Bahnhofstraße 14 // D-37181 Hardegsen // T +49 (0)5505 94098-0
Geschäftsführer: Ralf Klaus Blecher // Amtsgericht Göttingen HRB 130263
www.crb-gmbh.de // labor@crb-gmbh.de

CRB Analyse Service GmbH

Central Geological Laboratory of Mongolia - CGL127, Mangan Erz

Veranstalter: Central Geological Laboratory of Mongolia (CGL)
Ringversuchsmaterial: CGL 127 (MnH, Manganese Ore)
RV geschlossen: 2013 – 6
Literatur: Certificate of Analysis

Hauptelemente [MA%]

	CRB	RV	1sRV	Z-Score
Na_2O*	0,12	0,09	---	---
MgO	0,82	0,79	0,02	---
Al_2O_3	9,44	9,27	0,16	---
SiO_2	11,18	10,84	0,15	---
P_2O5	0,8	0,76	0,02	---
K_2O*	0,01	0,02	---	---
CaO*	1,63	1,63	---	---
TiO_2	0,55	0,53	0,01	---
Fe_2O_3 tot	20,1	19,51	0,37	---
MnO	47,0	45,9	0,54	---
L.O.I.*	6,4	6,41	---	---

Spurenelemente [µg/g]

	CRB	RV	1sRV	Z-Score
Ba*	9528	9384	---	---
Co	323	316	25	---
Cr*	67	86	---	---
Cu*	111	127	---	---
La*	117	88	---	---
Nb*	11	15,7	---	---
Nd*	82	78,7	---	---
Ni	374	377	---	---
Pb*	43	38	---	---
Sr	1230	1354	62	---
V*	197	241	---	---
Y	97	104	6	---
Zn	170	182	8	---
Zr	166	208	11	---

Legende

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

ACLASS ACCREDITED
REFERENCE MATERIAL PRODUCER

MONGOLIA
CENTRAL GEOLOGICAL LABORATORY

CRM FROM MONGOLIA

CERTIFICATE OF ANALYSIS

CERTIFIED REFERENCE MATERIAL

MANGANESE ORE "MnH"

No.	Oxide/element	Unit	CV[1]	U[2]	N[3]
1	Al_2O_3	%	9.27	0.16	14
2	T Fe_2O_3	%	19.51	0.37	12
3	MgO	%	0.79	0.02	11
4	MnO	%	45.9	0.54	12
5	P_2O_5	%	0.76	0.02	13
6	SiO_2	%	10.84	0.15	11
7	TiO_2	%	0.53	0.01	11
8	Co	mg/kg	316	25	11
9	Ni	mg/kg	377	18	11
10	Sr	mg/kg	1354	62	10
11	Y	mg/kg	104	6	10
12	Zn	mg/kg	182	8	14
13	Zr	mg/kg	208	11	11

[1] Certified values (CV) – based on a minimum of 10 mean 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 the 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")

No.	Oxide/element	Unit	IV[4]	N[3]
1	Na_2O	%	0.086	9
2	CaO	%	1.63	11
3	K_2O	%	0.017	8
4	LOI	%	6.41	11
5	As	mg/kg	131	9
6	Ba	mg/kg	9384	10
7	Be	mg/kg	4	6
8	Ce	mg/kg	261	7
9	Cr	mg/kg	86	12
10	Cu	mg/kg	127	10
11	Dy	mg/kg	14.9	4
12	Er	mg/kg	9.4	4
13	Eu	mg/kg	3	4
14	Ga	mg/kg	23	8
15	Gd	mg/kg	15	4
16	Hf	mg/kg	3.7	5

17	Ho	mg/kg	3.3	4
18	La	mg/kg	88	8
19	Lu	mg/kg	1.2	4
20	Nb	mg/kg	15.7	7
21	Nd	mg/kg	78.7	7
22	Pb	mg/kg	38	10
23	Pr	mg/kg	16.3	4
24	Rb	mg/kg	5.8	5
25	Sb	mg/kg	7.1	4
26	Sc	mg/kg	21.6	4
27	Sm	mg/kg	13.7	4
28	Sn	mg/kg	2.9	6
29	Ta	mg/kg	0.59	4
30	Tb	mg/kg	2.3	4
31	Th	mg/kg	9	5
32	Tm	mg/kg	1.3	4
33	U	mg/kg	3.9	5
34	V	mg/kg	241	10
35	W	mg/kg	12.8	4
36	Yb	mg/kg	7.97	4

[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 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 manganese ore with a total mass of 350 kg was collected by the Central Geological Laboratory (CGL) from the iron – manganese occurrence located at Saikhan River area, in Renchinlkhumbe soum, Khuvsgul province, Mongolia.

