

CERTIFICATE OF ANALYSIS

ERM[®]-EB317

AlZn6CuMgZr			
	Certified value ¹⁾	Uncertainty ²⁾	
Element	Mass fraction in %		
Fe	0.112	±	0.003
Cu	1.77	±	0.06
Mg	2.39	±	0.07
Cr	0.141	±	0.003
Zn	6.93	±	0.26
Zr	0.130	±	0.008
Mass fraction in mg/kg			
Si	271	±	22
Mn	912	±	19
Ni	359	±	14
Ti	952	±	156
Ag	73	±	5
Be	10.1	±	0.8
Bi	41	±	6
Ga	183	±	12
In	162	±	11
Pb	48.1	±	2.3
Sn	237	±	18
V	105	±	7
<p>¹⁾ Unweighted mean value of the means of accepted sets of data, each set being obtained by a different laboratory and/or with a different method of measurement. The values are traceable to the SI (Système International d'Unités) via calibration using pure metals or substances of known stoichiometry.</p> <p>²⁾ Estimated expanded uncertainty U with a coverage factor of $k=2$, corresponding to a level of confidence of approx. 95 %, as defined in the Guide to the expression of uncertainty in measurement, (GUM, ISO/IEC Guide 98-3:2008).</p>			

This certificate is valid until 08/2062.

DESCRIPTION OF THE SAMPLE

The Reference Material is available in the form of discs (50 mm diameter and 30 mm height).

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BAM Department 1
Analytical Chemistry;
Reference Materials

BAM Division 1.6
Inorganic Reference Materials

Prof. Dr. U. Panne
(Head of Department)

Dr. S. Recknagel
(Head of Division)

Indicative Values ¹⁾			
	Indicative value	Uncertainty	
Element	Mass fraction in mg/kg		
B	37	±	32
Ca	6.0	±	2.7
P	27	±	15

¹⁾ Values were not certified, but given as indicative values, when the number of accepted data sets was considered to be too low (< 5) or when the uncertainty from the inter-laboratory certification was considerably larger than the expected range. The values are traceable to the SI (Système International d'Unités) via calibration using pure metals or substances of known stoichiometry.

²⁾ Estimated expanded uncertainty U with a coverage factor of $k = 2$ (B) resp. $k = 3$ (Ca, P), assuming a level of confidence of 95 % as defined in the Guide to the expression of uncertainty in measurement, (GUM, ISO/IEC Guide 98-3:2008).

NOTE

European Reference Material ERM[®]-EB317 was produced and certified under the responsibility of BAM Federal Institute for Materials Research and Testing in cooperation with the Committee of Chemists of the GDMB, Society for Mining, Metallurgy, Resource and Environmental Technology 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>).

INTENDED USE

The CRM is intended for establishing or checking the calibration of optical emission and X-ray spectrometers (excluding micro-analysis) for the analysis of samples of similar matrix composition. The minimum sample size for wet chemical analysis is 0.5 g.

INSTRUCTIONS FOR USE

Before use, the surface of the material must be prepared by milling or turning on a lathe. For wet chemical analysis chips have to be prepared by turning or milling of the sample surface.

MEANS OF ACCEPTED DATA SETS

Certified values

Mass fraction in %

Mass fraction in mg/kg

Line no.	Fe	Cu	Mg	Cr	Zn	Zr		Si	Mn	Ni	Ti	Ag
1	0.1050	1.756	2.265	0.1380	6.741	0.1184		235	---	329	890	64.2
2	0.1064	1.759	2.296	0.1397	6.757	0.1248		250	893	336	906	66.6
3	0.1099	1.760	2.333	0.1406	6.834	0.1259		251	895	351	909	66.7
4	0.1100	1.760	2.347	0.1407	6.846	0.1281		251	905	357	930	67.4
5	0.1107	1.761	2.364	0.1408	6.897	0.1303		261	907	358	938	67.7
6	0.1111	1.763	2.382	0.1410	6.922	0.1306		265	907	359	941	68.3
7	0.1114	1.764	2.410	0.1413	6.938	0.1311		284	907	360	946	72.5
8	0.1115	1.767	2.412	0.1413	6.946	0.1320		289	910	360	953	74.0
9	0.1123	1.767	2.412	0.1413	6.952	0.1342		291	914	362	957	78.8
10	0.1123	1.777	2.418	0.1416	6.953	0.1360		298	916	364	963	84.5
11	0.1123	1.785	2.428	0.1424	6.990	0.1438		303	916	364	966	87.2
12	0.1126	1.791	2.446	0.1433	7.073				927	365	985	
13	0.1133	1.801	2.516	0.1440	7.220				927	366	1018	
14	0.1141			0.1441					932	369	1024	
15	0,1196									391		
<i>M</i>	0.1115	1.770	2.387	0.1414	6.928	0.1305		271	912	359	952	72.5
<i>s_M</i>	0.0033	0.015	0.067	0.0016	0.127	0.0066		23	12	15	39	7.8
\bar{s}_i	0.0015	0.025	0.022	0.0020	0.057	0.0014		12	10	6	13	1.1

