Certification Report

Certified Reference Material

ERM®-EB312a

AlMgSi0,5

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Summary

This report describes preparation, analysis and certification of the aluminium alloy reference material ERM®-EB312a.
The certified reference material (CRM) is available in the form of discs (65 mm diameter and 30 mm height). It is intended for establishing and checking the calibration of optical emission and X-ray spectrometers (excluding micro-analysis) for the analysis of samples of similar matrix composition. It is also suitable for wet chemical analysis.

The following mass fractions and uncertainties have been certified:

Element	**Mass fraction**[1] in %	**Uncertainty**[2] in %
Si	0.403	0.008
Fe	0.198	0.004
Cu	0.0509	0.0014
Mn	0.0488	0.0011
Mg	0.379	0.004
Cr	0.0320	0.0009
Zn	0.0297	0.0008
Ti	0.0291	0.0011
Ga	0.0129	0.0003
	in mg/kg	in mg/kg
Ni	40.7	2.4
Bi	18.0	1.8
Cd	16.7	1.3
Li	6.0	1.1
Pb	49.7	2.1
Sr	11.1	0.7
V	67.3	1.4
Zr	8.5	0.7

1 Unweighted mean value of the means of accepted sets of data, each set being obtained in a different laboratory and/or with a different method of determination. The values are traceable to the SI (Système International d'Unités) by the use of pure substances of known stoichiometry for calibration.

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)].

This report contains detailed information on the preparation of the CRM as well as on homogeneity investigations and on the analytical methods used for certification analysis.
The certified values are based on the results of 8 laboratories which participated in the certification inter-laboratory comparison.

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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
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 2 – 21)
...(R)	..., revised value (Tables 2 – 21)
IMS	ICP-MS (Tables 2 – 21)
A	FAAS (Tables 2 – 21)
EA	ETAAS (Tables 2 – 21)
P	spectrophotometry (Tables 2 – 21)
-s	dissolution in acid (Tables 2 – 21)
-a	dissolution in base (Tables 2 – 21)

1. Introduction

In the metal-producing and metal-working industry mainly spark 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. The certified reference material ERM®-EB312a is based on the aluminium alloy AlMgSi0,5. It replaces the sold out CRM BAM-312.

The CRM was produced in close cooperation with the working group „Aluminium" of the Committee of Chemists of GDMB Society of Metallurgists und Miners. Since all the laboratories participating in this certification project are highly experienced with aluminium analysis and had already participated in earlier inter-laboratory comparisons, there was no preceding round robin for qualification.

Certification 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:

– Constellium, Centre de Recherches de Voreppe, Voreppe, France

Test for homogeneity:

– Bundesanstalt für Materialforschung und -prüfung (BAM), Berlin, Germany
– Constellium, Centre de Recherches de Voreppe, Voreppe, France

Participants in the certification inter-laboratory comparison:

AMAG Austria Metall AG, Ranshofen, Austria
Bundesanstalt für Materialforschung und -prüfung (BAM), Berlin, Germany
Hydro Aluminium Rolled Products GmbH, R&D, Bonn, Germany
Hydro Aluminium Rolled Products GmbH, Hamburg, Germany
Institute of Non-Ferrous Metals, Gliwice, Poland
Leichtmetall Aluminium Giesserei Hannover GmbH, Hannover, Germany
Otto Fuchs KG, Meinerzhagen, Germany
TRIMET Aluminium SE, Essen, Germany

Statistical evaluation of the data:

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

3. Candidate material

The candidate material was produced by Constellium, Centre de Recherches de Voreppe, Voreppe, France. About 500 kg of an aluminium melt were doped with the desired elements. The melt was casted into six rods (A – F) with a length of 3775 mm each. 250 mm on both ends of each rod were discarded. The rods were cut into segments of 800 mm length (A1, A2, A3, A4, B1, B2, ..., F3, F4). Between the segments 15-mm discs (AA, AB, AC, AD, AE, BA, BB, ..., FD, FE) were taken for homogeneity testing (see Fig. 1).

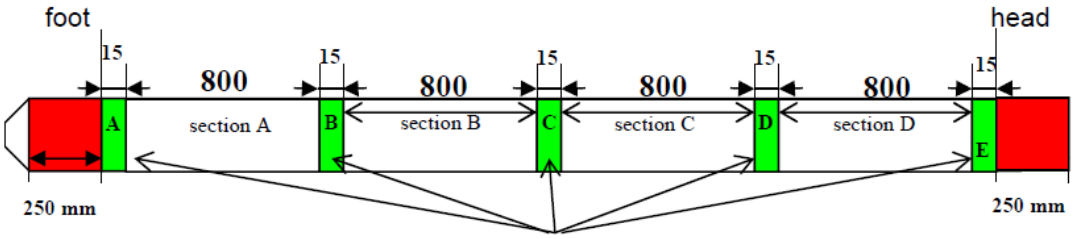

Fig.1: Preparation of the rods casted

In total approx. 500 discs with a diameter of ca. 70 mm and 30 mm height were obtained.

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 volatise or because of possible segregation 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 2 and 3):

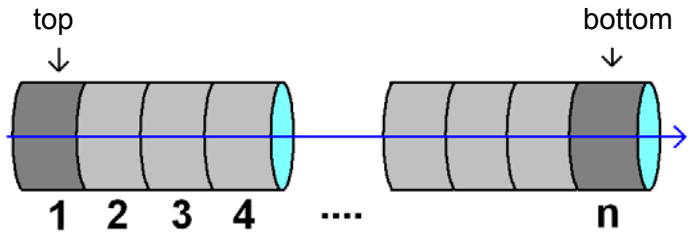

Fig. 2: Axial composition gradient

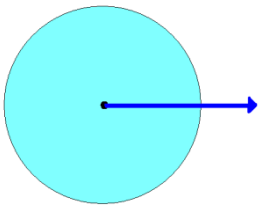

Fig. 3: Radial composition gradient

Therefore it is necessary to investigate the raw material for both axial and radial inhomogeneities. Radial homogeneity testing of the candidate material using spark emission spectrometry was performed by Constellium, Centre de Recherches de Voreppe on the discs taken from the rods as shown in Fig. 1. In total 30 discs were investigated, this corresponds to 6 % of the whole batch.

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):

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

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

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 two discs 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: 16 sparks, mean circle: 11 sparks, inner circle: 8 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 considering 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), r_mean (mean circle) and r_out (outer circle). As results from these calculations an inhomogeneity component for the radius of the disc is obtained. From these values a combined inhomogeneity component is calculated. This component is compared with the within standard deviation calculated from the ANOVA-data. The higher component is used for uncertainty calculation.

Annex 2 shows the results of the calculations.

5. Characterisation study

5.1 Analytical methods

8 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. Table 1 shows the analytical methods used by the participating laboratories.
For all analytical methods where a calibration was necessary this calibration 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.

Table 1: Analytical procedures used by the participating laboratories

Lab-No.	Element.	Sample mass	Sample pretreatment	Analytical method
2	Si, Fe, Cu, Mn, Mg, Zn, Ti	0.5 g	Dissolution with NaOH	ICP-OES, calibration with pure metals or pure chemicals, matrix matching with pure Al (5N5)
	Cr, Sr	0.5 g	Dissolution with NaOH/HNO_3/HF	ICP-OES, calibration with pure metals or pure chemicals, matrix matching with pure Al (5N5)
	Ga, Ni, B, Bi, Cd, Pb, V	0.5 g	Dissolution with HNO_3/HF	ICP-MS, calibration with pure metals or pure chemicals, matrix matching with pure Al (5N5)
	Zr, Li, Na, Ca	0.5 g	Dissolution with HNO_3/HF	ICP-OES, calibration with pure metals or pure chemicals, matrix matching with pure Al (5N5)
4	Si	0.5 g	Dissolution with NaOH	Photometry, commercial mono-element solution
	Fe, Cu, Mn, Mg, Cr, Zn, Ti, Ga	0.5 g	Dissolution with HNO_3/HCl/H_2O_2	ICP-OES, commercial mono-element solutions
	Ni, B, Bi, Cd, Pb, Sr,V, Zr, Li, Na, Ca	1.0 g	Dissolution with HNO_3/HCl/H_2O_2/HF	ICP-OES, commercial mono-element solutions
5	Si, Fe, Cu, Mn, Mg, Cr, Zn, Ti, Ga, Ni, B, Be, Cd, Pb, Sr, Na, Li, Ca, V, Zr	0.5 g	Dissolution with NaOH	ICP-OES, commercial solutions
6	Si, Fe, Cu, Mn, Mg, Cr, Zn, Ti, Ga, Bi	0.5 g	Dissolution with NaOH	ICP-OES, calibration with pure metals or pure chemicals
	Ni, B, Cd, Pb, Sr, V, Zr, Li, Na, Ca	0.5 g	Dissolution with HCl/ HNO_3	ICP-OES with matrix matched standards (pure Al), commercial multi-element standard solutions
7	Si, Bi, Ca, Cd, Cr, Cu, Fe, Mg, Mn, Ni, Pb, Ti, V, Zn, Zr	0.5 g	Dissolution with HCl/ HNO_3/HF	ICP-OES with matrix matched standards (pure Al), commercial multi-element standard solutions
	B, Bi, Cd, Ni, Pb, Sr, V, Zr	0.5 g	Dissolution with HNO_3/HF	ICP-MS with matrix matched standards (pure Al), commercial multi-element standard solutions

Table 1 (cont.): Analytical procedures used by the participating laboratories

8	Si, Fe, Cu, Mn, Mg, Cr, Zn, Ti, Ga, Ni, Cd, Sr, V, Zr	0.5 g	Dissolution with NaOH (microwave assisted)	ICP-OES, with matrix matched standards, commercial mono-element solutions
	Si, Fe, Cu, Mn, Mg, Cr, Zn, Ti, Ni, Cd, Pb, V, Zr			XRF, calibration with BAM-CRMs
9	Zr, V	0.5 g	Dissolution with NaOH,	Spectrophotometry, calibration with pure metals or pure chemicals
	Fe	0.5 g	Dissolution with HCl/H_2O_2	Spectrophotometry, calibration with pure metals or pure chemicals
	Fe, Cu, Mn, Mg, Cr, Zn, Ti, Ga, Bi, Cd, Pb, Sr, V, Zr, Li, Na	1 g	Dissolution with HCl/HNO_3	ICP-OES, calibration with matrix matched standards, commercial mono-element solutions (Merck)
	Cu, Mn, Cr, Zn, Ga, Ni, B, Bi, Cd, Pb, Sr,V, Zr, Li	0.25 g	Dissolution with HCl/HNO_3	ICP-MS, calibration with matrix matched standards, commercial mono-element solutions (Merck)
	Zn	0.3 g	Dissolution with $HCl/H_2O_2/HF$	FAAS, calibration with matrix matched standards, commercial mono-element solution (Merck)
	Cr	0.3 g	Dissolution with $HCl/H_2O_2/HF$	ETAAS, calibration with commercial solution (Merck)
	Cd, Pb, Bi	0.3 g	Dissolution with $HCl/HNO_3/HF$	ETAAS, calibration with commercial solutions (Merck)
10	Si, Fe, Cu, Mn, Mg, Cr, Zn, Ti, Ga, Ni, Cd, V, Zr	0.5 g	Dissolution with NaOH	ICP-OES, calibration with commercial solutions

5.2 Analytical results and statistical evaluation

The analytical results of the certification inter-laboratory comparison are listed in Tables 2 to 21. 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 ($\bar{s}_i$) where 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 in yellow.

Lab./Meth.	7/I-s	10/I-a	8/I-a(R)	5/I-a	4/P	2/I-a	6/I-a	8/XRF		
M_i [%]	0.393	0.391	0.398	0.400	0.405	0.406	0.413	0.416		*n*
	0.396	0.392	0.397	0.401	0.400	0.405	0.409	0.415		8
	0.393	0.393	0.398	0.400	0.411	0.404	0.408	0.414		
	0.396	0.398	0.400	0.401	0.405	0.406	0.409	0.416		
	0.398	0.397	0.399	0.401	0.400	0.405	0.412	0.415		
	0.396	0.402	0.399	0.400	0.404	0.406	0.414	0.416		
***M* [%]**	**0.395**	**0.396**	**0.399**	**0.401**	**0.404**	**0.405**	**0.411**	**0.415**		**0.403**
s [%]	0.0021	0.0042	0.0010	0.0005	0.0041	0.0008	0.0025	0.0006	s_M [%]	0.0072
									$\bar{s}_i$ [%]	0.0024
s_{rel}	0.00533	0.01070	0.00262	0.00129	0.01007	0.00204	0.00604	0.00142		0.01776

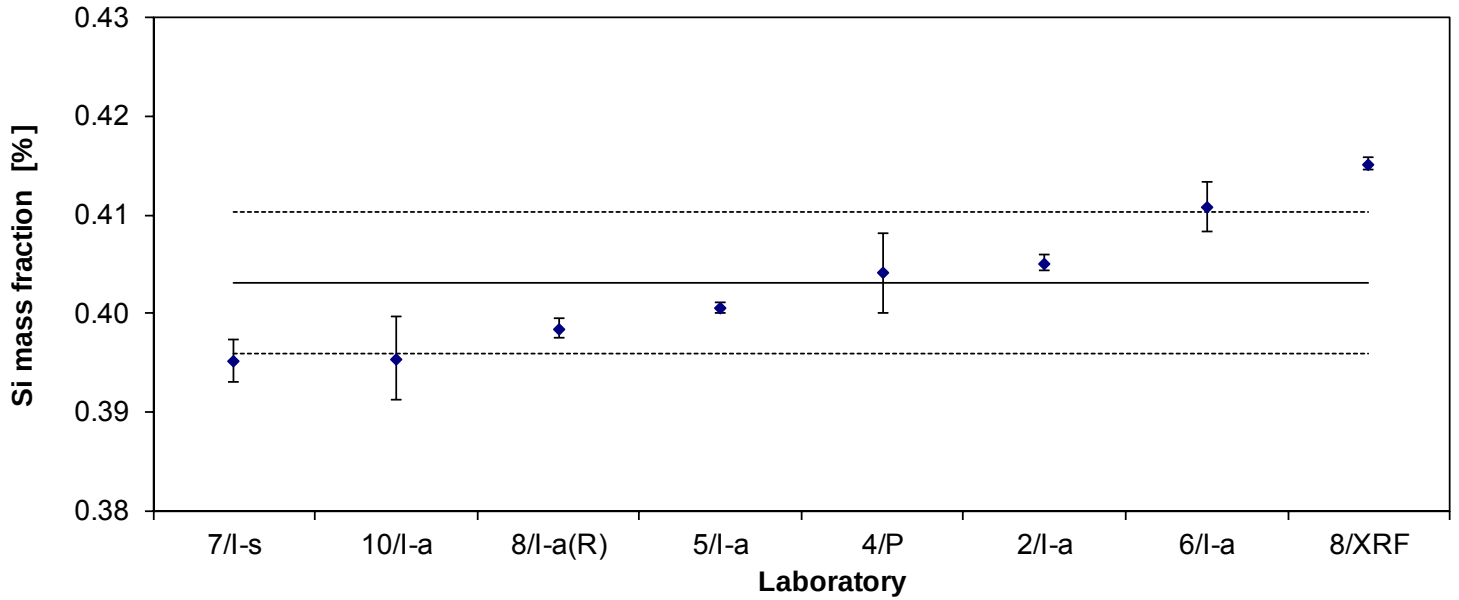

Table 2: Results for Si

Lab./Meth.	8/I-a(R)	2/I-a	5/I-a	6/I-a	4/I-s	10/I-a	9/P	8/XRF	7/I-s	9/I-s		
M_i [%]	0.195	0.196	0.196	0.196	0.197	0.196	0.198	0.200	0.199	0.200		*n*
	0.195	0.195	0.196	0.197	0.195	0.196	0.199	0.200	0.201	0.203		10
	0.193	0.196	0.197	0.197	0.198	0.204	0.196	0.200	0.199	0.202		
	0.194	0.195	0.195	0.197	0.197	0.198	0.199	0.200	0.201	0.200		
	0.196	0.195	0.197	0.197	0.198	0.195	0.198	0.200	0.201	0.202		
	0.195	0.196	0.197	0.196	0.197	0.196	0.197	0.200	0.201	0.201		
							0.197					
***M* [%]**	**0.1948**	**0.1955**	**0.1961**	**0.1964**	**0.1970**	**0.1975**	**0.1977**	**0.2000**	**0.2003**	**0.2013**		**0.1977**
s [%]	0.0011	0.0003	0.0005	0.0004	0.0011	0.0033	0.0011	0.0002	0.0008	0.0012	s_M [%]	0.0022
											$\bar{s}_i$ [%]	0.0013
s_{rel}	0.00563	0.00170	0.00271	0.00205	0.00556	0.01687	0.00577	0.00124	0.00397	0.00602		0.01113

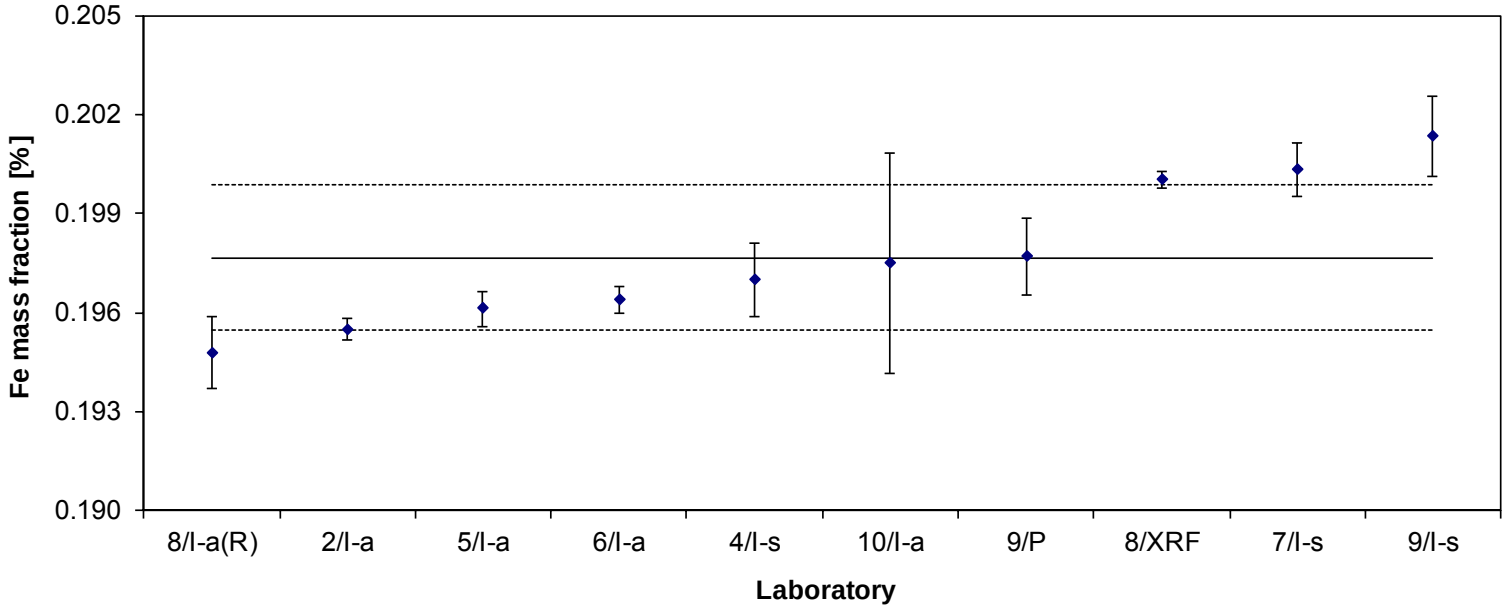

Table 3: Results for Fe

Lab./Meth.	9IMS	9/I-s	8/I-a(R)	10/I-a	7/I-s	5/I-a	6/I-a	8/XRF(R)	2/I-a	4/I-s		
M_i [%]	0.0487	0.0500	0.0502	0.0495	0.0508	0.0516	0.0517	0.0521	0.0520	0.0526		*n*
	0.0480	0.0500	0.0500	0.0502	0.0506	0.0516	0.0521	0.0520	0.0519	0.0521		10
	0.0489	0.0500	0.0498	0.0506	0.0505	0.0516	0.0515	0.0521	0.0519	0.0530		
	0.0479	0.0490	0.0499	0.0496	0.0505	0.0518	0.0519	0.0521	0.0519	0.0525		
	0.0481	0.0490	0.0504	0.0509	0.0510	0.0517	0.0522	0.0521	0.0522	0.0526		
	0.0485	0.0490	0.0501	0.0502	0.0505	0.0517	0.0521	0.0521	0.0526	0.0523		
	0.0486											
***M* [%]**	**0.0484**	**0.0495**	**0.0501**	**0.0502**	**0.0507**	**0.0517**	**0.0519**	**0.0521**	**0.0521**	**0.0525**		**0.0509**
s [%]	0.0004	0.0005	0.0002	0.0005	0.0002	0.0001	0.0003	0.0000	0.0003	0.0003	s_M [%]	0.0014
											$\bar{s}_i$ [%]	0.0003
s_{rel}	0.00806	0.01107	0.00431	0.01089	0.00409	0.00132	0.00523	0.00096	0.00562	0.00583		0.02668

