

FLUXANA

New Certified Reference Materials

FLX-CRM 111, FLX-CRM 112



Proficiency Test Report

FLX-CRM 111, FLX-CRM 112

Introduction

X-ray fluorescence analysis is a widely used technique for the analysis of oxidic materials. Different ISO methods like e.g. 12677:2011 or 29581-2:2010 describe the use in detail.

However for the calibration of xrf instruments dedicated standard material is needed. As a world wide supplier for xrf laboratories FLUXANA has developed a number of services to support xrf users. One of these services is the production of new reference materials in combination with a proficiency test.

From 2011 FLUXANA has introduced its own quality management in agreement with ISO 17025.

The production of reference materials and the corresponding proficiency tests including all evaluations are performed in agreement with ISO 17043, ISO Guide 34-2009, ISO Guide 31-2000 and ISO Guide 35-2006.

Proficiency test

All laboratories which applied until 29.02.2012 for the participation of the proficiency test got their samples starting week 10 and sent in their results until 31.05.2012.

Further information

In the following evaluation report all laboratory data are listed. Also the used methods like XRF according ISO 12677, XRF preparation as fused bead, XRF preparation as pressed pellet, XRF as reconstitution method, ICP-OES, combustion with HF-IR (high frequency infrared) or others are specified. Laboratories which are working under ISO 17025 accreditation are highlighted. Under Remark additional information is given.

Certificate of Analysis

Based on this report a certificate of analysis is issued separately.

Outlier evaluation

There will be two outlier tests based on **Grubbs** and **z-score**.

However every outlier detected by the test was verified individually. Sometimes a value detected as outlier is included to guarantee a balance between different analytical methods. These values are marked as '**included**'. Real outliers which were excluded from the calculation of mean, standard deviation and uncertainty are marked as '**confirmed outliers**'.

Statistical Evaluation for a new RM (reference material)

All mentioned calculations are based on:

Reference materials – General and statistical principles for certification ISO Guide 35:2006.

Conformity assessment - General requirements for proficiency testing ISO 17043:2010.

Calculation of laboratory average

Each participant of the proficiency test must perform a number of single measurements and report with significant digits.

For each participant a laboratory average \bar{x} is calculated:

$$(1) \quad \bar{x} = \sum_{k=1}^p \frac{x}{p}$$

1 x Single measurement

p Number of single measurements

Calculation of total average

From all laboratory averages a total average $\bar{\bar{x}}$ is calculated:

$$(2) \quad \bar{\bar{x}} = \sum_{k=1}^n \frac{\bar{x}}{n}$$

n Number of participants

Calculation of standard deviation

From all laboratory averages the standard deviation s is calculated:

$$(3) \quad s = \sqrt{\sum_{k=1}^n (\bar{x} - \bar{\bar{x}})^2 / (n - 1)}$$

Test for outliers

From all laboratory averages the **z-score** z is calculated:

$$(4) \quad z = \left| \frac{(\bar{x} - \bar{x})}{s} \right|$$

An outlier test based on z-score is performed:

$z \leq 2,0$	indicates ‚satisfactory‘ performance = generates no signal
$2,0 < z < 3,0$	indicates ‚questionable‘ performance = generates a warning signal
$z \geq 3,0$	indicates ‚unsatisfactory‘ performance = generates an action signal

Parallel an outlier test based on Grubbs is performed:

$$(5) \quad PG = \left| \frac{(\bar{x} - \bar{x})}{s} \right|$$

PG test value

Based on table 1 a comparison value for the half width confidence interval is calculated for n:

$PG \leq VG$	indicates ‚satisfactory‘ performance = generates no signal
$PG > VG$	indicates ‚unsatisfactory‘ performance = generates an action signal

In case an outlier is detected the data will be taken out and all calculations according formulars 2,3,4,5 have to be repeated. A new test for outliers must be performed.

Calculation of the uncertainty

The uncertainty values are coming from the half width confidence interval C(95%). It is equal to:

$$(6) \quad C(95\%) = t * s / \sqrt{n}$$

t Student's value

where t is the appropriate Student's value, n the number of acceptable mean values and s the standard deviation.

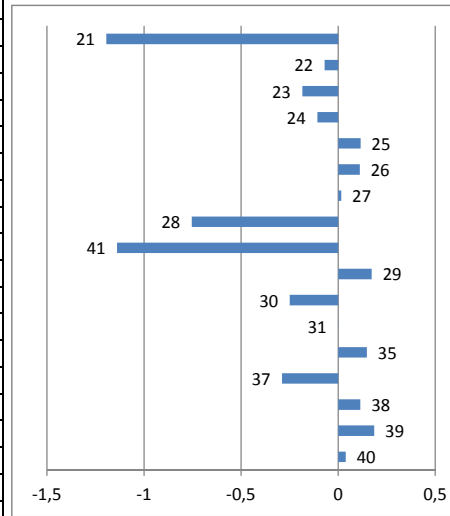
Participating Laboratories

Bachema AG	Schlieren	Switzerland
BASF Coatings GmbH	Münster	Germany
CRB Analyse Service GmbH	Hardegsen	Germany
Deutsches Institut für Feuerfest und Keramik GmbH	Bonn	Germany
Dorfner Anzaplan	Hirschau	Germany
FLUXANA GmbH & Co.KG	Bedburg-Hau	Germany
Fundacion ITMA	Llanera-Asturias	Spain
Grothe Rohstoffe GmbH & Co. KG	Bückeberg	Germany
Holcim (Deutschland) AG	Sehnde	Germany
Hoppecke Batterien GmbH & Co. KG	Brilon-Hoppecke	Germany
HuK Umweltlabor GmbH	Wenden-Hünsborn	Germany
Imerys Minerals Ltd.	Cornwall	England
Instituto Nacional del Carbón (INCAR-CSIC)	Oviedo (Asturias)	Spain
Rockwool BV	JG Roermond	Netherlands
ThyssenKrupp Steel Europe AG	Duisburg	Germany
Vargön Alloys AB	Vargön	Sweden

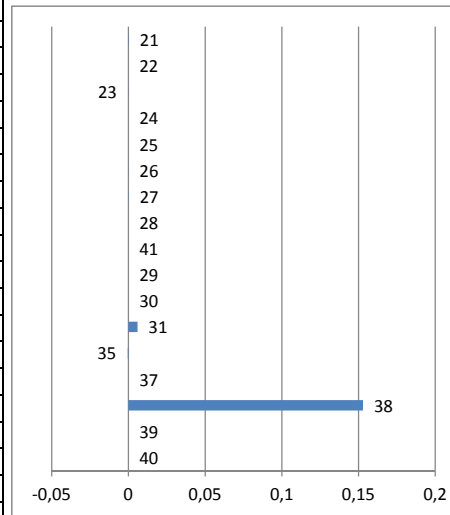
Al2O3		FLX-CRM 111			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:28:20	z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean					
21	ISO 12677			3,942	4,232	x4,087		>3	n=13 VG=2,331	confirmed	
22	ISO 12677		reconstitution	4,726	4,443	4,585		3,68	Outlier	x	
23	ISO 12677	YES		4,770	4,630	4,700		0,50			
24	ISO 12677			4,640	4,668	4,654		0,23			
25	XRF bead			4,700	4,440	4,570		0,06			
26	XRF pellet			3,832	3,706	x3,769		0,60			
27	ISO 12677	YES		4,680	4,520	4,600		5,71	Outlier	x	
28	ISO 12677	YES		4,670	4,730	4,700		0,41			
41	ICP-OES	YES	ISO 11885-E22	4,500		4,500		0,23			
29	ISO 12677	YES		4,650	4,722	4,686		1,04			
30	XRF bead			4,130	4,180	x4,155		0,14			
31	ISO 12677	YES		0,837	1,061	x0,949		3,24	Outlier	x	
35	ISO 12677			4,784	4,714	4,749		23,70	Outlier	x	
37	ICP-OES		Borax fusion	4,310		4,310	0,55				
38	ISO 12677	YES		4,814	4,870	4,842	2,26	Included			
39	XRF bead			4,780	4,930	4,855	1,14				
40	ISO 12677			4,936	4,815	4,876	1,22				
							n	13			
							Mean	4,664			
							Max	4,876			
							Min	4,310			
							Stdev s	0,157			
							C(95%)	0,095			
							C(95%)=t*s/SQR(n) t(13)=2,179				

