

CENTRAL GEOLOGICAL LABORATORY

CERTIFIED REFERENCE MATERIAL

CERTIFICATE OF ANALYSIS

USZ 45-2007			
Nepheline syenite "LNS"			
Elements	Mass fraction (based on dry mass at 105 ⁰ 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	
SiO ₂	51.88	0.24	33
TiO ₂	0.37	0.02	30
Al ₂ O ₃	22.58	0.13	30
Fe ₂ O ₃	2.63	0.13	33
FeO	0.80	0.06	14
CaO	2.28	0.25	31
MgO	0.24	0.02	20
MnO	0.14	0.01	30
Na ₂ O	6.78	0.23	30
K ₂ O	9.10	0.73	29
P ₂ O ₅	0.04	0.05	24
Loss on ignition	3.35	0.07	25
As, mg/kg	23.8	2.88	7
Ba, mg/kg	447	44	20
Ce, mg/kg	308	15	7
Cr, mg/kg	44	7	18
Ga, mg/kg	23	0.80	8
La, mg/kg	163	12	7
Li, mg/kg	54	5	9
Nb, mg/kg	40	0.97	6
Pb, mg/kg	114	20	22
Rb, mg/kg	207	16	16
Sr, mg/kg	1740	48	19
Th, mg/kg	61.6	7.5	7
U, mg/kg	12.4	1.5	7
V, mg/kg	30	3.6	16
Y, mg/kg	23	4	8
Zn, mg/kg	98	6	26
Zr, mg/kg	600	145	15

⁽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 Lugiin gol deposit of the Khatanbulag sum, Dornogobi 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 cg.g^{-1} :

- potassium feldspar	67.5
- plagioclase	13.7
- alkali amphibole, (arfvedsonite)	8.0
- nepheline	7.5
- calcite	1.5
- fluorite	1.0
- pyrite	0.2
- galenite	0.08
- geothite	0.1
- hydrogeothite	0.2
- magnetite, ilmenite, spen	few

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 2004-2007. Duration of use is 20 years.

METHODS USED

Methods of final determination were:

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|-----------------------------------|--|
| - Atomic absorption spectrometry | Al ₂ O ₃ , TiO ₂ , Fe ₂ O ₃ , MnO, MgO, CaO, Na ₂ O, K ₂ O, Ba, Cs, Cu, Cr, Li, Rb, Mo, Ni, Pb, Sr, Zn, |
| - flame photometry | Na ₂ O, K ₂ O |
| - photometry | SiO ₂ , TiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , MnO, P ₂ O ₅ , F, Cr, Pb, Mo, Th, V, W, Zr |
| - X-ray fluorescence spectrometry | SiO ₂ , TiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , FeO, MnO, MgO, CaO, Na ₂ O, K ₂ O, P ₂ O ₅ , SO ₃ , F, As, Ag, Ba, La, Li, Ce, Co, Cr, Cs, Cu, Ga, Mo, Nb, Nd, Ni, Pb, Rb, Sr, Th, U, V, W, Y, Zn, Zr |
| - ICP spectrometry | SiO ₂ , TiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , FeO, MnO, MgO, CaO, Na ₂ O, K ₂ O, P ₂ O ₅ , SO ₃ , Ga, Au, As, Ba, Ce, Co, Cs, Cr, Cu, Mo, Ni, Pb, Sr, V, W, Zn, Zr, La, Li, Nb, Nd, Rb, Th, U, Y |
| -gravimetric | SiO ₂ , H ₂ O ⁻ , SO ₃ , H ₂ O ⁺ , Lol, Ba, Cr |
| -volumetric | Al ₂ O ₃ , Fe ₂ O ₃ , FeO, MgO, CaO, CO ₂ , F |

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
- 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
- Research-Scientific Laboratory of the Institute for Medicine, Ulaanbaatar, Mongolia
- Exploitation and Investigation Center of Technology of Mineral Resources, Ulaanbaatar, Mongolia
- Nuclear Research Centre, Mongolian State University, Ulaanbaatar, Mongolia
- Institute of Physics and Technology, Mongolian Academy of Science, Ulaanbaatar, Mongolia
- Food Biotechnology School, Mongolian University of Science and Technology, Mongolia

- SGS Mongolia Minerals, Ulaanbaatar, Mongolia
- 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, China
- State Geological Institute of Dionyz Stur, Geoanalytical Laboratories, Slovak
- Eurotest Control JSC, Bulgar
- Southern and Eastern African Mineral Centre, Tanzania

LEGAL NOTICE

This reference material was confirmed and given the number USZ 45-2007 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 45-2007**

Additional information (not certified) on provisional values contents 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	
SO ₃	0.28	0.06	24
H ₂ O ⁻	0.17	0.04	16
CO ₂	1.16	0.11	15
H ₂ O ⁺	0.69	0.26	15
F	0.26	0.06	16
Co, mg/kg	10.03	10.83	7
Cs, mg/kg	34	20	10
Cu, mg/kg	26	15.6	18
Mo, mg/kg	11	6	14
Ni, mg/kg	19	19	9
W, mg/kg	9	3.8	10