01$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.05$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.01$)	Distribution: normal

Tab. 29: Outcome of statistical tests on the results obtained for Cd

Number of data sets	10
Scheffe's test (data compatible?)	yes
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon ($\alpha = 0.05$)	---
Dixon ($\alpha = 0.01$)	---
Nalimov ($\alpha = 0.05$)	Laboratory 2/GD
Nalimov ($\alpha = 0.01$)	---
Grubbs ($\alpha = 0.05$)	---
Grubbs ($\alpha = 0.01$)	---
Grubbs Pair ($\alpha = 0.05$)	---
Grubbs Pair ($\alpha = 0.01$)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.05$)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.01$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.05$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.01$)	Distribution: normal

The straggler (Lab. 2/GD) was not removed.

Tab. 30: Outcome of statistical tests on the results obtained for Se

Number of data sets	5
Scheffe's test (data compatible?)	yes
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon ($\alpha = 0.05$)	Laboratory 5
Dixon ($\alpha = 0.01$)	---
Nalimov ($\alpha = 0.05$)	Laboratory 5
Nalimov ($\alpha = 0.01$)	Laboratory 5
Grubbs ($\alpha = 0.05$)	Laboratory 5
Grubbs ($\alpha = 0.01$)	---
Grubbs Pair ($\alpha = 0.05$)	---
Grubbs Pair ($\alpha = 0.01$)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.05$)	Distribution: not normal
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.01$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.05$)	Insufficient data
Skewness & Kurtosis Test ($\alpha = 0.01$)	Insufficient data

The data set (Lab. 5) was not removed.

Tab. 31: Outcome of statistical tests on the results obtained for Sb

Number of data sets	7
Scheffe's test (data compatible?)	yes
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon ($\alpha = 0.05$)	---
Dixon ($\alpha = 0.01$)	---
Nalimov ($\alpha = 0.05$)	---
Nalimov ($\alpha = 0.01$)	---
Grubbs ($\alpha = 0.05$)	---
Grubbs ($\alpha = 0.01$)	---
Grubbs Pair ($\alpha = 0.05$)	---
Grubbs Pair ($\alpha = 0.01$)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.05$)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.01$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.05$)	Distribution: normal
Skewness & Kurtosis Test ($\alpha = 0.01$)	Distribution: normal

Tab. 32: Outcome of statistical tests on the results obtained for Bi

Number of data sets	4
Scheffe's test (data compatible?)	yes
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon ($\alpha = 0.05$)	Laboratory 8
Dixon ($\alpha = 0.01$)	Laboratory 8
Nalimov ($\alpha = 0.05$)	Laboratory 8
Nalimov ($\alpha = 0.01$)	Laboratory 8
Grubbs ($\alpha = 0.05$)	Laboratory 8
Grubbs ($\alpha = 0.01$)	Laboratory 8
Grubbs Pair ($\alpha = 0.05$)	---
Grubbs Pair ($\alpha = 0.01$)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.05$)	Distribution: not normal
Kolmogorov-Smirnov-Lilliefors Test ($\alpha = 0.01$)	Distribution: not normal
Skewness & Kurtosis Test ($\alpha = 0.05$)	Insufficient data
Skewness & Kurtosis Test ($\alpha = 0.01$)	Insufficient data

The outlier (Lab. 8) was removed.

The resp. combined uncertainties were calculated from the spread resulting from the certification inter-laboratory comparison (u_{ilc}) and the uncertainty contributions from possible inhomogeneity of the material using Equation 3.

$$u_{\text{combined}} = \sqrt{u_{ilc}^2 + u_{bb}^2(1) + u_{bb}^2(2)} \quad (3)$$

with

$$u_{ilc} = \sqrt{\frac{s_M^2}{n}} : \text{uncertainty contribution resulting from inter-laboratory comparison}$$

n : number of data sets used for calculating the certified mass fraction of each element

Table 33: Uncertainty calculation

	M	n	uncertainty contribution from				u(comb)	U	u _{bb} (rel)	
			s _M	u _{ilc}	u _{bb} (1)	u _{bb} (2)			Length	Area
			%	%	Length	Area				
%	%	%	%	%	%	%				
Cu	75.750	14	0.0773	0.0207	0.0152	0.1444	0.1466	0.2933	0.0200	0.1906
Si	3.3530	14	0.0560	0.0150	0.0031	0.0216	0.0264	0.0529	0.0923	0.6430
P	0.0454	10	0.0009	0.0003	0.0001	0.0005	0.0006	0.00113	0.2281	1.0530
	mg/kg		mg/kg	mg/kg	mg/kg	mg/kg				
Pb	103.78	11	3.3150	0.9995	0.6739	1.1997	1.7007	3.4015	0.6494	1.1560
Fe	142.53	11	5.9500	1.7940	0.2956	1.4381	2.3182	4.6364	0.2074	1.0090
Sn	38.960	11	1.1490	0.3464	0.0883	0.2582	0.4410	0.8820	0.2267	0.6627
Al	2.1000	7	0.4140	0.1565	0.0024	0.0061	0.1566	0.3915	0.1150	0.2920
Cr	1.5570	10	0.4256	0.1346	0.0228	0.0228	0.1384	0.2768	1.4645	1.4623
Mn	18.450	14	0.6370	0.1702	0.0418	0.1873	0.2565	0.5130	0.2267	1.0150
Ni	29.670	12	1.3080	0.3776	0.0691	0.6201	0.7293	1.4586	0.2330	2.0900
As	1.3400	7	0.1580	0.0597	0.0258	0.0415	0.0772	0.1544	1.9276	3.0980
Cd	0.6100	9	0.1820	0.0607	0.0393	0.0407	0.0830	0.1659	6.4500	6.6700
Se	0.4700	4	0.0820	0.0410	0.0317	0.0230	0.0567	0.1418	6.7500	4.9000
Sb	0.9300	7	0.2880	0.1089	0.0042	0.0352	0.1145	0.2862	0.4500	3.7900
Bi	0.1900	3	0.0180	0.0104	0.0023	0.0122	0.0162	0.0486	1.2320	6.4300

The expanded uncertainties U are calculated by multiplication of $u_{combined}$ with a coverage factor of $k = 2$ (Al, Se, Sb; $k = 2.5$; Bi $k = 3$) using Equation 4.

$$U = k \cdot u_{combined} \quad (4)$$

The calculated mass fractions and their resp. expanded uncertainties are given on Page 3 of this report.

Rounding was done according to DIN 1333.

6. Instructions for users and stability statement

The certified reference material ERM®-EB393a is intended for the calibration and quality control of spark emission and X-ray fluorescence spectrometry used for the analysis of similar materials. It can also be used for wet chemical analysis.

Before analysis the surface of the material should be cleaned by turning or milling. The preparation of the surface has to be done slowly to avoid heating of the disc.

If chips prepared from the compact material are used for wet chemical analysis, a minimum sample intake of 0.1 g should be used.

The material will remain stable provided that it is not subjected to excessive heat (e.g., during preparation of the working surface).

7. References

- [1] ISO Guide 31, Reference materials - Contents of certificates, labels and accompanying documentation, 2015
- [2] ISO Guide 34, General requirements for the competence of reference material producers, 2009
- [3] ISO Guide 35, Reference materials - General and statistical principles for certification. Third edition, 2006
- [4] Guidelines for the development and production of BAM Reference Materials, 2016
- [5] Technical Guidelines for the Production and Acceptance of a European Reference Material (www.erm-crm.org)
- [6] Bonas G, Zervou M, Papaeoannou T, Lees M: Accred Qual Assur (2003) 8:101-107

8. Information on and purchase of the CRM

Certified reference material ERM[®]-EB393a is supplied by

Bundesanstalt für Materialforschung und -prüfung (BAM)

Fachbereich 1.6: Anorganische Referenzmaterialien

Richard-Willstätter-Str. 11, D-12489 Berlin, Germany

Phone: +49 (0)30 - 8104 2061

Fax: +49 (0)30 - 8104 1117

E-Mail: sales.crm@bam.de

Each disc of ERM[®]-EB393a will be distributed together with a detailed certificate containing the certified values and their uncertainties, the mean values and standard deviations of all accepted data sets and information on the analytical methods used and the names of the participating laboratories. Information on certified reference materials can be obtained from BAM, <https://www.bam.de/> www.webshop.bam.de
Tel. +49 30 8104 1111.

