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Analyse Service GmbH

Central Geological Laboratory of Mongolia - CGL129, Titan Erz

Veranstalter: Central Geological Laboratory of Mongolia (CGL)
Ringversuchsmaterial: CGL 129 (TiH, Titanium Ore)
RV geschlossen: 2013 – 6
Literatur: Certificate of Analysis

Hauptelemente [MA%]

	CRB	RV	1sRV	Z-Score
Na_2O*	0,03	0,09	---	---
MgO	3,14	3,15	0,04	---
Al_2O_3	9,95	9,79	0,09	---
SiO_2	7,3	7,77	0,35	---
P_2O5	0,027	0,022	0,003	---
K_2O	0,107	0,137	0,005	---
CaO	1,2	1,16	0,03	---
TiO_2	14,73	14,88	0,56	---
Fe_2O_3 tot	61,68	61,86	0,44	---
MnO	0,25	0,24	0,006	---
L.O.I.*	-0,34	-0,25	---	---

Spurenelemente [µg/g]

	CRB	RV	1sRV	Z-Score
Ba*	487	414	---	---
Co	182	209	16	---
Cr	2720	3068	177	---
Cu*	8	21	---	---
Ni	311	306	18	---
V	2131	2818	233	---
Zn	556	575	16	---

Legende

CRB: Ergebnisse CRB – **RV:** Ergebnisse Ringversuch -- **1s-RV:** Standardabweichung Ringversuch
Z-Score: Differenz des Messwertes vom Mittelwert des Ringversuchs -- * Wert nicht zertifiziert

MONGOLIA
CENTRAL GEOLOGICAL LABORATORY

CERTIFICATE OF ANALYSIS

CERTIFIED REFERENCE MATERIAL

TITANIUM ORE "TiH"

№	Oxide/element	Unit	CV[1]	U[2]	N[3]
1	Al_2O_3	%	9.79	0.09	18
2	CaO	%	1.16	0.03	16
3	T Fe_2O_3	%	61.86	0.44	15
4	K_2O	%	0.137	0.005	13
5	MgO	%	3.05	0.04	17
6	MnO	%	0.240	0.006	14
7	P_2O_5	%	0.022	0.003	15
8	SiO_2	%	7.77	0.35	15
9	TiO_2	%	14.88	0.56	15
10	Co	mg/kg	209	16	13
11	Cr	mg/kg	3068	177	15
12	Ni	mg/kg	306	17	11
13	Sr	mg/kg	152	10	12
14	V	mg/kg	2818	233	10
15	Zn	mg/kg	575	19	13
16	Zr	mg/kg	35.4	3.7	10

[1] Certified value (CV) – based on a minimum of 10 results with a minimum of 2 independent methods
[2] Estimated expanded uncertainty (U) - with a coverage factor k=2, corresponding to a level of confidence of about 95 %, as defined in ISO/IEC GUIDE 98-3:2008 "Uncertainty of measurement - Part 3: Guide to the Expression of Uncertainty in Measurement (GUM:1995)"
[3] Number of datasets (N)

Additional Information (non-certified "information values")

№	Oxide/element	Unit	IV[4]	N[3]
1	Na_2O	%	0.086	10
2	LOI	%	-0.25	11
3	Ba	mg/kg	114	9
4	Ce	mg/kg	2.7	4
5	Cu	mg/kg	21	8
6	Dy	mg/kg	0.10	4
7	Eu	mg/kg	0.14	4
8	Ga	mg/kg	53	8
9	Gd	mg/kg	0.12	4

10	Hf	mg/kg	0.94	4
11	Ho	mg/kg	0.02	4
12	La	mg/kg	1.40	4
13	Lu	mg/kg	0.02	4
14	Nb	mg/kg	5.97	9
15	Nd	mg/kg	1.06	4
16	Pb	mg/kg	1.20	4
17	Pr	mg/kg	0.29	4
18	Rb	mg/kg	2.4	7
19	Sc	mg/kg	13	5
20	Sn	mg/kg	3	6
21	Tb	mg/kg	0.02	4
22	Th	mg/kg	0.28	5
23	U	mg/kg	0.09	4
24	Y	mg/kg	1.5	7

[4] Non-certified "information value" (IV) – one certification criteria is not fulfilled

Intended uses of this Certified Reference Material (CRM)

Based on defined metrological characteristics-metrological traceability of assigned property values and associated measurement uncertainties also physical characteristics – homogeneity and small particle size, this CRM is suitable for method development, calibration, validation and quality assurance, quality control purposes when analyzing samples that are matrix- matched to this material.