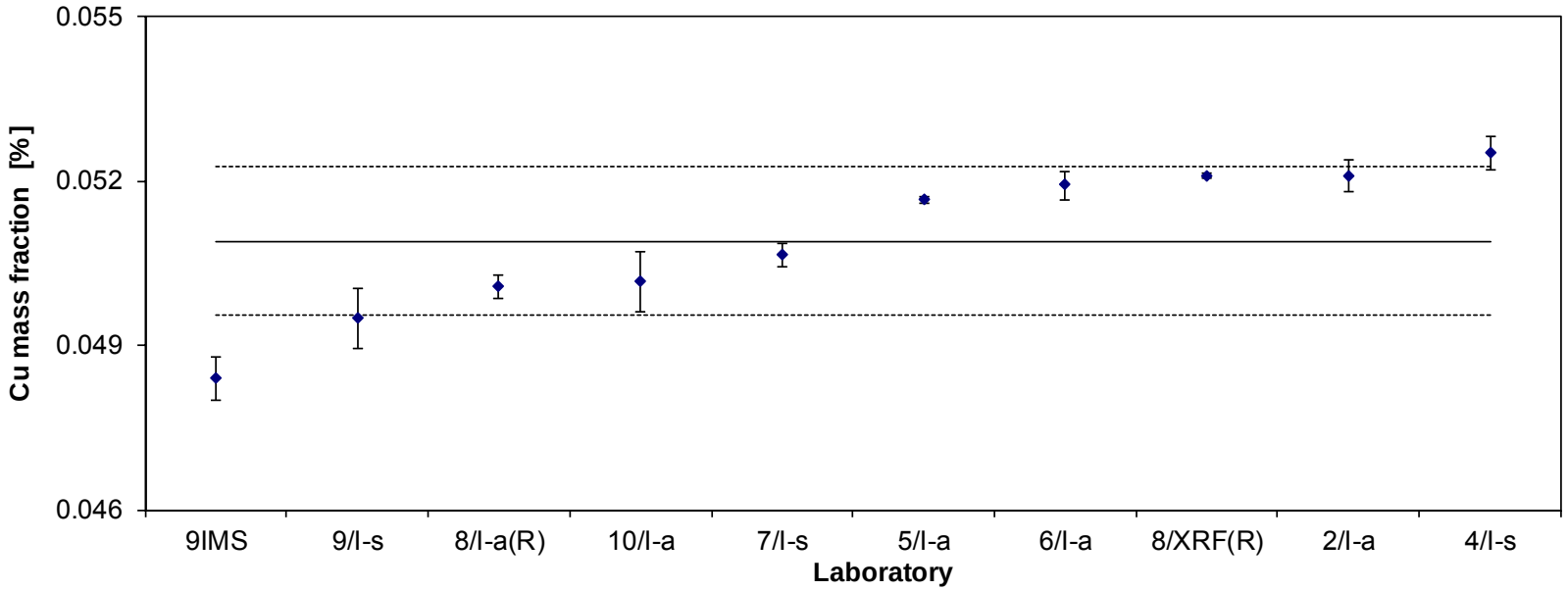

Table 4: Results for Cu

Lab./Meth.	9/I-s	5/I-a	2/I-a	9/IMS	8/XRF	6/I-a	9/I-a	4/I-s	7/I-s	8/I-a(R)	10/I-a		
M_i [%]	0.0460	0.0466	0.0479	0.0495	0.0485	0.0487	0.0505	0.0493	0.0496	0.0505	0.0516		*n*
	0.0460	0.0467	0.0482	0.0484	0.0486	0.0489	0.0474	0.0492	0.0506	0.0510	0.0512		11
	0.0460	0.0465	0.0482	0.0489	0.0487	0.0487	0.0480	0.0498	0.0490	0.0494	0.0521		
	0.0450	0.0465	0.0483	0.0481	0.0484	0.0488	0.0500	0.0494	0.0497	0.0509	0.0528		
	0.0460	0.0466	0.0486	0.0474	0.0486	0.0489	0.0497	0.0497	0.0493	0.0497	0.0519		
	0.0460	0.0465	0.0488	0.0487	0.0486	0.0488		0.0494	0.0497	0.0498	0.0501		
				0.0488									
***M* [%]**	**0.0458**	**0.0465**	**0.0483**	**0.0486**	**0.0486**	**0.0488**	**0.0491**	**0.0495**	**0.0497**	**0.0502**	**0.0516**		**0.0488**
s [%]	0.0004	0.0001	0.0003	0.0007	0.0001	0.0001	0.0013	0.0002	0.0005	0.0007	0.0009	s_M [%]	0.0016
												$\bar{s}_i$ [%]	0.0006
s_{rel}	0.00891	0.00149	0.00646	0.01402	0.00213	0.00183	0.02737	0.00473	0.01086	0.01341	0.01773		0.03267

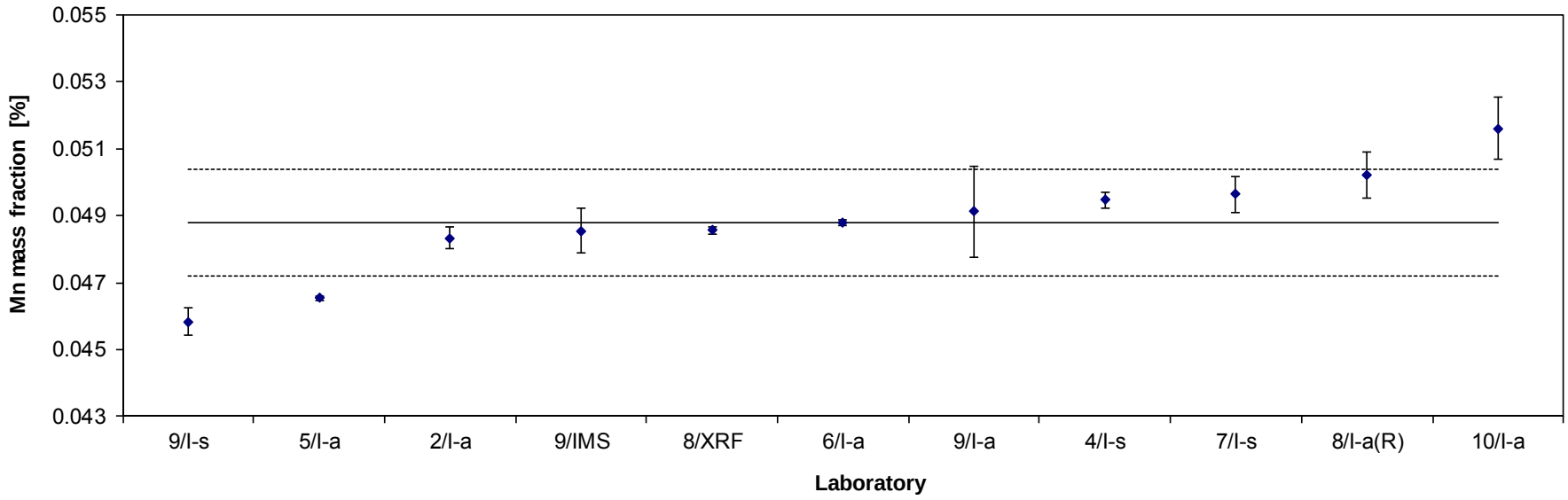

Table 5: Results for Mn

Lab./Meth.	8/XRF(R)	7/l-s	5/l-a	4/l-s	2/l-a	9/l-a	9/l-s	10/l-a	8/l-a	6/l-a(R)		
M_i [%]	0.375	0.376	0.375	0.378	0.382	0.385	0.381	0.376	0.381	0.395		n
	0.375	0.376	0.378	0.375	0.380	0.385	0.384	0.374	0.381	0.393		10
	0.375	0.377	0.377	0.380	0.379	0.369	0.382	0.383	0.386	0.395		
	0.375	0.376	0.378	0.376	0.377	0.380	0.380	0.391	0.378	0.394		
	0.374	0.377	0.378	0.383	0.378	0.380	0.381	0.390	0.380	0.396		
	0.375	0.376	0.378	0.376	0.380		0.382	0.384	0.396	0.397		
M [%]	**0.3750**	**0.3764**	**0.3773**	**0.3780**	**0.3792**	**0.3796**	**0.3817**	**0.3830**	**0.3837**	**0.3950**		**0.3809**
s [%]	0.0004	0.0004	0.0010	0.0030	0.0017	0.0064	0.0014	0.0070	0.0069	0.0016	s_M [%]	0.0057
											$\bar{s}_i$ [%]	0.0041
s_{rel}	0.00100	0.00105	0.00274	0.00802	0.00461	0.01680	0.00358	0.01824	0.01786	0.00395		0.01501

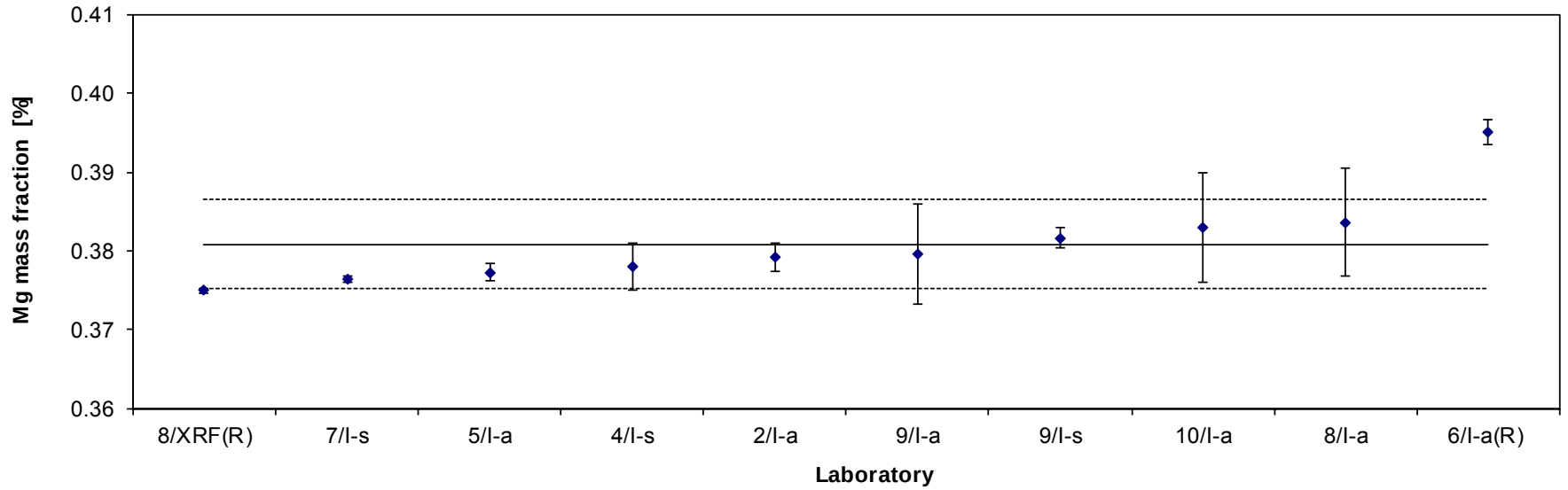

Table 6: Results for Mg

Lab./Meth.	10/I-a	9/I-a	9/IMS	5/I-a	8/I-a(R)	9/EA	7/I-s	2/I-a	6/I-a	8/XRF	9/I-s		
M_i [%]	0.0305	0.0313	0.0323	0.0314	0.0321	0.0330	0.0326	0.0325	0.0328	0.0329	0.0329		*n*
	0.0305	0.0314	0.0315	0.0316	0.0323	0.0324	0.0321	0.0325	0.0329	0.0329	0.0332		11
	0.0304	0.0302	0.0318	0.0315	0.0320	0.0325	0.0320	0.0326	0.0327	0.0332	0.0330		
	0.0302	0.0307	0.0307	0.0315	0.0310	0.0315	0.0327	0.0325	0.0329	0.0330	0.0328		
	0.0302	0.0307	0.0308	0.0316	0.0323	0.0314	0.0329	0.0326	0.0326	0.0329	0.0329		
	0.0305		0.0313	0.0314	0.0323	0.0316	0.0326	0.0327	0.0326	0.0327	0.0329		
			0.0314										
***M* [%]**	**0.0304**	**0.0309**	**0.0314**	**0.0315**	**0.0320**	**0.0321**	**0.0325**	**0.0326**	**0.0328**	**0.0329**	**0.0329**		**0.0320**
s [%]	0.0001	0.0005	0.0005	0.0001	0.0005	0.0007	0.0004	0.0001	0.0001	0.0002	0.0001	s_M [%]	0.0009
												$\bar{s}_i$ [%]	0.0004
s_{rel}	0.00484	0.01597	0.01751	0.00326	0.01581	0.02047	0.01091	0.00275	0.00421	0.00496	0.00440		0.02687

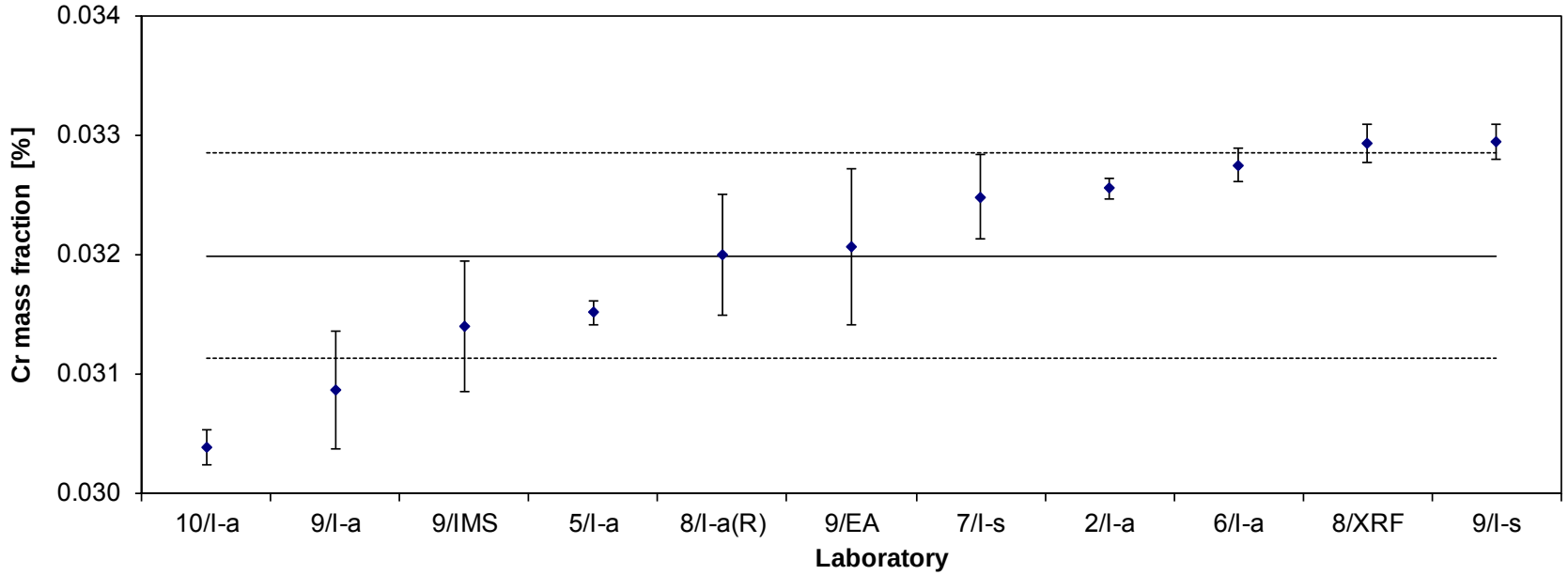

Table 7: Results for Cr

Lab./Meth.	9/IMS	8/I-a	10/I-a	8/XRF	7/I-s	9/A	2/I-a	5/I-a	9/I-s	9/I-a	6/I-a	4/I-s		
M_i [%]	0.0283	0.0294	0.0290	0.029	0.0291	0.0293	0.0297	0.0301	0.0303	0.0302	0.0302	0.0305		*n*
	0.0290	0.0292	0.0294	0.029	0.0295	0.0292	0.0298	0.0296	0.0300	0.0295	0.0306	0.0304		12
	0.0282	0.0291	0.0297	0.029	0.0293	0.0291	0.0296	0.0296	0.0304	0.0301	0.0301	0.0308		
	0.0275	0.0290	0.0291	0.029	0.0292	0.0301	0.0297	0.0297	0.0301	0.0308	0.0306	0.0307		
	0.0281	0.0296	0.0296	0.029	0.0295	0.0295	0.0298	0.0299	0.0305	0.0306	0.0300	0.0308		
	0.0277	0.0291	0.0292	0.029	0.0298	0.0297	0.0301	0.0302	0.0301		0.0300	0.0308		
	0.0281													
***M* [%]**	**0.0281**	**0.0292**	**0.0293**	**0.0294**	**0.0294**	**0.0295**	**0.0298**	**0.0298**	**0.0302**	**0.0302**	**0.0303**	**0.0307**		**0.0297**
s [%]	0.0005	0.0002	0.0003	0.0001	0.0003	0.0004	0.0002	0.0003	0.0002	0.0005	0.0003	0.0002	s_M [%]	0.00067
													$\bar{s}_i$ [%]	0.00030
s_{rel}	0.01691	0.00770	0.00956	0.00239	0.00860	0.01256	0.00644	0.00907	0.00635	0.01663	0.00929	0.00571		0.02260

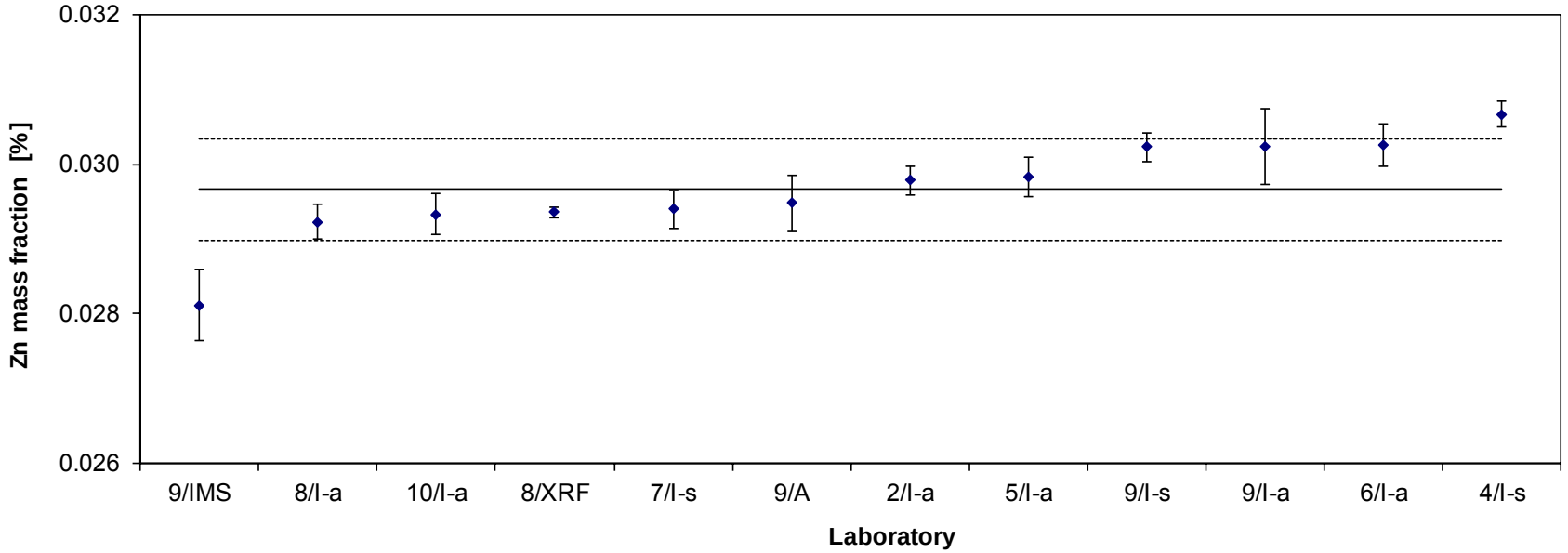

Table 8: Results for Zn

Lab./Meth.	10/l-a	6/l-a	5/l-a	4/l-s	2/l-a	9/l-s	8/XRF	8/l-a(R)	9/l-a	7/l-s(R)		
M_i [%]	0.0283	0.0290	0.0290	0.0290	0.0289	0.0290	0.0292	0.0295	0.0293	0.0292		*n*
	0.0284	0.0291	0.0290	0.0288	0.0289	0.0293	0.0292	0.0292	0.0285	0.0299		10
	0.0284	0.0291	0.0291	0.0291	0.0292	0.0292	0.0294	0.0292	0.0291	0.0295		
	0.0292	0.0288	0.0291	0.0292	0.0291	0.0290	0.0294	0.0291	0.0298	0.0293		
	0.0291	0.0291	0.0292	0.0293	0.0292	0.0291	0.0292	0.0293	0.0297	0.0292		
	0.0289	0.0291	0.0291	0.0291	0.0293	0.0291	0.0292	0.0293		0.0294		
***M* [%]**	**0.0287**	**0.0290**	**0.0291**	**0.0291**	**0.0291**	**0.0291**	**0.0293**	**0.0293**	**0.0293**	**0.0294**		**0.0291**
s [%]	0.0004	0.0001	0.0001	0.0002	0.0002	0.0001	0.0001	0.0001	0.0005	0.0003	s_M [%]	0.00019
											$\bar{s}_i$ [%]	0.00025
s_{rel}	0.01383	0.00417	0.00232	0.00592	0.00576	0.00445	0.00353	0.00467	0.01781	0.00911		0.00656

