

Certificate of Certified Reference Materials

NCS ZC73018	(GSB-11)	Citrus leaves
NCS ZC73019	(GSB-12)	Fresh Kidney beans
NCS ZC73020	(GSB-13)	Garlic
NCS ZC73021	(GSB-14)	Laver
NCS ZC73022	(GSB-15)	Scallop
NCS ZC73023	(GSB-16)	Spirulina
NCS ZC73024	(GSB-17)	Pollen
NCS ZC73025	(GSB-18)	Ginseng
NCS ZC73026	(GSB-19)	Huang-qi

Issued in 2007

Approved by China National Analysis Center for Iron and Steel

(Beijing China)

Note:

1. The certified value is the mean of analytical results of no less than 6 independent laboratories.
2. Standard uncertainty U is got by

$$U = t_{0.05(n-1)} \cdot \sqrt{u_a^2 + u_b^2} = t_{0.05(n-1)} \cdot \sqrt{(s/\sqrt{n})^2 + [R/(2 \cdot \sqrt{3m})]^2}$$

U_a , U_b is type A and type B standard uncertainty respectively, t is t value of t distribution from 95% confidence interval and degree of freedom n-1; S is standard deviation; n is number of data; R is the max difference of the mean of analytical method; m is number of analytical methods for statistic ($n \geq 2$). If there is only one kind of method,

3 • s/\sqrt{N} is used to estimate the uncertainty.

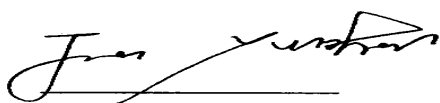
3. The sample is packed in bottle with size less 80 meshes. The minimum weight for analysis is 0.2g. The sample should be stoved at 80 °C for 4 hours before using (for elements that easy to evaporate the temperature is 60 °C). The package is: NCS ZC73022 — NCS ZC73025 is 12g/bottle; others is 35g/bottle.
4. The sample should be tight sealed after each use and stored in drier at dark and cool place.
The samples NCS ZC73022 should be stored at temperature lower than -10°C. If the sample was find moldy, it should be stop using.
5. The certification will expire in Dec.2015, although we reserve the right to make change as issue revisions.

Analytical Methods

Methods	Element
ICP-MS	Ag, As, B, Ba, Be, Bi, Br, Cd, Ce, Co, Cr, Cs, Cu, Dy, Er, Eu, Gd, Ge, Hf, Ho, I, La, Li, Lu, Mn, Mo, Nb, Nd, Ni, Pb, Pr, Rb, Sb, Sc, Se, Sm, Sn, Sr, Tb, Th, Ti, Tl, Tm, U, V, Y, Yb, Zn
ICP-AES	Al, B, Ba, Ca, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Na, Ni, P, Pb, S, Sb, Si, Sr, Zn
INAA	Al, As, Ba, Br, Ca, Ce, Cl, Co, Cr, Cs, Cu, Eu, Fe, Hf, I, K, La, Mg, Mn, Mo, Na, Rb, S, Sb, Se, Sm, Sr, Tb, Th, U, V, Zn
XRF	Al, Br, Ca, Rb, Cu, Fe, K, Mg, Mn, Na, Rb, S, Si, Sr, Zn
AFS	As, Bi, Hg, Sb, Se
GFAAS	Cd, Pb
COL	Al, B, Cl, I, P, Si
VOL	N, S
POL	Mo
IC	Br, Cl, I
IES	F
AES	Ag, B, Sn

Note:

AES: Atomic Emission Spectrography
 AFS: Atomic Fluorescence Spectrophotometry
 COL: Colorimetry
 IC: Ion Chromatogram
 ICP-AES: Inductively Coupled Plasma- Atomic Emission Spectrography
 ICP-MS Inductively Coupled Plasma- Mass spectrometry
 ISE: Ion Selective Electrode method
 INAA: Instrumental Neutron Activation Analysis method
 GFAAS: Graphite Furnace Atomic Absorption Spectrophotometry
 POL: Polarography
 VOL: Volumetry
 XRF: X-Ray Fluorescence spectrometry



