Analytical Methods

Methods	Composition
FAA	Ag,Ba,Bi,Cd,Co,Cr,Cs,Cu,Hg,Li,Mn,Nb,Pb,Rb,Sb,Sr,Zn,Fe,Mg,Ca,Na,K
GAAA	Ag,Be,Cd,In,Te,Tl
AF	As,Bi,Hg,Sb,Se,Te
COL	As,B,Be,Bi,Br,Co,Cr,Cu,F,Ga,Ge,In,Mn,Mo,Nb,Ni,P,Pb,Sb,Sc,Se,Sn,Ta,Te,Th,Ti, Tl,U,V,W,Zn,Zr,Si,Al,Fe
OES	Ag,B,Be,In,Mo,Nb,Sn,Tl,Y,Zr
ICP	B,Ba,Be,Co,Cr,Cu,Ga,Li,Mn,Nb,Ni,P,Pb,Sc,Sr,Th,Ti,V,Zn,Zr,Mg,Ca,Na,K,RE
NA	Ag,As,Ba,Br,Ce,Co,Cr,Cs,Dy,Er,Eu,Gd,Hf,La,Lu,Mn,Nd,Rb,Sb,Sc,Sm,Sr,Ta,Tb, Th,Tm,U,W,Yb,Zn,Fe,Na,K
MS	Hf,Pb,Th,U,RE
IC	Br,Cl
POL	Be,Bi,Cd,Ce,Co,Cr,Cu,Ge,Mo,Ni,Pb,Se,Sn,Te,Th,U,Tl,V,W,Zn
GR	SiO_2,H_2O^+Corg.,CO_2
VOL	Si,Al,Fe^{3+},Fe^{2+},Mg,Ca,CO_2,Corg.,S
XRF	Ba,Co,Cr,Cu,Hf,Mn,Nb,Ni,P,Pb,Rb,Sc,Sr,Th,Ti,U,V,Zn,Zr, main content, RE

Note:

AF:Atomic Fluorescence spectrophotometry
COL:Colorimetry
OES: Optical Emisson Spectrometry
FAA: Flame Atomic Absorption spectrometry
GR:Gravimetry
GAAA:Graphite Furnace Atomic Absorption spectrophotometry
IC:Ion Chromatography
ICP:Inductively Coupled Plasma spectrography
MS;Mass Spectrometry
NA:Neutron Activation analysis
POL:Polarography
RE: Rare Earth elements
VOL:Volumetry
XRF:X-Ray Fluorescence spectrometry

Professor Wang Haizhou, Chief
China National Analysis Center for Iron and Steel

Certificate of Certified Reference Materials

NCS DC 73371	Stream Sediment
NCS DC 73372	Lake Deposit
NCS DC 73373	Stream Sediment
NCS DC 73374	Stream Sediment
NCS DC 73375	Limestone
NCS DC 73376	Granite-gneiss
NCS DC 73377	Amphibolite

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Approved by China National Analysis Center for Iron and Steel

(Beijing China)

CERTIFIED VALUES (Certification 1999, Revision 2007) OF ROCK AND STREAM SEDIMENT REFERENCE MATERIALS

