



Designation: D7569/D7569M – 24

Standard Practice for Determination of Gas in Coal—Direct Desorption Method¹

This standard is issued under the fixed designation D7569/D7569M; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This practice describes methods for the direct determination of the gas in coal by desorption using samples obtained by drill coring methods from the surface. It sets out guidelines for the equipment construction, sample preparation and testing procedure, and method of calculation.

1.2 Indirect methods for the determination of the gas in coal (not covered in this practice) are based on either the gas absorption characteristics of coal under a given pressure and temperature condition or other empirical data that relate the gas in coal to such other parameters as coal rank, depth of cover, or gas emission rate.

1.3 This practice covers the following two direct methods, which vary only in the time allowed for the gas to desorb from the core, or sidewall core, before final crushing:

1.3.1 The slow desorption method in which volumetric readings of gas volume are taken frequently (for example, every 10 min to 15 min) during the first few hours, followed by hourly measurements for several hours, and then measurements on 24-h intervals until no or very little gas is being desorbed for an extended period of time.

1.3.2 The fast desorption method in which after initial desorbed gas measurements to obtain data for lost gas calculations are taken, the canister is opened and the sample is transferred to the coal crusher. The remaining gas volume is measured on a crushed sample.

1.4 This practice is confined to the direct method using core, or sidewall core obtained from drilling. The practice can be applied to drill cuttings samples; however, the use of cuttings is not recommended because the results may be misleading and are difficult to compare to the results obtained from core desorption. The interpretation of the results does not fall within the scope of the practice.

1.5 *Units*—The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents;

therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.6 *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.*

1.7 *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
- D167 Test Method for Apparent and True Specific Gravity and Porosity of Lump Coke
- D1412 Test Method for Equilibrium Moisture of Coal at 96 to 97 Percent Relative Humidity and 30 °C
- D2799 Test Method for Microscopical Determination of the Maceral Composition 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
- D3176 Practice for Ultimate Analysis of Coal and Coke
- D3180 Practice for Calculating Coal and Coke Analyses from As-Determined to Different Bases
- D3302 Test Method for Total Moisture in Coal
- D5192 Practice for Collection of Coal Samples from Core
- E1272 Specification for Laboratory Glass Graduated Cylinders

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.

2.2 Australian Standard:

AS 3980 Guide to the determination of gas content of coal—Direct desorption method³

2.3 ISO Standard:

ISO 6706 Plastics laboratory ware—Graduated measuring cylinders⁴

2.4 DIN Standard:

DIN 12681 Plastics laboratory ware—Graduated measuring cylinders⁵

3. Terminology

3.1 Definitions:

3.1.1 For additional definitions of terms used in this practice, refer to Terminology **D121**.

3.1.2 *absolute permeability*, *n*—permeability of a rock to a particular fluid when the rock is 100 % saturated with the flowing fluid. **(1)**⁶

3.1.3 *absorbed gas*, *n*—gas that is molecularly dissolved within a liquid phase or has penetrated into the lattice structure of a solid. **(1)**

3.1.4 *actual lost gas time*, *n*—lost gas time determined from the time at which the sample being recovered reaches a depth where the hydrostatic pressure of the drilling fluid column equals the original (immediately before sampling) reservoir pressure in the sample to the time at which the sample is sealed in a desorption canister.

3.1.4.1 *Discussion*—Essentially, the actual lost gas time is the amount of time between when the core starts its trip to the surface and when it is sealed in the canister. **(1)**

3.1.5 *adsorption*, *n*—attachment, through physical or chemical bonding, of fluid phase molecules to an interfacial surface.

3.1.5.1 *Discussion*—The adsorbed phase molecules are sequestered at the interfacial surface in a metastable equilibrium state, the stability of which is strongly affected by changes in temperature and pressure. **(1)**

3.1.6 *adsorption isotherm*, *n*—quantitative relationship, at constant temperature, describing how the concentration of adsorbed phase molecules at an interfacial surface varies as a function of increasing system pressure. **(1)**

3.1.7 *as-received basis*, *n*—analytical data calculated to the moisture condition of the sample as it arrived at the laboratory and before any processing or conditioning.

