



Certificate of Certified Reference Materials

NCS ZC73027	Rice
NCS ZC73028	Rice
NCS ZC73029	Rice
NCS ZC73030	Wheat
NCS ZC73031	Carrot
NCS ZC73032	Celery
NCS ZC73033	Scallion
NCS ZC73034	Prawn
NCS ZC73035	Pork liver
NCS ZC73036	Green tea

Reissued in 2019

Approved by China National Analysis Center for Iron and Steel

(Beijing China)

Certified values of biology reference materials

Element	NCS ZC 73027	NCS ZC 73028	NCS ZC 73029	NCS ZC 73030	NCS ZC 73031
Ag(10^{-6})			(0.007)	(0.004)	(0.006)
Al(10^{-2})	0.045±0.007	(0.059)	(0.057)	(0.021)	(0.046)
As(10^{-6})	0.114±0.018	0.12±0.03	0.11±0.02	(0.025)	0.11±0.02
B(10^{-6})	0.94±0.11	1.06±0.08	0.58±0.13	0.54±0.11	18.1±1.1
Ba(10^{-6})	0.33±0.04	0.75±0.09	0.50±0.08	1.4±0.2	24±3
Be(10^{-9})	2.1±0.5	3.4±0.6	2.3±0.4	1.5±0.4	6.5±1.5
Bi(10^{-9})	(4.5)	(16)	6.2±1.4	(1.8)	(2.5)
Br(10^{-6})	(0.5)	(0.4)	(0.3)	(0.5)	(2.4)
Ca(10^{-2})	0.011±0.001	0.013±0.002	0.010±0.001	0.033±0.002	0.255±0.010
Cd(10^{-6})	0.012±0.003	0.018±0.002	0.19±0.02	0.018±0.002	0.034±0.004
Ce(10^{-9})	(7.7)	17±2	7.2±1.8	13.0±2.4	177±38
Cl(10^{-2})	(0.038)	(0.028)	(0.025)	(0.08)	(0.23)
Co(10^{-9})	5.5±1.6	8.2±1.7	12.5±1.6	8.0±1.6	66±7
Cr(10^{-6})	0.14±0.05	0.17±0.05	(0.14)	(0.19)	1.04±0.13
Cs(10^{-9})	4.0±0.3	2.9±0.6	72±9	8.1±0.5	42±4
Cu(10^{-6})	1.7±0.1	2.6±0.1	2.4±0.2	2.4±0.1	4.1±0.3
Dy(10^{-9})	(0.62)	1.15±0.11	0.48±0.14	0.9±0.2	11.0±1.4
Er(10^{-9})	0.32±0.11	0.70±0.10	0.21±0.06	0.5±0.1	5.6±0.6
Eu(10^{-9})	0.21±0.08	0.42±0.12	0.25±0.09	0.45±0.14	7.6±2.3
Fe(10^{-6})	7.5±2.0	14.4±2.0	6.3±0.8	20±3	148±15
Gd(10^{-9})	0.6±0.2	1.5±0.2	0.59±0.15	1.1±0.2	14.5±2.8
Ge(10^{-9})	(2.3)	(4.3)	2.0±0.6	1.6±0.4	6.6±1.5
Hg(10^{-9})	4.8±0.8	2.2±0.5	2.8±0.5	(2.2)	3.2±0.8
Ho(10^{-9})	0.12±0.04	0.21±0.04	0.13±0.04	0.20±0.05	2.0±0.2
I(10^{-6})	(0.09)		(0.09)		(0.08)
K(10^{-2})	0.13±0.01	0.14±0.01	0.07±0.01	0.21±0.01	1.08±0.04
La(10^{-9})	(5)	10.3±1.1	(4.5)	8.1±1.4	114±24
Li(10^{-6})	0.035±0.010	0.068±0.016	0.050±0.016	0.027±0.007	0.16±0.02
Lu(10^{-9})	(0.06)	(0.10)		(0.07)	(0.8)
Mg(10^{-2})	0.042±0.002	0.053±0.002	0.025±0.001	0.048±0.002	0.091±0.003
Mn(10^{-6})	10.6±0.6	11.5±0.6	9.0±0.4	10.8±0.4	12.1±0.5
Mo(10^{-6})	0.43±0.02	0.61±0.03	0.89±0.06	0.25±0.02	0.10±0.01
N(10^{-2})	(1.28)	(1.47)	(1.25)	(2.3)	(1.06)
Na(10^{-6})	25±2	11.0±2.5	(10)	14.2±3.4	0.65±0.03*
Nb(10^{-9})	(2)	(5)	(2.7)	(2.3)	24±4
Nd(10^{-9})	(4.1)	7.9±1.3	(3.5)	6.0±1.2	79±9
Ni(10^{-6})	0.16±0.04	0.21±0.06	0.31±0.04	(0.11)	0.67±0.10
P(10^{-2})	0.127±0.004	0.16±0.01	0.10±0.01	0.15±0.01	0.23±0.02
Pb(10^{-6})	0.075±0.025	0.09±0.03	0.070±0.023	0.067±0.016	0.43±0.07
Pr(10^{-9})	1.1±0.4	2.0±0.3	(0.88)	1.4±0.2	21±3
Rb(10^{-6})	2.4±0.2	0.29±0.06	4.0±0.3	3.2±0.3	6.9±0.5
S(10^{-2})	(0.11)	(0.13)	(0.12)	0.17±0.02	(0.10)
Sb(10^{-9})	(4.5)	(5.8)	(10)	(8)	(15)
Sc(10^{-9})	(2.8)	(5)	(2.6)	(4)	(32)
Se(10^{-6})	0.040±0.013	(0.03)	0.053±0.014	0.060±0.010	0.031±0.010
Si(10^{-2})	(0.011)	(0.033)	(0.009)	(0.008)	(0.156)
Sm(10^{-9})	0.68±0.24	1.6±0.3	0.49±0.12	1.06±0.10	14.3±2.3
Sn(10^{-9})	(9.5)	(9)	(8)	(8)	(22)
Sr(10^{-6})	0.30±0.05	0.29±0.05	0.16±0.03	1.4±0.1	22±2
Tb(10^{-9})	(0.12)	(0.25)	(0.09)	0.17±0.05	2.1±0.5
Th(10^{-9})	(1.8)	4.0±1.2	(1.1)	(3.2)	28±6
Ti(10^{-6})	(1.2)	(2.7)	(1.3)	(2.4)	(12)
Tl(10^{-9})	(0.34)	0.30±0.04	0.20±0.07	(0.27)	10.7±2.1
Tm(10^{-9})	(0.06)	0.12±0.04	(0.07)	0.12±0.04	0.83±0.14
U(10^{-9})	(1.7)	(2.6)	(2.0)	(2.0)	9.8±1.7
V(10^{-6})	(0.03)	(0.05)	(0.03)	(0.04)	(0.21)
Y(10^{-6})	0.17±0.04	0.22±0.05	0.20±0.03	0.10±0.02	0.09±0.02
Yb(10^{-9})	(0.38)	0.61±0.14	0.26±0.08	0.48±0.12	5.5±0.8
Zn(10^{-6})	13.0±0.6	14.6±0.6	14.4±0.8	12.4±0.6	11.2±0.5

