INSTITUTE OF NON-FERROUS METALS

Analytical Chemistry Department

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CERTIFICATE OF ANALYSIS

Refined copper CT6

The average results of chemical analysis in wt %

The uncertainity intervals in wt% at the probability level of 0.05 CRMs developed in cooperation with MBH

Element	Concentration	Uncertainity
Ag	0,0039	0,0003
Sn	0,013	0,0011
Fe	0,014	0,0003
As	0,0054	0,0004
Sb	0,011	0,0004
Bi	0,0040	0,0002
Zn	0,030	0,002
Pb	0,0014	0,0002
Ni	0,011	0,002
P	0,011	0,001
S	0,0069	0,0008
Se	0,011	0,001
Te	0,012	0,0008
Co	0,011	0,0007
B	0,0060	0,0009

Gliwice. November 2005

Director of the Institute

Prof. Ph. D. Zbigniew Śmieszek

Analysis have been made using the following analitical methods:

Ag - atomic emission spectrometry with ICP, atomic absorption spectrometry,

Sn - atomic emission spectrometry with ICP, atomic absorption spectrometry after coprecipitation on $Fe(OH)_3$

Fe - atomic emission spectrometry with ICP, atomic absorption spectrometry,

As - atomic emission spectrometry with ICP, atomic absorption spectrometry directly and after coprecipitation on $Fe(OH)_3$

Sb - atomic emission spectrometry with ICP, atomic absorption spectrometry directly and after coprecipitation on $FE(OH)_3$

Bi - atomic emission spectrometry with ICP, atomic absorption spectrometry directly and after coprecipitation on $Fe(OH)_3$

Zn - atomic emission spectrometry with ICP, atomic absorption spectrometry directly and after electrolytic matrix separation,

Pb - atomic emission spectromrty with ICP, atomic absorption spectrometry directly and after coprecipitation on $FE(OH)_3$

Ni - atomic emission spectrometry with ICP, atomic absorption spectrometry drectly and after electrolytic matrix separation

P - atomic emission spectrometry, spectrophotometric in form of ammonium molybdanate komplex directly and after separation (extraction) of coloured komplex

S - atomic emission spectrometry with ICP, method of combusting and infrared determination of CO_2

Se - atomic emission spectrometry with ICP, atomic absorption spectrometry directly and after coprecipitation on $Fe(OH)_3$

Te - atomic emission spectrometry with ICP, atomic absorption spectrometry directly and after coprecipitation on $Fe(OH)_3$,

Co - atomic emission spectrometry, atomic absorption spectrometry

directly and after electrolytic matrix separation

B - atomic emission spectrometry with ICP, spectrophotometric with azomethin H

The chemical analysis have been carried out in thirteen specialistic laboratories: RWTU (Czech-Republic Brno CAL accreditation 1060), Genitest Inc Canada Montreal, Luo Yang Copper Company China Luo Yang, He Nan accreditation CNAL 0173, Institute of Iron and Steel Technology China Shanghai CNAL 0783, Laboratory Testing Inc. The USA Hatfield accreditation AZLA 0117, De Bruyn Spectroscopic Solutions South Africa Melkbosstrand, Universal Scientific Laboratory Pty Ltd Australia Milpera, NSW accreditation NATA 0492, Colesill Laboratories Ltd England Colesil, Institute of Non-Ferrous Metals (ICP Laboratory) Poland Gliwice, Institute of Non-Ferrous Metals (AAS and clasical Laboratory) Poland Gliwice and three specialistic laboratories from' Poland Hutmen S.A., WM Łabędy, WM Dziedzice. Melts have been perfprmed using induction furnace. CRMs is in form of discs about 40mm in diameter and about 30 mm height.

Homogeneity investigations 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 test F. Uncertainity intervals in wt % was calculated at the probability level of 0,05 as half-width confidence interval. This Certified Reference Materials have been produced and certified according to the requirements of ISO Guide to the Expression of Uncertainity in measurement (GUM).

Application of CRMs- Atomic absorption spectrometry

- Atomic emission spectrometry
- X-Ray spectrometry

CRMs are stable in time.