U. S. Department of Commerce
Malcolm Baldrige
Secretary

National Bureau of Standards
Ernest Ambler, Director

National Bureau of Standards

Certificate of Analysis

Standard Reference Material C1252

Phosphorized Copper – Cu IX

Wolverine Tube-NBS-ASTM Cooperative Program

This Standard Reference Material (SRM) is in the form of a directionally solidified chill-cast block, approximately 32 mm (1 1/4 in) square and 19 mm (3/4 in) thick. The test surface is opposite the numbered surface. The certified portion extends from the test surface to a depth of 13 mm (1/2 in). SRM C1253 is intended for use in the analysis of copper for trace elements. It is particularly well-suited for use in the calibration of instruments and the evaluation of optical emission methods of analysis.

The certified values are given in Table 1 and the noncertified values are given for information only in Table 2. Methods and techniques used in the certification of SRM C1252 are given in Table 3.

Table 1

Element	$\mu g/g^a$	Element	$\mu g/g^a$
Antimony	42 ± 3	Lead	60 ± 2
Arsenic	115 ± 2	Nickel	128 ± 3
Bismuth	21 ± 4	Selenium	53.6 ± 1.5
Cadmium	14 ± 2	Silver	166.6 ± 0.8
Chromium	7.4 ± 0.8	Tellurium	51 ± 4
Cobalt	90 ± 9	Zinc	60 ± 9
Gold	34.9 ± 0.2		

Percent by Weight

Copper, assay 99.89 ± 0.02

[a]The certified values and the estimated uncertainties are based on judgment and represent an evaluation of the combined effects of method imprecision, possible systematic errors among methods and material variability for samples of 1.0 g or more.

The overall coordination of the NBS measurements leading to certification was under the direction of I.L. Barnes.

The technical and support aspects involved in the issuance of this certificate were coordinated through the Office of Standard Reference Materials by R.E. Michaelis and T.E. Gills.

Gaithersburg, MD 20899
April 10, 1986
(Revision of certificate
dated 9-16-80)

Stanley D. Rasberry, Chief
Office of Standard Reference Materials

(Over)

Table 2. Noncertified Values for SRM C1252

These noncertified values are given as additional information on the composition of SRM C1252.

Element	μg/g
Aluminum	(7)
Beryllium	(<5)
Calcium	(6)
Iron	(35)
Lithium	(0.03)
Magnesium	(20)
Manganese	(17)
Silicon	(13)
Sulfur	(29)
Tin	(110)

MATERIAL PREPARATION

SRM C1252 is one in a series of twelve different copper composition "Benchmark" materials. The series consists of Cu "O" through Cu "XI" that was prepared in a cooperative NBS-ASTM-Industry Program.

The base material for the preparation of Cu IX was vacuum melted and cast into a single ingot at Cannon Muskegon Corp., Muskegon, Mich., at the request of R.E. Stanton of Wolverine Tube, Decatur, Ala. About 25 elements were included in the aim composition, covering the concentration range of about 15 to 500 μg/g.

The final base material for SRM C1252, Cu IX, was prepared by remelting and recasting portions of the original ingot sections on the NBS water-cooled, copper plate mold assembly at the Brass Foundry, American Cast Iron Pipe Co., Birmingham, Ala. The preparation and homogeneity testing plan was similar to that described in NBS Special Publication 260-2, Standard Reference Materials: Preparation of NBS Copper-Based Spectrochemical Standards.

Extensive homogeneity studies were performed at NBS Boulder, by J.G. Hust using residual resistivity ratio measurements, and at NBS Gaithersburg by C.H. Brady using metallographic studies, and by G.J. Lutz using neutron activation analysis. The results of measurements indicated the maximum material variability to be less than 10 percent.

Cooperative analyses for material characterization and certification were performed in the following laboratories:

Anaconda Company, Primary Metals Division, Raritan Copper Works, Perth Amboy, N.J., P.F. Stryker and A.J. Simon.

Kennecott Copper Corporation, Metals Mining Division, Salt Lake City, Utah, and Utah Copper Division, Magna, Utah, A.P. Langheinrich.

Kennecott Refining Corporation, Baltimore, Md., A.A. Di Leonardi.

Phelps Dodge Refining Corporation, El Paso Works, El Paso, Tex., A.L. Cardinal.

Reading Metals Refining Company, Carteret, N.J., W.P. Darrow.

U.S. Metals Refining Company, AMAX Copper Division, Carteret, N.J., R.M. Kennedy.

Analyses were performed in the NBS Inorganic Analytical Research Division by the following:

L. Beary
D.A. Becker
C. Blundell
K.A. Brletic
B.I. Diamondstone
M. Epstein
J.D. Fassett
E.L. Garner
J.W. Gramlich
R.R. Greenberg
W.R. Kelly
G.J. Lutz
L.A. Machlan
J.R. Moody
P.J. Paulsen
T.C. Rains
R.K. Bell, ASTM-NBS Research Associate

Table 3. Methods and Techniques Used For Determining the Certified Values in SRM C1252

Element	A	B	C	D	E	F	G	H	I
Antimony								•	
Arsenic		•						•	
Bismuth		•							•
Cadmium	•		•						
Chromium							•	•	
Cobalt								•	
Copper				•					
Gold		•				•			
Lead							•		
Nickel									•
Selenium							•	•	
Silver					•		•	•	
Tellurium							•		
Zinc								•	

A. Atomic Absorption Spectrometry
B. Chemical Analysis
C. DCP Atomic Emission Spectrometry
D. Electrogravimetry (corrected for silver)
E. Emission Spectrometry
F. Fire Assay Method
G. Isotope Dilution Spark Source Mass Spectrometry
H. Neutron Activation Analysis
I. Photon Activation Analysis