



Standard Test Methods for Chemical Analysis of Copper-Tellurium Alloys¹

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1. Scope

1.1 These test methods cover procedures for the chemical analysis of copper-tellurium alloys having chemical compositions within the following limits:

Copper, ^A %	98 and over
Tellurium, %	0.04 to 0.6

^AIncludes silver.

1.2 The analytical procedures appear in the following order:

Copper by the Electrolytic Method	Sections 8 to 12
Tellurium by the Dichromate (Volumetric) Method	13 to 17

2. Referenced Documents

2.1 ASTM Standards:

- E 29 Practice for Using Significant Digits in Test Data to Determine Conformance With Specifications²
- E 50 Practices for Apparatus, Reagents, and Safety Precautions for Chemical Analysis of Metals³
- E 55 Practice for Sampling Wrought Nonferrous Metals and Alloys for Determination of Chemical Composition³

3. Significance and Use

3.1 These test methods for the chemical analysis of metals and alloys are primarily intended to test such materials for compliance with compositional specifications. It is assumed that all who use these test methods will be trained analysts capable of performing common laboratory procedures skillfully and safely. It is expected that work will be performed in a properly equipped laboratory.

4. Apparatus and Reagents

4.1 Apparatus and reagents required for each determination are listed in separate sections preceding the procedure. The apparatus, standard solutions, and certain other reagents used in more than one procedure are referred to by number and shall conform to the requirements prescribed in Practices E 50.

5. Precautions

5.1 For precautions to be observed in these test methods, reference shall be made to Practices E 50.

6. Sampling

6.1 Sampling shall conform to Practice E 55.

7. Rounding Calculated Values

7.1 Calculated values shall be rounded to the desired number of places in accordance with the rounding method given in 3.4 and 3.5 of Practice E 29.

COPPER BY THE ELECTROLYTIC TEST METHOD

8. Summary of Test Method

8.1 Copper is deposited electrolytically on a platinum cathode. The addition of manganese nitrate to the electrolyte prevents the deposition of tellurium.

9. Apparatus

9.1 *Electrodes for Electroanalysis*—Apparatus No. 9.

10. Reagents

10.1 *Manganese Nitrate Solution* (20 g/L)—Dilute 4 mL of the commercially available $\text{Mn}(\text{NO}_3)_2$ solution (50 %) to 100 mL with water.

10.2 *Potassium Permanganate Solution* (20 g/L)—Dissolve 2 g of KMnO_4 in water and dilute to 100 mL.

10.3 *Sulfuric-Nitric Acid Mixture*—Add slowly, while stirring, 300 mL of H_2SO_4 to 750 mL of water. Cool and add 210 mL of HNO_3 .

11. Procedure

11.1 Transfer 2.00 g of the sample to a 300-mL electrolysis beaker. Add 30 mL of H_2SO_4 - HNO_3 mixture, cover, and allow to stand a few minutes until reaction has nearly ceased. Heat at 80 to 90°C until dissolution is complete and brown fumes have been expelled. Wash down the cover glass and the sides of the beaker and dilute to about 200 mL. Add KMnO_4 solution dropwise until a faint, permanent pink color is produced and then add 5 mL of $\text{Mn}(\text{NO}_3)_2$ solution.

11.2 Insert the electrodes, cover the solution with a pair of split watch glasses, and electrolyze at a current density of about 0.6 A/dm² for about 16 h or at a current density of 4 A/dm² for

¹ These test methods are under the jurisdiction of ASTM Committee E-1 on Analytical Chemistry for Metals, Ores, and Related Materials and are the direct responsibility of Subcommittee E01.05 on Cu, Pb, Zn, Cd, Sn, Be, their Alloys and Related Metals.

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² *Annual Book of ASTM Standards*, Vol 14.02.

³ *Annual Book of ASTM Standards*, Vol 03.05.