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CERTIFICATE OF ANALYSIS

ERM®-EB313

AlMg3

Certified Values			
Element	Certified value ¹⁾		Uncertainty ²⁾
	Mass fraction in %		
Si	0.363	±	0.007
Fe	0.391	±	0.003
Cu	0.0931	±	0.0014
Mn	0.495	±	0.003
Mg	3.40	±	0.04
Cr	0.1224	±	0.0012
Ni	0.0278	±	0.0006
Zn	0.158	±	0.002
Ti	0.0947	±	0.0014
Element	Mass fraction in mg/kg		
As	7.2	±	0.7
Be	5.5	±	0.2
Bi	95	±	8
Ca	5.7	±	0.8
Cd	7.4	±	0.4
Ga	121	±	5
Hg	4.1	±	0.4
Li	6.04	±	0.12
Mo	5.3	±	1.9
Na	37.0	±	2.4
Pb	43.3	±	2.8
Sb	8.7	±	1.9
Sn	197	±	6
Tl	6.4	±	0.4
V	299	±	6
Zr	359	±	19

¹⁾ Unweighted mean value of the means of accepted sets of data (at least 4 but usually 6), each set being obtained in a different laboratory and/or a different method of measurement. The values are traceable to the SI (Système International d'Unités) via calibration using sufficiently pure substances of known stoichiometry.

²⁾ Estimated expanded uncertainty U with a coverage factor of about $k=2$, corresponding to a level of confidence of 95 %, as defined in the Guide to the expression of uncertainty in measurement, ISO, 1993.

This certificate is valid until 02/2056; this validity may be extended as further evidence of stability becomes available.

The minimum sample size for wet chemical analysis is 0.5 g.

NOTE

European Reference Material ERM[®]-EB313 was originally certified as BAM-313. It was produced and certified under the responsibility of Bundesanstalt für Materialforschung und -prüfung (BAM) in cooperation with the Committee of Chemists of the GDMB, Gesellschaft für Bergbau, Metallurgie, Rohstoff- und Umwelttechnik according to the principles laid down in the technical guidelines of the European Reference Materials[®] co-operation agreement between BAM-LGC-IRMM. Information on these guidelines is available on the Internet (<http://www.erm-crm.org>).

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DESCRIPTION OF THE SAMPLE

The Reference Material is available in the form of discs (58 mm diameter and 25 mm height). It is intended for establishing and checking the calibration especially of optical emission and X-ray spectrometers for the analysis of samples of similar materials.

MEANS OF ACCEPTED DATA SETS (FOR ONE METHOD AT ONE LABORATORY, RESPECTIVELY)

Mass fraction in %

No.	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti
1	0.3489	0.3796	0.0893	0.4851	3.277	0.1188	0.0261	0.1531	0.0902
2	0.3502	0.3826	0.0894	0.4853	3.316	0.1188	0.0262	0.1544	0.0920
3	0.3515	0.3843	0.0906	0.4894	3.362	0.1193	0.0262	0.1548	0.0924
4	0.3520	0.3870	0.0910	0.4914	3.368	0.1210	0.0267	0.1548	0.0930
5	0.3559	0.3872	0.0913	0.4921	3.383	0.1210	0.0268	0.1560	0.0930
6	0.3622	0.3872	0.0913	0.4939	3.401	0.1212	0.0273	0.1564	0.0933
7	0.3662	0.3908	0.0916	0.4947	3.404	0.1213	0.0274	0.1566	0.0939
8	0.3663	0.3916	0.0929	0.4953	3.406	0.1214	0.0278	0.1574	0.0941
9	0.3694	0.3926	0.0934	0.4971	3.408	0.1219	0.0279	0.1577	0.0942
10	0.3713	0.3931	0.0937	0.4977	3.414	0.1224	0.0280	0.1578	0.0942
11	0.3744	0.3941	0.0938	0.4980	3.416	0.1228	0.0281	0.1579	0.0943
12	0.3747	0.3943	0.0939	0.4982	3.431	0.1233	0.0283	0.1583	0.0953
13	0.3756	0.3958	0.0945	0.4986	3.487	0.1235	0.0283	0.1584	0.0958
14		0.3962	0.0952	0.4989	3.518	0.1238	0.0284	0.1592	0.0958
15		0.3975	0.0955	0.5009		0.1254	0.0285	0.1597	0.0983
16		0.3975	0.0978	0.5066		0.1260	0.0289	0.1625	0.0994
17		0.4001	0.0982			0.1267	0.0290	0.1631	0.1015
18						0.1254	0.0294	0.1644	
19							0.0295		
$\bar{M}$	0.3630	0.3913	0.0931	0.4952	3.399	0.1224	0.0278	0.1579	0.0947
s_M	0.0101	0.0058	0.0026	0.0056	0.061	0.0024	0.0011	0.0031	0.0028
$\bar{s}_i$	0.0039	0.0034	0.0012	0.0055	0.021	0.0015	0.0004	0.0014	0.0011