Description of sample

The starting material, a bulk of titanium ore with a total mass of 150 kg was collected by Central Geological Laboratory (CGL) from the titanium – magnetite occurrence of Tarvagatai nuruu, a gabbro – anorthose massive in Must Mountain of Tariat soum, Arkhangai province, Mongolia,

Based on mineralogical and petrographical investigation at CGL laboratories, the mineral composition of the material has been determined to be:

Minerals	Percentage (%)
Titanium-magnetite	70.6
Chlorite	13.1
Sericite -Muscovite	8.86
Carbonite	3.57
Epidote zoisite	1.63
Martite	1.2
Pyrite	0.13
Hydro goethite	0.6
Quartz	0.29

Sample preparation

The preparation, homogeneity and stability testing were performed by the CGL laboratories in 2008 – 2009.

After crushing and pulverization, the entire batch of selected bulk material passed a sieve with an opening of 0.075 mm of an ultrasonic sieving machine.

The pulverized bulk material was homogenized by a high performance intensive mixer.

After testing the homogeneity, portions of 100 g and 150 g reference material each were bottled by rotary splitting from this batch to polyethylene bottles and labeled.

Homogeneity of material

Within and between bottles homogeneity testing was performed under repeatability condition, using 10 samples randomly selected. Homogeneity test result confirmed that material is sufficiently homogeneous.

Certification

An interlaboratory approach with 18 participating laboratories was selected to obtain a reliable base of data for assignment of the certified values. A nested design was chosen for maximum information output.

The traceability was established to the existing CRM – Coulsonite NCS DC 19001 and Coulsonite NCS DC 19002 produced at China National Analyses Center, China.

Production and evaluation procedures for compliance with the valid ISO – Guides were assessed and certified by the Technical Commitee of CGL.

Instructions for Storage and Use

The CRM should be stored at room temperature and tightly sealed to protect it from absorption of atmospheric moisture, direct sun reflection and laboratory chemicals. The material can be transported by any kind of transport means.

To overcome segregation effect due to storage or transportation, the material should be shaken appropriately before opening the bottle.

No material that had once been removed from the original sample bottle should be returned to it, as that might cause contamination of the remaining sample.

Certified values and information values are reported on a dry weight basis (105°C, 2 h).

The recommended minimum sample test portion mass is 100 mg. If a test method requires a test to portion less than 100 mg, it is recommended that an excess of the CRM (> 100 mg) is further pulverized in an agate mortar, before weighing out the needed mass.

Validity of the Certificate

This material is considered to be stable. The stability of the material will be monitored regularly for the duration of the inventory. Therefore, this certificate of analysis shall remain valid through 2033, unless users are otherwise notified.

Availability of Material

This certified reference material will be classified as **"CGL 129"** in accordance with CGL CRM classification system. It is available from:

Central Geological Laboratory
CGL-building
Trade Union Street
Songinokhairkhan District
P.O.Box -437
18080 Ulaanbaatar
MONGOLIA

Tel.: +/ 976 11/ 632904, 632914
Fax: +/ 976 11/ 632944, 632564
e-mail: info@cengeolab.com
cengeolab@mbox.mn
web: www.cengeolab.com

Customer Feedback

Customers, using this CRM are kindly requested to register at the Central Geological Laboratory. This opens the opportunity to notify the user community on any new development with regard to this CRM. Customer feedback with respect to any information included in this certificate is highly appreciated.