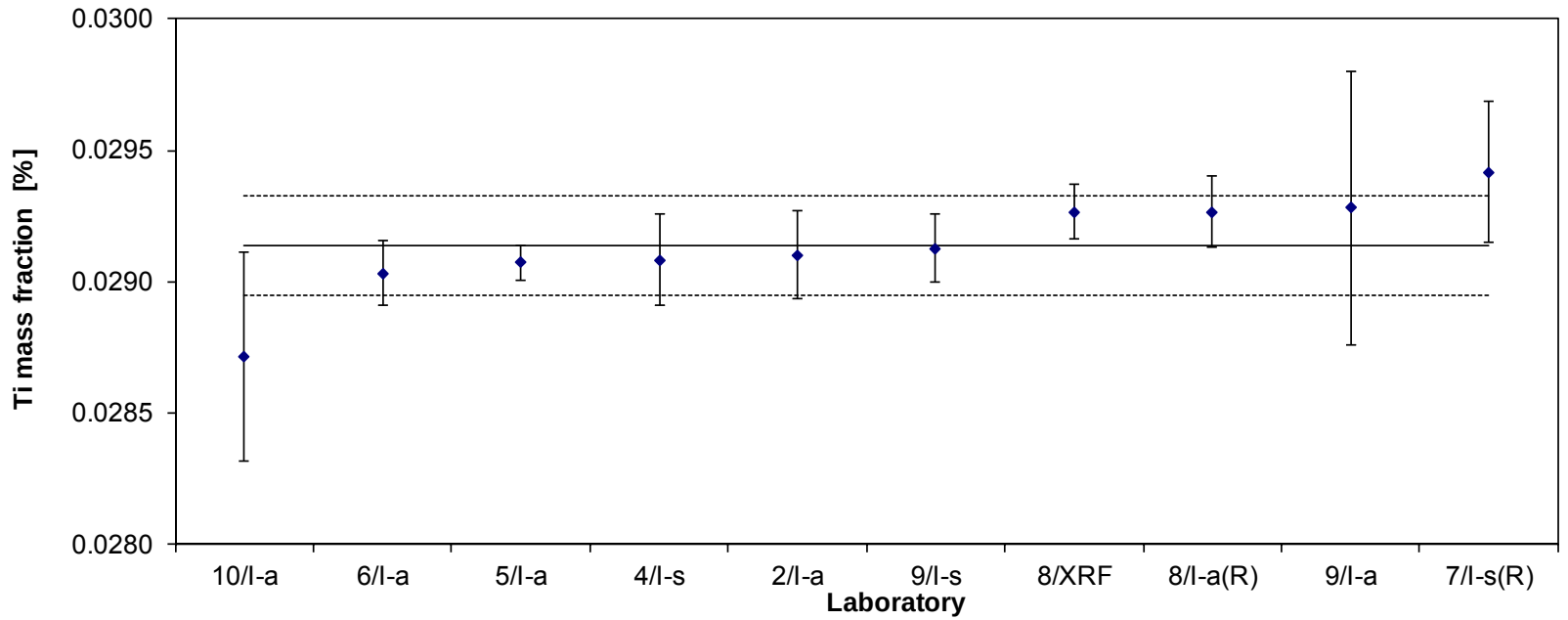

Table 9: Results for Ti

Lab./Meth.	8/I-a(R)	6/I-a	9/I-s	2/IMS-s	9/I-a	4/I-s	10/I-a(R)	9/IMS	5/I-a		
M_i [%]	0.0130	0.0127	0.0128	0.0129	0.0127	0.0131	0.0131	0.0132	0.0132		*n*
	0.0121	0.0128	0.0127	0.0127	0.0125	0.0129	0.0132	0.0130	0.0133		9
	0.0124	0.0128	0.0127	0.0128	0.0129	0.0132	0.0135	0.0132	0.0134		
	0.0124	0.0128	0.0127	0.0129	0.0136	0.0131	0.0128	0.0132	0.0133		
	0.0126	0.0127	0.0128	0.0128	0.0135	0.0131	0.0132	0.0130	0.0133		
	0.0127	0.0126	0.0127	0.0129		0.0130	0.0130	0.0133	0.0133		
								0.0131			
***M* [%]**	**0.0125**	**0.0127**	**0.0127**	**0.0128**	**0.0130**	**0.0131**	**0.0131**	**0.0131**	**0.0133**		**0.0129**
s [%]	0.0003	0.0001	0.0000	0.0001	0.0005	0.0001	0.0002	0.0001	0.0001	s_M [%]	0.00025
										$\bar{s}_i$ [%]	0.00022
s_{rel}	0.025	0.006	0.004	0.007	0.037	0.008	0.018	0.008	0.004		0.019

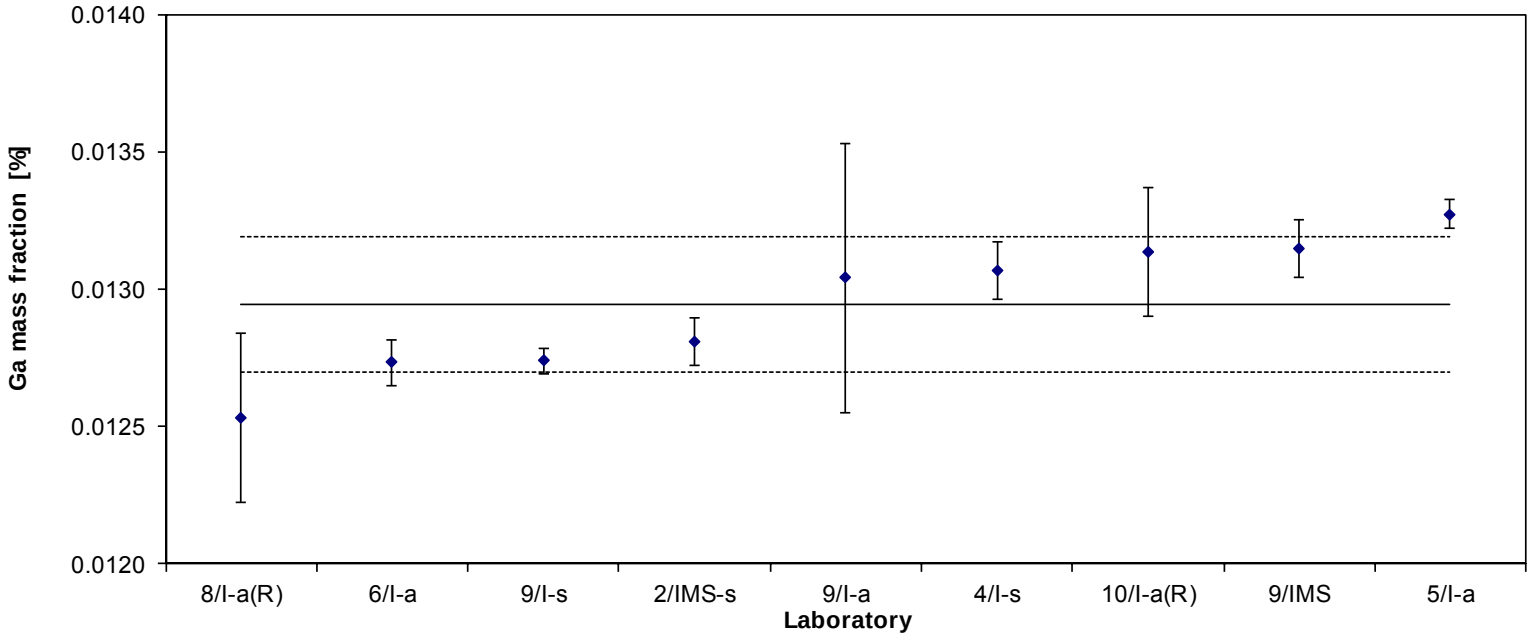

Table 10: Results for Ga

Lab./Meth.	10/I-a	7/IMS-s(I)	9/IMS	8/XRF(R)	7/I-s	6/I-s	7/IMS-s(II)	4/I-s	2/IMS-s	8/I-s(R)	5/I-a		
M_i [mg/kg]	38.0	39.2	41.5	39.2	40.0	40.0	39.2	41.4	42.5	43.0	42.4		*n*
	36.0	39.1	39.6	40.2	40.1	40.6	39.0	42.1	42.2	43.0	42.8		11
	41.0	39.8	39.8	39.5	39.9	40.9	41.1	41.4	42.0	42.0	42.5		
	40.0	38.9	38.9	39.8	40.0	40.1	45.7	41.6	42.8	43.0	42.4		
	39.0	38.6	39.4	40.6	39.9	39.4	42.5	41.6	41.7	42.0	42.7		
	40.0	38.6	39.4	40.3	40.0	40.7	40.9	41.5	42.0	42.0	42.2		
			39.6										
***M* [mg/kg]**	**39.00**	**39.03**	**39.74**	**39.93**	**39.96**	**40.28**	**41.40**	**41.60**	**42.20**	**42.50**	**42.50**		**40.74**
s [mg/kg]	1.789	0.450	0.800	0.528	0.054	0.556	2.475	0.261	0.379	0.548	0.219	s_M [mg/kg]	1.338
												$\bar{s}_i$ [mg/kg]	1.014
s_{rel}	0.046	0.012	0.020	0.013	0.001	0.014	0.060	0.006	0.009	0.013	0.005		0.033

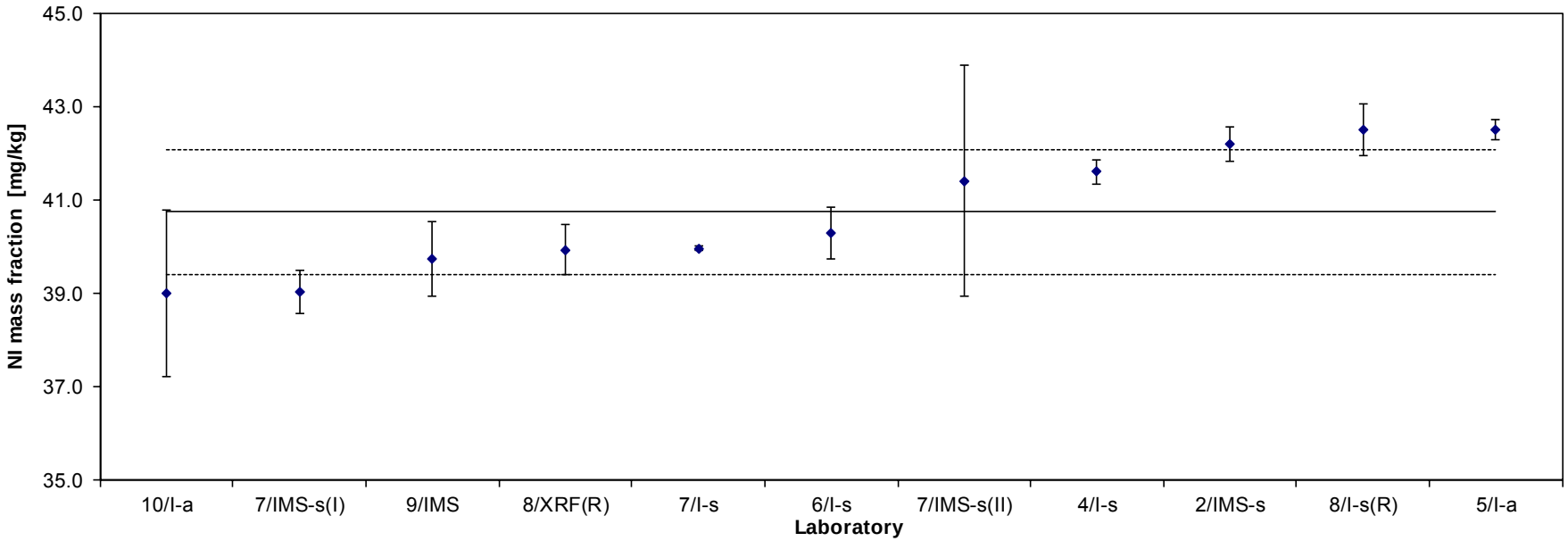

Table 11: Results for Ni

Lab./Meth.	4/I-s	9/I-s	5/I-a	2/IMS-s	9/IMS	6/I-s(R)	7/IMS-s	7/I-s	9/EA		
M_i [mg/kg]	16.2	17.8	17.2	17.7	17.8	19.0	17.5	19.7	19.8		*n*
	16.2	17.1	17.2	17.7	17.7	18.7	17.9	19.6	20.6		9
	16.2	17.0	18.4	17.7	18.2	19.8	20.2	19.6	19.3		
	16.2	16.7	17.5	17.8	17.9	18.4	19.1	19.7	19.9		
	16.1	17.2	17.0	17.5	17.6	17.2	17.9	19.6	19.8		
	16.2	16.6	16.7	17.7	17.7	16.7	18.2	19.6			
					17.4						
***M* [mg/kg]**	**16.18**	**17.05**	**17.33**	**17.68**	**17.75**	**18.30**	**18.47**	**19.64**	**19.84**		**18.03**
s [mg/kg]	0.041	0.415	0.585	0.096	0.237	1.156	1.005	0.035	0.465	s_M [mg/kg]	1.182
										$\bar{s}_i$ [mg/kg]	0.591
s_{rel}	0.003	0.024	0.034	0.005	0.013	0.063	0.054	0.002	0.023		0.066

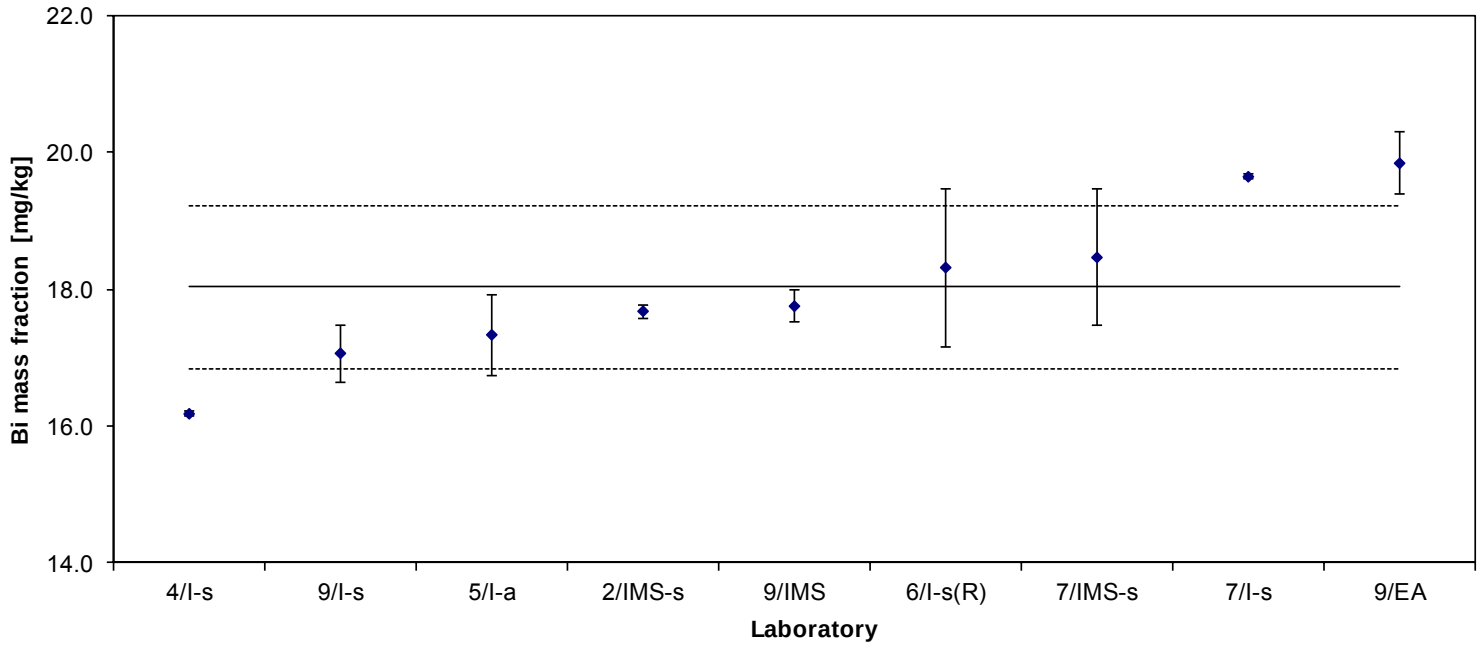

Table 12: Results for Bi

Lab./Meth.	9/I-s	10/I-a	2/IMS-s	9/EA	7/IMS-s(I)	4/I-s	9/IMS	7/IMS-s(II)	8/I-a(R)	7/I-s(R)	6/I-s	5/I-a		
M_i [mg/kg]	16.0	16.2	16.44	16.58	15.9	16.5	16.7	16.6	17.0	17.1	16.9	17.3		*n*
	16.3	16.5	16.66	15.81	15.7	16.7	16.7	17.1	17.0	17.2	17.1	17.4		12
	16.1	16.5	16.74	16.93	17.4	16.6	16.6	17.1	17.0	17.0	17.0	17.2		
	16.0	16.2	16.07	16.46	16.7	16.6	16.7	16.8	17.0	16.9	17.1	17.2		
	16.0	16.2	16.32	16.60	16.5	16.6	16.6	16.6	17.0	17.1	17.0	17.1		
	16.1	16.4	16.36	16.82	17.1	16.6	16.5	17.0	17.0	16.9	17.1	16.9		
							16.8							
***M* [mg/kg]**	**16.09**	**16.33**	**16.43**	**16.53**	**16.55**	**16.60**	**16.65**	**16.87**	**17.00**	**17.03**	**17.03**	**17.18**		**16.69**
s [mg/kg]	0.123	0.151	0.242	0.394	0.663	0.063	0.080	0.234	0.000	0.123	0.082	0.172	s_M [mg/kg]	0.332
													$\bar{s}_i$ [mg/kg]	0.259
s_{rel}	0.008	0.009	0.015	0.024	0.040	0.004	0.005	0.014	0.000	0.007	0.005	0.010		0.020

