

Bundesanstalt für Materialforschung und -prüfung (BAM)

in cooperation with the Committee of Chemists of the GDMB
Gesellschaft der Metallurgen und Bergleute e.V.

Certified Reference Material

BAM-M308a

AlZnMgCu1,5

Certified Values

Element	Mass fraction ¹⁾ in %	Uncertainty ²⁾ in %
Si	0.072	0.003
Fe	0.164	0.005
Cu	1.36	0.03
Mn	0.0343	0.0005
Mg	2.28	0.05
Cr	0.192	0.004
Zn	5.61	0.08
	in mg/kg	in mg/kg
Ni	147	3
Ti	257	7
Ag	6.5	0.6
Be	1.8	0.1
Na	15.8	2.2
Pb	43.6	2.7
Zr	87.3	2.6

¹⁾ Unweighted mean value of the means of accepted sets of data (consisting of at least 5 but usually 6 single results), each set being obtained by a different laboratory and/or a different method of measurement.

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).

This certificate is valid until 07/2048.

Values for information

Element	Mass fraction ¹⁾ in mg/kg	Uncertainty ²⁾ in mg/kg
Ca	10.8	1.6

¹⁾ Value was not certified, but given for information, because the number of accepted data sets was considered to be too low (n = 4).

²⁾ Estimated expanded uncertainty *U* with a coverage factor of *k* = 3, 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).

Sample Description

The Reference Material is available in the form of discs (approx. 65 mm diameter and 30 mm height).

Recommended Use

The CRM is intended for establishing or checking the calibration of spark optical emission and X-ray spectrometers for the analysis of samples of similar matrix composition. The minimum sample size for wet chemical analysis is 0.2 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.

Transport and Storage

The material should be stored in a dry and clean environment at room temperature. Transport under normal ambient conditions.

Participating Laboratories

AMAG Austria Metall AG, Ranshofen, Austria
Bundesanstalt für Materialforschung und -prüfung (BAM), Berlin, Germany
Constellium, Centre de Recherches de Voreppe, Voreppe, France
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
Suisse Technology Partners AG, Neuhausen, Switzerland
TRIMET Aluminium SE, Essen, Germany

Metrological Traceability

The ensure traceable of the certified mass fractions to the SI (Système International d'Unités) calibration was performed using certified standard solutions or pure metals or substances of known stoichiometry.

Technical Report

A detailed technical report describing the analysis procedures and the treatment of the analytical data used to certify BAM-M308a is available on request or can be downloaded from BAM website (www.bam.de).

Means of Accepted Data Sets

Certified values

Mass fraction in %

Mass fraction in mg/kg

Values for information

Mass fraction in mg/kg

Line No.	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ni	Ti	Ag	Be	Na	Pb	Zr	Ca
1	0.067	0.1592	---	0.0333	2.213	0.1878	5.53	141.8	249.2	5.25	1.70	13.38	41.3	81.7	9.39
2	0.069	0.1608	1.344	0.0334	2.262	0.1886	5.54	143.2	251.7	5.43	1.72	14.12	42.1	83.0	11.00
3	0.069	0.1617	1.350	0.0339	2.268	0.1899	5.56	143.3	255.3	6.38	1.73	15.65	42.2	84.7	11.29
4	0.070	0.1626	1.351	0.0340	2.270	0.1904	5.56	145.2	255.4	6.61	1.75	16.00	42.8	85.2	11.60
5	0.071	0.1631	1.353	0.0342	2.273	0.1912	5.57	145.4	256.2	6.72	1.79	16.29	43.6	85.9	
6	0.071	0.1634	1.355	0.0342	2.274	0.1923	5.58	146.0	256.8	7.04	1.79	16.38	44.3	86.2	
7	0.072	0.1639	1.357	0.0344	2.275	0.1930	5.61	146.7	256.9	7.13	1.83	16.60	44.3	86.7	
8	0.073	0.1640	1.359	0.0345	2.285	0.1930	5.64	146.8	257.1	7.17	1.84	17.73	44.5	87.6	
9	0.073	0.1642	1.360	0.0346	2.287	0.1930	5.64	147.1	258.0		1.85		45.5	88.0	
10	0.074	0.1643	1.365	0.0346	2.294	0.1944	5.65	147.4	258.4		1.86		45.5	88.4	
11	0.075	0.1646	1.367	0.0346	2.297	0.1949	5.65	148.8	259.1		1.87			89.9	
12	0.076	0.1648	1.367	0.0348	2.328	0.1953	5.67	149.3	259.2		1.87			91.4	
13		0.1676	1.372	0.0349	2.343		5.71	149.5	260.2		1.90			91.6	
14		0.1679	1.384	0.0349				151.5	261.3					92.0	
15		0.1683						152.2	261.4						
16		0.1697							---						
<i>M</i>	0.072	0.1644	1.360	0.0343	2.282	0.1920	5.61	146.9	257.1	6.47	1.81	15.77	43.6	87.3	10.82
<i>s_M</i>	0.003	0.0028	0.011	0.0005	0.032	0.0024	0.06	3.0	3.3	0.75	0.07	1.40	1.5	3.2	0.99
\bar{s}_i	0.002	0.0007	0.014	0.0004	0.019	0.0019	0.06	1.9	2.8	0.16	0.04	0.41	1.2	1.7	0.62

