



Designation: D3176 – 15 (Reapproved 2023)

Standard Practice for Ultimate Analysis of Coal and Coke¹

This standard is issued under the fixed designation D3176; 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 approval. A superscript symbol (¹) indicates an editorial change since the last revision or approval.

1. Scope

1.1 This practice covers the term ultimate analysis as it is applied to the analysis of coal and coke. The information derived is intended for the general utilization by applicable industries, to provide the basis for evaluation, beneficiation, or for other purposes.

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

1.2.1 All percentages are percent mass fractions.

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

1.4 This international standard was developed in accordance with internationally recognized principles on standardization established in the Declaration 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

D3596 Practice for Collection and Preparation of Coke Samples for Laboratory Analysis

D2013 Practice for Preparing Coal Samples for Analysis

D2234/D2234M Practice for Collection of a Gross Sample of Coal

D3172 Practice for Proximate Analysis of Coal and Coke

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

D3302 Test Method for Total Moisture in Coal

D4239 Test Method for Sulfur in the Analysis Sample of Coal and Coke Using High-Temperature Tube Furnace Combustion

D4596 Practice for Collection of Channel Samples of Coal in a Mine

D5192 Practice for Collection of Coal Samples from Core

D5373 Test Methods for Determination of Carbon, Hydrogen and Nitrogen in Analysis Samples of Coal and Carbon in Analysis Samples of Coal and Coke

D6609 Guide for Part-Stream Sampling of Coal

D6883 Practice for Manual Sampling of Stationary Coal from Railroad Cars, Barges, Trucks, or Stockpiles

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 ultimate analysis—in the case of coal and coke, the determination of carbon, hydrogen, nitrogen, and sulfur in the material, as found in the gaseous products of its complete combustion, the determination of ash in the material as a whole, and the calculation of oxygen by difference.

Note 1—Moisture is not by definition a part of the ultimate analysis of coal or coke but must be determined in order that analytical data may be converted to bases other than that of the analysis sample.

Note 2—Inasmuch as some coals contain mineral carbonates, and practically all contain clay or shale containing combined water, a part of the carbon, hydrogen, and oxygen found in the products of combustion may arise from these mineral components.

4. Significance and Use

4.1 Summarizing the ash content and the content of the organic constituents in a specific format under the heading, *Ultimate Analysis*, provides a convenient and uniform system for comparing coals or cokes. This tabulation used with that of *Proximate Analysis* (Practice D3172) permits cursory valuation of coals for use as fuel or in other carbonaceous processes and of cokes for metallurgical purpose.

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.

Astm Standard Coal Analysis

ASTM International

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ASTM Standards on Coal and Coke American Society for Testing Materials. Committee D-5 on Coal and Coke,1936
Handbook of Coal Analysis James G. Speight,2005-05-13 All the guidance needed to test coal and analyze the results With the skyrocketing costs of most fuel sources government industry and consumers are taking a greater interest in coal an abundant and inexpensive alternative which has been made more environmentally friendly through new technology Published in response to this renewed interest Handbook of Coal Analysis provides readers with everything they need to know about testing and analyzing coal Moreover it explains the meaning of test results and how these results can predict coal behavior and its corresponding environmental impact during use The thorough coverage of coal analysis includes Detailed presentation of necessary standard tests and procedures Explanation of coal behavior relative to its usage alongside the corresponding environmental issues Coverage of nomenclature terminology sampling and accuracy and precision of analysis Step by step test method protocols for proximate analysis ultimate analysis mineral matter physical and electrical properties thermal properties mechanical properties spectroscopic properties and solvent properties Emphasis on relevant American Society for Testing and Materials ASTM standards and test methods including corresponding International Organization for Standardization ISO and British Standards Institution BSI test method numbers To assist readers in understanding the material a glossary of terms is provided Each term is defined in straightforward language that enables readers to better grasp complex concepts and theory References at the end of each chapter lead readers to more in depth discussions of specialized topics This is an essential reference for analytical chemists process chemists and engineers in the coal industry as well as other professionals and researchers who are looking to coal as a means to decrease dependence on foreign oil sources and devise more efficient cleaner methods of energy production

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Standard Practice for Preparing Coal Samples for Analysis ASTM International,2012 *A.S.T.M. Standards on Coal and Coke* American Society for Testing Materials. Committee D-5 on Coal and Coke,1947 *A.S.T.M. Standards on Coal and Coke* American Society for Testing and Materials. Committee D-5 on Coal and Coke,1959

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