CaO		FLX-CRM 111			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:27:51	z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean					
21	ISO 12677			1,975	1,888	1,932		>3	n=15 VG=2,409	confirmed	
22	ISO 12677		reconstitution	1,871	1,830	x1,851		2,12			
23	ISO 12677	YES		2,040	2,030	2,035		3,41	Outlier	x	
24	ISO 12677			2,089	2,108	2,099		0,48			
25	XRF bead			2,050	2,060	2,055		0,53			
26	XRF pellet			2,851	2,828	x2,840		0,16			
27	ISO 12677	YES		2,070	2,090	2,080		12,32	Outlier	x	
28	ISO 12677	YES		2,120	2,140	2,130		0,23			
41	ICP-OES	YES	ISO 11885-E22	2,000		2,000		1,03			
29	ISO 12677	YES		2,015	2,050	2,033		1,04			
30	XRF bead			2,140	2,110	2,125		0,52			
31	ISO 12677	YES		2,141	2,122	2,132		0,95			
35	ISO 12677			2,138	2,123	2,131		1,05			
37	ICP-OES		aqua regia	1,960		1,960	1,04				
38	ISO 12677	YES		2,094	2,071	2,083	1,68				
39	XRF bead			2,080	2,140	2,110	0,27				
40	ISO 12677			2,069	2,087	2,078	0,71				
							n	15			
							Mean	2,065			
							Max	2,132			
							Min	1,932			
							Stdev s	0,063			
							C(95%)	0,035			
							C(95%)=t*s/SQR(n) t(15)=2,145				

Fe2O3		FLX-CRM 111			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:28:29		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean			z>3	n=14 VG=2,371	confirmed	
21	ISO 12677			8,367	8,323	x8,345			7,58	Outlier	x	
22	ISO 12677		reconstitution	9,482	9,457	9,470			0,44			
23	ISO 12677	YES		9,310	9,400	9,355			1,17			
24	ISO 12677			9,407	9,457	9,432			0,68			
25	XRF bead			9,620	9,690	9,655			0,73			
26	XRF pellet			9,483	9,818	9,651			0,71			
27	ISO 12677	YES		9,500	9,610	9,555			0,10			
28	ISO 12677	YES		8,770	8,800	x8,785			4,79	Outlier	x	
41	ICP-OES	YES	ISO 11885-E22	8,400		x8,400			7,23	Outlier	x	
29	ISO 12677	YES		9,768	9,656	9,712			1,10			
30	XRF bead			9,280	9,300	9,290			1,58			
31	ISO 12677	YES		9,555	9,522	9,539			0,01			
35	ISO 12677			9,715	9,659	9,687			0,94			
37	ICP-OES		Borax fusion	9,250		9,250			1,84			
38	ISO 12677	YES		9,699	9,607	9,653			0,72			
39	XRF bead			9,810	9,640	9,725			1,18			
40	ISO 12677			9,522	9,634	9,578			0,25			
						n	14					
						Mean	9,539					
						Max	9,725					
						Min	9,250					
						Stdev s	0,158					
						C(95%)	0,091	C(95%)=t*s/SQR(n)		t(14)=2,160		



HfO2		FLX-CRM 111			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:10:27		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean			z>3	n=5 VG=1,672	confirmed	
21	XRF pellet			0,001	0,001	0,001			0,96			
22												
23	ISO 12677	YES		0,001	0,001	0,001			0,15			
24	ISO 12677			<0,02	<0,02							
25												
26	XRF pellet			0,001	0,001	0,001			0,29			
27	ICP-OES	YES		0,001	0,002	0,001			0,54			
28	ISO 12677	YES		<0,01	<0,01							
41	ICP-OES	YES	ISO 11885-E22	<0,005								
29												
30												
31	ISO 12677	YES		0,007	0,007	x0,007			22,10	Outlier	x	
35	ISO 12677			0,001	0,001	0,001			1,64			
37												
38	ISO 12677	YES		0,154	0,154	x0,154			567,29	Outlier	x	
39												
40	ISO 12677											
						n	5					
						Mean	0,001					
						Max	0,001					
						Min	0,001					
						Stdev s	0,000					
						C(95%)	0,000	C(95%)=t*s/SQR(n)		t(5)=2,776		



K2O		FLX-CRM 111			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:28:38		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean			z>3	n=9 VG=2,110	confirmed	
21	ISO 12677			0,026	0,044	x0,035			4,53	Outlier	x	
22									0,74			
23	ISO 12677	YES		0,005	0,007	0,006						
24	ISO 12677			<0,03	<0,03							
25	XRF bead			<0,1	<0,1							
26	XRF pellet			0,013	0,007	0,010			0,03			
27	ICP-OES	YES		0,020	0,010	0,015			0,89			
28	ISO 12677	YES		0,020	0,020	0,020			1,80			
41	ICP-OES	YES	ISO 11885-E22	0,006		0,006			0,74			
29	ISO 12677	YES		0,001	0,001	0,001			1,65			
30	XRF bead			0,066	0,071	x0,069			10,71	Outlier	x	
31	ISO 12677	YES		<0,0012	<0,0012							
35	ISO 12677			<0,0100	<0,0100							
37	ICP-OES		aqua regia	0,012		0,012			0,35			
38	ISO 12677	YES		<0,01	<0,01							
39	XRF bead			0,010	0,010	0,010			0,01			
40	ISO 12677			0,011	0,010	0,011			0,08			
						n	9					
						Mean	0,010					
						Max	0,020					
						Min	0,001					
						Stdev s	0,006					
						C(95%)	0,004					

C(95%)=t*s/SQR(n) t(9)=2,306

MgO		FLX-CRM 111			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:28:49		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean			z>3	n=16 VG=2,443	confirmed	
21	ISO 12677			70,605	69,964	70,285			0,06			
22	ISO 12677		reconstitution	69,913	69,945	69,929			0,20			
23	ISO 12677	YES		70,080	70,070	70,075			0,10			
24	ISO 12677			70,970	71,284	71,127			0,69			
25	XRF bead			70,590	69,930	70,260			0,04			
26	XRF pellet			66,790	66,370	x66,580			2,69	Outlier	x	
27	ISO 12677	YES		69,900	69,800	69,850			0,26			
28	ISO 12677	YES		71,300	70,900	71,100			0,67			
41	ICP-OES	YES	ISO 11885-E22	72,900		72,900			2,00			
29	ISO 12677	YES		69,669	70,284	69,977			0,17			
30	XRF bead			70,940	70,426	70,683			0,36			
31	ISO 12677	YES		72,780	72,650	72,715			1,86			
35	ISO 12677			68,605	68,200	68,403			1,34			
37	ICP-OES		aqua regia	67,840		67,840			1,76			
38	ISO 12677	YES		69,455	69,333	69,394			0,60			
39	XRF bead			69,010	68,650	68,830			1,02			
40	ISO 12677			69,883	69,917	69,900			0,23			
						n	16					
						Mean	70,204					
						Max	72,900					
						Min	67,840					
						Stdev s	1,347					
						C(95%)	0,717					

C(95%)=t*s/SQR(n) t(16)=2,131

Na2O		FLX-CRM 111			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:28:58		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean			z>3	n=10 VG=2,176	confirmed	
21	ISO 12677			0,500	0,483	x0,492			22,51	Outlier	x	
22	ISO 12677		reconstitution	0,049	0,075	0,062			0,39			
23	ISO 12677	YES		<0,03	<0,03							
24												
25	ICP-OES			0,060	0,060	0,060			0,50			
26	XRF pellet			0,351	0,368	x0,360			15,48	Outlier	x	
27	ICP-OES	YES		0,070	0,080	0,075			0,30			
28	ISO 12677	YES		0,080	0,070	0,075			0,30			
41	ICP-OES	YES	ISO 11885-E22	0,050		0,050			1,03			
29	ISO 12677	YES		0,104	0,109	0,107			1,98			
30	XRF bead			0,277	0,289	x0,283			11,38	Outlier	x	
31	ISO 12677	YES		<0,014	<0,014							
35	ISO 12677			0,038	0,045	0,042			1,49			
37	ICP-OES		aqua regia	0,067		0,067			0,13			
38	ISO 12677	YES		0,072	0,062	0,067			0,13			
39	XRF bead			0,080	0,100	0,090			1,10			
40	ISO 12677			<0,1	<0,1							
				n	10							
				Mean	0,069							
				Max	0,107							
				Min	0,042							
				Stdev s	0,019							
				C(95%)	0,013							

