



Standard Test Method for Total Sulfur in Coal and Coke Combustion Residues Using a High-Temperature Tube Furnace Combustion Method with Infrared Absorption¹

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1. Scope

1.1 This test method describes a procedure using a high-temperature tube furnace and infrared detection for the determination of sulfur in coal and coke combustion residues, including lab ashes and residues from coal and coke combustion.

1.2 The values stated in SI units are to be regarded as standard. 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.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[D121 Terminology of Coal and Coke](#)

[D3174 Test Method for Ash in the Analysis Sample of Coal and Coke from Coal](#)

[D3682 Test Method for Major and Minor Elements in Combustion Residues from Coal Utilization Processes](#)

[D3683 Test Method for Trace Elements in Coal and Coke Ash by Atomic Absorption](#)

[D4326 Test Method for Major and Minor Elements in Coal and Coke Ash By X-Ray Fluorescence](#)

[D4621 Guide for Quality Management in an Organization That Samples or Tests Coal and Coke \(Withdrawn 2010\)](#)³

[D5142 Test Methods for Proximate Analysis of the Analysis](#)

¹ This test method is under the jurisdiction of ASTM Committee [D05](#) on Coal and Coke and is the direct responsibility of Subcommittee [D05.29](#) on Major Elements in Ash and Trace Elements of Coal.

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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.

[Sample of Coal and Coke by Instrumental Procedures \(Withdrawn 2010\)](#)³

[D6349 Test Method for Determination of Major and Minor Elements in Coal, Coke, and Solid Residues from Combustion of Coal and Coke by Inductively Coupled Plasma—Atomic Emission Spectrometry](#)

[D6357 Test Methods for Determination of Trace Elements in Coal, Coke, and Combustion Residues from Coal Utilization Processes by Inductively Coupled Plasma Atomic Emission Spectrometry, Inductively Coupled Plasma Mass Spectrometry, and Graphite Furnace Atomic Absorption Spectrometry](#)

3. Terminology

3.1 For definitions of terms used in these test methods, refer to Terminology [D121](#).

3.2 Throughout this test method the term ash is used to describe the sample being analyzed. The term ash is to be interpreted as a combustion residue.

4. Summary of Test Method

4.1 A weighed test portion is mixed with a promoting agent and ignited in a tube furnace at an operating temperature of 1450 °C in a stream of oxygen. The combustible sulfur contained in the test portion is oxidized to gaseous oxides of sulfur. Moisture and particulates are removed by traps filled with anhydrous magnesium perchlorate. The gas stream is passed through a cell in which sulfur dioxide is measured by an infrared absorption detector. Sulfur dioxide absorbs IR energy at a precise wavelength within the IR spectrum. Energy is absorbed as the gas passes through the cell body in which the IR energy is being transmitted; thus, at the detector, less energy is received. All other IR energy is eliminated from reaching the detector by a precise wavelength filter. The absorption of IR energy can be attributed only to sulfur dioxide whose concentration is proportional to the change in energy at the detector. One cell is used as both a reference and a measurement chamber. Total sulfur as sulfur dioxide is detected on a continuous basis.

4.2 This test method is applicable for use with sulfur analyzers equipped to carry out the operations in [4.1](#) and must