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Standard Practice for Proximate Analysis of Coal and Coke¹

This standard is issued under the fixed designation D3172; 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.

^{ε1} NOTE—Editorial corrections were made throughout in May 2021.

1. Scope

1.1 This practice covers the determination of moisture, volatile matter, and ash and the calculation of fixed carbon on coals and cokes sampled and prepared by prescribed methods and analyzed according to ASTM established procedures.

1.2 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.3 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[D121 Terminology of Coal and Coke](#)

[D346 Practice for Collection and Preparation of Coke Samples for Laboratory Analysis](#)

[D388 Classification of Coals by Rank](#)

[D2013/D2013M Practice for Preparing Coal Samples for Analysis](#)

[D2234/D2234M Practice for Collection of a Gross Sample of Coal](#)

[D3173 Test Method for Moisture in the Analysis Sample of Coal and Coke](#)

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

[D3175 Test Method for Volatile Matter in the Analysis](#)

¹ This practice is under the jurisdiction of ASTM Committee D05 on Coal and Coke and is the direct responsibility of Subcommittee D05.21 on Methods of Analysis.

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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.

Sample of Coal and Coke

[D4596 Practice for Collection of Channel Samples of Coal in a Mine](#)

[D5192 Practice for Collection of Coal Samples from Core](#)

[D6883 Practice for Manual Sampling of Stationary Coal from Railroad Cars, Barges, Trucks, or Stockpiles](#)

[D6609 Guide for Part-Stream Sampling of Coal](#)

[D7430 Practice for Mechanical Sampling of Coal](#)

[D7582 Test Methods for Proximate Analysis of Coal and Coke by Macro Thermogravimetric Analysis](#)

3. Terminology

3.1 *Definitions:*

3.1.1 *proximate analysis of coal and coke*—an assay of the moisture, ash, and volatile matter as determined by prescribed methods and the calculation of fixed carbon by difference. Other constituents such as sulfur and characteristics such as gross calorific value are not included.

3.1.2 For additional definitions of terms used in this practice, refer to Terminology [D121](#).

4. Significance and Use

4.1 Test methods, as herein described, can be used to establish the rank of coals, show the ratio of combustible to incombustible constituents, provide the basis for buying and selling, and evaluate for beneficiation or for other purposes.

5. Sampling

5.1 If the proximate analysis is to be used for classification of coal by rank, coal sample collection shall be in accordance with Classification [D388](#). Otherwise, coal sample collection shall be done in accordance with any of the following Guides or Practices as appropriate:

Guide [D6609](#), Practice [D4596](#), Practice [D5192](#), Practice [D6883](#), and Practice [D7430](#). In all other cases, sample collection shall be in accordance with Practice [D2234/D2234M](#).

5.2 Coke sampling shall be done in accordance with Practice [D346](#).

6. Analysis Sample

6.1 For coal, sample preparations shall be in accordance with Practices [D2013/D2013M](#) or [D7430](#). The analysis sample

shall be the material pulverized to pass a 250 μm (No. 60) sieve in accordance with Practice **D2013/D2013M**.

6.2 For coke, sample preparations shall be in accordance with Practice **D346**.

7. Test Methods

7.1 *Moisture*—Test Methods **D3173** and **D7582**.

7.2 *Ash*—Test Methods **D3174** and **D7582**.

7.3 *Volatile Matter*—Test Methods **D3175** and **D7582**. If the modified procedure of **D3175** is required, the report should show that the modified procedure was used.

7.4 *Fixed Carbon*—The fixed carbon is a calculated value. It is the resultant of the summation of percentage moisture, ash, and volatile matter subtracted from 100 %. All percentages shall be on the same moisture reference base.

$$\text{Fixed carbon} = 100 - (\text{moisture} + \text{ash} + \text{volatile matter}) \quad (1)$$

where the unit for all quantities is expressed as %.

8. Keywords

8.1 ash; coal; coal rank; coke; fixed carbon; moisture; proximate analysis; volatile matter

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