CERTIFICATE OF ANALYSIS

ERM®-EB400

Pb in bronze			
Certified quantity	**Unit**	**Certified value [1)]**	**Uncertainty [2)]**
Isotope amount ratio $n(^{206}Pb)/n(^{204}Pb)$	mol/mol	18.072	0.017
Isotope amount ratio $n(^{207}Pb)/n(^{204}Pb)$	mol/mol	15.578	0.018
Isotope amount ratio $n(^{208}Pb)/n(^{204}Pb)$	mol/mol	38.075	0.046
Isotope amount ratio $n(^{208}Pb)/n(^{206}Pb)$	mol/mol	2.1068	0.0014
Isotope amount fraction $n(^{204}Pb)/n(Pb)$	mol/mol	0.013 7504	0.000 0098
Isotope amount fraction $n(^{206}Pb)/n(Pb)$	mol/mol	0.248 50	0.000 24
Isotope amount fraction $n(^{207}Pb)/n(Pb)$	mol/mol	0.214 20	0.000 24
Isotope amount fraction $n(^{208}Pb)/n(Pb)$	mol/mol	0.523 55	0.000 35
Molar mass of Pb in bronze $M(Pb)$	g/mol	207.209 68	0.000 57

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 each calibrated against SI-traceable calibrators. The certified values of this European Reference Material (ERM) are traceable to the International System of units (SI).

2) The uncertainty of the certified value is the expanded uncertainty U with a coverage factor of $k = 2$ corresponding to a 95 % confidence level estimated in accordance with international guidelines (JCGM 100:2008, EURACHEM/CITAC 2012).

This certificate is valid until 2037 for units with unbroken seal stored under required conditions. This validity may be extended as further evidence of stability becomes available.

NOTE

European Reference Material ERM®-EB400 was produced and certified under the responsibility of Bundesanstalt für Materialforschung und –prüfung (BAM) 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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Additional Material Information

Mass fraction	Unit	Value [1)]	Uncertainty [2)]
Cu mass fraction	kg/kg	0.9404	0.0005
Sn mass fraction	kg/kg	0.0592	0.0013
Bi mass fraction	mg/kg	42.2	1.5
Pb mass fraction	mg/kg	44.9	2.3

1) The additional information values of this European Reference Material (ERM) are traceable to the International System of units (SI), by calibrating all instruments against SI-traceable calibrators.

2) The uncertainty of the additional information values is the expanded uncertainty U with a coverage factor of $k = 2$ corresponding to a 95 % confidence level estimated in accordance with international guidelines (JCGM 100:2008, EURACHEM/CITAC 2012).

DESCRIPTION OF THE SAMPLE

The isotopic reference material ERM-EB400 is a chipped bronze material with a Pb mass fraction of 45 mg/kg. Approximately 1 g of bronze swarfs is filled in crimp vials, which are sealed in PE bags. This material is designed for verification and validation of all procedures (e.g. TIMS, ICPMS) being used for the determination of Pb isotope amount ratios.

ANALYTICAL METHOD USED FOR CERTIFICATION

The certified values were determined by multi-collector ICPMS and multi collector TIMS after the Pb has been separated from the matrix. The mass fractionation or discrimination was corrected by using the certified isotopic reference material NIST SRM 981. More details can be found in the certification report, which can be requested from BAM.

PARTICIPANTS

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INSTRUCTIONS FOR USE

No specific precautions are necessary aside from exposure to any contaminants.

The minimum sample intake should be 100 mg.

SAFETY INFORMATION

The usual laboratory safety precautions apply.

STORAGE

ERM-EB400 should be stored under normal lab conditions in a tightly sealed container.

BAM cannot be held responsible for changes that happen during storage of the material at the customer's premises, especially of opened samples.

LEGAL NOTICE

Neither BAM, its contractors nor any person acting on their behalf:

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NOTE

A detailed technical report describing the production, characterisation as well as the analytical procedures applied and the treatment of the analytical data used to certify ERM®-EB400 is available on request from BAM (https://www.bam.de).

Supply of Reference Materials by: Bundesanstalt für Materialforschung und –prüfung (BAM)
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