

CENTRAL GEOLOGICAL LABORATORY

CERTIFIED REFERENCE MATERIAL

CERTIFICATE OF ANALYSIS

USZ 44-2007 Rare earth ore "TRHB"			
Elements	Mass fraction (based on dry mass at 105 ^o C)		Number of accepted sets of results p
	Certified value ⁽¹⁾ expressed as cg.g ⁻¹	95% confidence interval ⁽²⁾ expressed as cg.g ⁻¹	
1	2	3	4
SiO ₂	71.38	0.39	28
TiO ₂	0.31	0.06	28
Al ₂ O ₃	10.93	0.10	29
Fe ₂ O ₃	3,38	0.06	30
CaO	2.03	0.03	29
MnO	0.06	0.001	30
Na ₂ O	3.46	0.06	25
K ₂ O	3.70	0.06	25
Loss on ignition	1.64	0.10	23
As, mg/kg	43.70	3.70	10
Ba, mg/kg	95	9	15
Ce	0.10	0.008	14
Cr, mg/kg	200	16	17
Cs, mg/kg	1.05	0.15	6
Cu, mg/kg	13	3	15
Dy, mg/kg	165	35	7
Eu, mg/kg	8.3	1.1	7
Ga, mg/kg	64	8	8
Gd, mg/kg	117	19	7
Hf, mg/kg	400	30	8
Ho, mg/kg	37	10	7
La, mg/kg	434	34	14
Li, mg/kg	37	6	8
Nd, mg/kg	434	24	14
Pb, mg/kg	149	16	21
Pr, mg/kg	122	10	10
Rb, mg/kg	641	51	20
Sm, mg/kg	120	5	13
Sn, mg/kg	126	7	8
Sr, mg/kg	158	12	21
Ta, mg/kg	123	9	9

1	3	4	7
Tb, mg/kg	25	4	7
Th, mg/kg	202	13	14
U, mg/kg	57	6	9
W, mg/kg	88	9	8
Y, mg/kg	1102	63	13
Yb, mg/kg	123	27	8
Zn, mg/kg	534	28	26
Zr	1.58	0.06	16

(¹) This value is the unweighted mean of p accepted sets of results.
(²) The 95% confidence interval is a value of the uncertainty and is acceptable when the reference material is used for calibration purposes.

DESCRIPTION OF THE SAMPLE

The bulk for a reference material is taken from the Khalzanburegdei, Tsakhiriin ord deposit of the Myangad sum, Khovd province, Mongolia.

The material consists of a homogeneous powder (particles have passed a sieve with apertures smaller than 63 μm). The material contains following minerals expressed as $\text{cg}\cdot\text{g}^{-1}$:

- potassium feldspar	41.1
- quartz	13.5
- plagioclase	24.3
- amphibole	3.7
- biotite	5.2
- epidote	3.3
- monocline pyroxene	1.4
- sericite-muscovite	1.1
- hydrogeothite	0.4
- fluorite	0.9
- leucoxene	1.2
- chlorite	0.1
- zircon	3.2
- magnetite, ilmenite, hematite, monazite, xenotime, sphen, columbite-tantalite, pyrite, garnet, jarosite, apatite, pyrrhotite, goethite	0.7

Additional information is presented on the attached sheet.

INSTRUCTION FOR USE, STORAGE AND TRANSPORTATION

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. Duration of production is 2003-2007. Duration of use is 20 years.

METHODS USED

Methods of final determination were:

- Atomic absorption spectrometry TiO₂, Al₂O₃, Fe₂O₃, MnO, MgO, Na₂O, K₂O, As, Ba, Co, Cs, Cu, Li, Mo, Ni, Pb, Rb, Sr, Zn
- X-ray fluorescence spectrometry SiO₂, TiO₂, Al₂O₃, Fe₂O₃, CaO, MnO, MgO, Na₂O, K₂O, P₂O₅, F, As, Ba, Bi, Ce, Co, Cr, Cs, Cu, Eu, Gd, La, Mo, Nb, Nd, Ni, Pb, Pr, Rb, Sm, Sr, Th, U, V, W, Y, Zn, Zr, Σ TR₂O₃
- flame photometry Na₂O, K₂O, Rb
- photometry SiO₂, TiO₂, Al₂O₃, Fe₂O₃, MnO, Na₂O, K₂O, P₂O₅, F, As, Co, Cr, Ni, Th, V, W, Zr
- ICP spectrometry SiO₂, TiO₂, Al₂O₃, Fe₂O₃, CaO, MnO, MgO, Na₂O, K₂O, P₂O₅, F, As, Ba, Bi, Ce, Co, Cr, Cs, Cu, Dy, Er, Eu, Gd, Ho, La, Li, Mo, Nb, Nd, Ni, Pb, Pr, Rb, Sc, Sm, Sr, Tb, Th, U, V, W, Y, Yb, Zn, Zr, Σ TR₂O₃
- gravimetric SiO₂, Al₂O₃, CaO, H₂O⁻, SO₃, H₂O⁺, LoI, Σ TR₂O₃
- volumetric Al₂O₃, Fe₂O₃, FeO, CaO, MgO, CO₂, F, CaF₂, CaCO₃, Pb

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
- Nuclear Research Centre, Mongolian State University, Ulaanbaatar, Mongolia
- Laboratory of Precious Metals, the Faculty of Chemistry, Mongolian State University, Ulaanbaatar, Mongolia
- Chemical and Technological Centre for New Materials, Mongolian State University, Ulaanbaatar, Mongolia
- Exploitation and Investigation Center of Technology of Mineral Resources, Ulaanbaatar, Mongolia
- Institute of Physics and Technology, Mongolian Academy of Science, Ulaanbaatar, Mongolia
- SGS Mongolia Minerals, Ulaanbaatar, Mongolia
- Institute of Geochemistry SB Ras, Irkutsk, Russia
- Federal Agency of Mineral Resources of the Russian Federation, A.P.Karpinsky Russian Geological Research Institute (VSEGEI), St.-Petersburg, Russia
- SGS Welshpool Minerals, Australia
- Federal Institute for Geosciences and Natural Resources (BGR), RFA-Laboratory, Hannover, Germany
- Institute de Tecnologia 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, Beijing Research Institute of Uranium Geology, China
- State Geological Institute of Dionyz Stur, Geoanalytical Laboratories, Slovak
- Eurotest Control JSC, Bulgaria

LEGAL NOTICE

This reference material was confirmed and given the number USZ 44-2007 by the Mongolian Agency 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.

**INFORMATION SHEET ATTACHED TO THE CERTIFICATE
OF USZ 44-2007**

Additional information (not certified) on provisional values is presented here. The data are mean values of various sets of results obtained by various techniques in various laboratories.

Element	Mass fraction expressed as cg.g^{-1}		Number of individual sets
	Content	Standard deviation	
FeO	0.36	0.15	9
MgO	0.05	0.04	17
P ₂ O ₅	0.03	0.005	17
H ₂ O ⁻	0.18	0.056	11
H ₂ O ⁺	0.68	0.26	10
F	0.92	0.33	13
CaF ₂	2.20	0.85	6
CaCO ₃	0.99	0.24	6
Co, mg/kg	13.31	6.29	10
Er, mg/kg	112	37	7
Mo, mg/kg	12.60	6.4	6
Nb	0.17	0.03	9
Ni, mg/kg	10.40	3.7	12