



INSTITUTE OF NON-FERROUS METALS

Analytical Chemistry Department

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CERTIFICATE OF ANALYSIS

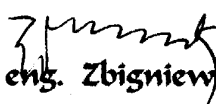
Ounce metal

(in co-operation with the National Institute of Standards and Technology NIST, USA)

The average results of chemical analysis in wt %

Element	No.	BI 1	BI 2	BI 3	BI 4
Sn		3,19	4,18	5,01	7,69
Pb		(6,97)	(5,48)	4,52	3,82
Zn		3,54	5,73	7,23	10,22
Al		0,18	(0,077)	0,034	(0,0021)
Fe		0,42	0,31	0,17	0,083
Sb		0,58	0,43	0,24	0,075
As		0,14	(0,11)	0,052	(0,010)
Ni		2,41	1,46	0,29	0,083
Mn		0,26	0,15	0,082	0,025
Bi		0,12	0,070	0,028	0,0030
P		0,70	0,59	0,32	0,029
Si		0,23	0,13	0,076	(0,0097)
S		(0,025)	(0,011)	(0,0039)	(0,0029)
Cu		the rest	the rest	the rest	the rest

Director of the Institute


Prof. Dr eng. Zbigniew Śmieszek

The confidence intervals in wt % at the probability level of 0,05

Element	No.	BI 1	BI 2	BI 3	BI 4
Sn		0,059	0,096	0,057	0,083
Pb		0,041	0,049	0,040	0,052
Zn		0,026	0,040	0,049	0,11
Al		0,014	0,0014	0,0028	--
Fe		0,0078	0,0082	0,0036	0,0011
Sb		0,011	0,0071	0,0058	0,0032
As		0,0064	--	0,0017	--
Ni		0,048	0,015	0,011	0,0036
Mn		0,013	0,0090	0,0018	0,0011
Bi		0,0080	0,0011	0,0011	0,000071
P		0,019	0,016	0,0066	0,0017
Si		0,0089	0,0058	0,0021	--
S		--	--	--	--
Cu		--	--	--	--

Analytical methods applied:

- Sn - AAS (atomic absorption directly) and AES (atomic emission spectrometry with ICP)
- Pb - AAS (atomic absorption directly) and AES (atomic emission spectrometry with ICP)
- Zn - AAS (atomic absorption directly) and AES (atomic emission spectrometry with ICP)
- Al - AAS (atomic absorption after Cu electrolysis) and AES (atomic emission spectrometry with ICP)
- Fe - AAS (atomic absorption directly) and AES (atomic emission spectrometry with ICP)
- Sb - AAS (atomic absorption directly) and AES (atomic emission spectrometry with ICP)
- As - AAS (atomic absorption directly and after co-precipitation on Fe(OH)₃) and AES (atomic emission spectrometry with ICP)
- Ni - AAS (atomic absorption spectrometry directly) and AES (atomic emission spectrometry with ICP) and spectrophotometric with dimethyl glyoxime
- Mn - AAS (atomic absorption spectrometry directly) and AES (atomic emission spectrometry with ICP)
- Bi - AAS (atomic absorption spectrometry after co-precipitation on Fe(OH)₃) and AES (atomic emission spectrometry with ICP)
- P - spectrophotometric, AES (atomic emission spectrometry with ICP)
- Si - weight method, AES (atomic emission spectrometry with spark excitation)
- S - AES (atomic emission spectrometry with ICP)

The chemical analyses have been carried out in three industrial laboratories and in the laboratory of the Institute of Non-Ferrous Metals. Ounce metals were made by melting of all components in the coreless induction furnace and using horizontal continuous casting. Final product of CRMs have been obtained in form of discs 40 mm in diameter and 25 mm height.