Element	NCS ZC 73032	NCS ZC 73033	NCS ZC 73034	NCS ZC 73035	NCS ZC 73036
Ag(10^{-6})	(0.012)	(0.014)	(0.017)		(0.015)
Al(10^{-2})	(0.14)	(0.30)	(0.029)	(0.012)	
As(10^{-6})	0.39±0.08	0.52±0.11	(2.5)	1.4±0.3	0.27±0.05
B(10^{-6})	32±3	25±2	2.0±0.3	(0.6)	14.1±1.2
Ba(10^{-6})	17.3±2.3	36±5	2.3±0.3	(0.24)	41±4
Be(10^{-9})	31±5	59±11	4.9±0.8	0.9±0.3	25±3
Bi(10^{-9})	(13)	(13)	(5.4)	(0.9)	40±11
Br(10^{-6})	16±4	20±2	8.5±1.1	(2.8)	2.9±0.5
Ca(10^{-2})	1.66±0.06	2.28±0.09	0.30±0.01	(0.023)	1.21±0.03
Cd(10^{-6})	0.092±0.006	0.19±0.02	0.039±0.002	1.00±0.07	0.076±0.004
Ce(10^{-6})	1.04±0.11	2.1±0.3	0.13±0.03	(0.005)	0.81±0.03
Cl(10^{-2})	(3.54)	(0.85)	(0.189)	(0.17)	(0.056)
Co(10^{-6})	0.25±0.02	0.59±0.04	0.044±0.005	0.057±0.004	0.30±0.02
Cr(10^{-6})	1.35±0.22	2.6±0.4	0.35±0.11	0.23±0.06	0.92±0.20
Cs(10^{-6})	0.165±0.018	0.19±0.02	0.027±0.002	0.070±0.007	0.58±0.03
Cu(10^{-6})	8.2±0.4	5.5±0.3	10.3±0.7	52±3	24±1
Dy(10^{-9})	64±11	119±12	7.9±0.5	(0.3)	65±7
Er(10^{-9})	30±4	57±12	4.4±0.4	(0.2)	37±6
Eu(10^{-9})	20±2	39±4	2.5±0.3	(0.2)	22±6
Fe(10^{-6})	597±34	1010±55	112±12	519±34	322±23
Gd(10^{-9})	81±13	155±34	10.5±1.2	(0.6)	76±11
Ge(10^{-9})	21±7	(32)	6.0±1.4	(12)	15±5
Hg(10^{-9})	14.6±2.4	12.0±2.3	49±8	45±8	8.1±1.5
Ho(10^{-9})	12.4±1.3	22±4	1.5±0.2	(0.14)	13±2
I(10^{-6})	(0.43)	(0.44)	(0.43)	(0.18)	(0.13)
K(10^{-2})	2.7±0.2	2.1±0.1	0.49±0.01	0.66±0.03	1.55±0.07
La(10^{-6})	0.55±0.05	1.16±0.10	0.066±0.005	(0.004)	0.54±0.04
Li(10^{-6})	3.2±0.2	1.6±0.2	0.15±0.01	(0.02)	0.52±0.04
Lu(10^{-9})	4.5±1.3	(8)	0.64±0.21		6.2±0.9
Mg(10^{-2})	0.53±0.03	0.27±0.01	0.169±0.006	0.063±0.004	0.220±0.008
Mn(10^{-6})	45±2	173±7	8.9±0.3	10.1±0.4	0.117±0.006*
Mo(10^{-6})	1.02±0.09	0.12±0.03	0.037±0.012	4.2±0.2	0.11±0.02
N(10^{-2})	(2.6)	(2.9)	(13.5)	(11.2)	(3.7)
Na(10^{-2})	2.17±0.23	(0.03)	0.31±0.02	0.163±0.010	0.010±0.001
Nb(10^{-9})	(85)	(215)	16.5±4.0		(50)
Nd(10^{-6})	0.47±0.08	0.91±0.11	0.056±0.006	(0.003)	0.35±0.04
Ni(10^{-6})	1.8±0.4	(1.9)	(0.23)	(0.10)	5.4±0.4
P(10^{-2})	0.35±0.01	0.36±0.02	0.77±0.03	1.14±0.06	0.28±0.01
Pb(10^{-6})	2.7±0.7	1.34±0.16	0.20±0.05	0.12±0.03	1.6±0.2
Pr(10^{-9})	118±13	235±29	14.5±1.1	(0.60)	93±8
Rb(10^{-6})	18.5±1.2	9.4±0.8	1.4±0.1	27±2	89±9
S(10^{-2})	(1.0)	0.46±0.04	(1.0)	0.80±0.12	(0.42)
Sb(10^{-9})	(56)	(45)	(16)	(12)	(52)
Sc(10^{-6})	(0.16)	(0.26)	(0.02)	(0.012)	(0.07)
Se(10^{-6})	0.118±0.017	0.069±0.009	(5.1)	1.54±0.29	0.10±0.03
Si(10^{-2})	(0.38)	(1.1)	(0.048)		(0.26)
Sm(10^{-9})	87±9	167±18	10.7±1.8	(0.5)	66±10
Sn(10^{-6})	(0.10)	(0.07)	(0.024)		(0.17)
Sr(10^{-6})	213±19	74±5	20±2	0.51±0.04	36±2
Tb(10^{-9})	12.6±2.6	22±5	1.5±0.2	(0.25)	11.4±1.9
Th(10^{-9})	177±31	364±58	28±8	(4.5)	79±12
Ti(10^{-6})	(45)	(62)	(17)		(21)
Tl(10^{-9})	21±4	37±8	2.0±0.5	1.2±0.2	57±11
Tm(10^{-9})	4.2±1.1	7.8±1.5	0.69±0.18		5.9±1.1
U(10^{-9})	48±12	(50)	9.7±0.8	3.2±0.9	47±7
V(10^{-6})	1.3±0.3	(3)	0.24±0.07	(0.078)	0.60±0.15
Y(10^{-6})	0.35±0.08	0.61±0.14	0.09±0.02	(0.04)	0.52±0.03
Yb(10^{-9})	29±7	57±17	4.1±0.8	(0.17)	38±5
Zn(10^{-6})	26±2	25±1	76±4	211±11	35±2