$\bar{M}$: mean of means of data sets

s_M : standard deviation of means of data sets

$\bar{s}_i$: mean of standard deviations of data sets under repeatability conditions

MEANS OF ACCEPTED DATA SETS (FOR ONE METHOD AT ONE LABORATORY, RESPECTIVELY)

Mass fraction in mg/kg



Lfd. Nr.	As	B	Be	Bi	Ca	Cd	Ga	Hg	Li	Mo	Na	P	Pb	Sb	Sn	Tl	V	Zr
1	6.43	3.48	4.96	75.2	4.230	6.28	110.9	3.12	5.70	4.41	32.2	11.2	39.0	5.74	174.4	5.80	281.1	280.0
2	6.48	4.53	5.12	76.4	4.250	6.52	112.9	3.85	5.74	4.53	33.6	11.8	39.4	6.42	188.9	6.29	282.5	290.9
3	6.86	5.24	5.39	86.9	5.050	6.79	114.1	4.06	5.96	4.88	34.7	12.3	39.5	8.27	189.0	6.45	290.6	341.8
4	7.26	6.91	5.49	90.4	5.700	6.76	114.4	4.10	6.04	4.94	35.8	13.0	41.0	8.75	192.5	6.49	291.8	349.6
5	7.33		5.55	90.7	5.920	6.79	115.7	4.24	6.06	5.73	36.3	16.4	44.6	8.80	193.4	6.63	300.4	356.5
6	7.82		5.64	90.0	6.030	6.84	116.0	4.34	6.10	7.42	36.6		45.3	8.89	196.5	6.68	300.4	359.2
7	8.42		5.69	93.6	6.310	7.44	116.6	4.53	6.12		37.0		45.7	10.2	196.6		300.8	359.7
8			5.70	97.1	6.470	7.49	117.0	4.67	6.14		40.4		47.6	12.8	198.9		300.9	359.9
9			5.84	97.1	7.340	7.52	118.9		6.18		40.5		47.9		199.2		301.1	372.1
10			5.28	97.3		7.57	120.0		6.18		42.5				200.1		303.4	374.3
11				105.8		7.68	120.0		6.20						201.6		304.0	375.8
12				112.5		7.69	120.1								203.8		305.9	379.5
13				122.8		7.73	121.6								208.3		309.0	387.0
14						7.92	126.3								209.6		312.1	394.7
15						8.18	129.5											406.2
16						9.17	138.0											
17							139.0											
<i>M</i>	7.2	5.0	5.5	95	5.7	7.4	121	4.1	6.04	5.3	37.0	12.9	43.3	8.7	197	6.4	299	359
<i>s_M</i>	0.7	1.4	0.3	13	1.0	0.7	8	0.5	0.17	1.1	3.3	2.0	3.6	2.2	9	0.3	9	35
<i>s_i</i>	0.3	0.1	0.1	2	0.34	0.3	3	0.2	0.09	0.2	1.0	0.5	1.3	0.5	4	0.3	4	8

M : mean of means of data sets

s_i : mean of standard deviations of data sets under repeatability conditions

s_M : standard deviation of means of data sets

numbers in *italics* are indicative values

Additionally in one laboratory, the following elements (mass fraction in µg/g) have been measured using PAA: Nb: 2.43 ; Te: 2.92 ; U: 1.39 ; Y: 2.08

