



Standard Test Method for Hydrocarbon Types, Oxygenated Compounds and Benzene in Spark Ignition Engine Fuels by Gas Chromatography¹

This standard is issued under the fixed designation D 6839; 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 provides for the quantitative determination of saturates, olefins, aromatics and oxygenates in spark-ignition engine fuels by multidimensional gas chromatography. Each hydrocarbon type can be reported either by carbon number (see Note 1) or as a total.

NOTE 1—There can be an overlap between the C_9 and C_{10} aromatics; however, the total is accurate. Isopropyl benzene is resolved from the C_8 aromatics and is included with the other C_9 aromatics.

1.2 This test method is applicable to spark-ignition engine fuel with total aromatic content up to 50 % (V/V), total olefinic content up to 30 % (V/V) and oxygen compounds up to 15 % (V/V).

1.3 This test method is not intended to determine individual hydrocarbon components except benzene.

1.4 Oxygenates as specified in Test Method D 4815 have been verified not to interfere with hydrocarbons. Within the round robin sample set, the following oxygenates have been tested: MTBE, ethanol, ETBE, and TAME. Other oxygenates can be determined and quantified using Test Method D 4815 or D 5599.

1.5 The values stated in SI units are to be regarded as the standard.

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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

D 4307 Practice for Preparation of Liquid Blends for Use as Analytical Standards²

D 4815 Test Method for Determination of MTBE, ETBE, TAME, DIPE tertiary-Amyl Alcohol and C_1 to C_4 Alcohols in Gasoline by Gas Chromatography²

D 5599 Test Method for Determination of Oxygenates in Gasoline by Gas Chromatography and Oxygen Selective Flame Ionization Detection³

3. Terminology

3.1 Definitions:

3.1.1 *oxygenate, n*—an oxygen-containing organic compound, which may be used as a fuel or fuel supplement, for example, various alcohols and ethers.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *hydrogenation, n*—the process of adding hydrogen to olefin molecules as a result of a catalytic reaction.

3.2.1.1 *Discussion*—Hydrogenation is accomplished when olefins in the sample contact platinum at a temperature of 180°C in the presence of hydrogen. The olefins are converted into hydrogen saturated compounds of the same carbon number and structure. Monoolefins and diolefins convert to paraffins while cycloolefins and cyclodienes convert to cycloparaffins.

3.2.2 *trap, n*—a device utilized to selectively retain specific portions (individual or groups of hydrocarbons or oxygenates) of the test sample and to release the retained components by changing the trap temperature.

3.3 Acronyms:

3.3.1 *ETBE*—ethyl-*tert*-butylether

3.3.2 *MTBE*—methyl-*tert*-butylether

3.3.3 *TAME*—*tert*-amyl-methylether

4. Summary of Test Method

4.1 A representative sample is introduced into a computer controlled gas chromatographic system⁴ consisting of switching valves, columns, and an olefin hydrogenation catalyst, all operating at various temperatures. The valves are actuated at predetermined times to direct portions of the sample to appropriate columns and traps. As the analysis proceeds, the

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² *Annual Book of ASTM Standards*, Vol 05.02.

³ *Annual Book of ASTM Standards*, Vol 05.03.

⁴ The sole source of supply of the AC Reformulyzer known to the committee at this time is AC Analytical Controls, Inc., 3494 Progress Dr., Bensalem, PA 19020. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,¹ which you may attend.