C(95%)=t*s/SQR(n) t(10)=2,262

NiO		FLX-CRM 111			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:11:18		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean			z>3	n=14 VG=2,371	confirmed	
21	XRF pellet			0,031	0,031	0,031			0,02			
22	ISO 12677		reconstitution	0,018	0,018	0,018			1,87			
23	ISO 12677	YES		0,030	0,031	0,031			0,05			
24	ISO 12677			0,033	0,033	0,033			0,30			
25												
26	XRF pellet			0,033	0,031	0,032			0,20			
27	ICP-OES	YES		0,017	0,017	0,017			1,97			
28	ISO 12677	YES		0,040	0,040	0,040			1,33			
41	ICP-OES	YES	ISO 11885-E22	0,040		0,040			1,33			
29	ISO 12677	YES		0,029	0,029	0,029			0,27			
30												
31	ISO 12677	YES		0,035	0,034	0,035			0,54			
35	ISO 12677			0,031	0,032	0,031			0,07			
37	ICP-OES		aqua regia	0,026		0,026			0,70			
38	ISO 12677	YES		0,031	0,031	0,031			0,02			
39												
40	ISO 12677			0,038	0,038	0,038			1,04			
				n	14							
				Mean	0,031							
				Max	0,040							
				Min	0,017							
				Stdev s	0,007							
				C(95%)	0,004							

C(95%)=t*s/SQR(n) t(14)=2,160

SiO2		FLX-CRM 111			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:29:06		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean			z-score	n=14 VG=2,371	confirmed	
21	ISO 12677			1,694	2,177	x1,936			z>3			
22	ISO 12677		reconstitution	1,311	1,299	1,305			4,78	Outlier	x	
23	ISO 12677	YES		1,290	1,260	1,275			0,84			
24	ISO 12677			1,302	1,301	1,302			1,11			
25	XRF bead			1,310	1,390	1,350			0,87			
26	XRF pellet			2,654	2,552	x2,603			0,44			
27	ISO 12677	YES		1,350	1,400	1,375			10,72	Outlier	x	
28	ISO 12677	YES		1,610	1,630	1,620			0,22			
41	ICP-OES	YES	ISO 11885-E22	1,500		1,500			1,97			
29	ISO 12677	YES		1,436	1,405	1,421			0,90			
30	XRF bead			1,490	1,500	1,495			0,19			
31	ISO 12677	YES		1,312	1,291	1,302			0,85			
35	ISO 12677			1,814	1,758	x1,786			0,87			
37	ICP-OES		Borax fusion	1,260		1,260			3,44	Outlier	x	
38	ISO 12677	YES		1,406	1,405	1,406			1,24			
39	XRF bead			1,510	1,630	1,570			0,05			
40	ISO 12677			1,412	1,415	1,414			1,52			
						n	14			0,13		
						Mean	1,399					
						Max	1,620					
						Min	1,260					
						Stdev s	0,112					
						C(95%)	0,065					

C(95%)=t*s/SQR(n) t(14)=2,160

Total S expressed as SO3		FLX-CRM 111			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:29:12		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean			z-score	n=14 VG=2,371	confirmed	
21	HF-IR			0,153	0,153	0,153			z>3			
22	ISO 12677		reconstitution	0,173	0,180	0,177			0,38			
23	ISO 12677	YES		0,120	0,140	0,130			0,85			
24	HF-IR			0,145	0,140	0,143			0,08			
25	HF-IR			0,150	0,150	0,150			0,17			
26	XRF pellet			0,474	0,826	x0,650			0,32			
27	HF-IR	YES		0,040	0,033	0,037			10,29	Outlier	x	
28	ISO 12677	YES		0,120	0,130	0,125			1,95			
41									0,18			
29	ISO 12677	YES		0,064	0,092	0,078						
30	XRF bead			0,189	0,203	0,196			1,12			
31	ISO 12677	YES		0,161	0,167	0,164			1,23			
35	ISO 12677			0,101	0,098	0,099			0,60			
37	ICP-OES		aqua regia	0,175		0,175			0,69			
38	HF-IR		DIN 51095-1	0,195	0,196	0,196			0,82			
39									1,22			
40	ISO 12677			0,073	0,040	0,057						
						n	14			1,55		
						Mean	0,134					
						Max	0,196					
						Min	0,037					
						Stdev s	0,050					
						C(95%)	0,029					

C(95%)=t*s/SQR(n) t(14)=2,160

TiO2		FLX-CRM 111			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:29:21		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean			z>3	n=14 VG=2,371	confirmed	
21	ISO 12677			0,158	0,158	0,158						
22	ISO 12677		reconstitution	0,103	0,109	x0,106						
23	ISO 12677	YES		0,167	0,173	0,170			8,99	Outlier	x	
24	ISO 12677			0,170	0,165	0,168			1,72			
25	XRF bead			0,170	0,160	0,165			1,30			
26	XRF pellet			0,161	0,165	0,163			0,89			
27	ISO 12677	YES		0,160	0,160	0,160			0,53			
28	ISO 12677	YES		0,160	0,160	0,160			0,05			
41	ICP-OES	YES	ISO 11885-E22	0,150		0,150			0,05			
29	ISO 12677	YES		0,165	0,162	0,164			1,62			
30	XRF bead			0,158	0,156	0,157			0,63			
31	ISO 12677	YES		0,188	0,190	x0,189			0,45			
35	ISO 12677			0,149	0,164	0,157			4,90	Outlier	x	
37	ICP-OES		Borax fusion	0,250		x0,250			0,54			
38	ISO 12677	YES		0,154	0,154	0,154			15,11	Outlier	x	
39	XRF bead			0,150	0,150	0,150			0,96			
40	ISO 12677			0,164	0,159	0,162			1,62			
				n	14							
				Mean	0,160							
				Max	0,170							
				Min	0,150							
				Stdev s	0,006							
				C(95%)	0,003							

C(95%)=t*s/SQR(n) t(14)=2,160

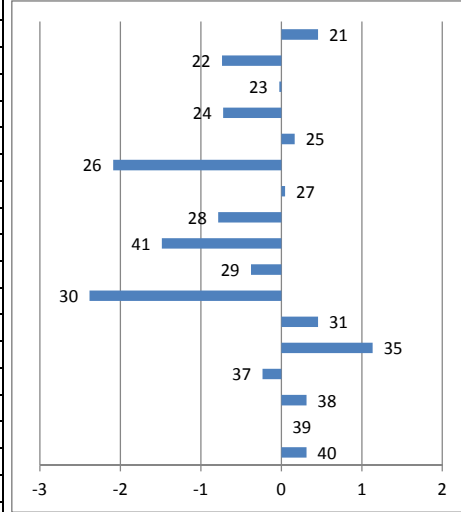
ZrO2		FLX-CRM 111			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:29:26		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean			z>3	n=15 VG=2,409	confirmed	
21	XRF pellet			0,047	0,047	0,047						
22	ISO 12677		reconstitution	0,054	0,044	0,049						
23	ISO 12677	YES		0,073	0,069	0,071						
24	ISO 12677			0,051	0,052	0,051						
25												
26	XRF pellet			0,058	0,055	0,057						
27	ISO 12677	YES		0,070	0,080	0,075						
28	ISO 12677	YES		0,060	0,070	0,065						
41	ICP-OES	YES	ISO 11885-E22	0,060		0,060						
29	ISO 12677	YES		0,043	0,050	0,047						
30	XRF bead			0,041	0,044	0,043						
31	ISO 12677	YES		0,078	0,079	0,078						
35	ISO 12677			0,042	0,040	0,041						
37	ICP-OES		Borax fusion	0,054		0,054						
38	ISO 12677	YES		0,051	0,055	0,053						
39												
40	ISO 12677			0,067	0,057	0,062						
				n	15							
				Mean	0,057							
				Max	0,078							
				Min	0,041							
				Stdev s	0,012							
				C(95%)	0,006							

C(95%)=t*s/SQR(n) t(15)=2,145

Co3O4		FLX-CRM 111			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:12:23		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean			z>3	n=9 VG=2,110	confirmed	
21	XRF pellet			0,011	0,011	0,011			0,43			
22	ISO 12677			0,013	0,013	0,013			1,08			
23	ISO 12677	YES		0,006	0,007	x0,007			3,46	Outlier	x	
24	ISO 12677			<0,02	<0,02							
25												
26	XRF pellet			0,011	0,011	0,011			0,27			
27	ICP	YES		0,011	0,013	0,012			0,25			
28	ISO 12677	YES		0,010	0,010	0,010			1,19			
41	ICP-OES	YES	ISO 11885-E22	0,014		0,014			1,84			
29												
30												
31	ISO 12677	YES										
35	ISO 12677			0,013	0,011	0,012			0,33			
37	ICP-OES		aqua regia	0,010		0,010			1,19			
38	ISO 12677	YES		<0,01	<0,01							
39												
40	ISO 12677			0,010	0,012	0,011			0,43			
						n	9					
						Mean	0,012					
						Max	0,014					
						Min	0,010					
						Stdev s	0,001					
						C(95%)	0,001	C(95%)=t*s/SQR(n)		t(9)=2,306		

