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An American National Standard
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Standard Test Method for Ramsbottom Carbon Residue of Petroleum Products¹

This standard is issued under the fixed designation D 524; 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.

This standard has been approved for use by agencies of the Department of Defense.

This test method has been adopted for use by government agencies to replace Method 5002 of Federal Test Method Standard No. 791b.

1. Scope

1.1 This test method covers the determination of the amount of carbon residue (Note 1) left after evaporation and pyrolysis of an oil, and is intended to provide some indication of relative coke-forming propensity. This test method is generally applicable to relatively nonvolatile petroleum products which partially decompose on distillation at atmospheric pressure. Petroleum products containing ash-forming constituents as determined by Test Method D 482, will have an erroneously high carbon residue, depending upon the amount of ash formed (Note 2 and Note 3).

NOTE 1—The term *carbon residue* is used throughout this test method to designate the carbonaceous residue formed during evaporation and pyrolysis of a petroleum product. The residue is not composed entirely of carbon, but is a coke which can be further changed by pyrolysis. The term *carbon residue* is continued in this test method only in deference to its wide common usage.

NOTE 2—Values obtained by this test method are not numerically the same as those obtained by Test Method D 189, or Test Method D 4530. Approximate correlations have been derived (see Fig. X2.1) but need not apply to all materials which can be tested because the carbon residue test is applicable to a wide variety of petroleum products. The Ramsbottom Carbon Residue test method is limited to those samples that are mobile below 90°C.

NOTE 3—In diesel fuel, the presence of alkyl nitrates such as amyl nitrate, hexyl nitrate, or octyl nitrate, causes a higher carbon residue value than observed in untreated fuel, which can lead to erroneous conclusions as to the coke-forming propensity of the fuel. The presence of alkyl nitrate in the fuel can be detected by Test Method D 4046.

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.*

2. Referenced Documents

2.1 ASTM Standards:

- D 189 Test Method for Conradson Carbon Residue of Petroleum Products²
- D 482 Test Method for Ash from Petroleum Products²
- D 4046 Test Method for Alkyl Nitrate in Diesel Fuels by Spectrophotometry³
- D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products³
- D 4175 Terminology Relating to Petroleum, Petroleum Products, and Lubricants³
- D 4177 Practice for Automatic Sampling of Petroleum and Petroleum Products³
- D 4530 Test Method for Determination of Carbon Residue (Micro Method)³
- E 1 Specification for ASTM Thermometers⁴
- E 133 Specification for Distillation Equipment⁵

3. Terminology

3.1 Definitions:

3.1.1 *carbon residue, n*—the residue formed by evaporation and thermal degradation of a carbon containing material.

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3.1.1.1 *Discussion*—The residue is not composed entirely of carbon but is a coke that can be further changed by carbon pyrolysis. The term carbon residue is retained in deference to its wide common usage.

4. Summary of Test Method

4.1 The sample, after being weighed into a special glass bulb having a capillary opening, is placed in a metal furnace maintained at approximately 550°C. The sample is thus quickly heated to the point at which all volatile matter is evaporated out of the bulb with or without decomposition while the heavier residue remaining in the bulb undergoes

¹ This test method is under the jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.06 on Analysis of Lubricants.

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In the IP, this test method is under the jurisdiction of the Standardization Committee.

² *Annual Book of ASTM Standards*, Vol 05.01.

³ *Annual Book of ASTM Standards*, Vol 05.02.

⁴ *Annual Book of ASTM Standards*, Vol 14.03.

⁵ *Annual Book of ASTM Standards*, Vol 14.02.