



Standard Test Methods for Chemical Analysis of Graphite¹

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^{ε1} NOTE—Subsection 1.2 was corrected editorially in February 2017.

1. Scope*

1.1 These test methods cover the chemical analysis of graphite.

1.2 The analytical procedures appear in the following order:

	Sections
Silicon by the Molybdenum Blue (Colorimetric) Test Method	9 to 15
Iron by the α -Phenanthroline (Colorimetric) Test Method	16 to 22
Calcium by the Permanganate (Colorimetric) Test Method	23 to 29
Aluminum by the 2-Quinizarin Sulfonic Acid Test Method	30 to 36
Titanium by the Peroxide (Colorimetric) Test Method	37 to 44
Vanadium by the 3,3'-Dimethylnaphthidine (Colorimetric) Test Method	45 to 52
Boron by the Curcumin-Oxalic Acid (Colorimetric) Test Method	53 to 60

1.3 The preferred concentration of sought element in the final solution, the limits of sensitivity, and the precision of the results are given in Table 1.

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

1.5 *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.* See 56.1 for specific caution statement.

2. Referenced Documents

2.1 ASTM Standards:²

C561 Test Method for Ash in a Graphite Sample

D1193 Specification for Reagent Water

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

¹ These test methods are under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and are the direct responsibility of Subcommittee D02.F0 on Petroleum Products, Liquid Fuels, and Lubricants

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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. Terminology

3.1 Definitions:

3.1.1 *calibration curve, n*—graphical or mathematical representation of the relationship between known concentrations of an element in a series of standard calibration solutions and the measured response from the measurement system.

3.1.2 *calibration solutions, n*—solutions of accurately known concentrations of the chemical element to be determined using the calibration curve method.

3.1.3 *colorimetric analysis, n*—photometric analysis method of using absorption of monochromatic light in the visible spectrum.

3.1.4 *photometric analysis, n*—analytical chemistry method for quantitative chemical analysis based on the relationship between solution concentrations and the absorption of monochromatic light, as expressed by the Beer law.

4. Significance and Use

4.1 These test methods provide a practical way to measure the concentration of certain trace elements in graphite. Many end uses of graphite require that it be free of elements which may be incompatible with certain nuclear applications. Other elemental contamination can affect the rate of oxidative degradation.

4.2 These test methods allow measurement of trace amounts of contaminants with a minimal amount of costly equipment. The colorimetric procedures used are accessible to most laboratories.

4.3 Other instrumental analysis techniques are available, capable of simultaneous quantitative analysis of 76 stable elements in a single run, with detectability limits in the parts per million range. Standards are currently being developed for elemental analysis of impurities in graphite using glow discharge mass spectrometry (GDMS), inductively coupled plasma optical emission spectroscopy (ICP-OES), combustion ion chromatography (CIC).

5. Reagents

5.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that

*A Summary of Changes section appears at the end of this standard