Jia Yunhai

Laboratory Director

Certified values and uncertainty

Element	NCS ZC 73018	NCS ZC 73019	NCS ZC 73020	NCS ZC 73021	NCS ZC 73022	Element	NCS ZC 73023	NCS ZC 73024	NCS ZC 73025	NCS ZC 73026
Ag(10^{-9})	54 ± 5	(5)	(5)	73 ± 16	(8)	Ag(10^{-9})	42 ± 8	(5.8)	(4)	(8)
Al(10^{-2})	0.115 ± 0.010	0.043 ± 0.004	0.021 ± 0.002	0.49 ± 0.08	0.0156 ± 0.0027	Al(10^{-2})	0.033 ± 0.007	(0.045)	(0.036)	0.18 ± 0.03
As(10^{-6})	1.1 ± 0.2	0.15 ± 0.02	0.31 ± 0.04	27 ± 6	3.6 ± 0.6	As(10^{-6})	0.22 ± 0.03	0.095 ± 0.020	(0.03)	0.57 ± 0.05
B(10^{-6})	32 ± 3	21 ± 2	7.5 ± 0.9	14.5 ± 1.0	12 ± 1	B(10^{-6})	(2.8)	85 ± 7	10.5 ± 1.4	16.8 ± 1.6
Ba(10^{-6})	98 ± 6	11.4 ± 0.7	4.1 ± 0.3	10.4 ± 1.5	0.62 ± 0.06	Ba(10^{-6})	11.0 ± 0.8	2.9 ± 0.5	35 ± 2	20.5 ± 2.5
Be(10^{-9})	31 ± 7	14 ± 3	4.4 ± 1.1	115 ± 14	3.2 ± 0.7	Be(10^{-9})	21 ± 4	10 ± 3	5.3 ± 1.1	50 ± 14
Bi(10^{-9})	230 ± 25	4.8 ± 1.5	13 ± 1	31 ± 3	3.8 ± 0.8	Bi(10^{-9})	81 ± 7	4.4 ± 1.2	(2.4)	14 ± 2
Br(10^{-6})	3.4 ± 0.5	0.62 ± 0.13	1.9 ± 0.3	92 ± 7	32 ± 3	Br(10^{-6})	4.8 ± 1.0	1.1 ± 0.2	(0.27)	2.6 ± 0.9
Ca(10^{-2})	4.2 ± 0.4	0.67 ± 0.04	0.081 ± 0.008	0.153 ± 0.018	0.075 ± 0.009	Ca(10^{-2})	0.158 ± 0.015	0.308 ± 0.013	0.406 ± 0.033	0.456 ± 0.018
Cd(10^{-6})	0.17 ± 0.02	(0.020)	0.062 ± 0.003	0.57 ± 0.05	1.06 ± 0.10	Cd(10^{-9})	0.37 ± 0.03	0.037 ± 0.003	0.033 ± 0.005	0.042 ± 0.010
Ce(10^{-6})	1.00 ± 0.13	0.35 ± 0.07	0.16 ± 0.03	4.7 ± 0.2	0.053 ± 0.013	Ce(10^{-6})	7.2 ± 0.6	0.35 ± 0.09	0.06 ± 0.02	2.03 ± 0.23
Cl(10^{-2})	0.032 ± 0.004	0.14 ± 0.01	0.075 ± 0.006	2.8 ± 0.3	0.81 ± 0.02	Cl(10^{-2})	0.49 ± 0.02	0.033 ± 0.004	0.023 ± 0.003	0.042 ± 0.005
Co(10^{-6})	0.23 ± 0.06	0.29 ± 0.02	0.056 ± 0.008	0.63 ± 0.05	0.047 ± 0.006	Co(10^{-6})	0.41 ± 0.03	0.10 ± 0.02	0.072 ± 0.014	0.44 ± 0.03