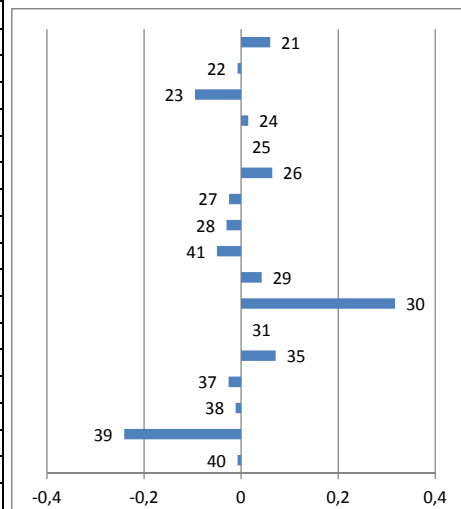
WO3		FLX-CRM 111			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:29:47		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean			z>3	n=7 VG=1,938	confirmed	
21	XRF pellet			0,005	0,005	0,005			0,64			
22	ISO 12677		reconstitution	0,007	0,007	0,007			0,33			
23	ISO 12677	YES		0,007	0,007	0,007			0,43			
24												
25												
26	XRF pellet			0,005	0,002	0,004			1,17			
27	ICP	YES		0,005	0,006	0,006			0,30			
28	ISO 12677	YES		0,010	0,010	0,010			1,88			
41												
29												
30												
31	ISO 12677	YES		0,054	0,055	x0,054			23,20	Outlier	x	
35	ISO 12677			<0,004	<0,004							
37	ICP-OES		aqua regia	0,005		0,005			0,54			
38	ISO 12677	YES		<0,01	<0,01							
39												
40	ISO 12677			<0,02	<0,02							
						n	7					
						Mean	0,006					
						Max	0,010					
						Min	0,004					
						Stdev s	0,002					
						C(95%)	0,002	C(95%)=t*s/SQR(n)		t(7)=2,447		

Cr203							FLX-CRM 111					Freitag, 12. Oktober 2012 11:29:57		
Lab.No:	Method	ISO 17025	Remark	Mass % Meas #1	Mass % Meas #2	Mass % Mean	z-score	Grubbs	Outlier					
21	XRF pellet			11,940	11,940	11,940	>3	n=13 VG=2,331	confirmed					
22	ISO 12677		reconstitution	10,658	10,838	10,748	0,81							
23	ISO 12677	YES		11,420	11,500	11,460	1,31							
24	ISO 6331			10,777	10,747	10,762	0,04							
25	XRF bead			11,690	11,610	11,650	1,28							
26	XRF pellet			9,305	9,482	x9,394	0,29							
27	ISO 12677	YES		11,560	11,500	11,530	3,71	Outlier	x					
28	ISO 12677	YES		10,600	10,800	10,700	0,08							
41	ICP-OES	YES	ISO 11885-E22	10,000		x10,000	1,39							
29	ISO 12677	YES		11,382	10,832	11,107	2,64	Outlier	x					
30	XRF bead			8,975	9,224	x9,100	0,67							
31	ISO 12677	YES		11,950	11,930	11,940	4,24	Outlier	x					
35	ISO 12677			12,570	12,666	12,618	0,81							
37	ICP-OES		Borax fusion	11,250		11,250	2,01							
38	ISO 12677	YES		11,701	11,894	11,798	0,42							
39							0,56							
40	ISO 12677			11,800	11,794	11,797	0,55							
						n	13							
						Mean	11,485							
						Max	12,618							
						Min	10,700							
						Stdev s	0,563							
						C(95%)	0,340							



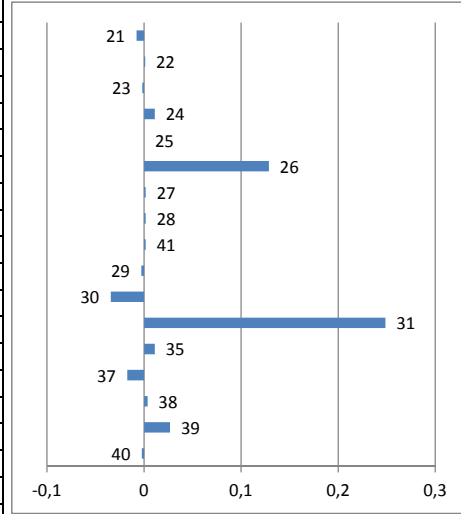
C(95%)=t*s/SQR(n) t(13)=2,179

Mn304							FLX-CRM 111					Freitag, 12. Oktober 2012 11:30:02		
Lab.No:	Method	ISO 17025	Remark	Mass % Meas #1	Mass % Meas #2	Mass % Mean	z-score	Grubbs	Outlier					
21	XRF pellet			0,430	0,430	0,430	>3	n=13 VG=2,331	confirmed					
22	ISO 12677		reconstitution	0,361	0,364	0,363	1,23							
23	ISO 12677	YES		0,280	0,270	0,275	0,15							
24	ISO 12677			0,384	0,386	0,385	1,94							
25							0,30							
26	XRF pellet			0,429	0,439	0,434								
27	ISO 12677	YES		0,340	0,350	0,345	1,31							
28	ISO 12677	YES		0,340	0,340	0,340	0,51							
41	ICP-OES	YES	ISO 11885-E22	0,320		0,320	0,61							
29	ISO 12677	YES		0,408	0,417	0,413	1,02							
30	XRF bead			0,686	0,688	x0,687	0,87							
31	ISO 12677	YES					6,48	Outlier	x					
35	ISO 12677			0,444	0,438	0,441	1,45							
37	ICP-OES		Borax fusion	0,344		0,344	0,53							
38	ISO 12677	YES		0,359	0,358	0,359	0,23							
39	XRF bead			0,129	0,129	x0,129	4,92	Outlier	x					
40	ISO 12677			0,363	0,362	0,363	0,15							
						n	13							
						Mean	0,370							
						Max	0,441							
						Min	0,275							
						Stdev s	0,049							
						C(95%)	0,030							

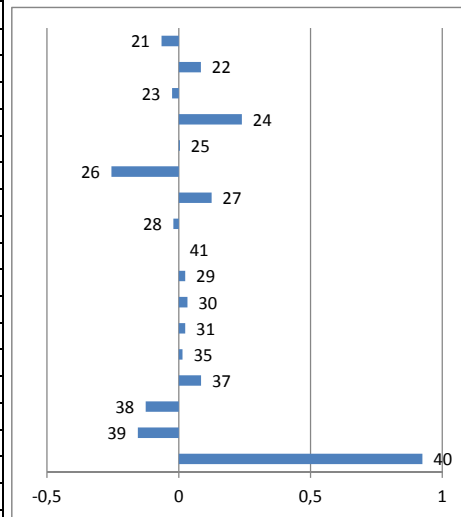


C(95%)=t*s/SQR(n) t(13)=2,179

P205		FLX-CRM 111			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:30:11		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean			z-score	n=12 VG=2,285	confirmed	
21	ISO 12677			0,082	0,079	0,081			1,02			
22	ISO 12677		reconstitution	0,092	0,087	0,090			0,16			
23	ISO 12677	YES		0,087	0,086	0,087			0,24			
24	ISO 12677			0,099	0,100	0,099			1,45			
25	XRF bead			<0,1	<0,1							
26	XRF pellet			0,222	0,211	x0,217			16,81	Outlier	x	
27	ISO 12677	YES		0,090	0,090	0,090			0,22			
28	ISO 12677	YES		0,080	0,100	0,090			0,22			
41	ICP-OES	YES	ISO 11885-E22	0,090		0,090			0,22			
29	ISO 12677	YES		0,085	0,086	0,086			0,37			
30	XRF bead			0,052	0,056	x0,054			4,48	Outlier	x	
31	ISO 12677	YES		0,346	0,327	x0,337			32,49	Outlier	x	
35	ISO 12677			0,100	0,099	0,099			1,44			
37	ICP-OES		aqua regia	0,071		0,071			2,26	Included		
38	ISO 12677	YES		0,092	0,092	0,092			0,48			
39	XRF bead			0,110	0,120	x0,115			3,49	Outlier	x	
40	ISO 12677			0,087	0,085	0,086			0,30			
						n	12					
						Mean	0,088					
						Max	0,099					
						Min	0,071					
						Stdev s	0,008					
						C(95%)	0,005	C(95%)=t*s/SQR(n) t(12)=2,201				



