



Standard Practice for Electrothermal (Graphite Furnace) Atomic Absorption Analysis¹

This standard is issued under the fixed designation E 1184; 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 practice covers a procedure for the determination of microgram per millilitre (µg/mL) or lower concentrations of elements in solution using an electrothermal atomization device attached to an atomic absorption spectrophotometer. A general description of the equipment is provided. Recommendations are made for preparing the instrument for measurements, establishing optimum temperature conditions and other criteria which should result in determining a useful calibration concentration range, and measuring and calculating the test solution analyte concentration.

1.2 *This standard does not purport to address all of the safety problems, 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 safety hazard statements are given in Section 9.

NOTE 1—This practice is a companion to Practice E 663.

2. Referenced Documents

2.1 ASTM Standards:

- E 50 Practices for Apparatus, Reagents, and Safety Precautions for Chemical Analysis of Metals
- E 131 Terminology Relating to Molecular Spectroscopy
- E 135 Terminology Relating to Analytical Chemistry for Metals, Ores, and Related Materials²
- E 406 Practice for Using Controlled Atmospheres in Spectrochemical Analysis³
- E 416 Practice for Planning and Safe Operation of a Spectrochemical Laboratory³
- E 663 Practice for Flame Atomic Absorption Analysis³
- E 863 Practice for Describing Flame Atomic Absorption Spectroscopy Equipment³

3. Terminology

3.1 Refer to Terminology E 131 and E 135 for the definition of terms used in this practice.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *atomization*—the formation of ground state atoms that absorb radiation from a line emission source (see Practice E 663). The atomization process in electrothermal atomic absorption analysis is covered in greater detail in 6.2.

3.2.2 *pyrolysis*—the process of heating a specimen to a temperature high enough to remove or alter its original matrix, but not so high as to volatilize the element to be measured. The purpose of the pyrolysis step in electrothermal atomic absorption analysis is to remove or alter the original specimen matrix, thereby reducing or eliminating possible interferences to the formation of ground state atoms that are formed when the temperature is increased during the atomization step. Many publications and references will refer to pyrolysis as *charring* or *ashing*.

3.2.3 *pyrolytic graphite coating*—a layer of pyrolytic graphite that coats a graphite tube used in electrothermal atomic absorption analysis. Pyrolytic graphite is formed by pyrolyzing a hydrocarbon, for example, methane, at 2000°C.

3.2.4 *ramping*—a slow, controlled increase of the temperature in the graphite tube. Ramping will provide for an efficient but not too rapid removal or decomposition of the specimen matrix. Most electrothermal atomizers allow for ramping during the drying, pyrolysis, and atomization steps. It is usually employed during the drying and pyrolysis steps. However, some instrument manufacturers may recommend ramping during the atomization step depending on the specimen matrix and the element being measured (for example, the analysis of cadmium or lead in hair or blood). The power supplies for most instruments also allow the rate of the temperature increase to be varied.

¹ This practice is under the jurisdiction of ASTM Committee E01 on Analytical Chemistry for Metals, Ores and Related Materials and is the direct responsibility of Subcommittee E01.20 on Fundamental Practices and Measurement Traceability.

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