Cr(10^{-6})	1.25 ± 0.11	0.66 ± 0.08	0.30 ± 0.07	2.4 ± 0.4	0.28 ± 0.07	Cr(10^{-6})	1.50 ± 0.13	0.51 ± 0.09	0.13 ± 0.04	2.2 ± 0.4
Cs(10^{-6})	0.14 ± 0.01	0.036 ± 0.004	0.025 ± 0.002	0.35 ± 0.03	0.014 ± 0.001	Cs(10^{-6})	0.034 ± 0.002	0.061 ± 0.005	0.017 ± 0.003	0.235 ± 0.014
Cu(10^{-6})	6.6 ± 0.5	8.7 ± 0.5	4.6 ± 0.4	12.2 ± 1.1	1.34 ± 0.18	Cu(10^{-6})	7.7 ± 0.6	8.2 ± 0.8	5.9 ± 0.4	8.5 ± 0.7
Dy(10^{-9})	57 ± 5	23 ± 3	8.9 ± 1.1	654 ± 66	5.3 ± 1.2	Dy(10^{-9})	186 ± 24	20 ± 4	3.2 ± 0.4	122 ± 13
Er(10^{-9})	26 ± 6	12 ± 2	4.2 ± 0.8	312 ± 30	3.3 ± 0.7	Er(10^{-9})	78 ± 8	10.8 ± 2.7	1.7 ± 0.4	60 ± 12
Eu(10^{-9})	(33)	7.2 ± 1.5	3.2 ± 0.8	126 ± 10	0.9 ± 0.3	Eu(10^{-9})	87 ± 12	6.2 ± 1.3	(8)	32 ± 6
F(10^{-6})	(38)	(15)	(35)	(27)	(13)	F(10^{-6})	(37)	(12)	(9)	(20)
Fe(10^{-6})	480 ± 30	330 ± 20	205 ± 18	$0.145 \pm 0.010^*$	41 ± 5	Fe(10^{-6})	$0.110 \pm 0.007^*$	212 ± 10	55 ± 4	$0.113 \pm 0.007^*$
Gd(10^{-9})	81 ± 10	28 ± 3	11.4 ± 1.5	760 ± 75	5.2 ± 1.2	Gd(10^{-9})	355 ± 70	27 ± 2	5.5 ± 1.2	160 ± 18
Ge(10^{-9})	(26)	14 ± 2	(12)	52 ± 14	(8)	Ge(10^{-9})	(36)	(8)		(26)
Hf(10^{-6})	(0.085)		(0.04)			Hf(10^{-6})	(0.03)			
Hg(10^{-9})	150 ± 20	3.8 ± 1.4	4.0 ± 1.5	16 ± 4	40 ± 7	Hg(10^{-9})	(15)	3.2 ± 1.3	4.0 ± 0.8	(12)
Ho(10^{-9})	11 ± 1	4.5 ± 0.7	1.6 ± 0.3	126 ± 22	1.2 ± 0.3	Ho(10^{-9})	33 ± 7	3.8 ± 0.5	0.67 ± 0.09	23 ± 4
I(10^{-6})	0.53 ± 0.16	(0.14)	0.57 ± 0.09	79 ± 8	1.83 ± 0.32	I(10^{-6})	0.54 ± 0.19	(0.16)	(0.1)	0.3 ± 0.1
K(10^{-2})	0.77 ± 0.04	2.26 ± 0.06	1.14 ± 0.05	3.36 ± 0.18	1.15 ± 0.06	K(10^{-2})	1.41 ± 0.05	0.585 ± 0.015	0.96 ± 0.04	0.70 ± 0.04
La(10^{-6})	0.57 ± 0.06	0.17 ± 0.03	0.092 ± 0.018	3.4 ± 0.3	0.037 ± 0.008	La(10^{-6})	4.8 ± 0.3	0.17 ± 0.04	0.045 ± 0.003	1.07 ± 0.09
Li(10^{-6})	1.0 ± 0.1	0.31 ± 0.05	0.13 ± 0.02	2.36 ± 0.15	0.13 ± 0.02	Li(10^{-6})	0.24 ± 0.03	0.21 ± 0.04	0.087 ± 0.025	1.25 ± 0.12