LOI (@ 1025°C)		FLX-CRM 111			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:30:16		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean			z-score	n=13 VG=2,331	confirmed	
21	gravimetric			0,510	0,510	0,510			0,82			
22	ISO 12677			0,635	0,684	0,660			1,04			
23	ISO 12677	YES		0,560	0,540	0,550			0,32			
24	ISO 12677			0,820	0,810	x0,815			2,98	Outlier	x	
25	gravimetric			0,580	0,580	0,580			0,05			
26				0,330	0,310	x0,320			3,18	Outlier	x	
27	ISO 12677	YES		0,700	0,700	0,700			1,55			
28	ISO 12677	YES		0,550	0,560	0,555			0,26			
41												
29	DIN 51081	YES	1 h at 1025°C	0,590	0,610	0,600			0,30			
30	gravimetric			0,592	0,625	0,609			0,41			
31	ISO 12677			0,600	0,600	0,600			0,30			
35	ISO 12677			0,590	0,590	0,590			0,18			
37	gravimetric			0,660		0,660			1,05			
38	ISO 12677	YES		0,440	0,460	0,450			1,56			
39	gravimetric			0,450	0,390	0,420			1,94			
40	ISO 12677			1,500	1,500	x1,500			11,50	Outlier	x	
						n	13					
						Mean	0,576					
						Max	0,700					
						Min	0,420					
						Stdev s	0,080					
						C(95%)	0,049	C(95%)=t*s/SQR(n) t(13)=2,179				



AI2O3		FLX-CRM 112			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:47:41		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean				>3	n=11 VG=2,234	confirmed
21	ISO 12677			82,462	82,025	x82,244				4,54	Outlier	x
22	ISO 12677		reconstitution	77,563	77,673	x77,618				4,10	Outlier	x
23	ISO 12677	YES		80,020	80,050	80,035				0,41		
24	ISO 12677			79,495	79,594	79,545				0,50		
25	XRF bead	YES		80,340	80,060	80,200				0,72		
26	XRF pellet			55,350	54,190	x54,770				46,75	Outlier	x
27	ISO 12677	YES		80,500	80,900	80,700				1,66		
28	ISO 12677	YES		79,600	79,700	79,650				0,30		
41												
29	ISO 12677	YES		79,652	79,681	79,667				0,27		
30	XRF bead			79,610	80,860	80,235				0,79		
31	ISO 12677	YES		78,620	78,620	78,620				2,23	Included	
35	ISO 12677			79,832	80,193	80,013				0,37		
37	ICP-OES		Borax fusion	70,990		x70,990				16,47	Outlier	x
38	ISO 12677	YES		79,790	79,842	79,816				0,01		
39	XRF bead			75,230	75,510	x75,370				8,29	Outlier	x
40	ISO 12677			79,574	79,351	79,463				0,65		
				n	11							
				Mean	79,813							
				Max	80,700							
				Min	78,620							
				Stdev s	0,536							
				C(95%)	0,360							

C(95%)=t*s/SQR(n) t(11)=2,228

CaO		FLX-CRM 112			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:47:47		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean				>3	n=14 VG=2,371	confirmed
21	ISO 12677			0,205	0,246	x0,226				2,93	Outlier	x
22	ISO 12677		reconstitution	0,141	0,154	0,148				0,03		
23	ISO 12677	YES		0,167	0,153	0,160				0,49		
24	ISO 12677			0,165	0,161	0,163				0,60		
25	XRF bead	YES		<0,1	<0,1							
26	XRF pellet			0,182	0,181	0,182				1,29		
27	ISO 12677	YES		0,110	0,120	0,115				1,17		
28	ISO 12677	YES		0,100	0,100	0,100				1,72		
41	ICP-OES	YES	ISO 11885-E22	0,140		0,140				0,24		
29	ISO 12677	YES		0,124	0,131	0,128				0,71		
30	XRF bead			0,270	0,260	x0,265				4,36	Outlier	x
31	ISO 12677	YES		0,158	0,157	0,157				0,39		
35	ISO 12677			0,150	0,151	0,150				0,14		
37	ICP-OES		aqua regia	0,098		0,098				1,79		
38	ISO 12677	YES		0,178	0,168	0,173				0,97		
39	XRF bead			0,200	0,150	0,175				1,05		
40	ISO 12677			0,169	0,160	0,165				0,66		
				n	14							
				Mean	0,147							
				Max	0,182							
				Min	0,098							
				Stdev s	0,027							
				C(95%)	0,016							

C(95%)=t*s/SQR(n) t(14)=2,160

Fe2O3		FLX-CRM 112			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:47:53		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean			z-score	n=16 VG=2,443	confirmed	
21	ISO 12677			0,338	0,307	0,323			0,04			
22	ISO 12677		reconstitution	0,360	0,360	0,360			0,46			
23	ISO 12677	YES		0,400	0,380	0,390			0,87			
24	ISO 12677			0,379	0,390	0,385			0,80			
25	XRF bead	YES		0,400	0,410	0,405			1,07			
26	XRF pellet			1,027	1,138	x1,083			10,25	Outlier	x	
27	ISO 12677	YES		0,390	0,390	0,390			0,87			
28	ISO 12677	YES		0,210	0,200	0,205			1,63			
41	ICP-OES	YES	ISO 11885-E22	0,340		0,340			0,19			
29	ISO 12677	YES		0,399	0,342	0,371			0,61			
30	XRF bead			0,240	0,240	0,240			1,16			
31	ISO 12677	YES		0,281	0,269	0,275			0,69			
35	ISO 12677			0,346	0,350	0,348			0,30			
37	ICP-OES		Borax fusion	0,415		0,415			1,21			
38	ISO 12677	YES		0,356	0,327	0,342			0,21			
39	XRF bead			0,180	0,190	0,185			1,91			
40	ISO 12677			0,253	0,226	0,240			1,17			
				n	16							
				Mean	0,326							
				Max	0,415							
				Min	0,185							
				Stdev s	0,074							
				C(95%)	0,039							

C(95%)=t*s/SQR(n) t(16)=2,131

HfO2		FLX-CRM 112			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:17:35		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean			z-score	n=12 VG=2,285	confirmed	
21	XRF pellet			0,362	0,362	x0,362			9,31	Outlier	x	
22	ISO 12677			0,243	0,241	x0,242			5,06	Outlier	x	
23	ISO 12677	YES		0,121	0,122	0,122			0,80			
24	ISO 12677			0,138	0,139	0,139			1,40			
25	XRF bead			0,130	0,120	0,125			0,92			
26	XRF pellet			0,082	0,087	0,085			0,50			
27	ICP-OES	YES		0,117	0,120	0,119			0,69			
28	ISO 12677	YES		0,070	0,070	0,070			1,03			
41	ICP-OES	YES	ISO 11885-E22	0,044		0,044			1,95			
29	ISO 12677	YES		0,100	0,097	0,099			0,01			
30												
31	ISO 12677	YES		0,107	0,107	0,107			0,28			
35	ISO 12677			0,082	0,081	0,082			0,62			
37												
38	ISO 12677	YES		0,070	0,079	0,075			0,87			
39												
40	ISO 12677			0,124	0,124	0,124			0,89			
				n	12							
				Mean	0,099							
				Max	0,139							
				Min	0,044							
				Stdev s	0,028							
				C(95%)	0,018							

C(95%)=t*s/SQR(n) t(12)=2,201

K2O		FLX-CRM 112			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:48:04		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean				>3	n=10 VG=2,176	confirmed
21	ISO 12677			0,092	0,092	0,092				0,35		
22	ISO 12677		reconstitution	0,075	0,106	0,091				0,07		
23	ISO 12677	YES		0,087	0,081	0,084				1,16		
24	ISO 12677			0,099	0,094	0,097				1,20		
25	XRF bead	YES		<0,1	<0,1							
26	XRF pellet			0,176	0,172	x0,174				15,80	Outlier	x
27	ICP-OES	YES		0,095	0,095	0,095				0,91		
28	ISO 12677	YES		0,080	0,090	0,085				0,97		
41	ICP-OES	YES	ISO 11885-E22	0,040		x0,040				9,45	Outlier	x
29	ISO 12677	YES		0,100	0,098	0,099				1,67		
30	XRF bead			0,177	0,190	x0,184				17,68	Outlier	x
31	ISO 12677	YES		0,051	0,052	x0,051				7,38	Outlier	x
35	ISO 12677			0,071	0,074	x0,073				3,23	Outlier	x
37	ICP-OES		aqua regia	0,048		x0,048				7,94	Outlier	x
38	ISO 12677	YES		0,089	0,085	0,087				0,59		
39	XRF bead			0,090	0,080	0,085				0,97		
40	ISO 12677			0,089	0,086	0,088				0,50		
				n	10							
				Mean	0,090							
				Max	0,099							
				Min	0,084							
				Stdev s	0,005							
				C(95%)	0,004							