The laboratory mean values have been examined statistically to eliminate outlying values. Where a " --- " appears in the table it indicates that an outlying value has been omitted (Grubbs 95 %). A data set consists of at least 5 but usually 6 single values of one laboratory.

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 Number	Method
Si	1, 5, 6, 7, 9, 10, 11, 12	ICP-OES, dissolution with NaOH
	2	XRF
	3, 8	Spectrophotometry
	4	ICP-OES, dissolution with acid
Fe	1, 4, 6, 9, 15	ICP-OES, dissolution with acid
	2, 3, 5, 8, 10, 11, 12, 16	ICP-OES, dissolution with NaOH
	7	Spectrophotometry
	13	FAAS, dissolution with acid
Cu	14	XRF
	2, 4, 5, 7, 9, 10, 13	ICP-OES, dissolution with NaOH
Mn	3, 6, 8, 11, 14	ICP-OES, dissolution with acid
	12	XRF
	1, 7, 9, 11, 13	ICP-OES, dissolution with acid
Mg	2	XRF
	3, 4, 5, 6, 8, 10, 12, 14	ICP-OES, dissolution with NaOH
	1, 2, 4, 7, 8, 9, 11	ICP-OES, dissolution with NaOH
Cr	3, 5, 6, 12, 13	ICP-OES, dissolution with acid
	10	FAAS, dissolution with acid
	1, 2, 5, 6, 8	ICP-OES, dissolution with NaOH
Zn	3	XRF
	4, 7, 9, 10, 11, 12	ICP-OES, dissolution with acid
	1, 3, 10, 12	ICP-OES, dissolution with acid
	2, 6, 7, 8, 9, 11, 13	ICP-OES, dissolution with NaOH
Ni	4	FAAS, dissolution with acid
	5	XRF
	1, 4, 11, 12, 13, 14	ICP-OES, dissolution with NaOH
	2, 5, 6, 9, 10, 15	ICP-OES, dissolution with acid
	3	ETAAS, dissolution with NaOH
Ti	7	ETAAS, dissolution with acid
	8	XRF
	1, 2, 4, 7, 9, 13	ICP-OES, dissolution with NaOH
	3, 6, 8, 10, 12, 14	ICP-OES, dissolution with acid
	5	FAAS, dissolution with acid
Ag	11	Spectrophotometry
	15	XRF
	1	XRF
	2, 5, 6, 7	ICP-OES, dissolution with acid
Be	3, 8	ICP-OES, dissolution with NaOH
	4	ICP-MS, dissolution with acid
	1, 5, 6, 7, 9	ICP-OES, dissolution with acid
	2, 3, 4, 10, 12, 13	ICP-OES, dissolution with NaOH
	8	ETAAS, dissolution with acid
	11	ICP-MS, dissolution with acid

Element	Line Number	Method
Na	1, 3, 6, 7, 8	ICP-OES, dissolution with acid
	2, 5	FAAS, dissolution with acid
	4	ICP-OES, dissolution with NaOH
Pb	1, 3, 5, 9	ICP-OES, dissolution with NaOH
	2, 4, 10	ICP-MS, dissolution with acid
	6, 7	ICP-OES, dissolution with acid
	8	XRF
Zr	1, 13	ICP-MS, dissolution with acid
	2, 8, 9, 11, 12	ICP-OES, dissolution with NaOH
	3	XRF
	4	Spectrophotometry
	5, 6, 7, 10, 14	ICP-OES, dissolution with acid
Ca	1, 3, 4	ICP-OES, dissolution with acid
	2	ICP-OES, dissolution with NaOH

Abbreviations: ETAAS – Electrothermal atomic absorption spectrometry
FAAS – Flame atomic absorption spectrometry
ICP-OES – Inductively coupled plasma - optical emission spectrometry
ICP-MS – Mass spectrometry with inductively coupled plasma
XRF – X-ray fluorescence spectrometry

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Reference Materials

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Head of Division 1.6
Inorganic Reference Materials

BAM holds an accreditation as a reference material producer according to ISO Guide 34 in combination with ISO/IEC 17025. This accreditation is valid only for the scope as specified in the certificate D-RM-11075-01-00. DAkkS is a signatory of the multilateral agreement (MLA) between EA, ILAC and IAF for mutual acceptance.



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