

National Bureau of Standards

Certificate of Analysis

Standard Reference Material 1035

Leaded-Tin Bronze Alloy

(In cooperation with the American Society for Testing & Materials)

This Standard Reference Material (SRM) is in the form of chips and is intended for use in calibrating instruments used in the determination of sulfur in unalloyed copper and copper-base alloys.

Determination of Sulfur

Lab	Method ^a	Certified Value, ppm by wt	Estimated Uncertainty
NBS	Isotope Dilution-Thermal Ionization Mass Spectrometry (ID-TIMS)	22.3 ^b	0.3 ^c

Cooperating Labs	Method	Reported Average Value, ppm by wt ^d
1	Combustion-Infrared	(19.0)
2	Combustion-Infrared	(22)
3	Combustion-Infrared	(22)
4	Combustion-Infrared	(22)
5	Combustion-Infrared	(23.6)
6	Combustion-Infrared	(24.2)

^aID-TIMS - In this method, all sources of measurement error, including blank, have been investigated fully, and the certified value is believed to be free from systematic error, P. J. Paulsen and W. R. Kelly, Inorganic Analytical Research Division.

^bThe certified value is the *present best estimate* of the "true" value based on the results at NBS by using the ID-TIMS method.

^cThe estimated uncertainty is based on judgment and represents an evaluation of the combined effects of method imprecision and material variability (1 g or more).

^dCooperating laboratories were furnished a portion of SRM 52c, Cast Bronze (now out of stock), with an assigned value of 20 ppm of sulfur, for calibration of their equipment. The determined value for sulfur in SRM 52c is 19.8 ppm by ID-TIMS. If a linear correction is assumed for SRM 1035, the corrected average would be 21.9 ppm of sulfur, which is in good agreement with the certified value of 22.3 ppm.

PLANNING, PREPARATION, TESTING, ANALYSIS: The material for this standard was provided by the Bureau of Ships, U.S. Department of the Navy;

Homogeneity testing was performed by P.J. Paulsen and W.R. Kelly, Inorganic Analytical Research Division, and by R.K. Bell, ASTM-NBS Research Associate Program.

Cooperative analyses for certification were performed in the following laboratories:

American Cast Iron Pipe Co., Birmingham, Ala., R.N. Smith and L.J. Moore.

Kennecott Minerals Co., Research Center, Salt Lake City, Utah, A.P. Langheinrich.

Magma Copper Co., San Manuel Division, San Manuel, Ariz.; M. Greene and M. Toelkes.

Phelps Dodge Refining Corp., El Paso Works, El Paso, Texas, A.L. Cardinal.

U.S. Bureau of Mines, Albany Research Center, Albany, Oreg., A.J. Mackie and D.H. Bollman.

Western Electric, Hawthorne Station, Chicago, Ill., J.P. Kapetan.

The overall coordination of the technical measurements leading to certification were performed under the direction of J.I. Shultz, Research Associate, ASTM-NBS Research Associate Program.

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 R.E. Michaelis.

Although *not certified*, the following is given as additional information on the composition of SRM 1035.

<u>Element</u>	<u>Information Value, % by Wt</u>
Copper	(78.5)
Lead	(13.5)
Tin	(6.8)
Nickel	(0.75)
Zinc	(.25)
Iron	(.001)
Phosphorus	(.004)
Oxygen	(.64)