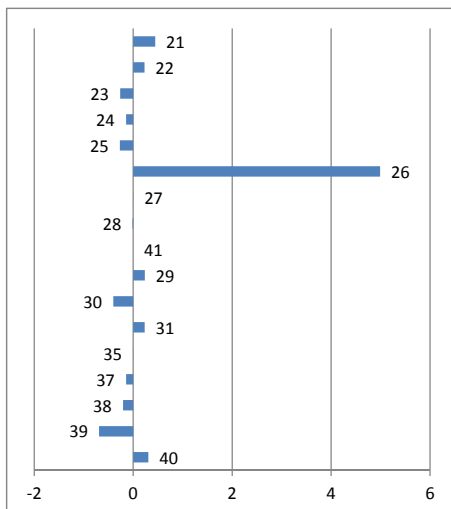
C(95%)=t*s/SQR(n) t(10)=2,262

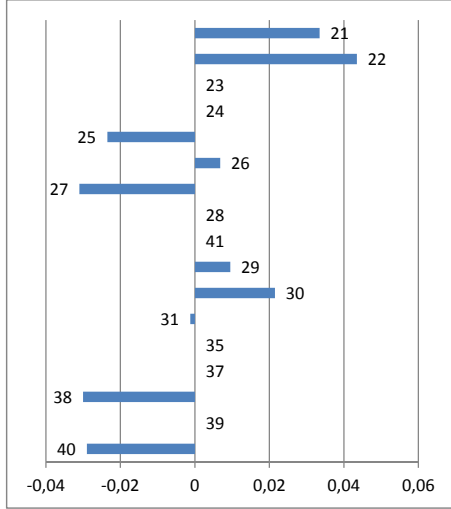
MgO		FLX-CRM 112			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:48:08		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean				>3	n=16 VG=2,443	confirmed
21	ISO 12677			0,789	0,808	0,799				0,55		
22	ISO 12677		reconstitution	0,901	0,883	0,892				1,72		
23	ISO 12677	YES		0,720	0,720	0,720				0,44		
24	ISO 12677			0,651	0,630	0,641				1,43		
25	XRF bead	YES		0,690	0,680	0,685				0,87		
26	XRF pellet			0,864	0,838	0,851				1,21		
27	ISO 12677	YES		0,570	0,540	x0,555				2,50	Outlier	x
28	ISO 12677	YES		0,660	0,630	0,645				1,38		
41	ICP-OES	YES	ISO 11885-E22	0,690		0,690				0,81		
29	ISO 12677	YES		0,781	0,815	0,798				0,54		
30	XRF bead			0,824	0,844	0,834				0,99		
31	ISO 12677	YES		0,819	0,833	0,826				0,89		
35	ISO 12677			0,779	0,715	0,747				0,10		
37	ICP-OES		aqua regia	0,630		0,630				1,56		
38	ISO 12677	YES		0,781	0,782	0,782				0,34		
39	XRF bead			0,760	0,770	0,765				0,13		
40	ISO 12677			0,772	0,771	0,772				0,21		
				n	16							
				Mean	0,755							
				Max	0,892							
				Min	0,630							
				Stdev s	0,080							
				C(95%)	0,042							

C(95%)=t*s/SQR(n) t(16)=2,131

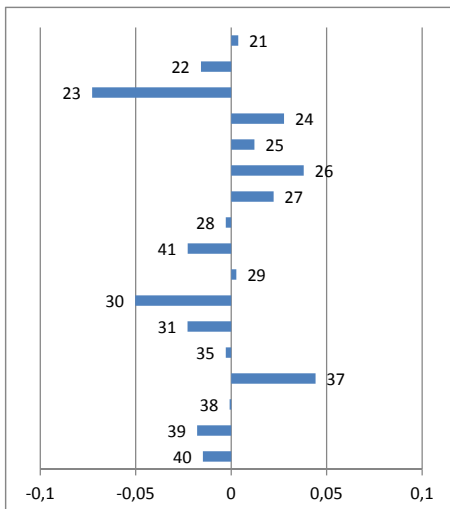
Na2O		FLX-CRM 112			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:48:13		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean	Bar chart showing individual measurements (Lab.No. 21-40) with values ranging from 0,135 to 1,196. The x-axis ranges from -0,5 to 1.		>3	n=14 VG=2,371	confirmed	
21	ISO 12677			0,348	0,368	0,358	21		1,38			
22	ISO 12677		reconstitution	0,184	0,191	0,188	22		1,20			
23	ISO 12677	YES		0,330	0,330	0,330	23		0,96			
24							24					
25	ICP-OES	YES		0,260	0,240	0,250	25		0,25			
26	XRF pellet			1,233	1,158	x1,196	26		14,04	Outlier	x	
27	ICP-OES	YES		0,310	0,310	0,310	27		0,66			
28	ISO 12677	YES		0,180	0,170	0,175	28		1,38			
41	ICP-OES	YES	ISO 11885-E22	0,230		0,230	41		0,55			
29	ISO 12677	YES		0,312	0,301	0,307	29		0,60			
30	XRF bead			0,277	0,266	0,272	30		0,07			
31	ISO 12677	YES		0,628	0,586	x0,607	31		5,14	Outlier	x	
35	ISO 12677			0,259	0,272	0,266	35		0,02			
37	ICP-OES		aqua regia	0,135		0,135	37		1,99			
38	ISO 12677	YES		0,316	0,317	0,317	38		0,75			
39	XRF bead			0,260	0,260	0,260	39		0,10			
40	ISO 12677			0,332	0,342	0,337	40		1,06			
				n	14							
				Mean	0,267							
				Max	0,358							
				Min	0,135							
				Stdev s	0,066							
				C(95%)	0,038							
						C(95%)=t*s/SQR(n)		t(14)=2,160				

NiO		FLX-CRM 112			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:31:40		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean	Bar chart showing individual measurements (Lab.No. 21-40) with values ranging from 0,001 to 0,020. The x-axis ranges from -0,01 to 0,015.		>3	n=10 VG=2,176	confirmed	
21	XRF pellet			0,019	0,019	0,019	21		1,34			
22	ISO 12677		reconstitution	0,014	0,015	0,015	22		0,71			
23	ISO 12677	YES		0,001	0,001	0,001	23		1,16			
24	ISO 12677			<0,005	<0,005		24					
25							25					
26	XRF pellet			0,002	0,003	0,002	26		0,96			
27	ICP-OES	YES		0,002	0,002	0,002	27		1,04			
28	ISO 12677	YES		0,010	0,010	0,010	28		0,09			
41	ICP-OES	YES	ISO 11885-E22	<0,005		<0,005	41					
29	ISO 12677	YES		0,013	0,015	0,014	29		0,64			
30							30					
31	ISO 12677	YES		0,007	0,007	0,007	31		0,28			
35	ISO 12677			<0,004	<0,004		35					
37							37					
38	ISO 12677	YES		0,020	0,020	0,020	38		1,48			
39							39					
40	ISO 12677			0,004	0,003	0,004	40		0,81			
				n	10							
				Mean	0,009							
				Max	0,020							
				Min	0,001							
				Stdev s	0,007							
				C(95%)	0,005							
						C(95%)=t*s/SQR(n)		t(10)=2,262				