Indicative values

Mass fraction in mg/kg

Mass fraction in mg/kg

Line no.	Be	Bi	Ga	In	Pb	Sn	V		B	Ca	P
1	9.37	37.8	158.8	152.2	45.50	225	100.9		29.33	4.68	18.4
2	9.52	38.8	162.7	152.7	45.62	228	100.9		30.83	5.83	19.0
3	9.56	39.3	168.6	156.7	45.67	233	103.5		33.97	5.97	30.5
4	9.57	40.1	171.3	158.6	45.92	233	104.0		35.57	7.72	31.9
5	9.79	41.4	171.3	159.7	46.33	234	104.7		40.34		33.7
6	10.05	41.5	180.0	160.0	46.67	236	104.8		43.33		
7	10.36	42.8	185.7	160.0	48.47	241	105.0		47.33		
8	10.54	43.1	186.8	160.4	49.93	242	105.0				
9	11.00		187.2	162.4	50.76	244	106.2				
10	11.10		190.3	170.0	53.82	251	109.4				
11			192.4	172.0		---	110.0				
12			209.2	176.3							
13			209.5								
14											
<i>M</i>	10.08	40.6	182.6	161.8	48.1	237	104.9		37.24	6.05	26.7
<i>s_M</i>	0.64	1.9	16.0	7.5	2.9	8	2.9		6.66	1.25	7.4
\bar{s}_i	0.14	2.1	2.1	2.7	1.6	4	1.0		1.79	0.98	2.1

The laboratory mean values have been examined statistically to eliminate outlying values. Each laboratory mean consists of at least 3 but usually 6 single values.

Where " --- " appears in the table it indicates that an outlying value has been omitted (Grubbs 95 %).

\bar{M} : mean of laboratory means

s_M : standard deviation of laboratory means

\bar{s}_i : averaged repeatability standard deviation (square root of the mean of laboratory variances)

ANALYTICAL METHOD USED FOR CERTIFICATION

Element	Line no.	Method
Fe	1, 3, 4, 6, 8, 9, 13	ICP-OES, dissolution with acid
	2	FAAS
	5, 7, 10, 12, 14	ICP-OES, dissolution with NaOH
	11	INAA
	15	XRF
Cu	1, 3, 4, 5, 7, 9	ICP-OES, dissolution with acid
	2, 6, 8, 10, 13	ICP-OES, dissolution with NaOH
	11	FAAS, dissolution with acid
	12	XRF
Mg	1, 3, 5, 7, 8, 10	ICP-OES, dissolution with acid
	2	FAAS, dissolution with acid
	4, 6, 9, 11, 12	ICP-OES, dissolution with NaOH
	13	XRF
Cr	1	INAA
	2, 4, 8, 10, 11, 12	ICP-OES, dissolution with acid
	3, 5, 6, 9, 13, 14	ICP-OES, dissolution with NaOH
	7	XRF
Zn	1	INAA
	2	FAAS, dissolution with acid
	3, 4, 8, 10, 11	ICP-OES, dissolution with acid
	5, 6, 7, 9, 12	ICP-OES, dissolution with NaOH
	13	XRF
Zr	1, 2, 3, 6, 7, 10	ICP-OES, dissolution with acid
	4, 5, 8, 9	ICP-OES, dissolution with NaOH
	11	XRF
Si	1, 2, 3, 6, 10, 11	ICP-OES, dissolution with NaOH
	4	XRF
	5, 7, 8	ICP-OES, dissolution with acid
	8, 9	Spectrophotometry
Mn	2, 4, 6, 8, 9, 10, 12	ICP-OES, dissolution with acid
	3, 5, 7, 11, 13	ICP-OES, dissolution with NaOH
	14	INAA
Ni	1, 3, 5, 6, 7, 8, 10, 12	ICP-OES, dissolution with acid
	2	FAAS, dissolution with acid
	4, 9, 11, 14	ICP-OES, dissolution with NaOH
	13	Spectrophotometry
	15	XRF

