



Standard Test Method for Benzene in Motor and Aviation Gasoline by Infrared Spectroscopy¹

This standard is issued under the fixed designation D 4053; 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 the percent benzene in full-range gasoline. It is applicable to concentrations from 0.1 % to 5 volume %.

1.2 This test method has not been validated for gasolines containing oxygenates. Certain oxygenates interfere with the measurement described in this test method. Test Method D 6277 is recommended for gasolines containing oxygenates.

1.3 The values in SI units are regarded as the standard.

1.4 *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.* For specific warning statements, see Section 8 and 9.1.

2. Referenced Documents

2.1 ASTM Standards:²

D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products

D 6277 Test Method for Determination of Benzene in Spark-Ignition Engine Fuels Using Mid Infrared Spectroscopy

E 131 Terminology Relating to Molecular Spectroscopy

E 932 Practice for Describing and Measuring Performance of Dispersive Infrared Spectrophotometers

E 1421 Practice for Describing and Measuring Performance of Fourier Transform Mid-Infrared (FT-MIR) Spectrometers: Level Zero and Level One Tests

3. Terminology

3.1 Definitions:

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.

Current edition approved Nov. 1, 2004. Published November 2004. Originally approved in 1981. Last previous edition approved in 2003 as D 4053-98(2003).

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.

3.1.1 Definitions of terms and symbols relating to absorption spectroscopy in this test method shall conform to Terminology E 131. Terms of particular significance are the following:

3.1.2 *absorbance, A, n*—the molecular property of a substance that determines its ability to take up radiant power, expressed by:

$$A = \log_{10}(1/T) = -\log_{10}T \quad (1)$$

where

T = the transmittance as defined in 3.1.5.

3.1.3 *radiant energy, n*—energy transmitted as electromagnetic waves.

3.1.4 *radiant power, P, n*—the rate at which energy is transported in a beam of radiant energy.

3.1.5 *transmittance, T, n*—the molecular property of a substance that determines its transportability of radiant power, expressed by:

$$T = P/P_o \quad (2)$$

where:

P = the radiant power passing through the sample, and

P_o = the radiant power incident upon the sample.

4. Summary of Test Method

4.1 A sample of gasoline is examined by infrared spectroscopy and, following a correction for interference, compared with calibration blends of known benzene concentration. From this comparison the amount of benzene in the gasoline is determined.

5. Significance and Use

5.1 Benzene is classed as a toxic material. A knowledge of the concentration of this compound may be an aid in evaluating the possible health hazard to persons handling and using the gasoline. This test method is not intended to evaluate such hazards.

6. Interferences

6.1 Toluene and heavier aromatic compounds have some interference in this test method. In order to minimize the effect of such interference, this test method includes a procedure that

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