



CERTIFICATE OF REFERENCE MATERIAL

BR1

Copper alloy
Bronze B555

The assigned certified values¹ and uncertainties² in % w/w

Zn	5.079	± 0.062
Sn	4.946	± 0.110
Pb	5.037	± 0.097
Fe	0.0852	± 0.0029
P	0.0097	± 0.0021
As	0.0102	± 0.0008
Sb	0.0903	± 0.0036
Mn	0.0801	± 0.0033
Ni	0.481	± 0.016
Al	0.00745	± 0.00031
S	0.0143	± 0.0025

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 determination.

² The certified uncertainty is the expanded uncertainty with a coverage factor $k=2$, corresponding to a level of confidence of about 95 %.

Values for information in % w/w

Si ³	0.0077
Cu	The rest

³ Values obtained by two laboratories (unweighted mean value of the means)

Certified on October 2019
Last revision on October 2021

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Description of the material:

The certified reference material is available in the form of discs (40 mm diameter and ~25 mm height).

Traceability:

The certified values are traceable to the SI via calibration using pure metals or certified monoelement standard solutions. All values were confirmed in an inter-laboratory comparison using independent analytical methods. CRM BR1 is consistent with CRMs BI series produced by The Institute of Non-Ferrous Metals.

Analytical methods applied:

- Zn, Sn, Pb, Fe, Si, P, As, Sb, Mn, Ni, Al, S – Inductively coupled plasma optical emission spectrometry (ICP OES),
Zn, Sn, Pb, Fe, Sb, Mn, Ni, Al – Flame atomic absorption spectrometry (FAAS),
Zn, Sn, Pb, Fe, P, As, Sb, Mn, Ni, Al, S – Wavelength Dispersive X-Ray Fluorescence Spectroscopy (WDXRF)
Sn – Volumetric method
Pb – Complexometric titration with potentiometric end-point detection
P – Colourmetric method
S – Leco analyzer

Participants:

1. Łukasiewicz Research Network-Institute of Non-Ferrous Metals, Analytical Chemistry Department, Emission Spectrometry Laboratory, Gliwice, Poland
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5. Łukasiewicz Research Network-Foundry Research Institute
6. Universal Scientific Laboratory Pty Ltd, Milperra, Australia
7. AIM, Montreal, Kanada

Intended use:

The CRM is intended for establishing or checking the calibration of optical emission and X-ray spectrometers for analysis of samples of similar matrix composition (for micro-analysis is not verified).



Minimum sample size

Materials designed for spark-OES spectrometry, XRF spectrometry (>1 mm spot size). For other analytical techniques minimum 0.5 g of the CRM is required.

Instructions for storage and use:

Storage the material in a dry and clean environment at room temperature.

Transport under normal conditions.

Before every use, the surface of CRM must be prepared by milling or turning on a lathe. Overheating of the material during preparation should be avoided. Samples should be prepared in the same way as the CRM. Such preparation does not result in change of certified values.

Brief description of the production and certification process:

The CRM – BR1 was made by melting of all components in the inductive, of crucible furnace and by casting into special moulds protecting elimination of segregation of the components during solidification. Homogeneity testing were made taking into account over 30% of the material produced. Investigations were carried out using atomic emission spectrometry method with low voltage spark. Homogeneity was estimated statistically with application of the ANOVA.

The certification of BR1 is valid 50 years, within the measurement uncertainties specified, provided the CRM is handled in accordance with the instructions given in this certificate.

Expired date:

50 years

The Certified Reference Material was produced according to PN-EN ISO 17034:2017-03 – Reference Material Producer. The consistency was confirmed by The Polish Centre for Accreditation (scope and certificate no RM 006)

Certificate Revision History: 31st of October 2019 (original certificate date); 27th of February 2021 (additional information about traceability, methods used for certification and minimum sample size was added; uncertainties were recalculated); 30th of March (edition and supplementation of: title section, the tables, traceability section, instruction for storage and use section and expired date); 19th of October (edition and supplementation of: validity, information about accreditation)

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