Element	Line no.	Method
Ti	1, 9, 10, 12, 13 2, 3, 5, 6, 7, 8, 14 4 10	ICP-OES, dissolution with NaOH ICP-OES, dissolution with acid Spectrophotometry XRF
Ag	1 2, 7, 8, 9 3, 4 5, 6, 10, 11	INAA ICP-OES, dissolution with acid ICP-MS ICP-OES, dissolution with NaOH
Be	1, 4, 5, 8, 9 2, 6, 7, 10 3	ICP-OES, dissolution with acid ICP-OES, dissolution with NaOH ICP-MS
Bi	1, 4 2, 3, 6, 7 5	ICP-MS ICP-OES, dissolution with acid ICP-OES, dissolution with NaOH
Ga	1 2, 4, 12 3, 5, 6, 7, 9, 11, 13 8 10	INAA ICP-OES, dissolution with NaOH ICP-OES, dissolution with acid ICP-MS XRF
In	1 2 2, 4, 6, 8, 9, 10 3 5, 7 11	INAA (short term radiation) INAA (long term radiation) ICP-OES, dissolution with acid ICP-MS ICP-OES, dissolution with NaOH XRF
Pb	1, 2, 3, 6, 9 4, 7 5, 8, 10	ICP-OES, dissolution with acid ICP-MS ICP-OES, dissolution with NaOH
Sn	1, 6, 7, 10 2, 4, 8, 9 3, 5	ICP-OES, dissolution with acid ICP-OES, dissolution with NaOH ICP-MS
V	1, 3, 4, 6, 9, 11 2 5, 7, 8, 10	ICP-OES, dissolution with acid ICP-MS ICP-OES, dissolution with NaOH
B	1, 3, 4, 6 2, 7 5	<i>ICP-OES, dissolution with acid</i> <i>ICP-OES, dissolution with NaOH</i> <i>ICP-MS</i>
Ca	1, 2, 3, 4	<i>ICP-OES, dissolution with acid</i>
P	1, 2, 4, 5 3	<i>ICP-OES, dissolution with acid</i> <i>ICP-MS</i>

Abbreviations:

ICP-OES:	Inductively coupled plasma - optical emission spectrometry
INAA:	Instrumental neutron activation analysis
FAAS:	Flame atomic absorption spectrometry
ICP-MS	Inductively coupled plasma - mass spectrometry
XRF:	X-Ray fluorescence spectrometry

STORAGE

The material should be stored in a dry and clean environment at room temperature (approx. 20 °C).

PARTICIPANTS

3A Technology & Management AG, Neuhausen, Switzerland
Constellium, Centre de Recherches de Voreppe, Voreppe, France
AMAG Austria Metall AG, Ranshofen, Austria
BAM Bundesanstalt für Materialforschung und -prüfung, Berlin, Germany
- Division 1.6 Inorganic Reference Materials
- Division 1.4 Process Analytical Technology
HORIBA Jobin Yvon GmbH, Unterhaching, Germany
Hydro Aluminium Rolled Products GmbH, R&D-Bonn, Germany
Hydro Aluminium Rolled Products GmbH, Hamburg, Germany
Hydro Aluminium Gießerei Hannover GmbH, Hannover, Germany
Institute of Non-Ferrous Metals, Gliwice, Poland
Otto Fuchs KG, Meinerzhagen, Germany
Trimet Aluminium AG, Essen, Germany

TECHNICAL REPORT

A detailed technical report describing the analysis procedures and the treatment of the analytical data used to certify ERM®-EB317 is available on request or can be downloaded from BAM website (www.bam.de/en/fachthemen/referenzmaterialien/index.htm).

Supply of this Reference Material by: BAM Federal Institute for Materials Research and Testing

Richard-Willstätter-Straße 11, 12489 Berlin, Germany

Phone: +49 30 8104 2061

e-mail: sales.crm@bam.de

Fax: +49 30 8104 1117

internet: www.bam.de