



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 D6839; 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.

NOTE—Previously balloted and approved material was included and the year date changed on April 20, 2016.

1. Scope*

1.1 This test method covers 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 not intended to determine individual hydrocarbon components except benzene.

1.3 This test method is divided into two parts, Part A and Part B.

1.3.1 Part A is applicable to automotive motor gasoline for which precision (Table 9) has been obtained for total volume fraction of aromatics of up to 50 %; a total volume fraction of olefins from about 1.5 % up to 30 %; a volume fraction of oxygenates, from 0.8 % up to 15 %; a total mass fraction of oxygen from about 1.5 % to about 3.7 %; and a volume fraction of benzene of up to 2 %. Although this test method can be used to determine higher-olefin contents of up to 50 % volume fraction, the precision for olefins was tested only in the range from about 1.5 % volume fraction to about 30 % volume fraction. The method has also been tested for an ether content up to 22 % volume fraction but no precision data has been determined.

1.3.1.1 This test method is specifically developed for the analysis of automotive motor gasoline that contains oxygenates, but it also applies to other hydrocarbon streams having similar boiling ranges, such as naphthas and reformates.

1.3.2 Part B describes the procedure for the analysis of oxygenated groups (ethanol, methanol, ethers, C_3 to C_5 alcohols) in ethanol fuels containing an ethanol volume fraction between 50 % and 85 % (17 % to 29 % oxygen). The gasoline

is diluted with an oxygenate-free component to lower the ethanol content to a value below 20 % before the analysis by GC. The diluting solvent should not be considered in the integration, this makes it possible to report the results of the undiluted sample after normalization to 100 %.

1.4 Oxygenates as specified in Test Method [D4815](#) have been verified not to interfere with hydrocarbons. Within the round robin sample set, the following oxygenates have been tested: MTBE, ethanol, ETBE, TAME, *iso*-propanol, isobutanol, *tert*-butanol and methanol. The derived precision data for methanol do not comply with the precision calculation as presented in this International Standard. Applicability of this test method has also been verified for the determination of *n*-propanol, acetone, and *di*-isopropyl ether (DIPE). However, no precision data have been determined for these compounds.

1.4.1 Other oxygenates can be determined and quantified using Test Method [D4815](#) or [D5599](#).

1.5 The method is harmonized with ISO 22854.

1.6 This test method includes a relative bias section for U.S. EPA spark-ignition engine fuel regulations for total olefins reporting based on Practice [D6708](#) accuracy assessment between Test Method D6839 and Test Method [D1319](#) as a possible Test Method D6839 alternative to Test Method [D1319](#). The Practice [D6708](#) derived correlation equation is only applicable for fuels in the total olefins concentration range from 0.2 % to 18.2 % by volume as measured by Test Method D6839. The applicable Test Method [D1319](#) range for total olefins is from 0.6 % to 20.6 % by volume as reported by Test Method [D1319](#).

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

1.8 *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 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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