

UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON

National Bureau of Standards

Certificate of Analyses

Standard Sample 52c

Cast Bronze

ANALYST	COPPER Electrolytic	TIN SnCl ₂ -KIO ₃	ZINC ZnS-ZnO	NICKEL Weighed as nickel dimethylglyoxime	LEAD Weighed as PbO ₂	IRON	PHOSPHORUS Colorimetric	SULFUR
1	^a 89.24	^b 7.85	2.11	0.76	^c 0.012	^d 0.003	^e <0.001	^f 0.002
2	^a 89.23	^b 7.90	2.10	.76	ⁱ .011	^j .003		
3	^a 89.26 ^k 89.25	^l 7.85	2.13	^m .76	ⁿ .011	^o .004	^p <.002	^q .002
4	^r 89.29	^s 7.84	2.11	.76	.015	^t .005	^u .001	
5	89.22	^v 7.85	2.14	.77	.013	^w .003		^x .002
6	^a 89.25	^l 7.86	2.11	^x .76	.010	^j .006	^p .001	
7	^y 89.24	^s 7.84	2.14	^z .76	.009	^z .004	^p <.001	
	^z 89.24	^z 7.84	2.14	.76	^z .009	^{j, z} .003		
	^z 89.25	^v 7.84	2.11	.76	^z .010	^z .005		
Average	89.25	7.85	2.12	0.76	0.011	0.004		0.002

^a Five-gram sample dissolved in 110 ml of HNO₃(1+4). Metastannic-acid precipitate filtered off, treated with HNO₃-HClO₄-HBr, and the residual solution added to the first filtrate. Two drops of 0.1 N HCl added, solution diluted to 325 ml and electrolyzed overnight, using a current density of 0.5 amp/dm². H₂SO₄ added to the electrolyte, solution evaporated to fumes of H₂SO₄, diluted, and residual copper precipitated as CuS and determined by the diethyldithiocarbamate-colorimetric method.

^b Two-gram sample dissolved in HCl-HNO₃, iron added, and tin precipitated twice with NH₄OH. Precipitate dissolved in HCl, tin reduced with nickel and titrated with KIO₃ standardized with pure tin. See ASTM method E54-49, Methods for Chemical Analysis of Metals, p. 267 (1950). American Society for Testing Materials, Philadelphia, Pa.

^c Ten-gram sample dissolved in 80 ml of HNO₃(1+1). Metastannic-acid precipitate treated with HNO₃-HClO₄-HBr. Residual solution added to the first filtrate, diluted to 300 ml, and electrolyzed for 6 hours, using a current density of 0.2 amp/dm².

^d Filtrate from CuS separation (footnote a) boiled to remove H₂S. Zinc precipitated with H₂S in 0.01 N acid and ignited to ZnO. Filtrate boiled to remove H₂S. Iron oxidized, precipitated with NH₄OH, and determined with orthophenanthroline.

^e Molybdenum blue-photometric method.

^f Combustion-iodate method on 1-g sample. Determination made by Charles C. Marshall.

^g Copper deposited in the presence of tin in an HNO₃-HF solution.

^h Tin reduced with aluminum and titrated with iodine.

ⁱ Dithizone-photometric method.

^j NH₄CNS-photometric method.

^k Three-gram sample. Residual copper in the metastannic-acid precipitate determined separately.

^l Tin reduced with iron plus antimony and titrated with KIO₃.

^m Nickel precipitated with dimethylglyoxime and titrated with KCN.

ⁿ Fifty-gram sample.

^o Thioglycolic acid-photometric method.

^p Molybdivanadophosphoric acid method. See ASTM method E62-50T.

^q Combustion-iodate method.

^r Copper deposited from a 2-g sample in 1.5 hr in the presence of tin in an HNO₃-H₂SO₄-HF solution, using magnetic stirring.

^s Tin reduced with iron plus zinc, and titrated with KIO₃.

^t Iron titrated with Ti₂(SO₄)₃.

^u Alkali-molybdate method on 10-g sample.

^v Tin reduced with nickel and titrated with KIO₃.

^w Orthophenanthroline-photometric method.

^x Dimethylglyoxime-photometric method.

^y Five-gram sample. Metastannic-acid precipitate treated with HNO₃-HClO₄-HBr and residual copper determined electrolytically.

^z Tin reduced with iron powder and titrated with KIO₃.

¹ Same value obtained by the dimethylglyoxime-photometric method.

² KCNS-photometric method.

³ As in footnote (a), except residual copper determined by electrolysis.

⁴ Tin reduced with aluminum and titrated with KIO₃.

⁵ Ten-gram sample dissolved in 80 ml of HNO₃(1+1). Metastannic-acid precipitate filtered off, ignited at 500° C, leached with dilute HNO₃, and solution filtered. Filtrate added to the first filtrate and electrolyzed for 6 hr, using a current density of 0.1 amp/dm².

⁶ Same value obtained by the SnCl₂-K₂Cr₂O₇ method.

⁷ As in footnote (a), except residual copper determined by the iodide-thiosulfate method.

⁸ Twenty-gram sample dissolved in 150 ml of HNO₃(1+1). Metastannic-acid precipitate filtered off, treated with HNO₃-HClO₄-HBr, and the residual solution added to the first filtrate.

⁹ SnCl₂-K₂Cr₂O₇ method. See ASTM method E54-39.

List of Analysts

- Nonferrous Laboratory, National Bureau of Standards, R. K. Bell in charge. Analysis by E. E. Maczkowske.
- E. A. Schroeder, O. P. Case, and R. P. Nevers, The American Brass Co., Waterbury, Conn.
- A. B. Shapiro, H. Kramer and Co., Chicago, Ill.
- E. P. Buxton, Western Cartridge Co., East Alton, Ill.
R. W. Notvest and W. A. Eddie, National Bearing Division, American Brake Shoe Co., St. Louis, Mo.
- J. W. Claypool, Nassau Smelting & Refining Co., Tottenville, N. Y.
- John P. Brull, North American Smelting Co., Wilmington, Del.
- J. D. Kopp and F. M. Barry, Scovill Manufacturing Co., Waterbury, Conn.
- D. R. Evans and T. Moffat, Western Electric Co., Kearny, N. J.

The bronze for the preparation of this standard was furnished by The American Brass Co.

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A. V. ASTIN, *Director*.