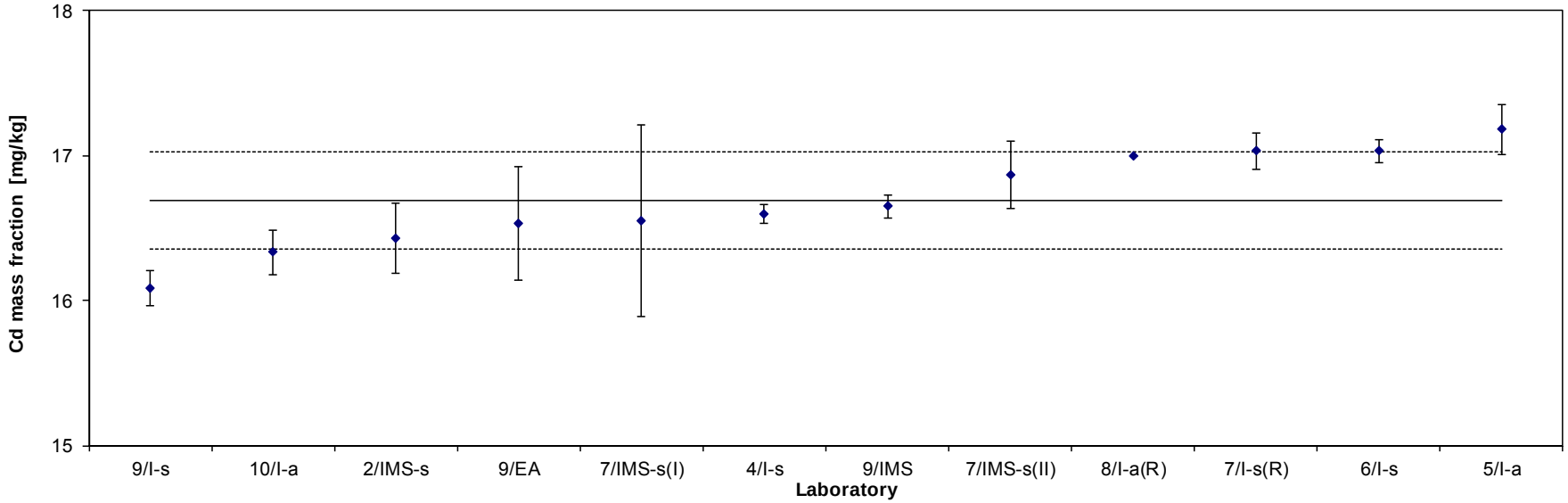

Table 13: Results for Cd

Lab./Meth.	2/I-s	7/IMS-s(I)	4/I-s	9/IMS	5/I-a	6/I-s	9/I-s		
M_i [mg/kg]	5.5	5.8	5.8	6.2	6.2	6.4	6.3		*n*
	5.5	5.9	5.8	6.0	6.1	6.4	6.4		7
	5.6	5.8	5.7	6.0	6.1	6.3	6.4		
	5.9	5.8	5.9	5.7	6.1	6.4	6.3		
	5.7	5.7	5.9	5.6	6.2	6.3	6.3		
	6.0	5.7	5.8	6.0	6.0	6.3	6.4		
***M* [mg/kg]**	**5.70**	**5.78**	**5.82**	**5.91**	**6.12**	**6.35**	**6.35**		**6.00**
s [mg/kg]	0.213	0.080	0.075	0.211	0.075	0.055	0.030	s_M [mg/kg]	0.271
								$\bar{s}_i$ [mg/kg]	0.126
s_{rel}	0.037	0.014	0.013	0.036	0.012	0.009	0.005		0.045

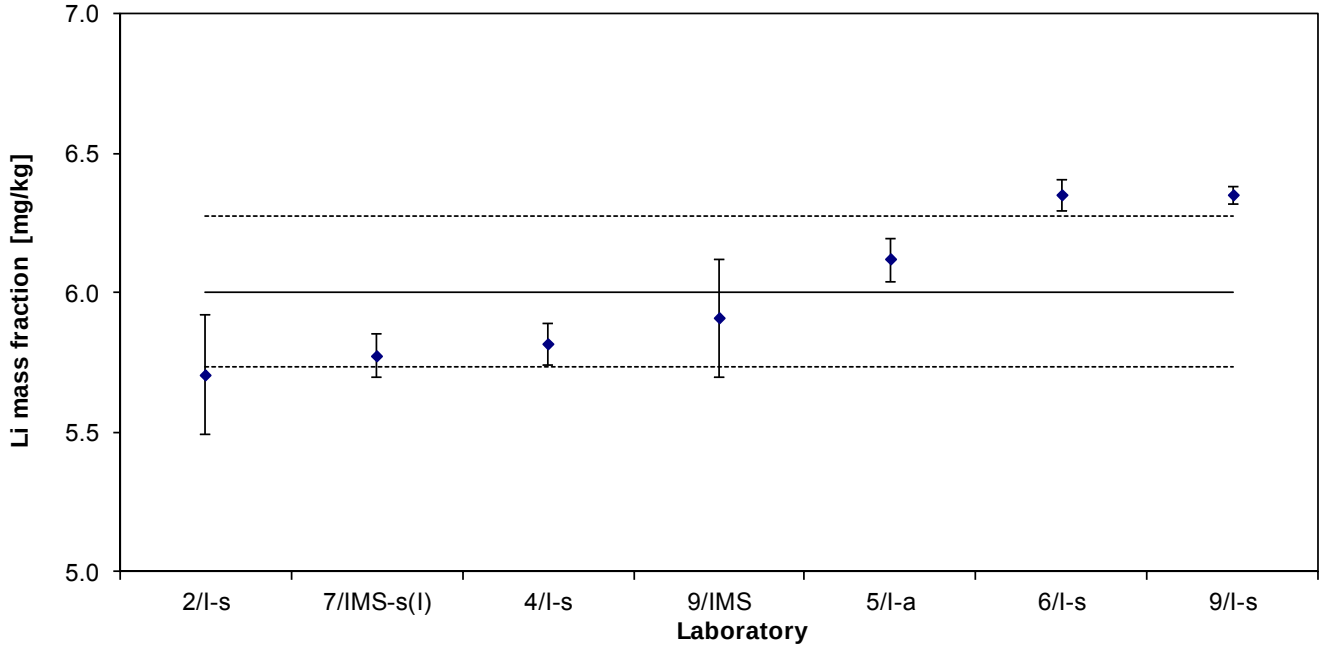

Table 14: Results for Li

Lab./Meth.	6/I-s	4/I-s	8/XRF	2/IMS-s	7/IMS-s(I)	7/IMS-s(II)	7/I-s(R)	9/IMS	9/I-s	9/EA	5/I-a		
M_i [mg/kg]	46.7	47.1	48.1	48.8	49.3	46.8	49.8	50.3	51.0	53.1	54.9		*n*
	46.9	47.4	48.3	48.7	48.9	47.7	48.8	49.8	51.4	50.6	51.2		11
	47.9	47.2	48.1	48.9	49.1	53.3	50.1	50.9	50.8	53.5	50.8		
	47.0	47.6	48.8	48.8	49.2	51.3	49.1	50.3	51.6	52.2	52.7		
	47.5	47.4	47.7	48.8	49.5	48.3	49.5	49.5	51.3	52.7	54.3		
	47.6	47.1	47.4	49.2	50.2	49.2	49.8	49.8	50.2	53.3	52.6		
								49.1					
***M* [mg/kg]**	**47.27**	**47.30**	**48.07**	**48.87**	**49.37**	**49.43**	**49.53**	**49.96**	**51.04**	**52.56**	**52.75**		**49.65**
s [mg/kg]	0.468	0.200	0.484	0.159	0.455	2.438	0.503	0.594	0.497	1.060	1.628	s_M [mg/kg]	1.858
												$\bar{s}_i$ [mg/kg]	1.013
s_{rel}	0.010	0.004	0.010	0.003	0.009	0.049	0.010	0.012	0.010	0.020	0.031		0.037

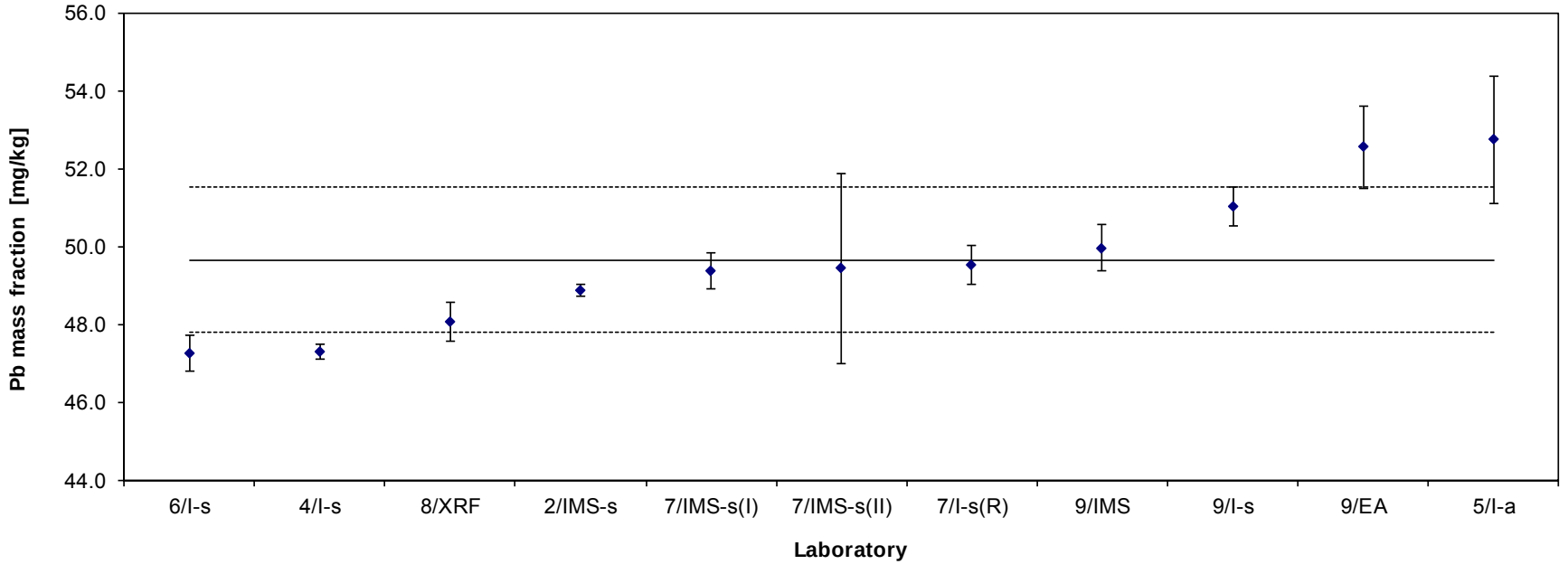

Table 15: Results for Pb

Lab./Meth.	6/I-s	9/I-s	2/I-a	9/IMS	5/I-a	4/I-s	7/IMS-s(II)	8/I-a(R)		
M_i [mg/kg]	10.6	10.9	10.9	10.8	11.2	11.1	11.3	13.0		*n*
	10.6	10.8	10.9	11.0	11.1	11.2	11.4	13.0		8
	10.7	10.8	10.5	10.9	11.1	11.1	11.7	11.0		
	10.5	10.7	10.9	10.9	11.0	11.2	10.9	11.0		
	10.4	10.7	10.8	10.7	11.0	11.2	12.0	12.0		
	10.6	10.7	10.9	10.7	11.0	11.0	11.9	13.0		
				10.7						
***M* [mg/kg]**	**10.57**	**10.76**	**10.81**	**10.83**	**11.07**	**11.13**	**11.53**	**12.17**		**11.11**
s [mg/kg]	0.103	0.071	0.157	0.109	0.082	0.082	0.413	0.983	s_M [mg/kg]	0.519
									$\bar{s}_i$ [mg/kg]	0.388
s_{rel}	0.010	0.007	0.015	0.010	0.007	0.007	0.036	0.081		0.047

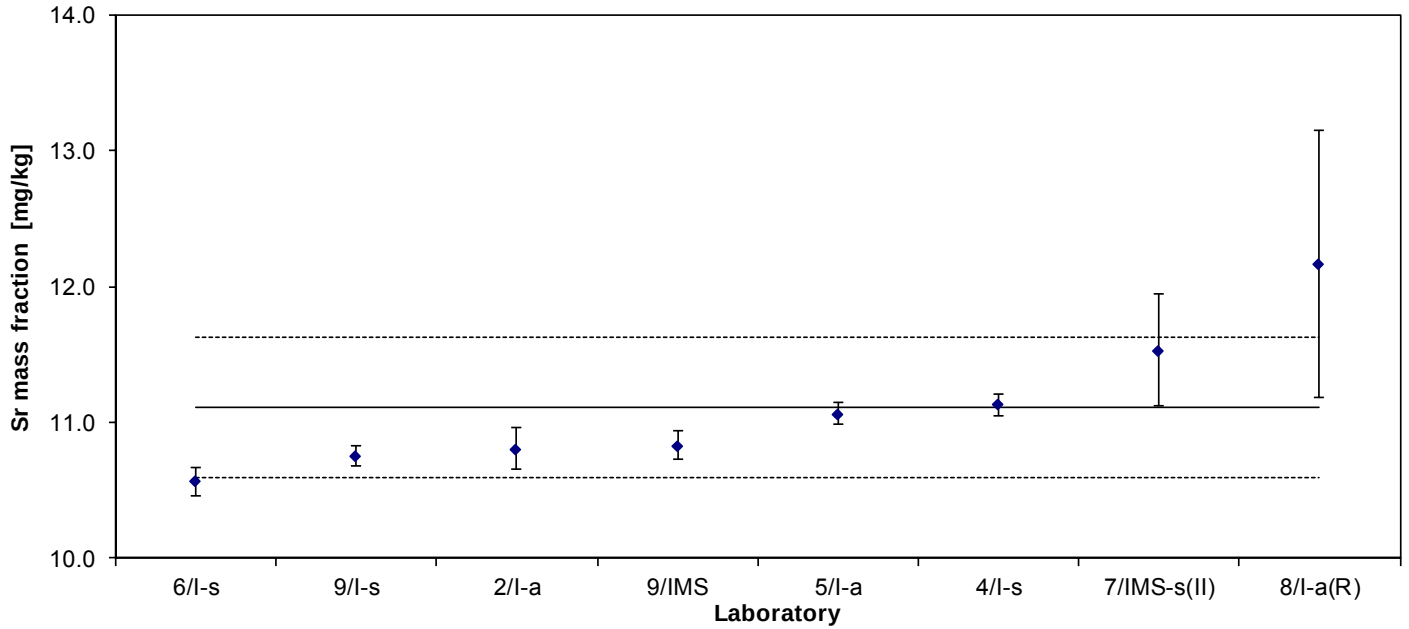

Table 16: Results for Sr

Lab./Meth.	9/IMS	7/IMS-s(I)	7/I-s(R)	4/I-s	8/I-a(R)	10/I-a(R)	7/IMS-s(II)	9/I-s	2/IMS-s	8/XRF(R)	6/I-s	9/P	5/I-a		
M_i [mg/kg]	67.2	69.0	65.2	66.7	65.0	66.2	63.1	66.8	69.4	68.3	68.2	67.6	67.9		*n*
	66.6	67.4	69.3	66.7	64.0	68.3	63.5	67.9	67.6	69.2	68.3	66.8	68.1		13
	66.5	65.2	65.2	67.1	67.0	67.5	67.4	67.6	67.3	68.1	68.5	69.5	68.4		
	65.4	66.2	67.1	66.6	68.0	66.3	72.9	67.1	68.2	69.4	68.3	70.7	68.7		
	64.6	63.7	65.0	66.2	67.0	64.5	68.1	67.2	68.0	68.5	68.4	67.4	68.9		
	66.7		66.9	66.6	69.0	67.9	66.1	67.7	68.0	66.2	68.1		68.7		
	66.4														
***M* [mg/kg]**	**66.20**	**66.30**	**66.44**	**66.65**	**66.67**	**66.78**	**66.85**	**67.37**	**68.09**	**68.28**	**68.30**	**68.40**	**68.45**		**67.29**
s [mg/kg]	0.899	2.030	1.698	0.288	1.862	1.403	3.587	0.406	0.744	1.141	0.141	1.636	0.389	s_M [mg/kg]	0.884
														$\bar{s}_i$ [mg/kg]	1.546
s_{rel}	0.014	0.031	0.026	0.004	0.028	0.021	0.054	0.006	0.011	0.017	0.002	0.024	0.006		0.013

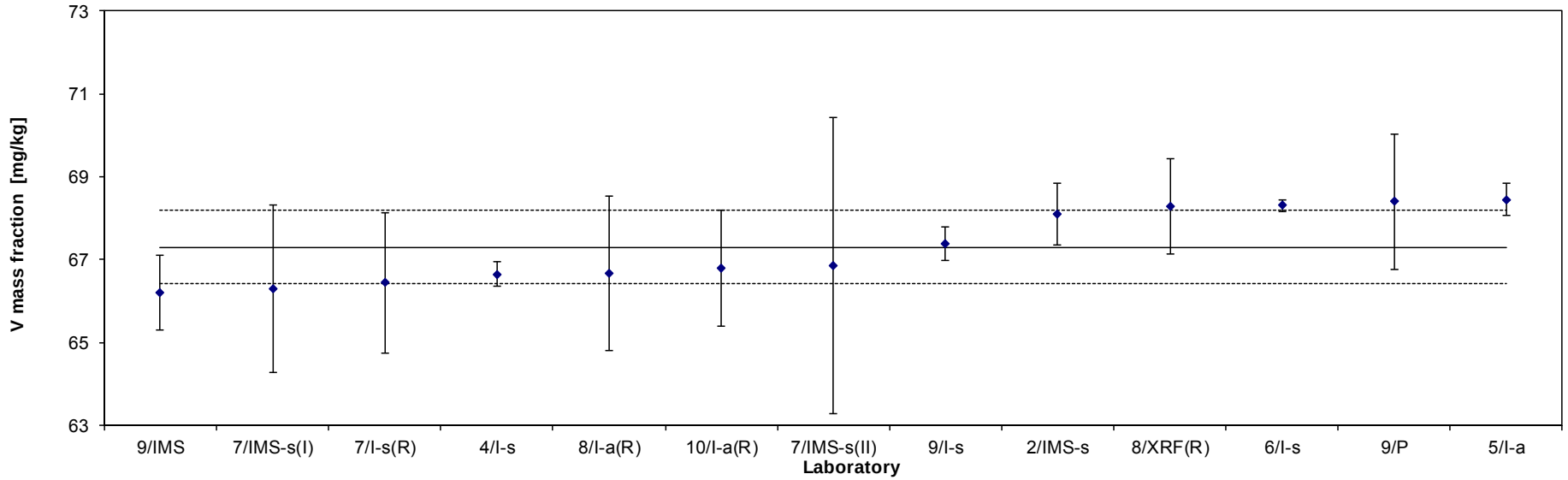

Table 17: Results for V

Lab./Meth.	8/XRF(R)	7/IMS-s(I)	9/I-s	9/P	9/IMS	6/I-s	8/I-a(R)	2/I-s	5/I-a	10/I-a(R)	7/I-s(R)	4/I-s		
M_i [mg/kg]	7.5	7.8	8.3	8.2	8.34	8.4	8.0	8.5	8.6	8.5	9.2	9.3		*n*
	7.5	7.7	8.1	8.5	8.19	8.3	8.0	8.5	8.6	8.7	9.2	9.4		12
	7.5	8.3	8.4	8.5	8.40	8.4	8.0	8.5	8.6	8.5	8.9	9.3		
	7.4	7.9	8.2	8.2	8.23	8.4	9.0	8.8	8.6	8.6	9.1	9.3		
	7.4	8.5	8.4	8.2	8.32	8.5	9.0	8.6	8.6	8.8	9.0	9.3		
	7.4	8.6	8.0	8.2	8.33	8.5	9.0	8.5	8.6	8.7	9.0	9.3		
					8.49									
***M* [mg/kg]**	**7.45**	**8.13**	**8.25**	**8.31**	**8.33**	**8.42**	**8.50**	**8.57**	**8.60**	**8.63**	**9.05**	**9.32**		**8.46**
s [mg/kg]	0.0548	0.3830	0.1443	0.1206	0.1018	0.0753	0.5477	0.1270	0.0000	0.1211	0.1121	0.0408	s_M [mg/kg]	0.4629
													$\bar{s}_i$ [mg/kg]	0.220
s_{rel}	0.00735	0.04709	0.01750	0.01451	0.01222	0.00894	0.06444	0.01482	0.00000	0.01403	0.01239	0.00438		0.05470

