

Central Geological Laboratory of Mongolia - CGL-128 - Lithiumerz

Veranstalter: Central Geological Laboratory of Mongolia (CGL)

Ringversuchsmaterial: CGL 128 (LiH, Lithium Ore)

RV geschlossen: 2015 – 4

Literatur: Certificate of Analysis

Hauptelemente [MA%]

	CRB	RV	1sRV	Z-Score
Na ₂ O*	0,60	0,603	---	---
MgO	0,035	0,033	0,003	---
Al ₂ O ₃	13,48	13,66	0,12	---
SiO ₂	72,29	73,40	0,65	---
P ₂ O ₅ *	0,023	0,029	---	---
K ₂ O	6,22	6,28	0,07	---
CaO	0,75	0,746	0,022	---
TiO ₂ *	0,056	0,053	---	---
Fe ₂ O ₃ tot	0,66	0,66	0,018	---
MnO	0,594	0,603	0,006	---
L.O.I. *	1,93	2,14	---	---
F *	1,97	1,81	---	---
Li ₂ O	0,603	0,578	0,015	---

Spurenelemente [µg/g]

	CRB	RV	1sRV	Z-Score
As	55	61,75	4,7	---
Ba	84	83,51	2,5	---
Bi	177	185	5,0	---
Cr *	114	105	---	---
Cs *	42	67	---	---
Cu	142	186	5	---
Ga *	28	29,7	---	---
Hf *	4,0	5,6	---	---
La *	37	28,9	---	---
Mo *	8	7,3	---	---
Nb *	78	77,6	---	---
Nd *	16	8,6	---	---
Pb	451	558	53	---
Pr *	6	3,4	---	---
Rb *	2105	2135	---	---
Sr	26	24,5	2,0	---
Ta *	8	9,7	---	---
U	48	45,3	2,5	---
W	69	107	10	---
Zn	516	594	19	---

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

LITHIUM ORE "MLiH"

Certified values

No.	Oxide/element	Units	CV ¹	U ²	N ³
1	SiO ₂	% m/m	73.40	0.65	10
2	Al ₂ O ₃	% m/m	13.66	0.24	11
3	Fe ₂ O _{3 total}	% m/m	0.663	0.018	13
4	MnO	% m/m	0.603	0.018	11
5	MgO	% m/m	0.033	0.005	11
6	CaO	% m/m	0.746	0.022	12
7	K ₂ O	% m/m	6.28	0.07	11
8	Li ₂ O	% m/m	0.578	0.015	11
9	As	mg/kg	61.75	9.37	11
10	Ba	mg/kg	83.51	5.44	10
11	Bi	mg/kg	185	10	11
12	Cu	mg/kg	186	5	12
13	Pb	mg/kg	558	53	12
14	Sr	mg/kg	24.54	4.24	10
15	U	mg/kg	45.28	5.00	10
16	W	mg/kg	107	6	10
17	Zn	mg/kg	594	19	12
18	Zr	mg/kg	69.94	11.45	10

¹ Certified values (CV) – based on a minimum of 10 mean results determined 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 approximately 95 %, as defined in the Guide to the Expression of Uncertainty in Measurement (GUM, ISO/IEC GUIDE 98-3:2008)

³ Number of datasets (N)

Informational value

No.	Element	Units	IV ⁴	N ³
1	LOI	% m/m	2.14	5
2	Na ₂ O	% m/m	0.603	9
3	P ₂ O ₅	% m/m	0.029	9
4	TiO ₂	% m/m	0.053	9

