



Standard Test Method for Determination of Trace Thiophene in Refined Benzene by Gas Chromatography and Sulfur Selective Detection¹

This standard is issued under the fixed designation D7011; 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 thiophene in refined benzene using gas chromatography and sulfur selective detection. The test method is applicable to the determination of thiophene at levels of 0.02 to 2.18 mg thiophene per kg in benzene (mg/kg) on the AED, 0.03 to 1.87 mg/kg on the PFPD, and 0.03 to 2.11 mg/kg on the SCD. The range of the test method may be extended by modifying the sample injection volume, split ratios, calibration range, or sample dilution with thiophene-free solvent.

1.2 In determining the conformance of the test results using this method to applicable specifications, results shall be rounded off in accordance with the rounding-off method of Practice E29.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this 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 hazard statements, see Section 7.

2. Referenced Documents

2.1 ASTM Standards:²

D1193 Specification for Reagent Water

D2359 Specification for Refined Benzene-535

D3437 Practice for Sampling and Handling Liquid Cyclic Products

D4734 Specification for Refined Benzene-545

¹ This test method is under the jurisdiction of ASTM Committee D16 on Aromatic Hydrocarbons and Related Chemicals and is the direct responsibility of Subcommittee D16.04 on Instrumental Analysis.

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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.

D4735 Test Method for Determination of Trace Thiophene in Refined Benzene by Gas Chromatography

D5871 Specification for Benzene for Cyclohexane Feedstock

D6809 Guide for Quality Control and Quality Assurance Procedures for Aromatic Hydrocarbons and Related Materials

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

E1510 Practice for Installing Fused Silica Open Tubular Capillary Columns in Gas Chromatographs

2.2 Other Document:

OSHA Regulations, 29 CFR paragraphs 1910.1000 and 1910.1200³

3. Summary of Test Method

3.1 The thiophene concentration in refined benzene is determined at the sub-mg/kg to low mg/kg level using conventional gas chromatography with a sulfur selective detector. A reproducible volume of sample is injected. Quantitative results are obtained by the use of the external standard calibration technique.

3.2 The method allows the use of a sulfur chemiluminescence detector, atomic emission detector, pulsed flame photometric detector, or any other sulfur selective detector provided that its performance meets requirements as set forth in 5.4. As sulfur compounds elute from the gas chromatographic column, they are detected and quantified. While the benzene molecule does not contain any sulfur atoms, the possibility of matrix quenching and interference is a concern, especially for thiophene determination at levels less than about 0.5 mg/kg. The column and conditions specified in Table 1 yield acceptable results with minimal matrix quenching and interference. Employing the column and conditions listed in Table 1 is not a

³ Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, <http://www.access.gpo.gov>.

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