MONGOLIA
CENTRAL GEOLOGICAL LABORATORY

CERTIFICATE OF ANALYSIS

Certified Reference Material "TRM-2"

Silver-bearing complex ore "CGL 111"

Certified values (CV) and their confidence interval ($\pm\Delta_A$)

No.	Oxides/ Elements	Unit	CV	$\pm\Delta_A$	N
1.	SiO_2	%	14.86	0.17	21
2.	TiO_2	%	0.15	0.04	20
3.	Al_2O_3	%	2.47	0.10	21
4.	Fe_2O_3	%	13.45	0.26	21
5.	FeO	%	0.14	0.03	13
6.	CaO	%	25.51	0.50	21
7.	MgO	%	0.50	0.02	22
8.	MnO	%	0.14	0.01	22
9.	Na_2O	%	0.92	0.05	19
10.	K_2O	%	0.91	0.08	17
11.	P_2O_5	%	19.26	0.28	19
12.	SO_3	%	4.58	0.32	24
13..	Loss on ignition	%	6.78	0.22	14
14.	CO_2	%	1.04	0.07	6
15.	As	mg/kg	155.83	26.58	12
16.	Ba	mg/kg	917	58	12
17.	Ce	%	2.90	0.12	19
18.	Co	mg/kg	32.46	6.03	16
19.	Cu	mg/kg	147	58	20
20..	Dy	mg/kg	206	32	9
21.	Eu	mg/kg	211.60	16.20	11
22.	Er	mg/kg	79.50	8.50	9
23.	Ho	mg/kg	36.60	7.40	9
24.	Gd	mg/kg	553	83	11
25.	La	%	1.93	0.10	25
26..	Lu	mg/kg	7.64	1.08	6
27.	Nd	%	0.89	0.08	20

No.	Oxides/ Elements	Unit	CV	$\pm\Delta_A$	N
28.	Ni	mg/kg	70.80	11.20	14
29.	Pb	%	0.11	0.014	16
30.	Pr	%	0.28	0.03	17
31.	Rb	mg/kg	43	10	10
32.	Sm	%	0.09	0.03	12
33.	Sr	%	2.24	0.095	11
34.	$\sum TR_2O_3$	%	7.56	0.25	13
35.	Tb	mg/kg	54.60	14.20	8
36.	Th	mg/kg	217.58	40.42	15
37.	V	mg/kg	138.6	18.9	8
38.	Y	mg/kg	959	40	14
39.	Yb	mg/kg	54.52	5.24	10
40.	Zn	%	0.06	0.004	21

Information values (IV)

No.	Oxides/ Elements	Unit	IV
1	H_2O^-	%	0.67
2	F	%	1.89
3	CaF_2	%	32.90
4	Mo	mg/kg	23.86

Classification criteria

CV – certified value satisfying certification criteria
IV - not certified value not satisfying certification criteria

Description of the sample

The material is a reference material taken from the Mushgia khudag deposit in the Umnogobi area of Mongolia. The material consists of a homogeneous powder (particles have passed a sieve with appertures smaller than 63 μm).

The mineral composition of the material has been determined to be:

Minerals	Percentage, % m/m
Apatite	48.6
secondary phosphate	11.6
Hydrous ferric oxide	16.8

quartz	10.1
Gypsum	5.5
Calcite	2.1
sericite	3.4
celestine	1.5
Fluorite	0.8
epidote, pyrite	few particles

Instructions for Storage and Use

The recommended minimum sample intake is 100 mg. If there is a need of sample intake below 100 mg for an analytical method (e.g. the optic emission spectrometry), weigh more than 100 mg and mix in an agate mortar. Then weigh necessary weight.

Taken portions should not be poured back in a bottle as it may contaminate the material.

The reference material is stored in a polyethylene bottle of 100 g. The bottle should be stored preferably in a dry place at the room temperature, protected from an effect of chemical reagents.

The reference material can be transported by any kind of transport means.

Validity of the Certificate

The date of production is December, 1998. The date of reattestation is December, 2006. Duration of use is 20 years.

Availability of Material

This reference material will be classified as "CGL 111" in the future in accordance with CGL CRM classification system.

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Participating Laboratories

Preparation, homogeneity and stability testing:

- Central Geological Laboratory

Certification analyses:

- Laboratory of Methods, Standards, Control and Metrology of the Central Geological Laboratory, Ulaanbaatar, Mongolia
- Laboratory of Chemical & Physical Techniques of the Central Geological Laboratory, Ulaanbaatar, Mongolia
- Spectral Laboratory of the Central Geological Laboratory, Ulaanbaatar, Mongolia
- Technological Testing Laboratory of the Central Geological Laboratory, Ulaanbaatar, Mongolia
- Geological and Investigation Company "Gurvan gol", Ulaanbaatar, Mongolia
- Nuclear Research Centre, Mongolian State University, Ulaanbaatar, Mongolia
- Chemical and Technological Centre for New Materials, Mongolian State University, Ulaanbaatar, Mongolia
- Institute of Physics and Technology, Mongolian Academy of Science, Ulaanbaatar, Mongolia
- Scientific-production Company "Erdes", Ulaanbaatar, Mongolia
- Amdel laboratories, Australia
- Shimadzy Corporation, Analytical group, Kyoto, Japan
- Institute for Earth crust SO RAN, Irkutsk, Russia
- Federal Institute for Geosciences and Natural Resources (BGR), RFA-Laboratory, Hannover, Germany
- Institute de Technologia Ceramica, Chemical Analysis Unit, Spain
- Geoscience Laboratories, Ontario, Canada
- The Geological Survey of Israel, Israel
- Geological Institute of Hungary, Hungary
- National Research Center for Geoanalysis, China
- Beijing Research Institute of Uranium Geology, China
- State Geological Institute of Dionyz Stur, Geoanalytical Laboratories, Slovak
- Eurotest Control JSC, Bulgaria

Methods used

Methods of final determination were:

- Atomic absorption spectrometry	MgO, MnO, As, Co, Ni, Cu, Zn, Pb, Rb
- X-ray fluorescence spectrometry	SiO_2, TiO_2, Al_2O_3, Fe_2O_3, CaO, MgO, MnO, Na_2O, K_2O, P_2O_5, LoI, F, Ba, As, Co, Ni, Cu, Zn, Pb, Rb, Mo, Sr, Th, La, Ce, Pr, Nd, Dy, Er, Eu, Ho, Gd, Sm, Tb, Lu, Yb, Y
- flame photometry	Na_2O, K_2O, Rb
- photometry	SiO_2, TiO_2, Al_2O_3, Fe_2O_3, P_2O_5, F, As, Mo, Th, ΣTR_2O_3
- ICP spectrometry	SiO_2, TiO_2, Al_2O_3, Fe_2O_3, CaO, MgO, MnO, Na_2O, K_2O, P_2O_5, LoI, F, Ba, As, Co, Ni, Cu, Zn, Pb, Rb, Mo, Sr, Th, La, Ce, Pr, Nd, Dy, Er, Eu, Ho, Gd, Sm, Tb, Lu, Yb, Y

- gravimetric	SiO_2, CaO, SO_3, LoI, H_2O^-, ΣTR_2O_3
- volumetric	Fe_2O_3, FeO, CaO, CaF_2, CO_2

Certification

This reference material was confirmed and given the number USZ 25-2006 by the National Center for Standardization and Metrology.

Note

A detailed technical report on the analysis procedure and the treatment of the analytical data is supplied with each sample.