



## Standard Test Method for Determination of Benzene, Toluene, and Total Aromatics in Finished Gasolines by Gas Chromatography/Mass Spectrometry<sup>1</sup>

This standard is issued under the fixed designation D 5769; 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 benzene, toluene, other specified individual aromatic compounds, and total aromatics in finished motor gasoline, including gasolines containing oxygenated blending components, by gas chromatography/mass spectrometry (GC/MS).

1.2 This test method has been tested for the following concentration ranges, in liquid volume %, for the following aromatics: benzene, 0.1 to 4 %; toluene, 1 to 13 %; and total (C6 to C12) aromatics, 10 to 42 %. The round-robin study did not test the method for *individual* hydrocarbon process streams in a refinery, such as reformates, fluid catalytic cracked naphthas, and so forth, used in the blending of gasolines.

1.3 Results are reported to the nearest 0.01 % for benzene and 0.1 % for the other aromatics by liquid volume.

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

1.5 *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 its use.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:

- D 1298 Practice for Density, Relative Density (Specific Gravity), or a API Gravity of Crude Petroleum Products by Hydrometer Method<sup>2</sup>
- D 4052 Test Method for Density and Relative Density of Liquids by Digital Density Meter<sup>3</sup>
- D 4057 Practice for Manual Sampling of Petroleum and Petroleum Product<sup>3</sup>
- D 4307 Practice for Preparation of Liquid Blends for Use as Analytical Standards<sup>3</sup>

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D.02.04 on Hydrocarbon Analysis.

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<sup>2</sup> Annual Book of ASTM Standards, Vol 05.01

<sup>3</sup> Annual Book of ASTM Standards, Vol 05.02

### 3. Terminology

#### 3.1 Definitions of Terms Specific to This Standard:

3.1.1 *aromatic*—any hydrocarbon compound containing a benzene or naphthalene ring.

3.1.2 *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.

3.1.3 *wall coated open tubular (WCOT)*—a type of capillary column prepared by coating or bonding the inside wall of the capillary with a thin film of stationary phase.

3.1.4 *cool on-column injector*—in gas chromatography, a direct sample introduction system that is set at a temperature at or below the boiling point of solutes or solvent on injection and then heated at a rate equal to or greater than the column. Normally used to eliminate boiling point discrimination on injection or to reduce adsorption on glass liners within injectors, or both. The sample is injected directly into the head of the capillary column tubing.

3.1.5 *open split interface*—GC/MS interface used to maintain atmospheric pressure at capillary column outlet and to eliminate mass spectrometer vacuum effects on the capillary column. Can be used to dilute the sample entering the mass spectrometer to maintain response linearity.

3.1.6 *retention gap*—in gas chromatography, refers to a deactivated precolumn which acts as a zone of low retention power for reconcentrating bands in space. The polarity of the precolumn must be similar to that of the analytical column.

3.1.7 *total ion chromatogram (TIC)*—mass spectrometer computer output representing either the summed intensities of all scanned ion currents or a sample of the current in the ion beam for each spectrum scan plotted against the corresponding spectrum number. Generally, it can be correlated with a flame ionization detector chromatogram.

3.1.8 *reconstructed ion chromatogram (RIC)*—a limited mass chromatogram representing the intensities of ion mass spectrometric currents for only those ions having particular

