Łukasiewicz
Instytut Metali
Nieżelaznych

CERTIFICATE
OF REFERENCE MATERIAL

MI
Gilding metal M90, M95
The assigned certified values[1] and uncertainties[2]

	MI1		MI2		MI3		MI4		MI5	
Ag	mg/kg				%					
	37.5	±2.8	**89.9**	±3.8	**0.0192**	±0.0015	**0.0264**	±0.0025	**0.0321**	±0.0021
Al	%						mg/kg			
	0.0401	±0.0047	**0.0550**	±0.0039	**0.0146**	±0.0054	**80**	±14	**21.1**	±4.5
As	%						mg/kg		%	
	0.0721	±0.0031	**0.0539**	±0.0023	**0.0343**	±0.0028	**30.2**	±2.4	**0.0152**	±0.0010
Bi	mg/kg									
	6.39	±0.58	**5.58**	±0.33	**25.5**	±2.4	**27.5**	±3.6	**42.9**	±2.8
Cd	%		mg/kg							
	0.0229	±0.0016	**156.7**	±8.4	**112.5**	±8.5	**53.9**	±3.4	**12.5**	±2.7
Fe	%									
	0.2392	±0.0094	**0.1483**	±0.0062	**0.0856**	±0.0045	**0.0408**	±0.0070	**0.0149**	±0.0029
Ni	mg/kg		%							
	58.8	±11	**0.0178**	±0.0014	**0.0727**	±0.0026	**0.1440**	±0.0084	**0.2520**	±0.0071
Pb	mg/kg		%							
	60.1	±11	**0.0157**	±0.0020	**0.0417**	±0.0024	**0.0708**	±0.0051	**0.0961**	±0.0043
Sb	mg/kg						mg/kg			
	4.4	±1.4	**18.9**	±1.2	-		**5.50**	±0.60	**95.7**	±4.6
Sn	%								mg/kg	
	0.1540	±0.0068	**0.1021**	±0.0041	**0.0663**	±0.0048	**0.0130**	±0.0012	**40.4**	±2.6
Te	mg/kg		%		mg/kg					
	64.7	±5.4	**0.0106**	±0.0016	**31.3**	±5.7	**21.3**	±6.3	-	
Zn	%									
	3.53	±0.13	**6.191**	±0.066	**8.01**	±0.12	**11.13**	±0.35	**4.44**	±0.12
Be	mg/kg									
	0.91	±0.35	**8.5**	±2.2	**19.3**	±5.9	**65.8**	±9.2	**71.6**	±9.0
Mn	mg/kg				%					
	30.5	±2.4	**80.8**	±4.2	**0.0345**	±0.0027	**0.0497**	±0.0083	**0.0693**	±0.0058
S	%								mg/kg	
	0.0467	±0.0021	**0.0492**	±0.0038	**0.0230**	±0.0032	**0.0120**	±0.0012	**19.0**	±3.9
P	%						mg/kg			
	0.0271	±0.0025	**0.0216**	±0.0023	**0.0150**	±0.0015	**73.3**	±6.4	**26.7**	±3.2
Si	mg/kg		%							
	31.5	±7.1	**0.0115**	±0.0017	**0.0313**	±0.0022	**0.0601**	±0.0051	**0.0818**	±0.0039
Cu	%									
	95.709	±0.066	**93.346**	±0.091	**91.46**	±0.13	**88.35**	±0.19	**94.69**	±0.40

[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%.

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

Signature

SIEĆ BADAWCZA ŁUKASIEWICZ-
INSTYTUT METALI NIEŻELAZNYCH
DYREKTOR

dr inż. Barbara Juszczyk, MBA

Description of the material:

The certified reference material is available in the form of disc (38 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 B9 (batch M), 31X B7 (batch L) 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 $Fe(OH)_3$ at pH 9
Sb – Atomic absorption spectrometry (AAS) with co-precipitation on $Fe(OH)_3$ at pH 4, Inductively coupled plasma optical emission spectrometry (ICP-OES)
As – Atomic absorption spectrometry (AAS) after co-precipitation on $Fe(OH)_3$, at pH 4, Inductively coupled plasma optical emission spectrometry (ICP-OES), Distillation, Spectrophotometric
Si – Extraction, Spectrophotometric with ammonium molibdenate, Weight method
Ag – Atomic absorption spectrometry (AAS), Inductively coupled plasma optical emission spectrometry (ICP-OES)
Mn – Atomic absorption spectrometry (AAS) directly and 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 $Fe(OH)_3$ at pH 4, Inductively coupled plasma optical emission spectrometry (ICP-OES)
Bi – Atomic absorption spectrometry (AAS) after co-precipitation on $Fe(OH)_3$ at pH 4 or after co-precipitation on $La(OH)_3$, 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 $Fe(OH)_3$, 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 $La(OH)_3$, 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
Zn – Titration, Inductively coupled plasma optical emission spectrometry (ICP-OES)

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. HUTMEN, Wrocław, Poland

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 MI 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 2001 (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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