ANALYTICAL METHOD USED FOR CERTIFICATION

Element	Lfd. Nr.	method	Element	Lfd. Nr.	Method	Element	Lfd. Nr.	Method
Silicium	3 1,2,4,7,8,9,12,13 5,6,7,10,11	Grav. ICP OES Phot.	Titan	2,3,4,5,7,8,10,12,14,15,17 1 9,11,13	ICP OES F AAS Phot.	Molybdän	6 1,3 5	ICP OES ICP-MS NAA
Eisen	2,3,6,7,9,10,11,12,14,15,17 5,8 13 4,12 1 16	ICP OES F AAS IDMS Phot. NAA RFA	Arsen	16 6 3 1,5 2,4 6 7	PAA RFA IH HG AAS ICP-MS NAA PAA	Natrium	2 1,3,7,8,10 2,4,5 9 6	ET AAS ICP OES F AAS NAA ET AAS
Kupfer	1,6,7,8,9,11,13,14,16,17 3,4,10 12 9 15 2 5	ICP OES F AAS IDMS Phot. NAA PAA RFA	Bor	1,3,4 2 1,2,3,4,6,8,9,10 7 5	ICP OES ICP-MS ICP OES ICP-MS ET AAS ICP OES	Phosphor	1,2,3,4,5 9 6 2 1,4,6 8	Phot. ICP OES F AAS IDMS ICP-MS PAA
Mangan	1,2,4,5,8,9,10,12,14,16 6,11,15 12 3,7 13	ICP OES F AAS Phot. NAA RFA	Beryllium	1,2,3,4,6,8,9,10 7 5 1,2,3,4,6,7,11 12 10,12 8 9 5,13	Hg AAS Phot. ICP-MS PAA ET AAS ICP OES F AAS ET AAS	Antimon	3,5,7 1 2,5 6 4 7 8	ET AAS ICP OES HG AAS ICP-MS NAA PAA ET AAS
Magnesium	1,3,4,5,6,7,8,9,10 2,11,12,14 13	ICP OES F AAS RFA	Calcium	2,3,4,5,7,8,9 1 6	ICP OES F AAS ET AAS ICP OES IDMS	Tallium	1 3 2,4 5	ICP OES IDMS ICP-MS ET AAS
Chrom	1,4,6,8,9,11,12,13,14 2,3,5,15,18 7 6 10 17 16	ICP OES F AAS IDMS Phot. NAA PAA RFA	Cadmium	1,2,3,4,5,8,14,15,16 7 11,13 10 6,9,12	ICP OES IDMS ICP-MS NAA ET AAS ICP OES	Vanadium	1,2,4,5,6,7,8,9,10,11,13 3 12,14	RFA ET AAS ICP OES
Nickel	3,7,8,9,10,11,13,14,17,18,19 2,5,6,15,17 12 1 16 4	ICP OES F AAS IDMS PAA RFA ET AAS ICP OES	Gallium	2,4,8,9,11,12,13,14,15,16 7 5,6 10 17 1 1 3 5	IDMS ICP-MS NAA PAA RFA ET AAS ICP OES CV AAS	Zinn	13 11,12 8 1,6 1,2,3,5,6,7,9,10,12,13	Phot. ICP-MS PAA ET AAS ICP OES
Zink	1,2,5,6,8,9,10,11,15,16,18 2,3,13,17 12 7 4 14	F AAS IDMS NAA PAA RFA	Quecksilber	3,6 2,8 1,4 7 1,2,3,4,6,8,9 5,7,11 10	HG AAS ICP-MS NAA ICP OES F AAS ET AAS	Zirkonium	8 11 14 15 4	Phot. ICP-MS NAA PAA RFA

Abbreviations:

Grav: Gravimetry
ET AAS: Electrothermal AAS
PAA: Photon activation analysis
ICP OES: ICP - Optical emission spectrometry
CV AAS: Cold vapour AAS
IM: ICP - Mass spectrometry

AAS: Atomic absorption spectrometry
IDMS: Isotope dilution mass spectrometry
RFA: X-ray fluorescence
F AAS: Flame - AAS
Phot: Spectrophotometry
HG AAS: Hydride generation AAS
NAA: Neutron activation analysis

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INSTRUCTIONS FOR USE

Before use, the surface of the material must be cleaned by turning on a lathe.

STORAGE

The material should be stored at ambient conditions in a dry and clean environment.

TECHNICAL REPORT

A detailed technical report (in German) describing the analysis procedures and the treatment of the analytical data used to certify ERM®-EB313 is available on request.

Supply of Reference Materials by BAM Bundesanstalt für Materialforschung und -prüfung:

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