Composition(μg/g)	NCS DC 73371	NCS DC 73372	NCS DC 73373	NCS DC 73374	NCS DC 73375	NCS DC 73376	NCS DC 73377
Ag	0.036±0.010	0.076±0.013	0.027±0.005	0.13±0.02	(0.025)	0.03±0.01	(0.05)
As	2.7±0.4	8.4±1.3	2.0±0.2	18±2	0.66±0.11	(0.25)	26±3
B	9.8±1.8	52±4	5.3±0.7	27±4	(12)	15±3	12±2
Ba	920±77	520±43	690±54	760±47	9±2	1140±80	62±14
Be	3.1±0.3	2.2±0.1	0.96±0.04	6.0±0.6	0.14±0.03	1.7±0.3	0.34±0.06
Bi	0.49±0.14	0.29±0.06	0.057±0.010	3.0±0.3	0.032±0.007	0.096±0.016	(0.06)
Br	(1.5)	3.7±0.4	(0.5)	(2.6)	(0.3)		
Cd	0.11±0.03	0.10±0.02	0.045±0.015	0.20±0.03	0.016±0.006	(0.06)	(0.14)
Ce	81±7	74±4	42±4	109±10	4.6±0.4	48±3	7.7±1.0
Cl	72±7	45±9	32±5	(58)	(24)	(120)	(116)
Co	20±2	14±2	3.5±0.4	28±2	0.8±0.3	7.8±1.1	52±5
Cr	128±6	75±5	10.7±1.7	243±16	3.4±0.4	24±2	137±5
Cs	5.5±0.2	8.3±0.7	1.0±0.1	4.3±0.8	(0.10)	2.6±0.3	1.8±0.3
Cu	28±2	25±3	11±2	66±6	2.2±0.3	(3.1)	84±5
Dy	4.3±0.3	4.7±0.4	1.56±0.19	7.0±0.6	0.28±0.07	1.52±0.14	3.5±0.5
Er	2.3±0.4	2.8±0.4	0.98±0.17	4.0±0.5	(0.17)	0.76±0.08	2.3±0.4
Eu	1.7±0.2	1.30±0.13	0.38±0.06	2.5±0.4	0.082±0.019	1.0±0.2	0.91±0.15
F	872±52	504±19	133±19	593±40	249±18	670±84	200±20
Ga	23.6±1.3	16.7±1.7	11.1±0.9	25±3	0.87±0.17	18.2±1.6	17.2±1.0
Gd	5.6±0.6	5.4±0.8	1.8±0.2	7.6±1.1	0.36±0.08	2.4±0.3	2.8±0.3
Ge	1.5±0.2	1.32±0.09	1.16±0.05	1.6±0.3	0.14±0.03	0.93±0.07	1.46±0.20
Hf	9.3±0.7	6.6±1.2	4.5±0.5	13.6±0.6	0.22±0.05	3.3±0.5	1.5±0.2
Hg	0.032±0.003	0.032±0.003	0.011±0.002	0.037±0.004	0.005±0.002	0.0035±0.0016	0.0033±0.0008
Ho	0.82±0.11	1.03±0.10	0.33±0.03	1.43±0.09	(0.045)	0.27±0.03	0.85±0.14
I	0.6±0.2	2.8±0.6	0.3±0.1	1.6±0.3	(0.1)		
In	(0.07)	(0.08)	(0.04)	(0.18)	(0.02)	(0.03)	(0.06)
La	41±2	38±2	24±3	54±3	2.3±0.2	25±2	2.9±0.4
Li	32±3	38±2	7.4±0.7	24±2	4.8±1.0	24.7±2.4	11.2±2.3
Lu	0.39±0.04	0.43±0.04	0.16±0.03	0.58±0.07	0.023±0.007	0.11±0.01	0.39±0.06
Mn	910±28	520±24	218±31	1230±82	28±4	430±14	1600±70
Mo	1.04±0.13	0.4±0.1	0.44±0.10	2.7±0.3	0.18±0.06	(0.27)	0.15±0.06
N	741±28	0.130±0.010(%)	(94)	668±25	(68)		
Nb	31.5±1.9	14.4±2.1	9.0±1.1	72±6	0.8±0.2	4.5±0.8	2.7±0.9
Nd	36±3	32±3	14.7±1.6	45±5	1.96±0.14	21±4	6.5±1.4
Ni	56±7	33±3	3.7±1.0	87±9	(4)	13±2	117±10
P	1520±77	480±31	166±11	1000±30	57±7	570±40	360±20
Pb	31±4	25±3	13.5±2.3	66±6	5±2	7.6±2.0	(8)
Pr	9.3±0.9	8.5±0.8	4.3±0.5	11.8±0.9	0.60±0.14	5.8±0.8	1.25±0.15
Rb	126±7	102±8	70±6	87±7	4.0±0.6	57±5	29±5
S	(144)	241±22	(50)	(110)	36±8	(50)	(60)
Sb	0.30±0.05	0.85±0.13① Sb: (1.1)②	0.19±0.05	2.7±0.4	0.072±0.013	0.063±0.013	0.63±0.25
Sc	14±2	12.1±1.2	2.4±0.3	18±2	(0.7)	5.0±0.5	43±4