3.1.7.1 *Discussion*—If the sample has been maintained in a sealed state so that there has been no gain or loss, the as-received basis is equivalent to the moisture basis as sampled. **(D3180, D5192, D1412, D3302)**

3.1.8 *canister*, *n*—container that can be sealed into which a coal sample is placed to allow desorption to occur.

3.1.8.1 *Discussion*—The reduction in pressure to atmospheric pressure (at the surface) causes the sample to release gas into the canister. By measuring the volume of gas released and the mass of the sample, the gas level can be determined. Gas level is conventionally reported in units of cubic centimetres/gram (cm³/g), cubic metres/tonne (m³/Mg), or standard cubic feet/ton (scf/ton). **(1)**

3.1.9 *continuous coring*, *v*—refers to continuous coring with wireline recovery. **(1)**

3.1.10 *conventional core*, *n*—“large” diameter core (8.9 cm [3.5 in.] diameter or larger) in which the core barrel is recovered to the surface after drilling a fixed interval by pulling the drill string. **(1)**

3.1.11 *core*, *n*—*in drilling*, a cylindrical section of rock (coal) that is usually 5 cm to 10 cm in diameter taken as part of the interval penetrated by a core bit and brought to the surface for geologic examination, representative sampling, and laboratory analyses. **(D121, D5192)**

3.1.12 *cuttings*, *n*—*in drilling*, rock fragments that break away because of the action of the drill bit and are transported to the surface by the drilling circulation system (mud or air).

3.1.12.1 *Discussion*—Cuttings may be screened and collected from the circulation medium for lithologic characterization or analytical tests. **(2)**

3.1.13 *delivery tube*, *n*—flexible tube connecting a desorption canister to a volumetric displacement apparatus. **(1)**

3.1.14 *desorption*, *n*—detachment of adsorbed molecules from an interfacial surface (see *adsorption*). **(1)**

3.1.15 *desorption data analysis software*, *n*—software used for analyzing desorption data. **(1)**

3.1.16 *desorption rate*, *n*—volumetric rate at which gas desorbs from a sample. **(1)**

3.1.17 *diffusion*, *n*—process whereby particles of liquids or gases move from a region of higher to lower concentration independent of the pressure gradient. **(1)**

3.1.18 *diffusivity*, *n*—ratio of the diffusion coefficient to the square of a typical diffusion distance. **(1)**

3.1.19 *direct desorption method*, *n*—method for representing desorption of gas from coal or other materials in which gas storage as a result of adsorption is significant.

3.1.19.1 *Discussion*—It mathematically presumes constant temperature diffusion from a sphere initially at uniform gas concentration. The solution of the basic equation adopted suggests that the measured desorbed gas volume is proportional to the square root of time since the start of desorption (time zero). The direct method is the most widely used method for estimating lost gas volume. **(1)**

3.1.20 *dry, ash-free basis*, *n*—data calculated to a theoretical base of no moisture or ash associated with the sample.

3.1.20.1 *Discussion*—Numerical values as established by Test Methods **D3173** and **D3174** are used for converting the as-determined data to a moisture- and ash-free basis. **(D3180)**

³ Available from Standards Australia Limited, 286 Sussex St., Sydney, NSW, 2000, Australia, GPO Box 476, Sydney, NSW, 2001 Australia or via the website: www.standards.org.au.

⁴ Available from the International Organization for Standardization (ISO), 1, rue de Varembe, Case Postale 56, CH-1211 Geneva 20, Switzerland or via the website: <http://www.iso.org/>.

⁵ Available from Deutsches Institut für Normung e. V., 10772 Berlin or via the website: <http://www2.din.de>.

⁶ The boldface numbers in parentheses refer to the standards in Section 2, or a list of references at the end of this standard.