



Standard Practice for Measuring Trace Elements in Water by Graphite Furnace Atomic Absorption Spectrophotometry¹

This standard is issued under the fixed designation D3919; 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 the general considerations for the quantitative determination of trace elements in water and wastewater by graphite furnace atomic absorption spectrophotometry. Furnace atomizers are a most useful means of extending detection limits; however, the practice should only be used at concentration levels below the optimum range of direct flame aspiration atomic absorption spectrophotometry. Because of differences between various makes and models of satisfactory instruments, no detailed operating instructions can be provided for each instrument. Instead, the analyst should follow the instructions provided by the manufacturer of a particular instrument.

1.2 Wavelengths, estimated detection limits, and optimum concentration ranges are given in the individual methods. Ranges may be increased or decreased by varying the volume of sample injected or the instrumental settings or by the use of a secondary wavelength. Samples containing concentrations higher than those given in the optimum range may be diluted or analyzed by other techniques.

1.3 This technique is generally not applicable to brines and seawater. Special techniques such as separation of the trace elements from the salt, careful temperature control through ramping techniques, or matrix modification may be useful for these samples.

1.4 The analyst is encouraged to consult the literature as provided by the instrument manufacturer as well as various trade journals and scientific publications.

1.5 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.6 *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 appro-*

priate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 ASTM Standards:²

- D1129 Terminology Relating to Water
- D1193 Specification for Reagent Water
- D2777 Practice for Determination of Precision and Bias of Applicable Test Methods of Committee D19 on Water
- D3370 Practices for Sampling Water from Closed Conduits
- D4841 Practice for Estimation of Holding Time for Water Samples Containing Organic and Inorganic Constituents
- D5673 Test Method for Elements in Water by Inductively Coupled Plasma—Mass Spectrometry
- D5810 Guide for Spiking into Aqueous Samples
- D5847 Practice for Writing Quality Control Specifications for Standard Test Methods for Water Analysis

3. Terminology

3.1 *Definitions*—For definitions of terms used in this practice, refer to Terminology D1129.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *graphite furnace, n*—an electrothermal graphite device capable of reaching the specified temperatures required by the element being determined.

3.2.2 *platform or similar device, n*— a flat, grooved or ungrooved piece of pyrolytic graphite (which is inserted in the graphite tube) on which the sample is placed (**1**).³

4. Summary of Practice

4.1 The element is determined by an atomic absorption spectrophotometer used in conjunction with a graphite furnace. The principle is essentially the same as with direct flame aspiration atomic absorption except a furnace, rather than a flame, is used to atomize the sample. The elemental atoms to be

¹ This practice is under the jurisdiction of ASTM Committee D19 on Water and is the direct responsibility of Subcommittee D19.05 on Inorganic Constituents in Water.

Current edition approved Feb. 1, 2015. Published March 2015. Originally approved in 1980. Last previous edition approved in 2008 as D3919 – 08. DOI: 10.1520/D3919-15.

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 boldface numbers in parentheses refer to the list of references at the end of this standard.