



Standard Test Method for Determination of Gold in Cyanide Solutions by Atomic Absorption Spectrometry¹

This standard is issued under the fixed designation E 1600; 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 covers the determination of gold in ore processing cyanide solution in the range from 0.3 to 10.0 $\mu\text{g/mL}$ of gold by direct aspiration into an atomic absorption spectrophotometer.

1.1.1 This test method may also be applied to cyanide leach solutions from metallurgical evaluation procedures.

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.* Specific precautions are given in Section 8 and in specific warning notes throughout.

2. Referenced Documents

2.1 ASTM Standards:

D 1293 Test Methods for pH of 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 Metals⁴

E 173 Practice for Conducting Interlaboratory Studies of Methods for Chemical Analysis of Metals⁴

E 663 Practice for Flame Atomic Absorption Analysis⁵

E 882 Guide for Accountability and Quality Control in the Chemical Analysis Laboratory⁵

E 1024 Guide for Chemical Analysis of Metals and Metal Bearing Ores by Flame Atomic Absorption Spectrophotometry⁵

E 1060 Practice for Interlaboratory Testing of Spectrochemical Methods of Analysis⁵

3. Summary of Test Method

3.1 The sample solution is collected and preserved with

sodium hydroxide, if necessary, by careful adjustment of pH. The test solution is filtered and gold content is determined by flame atomic absorption spectrophotometry.

4. Significance and Use

4.1 In primary metallurgical processes for gold bearing ores, gold is extracted with an alkaline cyanide solution. Metallurgical accounting, process control, and ore evaluation procedures depend on accurate, precise, and prompt measurements of the gold concentrations.

4.2 This test method is a referee method for compliance with compositional specifications for metal content. It is assumed that all who use this procedure 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. Follow appropriate quality control practices such as those described in Guide E 882.

5. Interferences

5.1 Elements normally found in ore processing cyanide solutions do not interfere. Use of instrumental background correction is required to compensate for nonspecific absorption interferences in the flame.

6. Apparatus

6.1 *Atomic Absorption Spectrophotometer*, equipped with background correction and capable of measuring gold at the 242.8-nm wavelength using an air and acetylene flame over a linear range from 0.3 to 10.0 $\mu\text{g/mL}$ gold.

7. Reagents

7.1 *Sodium Cyanide–Sodium Hydroxide Solution*—Dissolve 10 g of sodium hydroxide (NaOH) and 10 g of sodium cyanide (NaCN) in 1 L of water.

NOTE 1—Warning: The preparation, storage, use, and disposal of NaCN solutions require special care and attention. Avoid any possibility of inhalation, ingestion, or skin contact with the compound, its solution, or its vapors. Work only in a well-ventilated hood. Refer to Practices E 50.

7.2 *Gold Standard Solution A*—Weigh 1.000 g of gold metal (99.99 % min purity) and transfer to a 1-L beaker in a fume hood. Add 200 mL of water, 80 mL of HCl, and 50 mL of HNO₃(1 + 1). Boil gently to expel NO_x fumes, cool, transfer to a 1-L volumetric flask, dilute to volume, and mix.

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

Current edition approved April 10, 1996. Published June 1996. Originally published as E 1600 – 94. Last previous edition E 1600 – 94.

² *Annual Book of ASTM Standards*, Vol 11.01.

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

⁴ *Annual Book of ASTM Standards*, Vol 03.05.

⁵ *Annual Book of ASTM Standards*, Vol 03.06.