Annex 1: Calculation of uncertainty contribution of potential inhomogeneity (length)

Copper:

Sample	mass fraction in %				
	1	2	3	4	5
A1/01	76.707588	76.715172	76.697429	76.446854	76.665041
A1/05	76.594419	76.650941	76.651787	76.450426	76.677331
A1/06	76.704261	76.738726	76.705747	76.493813	76.642051
A1/07	76.817387	76.708387	76.780324	76.420302	76.614414
A1/08	76.695555	76.749593	76.615778	76.592252	76.637363
A1/10	76.64594	76.802505	76.622141	76.531647	76.566032
A1/11	76.743406	76.675598	76.714353	76.643452	76.55521
A1/12	76.729854	76.817183	76.72785	76.445851	76.641771
A1/13	76.759883	76.792325	76.751791	76.508631	76.624732
A1/14	76.741338	76.621553	76.585891	76.645681	76.511565
B1/02	76.78511	76.793396	76.789437	76.59084	76.602294
B1/03	76.733828	76.694075	76.656336	76.576481	76.781182
B1/04	76.790762	76.623726	76.666026	76.629812	76.736993
B1/08	76.734346	76.413483	76.784565	76.431261	76.726304
B1/09	76.751339	76.661954	76.684382	76.394794	76.696869
B1/10	76.706394	76.719641	76.613393	76.716574	76.780581
B1/11	76.744025	76.758821	76.661372	76.624141	76.672265
B1/12	76.738522	76.730405	76.686983	76.505375	76.788201
B1/14	76.785196	76.722941	76.673961	76.519927	76.60583
F1/01	76.741611	76.640999	76.560737	76.280612	76.629088
F1/02	76.787363	76.52615	76.735303	76.616129	76.580881
F1/03	76.736579	76.685625	76.742963	76.486486	76.646909
F1/04	76.672192	76.77078	76.645191	76.667112	76.598046
F1/06	76.683188	76.72275	76.800714	76.607942	76.602437
F1/07	76.733979	76.744137	76.743676	76.568644	76.635506
F1/09	76.685265	76.812425	76.568522	76.651615	76.621079
F1/11	76.723681	76.688892	76.782661	76.663583	76.63539
F1/12	76.694435	76.758913	76.656126	76.587853	76.584805
F1/13	76.759366	76.707276	76.720728	76.588312	76.597594
K1/02	76.668058	76.655508	76.767162	76.546848	76.641046
K1/03	76.738873	76.716284	76.744461	76.560781	76.695219
K1/04	76.789981	76.752831	76.729939	76.612209	76.694207
K1/05	76.721503	76.690371	76.696909	76.487262	76.697218
K1/06	76.770081	76.723105	76.632935	76.691859	76.716256
K1/07	76.807334	76.636307	76.656995	76.478102	76.702579
K1/08	76.622724	76.703658	76.768719	76.604593	76.67759
K1/09	76.805859	76.697829	76.716942	76.593035	76.61454
K1/10	76.709569	76.692826	76.765543	76.686426	76.670257
K1/13	76.699874	76.764646	76.782585	76.421465	76.780905
K1/14	76.728957	76.734606	76.67088	76.643665	76.712003

Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value
Between groups	0.18328861	39	0.00469971	0.47554491	0.99611311	1.47506592
Within groups	1.58124549	160	0.00988278			
Total	1.76453409	199				
(sbb) ²	-0.00103662	#ZAHL!				
ubb	0.01486559					
u_bb(rel.)	0.01938926					

Silicon:

Sample	mass fraction in %				
	1	2	3	4	5
A1/01	3.45687	3.393793	3.42459	3.427538	3.43888
A1/05	3.447791	3.438431	3.441404	3.448565	3.448941
A1/06	3.438574	3.418223	3.416296	3.466611	3.44113
A1/07	3.434242	3.436853	3.421015	3.466428	3.444565
A1/08	3.461606	3.388467	3.419108	3.426585	3.47504
A1/10	3.446842	3.441438	3.416716	3.454038	3.474089
A1/11	3.454222	3.401954	3.441728	3.459265	3.438808
A1/12	3.437442	3.419846	3.411194	3.448923	3.403936
A1/13	3.449951	3.438231	3.449486	3.459445	3.431718
A1/14	3.441855	3.408175	3.407253	3.462143	3.390558
B1/02	3.439076	3.428108	3.397075	3.460336	3.39974
B1/03	3.471298	3.420562	3.417812	3.439591	3.450126
B1/04	3.449131	3.43699	3.372094	3.458234	3.433158
B1/08	3.457764	3.418932	3.392388	3.434789	3.423904
B1/09	3.423885	3.41906	3.435951	3.427567	3.447015
B1/10	3.428516	3.426822	3.449803	3.431136	3.436358
B1/11	3.415946	3.399499	3.415626	3.460089	3.434763
B1/12	3.461361	3.413087	3.419215	3.438981	3.415685
B1/14	3.404175	3.419482	3.472907	3.467495	3.419656
F1/01	3.456404	3.414549	3.457084	3.468142	3.427265
F1/02	3.414425	3.403395	3.397929	3.411509	3.432474
F1/03	3.433174	3.423368	3.417029	3.450504	3.419618
F1/04	3.46256	3.462287	3.456845	3.443817	3.473097
F1/06	3.437447	3.426467	3.414221	3.415623	3.442338
F1/07	3.479811	3.427026	3.425276	3.415671	3.41795
F1/09	3.436043	3.408001	3.422397	3.432741	3.446
F1/11	3.422578	3.392581	3.398004	3.430942	3.443566
F1/12	3.426949	3.489968	3.430172	3.443408	3.460171
F1/13	3.481215	3.438402	3.430218	3.428455	3.430168
K1/02	3.460756	3.420644	3.39331	3.431384	3.440565
K1/03	3.446015	3.45184	3.448628	3.449973	3.443045
K1/04	3.437294	3.440578	3.432833	3.4232	3.456185
K1/05	3.448526	3.437152	3.44062	3.441972	3.445823
K1/06	3.444388	3.403316	3.429768	3.433598	3.455545
K1/07	3.452691	3.421531	3.419801	3.473202	3.449242
K1/08	3.439844	3.47118	3.420933	3.411199	3.410818
K1/09	3.448871	3.386177	3.479311	3.414277	3.453241
K1/10	3.445808	3.442058	3.417895	3.429136	3.45153
K1/13	3.45061	3.437145	3.468838	3.459532	3.412011
K1/14	3.462225	3.440571	3.430596	3.433917	3.43057

Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value
Between groups	0.01785664	39	0.00045786	1.01856903	0.45063879	1.47506592
Within groups	0.07192246	160	0.00044952			
Total	0.0897791	199				
(sbb)*2	1.6694E-06	0.001292057				
ubb	0.00317041					
u_bb (rel.)	0.09229213					

Phosphor:

Sample	mass fraction in %				
	1	2	3	4	5
A1/01	0.046301	0.04564	0.045845	0.044023	0.045302
A1/05	0.047107	0.046725	0.046176	0.045875	0.045428
A1/06	0.045146	0.045219	0.045591	0.045342	0.045394
A1/07	0.046787	0.045735	0.04609	0.046174	0.045504
A1/08	0.045954	0.044571	0.045669	0.045679	0.046793
A1/10	0.047035	0.046531	0.045652	0.045619	0.046342
A1/11	0.046347	0.044886	0.046561	0.045095	0.045649
A1/12	0.04684	0.045314	0.044343	0.045827	0.044755
A1/13	0.046948	0.046319	0.04618	0.045466	0.045788
A1/14	0.046401	0.045129	0.046192	0.045819	0.044953
B1/02	0.046464	0.046367	0.045032	0.045256	0.044455
B1/03	0.04649	0.04622	0.04601	0.045592	0.046285
B1/04	0.046065	0.045585	0.044909	0.045924	0.046294
B1/08	0.046868	0.045879	0.045493	0.044875	0.046173
B1/09	0.046122	0.045562	0.045886	0.045479	0.045344
B1/10	0.046971	0.046207	0.045639	0.045982	0.046117
B1/11	0.046429	0.046023	0.046152	0.045146	0.04537
B1/12	0.047465	0.046111	0.045659	0.044305	0.045525
B1/14	0.045519	0.04584	0.046452	0.045069	0.04611
F1/01	0.046514	0.045956	0.046383	0.045534	0.04522
F1/02	0.046668	0.044868	0.045693	0.044444	0.04539
F1/03	0.047067	0.046378	0.046501	0.045891	0.046105
F1/04	0.045957	0.046999	0.046549	0.046124	0.047602
F1/06	0.045801	0.04629	0.045688	0.044212	0.045765
F1/07	0.046836	0.046089	0.045254	0.045649	0.045499
F1/09	0.046548	0.044631	0.046327	0.045403	0.045537
F1/11	0.046686	0.046343	0.044926	0.045745	0.045671
F1/12	0.046631	0.048158	0.046259	0.044688	0.046289
F1/13	0.047245	0.0459	0.04613	0.045652	0.046319
K1/02	0.046772	0.04604	0.045572	0.044487	0.046142
K1/03	0.046736	0.046425	0.046467	0.045506	0.046005
K1/04	0.046336	0.045563	0.046423	0.044577	0.045908
K1/05	0.046979	0.046315	0.046332	0.046026	0.045499
K1/06	0.047182	0.045958	0.046178	0.045214	0.045233
K1/07	0.047069	0.046634	0.045893	0.045805	0.045899
K1/08	0.047702	0.04616	0.045951	0.0449	0.045463
K1/09	0.045524	0.043948	0.045755	0.045754	0.04596
K1/10	0.046641	0.046336	0.046076	0.045923	0.045957
K1/13	0.046896	0.045973	0.046152	0.045895	0.045166
K1/14	0.046596	0.046601	0.046235	0.04526	0.045686

Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value
Between groups	1.9694E-05	39	5.0497E-07	1.0296368	0.43372013	1.47506592
Within groups	7.8469E-05	160	4.9043E-07			
Total	9.8163E-05	199				
(sbb) ²	2.907E-09	5.39163E-05				
ubb	0.00010472					
u_bb(rel.)	0.22808754					

Lead:

Sample	mass fraction in %				
	1	2	3	4	5
A1/01	0.012521	0.0124024	0.0126396	0.0118164	0.012463
A1/05	0.012799	0.0124714	0.0130418	0.0128028	0.012864
A1/06	0.012012	0.0120336	0.012413	0.0127534	0.012427
A1/07	0.012605	0.0124256	0.0126756	0.0129398	0.012823
A1/08	0.012179	0.0122988	0.0124054	0.0125964	0.012899
A1/10	0.01289	0.0124828	0.0124888	0.0125794	0.012704
A1/11	0.012358	0.012218	0.012706	0.0125782	0.012375
A1/12	0.012451	0.0123596	0.0124636	0.0125454	0.012021
A1/13	0.012523	0.012455	0.0127026	0.0128772	0.01261
A1/14	0.012467	0.0122912	0.0126612	0.012721	0.012501
B1/02	0.012671	0.0124654	0.012505	0.0128752	0.012054
B1/03	0.012447	0.0124118	0.0124612	0.0126348	0.012999
B1/04	0.012409	0.0123348	0.0124864	0.0127546	0.01261
B1/08	0.012604	0.0125412	0.0123722	0.0123486	0.01257
B1/09	0.012486	0.012272	0.0128128	0.0126288	0.012701
B1/10	0.012613	0.0125714	0.012596	0.012555	0.0126108
B1/11	0.012326	0.0124498	0.01253	0.0126176	0.012545
B1/12	0.012853	0.01229	0.0125614	0.0121602	0.012452
B1/14	0.012334	0.0126428	0.0125834	0.0124452	0.012499
F1/01	0.012552	0.012322	0.012557	0.0128526	0.012507
F1/02	0.012434	0.0122252	0.0127058	0.0124108	0.012798
F1/03	0.012565	0.0126272	0.0125434	0.0124444	0.012783
F1/04	0.012738	0.0128342	0.0129648	0.0132646	0.013533
F1/06	0.012465	0.0124344	0.01263	0.0122052	0.012489
F1/07	0.012537	0.012549	0.012487	0.0125914	0.012486
F1/09	0.012568	0.0118652	0.0124878	0.0125332	0.012579
F1/11	0.012608	0.01219	0.0123326	0.0128	0.012511
F1/12	0.012439	0.0131382	0.0126472	0.01263	0.01257
F1/13	0.012577	0.0125066	0.0127446	0.012725	0.01263
K1/02	0.012533	0.0126404	0.012709	0.0125186	0.012798
K1/03	0.012526	0.0127106	0.0124892	0.0127918	0.012693
K1/04	0.012223	0.0124434	0.0126372	0.012477	0.012993
K1/05	0.012481	0.0124612	0.0127334	0.0125348	0.012664
K1/06	0.012821	0.0122954	0.0132302	0.0121466	0.012379
K1/07	0.012759	0.0123706	0.0125256	0.012479	0.01278
K1/08	0.012396	0.0124958	0.0123754	0.012558	0.012502
K1/09	0.012299	0.0119586	0.0124096	0.0127466	0.013001
K1/10	0.012345	0.0124536	0.0126784	0.0128024	0.012615
K1/13	0.01285	0.0124658	0.0128598	0.0128352	0.012536
K1/14	0.012626	0.01265	0.0125082	0.0125558	0.012436

Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value
Between groups	3.1812E-06	39	8.1569E-08	1.68808916	0.01305441	1.47506592
Within groups	7.7313E-06	160	4.8321E-08			
Total	1.0913E-05	199				
(sbb)^2	6.6498E-09	8.15461E-05				
ubb	3.2871E-05					
u_bb(rel.)		0.649394655				

Iron

Sample	mass fraction in %					
	1	2	3	4	5	
A1/01	0.013236	0.012902	0.012996	0.012506	0.01279	
A1/05	0.012985	0.012753	0.013018	0.012748	0.012867	
A1/06	0.012985	0.012737	0.012823	0.01288	0.01276	
A1/07	0.012923	0.012787	0.012878	0.012772	0.01326	
A1/08	0.013069	0.012741	0.012825	0.012747	0.012876	
A1/10	0.012997	0.012779	0.01291	0.012727	0.013008	
A1/11	0.013072	0.012748	0.013057	0.012871	0.012981	
A1/12	0.013186	0.012859	0.012804	0.012786	0.012659	
A1/13	0.013	0.012801	0.012867	0.01275	0.012656	
A1/14	0.013058	0.012797	0.012997	0.012794	0.012505	
B1/02	0.013088	0.012841	0.012781	0.012715	0.012702	
B1/03	0.013158	0.01284	0.012728	0.012672	0.012912	
B1/04	0.012809	0.012832	0.012811	0.012698	0.012766	
B1/08	0.013315	0.012993	0.012776	0.012698	0.012837	
B1/09	0.012971	0.012753	0.012802	0.012705	0.012933	
B1/10	0.013177	0.012865	0.012892	0.012858	0.01302	
B1/11	0.012935	0.012834	0.012732	0.012792	0.012777	
B1/12	0.013236	0.012891	0.012878	0.012826	0.012774	
B1/14	0.013075	0.012833	0.013065	0.012883	0.012753	
F1/01	0.013205	0.0128	0.013253	0.012908	0.012738	
F1/02	0.012895	0.012808	0.012996	0.012528	0.01274	
F1/03	0.012949	0.012888	0.012873	0.01263	0.012832	
F1/04	0.013234	0.012926	0.013027	0.012888	0.013064	
F1/06	0.012909	0.012913	0.012957	0.012551	0.012845	
F1/07	0.0131	0.012813	0.012823	0.012783	0.012656	
F1/09	0.013103	0.012617	0.012985	0.012773	0.012808	
F1/11	0.013069	0.012781	0.012712	0.012786	0.012866	
F1/12	0.013181	0.013159	0.012927	0.012862	0.012898	
F1/13	0.013345	0.012797	0.012951	0.012738	0.012844	
K1/02	0.013219	0.01302	0.012851	0.012825	0.012965	
K1/03	0.012903	0.012994	0.013018	0.012718	0.012684	
K1/04	0.013077	0.012705	0.012881	0.012656	0.012912	
K1/05	0.013028	0.012997	0.012854	0.012846	0.012681	
K1/06	0.013213	0.012734	0.012857	0.012546	0.012856	
K1/07	0.013506	0.012799	0.012879	0.012747	0.012767	
K1/08	0.013413	0.012973	0.012745	0.0126	0.012733	
K1/09	0.013005	0.012678	0.013156	0.012814	0.012855	
K1/10	0.013021	0.012864	0.013125	0.012851	0.012845	
K1/13	0.012997	0.012799	0.012965	0.012908	0.012743	
K1/14	0.013129	0.013062	0.012876	0.012701	0.012717	
Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value
Between groups	6.6789E-07	39	1.7125E-08	0.53615836	0.98788225	1.47506592
Within groups	5.1105E-06	160	3.1941E-08			
Total	5.7784E-06	199				
(sbb) ²	-2.9631E-09					
ubb	2.6725E-05					
u_bb(rel.)	0.20742548					

Tin:

