

National Bureau of Standards

Certificate of Analysis

Standard Reference Material 332

Copper Concentrate

This material is in the form of fine powder intended for use both in checking chemical methods of analysis and in calibration with instrumental methods of analysis.

This SRM is one of a series of four SRM's issued primarily for use in evaluation of the critically important "material balance" in the copper mining and metallurgical industries. The other three are: SRM 330, Copper Ore, Mill Heads; SRM 331, Copper Ore, Mill Tails; and SRM 333, Molybdenum Concentrate.

CAUTION: The bottle should be kept tightly closed except when in direct use. Store in a desiccator over desiccant.

Constituent	Certified Value ^{a b}	Estimated Uncertainty ^c
	<u>Percent by Weight</u>	
Total Copper	28.4	0.1
Molybdenum	0.64	.01
	<u>PPM by Weight</u>	
Rhenium	10.2	0.2

^a Based on samples dried at 105 °C for two hours. Separate samples are used for rhenium and calculated to a dry-weight basis.

^b The certified value is the *best estimate* of the "true" value.

^c Estimated uncertainty includes both method imprecision and material variability with samples 0.5 g (or more) for total copper, 0.2 g (or more) for molybdenum and 2.5 g (or more) for rhenium.

The following values indicate the results of the analytical tests:

Constituent/Method ¹	Average	Standard Deviation ²	Number of Determinations
	<u>Percent by Weight</u>		
<u>Total Copper</u>			
Isotopic dilution mass spectrometry ³ (0.5 g samples)	28.40	0.04	12
Electrogravimetry (2 g samples)	28.39	.02	6
<u>Molybdenum</u>		<u>Range</u>	
Isotopic dilution mass spectrometry ³ (0.2 g samples)	0.639	0.008	3
	<u>PPM by Weight</u>		
<u>Rhenium</u>		<u>Range</u>	
Isotopic dilution mass spectrometry ³ (2.5 g samples)	10.20	0.20	3

¹ Details of the methods used, including drying and dissolution procedures, are given in a separate publication [1].

² Of single determinations for total Cu; range given for Mo and Re.

³ This method has been studied extensively and the data are considered free from systematic errors. [2].

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(Revision of Provisional Certificate of 2-20-73
 and draft certificates of 7-4-76 and 1-20-77)

(Over)

J. Paul Cali, Chief
 Office of Standard Reference Materials

PLANNING, PREPARATION, TESTING, ANALYSIS: The material for this SRM (332) was carefully selected and provided to NBS by Magma Copper Company, San Manuel, Arizona, through the courtesy of T. L. Young.

At NBS, the material was sieved and thoroughly blended, which involved several independent procedures [1].

Homogeneity testing of selected samples representative of the lot of SRM 332 was performed simultaneously with the analytical program for certification. The maximum variability for total copper was determined to be ± 0.06 percent (0.5 g samples).

Analyses were performed in the NBS Analytical Chemistry Division by R. K. Bell, E. L. Garner, J. W. Gramlich, L. A. Machlan, J. R. Moody, L. J. Moore, and T. J. Murphy.

The overall direction and coordination of the technical measurements at NBS leading to certification were performed under the direction of W. R. Shields and I. L. Barnes.

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.

ADDITIONAL INFORMATION ON THE COMPOSITION: Certification is made *only* for total Cu, Mo, and Re. Although NOT CERTIFIED, the following additional information on the composition may be of interest.

Gold and Silver

Fire assay determinations for Au and Ag were made at Magma Copper Company:

	Gold	Silver
	PPM by Weight	
Fire assay	(2.13)	(31.5)

REFERENCES

- [1] J. R. Moody, I. L. Barnes, and R. E. Michaelis, Standard Reference Materials: Copper Ore, Mill Heads - SRM 330; Copper Ore, Mill Tails - SRM 331; Copper Concentrate - SRM 332; and Molybdenum Concentrate - SRM 333, Nat. Bur. Stand. Spec. Publ. 260-xx (in press).
- [2] W. R. Shields, Editor, Nat. Bur. Stand. Tech. Note 546, (1970).