



## Standard Test Methods for Analysis of Cyclohexane by Gas Chromatography<sup>1</sup>

This standard is issued under the fixed designation D 3054; 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 These test methods cover the determination of the hydrocarbon impurities typically found in cyclohexane and the purity of cyclohexane by difference by gas chromatography. Typical impurities in high purity cyclohexane are listed in Table 1.

1.2 These test methods are applicable to impurity concentrations in the range of 0.0001 to 0.1000 wt% and for cyclohexane purities of 98 % or higher when using the internal standard procedure.

1.3 The following applies to all specified limits in this test method: for purposes of determining conformance with this test method, an observed value or a calculated value shall be rounded off to the nearest unit in the last right-hand digit used in expressing the specification limit, in accordance with the rounding-off method of Practice E 29.

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 Note 2 and Section 7.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

D 3437 Practice for Sampling and Handling Liquid Cyclic Products<sup>2</sup>

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications<sup>3</sup>

E 260 Practice for Packed Column Gas Chromatography<sup>3</sup>

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method<sup>3</sup>

E 1510 Practice for Installing Fused Silica Open Tubular Capillary Columns in Gas Chromatographs<sup>3</sup>

#### 2.2 Other Document:

TABLE 1 Impurities Known or Suggested to be Present in Commercial Cyclohexane

|                                     |                |
|-------------------------------------|----------------|
|                                     | C <sub>4</sub> |
| (1) <i>n</i> -butane                |                |
| (2) isobutane                       |                |
|                                     | C <sub>5</sub> |
| (3) <i>n</i> -pentane               |                |
| (4) isopentane                      |                |
| (5) cyclopentane                    |                |
|                                     | C <sub>6</sub> |
| (6) <i>n</i> -hexane <sup>A</sup>   |                |
| (7) 2-methylpentane                 |                |
| (8) 3-methylpentane                 |                |
| (9) methylcyclopentane <sup>A</sup> |                |
| (10) benzene <sup>A</sup>           |                |
| (11) 2,2-dimethylbutane             |                |
| (12) 2,3-dimethylbutane             |                |
|                                     | C <sub>7</sub> |
| (13) 3,3-dimethylpentane            |                |
| (14) 2,3-dimethylpentane            |                |
| (15) 1,1-dimethylcyclopentane       |                |
| (16) 1,1,3-dimethylcyclopentane     |                |
| (17) 1,1,2-dimethylcyclopentane     |                |
| (18) 1,1,2-dimethylcyclopentane     |                |
| (19) 2,2-dimethylpentane            |                |
| (20) 2,4-dimethylpentane            |                |
| (21) 1,1,3-dimethylcyclopentane     |                |
| (22) ethylcyclopentane              |                |
| (23) methylcyclohexane <sup>A</sup> |                |
| (24) 3-ethylpentane                 |                |
| (25) 3-methylhexane                 |                |
| (26) 2-methylhexane                 |                |
| (27) <i>n</i> -heptane              |                |

<sup>A</sup> These components were used to prepare the standards used in the round robin program.

OSHA Regulations, 29 CFR, Paragraphs 1910.1000 and 1910.1200<sup>4</sup>

### 3. Summary of Test Methods

3.1 *Test Method A: Internal Standard Procedure*—This procedure is used when the impurities are at 0.00010 to 0.1000 wt% levels. A known amount of internal standard is added to the sample. A portion of the sample is injected into the chromatograph and the levels of impurities are calculated relative to the amount of internal standard added. The amount of measured impurities, including benzene, is subtracted from 100.00 to establish the purity of the cyclohexane samples.

3.2 *Test Method B: Straight Normalization Procedure*—A portion of the sample is injected into the chromatograph using

<sup>4</sup> Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20004.

<sup>1</sup> These test methods are under the jurisdiction of ASTM Committee D16 on Aromatic Hydrocarbons and Related Chemicals and are the direct responsibility of Subcommittee D16.01 on Benzene, Toluene, Xylenes, Cyclohexane, and Their Derivatives.

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<sup>2</sup> Annual Book of ASTM Standards, Vol 06.04.

<sup>3</sup> Annual Book of ASTM Standards, Vol 14.02.