Designation: D5443 – 14

Standard Test Method for Paraffin, Naphthene, and Aromatic Hydrocarbon Type Analysis in Petroleum Distillates Through 200 °C by Multi-Dimensional Gas Chromatography[1]

This standard is issued under the fixed designation D5443; 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 paraffins, naphthenes, and aromatics by carbon number in low olefinic hydrocarbon streams having final boiling points of 200 °C or less. Hydrocarbons with boiling points greater than 200 °C and less than 270 °C are reported as a single group. Olefins, if present, are hydrogenated and the resultant saturates are included in the paraffin and naphthene distribution. Aromatics boiling at C_9 and above are reported as a single aromatic group.

1.2 This test method is not intended to determine individual components except for benzene and toluene that are the only C_6 and C_7 aromatics, respectively, and cyclopentane that is the only C_5 naphthene. The lower limit of detection for a single hydrocarbon component or group is 0.05 % by mass.

1.3 This test method is applicable to hydrocarbon mixtures including virgin, catalytically converted, thermally converted, alkylated and blended naphtha.

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

1.4.1 The abbreviation for SI unit "coulomb" is "C".

1.5 *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.* Specific precautionary statements are given in Section 7 and Table 1.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

D4307 Practice for Preparation of Liquid Blends for Use as Analytical Standards

D5134 Test Method for Detailed Analysis of Petroleum Naphthas through n-Nonane by Capillary Gas Chromatography

D6839 Test Method for Hydrocarbon Types, Oxygenated Compounds, and Benzene in Spark Ignition Engine Fuels by Gas Chromatography

3. Summary of Test Method

3.1 A representative sample is introduced into a gas chromatographic system containing a series of columns and switching valves. As the sample passes through a polar column, the polar aromatic compounds, bi-naphthenes, and high boiling (>200 °C) paraffins and naphthenes are retained. The fraction not retained elutes to a platinum column, that hydrogenates olefins, if present, in this fraction, and then to a molecular sieve column which performs a carbon number separation based on molecular structure, that is, naphthenes and paraffins. The fraction remaining on the polar column is further divided into three separate fractions that are then separated on a non-polar column by boiling point. Eluting compounds are detected by a flame ionization detector.

3.2 The mass concentration of each group is determined by the multiplication of detected peak areas by flame ionization detector response factors and normalization to 100 %.

3.3 This test method provides limited identification of individual hydrocarbon components. Test Method D5134 may be used to obtain speciation of a number of individual compounds. For samples containing olefins, Test Method D6839 provides carbon number distributions of hydrocarbon types (PIONA).

4. Significance and Use

4.1 A knowledge of the composition of hydrocarbon refinery streams is useful for process control and quality assurance.

4.2 Aromatics in gasoline are soon to be limited by federal mandate. This test method can be used to provide such information.

[1] This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.04.0L on Gas Chromatography 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.

***A Summary of Changes section appears at the end of this standard**

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