J. S. Department of Commerce
Malcolm Baldrige
Secretary

National Bureau of Standards
Ernest Ambler, Director

National Bureau of Standards

Certificate of Analysis

Standard Reference Material 978a

Assay–Isotopic Standard for Silver

This Standard Reference Material (SRM) is certified for use as an assay and isotopic standard. It consists of 0.25 g of silver nitrate, $AgNO_3$, made from high purity silver metal and high purity nitric acid.

$AgNO_3$, Silver Assay, weight percent	99.99 ±0.02
Absolute Isotopic Abundance Ratio, $^{107}Ag/^{109}Ag$	1.07638 ±0.00022
Isotopic Composition	
^{107}Ag, Atom Percent	51.8392 ±0.0051
^{109}Ag, Atom Percent	48.1608 ±0.0051
Silver Atomic Weight	107.86815 ±0.00011

The indicated uncertainties are overall limits of error based on the sum of tl)5 percent confidence limits for the means and allowances for the effects of known sources of possible systematic error.

The assay shown is based on the determination of silver in the dried silver nitrate in which most of the silver is determined gravimetrically as silver iodide and the remainder by isotope dilution mass spectrometry. Details of this procedure are published [1]. The molecular weight of silver nitrate employed in this calculation is 169.8731.

The absolute abundance ratio of $^{107}Ag/^{109}Ag$ was determined by thermal ionization mass spectrometry. Mixtures of known $^{107}Ag/^{109}Ag$, prepared from nearly pure separated silver isotopes, were used to calibrate the mass spectrometers. Details of the preparation and measurements are described by Powell, L.J., Murphy, T.J., and Gramlich, J.W. "The Absolute Isotopic Abundance and Atomic Weight of a Reference Sample of Silver" [1].

The atomic weight of silver was calculated from the isotopic composition and nuclidic masses 106.905095 and 108.904754 from Wapstra and Bos [2].

The analytical measurements leading to the certification of this material were performed in the NBS Inorganic Analytical Research Division. Mass spectrometric measurements were made by J.W. Gramlich and L.J. Powell on calibration mixes prepared by T.J. Murphy. The purity of the separated isotopes and this SRM were determined by P.J. Paulsen, using spark source mass spectrometry.

Statistical analysis of the data was performed by K.R. Eberhardt, NBS Statistical Engineering Division.

The overall direction and coordination of the technical measurements leading to the certification were under the chairmanship of E.L. Garner of the NBS Inorganic Analytical Research Division.

The technical and support aspects involved in the preparation, certification, and issuance of this Standard Reference Material were coordinated through the Office of Standard Reference Materials by L.J. Powell.

Gaithersburg, MD 20899
September 21, 1984

Stanley D. Rasberry, Chief
Office of Standard Reference Materials

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Standard Reference Material 978a was prepared from SRM 748, Silver Vapor Pressure, which is high purity silver metal (greater than 99.99 percent) in rod form. SRM 748 was used by V.E. Bower and R.S. Davis to redetermine the electrochemical equivalent of silver [3]. Based on their work and the silver data presented here, the silver Faraday was recalculated with a high level of accuracy [4]. A portion of the metal was converted to silver nitrate and used as the isotopic reference sample for the redetermination of the atomic weight of silver [1]. Silver nitrate is non-hygroscopic up to about 80 percent relative humidity. At this relative humidity, or above, it will attract water and form a saturated solution. While this salt would not normally be exposed to such high humidities, as a precaution, it should be dried before use. Drying either in an oven for 1 hour at 105 °C or for approximately 15 hours in a desiccator over $MgClO_4$ is satisfactory.

[1] Powell, L.J., Murphy, T.J., and Gramlich, J.W., J. Res. Nat. Bur. Stand. (U.S.) 87(1), 9, (1982.)

[2] Wapstra, A.H. and Bos, K., At. Data Nucl. Data Tables, 19, 175 (1977).

[3] Bower, V.E. and Davis, R.S., J. Res. Nat. Bur. Stand. (U.S.), 85(3), 175 (1980).

[4] Bower, V.E., Davis, R.S., Murphy, T.J., Paulsen, P.J., Gramlich, J.W., and Powell, L.J., J. Res. Nat. Bur. Stand. (U.S.), 87(1), 21 (1982).