



Designation: D 3175 – 02

Standard Test Method for Volatile Matter in the Analysis Sample of Coal and Coke¹

This standard is issued under the fixed designation D 3175; 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 This test method determines the percentage of gaseous products, exclusive of moisture vapor, in the analysis sample which are released under the specific conditions of the test.

1.2 This test method for determination of volatile matter is empirical; because of its empirical nature, strict adherence to basic principals and permissible procedures is required to obtain valid results.

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.*

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 Analysis²

D 2013 Method of Preparing Coal Samples for Analysis²

D 3173 Test Method for Moisture in the Analysis Sample of Coal and Coke²

3. Terminology

3.1 Definition:

3.1.1 *sparking fuels*—within the context of this test method, fuels that do not yield a coherent cake as residue in the volatile matter determination but do evolve gaseous products at a rate sufficient to mechanically carry solid particles out of the crucible when heated at the standard rate. Such coals normally include all low-rank noncaking coals and lignites but may also include those anthracites, semianthracites, bituminous, chars and cokes that lose solid particles as described above. These are defined as sparking fuels because particles escaping at the higher temperatures may become incandescent and spark as they are emitted.

¹ This test method 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 05.05.

4. Summary of Test Method

4.1 Volatile matter is determined by establishing the loss in weight resulting from heating a coal or coke under rigidly controlled conditions. The measured weight loss, corrected for moisture as determined in Test Method D 3173 establishes the volatile matter content. Two procedures are described to permit conformity with differences in sample behavior.

4.2 In this empirical test method, the use of platinum crucibles shall be considered the standard reference method for volatile matter. Platinum crucibles shall be used in determining the volatile matter of coke and volatile matter determined for classification of coals by rank. Volatile matter determinations by some laboratories using alternate nickel-chromium alloy crucibles having the physical dimensions specified in 6.1 have been shown to differ from those obtained using platinum crucibles. A laboratory utilizing nickel-chromium crucibles shall first determine if a relative bias exists between the use of nickel-chromium and platinum crucibles on the coals is being tested. Where a relative bias is shown to exist, the volatile matter determined using nickel-chromium crucibles shall be corrected by a factor determined through comparison of volatile matter results from both crucible types on coals being tested or analysis of samples of known proximate analysis.

5. Significance and Use

5.1 Volatile matter, when determined as herein described, may be used to establish the rank of coals, to indicate coke yield on carbonization process, to provide the basis for purchasing and selling, or to establish burning characteristics.

6. Apparatus

6.1 *Platinum Crucible*, with closely fitting cover, for coal. The crucible shall be of not less than 10 or more than 20-mL capacity, not less than 25 or more than 35 mm in diameter, and not less than 30 or more than 35 mm in height.

6.2 *Platinum Crucible*, with closely fitting cover, for coke. The crucible shall be of 10-mL capacity, with capsule cover having thin flexible sides fitting down into crucible. Or the

double-crucible method may be used, in which the sample is placed in 10-mL platinum crucible, which is then covered with another crucible of such a size that it will fit closely to the sides of the outer crucible and its bottom will rest 8.5 to 12.7 mm ($\frac{1}{3}$ to $\frac{1}{2}$ in.) above the bottom of the outer crucible.

6.3 *Alternate Crucible Materials*, Nickel-chromium crucible with closely fitting cover. The crucible shall not be less than 10 or more than 20 mL capacity, not less than 25 or more than 35 mm in diameter, and not less than 30 or more than 35

mm in height. Nickel-chromium crucibles shall be heat-treated for 4 h at 500°C to ensure that they are completely oxidized prior to use.

6.4 *Vertical Electric Tube Furnace*, for coal or coke. The furnace may be of the form shown in Fig. 1. It shall be regulated to maintain a temperature of $950 \pm 20^\circ\text{C}$ in the crucible, as measured by a thermocouple positioned in the furnace.

6.5 *Balance*, sensitive to 0.1 mg.

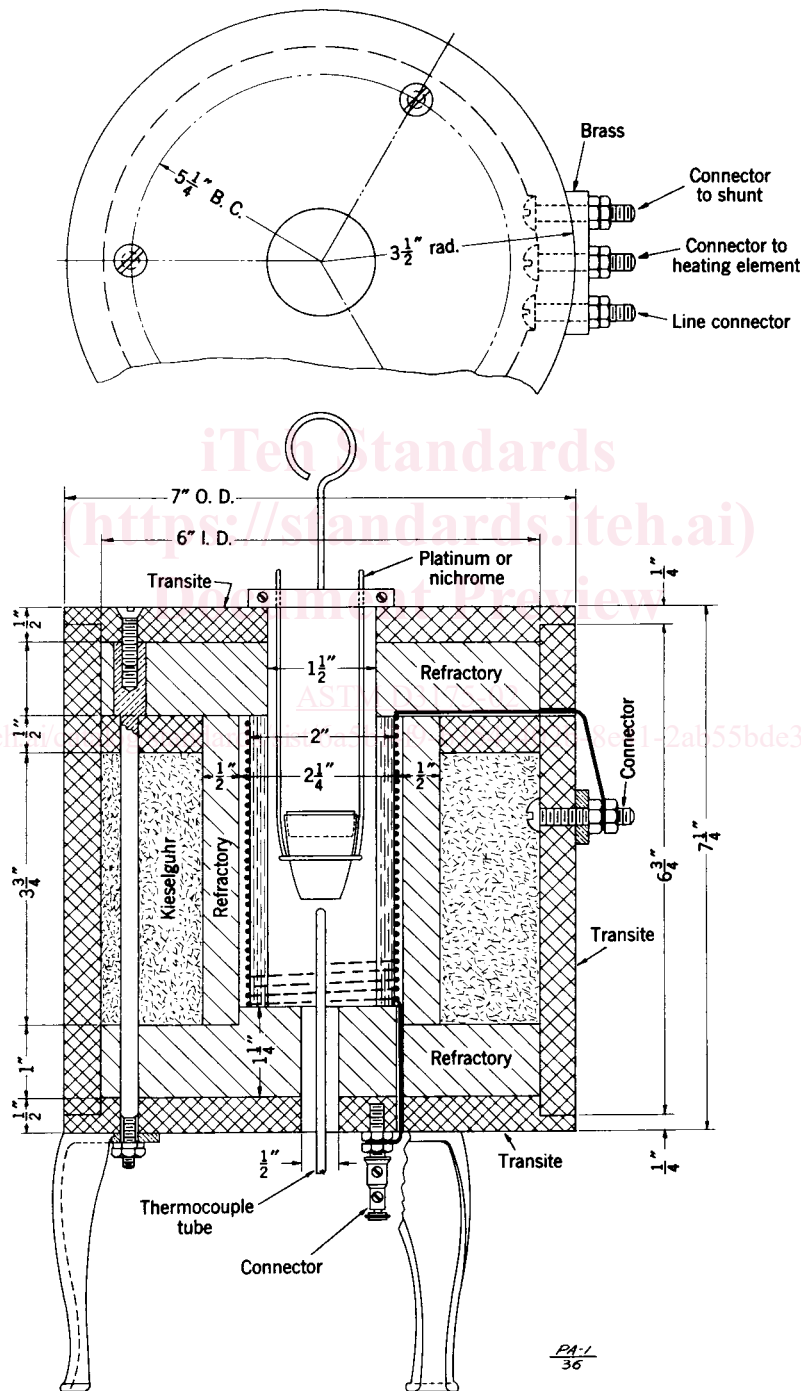


FIG. 1 Electric Furnace for Determining Volatile Matter