

Standard Test Method for Oxygenates and Paraffin, Olefin, Naphthene, Aromatic (O-PONA) Hydrocarbon Types in Low-Olefin Spark Ignition Engine Fuels by Gas Chromatography¹

This standard is issued under the fixed designation D 6293; 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.

^{ε1} NOTE—Warning notes were editorially moved into the standard text in August 2003.

1. Scope

1.1 This test method provides for the quantitative determination of oxygenates, paraffins, olefins, naphthenes, and aromatics in low-olefin 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 through C₁₀, except for olefins, which can only be reported through C₉. Higher boiling hydrocarbons cannot be reported by type and are reported as a composite group. The lower limit of detection for a single hydrocarbon component or carbon number type is 0.05 mass %.

NOTE 1—There can be an overlap between the C₉ and C₁₀ aromatics; however, the total is accurate. Isopropyl benzene is resolved from the C₈ aromatics and is included with the other C₉ aromatics. Naphthalene is determined with the C₁₁+ components.

1.2 This test method is applicable for total olefins in the range from 0.05 to 13 mass %. The test method can quantitatively determine olefins in samples where the olefin concentration does not exceed 0.6 % C₄ or 4.0 % C₅ or 4.5 % of the combined C₄ and C₅. Although the precision for benzene was determined in the range from 0.3 to 1.0 mass %, this test method can be used to determine benzene concentrations up to 5.0 mass %.

1.3 This test method is not intended to determine individual hydrocarbon components except for those hydrocarbon types for which there is only one component within a carbon number. Individually determined hydrocarbons are benzene, toluene, cyclopentane, propane, propylene, and cyclopentene.

1.4 Precision data has only been obtained on samples containing MTBE. Application of this test method to determine other oxygenates shall be verified in the user's laboratory. Methanol cannot be determined and shall be quantitated by an appropriate oxygenate method such as Test Method D 4815 or

D 5599. Methanol is fully resolved and does not interfere with the determination of other components or groups.

1.5 Although specifically written for spark-ignition engine fuels containing oxygenates, this test method can also be applied to other hydrocarbon streams having similar boiling ranges, such as naphthas and reformates.

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

1.7 *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 C₁ to C₄ 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

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 on Hydrocarbon Analysis.

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

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

