NationalCertified Reference Material(NCRM)

Code：GBW02794

Reference Material Certificate

Purity of High Pure Silver

Batch Number：2019001

Certification Date：Jan. 2017

Period of Validity：Jan. 2022

Reference Material Producer：National Institute of Metrology

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Version：1.0

The present CRM is mainly used for: 1) verification or confirmation of purity analysis method of high purity silver; 2) transfer of metrological traceability to primary standard solution of silver; 3) correction of matrix matching method in purity analysis of silver.

1. Sample Preparation

Select the high purity silver particle with good homogeneity, diameter φ(1-3) mm, loading incapping glass bottle packaging.

2. Traceability and Characterization Methods

The sample should be cleaned by fixed procedure before weighted and measured. The glow discharge mass spectrometry (GDMS), high resolution ICP-MS, carrier gas heating extraction (CGHE) methods were used to measure all the 94 elemental impurities in silver. The total purity of silver was calculated by subtract the total mass fractions of elemental impurities. By subtracting the mass fractions of all impurities, using suitable calibration methods and measurement standards (including reference materials) according to the content level of impurities and their contribution to the purity uncertainty, the certified total purity value of silver can be made traceable to the SI unit: kg and mole. The international comparison CCQM-P149 (purity analysis of zinc) was used to validate the measurement methods.

3. Property Value and Uncertainty

The property values and expanded uncertainties are as follows：

The chemical purity of silver: (99.9997± 0.0002) %, k=2;

The coverage factors were chosen to obtain an approximate 95 % level of confidence. The uncertainty evaluation considered sources from characterization, between-unit homogeneity and stability. The contents of impurities were shown in attached table.

4. Homogeneity and Stability Assessment

According to national technical specification of JJF1343（equivalent to ISO Guide 35）, the homogeneity and stability of samples were assessed by adopting same measurement method used for characterization. The results showed good homogeneity and stability of the CRM. The minimum sample intake is 0.5 g. The period of validity of this CRM is 60 months. The stability of this CRM is regularly monitored by NIM, during this period the customer will be informed of any change of the certified values just-in-less-time.

5. Packaging, Storage and Use

Each bottle contains 4 g. Preserved at room temperature.

Prior to use, the CRM should be cleaned according the procedure:

1. Ultrasonic cleaning 3 minutes with methanol;
2. Washed four times using pure water;
3. Ultrasonic cleaning 3 minutes using 2% nitric acid;

4. Washed four times using pure water;
5. Ultrasonic cleaning 3 times using pure water, each time 1 minute;
6. Washing 2 times with methanol;
7. Blow-drying by nitrogen to be used.

Statement

1. The reference material is only for lab study and analytical testing. In case of any complaint due to the improper use or storage by the user, the institute will bear no responsibility.
2. After receiving it, please immediately check variety, quantity and packaging. Relevant compensation is only limited to the reference material itself.
3. The institute is only responsible for the complete certificate affixed with the “Dedicated Seal for Reference Material of National Institute of Metrology”. Please properly keep this certificate.
4. To obtain more application related information, please contact the Department of Technical Consultation.

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Table：informative values of elemental impurities in high pure silver CRM（mg/kg）

El.	Met.	Value	*u*	El.	Met.	Value	*u*	El.	Met.	Value	*u*
H	3	< 0.35	0.18	As	1	0.029	0.058	Tb	1	< 0.001	0.0005
He	5	< 0.001	0.0005	Se	1	0.042	0.084	Dy	1	0.009	0.018
Li	1	0.003	0.006	Br	1	0.005	0.01	Ho	1	< 0.001	0.0005
Be	1	0.004	0.008	Kr	5	< 0.001	0.0005	Er	1	0.002	0.004
B	1	0.006	0.012	Rb	1	< 0.001	0.0005	Tm	1	< 0.001	0.0005
C	4	< 0.51	0.26	Sr	1	< 0.001	0.0005	Yb	1	0.004	0.008
N	3	< 0.45	0.23	Y	1	< 0.001	0.0005	Lu	1	< 0.001	0.0005
O	3	1.01	0.24	Zr	1	< 0.001	0.0005	Hf	1	0.003	0.006
F	1	0.024	0.048	Nb	1	< 0.001	0.0005	Ta	1	< 0.001	0.0005
Ne	5	< 0.001	0.0005	Mo	1	< 0.001	0.0005	W	1	0.010	0.020
Na	1	0.01	0.02	Tc	1,5	< 0.001	0.0005	Re	1	0.003	0.006
Mg	1	0.017	0.034	Ru	1	0.004	0.008	Os	1	0.009	0.018
Al	1	0.011	0.022	Rh	1	< 0.001	0.0005	Ir	1	0.002	0.004
Si	1	0.032	0.064	Pd	1	0.015	0.03	Pt	1	0.006	0.012
P	1	0.006	0.012	Cd	1	0.048	0.096	Au	1	0.013	0.026
S	1,4	< 0.85	0.43	In	1	0.002	0.004	Hg	1	0.013	0.026
Cl	1	0.019	0.038	Sn	1	0.056	0.112	Tl	1	0.005	0.010
A r	5	< 0.001	0.0005	Sb	1	0.024	0.048	Pb	1	0.003	0.006
K	1	0.013	0.026	Te	1	0.021	0.042	Bi	1	0.009	0.018
Ca	1	0.016	0.032	I	1	0.018	0.036	Po	1,5	< 0.001	0.0005
Sc	1	< 0.001	0.0005	Xe	5	< 0.001	0.0005	At	1,5	< 0.001	0.0005
Ti	1	0.005	0.01	Cs	1	< 0.001	0.0005	Rn	1,5	< 0.001	0.0005
V	1	< 0.001	0.0005	Ba	1	< 0.001	0.0005	Fr	1,5	< 0.001	0.0005
Cr	1	0.048	0.096	La	1	0.004	0.008	Ra	1,5	< 0.001	0.0005
Mn	1	< 0.001	0.0005	Ce	1	0.006	0.012	Ac	1,5	< 0.001	0.0005
Fe	1,2	0.103	0.020	Pr	1	0.0005	0.0005	Th	1,5	< 0.001	0.0005
Co	1	0.003	0.006	Nd	1	0.008	0.016	Pa	1,5	< 0.001	0.0005
Ni	1	0.006	0.012	Pm	1	< 0.001	0.0005	U	1,5	< 0.001	0.0005
Cu	1	0.020	0.040	Sm	1	0.002	0.004	Np	1,5	< 0.001	0.0005
Zn	1	0.072	0.144	Eu	1	< 0.001	0.0005	Pu	1,5	< 0.001	0.0005
Ga	1	0.003	0.006	Gd	1	0.004	0.008	Am	1,5	< 0.001	0.0005
Ge	1	0.047	0.094								

Note：

1：Glow discharge mass spectrometry（GDMS）method

2：High resolution- inductively coupled plasma mass spectrometry（HR-ICPMS）method

3：Inert gas fusion infrared and thermal conductivity method

4：Combustion infrared method

5：Estimated method

u：Standard uncertainty