Note:

1. Data behind "±" are uncertainty; Data in () is for reference only. Date with * is in percent.

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, $U = 3s/\sqrt{n}$ is

used to estimate of uncertainty.

3. The sample is packed in bottle with size less 80 meshes. The package size for ZC73034 is 12g, others are 35g.

The standard should be dried at 80°C (60°C for easy volatilizable elements) for 4 hours before analysis.

The minimum weight for analysis is 0.2g.

4. The sample should be tight sealed after each use and stored in drier at dark and cool place.

The samples NCS ZC73034 and NCS ZC73035 should be stored at temperature lower than -10 °C, others lower 25 °C.

If the sample was find moldy, it should be stop to use.

5. The certification will expire in Dec.2024, 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
AAS	Ca, Cu, Fe, K, Mg, Mn, Na, Zn
GFAAS	Cd, Pb
COL	Al, B, Cl, I, P, Si
VOL	N, S
POL	Mo
IC	Br, Cl, I
ISE	F
AES	B, Sn

Note: AAS: Atomic Absorption Spectrophotometry

AES: Atomic Emission Spectrography

AFS: Atomic Fluorescence Spectrophotometry

COL: Colorimetry

IC: Ion Chromatogram

ISE: Ion Selective Electrode

ICP-AES: Inductively Coupled Plasma- Atomic Emission Spectrography

ICP-MS Inductively Coupled Plasma- Mass spectrometry

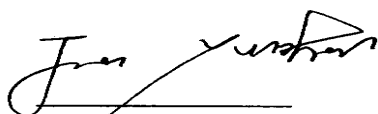
INAA: Instrumental Neutron Activation Analysis method

GFAAS: Graphite Furnace Atomic Absorption Spectrophotometry

POL: Polarography

VOL: Volumetry

XRF: X-Ray Fluorescence spectrometry



Jia Yunhai

Laboratory Director