



Designation: D3176 – 89 (Reapproved 2002)

Standard Practice for Ultimate Analysis of Coal and Coke¹

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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 *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.*

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

2. Referenced Documents

2.1 *ASTM Standards:*²

D346 Practice for Collection and Preparation of Coke Samples for Laboratory Analysis²

D2013 Practice for Preparing Coal Samples for Analysis²

D2234/D2234M Practice for Collection of a Gross Sample of Coal²

D2361 Test Method for Chlorine in Coal^{3 2}

D2795 Test Methods for Analysis of Coal and Coke Ash^{3 2}

D3172 Practice for Proximate Analysis of Coal and Coke²

D3173 Test Method for Moisture in the Analysis Sample of Coal and Coke²

D3174 Test Method for Ash in the Analysis Sample of Coal and Coke from Coal²

D3177 Test Methods for Total Sulfur in the Analysis Sample of Coal and Coke²

D3178 Test Methods for Carbon and Hydrogen in the Analysis Sample of Coal and Coke^{3 2}

D3179 Test Methods for Nitrogen in the Analysis Sample of Coal and Coke^{3 2}

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 *Annual Book of ASTM Standards*, Vol 05.06.

³ Withdrawn. The last approved version of this historical standard is referenced on www.astm.org.

D4239 Test Methods for Sulfur in the Analysis Sample of Coal and Coke Using High-Temperature Tube Furnace Combustion Methods²

D5142 Test Methods for Proximate Analysis of the Analysis Sample of Coal and Coke by Instrumental Procedures²

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

3. Terminology

3.1 *Definitions:*

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

NOTE 1—The determination of phosphorus or chlorine is not by definition a part of the ultimate analysis of coal or coke. See Test Method D2361 for the determination of chlorine and Test Methods D2795 for the determination of phosphorus.

NOTE 2—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 3—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.

5. General Requirements

5.1 Coal sample collection shall be in accordance with Practice D2234/D2234M, and sample preparation shall be in accordance with Method D2013. Coke sampling and preparation shall be in accordance with Practice D346.