



Standard Test Method for Determination of MTBE, ETBE, TAME, DIPE, Methanol, Ethanol and *tert*-Butanol in Gasoline by Infrared Spectroscopy¹

This standard is issued under the fixed designation D 5845; 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 (€) indicates an editorial change since the last revision or reapproval.

€¹ NOTE—Editorial corrections were made throughout in November 2000.

1. Scope

1.1 This test method covers the determination of methanol, ethanol, *tert*-butanol, methyl *tert*-butyl ether (MTBE), ethyl *tert*-butyl ether (ETBE), *tert*-amyl methyl ether (TAME), and diisopropyl ether (DIPE) in gasoline by infrared spectroscopy. The test method is suitable for determining methanol from 0.1 to 6 mass %, ethanol from 0.1 to 11 mass %, *tert*-butanol from 0.1 to 14 mass %, and DIPE, MTBE, ETBE and TAME from 0.1 to 20 mass %.

1.2 SI units of measurement are preferred and used throughout this standard.

1.3 *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 1298 Practice for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method²
- D 4052 Test Method for Density and Relative Density of Liquids by Digital Density Meter³
- D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products³
- D 4307 Practice for Preparation of Liquid Blends for Use as Analytical Standards³
- D 4815 Test Method for Determination of MTBE, ETBE, TAME, DIPE, *tert*-Amyl Alcohol, and C₁ to C₄ Alcohols in Gasoline by Gas Chromatography⁴
- D 5599 Test Method for Determination of Oxygenates in Gasoline by Gas Chromatography and Oxygen Selective Flame Ionization Detection⁴

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.OF on Absorption Spectroscopic Methods.

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² *Annual Book of ASTM Standards*, Vol 05.01.

³ *Annual Book of ASTM Standards*, Vol 05.02.

⁴ *Annual Book of ASTM Standards*, Vol 05.03.

E 1655 Practice for Infrared, Multivariate, Quantitative Analysis⁵

2.2 Other Standard:

GC/OFID EPA Test Method—Oxygen and Oxygenate Content Analysis⁶ (by way of gas chromatography with oxygen-selective flame ionization detection)

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 or ethers.

3.1.2 *multivariate calibration, n*—a process for creating a calibration model in which multivariate mathematics is applied to correlate the absorbances measured for a set of calibration samples to reference component concentrations or property values for the set of samples. The resultant multivariate calibration model is applied to the analysis of spectra of unknown samples to provide an estimate of the component concentration or property values for the unknown sample.

4. Summary of Test Method

4.1 A sample of gasoline is introduced into a liquid sample cell. A beam of infrared light is imaged through the sample onto a detector, and the detector response is determined. Regions of the infrared spectrum are selected for use in the analysis by either placing highly selective bandpass filters before or after the sample or mathematically selecting the regions after the whole spectrum is obtained. A multivariate mathematical analysis is carried out which converts the detector response for the selected regions in the spectrum of an unknown to a concentration for each component.

5. Significance and Use

5.1 Alcohols and ethers are added to gasoline to produce a reformulated lower emissions gasoline. Alcohols and ethers may also be added to gasoline to increase the octane number.

⁵ *Annual Book of ASTM Standards*, Vol 03.06.

⁶ Code of Federal Regulations, Part 80 of Title 40, Section 80.46(g); also published in the Federal Register, Volume 59, No. 32, February 16, 1994, p 7828.