



Certificate of Analysis 0893

Date: 05-10-2021

Version: 01

CRM ITAK-860 Certified Reference Material Copper Ore

Table 1 – ITAK-860 – Certified Values

Element/Unit	Certified Value ^[1]	s ^[2]	s _r ^[3]	s _L ^[4]	U ^[5]
Cu (%) ^{a, c, e, f, o, p, s}	0.938	0.025	0.018	0.017	± 0.0049
Fe (%) ^{a, c, f, o, p}	31.04	0.73	0.35	0.64	± 0.21
S (%) ^{c, k, o, u}	0.342	0.012	0.0081	0.0087	± 0.0027
Ag (g/t) ^{a, c, q}	2.28	0.17	0.089	0.14	± 0.049
Au (g/t) ^{g, h, i, j}	0.651	0.054	0.053	0.0095	± 0.0066
Ni (g/t) ^{c, q}	110.2	4.1	2.8	2.9	± 1.4
F (g/t) ^{l, n, t}	3339	595	84	589	± 199
Al (%) ^{c, o, p}	4.78	0.14	0.12	0.085	± 0.032
As (g/t) ^{c, e, q}	10.8	1.7	1.6	0.61	± 0.27
Ba (g/t) ^{c, p}	149.9	5.6	4.3	3.6	± 1.6
Bi (g/t) ^{c, q}	0.711	0.098	0.048	0.085	± 0.035
C (%) ^k	0.089	0.013	0.0050	0.012	± 0.0037
Ca (%) ^{c, o, p}	0.911	0.034	0.017	0.029	± 0.011
Cl (g/t) ^{l, m, s, t, v}	2384	274	179	208	± 114
Co (g/t) ^{c, q}	108.4	3.6	2.1	2.9	± 1.1
Cr (g/t) ^{c, q}	179.0	17.0	3.4	16.7	± 6.8
K (%) ^{c, o, p}	1.267	0.046	0.028	0.037	± 0.015
Mg (%) ^{c, o, p}	1.244	0.032	0.032	0.0055	± 0.0047
Mn (%) ^{c, o, p}	0.550	0.031	0.0091	0.029	± 0.010
Mo (%) ^{c, p, q}	0.00490	0.00041	0.00032	0.00025	± 0.00010
Na (%) ^{c, p}	0.2007	0.0071	0.0039	0.0059	± 0.0025
P (%) ^{c, o, p}	0.0760	0.0035	0.0023	0.0026	± 0.0011

Table 1 – ITAK-860 – Certified Values (cont.)

Element/Unit	Certified Value ^[1]	s ^[2]	s _r ^[3]	s _L ^[4]	U ^[5]
Pb (g/t) ^{c, q}	10.3	1.2	0.54	1.0	± 0.46
Pd (g/t) ^g	0.0064	0.0024	0.0011	0.0022	± 0.00094
Pt (g/t) ^g	0.0051	0.0031	0.00054	0.0031	± 0.0016
Se (g/t) ^c	1.79	0.61	0.32	0.52	± 0.24
Si (%) ^{o, p, u}	17.06	0.38	0.16	0.35	± 0.12
Sn (g/t) ^{c, q}	14.0	1.1	0.39	0.99	± 0.38
Te (g/t) ^c	0.563	0.065	0.048	0.043	± 0.021
Th (g/t) ^{c, q}	3.92	0.29	0.18	0.22	± 0.094
Ti (%) ^{c, o, p}	0.373	0.020	0.0092	0.018	± 0.0058
U (g/t) ^{c, q}	22.3	1.5	1.1	1.1	± 0.42
V (g/t) ^{b, c, p}	132.3	10.6	2.4	10.3	± 3.5
Zn (g/t) ^{a, c, q}	30.4	3.1	1.1	2.9	± 1.1

^[1] The Certified Value was calculated according to ISO Guide 35 and ISO 5725-2.

^[2] The standard deviation for proficiency assessment was calculated according to ISO 13528 and 5725-2. This standard deviation can be used for control charts for individual analysis ($n=1$).

^[3] The within-laboratory standard deviation was calculated according to ISO 5725-2.

^[4] The between-laboratory standard deviation was calculated according to ISO 5725-2.

^[5] The combined standard uncertainty of the certified value was calculated according to ISO Guide 35.