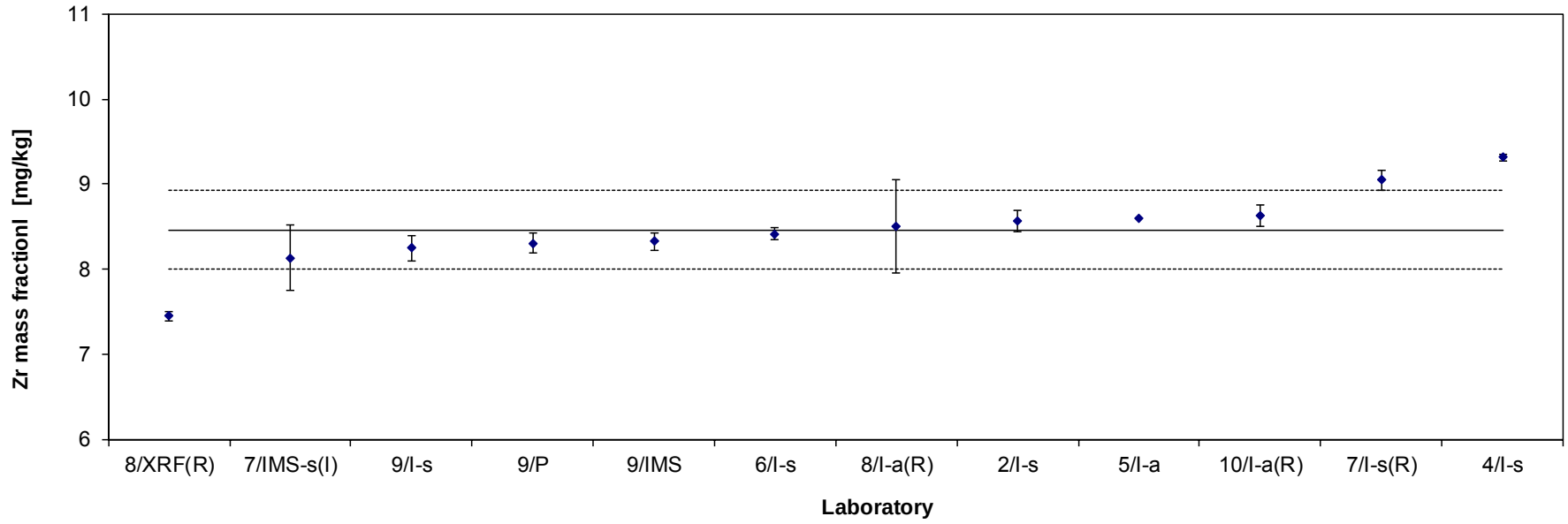

Table 18: Results for Zr

Lab./Meth.	4/I-s	5/I-a	6/I-s	2/IMS-s	9/IMS	7/IMS-s		
M_i [mg/kg]	2.1	2.4	2.1	3.0	3.0	3.5		*n*
	2.1	1.9	2.5	2.7	2.9	3.6		6
	2.1	2.2	2.5	2.9	3.0	4.2		
	2.0	1.9	2.3	2.9	3.3	3.3		
	2.0	2.4	2.5	2.9	2.7	3.6		
	2.1	2.3	2.3	2.8	2.9	3.4		
M [mg/kg]	**2.07**	**2.18**	**2.37**	**2.85**	**2.95**	**3.60**		**2.67**
s [mg/kg]	0.052	0.232	0.163	0.078	0.190	0.316	s_M [mg/kg]	0.577
							$\bar{s}_i$ [mg/kg]	0.194
s_{rel}	0.025	0.106	0.069	0.027	0.064	0.088		0.216

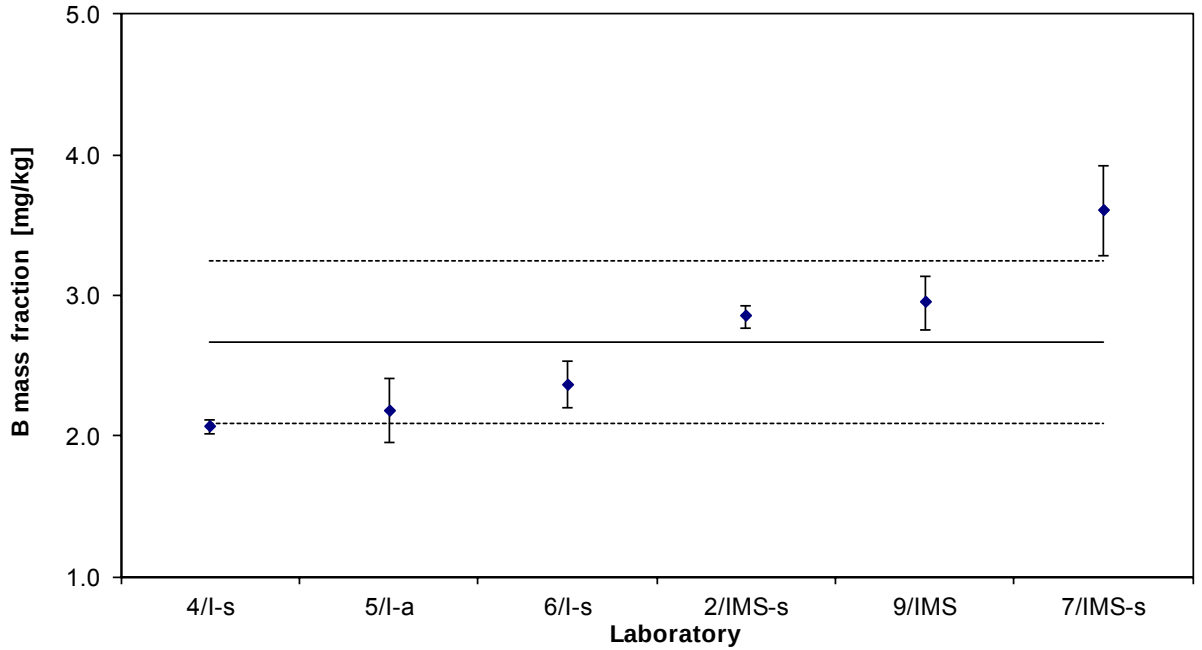

Table 19: Results for B

Lab./Meth.	2/I-s	4/I-s	9/I-s		
M_i [mg/kg]	3.4	4.0	5.3		*n*
	3.4	3.5	5.5		3
	3.4	3.6	5.8		
	3.5	3.6	4.6		
	3.3	3.4	4.5		
	3.4	3.5	4.6		
***M* [mg/kg]**	**3.40**	**3.60**	**5.05**		**4.02**
s [mg/kg]	0.073	0.210	0.547	s_M [mg/kg]	0.898
				$\bar{s}_i$ [mg/kg]	0.341
s_{rel}	0.021	0.058	0.108		0.223

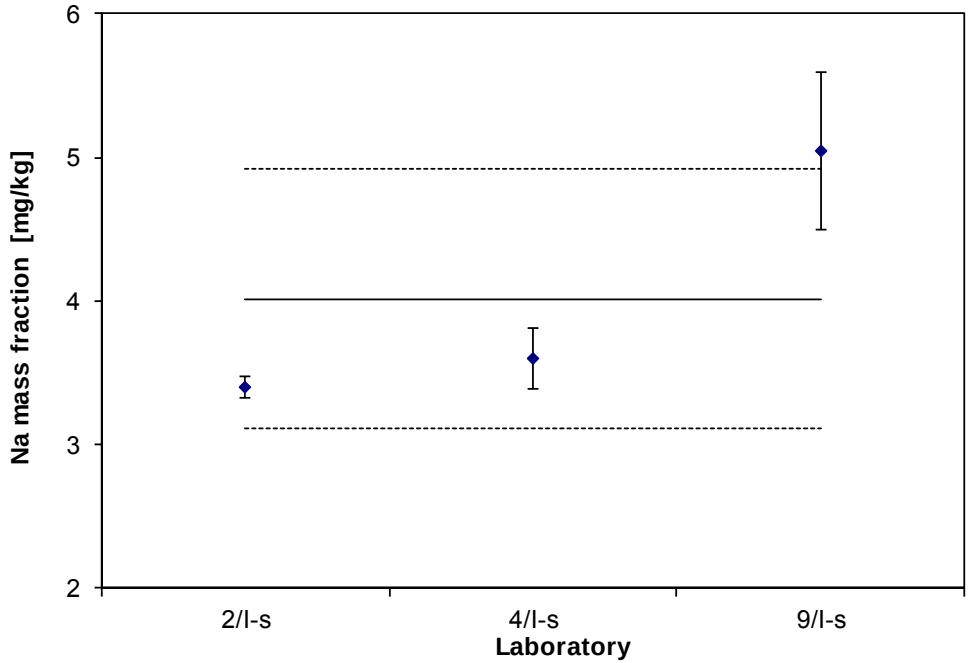

Table 20: Results for Na

Lab./Meth.	4/l-s	2/l-s	7/l-s		
M_i [mg/kg]	15.7	15.1	18.1		N
	16.1	16.0	18.3		3
	15.2	17.1	18.3		
	15.4	18.0	18.1		
	15.7	17.7	18.3		
	15.2	16.7	18.3		
M [mg/kg]	**15.55**	**16.77**	**18.23**		**16.85**
s [mg/kg]	0.351	1.075	0.090	s_M [mg/kg]	1.344
				$\bar{s}_i$ [mg/kg]	0.655
s_{rel}	0.023	0.064	0.005		0.080

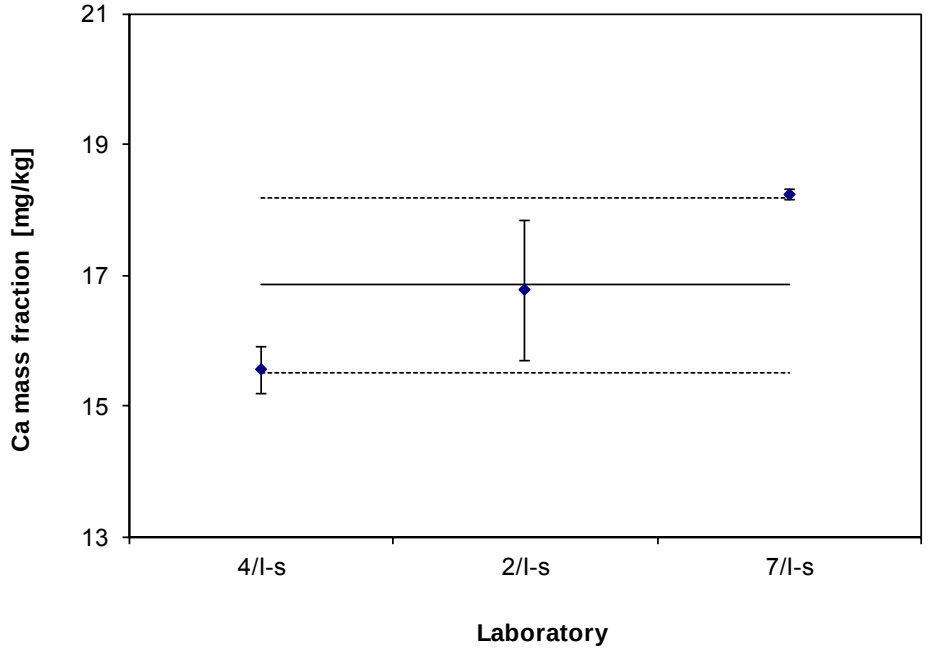

Table 21: Results for Ca

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

Table 22: Outcome of statistical tests of results obtained for Si

Number of data sets	8
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon (α = 0.05)	---
Dixon (α = 0.01)	---
Nalimov (α = 0.05)	---
Nalimov (α = 0.01)	---
Grubbs (α = 0.05)	---
Grubbs (α = 0.01)	---
Grubbs Pair (α = 0.05)	---
Grubbs Pair (α = 0.01)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test (α = 0.05)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test (α = 0.01)	Distribution: normal
Skewness & Kurtosis Test (α = 0.05)	Distribution: normal
Skewness & Kurtosis Test (α = 0.01)	Distribution: normal

Table 23: Outcome of statistical tests of results obtained for Fe

Number of data sets	10
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon (α = 0.05)	---
Dixon (α = 0.01)	---
Nalimov (α = 0.05)	---
Nalimov (α = 0.01)	---
Grubbs (α = 0.05)	---
Grubbs (α = 0.01)	---
Grubbs Pair (α = 0.05)	---
Grubbs Pair (α = 0.01)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test (α = 0.05)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test (α = 0.01)	Distribution: normal
Skewness & Kurtosis Test (α = 0.05)	Distribution: normal
Skewness & Kurtosis Test (α = 0.01)	Distribution: normal

Table 24: Outcome of statistical tests of results obtained for Cu

Number of data sets	10
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon (α = 0.05)	---
Dixon (α = 0.01)	---
Nalimov (α = 0.05)	Lab. 9/IMS
Nalimov (α = 0.01)	---
Grubbs (α = 0.05)	---
Grubbs (α = 0.01)	---
Grubbs Pair (α = 0.05)	---
Grubbs Pair (α = 0.01)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test (α = 0.05)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test (α = 0.01)	Distribution: normal
Skewness & Kurtosis Test (α = 0.05)	Distribution: normal
Skewness & Kurtosis Test (α = 0.01)	Distribution: normal

The straggler (Lab. 9/IMS) was not removed.

Table 25: Outcome of statistical tests of results obtained for Mn

Number of data sets	11
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon (α = 0.05)	Lab. 9/I-s
Dixon (α = 0.01)	---
Nalimov (α = 0.05)	Lab. 9/I-s
Nalimov (α = 0.01)	---
Grubbs (α = 0.05)	---
Grubbs (α = 0.01)	---
Grubbs Pair (α = 0.05)	---
Grubbs Pair (α = 0.01)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test (α = 0.05)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test (α = 0.01)	Distribution: normal
Skewness & Kurtosis Test (α = 0.05)	Distribution: normal
Skewness & Kurtosis Test (α = 0.01)	Distribution: normal

The straggler (Lab. 9/I-s) was not removed.

Table 26a: Outcome of statistical tests of results obtained for Mg

Number of data sets	10
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon (α = 0.05)	Lab. 6
Dixon (α = 0.01)	---
Nalimov (α = 0.05)	Lab. 6
Nalimov (α = 0.01)	Lab. 6
Grubbs (α = 0.05)	Lab. 6
Grubbs (α = 0.01)	Lab. 6
Grubbs Pair (α = 0.05)	---
Grubbs Pair (α = 0.01)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test (α = 0.05)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test (α = 0.01)	Distribution: normal
Skewness & Kurtosis Test (α = 0.05)	Distribution: not normal
Skewness & Kurtosis Test (α = 0.01)	Distribution: not normal

The outlier (Lab. 6) was removed.

Table 26b: Outcome of statistical tests of results obtained for Mg (after removal of outlier)

Number of data sets	9
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon (α = 0.05)	---
Dixon (α = 0.01)	---
Nalimov (α = 0.05)	---
Nalimov (α = 0.01)	---
Grubbs (α = 0.05)	---
Grubbs (α = 0.01)	---
Grubbs Pair (α = 0.05)	---
Grubbs Pair (α = 0.01)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test (α = 0.05)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test (α = 0.01)	Distribution: normal
Skewness & Kurtosis Test (α = 0.05)	Distribution: normal
Skewness & Kurtosis Test (α = 0.01)	Distribution: normal

Table 27: Outcome of statistical tests of results obtained for Cr

Number of data sets	10
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon (α = 0.05)	---
Dixon (α = 0.01)	---
Nalimov (α = 0.05)	---
Nalimov (α = 0.01)	---
Grubbs (α = 0.05)	---
Grubbs (α = 0.01)	---
Grubbs Pair (α = 0.05)	---
Grubbs Pair (α = 0.01)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test (α = 0.05)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test (α = 0.01)	Distribution: normal
Skewness & Kurtosis Test (α = 0.05)	Distribution: not normal
Skewness & Kurtosis Test (α = 0.01)	Distribution: normal

Table 28: Outcome of statistical tests of results obtained for Zn

Number of data sets	12
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon (α = 0.05)	---
Dixon (α = 0.01)	---
Nalimov (α = 0.05)	Lab. 9/IMS
Nalimov (α = 0.01)	---
Grubbs (α = 0.05)	---
Grubbs (α = 0.01)	---
Grubbs Pair (α = 0.05)	---
Grubbs Pair (α = 0.01)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test (α = 0.05)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test (α = 0.01)	Distribution: normal
Skewness & Kurtosis Test (α = 0.05)	Distribution: normal
Skewness & Kurtosis Test (α = 0.01)	Distribution: normal

The straggler (Lab. 9/IMS) was not removed.

Table 29: Outcome of statistical tests of results obtained for Ti

Number of data sets	10
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon (α = 0.05)	Lab. 10
Dixon (α = 0.01)	---
Nalimov (α = 0.05)	Lab. 10
Nalimov (α = 0.01)	Lab. 10
Grubbs (α = 0.05)	Lab. 10
Grubbs (α = 0.01)	---
Grubbs Pair (α = 0.05)	---
Grubbs Pair (α = 0.01)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test (α = 0.05)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test (α = 0.01)	Distribution: normal
Skewness & Kurtosis Test (α = 0.05)	Distribution: normal
Skewness & Kurtosis Test (α = 0.01)	Distribution: normal

The straggler (Lab. 10) was not removed.

Table 30: Outcome of statistical tests of results obtained for Ga

Number of data sets	9
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon (α = 0.05)	---
Dixon (α = 0.01)	---
Nalimov (α = 0.05)	---
Nalimov (α = 0.01)	---
Grubbs (α = 0.05)	---
Grubbs (α = 0.01)	---
Grubbs Pair (α = 0.05)	---
Grubbs Pair (α = 0.01)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test (α = 0.05)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test (α = 0.01)	Distribution: normal
Skewness & Kurtosis Test (α = 0.05)	Distribution: normal
Skewness & Kurtosis Test (α = 0.01)	Distribution: normal

Table 31: Outcome of statistical tests of results obtained for Ni

Number of data sets	11
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon (α = 0.05)	---
Dixon (α = 0.01)	---
Nalimov (α = 0.05)	---
Nalimov (α = 0.01)	---
Grubbs (α = 0.05)	---
Grubbs (α = 0.01)	---
Grubbs Pair (α = 0.05)	---
Grubbs Pair (α = 0.01)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test (α = 0.05)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test (α = 0.01)	Distribution: normal
Skewness & Kurtosis Test (α = 0.05)	Distribution: normal
Skewness & Kurtosis Test (α = 0.01)	Distribution: normal

Table 32: Outcome of statistical tests of results obtained for Bi

Number of data sets	9
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon (α = 0.05)	---
Dixon (α = 0.01)	---
Nalimov (α = 0.05)	---
Nalimov (α = 0.01)	---
Grubbs (α = 0.05)	---
Grubbs (α = 0.01)	---
Grubbs Pair (α = 0.05)	---
Grubbs Pair (α = 0.01)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test (α = 0.05)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test (α = 0.01)	Distribution: normal
Skewness & Kurtosis Test (α = 0.05)	Distribution: normal
Skewness & Kurtosis Test (α = 0.01)	Distribution: normal

Table 33: Outcome of statistical tests of results obtained for Cd

Number of data sets	12
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon (α = 0.05)	---
Dixon (α = 0.01)	---
Nalimov (α = 0.05)	---
Nalimov (α = 0.01)	---
Grubbs (α = 0.05)	---
Grubbs (α = 0.01)	---
Grubbs Pair (α = 0.05)	---
Grubbs Pair (α = 0.01)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test (α = 0.05)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test (α = 0.01)	Distribution: normal
Skewness & Kurtosis Test (α = 0.05)	Distribution: normal
Skewness & Kurtosis Test (α = 0.01)	Distribution: normal

Table 34: Outcome of statistical tests of results obtained for Li

Number of data sets	7
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon (α = 0.05)	---
Dixon (α = 0.01)	---
Nalimov (α = 0.05)	---
Nalimov (α = 0.01)	---
Grubbs (α = 0.05)	---
Grubbs (α = 0.01)	---
Grubbs Pair (α = 0.05)	---
Grubbs Pair (α = 0.01)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test (α = 0.05)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test (α = 0.01)	Distribution: normal
Skewness & Kurtosis Test (α = 0.05)	Distribution: normal
Skewness & Kurtosis Test (α = 0.01)	Distribution: normal

Table 35: Outcome of statistical tests of results obtained for Pb

Number of data sets	8
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon (α = 0.05)	---
Dixon (α = 0.01)	---
Nalimov (α = 0.05)	---
Nalimov (α = 0.01)	---
Grubbs (α = 0.05)	---
Grubbs (α = 0.01)	---
Grubbs Pair (α = 0.05)	---
Grubbs Pair (α = 0.01)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test (α = 0.05)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test (α = 0.01)	Distribution: normal
Skewness & Kurtosis Test (α = 0.05)	Distribution: normal
Skewness & Kurtosis Test (α = 0.01)	Distribution: normal

Table 36: Outcome of statistical tests of results obtained for Sr

8	8
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon (α = 0.05)	---
Dixon (α = 0.01)	---
Nalimov (α = 0.05)	Lab. 8
Nalimov (α = 0.01)	---
Grubbs (α = 0.05)	---
Grubbs (α = 0.01)	---
Grubbs Pair (α = 0.05)	---
Grubbs Pair (α = 0.01)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test (α = 0.05)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test (α = 0.01)	Distribution: normal
Skewness & Kurtosis Test (α = 0.05)	Distribution: normal
Skewness & Kurtosis Test (α = 0.01)	Distribution: normal

The straggler (Lab. 8) was not removed.