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

Minerals	Percentage (%)
Pyrolusite	22.5
Braunite	22.4
Psilomelane	3.9
Hydrogoethite	12.9
Sericite	9.6
Dolomite	5.7
Clay material	4.8
Quartz	18.3
Silicon material	
Pyrite	
Ilmenite	few
Apatite	

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, portion of 100 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 15 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- Manganese ore NCS DC-47006 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 Committee of CGL.

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

The recommended minimum sample test portion mass 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.

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 127"** 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	SPEC (1), ED/WDXRF (10), ICP-MS (1), FAAS/AAS (1), TITR (1)	Ni	ED/WDXRF (4), ICP-MS (3), ICP-OES/AES (3), FAAS/AAS (1)
As	ED/WDXRF (4), ICP-MS (3), ICP-OES/AES (2)	P_2O_5	ED/WDXRF (11), ICP-MS (1), ICP-OES/AES (1)
Ba	ED/WDXRF (4), ICP-MS (4), ICP-OES/AES (2)	Pb	ED/WDXRF (4), ICP-MS (4), ICP-OES/AES (1), FAAS/AAS (1)
Be	ICP-MS (5), ICP-OES/AES (1)	Pr	ED/WDXRF (1), ICP-MS (4)
CaO	ED/WDXRF (11)	Rb	ED/WDXRF (2), ICP-MS (4)
Ce	ED/WDXRF (3), ICP-MS (4),	Sb	ICP-MS (4)
Co	ED/WDXRF (4), ICP-MS (4), ICP-OES/AES (3)	Sc	ED/WDXRF (3), ICP-MS (2), ICP-OES/AES (1)
Cr	SPEC (1), ED/WDXRF (4), ICP-MS(4), ICP-OES/AES (3)	SiO_2	SPEC (1), ED/WDXRF (7), ICP-MS (1), GRAV (2)
Cu	ED/WDXRF (3), ICP-MS (4), ICP-OES/AES (2), FAAS/AAS (1)	Sm	ICP-MS (4)
Dy	ICP-MS (3)	Sn	ICP-MS (5), ICP-OES/AES (1)
Er	ICP-MS (4)	Sr	ED/WDXRF (4), ICP-MS (4), ICP-OES/AES (2)
Eu	ICP-MS (4)	Ta	ICP-MS (4)
T Fe_2O_3	SPEC(1), ED/WDXRF (10), TITR(1)	Tb	ICP-MS (4)
Ga	ED/WDXRF (3), ICP-MS (4), ICP-OES/AES (1)	Th	ED/WDXRF (2), ICP-MS (4)
Gd	ICP-MS (4)	TiO_2	SPEC (1), ED/WDXRF (8), ICP-MS (1)
Hf	ED/WDXRF (1), ICP-MS (4)	Tm	ICP-MS (4)
Ho	ICP-MS (4)	U	ICP-MS (5)
K_2O	ED/WDXRF (3), ICP-MS (4), ICP-OES/AES (1)	V	ED/WDXRF (5), ICP-MS (3), ICP-OES/AES (2)

La	ED/WDXRF (3), ICP-MS (4), ICP-OES/AES (1)	W	ED/WDXRF (1), ICP-MS (3)
Lu	ICP-MS (4)	Y	ED/WDXRF (4), ICP-MS (4), ICP-OES/AES (2)
MgO	ED/WDXRF (9), ICP-MS (1), ICP-OES/AES (1)	Yb	ED/WDXRF (1), ICP-MS (4)
MnO	ED/WDXRF (10), ICP-MS (1)	Zn	ED/WDXRF (5), ICP-MS (4), ICP-OES/AES (4), FAAS/AAS (1)
Na_2O	ED/WDXRF (8), ICP-OES/AES (1)	Zr	SPEC(1), ED/WDXRF (4), ICP-MS (4), ICP-OES/AES (2)
Nb	ED/WDXRF (3), ICP-MS (4)	LOI	GRAV (11)
Nd	ED/WDXRF (3), ICP-MS (4)		

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

Participating Laboratories

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

Legal notice

Based on the decision of Technical Committee of Central Geological Laboratory of 27 December 2012, by the resolution No.244 of director of CGL, this material had been approved as a Certified Reference Material with the code number CGL 127.

B.BATJARGAL **DIRECTOR**
Central Geological Laboratory