



Standard Test Method for Fire Assay Determination of Gold in Copper Concentrates by Gravimetry¹

This standard is issued under the fixed designation E 1805; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method is for the determination of gold in copper concentrates in the concentration range from 0.2 to 17 µg/g (0.007 to 0.500 Troy oz/short ton).

NOTE 1—The lower scope limit is set in accordance with Practice E 1601.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

D 1193 Specification for Reagent Water²

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications³

E 50 Practices for Apparatus, Reagents, and Safety Precautions for Chemical Analysis of Metals³

E 135 Terminology Relating to Analytical Chemistry for Metals, Ores, and Related Materials³

E 691 Practice for Conducting an Interlaboratory Test Program to Determine the Precision of Test Methods⁴

E 882 Guide for Accountability and Quality Control in the Quality Control Laboratory²

E 1601 Practice for Conducting an Interlaboratory Study to Evaluate the Performance of an Analytical Method⁴

3. Terminology

3.1 For definitions of terms used in this test method, refer to Terminology E 135.

4. Summary of Test Method

4.1 A test sample of copper concentrate is fused in a clay crucible. The precious metals are reduced, collected in a lead button, and then cupelled in a bone ash crucible, (cupel), to

remove the lead. The remaining doré bead is parted with nitric acid to remove the silver and other impurities from the gold. The gold then is cleaned, and weighed on a microbalance.

5. Significance and Use

5.1 In the metallurgical process used in the mining industries, gold is often carried along with copper during the flotation concentration process. Metallurgical accounting, process control, and concentrate evaluation procedures for this type of material depend on an accurate, precise measurement of the gold in the copper concentrate. This test method is intended to be a reference method for metallurgical laboratories and a referee method to settle disputes in commercial transactions.

5.2 It is assumed that all who use this test method will be trained analysts capable of performing common laboratory operations skillfully and safely. It is expected that the work will be performed in a properly equipped laboratory under appropriate quality control practices such as those described in Guide E 882.

6. Interferences

6.1 Elements normally found in copper concentrates do not interfere. High concentrations of arsenic, antimony, tellurium, bismuth, nickel, and platinum group metals (and, in some instances, copper), however, may interfere with the fusion and cupellation steps.

7. Apparatus

7.1 *Analytical Balance*, capable of weighing to 0.1 g.

7.2 *Semi-Microbalance*, capable of weighing to 0.001 mg.

7.3 *Assay Mold*, 100-mL capacity.

7.4 *Cube or Cone Mixer*, 1000-g capacity.

7.5 *Cupel*, magnesite or bone ash—40-g lead capacity.

7.6 *Dry Oven*, forced air circulation with temperature control, 104°C.

7.7 *Fire Assay Bead Brush*.

7.8 *Fire Assay Bead Pliers*.

7.9 *Fire Assay Clay Crucible*, 20 to 30-sample capacity.

7.10 *Fire Assay Tongs*, crucible and cupel.

7.11 *Fire Assay Tumble Mixer*, an industrial mixer-crucible tumbler.

7.12 *Hot Plate*, with variable temperature control and ventilation controls for acid fumes.

¹ This test method is under the jurisdiction of ASTM Committee E-1 on Analytical Chemistry for Metals, Ores, and Related Materials and is the direct responsibility of Subcommittee E01.02 on Ores, Concentrates, and Related Metallurgical Materials.

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² *Annual Book of ASTM Standards*, Vol 03.05.

³ *Annual Book of ASTM Standards*, Vol 14.02.

⁴ *Annual Book of ASTM Standards*, Vol 03.06.