Table 37: Outcome of statistical tests of results obtained for V

Number of data sets	13
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon (α = 0.05)	---
Dixon (α = 0.01)	---
Nalimov (α = 0.05)	---
Nalimov (α = 0.01)	---
Grubbs (α = 0.05)	---
Grubbs (α = 0.01)	---
Grubbs Pair (α = 0.05)	---
Grubbs Pair (α = 0.01)	---
Cochran (α = 0.01)	---
Kolmogorov-Smirnov-Lilliefors Test (α = 0.05)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test (α = 0.01)	Distribution: normal
Skewness & Kurtosis Test (α = 0.05)	Distribution: normal
Skewness & Kurtosis Test (α = 0.01)	Distribution: normal

Table 38: Outcome of statistical tests of results obtained for Zr

Number of data sets	12
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon (α = 0.05)	Lab. 4
Dixon (α = 0.01)	---
Nalimov (α = 0.05)	Labs. 4 and 8/XRF
Nalimov (α = 0.01)	---
Grubbs (α = 0.05)	---
Grubbs (α = 0.01)	---
Grubbs Pair (α = 0.05)	---
Grubbs Pair (α = 0.01)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test (α = 0.05)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test (α = 0.01)	Distribution: normal
Skewness & Kurtosis Test (α = 0.05)	Distribution: normal
Skewness & Kurtosis Test (α = 0.01)	Distribution: normal

The stragglers (Labs. 4 and 8) were not removed.

Table 39: Outcome of statistical tests of results obtained for B

Number of data sets	6
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon (α = 0.05)	---
Dixon (α = 0.01)	---
Nalimov (α = 0.05)	---
Nalimov (α = 0.01)	---
Grubbs (α = 0.05)	---
Grubbs (α = 0.01)	---
Grubbs Pair (α = 0.05)	---
Grubbs Pair (α = 0.01)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test (α = 0.05)	Distribution: normal
Kolmogorov-Smirnov-Lilliefors Test (α = 0.01)	Distribution: normal
Skewness & Kurtosis Test (α = 0.05)	Distribution: insufficient data
Skewness & Kurtosis Test (α = 0.01)	Distribution: insufficient data

Table 40: Outcome of statistical tests of results obtained for Na

Number of data sets	3
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon (α = 0.05)	---
Dixon (α = 0.01)	---
Nalimov (α = 0.05)	---
Nalimov (α = 0.01)	---
Grubbs (α = 0.05)	---
Grubbs (α = 0.01)	---
Grubbs Pair (α = 0.05)	---
Grubbs Pair (α = 0.01)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test (α = 0.05)	Distribution: insufficient data
Kolmogorov-Smirnov-Lilliefors Test (α = 0.01)	Distribution: insufficient data
Skewness & Kurtosis Test (α = 0.05)	Distribution: insufficient data
Skewness & Kurtosis Test (α = 0.01)	Distribution: insufficient data

Table 41: Outcome of statistical tests of results obtained for Ca

Number of data sets	3
Snedecor-F-Test and Bartlett-Test	Pooling not allowed
Dixon (α = 0.05)	---
Dixon (α = 0.01)	---
Nalimov (α = 0.05)	---
Nalimov (α = 0.01)	---
Grubbs (α = 0.05)	---
Grubbs (α = 0.01)	---
Grubbs Pair (α = 0.05)	---
Grubbs Pair (α = 0.01)	---
Cochran	---
Kolmogorov-Smirnov-Lilliefors Test (α = 0.05)	Distribution: insufficient data
Kolmogorov-Smirnov-Lilliefors Test (α = 0.01)	Distribution: insufficient data
Skewness & Kurtosis Test (α = 0.05)	Distribution: insufficient data
Skewness & Kurtosis Test (α = 0.01)	Distribution: insufficient data

The certified mass fractions of all elements were calculated as mean of the accepted data sets. These values are given in Table 42.
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 over the length ($u_{bb}(1)$) and over area ($u_{bb}(2)$) of the material using Equation 3.

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

with

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

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

Table 42: Uncertainty calculation

	uncertainty contribution from									u_{bb} (rel)	
	M	n	s_M	u_{ilc}	u_{bb} (1) Length	u_{bb} (2) Area	u(comb)	U		Length	Area
	%		%	%	%	%	%	%			
Si	0.4030	8	0.0072	0.0025	0.0020	0.0016	0.0036	0.00716		0.4843	0.3940
Fe	0.1977	10	0.0022	0.0007	0.0011	0.0011	0.0017	0.00341		0.5650	0.5480
Cu	0.0509	10	0.0014	0.0004	0.0002	0.0005	0.0007	0.00140		0.3730	1.0000
Mn	0.0488	11	0.0016	0.0005	0.0001	0.0002	0.0005	0.00104		0.2280	0.3180
Mg	0.3790	9	0.0030	0.0010	0.0007	0.0016	0.0020	0.00397		0.1900	0.4100
Cr	0.0320	11	0.0009	0.0003	0.0001	0.0003	0.0004	0.00082		0.1900	0.9400
Zn	0.0297	12	0.0007	0.0002	0.0001	0.0003	0.0004	0.00077		0.2340	1.1000
Ti	0.0291	10	0.0002	0.0001	0.0002	0.0005	0.0005	0.00106		0.7470	1.6400
Ga	0.0129	9	0.0002	0.0001	0.0000	0.0001	0.0001	0.00029		0.2953	0.9000
	mg/kg		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg			
B	2.6700	6	0.5770	0.2356	0.3818	0.0606	0.4527	0.9054		14.3000	2.2700
Bi	18.0300	9	1.1820	0.3940	0.3913	0.7014	0.8946	1.7891		2.1700	3.8900
Cd	16.6900	12	0.3320	0.0958	0.4106	0.4530	0.6188	1.2376		2.4600	2.7140
Ni	40.7400	11	1.3380	0.4034	0.7068	0.8759	1.1957	2.3913		1.7350	2.1500
Pb	49.6500	11	1.8580	0.5602	0.2751	0.8341	1.0418	2.0835		0.5540	1.6800
Sr	11.1100	8	0.5190	0.1835	0.2333	0.0642	0.3037	0.6074		2.1000	0.5780
V	67.2900	13	0.8850	0.2455	0.3442	0.5127	0.6645	1.3291		0.5115	0.7620
Zr	8.4600	12	0.4630	0.1337	0.2736	0.1151	0.3255	0.6510		3.2340	1.3600
Li	6.0000	7	0.2710	0.1024	0.5268	0.0551	0.5395	1.0790		8.7800	0.9180
Na	4.0200	3	0.8980	0.5185	0.2685	0.0949	0.5915	1.7746		6.6800	2.3600
Ca	16.8500	3	1.3440	0.7760	0.0835	0.1837	0.8018	2.4053		0.4954	1.0900

The expanded uncertainties *U* are calculated by multiplication of $u_{combined}$ with a coverage factor of $k = 2$ (Na, Ca: $k = 3$) using Equation 4.

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

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

In addition to the wet chemical characterization some of the laboratories analysed the material with spark emission to check if there is agreement between SOES and wet chemistry. Tab. 43 shows the mean values of wet chemical and spark emission results as well as their standard deviations. The agreement between wet chemistry and SOES is good for all elements.

Tab. 43: Comparison wet chemistry (incl. XRF) vs. SOES

Element	Wet chemical analysis			Spark emission		
	Mass fraction in %	**Std.-dev.** in %	***n***	**Mass fraction** in %	**Std.-dev.** in %	***n***
Si	0.403	0.0072	8	0.407	0.0070	8
Fe	0.1977	0.0022	10	0.1973	0.0018	8
Cu	0.0509	0.0014	10	0.0521	0.0018	8
Mn	0.0488	0.0016	11	0.0492	0.0009	8
Mg	0.379	0.003	9	0.379	0.005	8
Cr	0.0320	0.0009	11	0.0319	0.0013	8
Zn	0.0297	0.0007	12	0.0290	0.0011	7
Ti	0.0291	0.0002	10	0.0292	0.0004	8
Ga	0.0129	0.0003	9	0.0127	0.0002	8
	in mg/kg	in mg/kg		in mg/kg	in mg/kg	
Ni	40.7	1.4	11	41.2	1.7	7
B	..2.67	0.58	6	3.67	1.48	7
Bi	18.0	1.2	9	18.8	1.8	8
Ca	16.9	1.4	3	16.3	1.8	7
Cd	16.7	0.4	12	16.6	0.8	7
Li	6.00	0.28	7	5.93	0.50	7
Na	4.0	0.9	3	3.3	0.9	7
Pb	49.7	1.9	11	48.9	1.9	7
Sr	11.1	0.6	8	11.0	0.7	8
V	67.3	0.9	13	68.1	2.0	8
Zr	8.5	0.5	12	9.0	1.4	8

6. Instructions for users and stability

The certified reference material ERM®-EB312a is intended for the calibration and quality control of spark emission and X-ray fluorescence spectrometers used for the analysis of similar materials. It is also suitable for wet chemical analysis.
The surface of the material should be cleaned by turning or milling before analysis.
If chips prepared from the compact material are used for wet chemical analysis, a minimum sample intake of 0.2 g has to be used.
The material will remain stable if it is not subjected to excessive heat (eg, 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®-EB312a 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 72061
E-Mail: sales.crm@bam.de

Each disc of ERM®-EB312a 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)

Silicon:

Sample	*Number*	*Sum*	*Mean*	*Variance*		
AA	5	2.0276	0.40552	2.177E-06		
AB	5	2.0179	0.40358	6.522E-06		
AC	5	2.0394	0.40788	2.297E-06		
AD	5	2.0156	0.40312	1.067E-06		
AE	5	2.0364	0.40728	2.612E-06		
BA	5	2.0306	0.40612	3.017E-06		
BB	5	2.0181	0.40362	1.037E-06		
BC	5	2.0295	0.4059	1.375E-06		
BD	5	2.0291	0.40582	3.752E-06		
BE	5	2.0364	0.40728	2.447E-06		
DA	5	2.0447	0.40894	5.218E-06		
DB	5	2.0177	0.40354	1.0303E-05		
DC	5	2.0372	0.40744	3.053E-06		
DD	5	2.04	0.408	6.425E-06		
DE	5	2.0375	0.4075	2.285E-06		
EA	5	2.0385	0.4077	3.52E-06		
EB	5	2.0271	0.40542	1.302E-06		
EC	5	2.0219	0.40438	1.372E-06		
ED	5	2.0144	0.40288	2.712E-06		
EE	5	2.0162	0.40324	1.343E-06		
FA	5	2.0394	0.40788	1.532E-06		
FB	5	2.0246	0.40492	1.207E-06		
FC	5	2.0313	0.40626	2.098E-06		
FD	5	2.0129	0.40258	5.47E-07		
FE	5	2.0306	0.40612	9.77E-07		
			0.4057168			
ANOVA						
Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between group	0.000438047	24	1.82519E-05	6.5002588	8.0541E-12	1.62670811
Within groups	0.000280788	100	2.80788E-06			
Total	0.000718835	124				
within-sd	0.00167567					
effective r	4.00					
s_bb	0.00196495					
s_bb_min	0.00031508					
u_bb	0.00196495	1.96494699				
u_bb(rel.)	0.484314918					

Iron:

Sample	*Number*	*Sum*	*Mean*	*Variance*		
AA	5	0.9686	0.19372	8.57E-07		
AB	5	0.9603	0.19206	3.143E-06		
AC	5	0.9712	0.19424	1.383E-06		
AD	5	0.9637	0.19274	3.13E-07		
AE	5	0.9719	0.19438	1.972E-06		
BA	5	0.9767	0.19534	1.823E-06		
BB	5	0.9674	0.19348	8.7E-08		
BC	5	0.9681	0.19362	4.67E-07		
BD	5	0.9722	0.19444	1.183E-06		
BE	5	0.9701	0.19402	1.652E-06		
DA	5	0.9789	0.19578	2.132E-06		
DB	5	0.9641	0.19282	3.347E-06		
DC	5	0.9716	0.19432	1.392E-06		
DD	5	0.9723	0.19446	2.223E-06		
DE	5	0.9698	0.19396	1.108E-06		
EA	5	0.9715	0.1943	1.535E-06		
EB	5	0.9732	0.19464	6.68E-07		
EC	5	0.9627	0.19254	1.168E-06		
ED	5	0.9581	0.19162	5.92E-07		
EE	5	0.9641	0.19282	1.957E-06		
FA	5	0.9738	0.19476	5.83E-07		
FB	5	0.972	0.1944	6.95E-07		
FC	5	0.9707	0.19414	8.83E-07		
FD	5	0.9566	0.19132	2.07E-07		
FE	5	0.9701	0.19402	2.12E-07		
			0.1937576			
ANOVA						
Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	0.00014536	24	6.0566E-06	4.79430794	1.2383E-08	1.62670811
Within groups	0.00012633	100	1.2633E-06			
Total	0.00027169	124				
within-sd	0.001124					
effective n	4.00					
s_bb	0.001095					
s_bb_min	0.000211					
u_bb	0.001095	1.094677				
u_bb(rel.)	0.56497256					

Copper:

Sample	*Number*	*Sum*	*Mean*	*Variance*		
AA	5	0.2387	0.04774	4.3E-08		
AB	5	0.2366	0.04732	1.97E-07		
AC	5	0.2395	0.0479	1.05E-07		
AD	5	0.2375	0.0475	2.5E-08		
AE	5	0.2377	0.04754	6.8E-08		
BA	5	0.2395	0.0479	9E-08		
BB	5	0.2377	0.04754	8E-09		
BC	5	0.2375	0.0475	2.5E-08		
BD	5	0.2387	0.04774	4.8E-08		
BE	5	0.2381	0.04762	8.2E-08		
DA	5	0.2388	0.04776	8.3E-08		
DB	5	0.2377	0.04754	1.58E-07		
DC	5	0.2386	0.04772	9.2E-08		
DD	5	0.2377	0.04754	1.43E-07		
DE	5	0.2376	0.04752	2.7E-08		
EA	5	0.2381	0.04762	9.7E-08		
EB	5	0.239	0.0478	4E-08		
EC	5	0.2374	0.04748	4.7E-08		
ED	5	0.236	0.0472	4.5E-08		
EE	5	0.2374	0.04748	5.7E-08		
FA	5	0.2391	0.04782	2.7E-08		
FB	5	0.2387	0.04774	2.3E-08		
FC	5	0.2375	0.0475	2E-08		
FD	5	0.2357	0.04714	1.3E-08		
FE	5	0.2385	0.0477	2E-08		
			0.0475944			
ANOVA						
Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between gro	4.53408E-06	24	1.8892E-07	2.98357549	7.3666E-05	1.62670811
Within group	0.000006332	100	6.332E-08			
Total	1.08661E-05	124				
within-sc	0.0002516					
effective	4.00					
s_bb	0.0001772					
s_bb_min	4.731E-05					
u_bb	0.0001772	0.1772005				
u_bb(rel	0.372313658					

Manganese:

Sample	*Number*	*Sum*	*Mean*	*Variance*		
AA	5	0.254	0.0508	0.0000002		
AB	5	0.2556	0.05112	7.7E-08		
AC	5	0.2537	0.05074	5.8E-08		
AD	5	0.2531	0.05062	1.57E-07		
AE	5	0.2546	0.05092	2.7E-08		
BA	5	0.252	0.0504	4E-08		
BB	5	0.2535	0.0507	0.00000023		
BC	5	0.2545	0.0509	8.5E-08		
BD	5	0.2537	0.05074	6.8E-08		
BE	5	0.254	0.0508	9.5E-08		
DA	5	0.2542	0.05084	6.3E-08		
DB	5	0.253	0.0506	1.1E-07		
DC	5	0.2531	0.05062	7.2E-08		
DD	5	0.2537	0.05074	2.83E-07		
DE	5	0.2541	0.05082	8.2E-08		
EA	5	0.2537	0.05074	1.3E-08		
EB	5	0.2537	0.05074	1.8E-08		
EC	5	0.2556	0.05112	9.2E-08		
ED	5	0.2547	0.05094	3E-09		
EE	5	0.2543	0.05086	1.13E-07		
FA	5	0.2539	0.05078	1.32E-07		
FB	5	0.2548	0.05096	5.8E-08		
FC	5	0.2538	0.05076	1.03E-07		
FD	5	0.2561	0.05122	8.2E-08		
FE	5	0.254	0.0508	2.95E-07		
			0.0508112			
ANOVA						
Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	3.74032E-06	24	1.55847E-07	1.52432186	0.07698185	1.62670811
Within groups	0.000010224	100	1.0224E-07			
Total	1.39643E-05	124				
within-sd	0.00031975					
effective n	4.00					
s_bb	0.00011577					
s_bb_min	6.0123E-05					
u_bb	0.00011577	0.11576557				
u_bb(rel.)	0.227834745					

Magnesium:

Sample	*Number*	*Sum*	*Mean*	*Variance*		
AA	5	1.9132	0.38264	2.293E-06		
AB	5	1.9038	0.38076	4.513E-06		
AC	5	1.9059	0.38118	1.677E-06		
AD	5	1.8974	0.37948	9.02E-07		
AE	5	1.9063	0.38126	3.503E-06		
BA	5	1.9074	0.38148	2.777E-06		
BB	5	1.8987	0.37974	5.48E-07		
BC	5	1.901	0.3802	2.575E-06		
BD	5	1.9007	0.38014	1.073E-06		
BE	5	1.9037	0.38074	1.973E-06		
DA	5	1.9127	0.38254	4.53E-07		
DB	5	1.9012	0.38024	3.643E-06		
DC	5	1.9043	0.38086	4.383E-06		
DD	5	1.9054	0.38108	4.297E-06		
DE	5	1.9029	0.38058	2.717E-06		
EA	5	1.909	0.3818	4.735E-06		
EB	5	1.9058	0.38116	4.43E-07		
EC	5	1.9077	0.38154	2.293E-06		
ED	5	1.9039	0.38078	5.317E-06		
EE	5	1.8945	0.3789	1.225E-06		
FA	5	1.9122	0.38244	1.028E-06		
FB	5	1.9026	0.38052	1.302E-06		
FC	5	1.8997	0.37994	5.68E-07		
FD	5	1.9005	0.3801	1.105E-06		
FE	5	1.9067	0.38134	9.68E-07		
			0.3808576			
ANOVA						
Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	0.000104181	24	4.34089E-06	1.92719303	0.01295731	1.62670811
Within groups	0.000225244	100	2.25244E-06			
Total	0.000329425	124				
within-sd	0.0015008					
effective n	4.00					
s_bb	0.0007226					
s_bb_min	0.0002822					
u_bb	0.0007226	0.7225729				
u_bb(rel.)	0.189722602					

Chromium:

Sample	*Number*	*Sum*	*Mean*	*Variance*		
AA	5	0.159	0.0318	4.5E-08		
AB	5	0.1586	0.03172	3.2E-08		
AC	5	0.1587	0.03174	4.8E-08		
AD	5	0.1575	0.0315	5E-09		
AE	5	0.159	0.0318	7E-08		
BA	5	0.1581	0.03162	2.2E-08		
BB	5	0.1578	0.03156	3E-09		
BC	5	0.1587	0.03174	4.3E-08		
BD	5	0.1586	0.03172	1.7E-08		
BE	5	0.1585	0.0317	2.5E-08		
DA	5	0.1587	0.03174	2.3E-08		
DB	5	0.1583	0.03166	2.8E-08		
DC	5	0.1588	0.03176	5.3E-08		
DD	5	0.1584	0.03168	5.2E-08		
DE	5	0.1588	0.03176	3.3E-08		
EA	5	0.1588	0.03176	2.8E-08		
EB	5	0.1583	0.03166	2.8E-08		
EC	5	0.1591	0.03182	1.2E-08		
ED	5	0.158	0.0316	6.5E-08		
EE	5	0.1574	0.03148	1.7E-08		
FA	5	0.159	0.0318	1E-08		
FB	5	0.1583	0.03166	1.3E-08		
FC	5	0.1583	0.03166	2.3E-08		
FD	5	0.1583	0.03166	1.8E-08		
FE	5	0.159	0.0318	0		
			0.031696			
ANOVA						
Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between group	0.000001016	24	4.23333E-08	1.48433848	0.09065119	1.62670811
Within groups	2.852E-06	100	2.852E-08			
Total	3.868E-06	124				
within-sd	0.0001689					
effective r	4.00					
s_bb	5.877E-05					
s_bb_min	3.175E-05					
u_bb	5.877E-05	0.0587651				
u_bb(rel.)	0.185402161					