SiO2		FLX-CRM 112			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:48:20		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean			>3	n=14 VG=2,371	confirmed	
21	ISO 12677			12,410	12,810	12,610	21		1,75			
22	ISO 12677		reconstitution	12,357	12,427	12,392	22		0,90			
23	ISO 12677	YES		11,920	11,880	11,900	23		1,04			
24	ISO 12677			11,990	12,050	12,020	24		0,57			
25	XRF bead	YES		11,880	11,910	11,895	25		1,06			
26	XRF pellet			17,280	17,030	x17,155	26		19,61	Outlier	x	
27	ISO 12677	YES		12,270	12,060	12,165	27		0,00			
28	ISO 12677	YES		12,200	12,100	12,150	28		0,06			
41							41					
29	ISO 12677	YES		12,403	12,392	12,398	29		0,92			
30	XRF bead			11,810	11,710	11,760	30		1,59			
31	ISO 12677	YES		12,420	12,370	12,395	31		0,91			
35	ISO 12677			12,223	12,104	12,164	35		0,00			
37	ICP-OES		Borax fusion	12,020		12,020	37		0,57			
38	ISO 12677	YES		12,043	11,875	11,959	38		0,81			
39	XRF bead			11,530	11,420	x11,475	39		2,71	Outlier	x	
40	ISO 12677			12,511	12,430	12,471	40		1,20			
				n	14							
				Mean	12,164							
				Max	12,610							
				Min	11,760							
				Stdev s	0,254							
				C(95%)	0,147							
						C(95%)=t*s/SQR(n)	t(14)=2,160					

Total S expressed as SO3		FLX-CRM 112			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:48:27		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean			>3	n=10 VG=2,176	confirmed	
21	HF-IR			0,077	0,077	0,077	21		1,21			
22	ISO 12677		reconstitution	0,086	0,088	0,087	22		1,57			
23	ISO 12677	YES		<0,03	<0,03		23					
24							24					
25	HF-IR			0,010	0,030	0,020	25		0,85			
26	XRF pellet			0,041	0,059	0,050	26		0,25			
27	HF-IR	YES		0,010	0,015	0,013	27		1,12			
28	ISO 12677	YES		<0,01	<0,01		28					
41							41					
29	ISO 12677	YES		0,042	0,064	0,053	29		0,34			
30	XRF bead			0,065	0,065	0,065	30		0,78			
31	ISO 12677	YES		0,040	0,045	0,042	31		0,05			
35	ISO 12677			<0,010	<0,010		35					
37							37					
38	HF-IR		DIN 51095-1	0,016	0,011	0,014	38		1,09			
39							39					
40	ISO 12677			0,012	0,017	0,015	40		1,05			
				n	10							
				Mean	0,044							
				Max	0,087							
				Min	0,013							
				Stdev s	0,028							
				C(95%)	0,020							
						C(95%)=t*s/SQR(n)	t(10)=2,262					

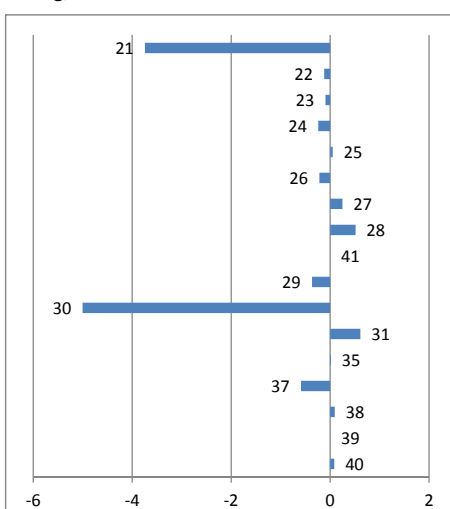
TiO2		FLX-CRM 112			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:48:32		z-score	Grubbs	Outlier	
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean							
21	ISO 12677			0,277	0,276	0,277				>3	n=16 VG=2,443	confirmed	
22	ISO 12677		reconstitution	0,257	0,257	0,257				0,15			
23	ISO 12677	YES		0,200	0,200	x0,200				0,64			
24	ISO 12677			0,297	0,304	0,301				2,94	Outlier	x	
25	XRF bead	YES		0,280	0,290	0,285				1,12			
26	XRF pellet			0,315	0,307	0,311				0,49			
27	ISO 12677	YES		0,290	0,300	0,295				1,53			
28	ISO 12677	YES		0,270	0,270	0,270				0,90			
41	ICP-OES	YES	ISO 11885-E22	0,250		0,250				0,11			
29	ISO 12677	YES		0,280	0,271	0,276				0,92			
30	XRF bead			0,223	0,222	0,223				0,11			
31	ISO 12677	YES		0,248	0,252	0,250				2,03			
35	ISO 12677			0,273	0,267	0,270				0,92			
37	ICP-OES		Borax fusion	0,317		0,317				0,11			
38	ISO 12677	YES		0,277	0,267	0,272				1,78			
39	XRF bead			0,260	0,250	0,255				0,03			
40	ISO 12677			0,261	0,255	0,258				0,72			
				n	16								
				Mean	0,273								
				Max	0,317								
				Min	0,223								
				Stdev s	0,025								
				C(95%)	0,013								



Sample	z-score
21	0,15
22	0,64
23	2,94
24	1,12
25	0,49
26	1,53
27	0,90
28	0,11
29	0,92
30	0,11
31	2,03
35	0,92
37	0,11
38	1,78
39	0,03
40	0,72

C(95%)=t*s/SQR(n) t(16)=2,131

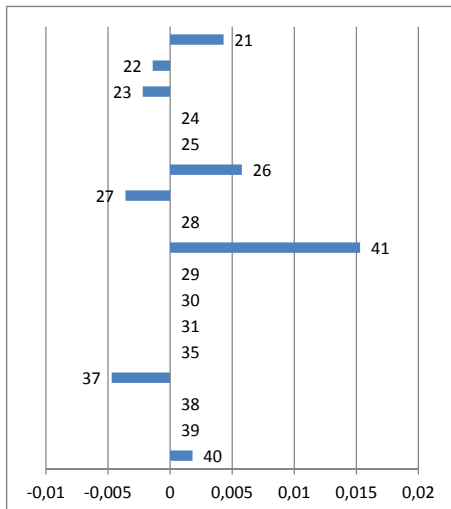
ZrO2		FLX-CRM 112			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:48:42		z-score	Grubbs	Outlier	
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean							
21	XRF pellet			2,208	2,208	x2,208				>3	n=13 VG=2,331	confirmed	
22	ISO 12677		reconstitution	5,706	5,951	5,829				11,23	Outlier	x	
23	ISO 12677	YES		5,830	5,880	5,855				0,36			
24	ISO 12677			5,704	5,715	5,710				0,28			
25	XRF bead			6,010	5,990	6,000				0,72			
26	XRF pellet			5,745	5,720	5,733				0,15			
27	ISO 12677	YES		6,300	6,100	6,200				0,65			
28	ISO 12677	YES		6,470	6,460	6,465				0,75			
41										1,55			
29	ISO 12677	YES		5,573	5,593	5,583				1,10			
30	XRF bead			0,950	0,942	x0,946				15,02	Outlier	x	
31	ISO 12677	YES		6,518	6,605	6,562				1,84			
35	ISO 12677			6,005	5,927	5,966				0,05			
37	ICP-OES		Borax fusion	5,360		5,360				1,77			
38	ISO 12677	YES		5,962	6,126	6,044				0,28			
39													
40	ISO 12677			6,045	6,022	6,034				0,25			
				n	13								
				Mean	5,949								
				Max	6,562								
				Min	5,360								
				Stdev s	0,333								
				C(95%)	0,201								



Sample	z-score
21	11,23
22	0,36
23	0,28
24	0,72
25	0,15
26	0,65
27	0,75
28	1,55
29	1,10
30	15,02
31	1,84
35	0,05
37	1,77
38	0,28
39	
40	0,25

C(95%)=t*s/SQR(n) t(13)=2,179

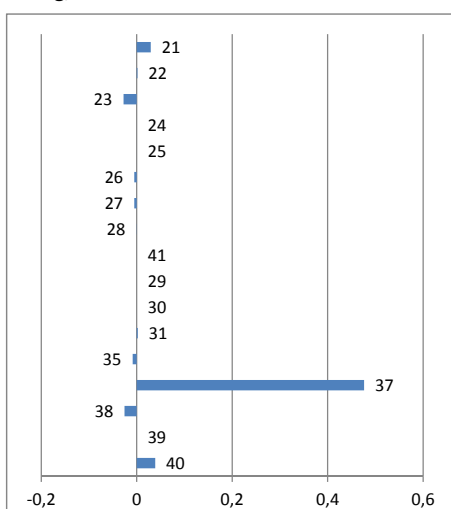
Co304		FLX-CRM 112			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:46:51				
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean				z-score	Grubbs	Outlier
21	XRF pellet			0,013	0,013	0,013				>3	n=7 VG=1,938	confirmed
22	ISO 12677			0,007	0,007	0,007				1,07		
23	ISO 12677	YES		0,006	0,007	0,007				0,35		
24	ISO 12677			<0,02	<0,02					0,55		
25												
26	XRF pellet			0,014	0,015	0,014				1,44		
27	ICP-OES	YES		0,005	0,005	0,005				0,89		
28	ISO 12677	YES		<0,01	<0,01							
41	ICP-OES	YES	ISO 11885-E22	0,024		x0,024				3,81	Outlier	x
29												
30												
31	ISO 12677	YES										
35	ISO 12677			<0,005	<0,005							
37	ICP-OES		aqua regia	0,004		0,004				1,17		
38	ISO 12677	YES		<0,01	<0,01							
39												
40	ISO 12677			0,011	0,010	0,011				0,45		
				n	7							
				Mean	0,009							
				Max	0,014							
				Min	0,004							
				Stdev s	0,004							
				C(95%)	0,004							



