



## Standard Test Methods for Total Sulfur in the Analysis Sample of Coal and Coke<sup>1</sup>

This standard is issued under the fixed designation D 3177; 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 These test methods cover two alternative procedures for the determination of total sulfur in samples of coal and coke. Sulfur is included in the ultimate analysis of coal and coke.

1.2 The procedures appear in the following order:

|                              |           |
|------------------------------|-----------|
| Method A—Eschka Method       | Sections  |
| Method B—Bomb Washing Method | 6-9       |
|                              | 10 and 11 |

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.* Specific precautionary statements are given in Sections 11.1.1-11.1.1.7.

1.4 The values stated in SI units are to be regarded as the standard.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

- D 346 Practice for Collection and Preparation of Coke Samples for Laboratory Analysis<sup>2</sup>
- D 1193 Specification for Reagent Water<sup>3</sup>
- D 2013 Practice for Preparing Coal Samples for Analysis<sup>2</sup>
- D 2015 Test Method for Gross Calorific Value of Coal and Coke by the Adiabatic Bomb Calorimeter<sup>2</sup>
- D 3173 Test Method for Moisture in the Analysis Sample of Coal and Coke<sup>2</sup>
- D 3176 Practice for Ultimate Analysis of Coal and Coke<sup>2</sup>
- D 3180 Practice for Calculating Coal and Coke Analyses from As-Determined to Different Bases<sup>2</sup>
- D 3286 Test Method for Gross Calorific Value of Coal and Coke by the Isoperibol Bomb Calorimeter<sup>2</sup>
- E 144 Practice for Safe Use of Oxygen Combustion Bombs<sup>4</sup>

<sup>1</sup> These test methods are under the jurisdiction of ASTM Committee D05 on Coal and Coke and are the direct responsibility of Subcommittee D05.21 on Methods of Analysis.

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<sup>2</sup> Annual Book of ASTM Standards, Vol 05.06.

<sup>3</sup> Annual Book of ASTM Standards, Vol 11.01.

<sup>4</sup> Annual Book of ASTM Standards, Vol 14.04.

### 3. Summary of Test Methods

3.1 *Eschka Method*—A weighed sample and Eschka mixture are intimately mixed and ignited together. The sulfur is dissolved in hot water and then precipitated from the resulting solution as barium sulfate (BaSO<sub>4</sub>). The precipitate is filtered, ashed, and weighed.

3.2 *Bomb Washing Method*—Sulfur is precipitated as BaSO<sub>4</sub> from oxygen-bomb calorimeter washings, and the precipitate is filtered, ashed, and weighed.

### 4. Significance and Use

4.1 Determination of sulfur is, by definition, part of the ultimate analysis of coal.

4.2 Sulfur analysis results obtained by these methods are used to serve a number of interests: evaluation of coal preparation, evaluation of potential sulfur emissions from coal combustion or conversion processes, evaluation of the coal quality in relation to contract specification, and other purposes of commercial or scientific interest.

### 5. Sample

5.1 The sample shall be the material pulverized to pass No. 60 (250-μm) sieve in accordance with Method D 2013 or Method D 346.

5.2 A separate portion of the analysis sample should be analyzed for moisture content in accordance with Test Method D 3173, so that calculation to other than the as-determined basis can be made.

5.3 Procedures for converting as-determined sulfur values obtained from the analysis sample to other bases are described in Practice D 3176 and Method D 3180.

5.4 Standard Reference Material (SRM), such as SRM Nos. 2682 through 2685—Sulfur in Coal<sup>5</sup> which consist of four different coals that have been individually crushed and ground to pass a No. 60 (250-μm) sieve, and bottled in 50-g units, or other commercially available reference material coals with a certified sulfur content of ± 0.0xx precision can be used. Sulfur values obtained by analyzing these coals, using any of

<sup>5</sup> Available from National Institute of Standards and Technology, Gaithersburg, MD 20899.