



Certificate of Analysis 1109

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CRM ITAK-1601

Certified Reference Material - Titanium Ore

Table 1 – ITAK-1601 – Certified Values

Element/Unit	Certified Value ^[1]	s ^[2]	s _r ^[3]	s _L ^[4]	U ^[5]
Fe (%) ^a	27.17	0.37	0.11	0.35	± 0.16
Al ₂ O ₃ (%) ^a	2.064	0.019	0.017	0.0084	± 0.0051
SiO ₂ (%) ^a	24.38	0.24	0.12	0.21	± 0.090
Mn (%) ^a	0.2498	0.0078	0.0026	0.0074	± 0.0030
TiO ₂ (%) ^a	9.09	0.10	0.036	0.097	± 0.044
P ₂ O ₅ (%) ^a	0.0227	0.0026	0.0022	0.0014	± 0.00074
CaO (%) ^a	1.120	0.017	0.014	0.010	± 0.0053
MgO (%) ^a	18.245	0.056	0.050	0.024	± 0.017
K ₂ O (%) ^a	0.3748	0.0054	0.0042	0.0035	± 0.0018
^[6] LOI (%) ^b	4.45	0.29	0.11	0.26	± 0.13
FeO (%) ^c	19.9	1.3	0.26	1.3	± 0.61
Cr ₂ O ₃ (%) ^a	0.2578	0.0092	0.0061	0.0070	± 0.0030
V ₂ O ₅ (%) ^a	0.3892	0.0064	0.0063	0.0010	± 0.0013
Co (%) ^a	0.0228	0.0038	0.0025	0.0029	± 0.0014

^[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 extended standard uncertainty of the mean ($\alpha = 5\%$) was calculated according to ISO Guide 35.

^[6] Loss On Ignition.

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

Table 2 – ITAK-1601 – Informative Values

Element/Unit	Reference Value ^[7]
Na ₂ O (%) ^a	< 0.1
BaO (%) ^a	< 0.02

^[7] These values are informative. They were calculated according to ISO Guide 35 and ISO 5725-2 using ten to thirty results from varying numbers of laboratories.

DESCRIPTION

ITAK-1601 was prepared from a sample of Titanium Ore donated by a Titanium Mining Company from Northeast Brazil in 2014.

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

INTENDED USE AND INSTRUCTIONS

ITAK-1601 provides 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 example, to calibrate analytical equipment, assess and develop new methods, validate analytical techniques, and arbitrate proficiency testing.

The contents of the bottles/sachets should be thoroughly mixed before taking samples of ITAK-1601.

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

The Certified Reference Material should be stored in a dry place, away from excessive heat and moisture.

The minimum test portion of the Certified Reference Material is 0.5 g.

CHARACTERISATION AND STATISTICAL EVALUATION OF ANALYTICAL DATA

Six specialised laboratories analysed ITAK-1601. The statistical evaluation was carried out according to ISO Guide 35 and ISO 5725-2, using the following procedures: identification and treatment of outliers, stragglers, and technically invalid data; calculation of certified values; calculation of standard deviations; and calculation of extended standard uncertainties.

The certified values are metrologically traceable to the International System of Units (SI) derived unit for mass fraction (expressed as percent).

The Technical Report RT-015/2026 STD provides comprehensive details of all manufacturing phases, including certifying results, participating laboratories, and statistical evaluation.

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

ANALYTICAL METHODS

The methods used in the characterisation of CRM ITAK-1601 are mentioned as follows:

- **a**: Fusion method and determination by X-Ray Fluorescence.
- **b**: Gravimetric method.
- **c**: Titrimetric method.

PERIOD OF VALIDITY

This CRM certification is valid until **April 14, 2036**.

CERTIFICATE REPRODUCTION

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



Bráulio de Freitas Pessoa
Chemist – CRQ 02.202.008
Technical Director