Se	0.12±0.03	0.15±0.03	0.040±0.011	(0.15)	0.021±0.004	0.019±0.007	0.083±0.009
Sm	6.7±0.4	6.2±0.5	2.3±0.2	8.5±0.6	0.40±0.05	3.3±0.3	2.1±0.2
Sn	3.3±0.6	3.4±0.5	0.97±0.33	9.5±1.7	(0.5)	0.8±0.2	(0.8)
Sr	486±32	172±9	87±4	216±6	107±9	690±20	142±9
Ta	3.0±0.3	1.1±0.2	(0.52)	5.0±0.4	(0.05)	(0.34)	(0.18)
Tb	0.81±0.07	0.86±0.14	0.28±0.06	1.23±0.11	0.054±0.010	0.29±0.03	0.57±0.08
Te		(0.035)					
Th	27±3	12.8±1.6	5.4±0.6	12.4±1.2	0.86±0.07	1.9±0.2	(0.4)
Ti	5370±210	0.424±0.023(%)	1370±120	14400±500	230±30	1800±140	5510±160
Tl	0.67±0.14	0.6±0.1	0.30±0.08	0.47±0.19	(0.03)	(0.20)	(0.11)
Tm	0.34±0.04	0.44±0.08	0.13±0.03	0.60±0.05	(0.024)	0.11±0.02	0.37±0.10
U	4.6±0.6	2.1±0.4	0.75±0.10	3.0±0.4	0.24±0.04	(0.4)	(0.14)
V	115±11	90±12	19±3	190±25	5.4±1.6	45±4	296±39
W	1.0±0.1	1.9±0.1	0.50±0.06	5.6±0.5	0.13±0.03	0.38±0.09	0.34±0.09
Y	22±2	26±2	8.9±1.2	34±5	1.9±0.4	7.3±0.9	20±3
Yb	2.3±0.2	2.6±0.4	0.99±0.17	3.8±0.6	0.15±0.05	0.69±0.08	2.4±0.4
Zn	90±7	61±5	18±2	165±15	7±2	47±3	100±12
Zr	316±16	233±7	187±16	524±16	11±3	(100)	(57)
%							
SiO_2	59.07±0.21	61.69±0.33	80.58±0.17	57.25±0.31	6.65±0.14	66.27±0.27	49.62±0.15
Al_2O_3	15.36±0.06	13.28±0.12	9.68±0.16	13.39±0.16	0.68±0.05	16.33±0.15	13.76±0.19
TFe_2O_3	6.50±0.15	4.8±0.1	1.46±0.05	9.5±0.1	0.21±0.01	3.12±0.08	14.8±0.3
FeO	(2.4)	(1.4)	(0.2)	(2.4)	(0.06)	(1.6)	10.8±0.6
MgO	3.30±0.17	1.52±0.18	0.24±0.04	3.4±0.1	0.71±0.09	1.63±0.10	7.2±0.3
CaO	4.0±0.1	5.0±0.1	0.34±0.03	3.5±0.1	51.1±0.4	2.66±0.10	9.6±0.2
Na_2O	3.4±0.1	1.28±0.05	2.35±0.06	2.0±0.1	0.03±0.01	5.3±0.1	2.07±0.09
K_2O	2.8±0.1	1.98±0.05	3.9±0.2	2.3±0.1	0.15±0.02	2.60±0.06	0.48±0.05
H_2O^+	(2.7)	(4.7)	(0.9)	(4.4)	(0.4)	(1.0)	(1.7)
CO_2	(0.07)	2.9±0.2	(0.08)	(0.26)	39.8±0.3	0.35±0.05	(0.16)
Corg.	(0.73)	1.1±0.1	(0.07)	(0.70)	(0.15)		
TC	(0.75)	1.9±0.2	(0.09)	(0.77)			
L.O.I	3.8±0.3		1.07±0.21	5.64±0.47	40.2±0.4	1.28±0.14	1.06±0.09

Note: ① Sb(DA) Decompose by aqua regia. ② Sb(T) Total quantity.

1. Data behind ± are uncertainty. Data enclosed in brackets is for reference only.
   $U = t_\alpha \bullet s/\sqrt{N}$. α=0.01, S is standard deviation, N means number of data.
2. Each certified value is the mean of 14 independent laboratories.
3. The sample is powder with size less 0.074 mm packed in bottle, the minimum package is 70 grams.
   The minimum weight for analysis is 0.1 g.
4. The sample should be stored in dark, dry and low temperature place.
5. The certification will expire in Dec.2019. although we reserve the right to make change as issue revisions.