



## Institute of Non-Ferrous Metals

# CERTIFICATE of REFERENCE MATERIAL

### Reference Materials for Chemical Analysis Ko-P 2 Copper Concentrate from "Polkowice-Sieroszowice" Mine

The reference material is intended for analytical method control during routine determination of copper, silver, lead and arsenic in copper concentrate. The bottle of reference material contains 250 g. of concentrate.

To control analytical method should be used material having contents of analytes similar to these being analysed. (Look into possibility of using RM Ko-R1 or Ko-L3)

**Certified values:** The certified values are presented in Table 1. Analytical methods used in certification are presented in Table 2. Certified values are calculated basing on 8 results from each laboratory participating in the attestation.

**Storage:** The material should be kept in the original container tightly closed in temperature 10°C - 30°C. It should not be exposed to the action of strong radiation (e.g. UV). After opening, closed bottle should be kept in desiccators in the mentioned temperature range.

**Usage:** The reference material should be used for analysis in a weighted amount of a mass not lower than 0.25 g of dried material for analysis of silver. The usage lower mass could cause obtained the result out of the confidence level.

**Drying:** the material should be dried through 2 hours in temperature 105°C or to constant weight. Presented values of concentrations concern the dried sample. Concentration determined in the not dried sample should be recalculated taking into account determined moisture content.

**Determination of homogeneity:** Homogeneity of the reference materials was examined in IMN laboratory by comparing variance of five analyses results obtained from the first bottle to similar variance obtained from the middle and last bottle. Homogeneity was assessed as satisfying because the ratio of the variances was less than critical value of Snedecor test (F). Finally homogeneity was confirmed during attestation through carrying out next two stage experiment. Laboratories 1 - 7 obtained two samples from the first and last bottle. Calculated ratio of summarised variances of silver, copper, lead and arsenic concentration in both samples did not exceed critical values.

**Origin of the material and a method of its preparation:** The reference material was prepared from the copper concentrate produced in "Polkowice - Sieroszowice" mine during normal ore enriching process. The material was sieved through 0.1 mm sieve, milled and mixed in rotation mixer during 8 hours.

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Table 1

**Certified values**

Element	Content	Confidence level	Variance
Silver	458,7 ppm	5,5 ppm	5,367
Copper	26,10 %	0,16 %	0,005
Arsenic	0,138 %	0,013 %	0,000028
Lead	1,16 %	0,02 %	0,00010

Table 2

**Analytical methods**

Ag	-	AAS, cupellation
Cu	-	iodometric, electrogravimetric
Pb	-	AAS, ICP
As	-	AAS after coprecipitation As on iron hydroxide, ICP

Analysts of IMN participated in certification and preparation  
reference materials

- Zofia Mzyk
- Jan Mzyk
- Maria Brzezicka
- Henryka Matusiak
- Ewa Cisowska

Laboratories participated in attestation

- Center of Quality Researche. - Laboratories : WBJ-1 Głogów I i Głogów II, DBJ-2 Legnica, WKJ-3 Lubin, WKJ-4 Polkowice-Sieroszowice, WKJ-5 Rudna
- Alfred H. Knight (England)