No.	Element	Units	IV ⁴	N ³
5	Cd	mg/kg	3.64	6
6	Ce	mg/kg	46.93	7
7	Co	mg/kg	0.401	5
8	Cr	mg/kg	105	9
9	Cs	mg/kg	67.38	6
10	Dy	mg/kg	1.37	5
11	Er	mg/kg	1.18	5
12	Eu	mg/kg	0.091	4
13	Ga	mg/kg	29.69	8
14	Gd	mg/kg	1.22	4
15	Hf	mg/kg	5.64	6
16	Ho	mg/kg	0.313	4
17	In	mg/kg	0.303	5
18	La	mg/kg	28.92	5
19	Lu	mg/kg	0.421	6
20	Mo	mg/kg	7.26	10
21	Nb	mg/kg	77.63	8
22	Nd	mg/kg	8.64	4
23	Ni	mg/kg	1.76	5
24	Pr	mg/kg	3.41	5
25	Rb	mg/kg	2135	7
26	S _{total}	% m/m	0.223	6
27	Sb	mg/kg	20.50	8
28	Sc	mg/kg	9.62	7
29	Sm	mg/kg	2.26	6
30	Sn	mg/kg	11.43	6
31	Ta	mg/kg	9.74	6
32	Tb	mg/kg	0.208	6
33	Te	mg/kg	1.12	4
34	Th	mg/kg	24.20	7
35	Tl	mg/kg	14.65	4
36	Tm	mg/kg	0.240	5
37	Y	mg/kg	12.33	9
38	Yb	mg/kg	2.19	6

⁴ Non-certified "informational value" (IV) – one of certification criteria is not fulfilled
LOI – Loss on Ignition

Intended use of the 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 use in 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 lithium ore was collected by the Central Geological Laboratory (CGL) from the wolfram – lithium deposit located at Arbayan area, in Erdenetsagaan soum, Sukhbaatar province of Mongolia in April, 2012.

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

Minerals	Percentage (% m/m)
Quartz	37
Feldspar	26
Plagioclase	13
Mica (zinnwaldite)	18
Topaz	3
Hubnerite	1
Sphalerite	1
Pyrite	0.1
Tennantite, galenite, hematite, covellite, fluorite, sphene	} few

Sample preparation

The preparation, homogeneity and stability tests were performed by the CGL laboratories from 2012 to 2014. After crushing and pulverization, the entire batch of selected bulk material passed a sieve with an opening of 75 μm of an ultrasonic sieving machine.

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

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

Homogeneity of the material

After homogenization and bottling, homogeneity test was performed under repeatability condition, using 10 samples randomly selected. Homogeneity test results confirmed that material is sufficiently homogeneous.

Certification

An interlaboratory approach with 14 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 – Lithium ore NCS DC 86303 produced at China National Center for Iron and Steel.

Production and evaluation procedures for compliance with the valid ISO-Guides were assessed and certified by Scientific and Technical Council of Central Geological Laboratory.

Instruction 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 informational values are reported on a dry weight basis (105°C, 2 hours).

The recommended minimum sample test portion is 100 mg. If a test method requires a test 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.

Material safety data sheet for this CRM is attached to this certificate.

Validity of the Certificate

This material is considered to be stable. Therefore, this certificate shall remain valid through 2024, unless users are otherwise notified.

The stability of the material will be monitored regularly for duration of an inventory.

