Designation: D5292 – 99 (Reapproved 2009)

Standard Test Method for Aromatic Carbon Contents of Hydrocarbon Oils by High Resolution Nuclear Magnetic Resonance Spectroscopy[1]

This standard is issued under the fixed designation D5292; 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 covers the determination of the aromatic hydrogen content (Procedures A and B) and aromatic carbon content (Procedure C) of hydrocarbon oils using high-resolution nuclear magnetic resonance (NMR) spectrometers. Applicable samples include kerosenes, gas oils, mineral oils, lubricating oils, coal liquids, and other distillates that are completely soluble in chloroform at ambient temperature. For pulse Fourier transform (FT) spectrometers, the detection limit is typically 0.1 mol % aromatic hydrogen atoms and 0.5 mol % aromatic carbon atoms. For continuous wave (CW) spectrometers, which are suitable for measuring aromatic hydrogen contents only, the detection limit is considerably higher and typically 0.5 mol % aromatic hydrogen atoms.

1.2 The reported units are mole percent aromatic hydrogen atoms and mole percent aromatic carbon atoms.

1.3 This test method is not applicable to samples containing more than 1 mass % olefinic or phenolic compounds.

1.4 This test method does not cover the determination of the percentage mass of aromatic compounds in oils since NMR signals from both saturated hydrocarbons and aliphatic substituents on aromatic ring compounds appear in the same chemical shift region. For the determination of mass or volume percent aromatics in hydrocarbon oils, chromatographic, or mass spectrometry methods can be used.

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

1.6 *This standard does not purport to address all of the safety problems, 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.* Specific precautionary statements are given in 7.2 and 7.3.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D3238 Test Method for Calculation of Carbon Distribution and Structural Group Analysis of Petroleum Oils by the n-d-M Method

D3701 Test Method for Hydrogen Content of Aviation Turbine Fuels by Low Resolution Nuclear Magnetic Resonance Spectrometry

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

E386 Practice for Data Presentation Relating to High-Resolution Nuclear Magnetic Resonance (NMR) Spectroscopy

2.2 *Energy Institute Methods:*

IP Proposed Method BD Aromatic Hydrogen and Aromatic Carbon Contents of Hydrocarbon Oils by High Resolution Nuclear Magnetic Resonance Spectroscopy [3]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *aromatic carbon content*—mole percent aromatic carbon atoms or the percentage of aromatic carbon of the total carbon:

$$\textit{aromatic carbon content} = 100 \times (\textit{aromatic carbon atoms})/(\textit{total carbon atoms}) \quad (1)$$

3.1.1.1 *Discussion*—For example, the aromatic carbon content of toluene is 100 × (6/7) or 85.7 mol % aromatic carbon atoms.

[1] This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.04.0F on Absorption Spectroscopic Methods.

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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.

[3] Available from Energy Institute, 61 New Cavendish St., London, WIG 7AR, U.K.

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