



Standard Test Method for Determination of Benzene, Toluene, Ethylbenzene, *p*/*m*- Xylene, *o*-Xylene, C₉ and Heavier Aromatics, and Total Aromatics in Finished Gasoline by Gas Chromatography¹

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1. Scope

1.1 This test method covers the determination of benzene, toluene, ethylbenzene, the xylenes, C₉ and heavier aromatics, and total aromatics in finished motor gasoline by gas chromatography.

1.2 The aromatic hydrocarbons are separated without interferences from other hydrocarbons in finished gasoline. Non-aromatic hydrocarbons having a boiling point greater than *n*-dodecane may cause interferences with the determination of the C₉ and heavier aromatics. For the C₈ aromatics, *p*-xylene and *m*-xylene co-elute while ethylbenzene and *o*-xylene are separated. The C₉ and heavier aromatics are determined as a single group.

1.3 This test method covers the following concentration ranges, in liquid volume %, for the preceding aromatics: benzene, 0.1 to 5 %; toluene, 1 to 15 %; individual C₈ aromatics, 0.5 to 10 %; total C₉ and heavier aromatics, 5 to 30 %, and total aromatics, 10 to 80 %.

1.4 Results are reported to the nearest 0.01 % by either mass or by liquid volume.

1.5 Many of the common alcohols and ethers that are added to gasoline to reduce carbon monoxide emissions and increase octane, do not interfere with the analysis. Ethers such as methyl *tert*-butylether (MTBE), ethyl *tert*-butylether (ETBE), *tert*-amylmethylether (TAME), and diisopropylether (DIPE) have been found to elute from the precolumn with the nonaromatic hydrocarbons to vent. Other oxygenates, including methanol and ethanol elute before benzene and the aromatic hydrocarbons. 1-Methylcyclopentene has also been found to elute from the precolumn to vent and does not interfere with benzene.

1.6 The values stated in SI units are to be regarded as standard. The values given in parentheses are provided for information only; they may not be exact equivalents.

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 appro-*

priate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 ASTM Standards:

D 1298 Test Method 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

E 355 Practice for Gas Chromatography Terms and Relationships⁴

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *aromatic*—any organic compound containing a benzene ring.

3.1.2 *low-volume connector*—a special union for connecting two lengths of narrow bore tubing 1.6-mm (0.06-in.) outside diameter and smaller; sometimes this is referred to as zero dead volume union.

3.1.3 *narrow bore tubing*—tubing used to transfer components prior to or after separation; usually 0.5-mm (0.02-in.) inside diameter and smaller.

3.1.4 *split ratio*—in capillary gas chromatography, the ratio of the total flow of carrier gas to the sample inlet versus the flow of the carrier gas to the capillary column, expressed by:

$$\text{split ratio} = (S + C)/C \quad (1)$$

where:

S = flow rate at the splitter vent and

C = flow rate at the column outlet.

3.1.5 *1,2,3-tris-2-cyanoethoxypropane (TCEP)*—a polar gas chromatographic liquid phase.

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.04.01 on Gas Chromatography.

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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 14.02.