Availability of Material

This certified reference material will be classified as **CGL 128** 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.: +/976/70182904, 70182914
Fax: +/976/70184212, 70182564
E-mail: cengeolab@mbox.mn
info@cengeolab.com
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 ₂ O ₃	ED/WDXRF (8), ICP-OES (3)	Na ₂ O	ED/WDXRF (6), ICP-OES (3)
As	ED/WDXRF (4), ICP-MS (4), ICP-OES (3)	Nb	ED/WDXRF (3), ICP-MS (4), ICP-OES (1)
Ba	ED/WDXRF (4), ICP-MS (2), ICP-OES (4)	Nd	ICP-MS (4)
Bi	ED/WDXRF (4), ICP-MS (6), ICP-OES (1)	Ni	ICP-MS (2), ICP-OES (3)
CaO	ED/WDXRF (7), ICP-OES (5)	P ₂ O ₅	ED/WDXRF (7), ICP-OES (2)
Cd	ICP-MS (6)	Pb	ED/WDXRF (3), ICP-MS (5), ICP-OES (4)
Ce	ED/WDXRF (1), ICP-MS (5), ICP-OES (1)	Pr	ICP-MS (5)
Co	ICP-MS (5)	Rb	ED/WDXRF (3), ICP-MS (4)
Cr	ED/WDXRF (3), ICP-MS (2), ICP-OES (4)	S _{total}	ED/WDXRF (2), ICP-OES (2), GRAV(2)
Cs	ED/WDXRF (2), ICP-MS (4)	Sb	ICP-MS (5), ICP-OES (3)
Cu	ED/WDXRF (3), ICP-MS (4), ICP-OES (5)	Sc	ICP-MS (6), ICP-OES (1)
Dy	ICP-MS (5)	SiO ₂	ED/WDXRF (8), ICP-OES (2)
Er	ICP-MS (5)	Sm	ED/WDXRF (1), ICP-MS (5)
Eu	ICP-MS (4)	Sn	ICP-MS (5), ICP-OES (1)
Fe ₂ O ₃ <i>total</i>	ED/WDXRF (8), ICP-OES (5)	Sr	ED/WDXRF (3), ICP-MS (3), ICP-OES (4)
Ga	ED/WDXRF (4), ICP-MS (4)	Ta	ED/WDXRF (2), ICP-MS (4)
Gd	ICP-MS (4)	Tb	ICP-MS (6)
Hf	ED/WDXRF (1), ICP-MS (5)	Te	ICP-MS (4)
Ho	ICP-MS (4)	Th	ED/WDXRF (2), ICP-MS (5)
K ₂ O	ED/WDXRF (7), ICP-OES (4)	TiO ₂	ED/WDXRF (7), ICP-OES (2)
In	ICP-MS (5)	Tl	ICP-MS (4)
La	ICP-MS (5)	Tm	ICP-MS (5)
Li ₂ O	ICP-OES (11)	U	ED/WDXRF (3), ICP-MS (6), ICP-OES (1)
LOI	GRAV (5)	W	ED/WDXRF (3), ICP-MS (5), ICP-OES (2)
Lu	ICP-MS (6)	Y	ED/WDXRF (1), ICP-MS (6), ICP-OES (2)

MgO	ED/WDXRF (6), ICP-OES (5)	Yb	ICP-MS (6)
MnO	ED/WDXRF (7), ICP-OES (4)	Zn	ED/WDXRF (3), ICP-MS (3), ICP-OES (6)
Mo	ED/WDXRF (3), ICP-MS (5), ICP-OES (2)	Zr	ED/WDXRF (3), ICP-MS (3), ICP-OES (4)

Abbreviations

- ED/WDXRF - energy and wavelength dispersive X-ray fluorescence spectrometry
- ICP- MS - inductively coupled plasma - mass spectrometry
- ICP-OES - inductively coupled plasma - optical emission spectrometry
- GRAV - gravimetry

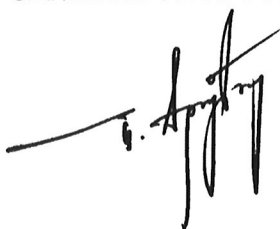
Participating Laboratories

1. Activation Laboratories Ltd, Ontario, Canada
2. ALS Group LLC, Ulaanbaatar, Mongolia
3. ALS Loughrea, Loughrea, Ireland
4. ALS Minerals-Vancouver, Vancouver, Canada
5. Bureau Veritas Inspection and Testing Mongolia LLC, Ulaanbaatar, Mongolia
6. Central Geological Laboratory, Ulaanbaatar, Mongolia
7. CRB Analyse Service GmbH, Germany
8. Eurotest Control JSC, Sofia, Bulgaria
9. Federal Institute for Geosciences and Natural Resources, Hannover, Germany
10. Galbraith INC, Knoxville, USA
11. Genalysis Laboratory Service Pty Ltd, Maddington, Australia
12. Institute de Tecnologia Ceramica, Castellon, Spain
13. Research Institute of Mineralogy, Geochemistry and Crystal Chemistry of Rare-Earth Metals, Moscow, Russia
14. SGS Mongolia LLC, Ulaanbaatar, Mongolia

Legal notice

Based on a decision of Scientific and Technical Council of Central Geological Laboratory on 30th December 2014, by a resolution No. 183 of director of CGL, this material had been approved as a Certified Reference Material with a code number CGL 128.

DIRECTOR
CENTRAL GEOLOGICAL LABORATORY



P.ARIUNBOLD