



Łukasiewicz
Instytut Metali
Nieżelaznych

CERTIFICATE OF REFERENCE MATERIAL

MH
Cartridge brasses M 68, M 70

The assigned certified values¹ and uncertainties²

	MH1		MH2		MH3		MH4		MH5	
Fe	%									
	0.01722	±0.00073	0.0268	±0.0017	0.0810	±0.0053	0.1289	±0.0021	0.1944	±0.0078
Pb	mg/kg		%							
	64.9	±6.6	0.0213	±0.0025	0.0782	±0.0066	0.326	±0.026	0.199	±0.019
Ni	%								mg/kg	
	0.259	±0.011	0.219	±0.011	0.096	±0.013	0.0521	±0.0018	72.3	±8.0
Mn	%						mg/kg		%	
	0.0349	±0.0022	0.0107	±0.0016	0.0855	±0.0040	16.5	±2.9	0.0721	±0.0058
Cd	%				mg/kg					
	0.0261	±0.0014	0.0178	±0.00077	89.0	±5.6	29.4	±2.7	11.8	±1.4
Sb	mg/kg		%						mg/kg	
	3.9	±1.0	0.0236	±0.0031	0.0126	±0.0020	0.0169	±0.0031	34.9	±2.5
Sn	%						mg/kg			
	0.1406	±0.0081	0.0974	±0.0032	0.02358	±0.00077	107.9	±7.2	20.6	±1.5
Ag	mg/kg		%		mg/kg		-		%	
	28.8	±7.5	0.0106	±0.0018	66	±14			0.0254	±0.0035
As	%						mg/kg			
	0.0669	±0.0039	0.0412	±0.0021	0.0162	±0.0011	10.7	±1.4	37.9	±2.3
Bi	mg/kg									
	37.4	±3.3	22.4	±1.8	11.4	±9.8	5.9	±1.6		-
P	%		mg/kg							
	0.0159	0.0022	55.4	±1.4	34.7	±3.2	21.5	±5.9	10.8	±1.1
Al	mg/kg		%		mg/kg				%	
	10.8	±2.6	0.0188	±0.0039	82	±12	27.6	±5.7	0.0135	±0.0028
Te	mg/kg									
	4.4	±1.0	15.3	±4.0	46	±11	35.2	±7.2	48	±11
Be	mg/kg									
	87.8	±6.5	15.2	±2.6	2.63	±0.78	43.8	±9.8	0.41	±0.13
Si	%						mg/kg		-	
	0.0739	±0.0025	0.0535	±0.0048	0.0307	±0.0043	155.4	±6.4		
Cu	%									
	65.95	±0.30	68.25	±0.41	71.28	±0.42	69.92	±0.31	72.87	±0.95
Zn	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

	MH1	MH2	MH3	MH4	MH5
S	mg/kg				%
	34	55	92	43	0.018
Si					mg/kg
	-	-	-	-	39

Value for S and Si are presented as informative because the values were reported only by one laboratory

The work was carried out in co-operation with the National Institute of Standards and Technology NIST, USA

Signature

SIEĆ BADAWCZA ŁUKASIEWICZ-
INSTYTUT METALI WIEŻELAZNYCH
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 (39 mm in diameter and 25 mm height).

Traceability:

The certified values are traceable to the SI via calibration using pure metals, certified monoelement standard solutions and certified reference materials i.e. 31X TB3 (batch L), 31X TB4 (batch G) produced by MBH Analytical Ltd. All values were confirmed in an inter-laboratory comparison using independent analytical methods.

Analytical methods applied for characterization:

Pb – Atomic absorption spectrometry (AAS) directly and after co-precipitation on $\text{Fe}(\text{OH})_3$ at pH 9
Sb – Atomic absorption spectrometry (AAS) with co-precipitation on $\text{Fe}(\text{OH})_3$ at pH 4, Inductively coupled plasma optical emission spectrometry (ICP-OES)
As – Atomic absorption spectrometry (AAS) after co-precipitation on $\text{Fe}(\text{OH})_3$ at pH 4, Inductively coupled plasma optical emission spectrometry (ICP-OES), Distillation, Colorimetric
Si – Extraction, Spectrophotometric with ammonium molybdenate, Weight method
Ag – Atomic absorption spectrometry (AAS) directly, Inductively coupled plasma optical emission spectrometry (ICP-OES)
Mn – Atomic absorption spectrometry (AAS) directly, Atomic absorption spectrometry (AAS) after electrolysis Cu, Inductively coupled plasma optical emission spectrometry (ICP-OES)
S – Inductively coupled plasma optical emission spectrometry (ICP-OES)
Ni – Atomic absorption spectrometry (AAS) after electrolysis Cu, Inductively coupled plasma optical emission spectrometry (ICP-OES)
Te – Atomic absorption spectrometry (AAS) after co-precipitation on $\text{Fe}(\text{OH})_3$ at pH 4, Inductively coupled plasma optical emission spectrometry (ICP-OES)
Bi – Atomic absorption spectrometry (AAS) after co-precipitation on $\text{Fe}(\text{OH})_3$ at pH 4 or after co-precipitation on $\text{La}(\text{OH})_3$, Inductively coupled plasma optical emission spectrometry (ICP-OES)
P – Extraction, Spectrophotometric, Titration, Inductively coupled plasma optical emission spectrometry (ICP-OES)
Sn – Atomic absorption spectrometry (AAS) after co-precipitation on $\text{Fe}(\text{OH})_3$, Spectrophotometric after co-precipitation on MnO_2 , Inductively coupled plasma optical emission spectrometry (ICP-OES)
Cd – Atomic absorption spectrometry (AAS) directly or after electrolysis Cu, Inductively coupled plasma optical emission spectrometry (ICP-OES)
Fe – Atomic absorption spectrometry (AAS) directly or after co-precipitation on $\text{La}(\text{OH})_3$, Atomic absorption spectrometry (AAS) after electrolysis Cu, Inductively coupled plasma optical emission spectrometry (ICP-OES)
Be – Atomic absorption spectrometry (AAS) directly, Inductively coupled plasma optical emission spectrometry (ICP-OES)
Al – Atomic absorption spectrometry (AAS) directly, Inductively coupled plasma optical emission spectrometry (ICP-OES)
Cu – Electrolysis.

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. Walcownia Metali Nieżelaznych "Łabędy" S.A., Gliwice, Poland
4. Walcowania Metali „Dziedzice” S.A., Czechowice – Dziedzice, Poland
5. Huta Metali Nieżelaznych „Szopienice” S.A., Katowice, Poland
6. Huttenwerke Kayser, Germany

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 MH 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 2000 (original certificate date); 30th of November 2024 (additional information about: expanded uncertainties, traceability, participating laboratories, methods used for certification, minimum sample size, instruction for storage and use 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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