Zinc:

Sample	*Number*	*Sum*	*Mean*	*Variance*		
AA	5	0.1384	0.02768	3.62E-07		
AB	5	0.1374	0.02748	1.17E-07		
AC	5	0.1377	0.02754	2.3E-08		
AD	5	0.1382	0.02764	2.03E-07		
AE	5	0.1381	0.02762	5.2E-08		
BA	5	0.1369	0.02738	6.2E-08		
BB	5	0.1381	0.02762	1.57E-07		
BC	5	0.1386	0.02772	9.2E-08		
BD	5	0.1377	0.02754	9.3E-08		
BE	5	0.1386	0.02772	9.7E-08		
DA	5	0.1375	0.0275	5E-09		
DB	5	0.1392	0.02784	1.38E-07		
DC	5	0.137	0.0274	1.35E-07		
DD	5	0.1383	0.02766	3.23E-07		
DE	5	0.1374	0.02748	1.17E-07		
EA	5	0.1367	0.02734	1.63E-07		
EB	5	0.1389	0.02778	1.07E-07		
EC	5	0.1401	0.02802	2.7E-08		
ED	5	0.1379	0.02758	4.2E-08		
EE	5	0.1387	0.02774	7.3E-08		
FA	5	0.138	0.0276	0.00000016		
FB	5	0.1394	0.02788	8.7E-08		
FC	5	0.1371	0.02742	6.2E-08		
FD	5	0.138	0.0276	7E-08		
FE	5	0.1379	0.02758	1.87E-07		
			0.0276144			
ANOVA						
Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	3.17808E-06	24	1.3242E-07	1.12068382	0.33628791	1.62670811
Within groups	0.000011816	100	1.1816E-07			
Total	1.49941E-05	124				
within-sd	0.00034374					
effective n	4.00					
s_bb	5.9708E-05					
s_bb_min	6.4634E-05					
u_bb	6.4634E-05	0.06463425				
u_bb(rel.)	0.234059964					

Titanium:

Sample	*Number*	*Sum*	*Mean*	*Variance*		
AA	5	0.1458	0.02916	8E-09		
AB	5	0.1436	0.02872	5.7E-08		
AC	5	0.1443	0.02886	2.3E-08		
AD	5	0.1457	0.02914	6.3E-08		
AE	5	0.145	0.029	1E-08		
BA	5	0.1462	0.02924	3.3E-08		
BB	5	0.1452	0.02904	2.3E-08		
BC	5	0.1457	0.02914	1.83E-07		
BD	5	0.146	0.0292	4.5E-08		
BE	5	0.1438	0.02876	1.33E-07		
DA	5	0.1447	0.02894	5.8E-08		
DB	5	0.1449	0.02898	1.7E-08		
DC	5	0.1458	0.02916	2.8E-08		
DD	5	0.1448	0.02896	1.8E-08		
DE	5	0.1439	0.02878	3.7E-08		
EA	5	0.1452	0.02904	4.3E-08		
EB	5	0.146	0.0292	6.5E-08		
EC	5	0.1448	0.02896	1.33E-07		
ED	5	0.1425	0.0285	1.5E-08		
EE	5	0.1462	0.02924	2.3E-08		
FA	5	0.1457	0.02914	2.3E-08		
FB	5	0.1459	0.02918	2.7E-08		
FC	5	0.145	0.029	1.5E-08		
FD	5	0.1422	0.02844	1.3E-08		
FE	5	0.1449	0.02898	1.7E-08		
			0.0289904			
ANOVA						
Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	5.56848E-06	24	2.3202E-07	5.22567568	1.7828E-09	1.62670811
Within groups	4.44E-06	100	4.44E-08			
Total	1.00085E-05	124				
within-sd	0.00021071					
effective n	4.00					
s_bb	0.00021658					
s_bb_min	3.962E-05					
u_bb	0.00021658	0.21657562				
u_bb(rel.)	0.747059792					

Gallium:

Sample	*Number*	*Sum*	*Mean*	*Variance*		
AA	5	0.0565	0.0113	5E-09		
AB	5	0.0563	0.01126	8E-09		
AC	5	0.0557	0.01114	3E-09		
AD	5	0.0561	0.01122	7E-09		
AE	5	0.0564	0.01128	2E-09		
BA	5	0.0562	0.01124	8E-09		
BB	5	0.0557	0.01114	8E-09		
BC	5	0.0562	0.01124	8E-09		
BD	5	0.0563	0.01126	1.3E-08		
BE	5	0.0558	0.01116	1.3E-08		
DA	5	0.0561	0.01122	1.2E-08		
DB	5	0.0561	0.01122	1.7E-08		
DC	5	0.0564	0.01128	1.2E-08		
DD	5	0.056	0.0112	5E-09		
DE	5	0.0557	0.01114	8E-09		
EA	5	0.0559	0.01118	7E-09		
EB	5	0.0563	0.01126	3E-09		
EC	5	0.0562	0.01124	8E-09		
ED	5	0.0564	0.01128	7E-09		
EE	5	0.056	0.0112	5E-09		
FA	5	0.0561	0.01122	7E-09		
FB	5	0.0559	0.01118	7E-09		
FC	5	0.0564	0.01128	2E-09		
FD	5	0.0564	0.01128	7E-09		
FE	5	0.0561	0.01122	2E-09		
			0.0112256			
ANOVA						
Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	2.8208E-07	24	1.17533E-08	1.59692029	0.05679116	1.62670811
Within groups	7.36E-07	100	7.36E-09			
Total	1.01808E-06	124				
within-sd	8.579E-05					
effective n	4.00					
s_bb	3.3141E-05					
s_bb_min	1.6131E-05					
u_bb	3.3141E-05	0.03314111				
u_bb(rel.)	0.295227983					

Bismuth:

Sample	*Number*	*Sum*	*Mean*	*Variance*		
AA	5	0.0085	0.0017	5.8775E-38		
AB	5	0.0081	0.00162	2E-09		
AC	5	0.0081	0.00162	2E-09		
AD	5	0.0082	0.00164	3E-09		
AE	5	0.0084	0.00168	2E-09		
BA	5	0.0083	0.00166	3E-09		
BB	5	0.008	0.0016	0		
BC	5	0.0085	0.0017	5.8775E-38		
BD	5	0.008	0.0016	0		
BE	5	0.008	0.0016	0		
DA	5	0.0084	0.00168	2E-09		
DB	5	0.0082	0.00164	3E-09		
DC	5	0.0085	0.0017	5.8775E-38		
DD	5	0.0084	0.00168	2E-09		
DE	5	0.008	0.0016	0		
EA	5	0.0082	0.00164	3E-09		
EB	5	0.0084	0.00168	2E-09		
EC	5	0.0083	0.00166	3E-09		
ED	5	0.0084	0.00168	2E-09		
EE	5	0.008	0.0016	0		
FA	5	0.0083	0.00166	3E-09		
FB	5	0.008	0.0016	0		
FC	5	0.0083	0.00166	3E-09		
FD	5	0.0083	0.00166	3E-09		
FE	5	0.008	0.0016	0		
			0.0016464			
ANOVA						
Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	1.5888E-07	24	6.62E-09	4.35526316	9.4292E-08	1.62670811
Within groups	1.52E-07	100	1.52E-09			
Total	3.1088E-07	124				
within-sd	3.8987E-05					
effective n	4.00					
s_bb	3.5707E-05					
s_bb_min	7.3308E-06					
u_bb	3.5707E-05	0.03570714				
u_bb(rel.)	2.168801151					

Cadmium:

Sample	*Number*	*Sum*	*Mean*	*Variance*		
AA	5	0.0073	0.00146	3E-09		
AB	5	0.0074	0.00148	2E-09		
AC	5	0.0071	0.00142	2E-09		
AD	5	0.007	0.0014	0		
AE	5	0.0074	0.00148	2E-09		
BA	5	0.007	0.0014	0		
BB	5	0.007	0.0014	0		
BC	5	0.0071	0.00142	2E-09		
BD	5	0.007	0.0014	0		
BE	5	0.007	0.0014	0		
DA	5	0.0071	0.00142	2E-09		
DB	5	0.007	0.0014	0		
DC	5	0.0071	0.00142	2E-09		
DD	5	0.0071	0.00142	2E-09		
DE	5	0.0072	0.00144	3E-09		
EA	5	0.007	0.0014	0		
EB	5	0.007	0.0014	0		
EC	5	0.0074	0.00148	2E-09		
ED	5	0.0075	0.0015	0		
EE	5	0.007	0.0014	0		
FA	5	0.0072	0.00144	3E-09		
FB	5	0.007	0.0014	0		
FC	5	0.0071	0.00142	2E-09		
FD	5	0.0075	0.0015	0		
FE	5	0.007	0.0014	0		
			0.001428			
ANOVA						

Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	0.000000144	24	0.000000006	5.55555556	4.2072E-10	1.62670811
Within groups	0.000000108	100	1.08E-09			
Total	0.000000252	124				
within-sd	3.286E-05					
effective n	4.00					
s_bb	3.507E-05					
s_bb_min	6.179E-06					
u_bb	3.507E-05	0.0350714				
u_bb(rel.)	2.455977299					

Lithium:

Sample	*Number*	*Sum*	*Mean*	*Variance*		
AA	5	0.003	0.0006	0		
AB	5	0.0025	0.0005	0		
AC	5	0.0025	0.0005	0		
AD	5	0.0025	0.0005	0		
AE	5	0.0025	0.0005	0		
BA	5	0.003	0.0006	0		
BB	5	0.0025	0.0005	0		
BC	5	0.0025	0.0005	0		
BD	5	0.0025	0.0005	0		
BE	5	0.0025	0.0005	0		
DA	5	0.003	0.0006	0		
DB	5	0.0025	0.0005	0		
DC	5	0.0025	0.0005	0		
DD	5	0.0025	0.0005	0		
DE	5	0.0025	0.0005	0		
EA	5	0.003	0.0006	0		
EB	5	0.0025	0.0005	0		
EC	5	0.0025	0.0005	0		
ED	5	0.0025	0.0005	0		
EE	5	0.0025	0.0005	0		
FA	5	0.003	0.0006	0		
FB	5	0.0025	0.0005	0		
FC	5	0.0025	0.0005	0		
FD	5	0.0025	0.0005	0		
FE	5	0.0025	0.0005	0		
			0.00052			
ANOVA						
Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	0.0000002	24	8.33333E-09	65535	#DIV/0!	1.62670811
Within groups	0	100	0			
Total	0.0000002	124				
within-sd	0					
effective n	4.00					
s_bb	4.5644E-05					
s_bb_min	0					
u_bb	4.5644E-05	0.04564355				
u_bb(rel.)	8.777605088					

Nickel:

Sample	*Number*	*Sum*	*Mean*	*Variance*		
AA	5	0.0206	0.00412	2E-09		
AB	5	0.0198	0.00396	3E-09		
AC	5	0.0202	0.00404	3E-09		
AD	5	0.0207	0.00414	3E-09		
AE	5	0.0202	0.00404	3E-09		
BA	5	0.02	0.004	0		
BB	5	0.0198	0.00396	3E-09		
BC	5	0.0203	0.00406	3E-09		
BD	5	0.0201	0.00402	2E-09		
BE	5	0.0205	0.0041	0		
DA	5	0.02	0.004	0		
DB	5	0.0198	0.00396	3E-09		
DC	5	0.02	0.004	0		
DD	5	0.0199	0.00398	7E-09		
DE	5	0.0198	0.00396	8E-09		
EA	5	0.0199	0.00398	2E-09		
EB	5	0.0206	0.00412	7E-09		
EC	5	0.0207	0.00414	8E-09		
ED	5	0.0196	0.00392	2E-09		
EE	5	0.0202	0.00404	3E-09		
FA	5	0.0209	0.00418	7E-09		
FB	5	0.0202	0.00404	3E-09		
FC	5	0.0201	0.00402	2E-09		
FD	5	0.0203	0.00406	3E-09		
FE	5	0.0201	0.00402	2E-09		
			0.0040344			
ANOVA						

Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	5.4608E-07	24	2.27533E-08	7.20042194	5.0585E-13	1.62670811
Within groups	0.000000316	100	3.16E-09			
Total	8.6208E-07	124				
within-sd	5.6214E-05					
effective n	4.00					
s_bb	6.9988E-05					
s_bb_min	1.057E-05					
u_bb	6.9988E-05	0.06998809				
u_bb(rel.)	1.73478322					

Lead:

Sample	*Number*	*Sum*	*Mean*	*Variance*		
AA	5	0.0237	0.00474	3E-09		
AB	5	0.0238	0.00476	3E-09		
AC	5	0.0235	0.0047	0		
AD	5	0.0237	0.00474	3E-09		
AE	5	0.0238	0.00476	3E-09		
BA	5	0.0236	0.00472	2E-09		
BB	5	0.0233	0.00466	3E-09		
BC	5	0.0237	0.00474	3E-09		
BD	5	0.0235	0.0047	5E-09		
BE	5	0.0236	0.00472	2E-09		
DA	5	0.0236	0.00472	2E-09		
DB	5	0.0236	0.00472	2E-09		
DC	5	0.0238	0.00476	3E-09		
DD	5	0.0237	0.00474	3E-09		
DE	5	0.0235	0.0047	5E-09		
EA	5	0.0236	0.00472	2E-09		
EB	5	0.0235	0.0047	0		
EC	5	0.0238	0.00476	3E-09		
ED	5	0.0238	0.00476	3E-09		
EE	5	0.0233	0.00466	3E-09		
FA	5	0.0236	0.00472	2E-09		
FB	5	0.0235	0.0047	0		
FC	5	0.0236	0.00472	2E-09		
FD	5	0.024	0.0048	5E-09		
FE	5	0.0235	0.0047	0		
			0.0047248			
ANOVA						
Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	1.2512E-07	24	5.21333E-09	2.10215054	0.00566894	1.62670811
Within groups	2.48E-07	100	2.48E-09			
Total	3.7312E-07	124				
within-sd	4.98E-05					
effective n	4.00					
s_bb	2.6141E-05					
s_bb_min	9.3638E-06					
u_bb	2.6141E-05	0.02614065				
u_bb(rel.)	0.553264588					

Strontium:

Sample	*Number*	*Sum*	*Mean*	*Variance*		
AA	5	0.0065	0.0013	0		
AB	5	0.0065	0.0013	0		
AC	5	0.0062	0.00124	3E-09		
AD	5	0.0064	0.00128	2E-09		
AE	5	0.0064	0.00128	2E-09		
BA	5	0.0065	0.0013	0		
BB	5	0.0063	0.00126	3E-09		
BC	5	0.0065	0.0013	0		
BD	5	0.0062	0.00124	3E-09		
BE	5	0.0061	0.00122	2E-09		
DA	5	0.0065	0.0013	0		
DB	5	0.0065	0.0013	0		
DC	5	0.0062	0.00124	3E-09		
DD	5	0.0062	0.00124	3E-09		
DE	5	0.006	0.0012	0		
EA	5	0.0065	0.0013	0		
EB	5	0.0065	0.0013	0		
EC	5	0.0064	0.00128	2E-09		
ED	5	0.0064	0.00128	2E-09		
EE	5	0.0062	0.00124	3E-09		
FA	5	0.0065	0.0013	0		
FB	5	0.0064	0.00128	2E-09		
FC	5	0.0064	0.00128	2E-09		
FD	5	0.0064	0.00128	2E-09		
FE	5	0.0063	0.00126	3E-09		
			0.001272			
ANOVA						
Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	0.000000104	24	4.33333E-09	2.92792793	9.716E-05	1.62670811
Within groups	0.000000148	100	1.48E-09			
Total	0.000000252	124				
within-sd	3.847E-05			status:		
effective n	4.00					
s_bb	2.671E-05					
s_bb_min	7.234E-06					
u_bb	2.671E-05	0.0267083				
u_bb(rel.)	2.099709185					

Vanadium:

Sample	*Number*	*Sum*	*Mean*	*Variance*		
AA	5	0.0294	0.00588	2E-09		
AB	5	0.029	0.0058	0		
AC	5	0.0288	0.00576	3E-09		
AD	5	0.0293	0.00586	3E-09		
AE	5	0.0291	0.00582	2E-09		
BA	5	0.0294	0.00588	7E-09		
BB	5	0.029	0.0058	0		
BC	5	0.0292	0.00584	3E-09		
BD	5	0.0293	0.00586	3E-09		
BE	5	0.029	0.0058	5E-09		
DA	5	0.0289	0.00578	7E-09		
DB	5	0.0293	0.00586	3E-09		
DC	5	0.0293	0.00586	3E-09		
DD	5	0.0289	0.00578	2E-09		
DE	5	0.0289	0.00578	2E-09		
EA	5	0.0289	0.00578	2E-09		
EB	5	0.0293	0.00586	3E-09		
EC	5	0.0291	0.00582	7E-09		
ED	5	0.029	0.0058	0		
EE	5	0.0293	0.00586	3E-09		
FA	5	0.0291	0.00582	2E-09		
FB	5	0.0291	0.00582	2E-09		
FC	5	0.0292	0.00584	3E-09		
FD	5	0.0289	0.00578	2E-09		
FE	5	0.0291	0.00582	2E-09		
			0.0058224			
ANOVA						

Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between group	1.5328E-07	24	6.38667E-09	2.24882629	0.00279285	1.62670811
Within groups	0.000000284	100	2.84E-09			
Total	4.3728E-07	124				
within-sd	5.3292E-05					
effective	4.00					
s_bb	2.9777E-05					
s_bb_min	1.002E-05					
u_bb	2.9777E-05	0.02977695				
u_bb(rel.)	0.511420524					

Zirconium:

Sample	*Number*	*Sum*	*Mean*	*Variance*		
AA	5	0.0035	0.0007	0		
AB	5	0.0035	0.0007	0		
AC	5	0.0037	0.00074	3E-09		
AD	5	0.0035	0.0007	0		
AE	5	0.0035	0.0007	0		
BA	5	0.0035	0.0007	0		
BB	5	0.0035	0.0007	0		
BC	5	0.0035	0.0007	0		
BD	5	0.0035	0.0007	0		
BE	5	0.0035	0.0007	0		
DA	5	0.0036	0.00072	2E-09		
DB	5	0.0035	0.0007	0		
DC	5	0.0035	0.0007	0		
DD	5	0.004	0.0008	0		
DE	5	0.0035	0.0007	0		
EA	5	0.0035	0.0007	0		
EB	5	0.0035	0.0007	0		
EC	5	0.0035	0.0007	0		
ED	5	0.0035	0.0007	0		
EE	5	0.0035	0.0007	0		
FA	5	0.0035	0.0007	0		
FB	5	0.0035	0.0007	0		
FC	5	0.0035	0.0007	0		
FD	5	0.0035	0.0007	0		
FE	5	0.0035	0.0007	0		
			0.0007064			
ANOVA						
Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	5.488E-08	24	2.28667E-09	11.4333333	3.2006E-19	1.62670811
Within groups	0.00000002	100	2E-10			
Total	7.488E-08	124				
within-sd	1.4142E-05					
effective r	4.00					
s_bb	2.284E-05					
s_bb_min	2.6591E-06					
u_bb	2.284E-05	0.02284002				
u_bb(rel.)	3.233298889					

Boron:

Sample	*Number*	*Sum*	*Mean*	*Variance*		
AA	5	0.0017	0.00034	8E-09		
AB	5	0.0015	0.0003	5.5E-08		
AC	5	0.0014	0.00028	7E-09		
AD	5	0.0015	0.0003	0.00000002		
AE	5	0.0014	0.00028	7E-09		
BA	5	0.0013	0.00026	8E-09		
BB	5	0.0011	0.00022	1.2E-08		
BC	5	0.0017	0.00034	2.8E-08		
BD	5	0.0012	0.00024	1.3E-08		
BE	5	0.001	0.0002	0.00000003		
DA	5	0.0018	0.00036	1.8E-08		
DB	5	0.0011	0.00022	7E-09		
DC	5	0.0013	0.00026	3E-09		
DD	5	0.0012	0.00024	3E-09		
DE	5	0.001	0.0002	1.5E-08		
EA	5	0.0018	0.00036	1.8E-08		
EB	5	0.0013	0.00026	1.3E-08		
EC	5	0.002	0.0004	0.00000002		
ED	5	0.0011	0.00022	2E-09		
EE	5	0.001	0.0002	5E-09		
FA	5	0.002	0.0004	0.00000001		
FB	5	0.001	0.0002	5E-09		
FC	5	0.0013	0.00026	8E-09		
FD	5	0.0012	0.00024	3E-09		
FE	5	0.0012	0.00024	1.3E-08		
			0.0002728			
ANOVA						
Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	4.6352E-07	24	1.93133E-08	1.45871098	0.10049749	1.62670811
Within groups	0.000001324	100	1.324E-08			
Total	1.78752E-06	124				
within-sd	0.0001151					
effective n	4.00					
s_bb	3.897E-05					
s_bb_min	2.164E-05					
u_bb	3.897E-05	0.0389658				
u_bb(rel.)	14.28364991					

Sodium:

Sample	*Number*	*Sum*	*Mean*	*Variance*		
AA	5	0.0018	0.00036	3E-09		
AB	5	0.0015	0.0003	0		
AC	5	0.0015	0.0003	0		
AD	5	0.0015	0.0003	0		
AE	5	0.0015	0.0003	0		
BA	5	0.0015	0.0003	0		
BB	5	0.0015	0.0003	0		
BC	5	0.0015	0.0003	0		
BD	5	0.0015	0.0003	0		
BE	5	0.0015	0.0003	0		
DA	5	0.0015	0.0003	0		
DB	5	0.0015	0.0003	0		
DC	5	0.0015	0.0003	0		
DD	5	0.0015	0.0003	0		
DE	5	0.0015	0.0003	0		
EA	5	0.0016	0.00032	2E-09		
EB	5	0.0015	0.0003	0		
EC	5	0.0015	0.0003	0		
ED	5	0.0015	0.0003	0		
EE	5	0.0015	0.0003	0		
FA	5	0.0019	0.00038	2E-09		
FB	5	0.0015	0.0003	0		
FC	5	0.0015	0.0003	0		
FD	5	0.0015	0.0003	0		
FE	5	0.0015	0.0003	0		
			0.0003064			
ANOVA						
Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	4.688E-08	24	1.95333E-09	6.97619048	1.2096E-12	1.62670811
Within groups	0.000000028	100	2.8E-10			
Total	7.488E-08	124				
within-sd	1.6733E-05					
effective n	4.00					
s_bb	2.0453E-05					
s_bb_min	3.1463E-06					
u_bb	2.0453E-05	0.0204532				
u_bb(rel.)	6.675325917					

Calcium:

Sample	*Number*	*Sum*	*Mean*	*Variance*		
AA	5	0.0066	0.00132	2E-09		
AB	5	0.0065	0.0013	0		
AC	5	0.0065	0.0013	0		
AD	5	0.0065	0.0013	0		
AE	5	0.0065	0.0013	0		
BA	5	0.0065	0.0013	0		
BB	5	0.0065	0.0013	0		
BC	5	0.0066	0.00132	2E-09		
BD	5	0.0065	0.0013	0		
BE	5	0.0065	0.0013	0		
DA	5	0.0065	0.0013	0		
DB	5	0.0065	0.0013	0		
DC	5	0.0065	0.0013	0		
DD	5	0.0065	0.0013	0		
DE	5	0.0065	0.0013	0		
EA	5	0.0065	0.0013	0		
EB	5	0.0065	0.0013	0		
EC	5	0.0067	0.00134	3E-09		
ED	5	0.0065	0.0013	0		
EE	5	0.0065	0.0013	0		
FA	5	0.0065	0.0013	0		
FB	5	0.0065	0.0013	0		
FC	5	0.0065	0.0013	0		
FD	5	0.0065	0.0013	0		
FE	5	0.0065	0.0013	0		
			0.0013032			
ANOVA						
Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	1.072E-08	24	4.46667E-10	1.5952381	0.05719866	1.62670811
Within groups	0.000000028	100	2.8E-10			
Total	3.872E-08	124				
within-sd	1.6733E-05					
effective n	4.00					
s_bb	6.455E-06					
s_bb_min	3.1463E-06					
u_bb	6.455E-06	0.00645497				
u_bb(rel.)	0.495317084					

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

Silicon:

r_0	0.300972792	0.311027208														
r_in	0.305	0.305	0.307	0.306	0.306	0.309	0.305	0.304								
r_middle	0.305	0.308	0.306	0.303	0.305	0.306	0.309	0.306	0.305	0.307	0.306	0.306				
r_out	0.315	0.311	0.31	0.309	0.31	0.308	0.308	0.309	0.31	0.307	0.308	0.305	0.306	0.305	0.307	0.306

Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	5.43487E-05	3	1.81162E-05	3.221999633	0.034666773	2.882604204
Within groups	0.000191171	34	5.62267E-06			
Total	0.000245519	37				

within-sd	0.002371216
effective n	8.56
s_bb	0.00120801
s_bb_min	0.000399104
u_bb	0.00120801
u_bb(rel.)	0.393375652

Iron:

r_0	0.171876428	0.176123572														
r_in	0.171	0.172	0.172	0.172	0.171	0.172	0.171	0.172								
r_middle	0.171	0.173	0.172	0.172	0.172	0.171	0.172	0.173	0.172	0.171	0.171	0.172				
r_out	0.173	0.176	0.175	0.174	0.174	0.174	0.173	0.172	0.174	0.173	0.173	0.173	0.172	0.171	0.174	0.172

Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	2.64945E-05	3	8.83151E-06	7.507101568	0.000552095	2.882604204
Within groups	3.99983E-05	34	1.17642E-06			
Total	6.64928E-05	37				

within-sd	0.001084629
effective n	8.56
s_bb	0.000945589
s_bb_min	0.000182556
u_bb	0.000945589
u_bb(rel.)	0.547980839

Copper:

r_0	0.039783254	0.042216746															
r_in	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041									
r_middle	0.04	0.04	0.04	0.041	0.04	0.041	0.04	0.04	0.041	0.04	0.04	0.041					
r_out	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.041	0.04	0.04	0.04	0.04	0.04	0.041	0.04	0.04	

Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	4.84649E-06	3	1.6155E-06	7.44508111	0.000582651	2.882604204
Within groups	7.37761E-06	34	2.16989E-07			
Total	1.22241E-05	37				

within-sd	0.00046582					
effective n	8.56					
s_bb	0.000404166					
s_bb_min	7.84032E-05					
u_bb	0.000404166			0.040441176		
u_bb(rel.)	0.999392994					

Manganese:

r_0	0.043093529	0.046906471										
r_in	0.045	0.044	0.046	0.045	0.045	0.046	0.045	0.045				
r_middle	0.045	0.045	0.044	0.044	0.046	0.045	0.045	0.045	0.045	0.045		
r_out	0.046	0.046	0.045	0.045	0.045	0.046	0.046	0.046	0.045	0.046	0.045	0.045

Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	0.0000021	3	7E-07	1.221620382	0.320236094	2.946685266
Within groups	1.60443E-05	28	5.73009E-07			
Total	1.81443E-05	31				

within-sd	0.000756974					
effective n	7.42					
s_bb	0.000130852					
s_bb_min	0.000143696					
u_bb	0.000143696			0.0451875		
u_bb(rel.)	0.317999313					

Magnesium:

r_0	0.451172589	0.462827411														
r_in	0.462	0.465	0.466	0.466	0.461	0.462	0.461	0.461								
r_middle	0.464	0.467	0.464	0.466	0.464	0.463	0.467	0.466	0.464	0.464	0.465	0.463				
r_out	0.462	0.462	0.463	0.461	0.467	0.468	0.463	0.467	0.464	0.469	0.464	0.464	0.462	0.465	0.463	0.463

Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	0.000110681	3	3.68936E-05	5.956098628	0.002232949	2.882604204
Within groups	0.000210605	34	6.19426E-06			
Total	0.000321286	37				

within-sd	0.002488828
effective n	8.56
s_bb	0.001893618
s_bb_min	0.0004189
u_bb	0.001893618
u_bb(rel.)	0.408288423

Chromium:

r_0	0.030753002	0.035246998														
r_in	0.031	0.031	0.031	0.032	0.032	0.032	0.031	0.032								
r_middle	0.032	0.033	0.031	0.031	0.03	0.032	0.032	0.031	0.031	0.032	0.031	0.032				
r_out	0.032	0.032	0.031	0.031	0.031	0.031	0.032	0.031	0.033	0.031	0.031	0.032	0.031	0.031	0.032	0.031

Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	4.45724E-06	3	1.48575E-06	2.017748522	0.129898409	2.882604204
Within groups	2.50355E-05	34	7.36338E-07			
Total	2.94927E-05	37				

within-sd	0.000858102
effective n	8.56
s_bb	0.00029586
s_bb_min	0.000144429
u_bb	0.00029586
u_bb(rel.)	0.936614986

Zinc:

r_0	0.025298914	0.028701086														
r_in	0.026	0.026	0.026	0.027	0.026	0.026	0.026	0.026								
r_middle	0.026	0.026	0.027	0.026	0.026	0.026	0.026	0.025	0.025	0.026	0.025	0.025				
r_out	0.026	0.026	0.026	0.027	0.026	0.027	0.027	0.026	0.026	0.027	0.025	0.026	0.026	0.027	0.026	
reuungsursac	*dratsummen (*	*heitsgrade*	*(e Quadratsum*	*rüfgröße (F)*	*P-Wert*	*tischer F-Wert*										
Unterschiede	3.50923E-06	3	1.16974E-06	2.436088923	0.082145995	2.891563517										
Innerhalb de	1.58457E-05	33	4.80173E-07													
Gesamt	1.9355E-05	36														
within-sd	0.000692945															
effective n	8.40															
s_bb	0.000286578															
s_bb_min	0.000118654															
u_bb	0.000286578			0.026088235												
u_bb(rel.)	1.098495999															

Titanium:

r_0	0.033115099	0.036884901														
r_in	0.035	0.035	0.035	0.035	0.034	0.034	0.035	0.035								
r_middle	0.036	0.036	0.036	0.036	0.035	0.037	0.035	0.035	0.035	0.035	0.036	0.035				
r_out	0.036	0.037	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036
Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*										
Between groups	9.90899E-06	3	3.303E-06	7.766454857	0.000441505	2.882604204										
Within groups	1.44599E-05	34	4.2529E-07													
Total	2.43689E-05	37														
within-sd	0.000652143															
effective n	8.56															
s_bb	0.000579763															
s_bb_min	0.000109764															
u_bb	0.000579763			0.035529412												
u_bb(rel.)	1.631784402															

Gallium:

r_0	0.055489723	0.057710277														
r_in	0.057	0.0559	0.0561	0.0564	0.0558	0.0562	0.0561	0.0563								
r_middle	0.0554	0.0556	0.056	0.0561	0.0555	0.0556	0.0554	0.0555	0.0555	0.0556	0.056	0.0561				
r_out	0.0566	0.0568	0.057	0.0568	0.0566	0.0572	0.0566	0.0572	0.0563	0.0569	0.0559	0.0569	0.0565	0.057	0.057	0.0569

Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	8.08807E-06	3	2.69602E-06	15.36171146	1.73976E-06	2.882604204
Within groups	5.9671E-06	34	1.75503E-07			
Total	1.40552E-05	37				

within-sd	0.000418931
effective n	8.56
s_bb	0.000542591
s_bb_min	7.05111E-05
u_bb	0.000542591
u_bb(rel.)	0.964808136

Bismuth:

r_0	8.088619679	30.31138032														
r_in	13.85	21.04	16.05	19.25	15.59	18.5	19.24	21.88								
r_middle	16.24	18.89	23.19	22.66	20.75	15.31	11.45	15.28	18.39	17.44	11.58	13.64				
r_out	16.57	16.9	12.46	15.22	19.28	18.61	14.41	17.86	13.77	14.41	15.85	16.07	18.96	18.42	17.27	15.82

Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	26.6490386	3	8.883012865	0.571427548	0.637676015	2.882604204
Within groups	528.5402119	34	15.54530035			
Total	555.1892505	37				

within-sd	3.94275289
effective n	8.56
s_bb	0
s_bb_min	0.663612939
u_bb	0.663612939
u_bb(rel.)	3.889943611

Cadmium:

r_0	6.04290431	17.37709569														
r_in	14.98	15.6	11.26	11.33	10.42	14.59	11.95	14.61								
r_middle	12.53	10.89	11.68	14.23	12.66	13.96	16.37	12.03	12.93	15.17	14.58	14.01				
r_out	12.19	13.48	14.64	9.8	12.69	12.91	11.04	13.58	11.83	14.41	12.72	14.98	12.17	14.03	13.32	11.38

Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	6.010403618	3	2.003467873	0.453072965	0.716811513	2.882604204
Within groups	150.3464409	34	4.421954143			
Total	156.3568445	37				

within-sd	2.102844298
effective n	8.56
s_bb	0
s_bb_min	0.353934097
u_bb	0.353934097
u_bb(rel.)	2.713545293

Lithium:

r_0	4.915913225	5.584086775														
r_in	5.32	5.37	5.21	5.23	5.22	5.1	5.26	5.34								
r_middle	5.5	5.49	5.31	5.46	5.55	5.39	5.36	5.23	5.27	5.36	5.17	5.4				
r_out	5.46	5.44	5.43	5.46	5.39	5.53	5.47	5.3	5.33	5.34	5.27	5.21	5.44	5.27	5.33	5.39

Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*
Between groups	0.109493202	3	0.036497734	2.291715504	0.0957253	2.882604204
Within groups	0.541482113	34	0.015925944			
Total	0.650975315	37				

within-sd	0.126198037
effective n	8.56
s_bb	0.049018899
s_bb_min	0.021240654
u_bb	0.049018899
u_bb(rel.)	0.917401092

Nickel:

r_0	0.003570645	0.004629355													
r_in	0.004	0.0041	0.0039	0.0041	0.0039	0.0041	0.0039	0.0041							
r_middle	0.0045	0.0042	0.0042	0.0041	0.004	0.004	0.0039	0.0039	0.0041	0.0041	0.0041	0.0037			
r_out	0.0043	0.0042	0.0047	0.0042	0.0041	0.0042	0.0043	0.004	0.004	0.0046	0.0043	0.0041	0.0043	0.0042	0.0041
reuungsursac	*dratsummen (*	*heitsgrade*	*(e Quadratsum*	*rüfgröße (F)*	*P-Wert*	*tischer F-Wert*									
Unterschiede	3.41556E-07	3	1.13852E-07	2.360220795	0.089301813	2.891563517									
Innerhalb de	1.59185E-06	33	4.82379E-08												
Gesamt	1.93341E-06	36													
within-sd	0.000219631														
effective n	8.40														
s_bb	8.84E-05														
s_bb_min	3.76077E-05														
u_bb	8.84E-05			0.004120588											
u_bb(rel.)	2.145325676														

Lead:

at:								
r_0	0.011272373	0.014727627						
r_in	0.013	0.014	0.013	0.013	0.013	0.013	0.013	0.014
r_middle	0.013	0.014	0.013	0.014	0.013	0.014	0.013	0.014
r_out	0.014	0.014	0.017	0.013	0.013	0.013	0.013	0.013
reuungsursac	*dratsummen (*	*heitsgrade*	*(e Quadratsum*	*rüfgröße (F)*	*P-Wert*	*tischer F-Wert*		
Unterschiede	1.46154E-06	3	4.87179E-07	0.466618825	0.708528958	3.049124989		
Innerhalb de	2.29694E-05	22	1.04406E-06					
Gesamt	2.44309E-05	25						
within-sd	0.001021794							
effective n	6.15							
s_bb	0							
s_bb_min	0.000226174							
u_bb	0.000226174			0.013461538				
u_bb(rel.)	1.680146626							

Strontium:

r_0	5.095534848	5.904465152														
r_in	5.16	5.26	5.18	5.4	5.18	5.4	5.45	5.44								
r_middle	5.12	5.47	5.4	5.36	5.3	5.38	5.28	5.19	5.18	5.26	5.18	5.04				
r_out	5.37	5.34	5.31	5.29	5.28	5.48	5.45	5.45	5.19	5.52	4.96	5.36	5.34	5.22	5.38	
reuungsursac	*dratsummen (*	*heitsgrade (*	*e Quadratsum*	*rüfgröße (F)*	*P-Wert*	*tischer F-Wert*										
Unterschiede	0.10368223	3	0.034560743	1.295981307	0.292142615	2.891563517										
Innerhalb de	0.880031619	33	0.026667625													
Gesamt	0.983713848	36														
within-sd	0.16330225															
effective n	8.40															
s_bb	0.030660402															
s_bb_min	0.027962417															
u_bb	0.030660402			5.312647059												
u_bb(rel.)	0.577121001															

Vanadium:

r_0	90.30921552	104.4907845														
r_in	96.3	99.5	97.3	95	92.8	98.4	96.1	98.5								
r_middle	91.6	94.8	94.6	97.6	90.9	92.3	97.6	94.7	92.7	96.4	95.7	96.1				
r_out	96.3	96.8	95.6	90.1	95.2	97.5	92.9	95.4	94	97	95	95.1	93.4	94.3	95.2	93.9
Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*										
Between groups	34.66520833	3	11.55506944	1.644001479	0.197480698	2.882604204										
Within groups	238.9732407	34	7.028624726													
Total	273.638449	37														
within-sd	2.651155357															
effective n	8.56															
s_bb	0.727120062															
s_bb_min	0.446221472															
u_bb	0.727120062			95.42941176												
u_bb(rel.)	0.761945451															

Boron:

r_0	3.779209903	9.240790097														
r_in	8.26	6.62	7.15	6.87	8.5	7.43	7.04	6.6								
r_middle	6.26	6.85	7.39	8.7	8	6.97	7.19	7.42	6.45	7.28	9.5	6.65				
r_out	6.68	7.65	7.07	6.81	8.14	6.52	7.97	7.83	7.2	7.06	7.53	7.51	7.83	7.09	6.53	6.44
Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*										
Between groups	1.346826096	3	0.448942032	0.463957071	0.709315932	2.882604204										
Within groups	32.89965828	34	0.967637008													
Total	34.24648437	37														
within-sd	0.983685421															
effective n	8.56															
s_bb	0															
s_bb_min	0.165566139															
u_bb	0.165566139			7.297647059												
u_bb(rel.)	2.268760572															

Sodium:

r_0	1.064496518	2.415503482														
r_in	1.64	1.66	1.63	1.71	1.63	1.69	1.7	1.68								
r_middle	1.59	2.57	1.63	1.64	1.61	1.71	1.63	1.62	1.7	1.61	1.63	1.56				
r_out	1.63	1.63	1.64	1.61	1.61	1.64	1.68	1.66	1.63	1.69	1.65	1.63	1.62	1.6	1.59	
reuungsursac	*dratsummen (*	*heitsgrade (*	*e Quadratsum*	*rüfgröße (F)*	*P-Wert*	*tischer F-Wert*										
Unterschiede	0.04688009	3	0.015626697	0.293119381	0.830057882	2.891563517										
Innerhalb de	1.759286574	33	0.053311714													
Gesamt	1.806166664	36														
within-sd	0.230893296															
effective n	8.40															
s_bb	0															
s_bb_min	0.039536104															
u_bb	0.039536104			1.677058824												
u_bb(rel.)	2.357466747															

Calcium:

r_0	20.89942129	21.76057871														
r_in	21.61	21.45	21.29	21.36	21.3	21.56	21.33	21.65								
r_middle	21.18	21.36	21.09	21.28	21.12	21.32	21.17	21.1	21.34	21.18	21.25	21.52				
r_out	20.88	20.81	20.76	21.01	20.92	20.89	21.03	21.21	21.16	20.99	20.9	21	20.93	21	20.92	20.89
Source of variation	*sums of squares (SS)*	*degrees of freedom (df)*	*Mean squares (MS)*	*F-value*	*P-value*	*critical F-value*										
Between groups	1.444770395	3	0.481590132	18.22614021	3.17419E-07	2.882604204										
Within groups	0.898383546	34	0.026423045													
Total	2.343153941	37														
within-sd	0.16255167															
effective n	8.56															
s_bb	0.230575385															
s_bb_min	0.02735941															
u_bb	0.230575385			21.19647059												
u_bb(rel.)	1.087800838															