

CERTIFICATE OF REFERENCE MATERIAL

LD
Bi58Sn42 alloy
The assigned certified values¹ and uncertainties²

	LD1		LD2		LD3		LD4		LD5		LD6	
Sb	mg/kg		%		mg/kg		%					
	21.9	±4.9	0.1225	±0.0046	73.8	±4.3	111.0	±5.5	0.0167	±0.0013	0.0757	±0.0028
As	mg/kg		%		mg/kg		%					
	6.28	±0.71	70.3	±3.7	208.3	±8.5	0.0202	±0.0023	0.0280	±0.0036	0.0165	±0.0014
Zn	mg/kg		%		mg/kg		%					
	1.86	±0.74	6.25	±0.75	14.3	±2.8	6.68	±0.93	5.46	±0.55	8.5	±1.2
In	mg/kg		%		mg/kg		%					
	14.4	±1.9	0.120	±0.011	55.4	±2.4	98.3	±3.6	151.4	±8.8	0.0735	±0.0028
Cd	mg/kg		%		mg/kg		%					
	4.39	±0.40	15.41	±0.42	11.4	±1.1	23.5	±2.0	23.2	±2.5	31.3	±2.1
Cu	mg/kg		%		mg/kg		%					
	27.7	±3.9	0.0333	±0.0014	0.0212	±0.0020	0.0440	±0.0016	0.0535	±0.0025	-	-
Ni	mg/kg		%		mg/kg		%					
	15.25	±0.94	0.0157	±0.0011	62.4	±7.6	14.0	±2.5	23.2	±2.5	-	-
Pb	mg/kg		%		mg/kg		%					
	112.5	±5.9	150.3	±6.8	0.0453	±0.0016	0.0711	±0.0018	0.0821	±0.0026	-	-
Ag	mg/kg		%		mg/kg		%					
	9.2	±2.3	0.1207	±0.0058	58.7	±9.5	55.9	±5.2	0.0136	±0.0012	0.0538	±0.0020
Au	mg/kg		%		mg/kg		%					
	66.1	±4.0	0.0166	±0.0013	0.0272	±0.0020	0.0406	±0.0016	0.0510	±0.0023	-	-
Fe	mg/kg		%		mg/kg		%					
	52.2	±11	62.4	±8.4	66.4	±3.9	0.0261	±0.0023	0.0318	±0.0033	-	-
Sn	mg/kg		%		mg/kg		%					
	43.65	±0.59	43.39	±0.67	41.76	±0.92	43.16	±0.61	43.06	±0.55	40.81	±0.61
Bi	The rest											

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%.

Not certified values

	LD1	LD4	LD5	LD6
	mg/kg			
Al	5	18	15	4

Values for Al are presented as informative because the values were reported only by one laboratory

SIEĆ BADAWCZA ŁUKASIEWICZ
INSTYTUT METALI NIEŻELAZNYCH
D Y R E K T O R

dr inż. Barbara Juszczyk, MBA

Description of the material:

The certified reference material is available in the form of disc (40 mm in diameter and 20 mm height).

Traceability:

The certified values are traceable to the SI via calibration using pure metals, certified monoelement standard solutions and certified reference materials produced by MBH Analytical Ltd. All values were confirmed in an inter-laboratory comparison using independent analytical methods.

Analytical methods applied for characterization:

Sb, As, Zn, Al, In, Cd, Cu, Ni, Pb, Ag, Au, Fe – Inductively coupled plasma optical emission spectrometry (ICP OES),
Flame atomic absorption spectrometry (FAAS),
Inductively Coupled Plasma – Mass Spectrometry (ICP MS)
Sn – Volumetric method

Participating laboratories:

1. Łukasiewicz Research Network - Institute of Non-Ferrous Metals, Analytical Chemistry Department, Emission Spectrometry Laboratory, Gliwice, Poland
2. Łukasiewicz Research Network - Institute of Non-Ferrous Metals, Analytical Chemistry Department, Atomic Spectrometry Laboratory, Gliwice, Poland
3. Łukasiewicz Research Network - Institute of Non-Ferrous Metals, Analytical Chemistry Department, Classical Analytical Methods Laboratory, Gliwice, Poland
4. Universal Scientific Laboratory Pty Ltd, Milperra, Australia
5. AIM Metals & Alloys S.E.C., Montreal, Canada

Intended use:

The CRM is intended for establishing or checking the calibration of chemical analysis methods, for validation and to demonstrate results traceability of samples with similar matrix composition (not verified for micro-analysis).

Minimum sample size:

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 at normal conditions.

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 material was produced by Łukasiewicz - IMN. Homogeneity investigations were made taking into account about 30% of the material produced. Investigations were carried out using optical emission spectrometry with low voltage spark and XRF techniques. Homogeneity was estimated statistically with analysis of variance (ANOVA).

The certification of LD 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

Certificate Revision History: December 2018 (original certificate date); 30th of November 2024 (additional information about: expanded uncertainties, minimum sample size, instruction for storage and expire date was added, change of graphic design)

Since 2018 our production of the certified reference materials is carried out in accordance with requirements of the ISO 17034 standard.

The Łukasiewicz Research Network —Institute of Non-Ferrous Metals holds an accreditation of the Polish Centre for Accreditation as a reference material producer according to ISO 17034 with certificate number RM 006.

Contact:

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