Sample	mass fraction in %				
	1	2	3	4	5
A1/01	0.008123	0.008022	0.008131	0.008021	0.008069
A1/05	0.007986	0.008007	0.008092	0.007935	0.008169
A1/06	0.008007	0.00798	0.008089	0.007953	0.008299
A1/07	0.008101	0.008029	0.008237	0.007919	0.008267
A1/08	0.008043	0.008005	0.008121	0.008005	0.008284
A1/10	0.008053	0.008071	0.008041	0.008034	0.008259
A1/11	0.008078	0.007982	0.008334	0.008077	0.008281
A1/12	0.008034	0.00788	0.008067	0.007951	0.008281
A1/13	0.008088	0.008177	0.008188	0.00807	0.00826
A1/14	0.008092	0.008088	0.008022	0.008096	0.008072
B1/02	0.008035	0.008047	0.008093	0.008022	0.008032
B1/03	0.00808	0.008073	0.008105	0.007874	0.008237
B1/04	0.008103	0.008	0.008134	0.00805	0.008301
B1/08	0.007961	0.008019	0.008046	0.007885	0.008266
B1/09	0.00814	0.007959	0.008086	0.008044	0.008281
B1/10	0.008045	0.008155	0.008101	0.00838	0.00821
B1/11	0.008139	0.008019	0.008151	0.008078	0.008189
B1/12	0.008106	0.008057	0.007978	0.007923	0.008222
B1/14	0.007915	0.00791	0.00809	0.007936	0.008248
F1/01	0.008097	0.008092	0.008162	0.008205	0.008244
F1/02	0.008036	0.00796	0.008148	0.007757	0.008229
F1/03	0.008159	0.008112	0.008221	0.007946	0.008196
F1/04	0.007974	0.008216	0.00836	0.008154	0.008366
F1/06	0.008087	0.007953	0.008059	0.00801	0.008195
F1/07	0.008093	0.008122	0.008032	0.008098	0.008252
F1/09	0.00813	0.007994	0.008203	0.007998	0.008251
F1/11	0.008081	0.008142	0.008058	0.007887	0.008201
F1/12	0.008074	0.008165	0.008196	0.008088	0.008358
F1/13	0.008036	0.008102	0.008163	0.007911	0.008401
K1/02	0.008099	0.007953	0.008103	0.007857	0.008436
K1/03	0.008234	0.008128	0.008165	0.008058	0.008324
K1/04	0.008101	0.007933	0.008138	0.007958	0.008199
K1/05	0.008032	0.008084	0.008134	0.008026	0.008155
K1/06	0.00799	0.008126	0.008216	0.007811	0.008335
K1/07	0.008172	0.008167	0.008229	0.007964	0.008208
K1/08	0.00822	0.008062	0.008083	0.0079	0.008229
K1/09	0.007995	0.007952	0.008267	0.008032	0.008249
K1/10	0.008146	0.008031	0.008117	0.008018	0.008242
K1/13	0.008063	0.008095	0.0082	0.007985	0.008231
K1/14	0.008203	0.008147	0.008288	0.008143	0.008194

Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value
Between groups	4.4944E-07	39	1.1524E-08	0.76398349	0.83700275	1.47506592
Within groups	2.4135E-06	160	1.5084E-08			
Total	2.8629E-06	199				
(sbb) ²	-7.1203E-10					
ubb	1.8366E-05					
u_bb(rel.)	0.22665215					

Aluminium:

Sample	mass fraction in %					
	1	2	3	4	5	
A1/01	0.007903	0.007978	0.007995	0.00796	0.008122	
A1/05	0.00791	0.008048	0.008069	0.008073	0.008072	
A1/06	0.007938	0.008012	0.008011	0.008085	0.008082	
A1/07	0.007959	0.007975	0.008034	0.008078	0.008075	
A1/08	0.0079	0.00794	0.008006	0.008008	0.008131	
A1/10	0.007964	0.008078	0.008061	0.008063	0.00806	
A1/11	0.007871	0.00796	0.007978	0.008077	0.00806	
A1/12	0.00797	0.008046	0.008056	0.008025	0.00802425	
A1/13	0.007946	0.008029	0.008075	0.008053	0.008069	
A1/14	0.007922	0.007947	0.008044	0.008069	0.008037	
B1/02	0.007981	0.008028	0.008043	0.008102	0.008027	
B1/03	0.007919	0.008003	0.008033	0.008088	0.00801075	
B1/04	0.007992	0.007986	0.007999	0.008103	0.008118	
B1/08	0.007902	0.00797	0.008023	0.00803	0.008054	
B1/09	0.007934	0.008002	0.008094	0.008011	0.008004	
B1/10	0.007922	0.007968	0.00807	0.008081	0.008048	
B1/11	0.00793	0.007977	0.008006	0.008082	0.008007	
B1/12	0.007858	0.007968	0.008071	0.008052	0.008071	
B1/14	0.007889	0.008007	0.008044	0.00812	0.008118	
F1/01	0.007978	0.007962	0.008026	0.008057	0.008115	
F1/02	0.007947	0.007945	0.008019	0.008034	0.008057	
F1/03	0.007964	0.008001	0.008025	0.008048	0.008039	
F1/04	0.007917	0.008	0.008021	0.008047	0.008057	
F1/06	0.007937	0.007979	0.008046	0.008005	0.008075	
F1/07	0.007952	0.008002	0.008141	0.008034	0.008096	
F1/09	0.007926	0.007933	0.008034	0.008042	0.00807	
F1/11	0.007917	0.008015	0.008051	0.008076	0.008056	
F1/12	0.007954	0.008069	0.008029	0.008064	0.00811	
F1/13	0.007931	0.008036	0.007997	0.008145	0.008027	
K1/02	0.007939	0.008004	0.008024	0.008064	0.008064	
K1/03	0.007977	0.008001	0.008012	0.008054	0.008099	
K1/04	0.007923	0.008038	0.00805	0.008041	0.008064	
K1/05	0.007969	0.00799	0.008028	0.008083	0.008074	
K1/06	0.00795	0.007989	0.008044	0.008073	0.008068	
K1/07	0.007973	0.007981	0.008044	0.008075	0.00809	
K1/08	0.007957	0.008047	0.008056	0.008028	0.008023	
K1/09	0.007994	0.007988	0.008044	0.008092	0.008052	
K1/10	0.007957	0.008021	0.008067	0.008096	0.008071	
K1/13	0.007952	0.007977	0.008066	0.008071	0.00809	
K1/14	0.008004	0.007991	0.008062	0.008032	0.008111	
Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value
Between groups	4.9607E-08	39	1.272E-09	0.33587291	0.999923	1.47506592
Within groups	6.0594E-07	160	3.7871E-09			
Total	6.5554E-07	199				
(sbb) ²	-5.0302E-10	#ZAHL!				
ubb	9.2023E-06					
u_bb(rel.)	0.11472495					

Chromium:

Sample	mass fraction in %					
	1	2	3	4	5	
A1/01	0.0012	0.001504	0.001453	0.001523	0.001703	
A1/05	0.001263	0.001356	0.001493	0.001497	0.001479	
A1/06	0.001641	0.001384	0.001682	0.001251	0.001752	
A1/07	0.001691	0.001321	0.001529	0.001402	0.001438	
A1/08	0.001379	0.001423	0.00157	0.001376	0.001585	
A1/10	0.001647	0.001417	0.001434	0.001412	0.001624	
A1/11	0.001386	0.001377	0.001111	0.001517	0.001477	
A1/12	0.001392	0.001354	0.001296	0.001546	0.001542	
A1/13	0.001496	0.001377	0.001318	0.001432	0.001688	
A1/14	0.001354	0.001335	0.00151	0.001595	0.001604	
B1/02	0.001714	0.001475	0.001417	0.001352	0.001581	
B1/03	0.001269	0.001357	0.001619	0.001512	0.001631	
B1/04	0.001704	0.001385	0.001559	0.001376	0.001544	
B1/08	0.001311	0.001574	0.001509	0.001352	0.00157	
B1/09	0.001627	0.001365	0.001776	0.001511	0.001421	
B1/10	0.001537	0.001286	0.001327	0.001543	0.001401	
B1/11	0.001525	0.001458	0.001322	0.001476	0.001617	
B1/12	0.001426	0.00143	0.001818	0.001303	0.001595	
B1/14	0.001481	0.001435	0.001397	0.001511	0.001578	
F1/01	0.001726	0.001334	0.001613	0.001429	0.001503	
F1/02	0.001714	0.001373	0.00141	0.001419	0.001532	
F1/03	0.00174	0.001454	0.001243	0.001447	0.001474	
F1/04	0.001286	0.001508	0.001371	0.00155	0.001456	
F1/06	0.001698	0.001493	0.001345	0.00142	0.001412	
F1/07	0.001229	0.00141	0.001866	0.00149	0.001648	
F1/09	0.001592	0.001401	0.001564	0.001402	0.001532	
F1/11	0.001528	0.001531	0.001818	0.001459	0.001522	
F1/12	0.001511	0.001397	0.001519	0.001517	0.001756	
F1/13	0.001437	0.001494	0.00142	0.001649	0.001493	
K1/02	0.0012	0.001319	0.001514	0.001259	0.001535	
K1/03	0.001718	0.001534	0.001358	0.00145	0.001627	
K1/04	0.001195	0.001347	0.001375	0.001417	0.001557	
K1/05	0.001772	0.001306	0.001549	0.001248	0.00157	
K1/06	0.001643	0.001422	0.001548	0.001399	0.001603	
K1/07	0.001231	0.001351	0.001499	0.001278	0.001532	
K1/08	0.001385	0.001434	0.001313	0.001485	0.0016	
K1/09	0.001602	0.001494	0.00131	0.001483	0.001615	
K1/10	0.001561	0.001321	0.001583	0.001502	0.001541	
K1/13	0.001382	0.001296	0.001586	0.001253	0.001615	
K1/14	0.001658	0.001304	0.001227	0.001425	0.001592	
Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value
Between groups	4.898E-07	39	1.2559E-08	0.60114704	0.96809695	1.47506592
Within groups	3.3427E-06	160	2.0892E-08			
Total	3.8325E-06	199				
(sbb) ²	-1.6666E-09	#ZAHL!				
ubb	2.1614E-05					
u_bb(rel.)	1.46449304					