Element	NCS ZC 73018	NCS ZC 73019	NCS ZC 73020	NCS ZC 73021	NCS ZC 73022	Element	NCS ZC 73023	NCS ZC 73024	NCS ZC 73025	NCS ZC 73026
Lu(10 ⁻⁹)	3.7±0.9	1.77±0.24	0.58±0.15	38±3	0.49±0.11	Lu(10 ⁻⁹)	9.5±1.9	1.22±0.32	(0.3)	9±3
Mg(10 ⁻²)	0.234±0.007	0.336±0.009	0.105±0.004	0.40±0.01	0.174±0.006	Mg(10 ⁻²)	0.287±0.010	0.163±0.008	0.137±0.006	0.228±0.010
Mn(10 ⁻⁶)	30.5±1.5	29.5±1.4	13.4±0.8	68±3	19.2±1.2	Mn(10 ⁻⁶)	31.7±1.2	22.7±0.6	21±1	33±1
Mo(10 ⁻⁶)	0.20±0.01	4.9±0.4	0.21±0.02	0.78±0.09	0.066±0.016	Mo(10 ⁻⁶)	0.30±0.04	0.42±0.06	0.18±0.02	5.7±0.6
N(10 ⁻²)	2.47±0.06	2.79±0.14	3.22±0.17	5.0±0.3	12.8±0.8	N(10 ⁻²)	10.6±0.4	4.3±0.3	1.9±0.1	2.35±0.13
Na(10 ⁻²)	0.013±0.002	0.081±0.009	0.095±0.013	1.55±0.06	0.46±0.04	Na(10 ⁻⁶)	1.90±0.09	(0.009)	0.0077±0.0010	0.145±0.019
Nd(10 ⁻⁶)	0.42±0.05	0.14±0.03	0.066±0.013	3.1±0.2	0.025±0.007	Nd(10 ⁻⁶)	2.4±0.2	0.14±0.03	0.024±0.004	0.90±0.11
Ni(10 ⁻⁶)	(1.1)	4.4±0.3	0.92±0.11	2.25±0.18	0.29±0.08	Ni(10 ⁻⁶)	1.44±0.17	0.50±0.10	1.11±0.06	2.26±0.15
P(10 ⁻²)	0.125±0.009	0.38±0.03	0.466±0.016	0.585±0.040	0.88±0.07	P(10 ⁻²)	1.17±0.09	0.65±0.04	0.263±0.015	0.225±0.012
Pb(10 ⁻⁶)	9.7±0.9	0.66±0.07	0.72±0.09	2.05±0.15	(0.12)	Pb(10 ⁻⁶)	2.8±0.2	0.25±0.04	0.12±0.04	1.44±0.10
Pr(10 ⁻⁹)	108±14	38±5	17±2	800±42	6.0±0.8	Pr(10 ⁻⁹)	705±36	38±6	6.5±1.2	231±28
Rb(10 ⁻⁶)	3.0±0.2	9.5±0.6	6.5±0.2	10.4±0.7	5.1±0.3	Rb(10 ⁻⁶)	1.5±0.1	6.4±0.3	4.1±0.3	10.5±0.5
S(10 ⁻²)	0.41±0.03	0.195±0.010	1.01±0.05	2.26±0.14	1.5±0.1	S(10 ⁻²)	0.78±0.08	0.38±0.02	0.110±0.007	0.193±0.012
Sb(10 ⁻⁶)	0.20±0.06	0.028±0.005	0.023±0.005	0.026±0.006	(0.014)	Sb(10 ⁻⁶)	0.083±0.021	0.014±0.004	(0.008)	0.063±0.014