Lab.No	Mean
21	0,013
22	0,007
23	0,006
24	<0,02
25	
26	0,014
27	0,005
28	<0,01
41	0,024
29	
30	
31	
35	<0,005
37	0,004
38	<0,01
39	
40	0,011

C(95%)=t*s/SQR(n) t(7)=2,447

WO3		FLX-CRM 112			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:47:17				
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean				z-score	Grubbs	Outlier
21	XRF pellet			0,070	0,070	0,070				>3	n=10 VG=2,176	confirmed
22	ISO 12677		reconstitution	0,043	0,041	0,042				1,41		
23	ISO 12677	YES		0,013	0,013	0,013				0,07		
24										1,32		
25												
26	XRF pellet			0,035	0,036	0,035				0,24		
27	ICP-OES	YES		0,034	0,037	0,036				0,24		
28	ISO 12677	YES		0,040	0,040	0,040				0,03		
41												
29												
30												
31	ISO 12677	YES		0,043	0,043	0,043				0,11		
35	ISO 12677			0,033	0,031	0,032				0,41		
37	ICP-OES		aqua regia	0,517		x0,517				22,80	Outlier	x
38	ISO 12677	YES		0,010	0,020	0,015				1,22		
39												
40	ISO 12677			0,076	0,083	0,080				1,86		
				n	10							
				Mean	0,041							
				Max	0,080							
				Min	0,013							
				Stdev s	0,021							
				C(95%)	0,015							



Lab.No	Mean
21	0,070
22	0,042
23	0,013
24	
25	
26	0,035
27	0,036
28	0,040
41	
29	
30	
31	0,043
35	0,032
37	0,517
38	0,015
39	
40	0,080

C(95%)=t*s/SQR(n) t(10)=2,262

Cr2O3		FLX-CRM 112			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:48:51		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean			z>3	n=10 VG=2,176	confirmed	
21	XRF pellet			0,130	0,130	x0,130						
22	ISO 12677		reconstitution	0,011	0,011	0,011						
23	ISO 12677	YES		0,020	0,021	0,021						
24	ISO 12677			0,021	0,022	0,022						
25												
26	XRF pellet			0,242	0,295	x0,269						
27	ISO 12677	YES		0,030	0,020	0,025						
28	ISO 12677	YES		<0,01	<0,01							
41	ICP-OES	YES	ISO 11885-E22	0,014		0,014						
29	ISO 12677	YES		0,022	0,024	0,023						
30	XRF bead			0,013	0,012	0,013						
31	ISO 12677	YES		0,016	0,018	0,017						
35	ISO 12677			0,013	0,017	0,015						
37	ICP-OES		Borax fusion	0,015		0,015						
38	ISO 12677	YES		0,059	0,057	x0,058						
39												
40	ISO 12677											
						n	10					
						Mean	0,017					
						Max	0,025					
						Min	0,011					
						Stdev s	0,005					
						C(95%)	0,003					

C(95%)=t*s/SQR(n) t(10)=2,262

z-score	Grubbs	Outlier
z>3	n=10 VG=2,176	confirmed
23,68	Outlier	x
1,36		
0,64		
0,85		
52,93	Outlier	x
1,59		
0,73		
1,17		
1,04		
0,10		
0,50		
0,52		
8,53	Outlier	x

Mn3O4		FLX-CRM 112			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:48:57		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean			z>3	n=12 VG=2,285	confirmed	
21	XRF pellet			0,034	0,034	0,034						
22	ISO 12677		reconstitution	0,026	0,024	0,025						
23	ISO 12677	YES		0,028	0,025	0,027						
24	ISO 12677			<0,03	<0,03							
25												
26	XRF pellet			0,026	0,028	0,027						
27	ISO 12677	YES		0,030	0,030	0,030						
28	ISO 12677	YES		0,020	0,020	0,020						
41	ICP-OES	YES	ISO 11885-E22	0,014		0,014						
29	ISO 12677	YES		0,029	0,033	0,031						
30	XRF bead			0,043	0,045	0,044						
31	ISO 12677	YES										
35	ISO 12677			<0,010	<0,010							
37	ICP-OES		Borax fusion	0,014		0,014						
38	ISO 12677	YES		0,020	0,010	0,015						
39	XRF bead			0,010	0,000	0,010						
40	ISO 12677											
						n	12					
						Mean	0,024					
						Max	0,044					
						Min	0,010					
						Stdev s	0,010					
						C(95%)	0,006					

C(95%)=t*s/SQR(n) t(12)=2,201

z-score	Grubbs	Outlier
z>3	n=12 VG=2,285	confirmed
0,98		
0,08		
0,23		
0,27		
0,58		
0,42		
1,02		
0,68		
1,99		
1,02		
0,92		
1,42		

P205		FLX-CRM 112			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:49:02		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean						
21	ISO 12677			0,069	0,068	0,069				>3	n=10 VG=2,176	confirmed
22	ISO 12677		reconstitution	0,126	0,123	x0,125				0,43		
23	ISO 12677	YES		0,082	0,082	0,082				4,34	Outlier	x
24	ISO 12677			0,081	0,081	0,081				0,71		
25	XRF bead	YES		<0,1	<0,1					0,62		
26	XRF pellet			0,230	0,222	x0,226				12,87	Outlier	x
27	ISO 12677	YES		0,080	0,080	0,080				0,54		
28	ISO 12677	YES		0,070	0,070	0,070				0,30		
41	ICP-OES	YES	ISO 11885-E22	0,061		0,061				1,06		
29	ISO 12677	YES		0,130	0,136	x0,133				5,01	Outlier	x
30	XRF bead			0,037	0,039	x0,038				3,01	Outlier	x
31	ISO 12677	YES		<0.00069	<0.00069							
35	ISO 12677			0,088	0,088	0,088				1,22		
37	ICP-OES		aqua regia	0,053		0,053				1,74		
38	ISO 12677	YES		0,089	0,086	0,088				1,17		
39	XRF bead			0,070	0,060	0,065				0,73		
40	ISO 12677											
				n	10							
				Mean	0,074							
				Max	0,088							
				Min	0,053							
				Stdev s	0,012							
				C(95%)	0,008							

C(95%)=t*s/SQR(n) t(10)=2,262

LOI (@ 1025°C)		FLX-CRM 112			Mass %	Mass %	Mass %	Freitag, 12. Oktober 2012 11:49:06		z-score	Grubbs	Outlier
Lab.No:	Method	ISO 17025	Remark	Meas #1	Meas #2	Mean						
21	gravimetric			5,350	5,200	5,275				>3	n=13 VG=2,331	confirmed
22	ISO 12677			5,559	5,559	5,559				1,18		
23	ISO 12677	YES		5,020	4,990	x5,005				1,07		
24	ISO 12677			5,200	5,270	5,235				3,32	Outlier	x
25	gravimetric			4,220	4,240	x4,230				1,50		
26	ISO 12677			5,260	5,280	5,270				9,46	Outlier	x
27	ISO 12677	YES		5,660	5,660	5,660				1,22		
28	ISO 12677	YES		5,400	5,430	5,415				1,87		
41										0,07		
29	DIN 51081	YES		5,370	5,360	5,365				0,47		
30	gravimetric			5,441	5,533	5,487				0,50		
31	ISO 12677			5,400	5,400	5,400				0,19		
35	ISO 12677			5,380	5,380	5,380				0,35		
37	gravimetric			5,480		5,480				0,45		
38												
39	950°C			5,390	5,430	5,410				0,11		
40	ISO 12677			5,657	5,488	5,573				1,18		
				n	13							
				Mean	5,424							
				Max	5,660							
				Min	5,235							
				Stdev s	0,126							
				C(95%)	0,076							

C(95%)=t*s/SQR(n) t(13)=2,179