Test methods applied for this certification

Al_2O_3	ED/WD XRF (13), ICP-MS (1), ICP-OES/AES (1), FAAS/AAS (1), TITR (2)	Nb	ED/WD XRF (4), ICP-MS (4), ICP- OES/AES (1)
Ba	ED/WD XRF (1), ICP-MS (4), ICP-OES/AES (4)	Nd	ICP-MS (4)
CaO	ED/WD XRF (13), ICP- OES/AES (1), TITR (2),	Ni	ED/WD XRF (5), ICP-MS (3), ICP- OES/AES (3),
Ce	ICP-MS (4)	P_2O_5	ED/WD XRF (13), ICP- OES/AES (2)
Co	ED/WD XRF (7), ICP-MS (4), ICP- OES/AES (2)	Pb	ICP-MS (3), ICP- OES/AES (1)
Cr	SPEC (1), ED/WD XRF (6), ICP-MS (3), ICP- OES/AES (5),	Pr	ICP-MS (4)
Cu	ED/WD XRF (4), ICP-MS (3), ICP- OES/AES (1)	Rb	ED/WD XRF (3), ICP-MS (4)
Dy	ICP-MS (4)	Sc	ED/WD XRF (2), ICP-MS (2), ICP- OES/AES (1)
Eu	ICP-MS (4)	SiO_2	ED/WD XRF (11), GRAV (3), OTHER (1)
T Fe_2O_3	ED/WD XRF (13), TITR (2)	Sn	ICP-MS (5), ICP- OES/AES (1)
Ga	ED/WD XRF (3), ICP-MS (4), ICP- OES/AES (1)	Sr	ED/WD XRF (6), ICP-MS (4), ICP- OES/AES (2)
Gd	ICP-MS (4)	Tb	ICP-MS (4)
Hf	ICP-MS (4)	Th	ICP-MS (4)
Ho	ICP-MS (4)	TiO_2	ED/WD XRF (13), ICP-MS (1), OTHER (1)
K_2O	ED/WD XRF (11), ICP- OES/AES (2),	U	ICP-MS (4)
La	ICP-MS (4)	V	ED/WD XRF (4), ICP-MS (3), ICP-OES (3)
Lu	ICP-MS (4)	Y	ED/WD XRF (2), ICP-MS (4), ICP-OES (1)
MgO	ED/WD XRF (13), ICP-MS (1), ICP-OES (1), FAAS/AAS (1), TITR (1)	Zn	ED/WD XRF (7), ICP-MS (4), ICP-OES (2)
MnO	ED/WD XRF (12), ICP-MS (1), AAS (1)	Zr	ED/WD XRF (5), ICP-MS (4), ICP-OES (1)
Na_2O	ED/WD XRF (10)	LOI	GRAV (11)

Abbrevations

- ED/WDXRF - energy/wavelength dispersive x-ray fluorescence spectroscopy
- ICP- MS - inductively coupled plasma - mass spectrometry
- ICP-OES/AES - inductively coupled plasma-optic/atomic emission spectroscopy
- FAAS/AAS - flame atomic/atomic absorption spectroscopy
- SPEC - spectrophotometry
- TITR - titrimetry
- GRAV - gravimetry
- OTHER - other method

Participating Laboratories

1. Central Geological laboratory, Ulaanbaatar, Mongolia
2. Institute for Ferrous Metallurgy Chemical Analysis Laboratory, Gliwice, Poland
3. All Russia Geological Research Institute, Petersburg, Russia
4. Center for Mineral Technology, Rio de Janeiro, Brazil
5. Institute of Mineralogy, Geochemistry and Crystal-chemistry for Rare Elements, Moscow, Russia
6. Institute de Technologia Ceramica, Chemical Analysis Unit, Castellan, Spain
7. Geoscience Laboratories, Ontario, Canada
8. Institute of Geochemistry SB Ras, Irkutsk, Russia
9. Eurotest Control JSC, Bulgaria
10. BGR-Federal Institute for Geosciences and Natural Resources, Hannover, Germany
11. Activation Laboratories Ltd. - Corporate Headquarters, Ontario, Canada
12. Vancouver Minerals Lab (ALS Minerals), North Vancouver, Canada
13. Environmental Laboratory Service Instrumental Chemistry, Lower Hutt, New Zealand
14. CRB Analyse Service GmbH, Hardegsen, Germany
15. Perth (ALS Minerals), Perth, Australia
16. Lima (ALS Minerals), Lima, Peru
17. Brisbane laboratory (ALS Minerals), Brisbane, Australia
18. Genalaysis laboratory service, Gosnells, Western Australia

Legal notice

Based on the decision of Technical Committee of Central Geological Laboratory of 27 December 2012, by the resolution No.242 of director of CGL, this material had been approved as a Certified Reference Material with the code number CGL 129.

B.BATJARGAL **DIRECTOR**
Central Geological Laboratory