



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 The values in SI units are regarded as the standard.

1.3 This test method has not been validated for gasolines containing oxygenates.

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 hazard statements, see Section 8 and 9.1.

2. Referenced Documents

2.1 ASTM Standards:

D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products²

E 131 Terminology Relating to Molecular Spectroscopy³

E 932 Practice for Describing and Measuring Performance of Dispersive Infrared Spectrophotometers³

E 1421 Practice for Describing and Measuring Performance of Fourier Transform Infrared (FT-IR) Spectrometers: Level Zero and Level One Tests³

3. Terminology

3.1 Definitions:

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:

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

¹ This test method is under the jurisdiction of ASTM Committee D-2 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 03.06.

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 corrects for the error caused by the presence of toluene. Error due to other sources of interference may be partially compensated for by calibrating with gasoline stocks containing little or no benzene but which otherwise are similar in aromatic content to the samples to be analyzed.

7. Apparatus

7.1 *Absorption Cell*, sealed. Windows of potassium bromide or other material having sufficient transmittance out to 440