Sc(10 ⁻⁶)	0.140±0.020	0.067±0.014	0.021±0.003	(0.49)	(0.012)	Sc(10 ⁻⁶)	0.25±0.07	0.068±0.015	(0.017)	(0.30)
Se(10 ⁻⁶)	0.17±0.03	0.043±0.015	0.39±0.07	0.124±0.014	1.5±0.3	Se(10 ⁻⁶)	0.24±0.05	0.03±0.01	0.012±0.004	0.071±0.024
Si(10 ⁻²)	0.41±0.08	(0.27)	(0.08)	0.83±0.16	(0.013)	Si(10 ⁻²)	(0.23)	(0.15)	(0.034)	(0.71)
Sm(10 ⁻⁹)	80±7	29±4	13±3	81±33	4.8±1.5	Sm(10 ⁻⁹)	354±23	30±3	4.5±0.5	172±13
Sn(10 ⁻⁶)	3.8±0.5	(0.2)	(0.07)	(0.2)	(0.13)	Sn(10 ⁻⁶)	(0.2)		(0.02)	(0.10)
Sr(10 ⁻⁶)	170±10	55±3	12.3±1.1	24±2	6.5±0.4	Sr(10 ⁻⁶)	36±2	13.2±0.7	33±2	51±3
Tb(10 ⁻⁹)	11.1	4.1±0.5	1.66±0.29	110±10	0.84±0.19	Tb(10 ⁻⁹)	41±4	3.7±0.7	0.65±0.05	22±2
Th(10 ⁻⁶)	0.14±0.02	0.055±0.010	0.024±0.003	0.73±0.05	(0.012)	Th(10 ⁻⁶)	0.17±0.02	0.053±0.012	(0.008)	0.30±0.04
Ti(10 ⁻⁶)	38±10	21±4	10±3	(92)	(6)	Ti(10 ⁻⁶)	34±7	20±4	5.8±1.6	102±11
Tl(10 ⁻⁶)	60±8	4.2±0.8	20±3	44±4	2.5±0.4	Tl(10 ⁻⁹)	51±6	11±1	8.2±0.9	51±6
Tm(10 ⁻⁹)	3.8±0.9	1.8±0.3	(0.65)	43±8	0.52±0.10	Tm(10 ⁻⁹)	10±2	1.4±0.5	(0.3)	8.8±1.8
U(10 ⁻⁹)	45±10	90±5	75±6	172±18	7.3±1.3	U(10 ⁻⁹)	31±4	12±4	3.5±0.8	122±14
V(10 ⁻⁶)	1.16±0.13	0.51±0.06	0.20±0.06	4.2±0.6	0.36±0.10	V(10 ⁻⁶)	0.70±0.07	0.46±0.08	0.073±0.025	2.56±0.32
Y(10 ⁻⁶)	0.42±0.04	0.155±0.017	0.057±0.011	6.6±1.3	0.107±0.012	Y(10 ⁻⁶)	0.90±0.11	0.12±0.03	0.16±0.03	0.6±0.1
Yb(10 ⁻⁹)	25±5	11±2	(4.2)	253±35	3.2±0.9	Yb(10 ⁻⁹)	62±10	9.8±3.5	1.8±0.4	62±19
Zn(10 ⁻⁶)	18±2	32±2	21.7±1.4	28±2	75±3	Zn(10 ⁻⁶)	42±2	32±1	11.1±0.9	22.3±1.0
Ash(%)	(13.3)	(6.9)	(3.4)	(15.1)	(4.5)	Ash(%)	(8.8)	(3.2)	(3.0)	(5.16)

Note: Data behind "±" are uncertainty; Data with * means percent. Data in () is reference value.