**Designation: ~~E1568 – 03 (Reapproved 2008)$^{\varepsilon 1}$~~ E1568 – 13**

# Standard Test Method for Determination of Gold in Activated Carbon by Fire Assay Gravimetry[1]

This standard is issued under the fixed designation E1568; 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 ($\varepsilon$) indicates an editorial change since the last revision or reapproval.

~~$\varepsilon^1$ NOTE—Warning notes were editorially revised throughout in November 2008.~~

## 1. Scope

1.1 This test method covers the determination of gold in activated carbon by fire assay collection and gravimetric measurement. It covers the range of ~~15 µg~~15 µg/g to 5000 µg/g gold.

1.2 The values stated in SI units are to be regarded as the standard. ~~The inch-pound values given in parentheses are for information only and are not considered~~ No other units of measurement are included in this standard.

1.3 *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.* For specific hazards statements, see Section 9 and 11.2.3-11.2.5, 11.3.4, and 11.3.4.

## 2. Referenced Documents

2.1 *ASTM Standards:*[2]

D2862 Test Method for Particle Size Distribution of Granular Activated Carbon
D2866 Test Method for Total Ash Content of Activated Carbon
D2867 Test Methods for Moisture in Activated Carbon
E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
E50 Practices for Apparatus, Reagents, and Safety Considerations for Chemical Analysis of Metals, Ores, and Related Materials
E135 Terminology Relating to Analytical Chemistry for Metals, Ores, and Related Materials
E173 Practice for Conducting Interlaboratory Studies of Methods for Chemical Analysis of Metals (Withdrawn 1998)[3]
E276 Test Method for Particle Size or Screen Analysis at No. 4 (4.75-mm) Sieve and Finer for Metal-Bearing Ores and Related Materials
E300 Practice for Sampling Industrial Chemicals
E882 Guide for Accountability and Quality Control in the Chemical Analysis Laboratory
E1601 Practice for Conducting an Interlaboratory Study to Evaluate the Performance of an Analytical Method



## 3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, refer to Terminology E135.

## 4. Summary of Test Method

4.1 The weighed test sample is ignited and fused with fire assay flux in a clay crucible. The lead metal from the fusion is separated and the precious metals concentrated by oxidation and adsorption of the lead on a cupel, the silver is parted with nitric acid, and the gold is annealed and weighed on a microbalance.

[1] This test method is under the jurisdiction of ASTM Committee E01 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] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

## 5. Significance and Use

5.1 In the primary metallurgical processes used by the mineral processing industry for gold bearing ores, gold is extracted with alkaline cyanide solutions and adsorbed onto activated carbon for recovery of the metal. Metallurgical accounting, process control, and ore evaluation procedures for this type of mineral processing plant depend on accurate, precise, and prompt measurements of gold concentrations in the activated carbon.

5.2 This test method for gold in activated carbon is intended primarily as a referee method to test such materials for metal content. It is assumed that those who use these procedures 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 and that proper waste disposal procedures will be followed. Appropriate quality control practices must be followed, such as those described in Guide E882.

## 6. Interferences

6.1 Elements normally found in ore processing activated carbon do not interfere. When present, platinum group metals may be reported as gold in gravimetric fire assay determinations and must be less than 0.1 mg in the final gold bead.

## 7. Apparatus

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

7.2 *Assay Mold,* 100-mL capacity.

7.3 *Cupel,* magnesite, 30-g lead capacity.

7.4 *Drying Oven,* having forced air circulation, with temperature control between 145 °C and 155 °C.

7.5 *Fire Clay Crucible,* 30-g sample capacity.

7.6 *Hot Plate,* having variable temperature control, used with ventilation control for acid fumes.

7.7 *Jeweler's Rolls,* capable of flattening doré beads.

7.8 *Muffle Furnace,* having air circulation with draft controls, capable of temperatures to 1100 °C, accurate to ± 10 °C, used with ventilation controls for lead fumes.

7.9 *Semi-Microbalance,* capable of weighing to 0.01 mg.

7.10 *Roasting Dish,* 15-g sample capacity.



## 8. Reagents

8.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available.[4] Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

8.2 *Ammonia Wash Solution,* $NH_4OH$ (1 + 17)—Add 100 mL $NH_4OH$ to 1700 mL of water.

8.3 *Borax*—$Na_2B_4O_7$—Sodium borate powder, with gold content less than 0.001 µg/g.

8.4 *Fire Assay Flux Mixture*—Mix 575 g of litharge (PbO) with 275 g of soda ash ($Na_2CO_3$), 75 g of borax ($Na_2B_4O_7$), 75 g of silica ($SiO_2$), and 30 g of baking flour.

8.5 *Lead Foil*—99.9 % minimum, with gold content less than 0.001 µg/g.

8.6 *PbO*—Lead oxide powder, with gold content less than 0.001 µg/g.

8.7 *$SiO_2$*—Silicon dioxide powder, with gold content less than 0.001 µg/g.

8.8 *Silver Foil*—99.9 % minimum, with gold content less than 0.001 µg/g.

8.9 *$Na_2CO_3$*—Sodium carbonate powder, with gold content less than 0.001 µg/g.

8.10 *Strong $HNO_3$ (1 + 2) Parting Solution*—Add 330 mL $HNO_3$ to 660 mL of water.

8.11 *Weak $HNO_3$ (1 + 4) Parting Solution*—Add 200 mL $HNO_3$ to 800 mL water.

## 9. Hazards

9.1 Refer to Practices E50 for precautions to be observed in this test method.

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[4] *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC, www.chemistry.org. For suggestions on the testing of reagents not listed by the American Chemical Society, see the *United States Pharmacopeia and National Formulary*, U.S. Pharmacopeial Convention, Inc. (USPC), Rockville, MD, http://www.usp.org.