Manganese

Sample	mass fraction in %					
	1	2	3	4	5	
A1/01	0.008123	0.008022	0.008131	0.008021	0.008069	
A1/05	0.007986	0.008007	0.008092	0.007935	0.008169	
A1/06	0.008007	0.00798	0.008089	0.007953	0.008299	
A1/07	0.008101	0.008029	0.008237	0.007919	0.008267	
A1/08	0.008043	0.008005	0.008121	0.008005	0.008284	
A1/10	0.008053	0.008071	0.008041	0.008034	0.008259	
A1/11	0.008078	0.007982	0.008334	0.008077	0.008281	
A1/12	0.008034	0.00788	0.008067	0.007951	0.008281	
A1/13	0.008088	0.008177	0.008188	0.00807	0.00826	
A1/14	0.008092	0.008088	0.008022	0.008096	0.008072	
B1/02	0.008035	0.008047	0.008093	0.008022	0.008032	
B1/03	0.00808	0.008073	0.008105	0.007874	0.008237	
B1/04	0.008103	0.008	0.008134	0.00805	0.008301	
B1/08	0.007961	0.008019	0.008046	0.007885	0.008266	
B1/09	0.00814	0.007959	0.008086	0.008044	0.008281	
B1/10	0.008045	0.008155	0.008101	0.00838	0.00821	
B1/11	0.008139	0.008019	0.008151	0.008078	0.008189	
B1/12	0.008106	0.008057	0.007978	0.007923	0.008222	
B1/14	0.007915	0.00791	0.00809	0.007936	0.008248	
F1/01	0.008097	0.008092	0.008162	0.008205	0.008244	
F1/02	0.008036	0.00796	0.008148	0.007757	0.008229	
F1/03	0.008159	0.008112	0.008221	0.007946	0.008196	
F1/04	0.007974	0.008216	0.00836	0.008154	0.008366	
F1/06	0.008087	0.007953	0.008059	0.00801	0.008195	
F1/07	0.008093	0.008122	0.008032	0.008098	0.008252	
F1/09	0.00813	0.007994	0.008203	0.007998	0.008251	
F1/11	0.008081	0.008142	0.008058	0.007887	0.008201	
F1/12	0.008074	0.008165	0.008196	0.008088	0.008358	
F1/13	0.008036	0.008102	0.008163	0.007911	0.008401	
K1/02	0.008099	0.007953	0.008103	0.007857	0.008436	
K1/03	0.008234	0.008128	0.008165	0.008058	0.008324	
K1/04	0.008101	0.007933	0.008138	0.007958	0.008199	
K1/05	0.008032	0.008084	0.008134	0.008026	0.008155	
K1/06	0.00799	0.008126	0.008216	0.007811	0.008335	
K1/07	0.008172	0.008167	0.008229	0.007964	0.008208	
K1/08	0.00822	0.008062	0.008083	0.0079	0.008229	
K1/09	0.007995	0.007952	0.008267	0.008032	0.008249	
K1/10	0.008146	0.008031	0.008117	0.008018	0.008242	
K1/13	0.008063	0.008095	0.0082	0.007985	0.008231	
K1/14	0.008203	0.008147	0.008288	0.008143	0.008194	
Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value
Between groups	4.4944E-07	39	1.1524E-08	0.76398349	0.83700275	1.47506592
Within groups	2.4135E-06	160	1.5084E-08			
Total	2.8629E-06	199				
(sbb) ²	-7.1203E-10					
ubb	1.8366E-05					
u_bb (rel.)	0.22665215					

Nickel:

Sample	mass fraction in %					
	1	2	3	4	5	
A1/01	0.02056	0.020261	0.02033	0.020183	0.021549	
A1/05	0.020447	0.020425	0.020754	0.02042	0.019426	
A1/06	0.020835	0.020181	0.020518	0.020536	0.02082	
A1/07	0.020732	0.020114	0.02042	0.020374	0.021027	
A1/08	0.020594	0.020292	0.020811	0.020186	0.020853	
A1/10	0.0208	0.020697	0.020467	0.020499	0.02087	
A1/11	0.020169	0.020555	0.020205	0.020471	0.020894	
A1/12	0.020824	0.020705	0.019255	0.020255	0.020777	
A1/13	0.020691	0.020441	0.02076	0.020216	0.02111	
A1/14	0.020594	0.020102	0.020729	0.020596	0.02098	
B1/02	0.020737	0.020315	0.020756	0.020692	0.021262	
B1/03	0.02063	0.020556	0.020164	0.020425	0.02044375	
B1/04	0.021028	0.020264	0.020298	0.0205	0.021205	
B1/08	0.02061	0.020076	0.020563	0.020487	0.020926	
B1/09	0.020658	0.02061	0.020559	0.020427	0.020455	
B1/10	0.020583	0.019889	0.020644	0.020269	0.020463	
B1/11	0.020568	0.02048	0.020839	0.020335	0.020584	
B1/12	0.019919	0.020356	0.020529	0.020476	0.021242	
B1/14	0.0207	0.020505	0.02098	0.020586	0.021123	
F1/01	0.020755	0.020235	0.020612	0.020652	0.02108	
F1/02	0.020694	0.020419	0.020611	0.020733	0.020865	
F1/03	0.020643	0.020345	0.02058	0.020373	0.021219	
F1/04	0.020704	0.020317	0.020604	0.02033	0.020938	
F1/06	0.020703	0.020281	0.020748	0.020413	0.020861	
F1/07	0.020774	0.020239	0.020695	0.020327	0.021211	
F1/09	0.020695	0.020567	0.020227	0.020533	0.020497	
F1/11	0.020544	0.020396	0.020652	0.020385	0.021052	
F1/12	0.020738	0.020435	0.020572	0.020693	0.020937	
F1/13	0.020449	0.020349	0.02057	0.020774	0.020912	
K1/02	0.020584	0.020392	0.020503	0.020514	0.020792	
K1/03	0.020716	0.020428	0.020564	0.020502	0.020921	
K1/04	0.020551	0.020575	0.020832	0.020438	0.020756	
K1/05	0.020712	0.020374	0.020689	0.02031	0.020893	
K1/06	0.020627	0.020481	0.020531	0.020574	0.020822	
K1/07	0.020607	0.020428	0.020578	0.020368	0.021149	
K1/08	0.020235	0.020453	0.020814	0.020543	0.020798	
K1/09	0.021065	0.020484	0.020511	0.020317	0.021051	
K1/10	0.020949	0.020223	0.02061	0.020253	0.020874	
K1/13	0.020565	0.019929	0.020856	0.020538	0.020893	
K1/14	0.020707	0.020255	0.020677	0.020313	0.021394	
Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value
Between groups	1.8675E-06	39	4.7884E-08	0.46588943	0.99683773	1.47506592
Within groups	1.6445E-05	160	1.0278E-07			
Total	1.8312E-05	199				
(sbb) ²	-1.0979E-08					
ubb	4.794E-05					
u_bb (rel.)	0.23291744					

Arsenic:

Sample	mass fraction in %				
	1	2	3	4	5
A1/01	0.000621	0.00055	0.000527	0.00055	0.000501
A1/05	0.000651	0.000463	0.000566	0.000578	0.000535
A1/06	0.000706	0.000539	0.000504	0.000561	0.000479
A1/07	0.000641	0.000496	0.000548	0.000618	0.000547
A1/08	0.000596	0.0005	0.000615	0.000574	0.000524
A1/10	0.000704	0.000511	0.000522	0.000575	0.000515
A1/11	0.00065	0.000576	0.000564	0.000525	0.000621
A1/12	0.000644	0.000475	0.000473	0.000528	0.000681
A1/13	0.000577	0.000526	0.00052	0.000506	0.00051
A1/14	0.000602	0.000518	0.000529	0.000443	0.000612
B1/02	0.000641	0.000445	0.000624	0.000553	0.000528
B1/03	0.000561	0.000441	0.000562	0.000491	0.000628
B1/04	0.00056	0.00042	0.000498	0.000573	0.000641
B1/08	0.000654	0.000559	0.000604	0.000648	0.000592
B1/09	0.000583	0.000487	0.000439	0.000553	0.000638
B1/10	0.00062	0.000614	0.000515	0.000585	0.000469
B1/11	0.000696	0.000515	0.00052	0.000644	0.000569
B1/12	0.000715	0.000533	0.000519	0.0006	0.000501
B1/14	0.00059	0.000452	0.000471	0.000536	0.000574
F1/01	0.000646	0.000531	0.000536	0.000558	0.00054
F1/02	0.000677	0.000476	0.000592	0.000473	0.000508
F1/03	0.000707	0.000607	0.000588	0.000556	0.000661
F1/04	0.000572	0.000481	0.000567	0.000549	0.000498
F1/06	0.000645	0.000557	0.000558	0.000524	0.00052
F1/07	0.000579	0.000536	0.000476	0.000507	0.000567
F1/09	0.000691	0.000573	0.000572	0.000529	0.000568
F1/11	0.000614	0.000605	0.000558	0.000525	0.000592
F1/12	0.000716	0.000464	0.000537	0.000462	0.00052
F1/13	0.000638	0.000541	0.000581	0.000474	0.000639
K1/02	0.000658	0.000439	0.000582	0.000499	0.000614
K1/03	0.000585	0.000483	0.000533	0.000531	0.000605
K1/04	0.00072	0.00054	0.000617	0.000448	0.000581
K1/05	0.000668	0.000524	0.00048	0.000606	0.000607
K1/06	0.000521	0.000528	0.000564	0.000401	0.000607
K1/07	0.000661	0.000422	0.000538	0.000478	0.000496
K1/08	0.000636	0.000469	0.000544	0.000515	0.000597
K1/09	0.000635	0.000446	0.000527	0.000599	0.000652
K1/10	0.000578	0.000414	0.000457	0.000582	0.000672
K1/13	0.000729	0.000528	0.000489	0.000495	0.000549
K1/14	0.000621	0.000496	0.000524	0.00055	0.000577

Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value
Between groups	1.0251E-07	39	2.6284E-09	0.50742677	0.99270154	1.47506592
Within groups	8.2879E-07	160	5.1799E-09			
Total	9.313E-07	199				
(sbb)*2	-5.103E-10	#ZAHL!				
ubb	1.0762E-05					
u_bb(rel.)	1.92758522					

Cadmium:

Sample	mass fraction in %					
	1	2	3	4	5	
A1/01	0.000031	0.000061	0.000048	0.000048	0.000078	
A1/05	0.000027	0.000067	0.000074	0.000058	0.000064	
A1/06	0.000029	0.000082	0.000062	0.000072	0.00004	
A1/07	0.000025	0.000054	0.000045	0.000066	0.000044	
A1/08	0.000041	0.000061	0.000063	0.000062	0.000061	
A1/10	0.000038	0.000068	0.00007	0.000037	0.000032	
A1/11	0.000026	0.000074	0.000038	0.000062	0.000034	
A1/12	0.000028	0.000065	0.000063	0.000066	0.000019	
A1/13	0.000041	0.000047	0.000058	0.00004	0.000023	
A1/14	0.000026	0.00006	0.000073	0.000056	0.000055	
B1/02	0.000036	0.000052	0.000061	0.000073	0.000032	
B1/03	0.000038	0.000072	0.000059	0.000077	0.000004	
B1/04	0.000046	0.000083	0.000045	0.000055	0.000024	
B1/08	0.000046	0.000057	0.00007	0.000049	0.000024	
B1/09	0.000022	0.00008	0.00007	0.000055	0.000024	
B1/10	0.00003	0.000056	0.000046	0.00006	-0.000011	
B1/11	0.000002	0.000052	0.000063	0.000049	0.000015	
B1/12	0.000017	0.000045	0.000071	0.000031	0.000017	
B1/14	0.000021	0.000065	0.000081	0.00005	0.00004	
F1/01	0.000041	0.000068	0.000041	0.000074	0.000056	
F1/02	0.000017	0.000086	0.000043	0.000064	0.000045	
F1/03	0.000012	0.00004	0.000031	0.000063	0.000038	
F1/04	0.000047	0.000052	0.000045	0.000053	0.000036	
F1/06	0.000035	0.000075	0.000055	0.000078	0.000046	
F1/07	0.000034	0.000074	0.000092	0.00005	0.000023	
F1/09	0.000026	0.000069	0.000039	0.000052	0.000031	
F1/11	0.000022	0.000029	0.000064	0.000066	0.000038	
F1/12	0.00004	0.000078	0.000047	0.000089	0.000029	
F1/13	0.000044	0.000064	0.000058	0.000088	0.000002	
K1/02	0.000037	0.000075	0.00004	0.000061	0.00001	
K1/03	0.000022	0.00007	0.000055	0.000057	0.000038	
K1/04	0.000014	0.000085	0.000048	0.000062	0.000048	
K1/05	0.000035	0.000055	0.000062	0.000044	0.000032	
K1/06	0.000047	0.000055	0.000054	0.000106	0.000032	
K1/07	0.000028	0.000058	0.000049	0.000061	0.00006	
K1/08	0.000028	0.000078	0.00004	0.000054	0.00002	
K1/09	0.000036	0.000069	0.000063	0.000033	0.000027	
K1/10	0.000031	0.00007	0.000064	0.000051	0.000018	
K1/13	0.000026	0.000067	0.000077	0.000074	0.000052	
K1/14	0.000028	0.000058	0.000045	0.000036	0.000056	
Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value
Between groups	7.847E-09	39	2.0121E-10	0.44996845	0.99778796	1.47506592
Within groups	7.1545E-08	160	4.4716E-10			
Total	7.9392E-08	199				
(sbb) ²	-4.919E-11	#ZAH!				
ubb	3.1621E-06					
u_bb(rel.)	6.44925655					

Antimony:

Sample	mass fraction in %					
	1	2	3	4	5	
A1/01	0.008907	0.008814	0.009147	0.008907	0.009578	
A1/05	0.008809	0.009256	0.009411	0.009159	0.009464	
A1/06	0.008818	0.009136	0.009101	0.009171	0.009386	
A1/07	0.008701	0.009006	0.009112	0.009351	0.009462	
A1/08	0.008972	0.009104	0.009248	0.009288	0.009662	
A1/10	0.008885	0.008737	0.009102	0.00885	0.009737	
A1/11	0.008785	0.009317	0.009276	0.009191	0.009431	
A1/12	0.008797	0.008949	0.009104	0.009197	0.009059	
A1/13	0.008851	0.009211	0.009444	0.009128	0.009377	
A1/14	0.008764	0.008892	0.009129	0.009168	0.009012	
B1/02	0.008764	0.009079	0.008967	0.009227	0.00918	
B1/03	0.009056	0.009101	0.009022	0.009255	0.009396	
B1/04	0.008923	0.009175	0.008649	0.009036	0.009401	
B1/08	0.008928	0.009025	0.008881	0.009216	0.009401	
B1/09	0.008616	0.009136	0.009244	0.009064	0.009273	
B1/10	0.008637	0.008965	0.009299	0.008973	0.009361	
B1/11	0.008537	0.008918	0.009203	0.00911	0.009146	
B1/12	0.008765	0.008994	0.009127	0.009183	0.009288	
B1/14	0.008455	0.009029	0.009757	0.009094	0.009267	
F1/01	0.00895	0.008976	0.009525	0.009389	0.009298	
F1/02	0.008544	0.008967	0.008969	0.008867	0.009302	
F1/03	0.008693	0.009086	0.009137	0.009124	0.009293	
F1/04	0.009031	0.009418	0.009504	0.008992	0.009726	
F1/06	0.008764	0.00908	0.00915	0.008807	0.009451	
F1/07	0.009158	0.009051	0.009208	0.00881	0.009271	
F1/09	0.008765	0.009002	0.009118	0.009003	0.009332	
F1/11	0.008588	0.008828	0.008937	0.008942	0.009509	
F1/12	0.008683	0.009672	0.009248	0.009129	0.009603	
F1/13	0.009101	0.009217	0.009232	0.00903	0.009327	
K1/02	0.008935	0.009017	0.008894	0.009024	0.009386	
K1/03	0.008827	0.009393	0.009436	0.009128	0.009421	
K1/04	0.008719	0.009281	0.009311	0.008881	0.0095	
K1/05	0.008857	0.009208	0.009368	0.009101	0.009422	
K1/06	0.008799	0.008931	0.009214	0.008947	0.009551	
K1/07	0.008855	0.009083	0.009138	0.009377	0.009508	
K1/08	0.009578	0.00951	0.00919	0.008831	0.00912	
K1/09	0.008939	0.008796	0.009674	0.00877	0.009547	
K1/10	0.008891	0.009201	0.009127	0.008867	0.009495	
K1/13	0.008847	0.009056	0.009692	0.009305	0.00911	
K1/14	0.008954	0.009201	0.00926	0.008922	0.009423	
Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value
Between groups	1.6581E-06	39	4.2515E-08	0.56629315	0.98046968	1.47506592
Within groups	1.2012E-05	160	7.5076E-08			
Total	1.367E-05	199				
(sbb) ²	-6.5122E-09	#ZAH!				
ubb	4.0973E-05					
u_bb(rel.)	0.44923383					

Bismuth:

Sample	mass fraction in %				
	1	2	3	4	5
A1/01	0.000289	0.000296	0.000278	0.000277	0.000281
A1/05	0.000283	0.000262	0.000285	0.000259	0.000272
A1/06	0.00028	0.00028	0.000277	0.000273	0.000285
A1/07	0.000289	0.000273	0.000277	0.000273	0.000269
A1/08	0.000305	0.00025	0.000286	0.000305	0.000254
A1/10	0.000235	0.000264	0.000268	0.000238	0.000285
A1/11	0.00031	0.000265	0.000295	0.000284	0.000286
A1/12	0.000289	0.000276	0.000246	0.00032	0.000275
A1/13	0.000282	0.00027	0.000323	0.000278	0.000249
A1/14	0.000292	0.000225	0.000265	0.000273	0.000298
B1/02	0.000229	0.000277	0.000289	0.000309	0.00028
B1/03	0.000286	0.000272	0.000283	0.000269	0.000291
B1/04	0.000327	0.00026	0.00028	0.000287	0.000288
B1/08	0.000284	0.000251	0.000295	0.000288	0.000288
B1/09	0.000239	0.000288	0.000303	0.000299	0.000277
B1/10	0.000279	0.00027	0.000264	0.000313	0.000262
B1/11	0.000246	0.000303	0.000249	0.000285	0.000255
B1/12	0.000282	0.000218	0.000292	0.00028	0.000289
B1/14	0.000261	0.000252	0.000261	0.000287	0.000287
F1/01	0.000258	0.000252	0.000286	0.000316	0.00029
F1/02	0.000267	0.000283	0.000308	0.000295	0.000315
F1/03	0.000223	0.00028	0.000279	0.000247	0.00027
F1/04	0.000296	0.000241	0.000304	0.00029	0.000289
F1/06	0.000285	0.000253	0.000252	0.000244	0.000261
F1/07	0.000269	0.00027	0.000301	0.000288	0.000309
F1/09	0.000286	0.000245	0.000214	0.000274	0.000293
F1/11	0.000283	0.000257	0.000289	0.00028	0.000312
F1/12	0.000284	0.000288	0.000292	0.000284	0.000282
F1/13	0.00026	0.00025	0.00029	0.000301	0.000308
K1/02	0.00026	0.000276	0.000307	0.000345	0.00027
K1/03	0.000303	0.000246	0.000247	0.000295	0.000304
K1/04	0.000266	0.000253	0.000273	0.000302	0.000268
K1/05	0.000256	0.000239	0.000274	0.000262	0.000296
K1/06	0.000325	0.000251	0.000241	0.000262	0.000274
K1/07	0.000277	0.000268	0.000269	0.000275	0.000301
K1/08	0.000288	0.000309	0.000303	0.000268	0.000295
K1/09	0.000319	0.000223	0.000283	0.000285	0.000278
K1/10	0.000252	0.00028	0.000277	0.000258	0.000326
K1/13	0.000254	0.000272	0.000247	0.000278	0.000286
K1/14	0.000266	0.000289	0.000313	0.000325	0.0003

Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value
Between groups	1.8025E-08	39	4.6219E-10	0.88275693	0.66811065	1.47506592
Within groups	8.3772E-08	160	5.2358E-10			
Total	1.018E-07	199				
(sbb)^2	-1.2277E-11	#ZAHL!				
ubb	3.4216E-06					
u_bb(rel.)	1.23135567					

Selenium.

Sample	mass fraction in %				
	1	2	3	4	5
A1/01	0.000042	0.000178	0.000288	0.000203	0.000233
A1/05	0.000184	0.000061	0.000031	0.000191	0.000231
A1/06	0.000249	0.000048	0.000187	0.000146	0.000258
A1/07	0.000169	0.000206	0.000267	0.000167	0.000312
A1/08	0.000218	0.000172	0.000201	0.00024	0.000086
A1/10	0.000205	0.000086	0.000072	0.000274	0.000311
A1/11	0.000144	0.000142	0.00023	0.000201	0.000364
A1/12	0.000173	0.000149	0.000237	0.000163	0.000425
A1/13	0.000296	0.000112	0.000227	0.000312	0.000191
A1/14	0.000204	0.000174	0.000155	0.000287	0.000252
B1/02	0.000248	0.000143	0.000178	0.000109	0.000311
B1/03	0.000244	0.000223	0.000329	0.000181	0.000314
B1/04	0.000217	0.000049	0.000136	0.000225	0.000314
B1/08	0.000109	0.000122	0.000194	0.000135	0.00037
B1/09	0.000342	0.000057	0.000123	0.000237	0.000446
B1/10	0.000285	0.000138	0.000231	0.000249	0.000313
B1/11	0.000256	0.000191	0.000219	0.000312	0.000242
B1/12	0.000293	0.000114	0.000152	0.000212	0.000283
B1/14	0.000246	0.000047	0.000073	0.000242	0.000364
F1/01	0.000164	0.000224	0.00017	0.000183	0.000114
F1/02	0.000265	0.000017	0.000209	0.000106	0.000304
F1/03	0.000234	0.000127	0.000229	0.000183	0.000253
F1/04	0.000077	0.000098	0.00022	0.00007	0.000321
F1/06	0.000276	0.000092	0.000208	0.000135	0.00041
F1/07	0.000059	0.000064	0.000064	0.000138	0.000288
F1/09	0.000246	0.000152	0.000275	0.000244	0.000294
F1/11	0.000275	0.000293	0.000265	0.000205	0.000323
F1/12	0.000189	0.000032	0.00024	0.000234	0.000256
F1/13	0.00015	0.000064	0.000282	0.000206	0.000424
K1/02	0.000277	0.000149	0.000161	0.000199	0.000388
K1/03	0.000224	0.000017	0.00018	0.000046	0.000217
K1/04	0.000452	0.00018	0.00028	0.00019	0.000218
K1/05	0.000199	0.000188	0.00027	0.000208	0.000307
K1/06	0.000179	0.000065	0.00014	-0.000003	0.000257
K1/07	0.000277	0.000161	0.000188	0.000166	0.000271
K1/08	0.000279	0.000063	0.000135	0.000297	0.000308
K1/09	0.000261	0.000039	0.000187	0.000224	0.000317
K1/10	0.00024	0.000128	0.000337	0.000208	0.00028
K1/13	0.000189	-0.000007	0.000195	0.000175	0.00024
K1/14	0.000305	0.000098	0.000228	0.000186	0.000227

Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value
Between groups	2.6371E-07	39	6.7618E-09	0.79336873	0.79977956	1.47506592
Within groups	1.3637E-06	160	8.5229E-09			
Total	1.6274E-06	199				
(sbb)^2	-3.5222E-10	#ZAHL!				
ubb	1.3805E-05					
u_bb(rel.)	6.74846888					

Annex 2: Calculation of uncertainty contribution of potential inhomogeneity (area)

Copper:

r_0	76.84671902	76.94014098											
r_in	76.735356	76.650895	76.581268	76.594305	76.647337	76.633107							
r_out	76.579167	76.394906	76.515601	76.500754	76.61116	76.596137	76.583567	76.421037	76.543186	76.541949	76.604739	76.48154	
Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value							
Between groups	0.238875658	2	0.119437829	27.11519262	5.14234E-06	3.591530568							
Within groups	0.07488212	17	0.004404831										
Total	0.313757778	19											
within-sd	0.066368898												
effective n	5.40												
s_bb	0.145953442			u_bb(rel.)	0.190539384								
s_bb_min	0.016726805												
u_bb	0.145953442			76.60014365									

Silicon:

r_0	3.353051577	3.374694423											
r_in	3.424773	3.40225	3.433177	3.43272	3.420208	3.427901							
r_out	3.451801	3.440539	3.418918	3.4118	3.411224	3.422067	3.406035	3.421257	3.39313	3.421319	3.393994	3.411985	
Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value							
Between groups	0.005673337	2	0.002836669	11.95895239	0.000572206	3.591530568							
Within groups	0.004032407	17	0.0002372										
Total	0.009705745	19											
within-sd	0.015401313			status:									
effective n	5.40												
s_bb	0.021940442			u_bb(rel.)	0.642728237								
s_bb_min	0.003881558												
u_bb	0.021940442			3.4136422									

Phosphor:

r_0	0.046402325	0.046845675											
r_in	0.047448	0.047752	0.04785	0.048283	0.047861	0.048464							
r_out	0.047953	0.047991	0.048124	0.048083	0.047331	0.048054	0.047726	0.047482	0.048294	0.047644	0.047794	0.047945	
<i>Source of variation</i>	<i>sums of squares (SS)</i>	<i>degrees of freedom (df)</i>	<i>Mean squares (MS)</i>	<i>F-value</i>	<i>P-value</i>	<i>critical F-value</i>							
Between groups	2.92217E-06	2	1.46108E-06	15.03998199	0.000173664	3.591530568							
Within groups	1.65149E-06	17	9.71467E-08										
Total	4.57366E-06	19											
within-sd	0.000311684			status:	inhomogeneous								
effective n	5.40												
s_bb	0.000502575			u_bb(rel.)	1.052151781								
s_bb_min	7.85529E-05												
u_bb	0.000502575			0.04776635									

Lead:

r_0	0.0122075	0.0124825											
r_in	0.012792	0.012476	0.012917	0.012637	0.012687	0.012707							
r_out	0.013014	0.012739	0.012633	0.012743	0.012494	0.012644	0.012965	0.012528	0.013228	0.012625	0.012815	0.01281	
<i>Source of variation</i>	<i>sums of squares (SS)</i>	<i>degrees of freedom (df)</i>	<i>Mean squares (MS)</i>	<i>F-value</i>	<i>P-value</i>	<i>critical F-value</i>							
Between groups	3.09576E-07	2	1.54788E-07	4.043726982	0.036596102	3.591530568							
Within groups	6.50736E-07	17	3.82786E-08										
Total	9.60312E-07	19											
within-sd	0.000195649												
effective n	5.40												
s_bb	0.000146887			u_bb(rel.)	1.15593649								
s_bb_min	4.9309E-05												
u_bb	0.000146887			0.0127072									