Note: The letters in front of the elements are codes for Analytical Methods used.

Table 2 – ITAK-860 – Informative Values

Element/Unit	Reference Value ^[6]
Sb (g/t) ^{c, e, q}	0.070
Cd (g/t) ^c	< 0.1
Soluble Cu (%) ^r	0.31
Hg (g/t) ^{d, e}	< 0.01
Tl (g/t) ^{c, q}	< 0.2

^[6] These values are informative. They were calculated according to ISO Guide 35 and ISO 5725-2 from ten to seventy-five results from a varying number of laboratories.

DESCRIPTION

ITAK-860 was prepared from a sample of Copper Ore donated by a Copper Mining Company from the North of Brazil in 2020.

This Certified Reference Material (CRM) is presented as a fine powder.

INTENDED USE AND INSTRUCTIONS

ITAK-860 provides an important control in analytical data from exploration and can be used as a tool for grade control in routine mining and laboratory operations.

This Certified Reference Material can be used for calibration of analytical equipment, assess and develop new methods, validation of analytical methods, and arbitration – proficiency testing for example.

The bottles/sachets content should be thoroughly mixed before taking samples of ITAK-860.

The Certified Reference Material should be used without pre-treatment. ITAK is not responsible for any changes occurring after opening said bottles/sachets.

The Certified Reference Material should be stored in a dry place and without contact with excessive heat or moisture.

CERTIFICATION AND STATISTICAL EVALUATION OF ANALYTICAL DATA

ITAK-860 was analyzed by twenty specialized laboratories. The statistical evaluation was carried out according to ISO GUIDE 35 and ISO 5725-2, using: identification and treatment of outliers, stragglers and technically invalid data, certified value calculation, standard deviation calculation, and extended standard uncertainty calculation.

The Technical Report: RT-013/2021 STD contains full details of all phases of manufacturing, certifying results, participating laboratories, and the statistical evaluation.

Note: This report is available on the ITAK database for CRM users.

ANALYTICAL METHODS

The methods used on the certification of CRM ITAK-860 are mentioned as follows:

- **a**: Acid digestion Method (HCl, HNO₃, HF, HClO₄) and determination by Atomic Absorption Spectrometry (AAS).
- **b**: Acid digestion Method (HCl, HNO₃, HF) and determination by Atomic Emission Spectrometry (ICP).
- **c**: Acid digestion Method (HCl, HNO₃, HF, HClO₄) and determination by Atomic Emission Spectrometry (ICP).
- **d**: Acid digestion Method (HCl, HNO₃, HF, HClO₄) and determination by Mass Spectrometry (ICPMS).
- **e**: Aqua Regia digestion Method (HCl, HNO₃) and determination by Atomic Emission Spectrometry (ICP).
- **f**: Aqua Regia digestion Method (HCl, HNO₃) and determination by Atomic Absorption Spectrometry (AAS).
- **g**: Fire Assay Method and determination by Atomic Emission Spectrometry (ICP).
- **h**: Fire Assay Method and determination by Atomic Absorption Spectrometry (AAS).
- **i**: Extraction by DIBK and determination by Atomic Absorption Spectrometry (AAS).
- **j**: Fire Assay Method and determination by Gravimetry.
- **k**: Infrared Analyzer (LECO).
- **l**: Acid Digestion and determination by Ion Chromatography.
- **m**: Fusion Method and determination by Titration.
- **n**: Fusion Method and determination by Ion specific electrode.
- **o**: Fusion Method and determination by X-Ray Fluorescence.
- **p**: Fusion Method and determination by Atomic Emission Spectrometry (ICP).
- **q**: Fusion Method and determination by Mass Spectrometry (ICPMS).
- **r**: Acetic Acid leaching Method and determination by Atomic Absorption Spectrometry (AAS).
- **s**: Acid digestion Method (HCl, HNO₃, HF, HClO₄) and determination by Titration.
- **t**: Fusion Method and determination by Potentiometric.
- **u**: Gravimetric Method.
- **v**: Colorimetric Method.

PERIOD OF VALIDITY

This CRM certification is valid until: **May 10, 2031.**

CERTIFICATE REPRODUCTION

This certificate must not be modified and may only be reproduced in its entirety and without change.



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