

CERTIFICATE OF ANALYSIS

ERM[®]-EB105

PbCaSn			
	Certified value ¹⁾	Uncertainty ²⁾	
Element	Mass fraction in %		
Ca	0.0595	±	0.0016
Sn	1.43	±	0.07
Mass fraction in mg/kg			
Ag	32.1	±	0.9
Bi	133	±	5

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 measurement. 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 $k=2$, 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 08/2061.

DESCRIPTION OF THE SAMPLE

The Reference Material is available in the form of discs (40 mm diameter and 40 mm height).

Accepted as an ERM[®], Berlin, 2011-11-10.

BAM Department 1
Analytical Chemistry;
Reference Materials

BAM Division 1.1
Inorganic Chemical Analysis;
Reference Materials

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(Head of Department)

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(Head of Division)

NOTE

European Reference Material ERM[®]-EB104 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>).

MEANS OF ACCEPTED DATA SETS

Certified values

Line no.	Mass fraction in %		Mass fraction in mg/kg	
	Ca	Sn	Ag	Bi
1	0.0577	1.388	30.0	123.0
2	0.0578	1.401	30.0	123.2
3	0.0587	1.414	31.1	128.2
4	0.0592	1.425	31.3	130.0
5	0.0594	1.428	31.9	130.9
6	0.0594	1.432	32.0	133.2
7	0.0595	1.432	32.2	133.4
8	0.0603	1.450	32.5	133.8
9	0.0604	1.456	32.6	135.2
10	0.0606	1.462	32.8	136.5
11	0.0611	1.477	33.0	138.1
12			33.0	138.2
13			33.3	139.0
14			33.9	146.1
15			---	
<i>M</i>	0.0595	1.433	32.1	133
<i>s_M</i>	0.0011	0.027	1.2	6.3
\overline{s}_i	0.0011	0.011	0.4	1.4

The laboratory mean values have been examined statistically to eliminate outlying values. Each laboratory mean consists of at least 4 but usually 6 single values.

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

M : mean of means of data sets

\overline{s}_i : square root of mean of variances of data sets under repeatability conditions

s_M : standard deviation of means of data sets

INTENDED USE

The CRM 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 materials. 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.

ANALYTICAL METHOD USED FOR CERTIFICATION

Element	Line no.	Method
Ca	1, 3, 5, 8, 9, 10, 11	ICP-OES, dissolution with tartaric acid/HNO ₃
	2, 7	FAAS, dissolution with tartaric acid/HNO ₃
	4	FAAS, dissolution with HNO ₃ /HF
	6	ICP-OES, dissolution with HNO ₃ /fusion with Na-tetraborate
Sn	1, 2, 3, 5, 6, 7, 8, 9, 11	ICP-OES, dissolution with tartaric acid/HNO ₃
	4	ICP-OES, dissolution with HNO ₃ /fusion with Na-tetraborate
	10	FAAS, dissolution with HNO ₃
Ag	1, 6, 13, 14	FAAS, dissolution with tartaric acid/HNO ₃
	2, 4, 5, 7, 8, 9, 10, 11,	ICP-OES, dissolution with tartaric acid/HNO ₃
	3	FAAS, dissolution with HNO ₃ /HF
	12	ICP-OES, dissolution with HNO ₃ /fusion with Na-tetraborate
Bi	1, 2, 4, 5, 6, 8, 9, 11, 12, 13, 14	ICP-OES, dissolution with tartaric acid/HNO ₃
	3	FAAS, dissolution with tartaric acid/HNO ₃
	7	FAAS, dissolution with HNO ₃ /HF
	10	ICP-OES, dissolution with HNO ₃ /fusion with Na-tetraborate

Abbreviations:

ICP-OES: Inductively coupled plasma - optical emission spectrometry

FAAS: Flame atomic absorption spectrometry

STORAGE

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

PARTICIPANTS

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TECHNICAL REPORT

A detailed technical report describing the analysis procedures and the treatment of the analytical data used to certify ERM[®]-EB105 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

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