Iron:

r_0	0.012859374	0.013070626										
r_in	0.013199	0.013267	0.013284	0.013277	0.013017	0.012935						
r_out	0.013569	0.013231	0.013226	0.013219	0.013252	0.013323	0.013361	0.01332	0.013536	0.013035	0.013304	
Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value						
Between groups	2.31935E-07	2	1.15967E-07	5.199059386	0.018212771	3.633723468						
Within groups	3.56888E-07	16	2.23055E-08									
Total	5.88823E-07	18										
within-sd	0.00014935			status:	inhomogeneous							
effective n	5.26											
s_bb	0.000133401			u_bb(rel.)	1.008661857							
s_bb_min	3.87088E-05											
u_bb	0.000133401			0.013225526								

Tin:

r_0	0.008027889	0.008154111										
r_in	0.008399	0.008247	0.008182	0.008212	0.008267	0.008206						
r_out	0.008173	0.008279	0.008062	0.008187	0.008232	0.008114	0.008012	0.008296	0.008211	0.008114	0.00807	0.008277
Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value						
Between groups	4.78201E-08	2	2.391E-08	2.980957856	0.077668841	3.591530568						
Within groups	1.36356E-07	17	8.02092E-09									
Total	1.84176E-07	19										
within-sd	8.95596E-05			status:	homogeneous							
effective n	5.40											
s_bb	5.42441E-05			u_bb(rel.)	0.662637164							
s_bb_min	2.25715E-05											
u_bb	5.42441E-05			0.0081861								

Aluminium:

r_0	0.00737723	0.00741677											
r_in	0.00741	0.007415	0.007422	0.007487	0.007439	0.00741							
r_out	0.007427	0.007446	0.007404	0.007426	0.007477	0.007447	0.007437	0.007485	0.007485	0.007462	0.007479	0.007476	
<i>Source of variation</i>	<i>sums of squares (SS)</i>	<i>degrees of freedom (df)</i>	<i>Mean squares (MS)</i>	<i>F-value</i>	<i>P-value</i>	<i>critical F-value</i>							
Between groups	6.63705E-09	2	3.31853E-09	4.261777537	0.031609376	3.591530568							
Within groups	1.32374E-08	17	7.78672E-10										
Total	1.98745E-08	19											
within-sd	2.79047E-05												
effective n	5.40												
s_bb	2.16874E-05			u_bb(rel.)	0.291442442								
s_bb_min	7.03276E-06												
u_bb	2.16874E-05			0.0074414									

Chromium:

r_0	0.000800705	0.000865295											
r_in	0.000766	0.000764	0.000789	0.000828	0.00082	0.000778							
r_out	0.000854	0.000818	0.000796	0.000853	0.000904	0.000816	0.000734	0.000787	0.000805	0.000768	0.00078	0.000711	
<i>Source of variation</i>	<i>sums of squares (SS)</i>	<i>degrees of freedom (df)</i>	<i>Mean squares (MS)</i>	<i>F-value</i>	<i>P-value</i>	<i>critical F-value</i>							
Between groups	2.67005E-09	2	1.33503E-09	0.616750748	0.551340857	3.591530568							
Within groups	3.67984E-08	17	2.16461E-09										
Total	3.94684E-08	19											
within-sd	4.65254E-05												
effective n	5.40												
s_bb	0			u_bb(rel.)	1.462329065								
s_bb_min	1.17257E-05												
u_bb	1.17257E-05			0.00080185									

Manganese:

r_0	0.003558215	0.003597785										
r_in	0.003607	0.003643	0.00368	0.003686	0.003627	0.003628						
r_out	0.003669	0.003633	0.00366	0.003712	0.003667	0.003682	0.00363	0.003685	0.003703	0.003692	0.003671	
Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value						
Between groups	1.60279E-08	2	8.01397E-09	10.31512215	0.001325078	3.633723468						
Within groups	1.24306E-08	16	7.76915E-10									
Total	2.84586E-08	18										
within-sd	2.78732E-05											
effective n	5.26											
s_bb	3.70815E-05			u_bb(rel.)	1.014747409							
s_bb_min	7.22422E-06											
u_bb	3.70815E-05			0.003654263								

Nickel:

r_0	0.002728042	0.003087958										
r_in	0.002585	0.003106	0.003243	0.00291	0.003522	0.003175						
r_out	0.003194	0.002969	0.003276	0.003254	0.003156	0.003257	0.003098	0.003132	0.002992	0.003029	0.00286	0.00251
Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value						
Between groups	5.09994E-08	2	2.54997E-08	0.400283343	0.676282719	3.591530568						
Within groups	1.08297E-06	17	6.37042E-08									
Total	1.13397E-06	19										
within-sd	0.000252397											
effective n	5.40											
s_bb	0			u_bb(rel.)	2.082739268							
s_bb_min	6.3611E-05											
u_bb	6.3611E-05			0.0030542								

Arsenic:

r_0	0.000633236	0.000740764										
r_in	0.000634	0.000706	0.000546	0.00063	0.000527	0.000569						
r_out	0.000793	0.000494	0.000596	0.000658	0.000655	0.000652	0.00061	0.000598	0.000565	0.000705	0.000558	0.000543
Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value						
Between groups	1.09276E-08	2	5.46382E-09	0.938970686	0.410394424	3.591530568						
Within groups	9.8922E-08	17	5.81894E-09									
Total	1.0985E-07	19										
within-sd	7.6282E-05											
effective n	5.40											
s_bb	0			u_bb(rel.)	3.097588128							
s_bb_min	1.92252E-05											
u_bb	1.92252E-05			0.00062065								

Cadmium:

r_0	0.000337585	0.000372415										
r_in	0.00036	0.000363	0.000377	0.000374	0.000367	0.000355						
r_out	0.00044	0.000483	0.000403	0.00039	0.000391	0.000392	0.000392	0.000394	0.000399	0.000386	0.000385	
Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value						
Between groups	8.25463E-09	2	4.12732E-09	6.637855075	0.007959767	3.633723468						
Within groups	9.94855E-09	16	6.21785E-10									
Total	1.82032E-08	18										
within-sd	2.49356E-05											
effective n	5.26											
s_bb	2.5808E-05			u_bb(rel.)	6.661476559							
s_bb_min	6.46285E-06											
u_bb	2.5808E-05			0.000387421								

Antimony:

r_0	0.004103388	0.004470612											
r_in	0.004586	0.004587	0.004905	0.004876	0.003732	0.004492							
r_out	0.004788	0.004753	0.004605	0.004698	0.004717	0.004695	0.004621	0.004931	0.004801	0.004669	0.00492	0.00477	
Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value							
Between groups	4.60184E-07	2	2.30092E-07	3.590320142	0.050042565	3.591530568							
Within groups	1.08947E-06	17	6.40868E-08										
Total	1.54966E-06	19											
within-sd	0.000253154												
effective n	5.40												
s_bb	0.000175333			u_bb(rel.)	3.781991826								
s_bb_min	6.38017E-05												
u_bb	0.000175333			0.004636									

Bismuth:

r_0	0.000215017	0.000256983											
r_in	0.000289	0.000317	0.000279	0.000308	0.000225	0.000341							
r_out	0.000301	0.000284	0.000285	0.000233	0.000283	0.0003	0.000253	0.000288	0.000282	0.000259	0.000266	0.000236	
Source of variation	sums of squares (SS)	degrees of freedom (df)	Mean squares (MS)	F-value	P-value	critical F-value							
Between groups	5.09712E-09	2	2.54856E-09	2.964162849	0.078641343	3.591530568							
Within groups	1.46164E-08	17	8.5979E-10										
Total	1.97136E-08	19											
within-sd	2.93222E-05												
effective n	5.40												
s_bb	1.76843E-05			u_bb(rel.)	6.429489277								
s_bb_min	7.39E-06												
u_bb	1.76843E-05			0.00027505									

Selenium:

r_0	0.000313353	0.000414647											
r_in	0.000379	0.000355	0.000488	0.00032	0.000326	0.000405							
r_out	0.000349	0.000333	0.000533	0.000264	0.000374	0.00032	0.000353	0.000432	0.00047	0.000359	0.000301	0.000323	
<i>Source of variation</i>	<i>sums of squares (SS)</i>	<i>degrees of freedom (df)</i>	<i>Mean squares (MS)</i>	<i>F-value</i>	<i>P-value</i>	<i>critical F-value</i>							
Between groups	6.0305E-10	2	3.01525E-10	0.05835654	0.943501684	3.591530568							
Within groups	8.78381E-08	17	5.16694E-09										
Total	8.84411E-08	19											
within-sd	7.18815E-05			status:	homogeneous								
effective n	5.40												
s_bb	0			u_bb(rel.)	4.888322706								
s_bb_min	1.81161E-05												
u_bb	1.81161E-05			0.0003706									