



INSTITUTE OF NON-FERROUS METALS

Analytical Chemistry Department

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CERTIFICATE OF ANALYSIS

Copper of higher purity

The average results of chemical analyses in ppm

| No. Element | CF 1 | CF 2 | CF 3 | CF 4 | CF 5 | CF 6 |
|----------------|------|------|------|------|------|---------|
| As | 6,7 | 1,1 | 1,8 | 43,0 | 2,3 | 0,32 |
| Sb | 24,0 | 1,4 | 2,2 | 11,0 | 1,9 | 0,2 |
| Pb | 33,0 | 0,6 | 8,9 | 1,1 | 3,2 | 1,8 |
| Sn | 21,0 | -- | 3,2 | 1,0 | 1,3 | (0,06) |
| Ni | 29,0 | 0,7 | 6,4 | 7,8 | 3,0 | (0,4) |
| Bi | 12,5 | -- | -- | 1,2 | 0,25 | (0,012) |
| Fe | 42,0 | 2,8 | 20,0 | 3,7 | 98,0 | 1,0 |
| Zn | 57,0 | 2,2 | 3,4 | 31,0 | 4,7 | -- |
| Ag | 45,0 | 9,0 | 3,2 | 18,0 | 12,0 | 12,0 |

Director of the Institute

Prof. Ph.D. Zbigniew Śmieszek

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

| No. Element | CF 1 | CF 2 | CF 3 | CF 4 | CF 5 | CF 6 |
|----------------|------|-------|------|-------|-------|-------|
| As | 0,55 | 0,11 | 0,16 | 3,8 | 0,20 | 0,057 |
| Sb | 0,5 | 0,086 | 0,12 | 0,74 | 0,29 | -- |
| Pb | 1,5 | 0,17 | 0,55 | 0,3 | 0,34 | 0,14 |
| Sn | 1,6 | -- | 0,28 | 0,064 | 0,10 | -- |
| Ni | 2,1 | 0,068 | 0,39 | 0,54 | 0,26 | -- |
| Bi | 1,0 | -- | -- | 0,21 | 0,038 | -- |
| Fe | 2,3 | 0,071 | 0,12 | 0,30 | 1,4 | -- |
| Zn | 3,2 | 0,30 | 0,37 | 3,0 | 0,35 | -- |
| Ag | 0,59 | 0,29 | 0,27 | 0,10 | 0,42 | 7,0 |

Analytical methods applied:

- As - spectrophotometric with ammonium molybdenate*
- Sb - spectrophotometric with crystal violet*
- Pb - spectrophotometric with dithizone, atomic absorption*
- Sn - spectrophotometric with phenylfluoran*
- Ni - atomic absorption*
- Bi - spectrophotometric with dithizone*
- Fe - atomic absorption*
- Zn - spectrophotometric with dithizone, atomic absorption*
- Ag - titration with dithizone, atomic absorption*

The chemical analyses have been carried out in four industrial laboratories and at the Institute of Non-Ferrous Metals.

The set consists of 6 reference materials in form of rods 6 mm and 3 mm in diameter and 100 mm long.