



Designation: D4424 – 90 (Reapproved 2001)^{ε1}

Standard Test Method for Butylene Analysis by Gas Chromatography¹

This standard is issued under the fixed designation D4424; 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.

^{ε1} NOTE—Warning notes were placed in the text editorially in January 2001.

1. Scope

1.1 This test method covers the gas chromatographic analysis of commercial butylenes, butylene concentrates, and butane-butylene mixtures.

1.2 This test method does not cover high-purity butene-1 or high-purity isobutene streams, or both. However, it is possible that one or more columns listed in [Appendix X1](#) may be capable of the separation necessary for high-purity analyses.

1.3 This test method is designed to cover the components listed below at about 0.05 % or greater. It is not intended for trace hydrocarbon analysis. Components to be determined are: propane, propylene, isobutane, *n*-butane, butene-1, isobutene, *trans*-butene-2, *cis*-butene-2, 1,3-butadiene, isopentane, *n*-pentane.

1.4 The values stated in SI units are to be regarded as the standard. The values stated in inch-pound units are for information only.

1.5 *This standard does not purport to address all of the safety concerns 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 warning statements, see [5.3.1](#).

2. Referenced Documents

2.1 *ASTM Standards:*²

[E260 Practice for Packed Column Gas Chromatography](#)

3. Summary of Test Method

3.1 The sample is separated in a gas chromatograph system using a packed chromatographic column with either helium or hydrogen as the carrier gas. The separated components of the

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.D0.04](#) on C4 Hydrocarbons.

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² *Annual Book of ASTM Standards*, Vol 03.06.

sample are detected by either a thermal conductivity detector or by a flame ionization detector. Calibration data are obtained by using either relative response factors or by using a standard calibration blend.

4. Significance and Use

4.1 This test method could be used to determine butylene stream composition for custody transfer payments. It is also capable of providing data necessary to evaluate processing requirements in an operating plant.

5. Apparatus

5.1 *Chromatograph*—Any chromatographic instrument having either a thermal conductivity or flame ionization detector with an overall sensitivity sufficient to detect at least 0.05 % of each of the components listed in the scope.

5.2 *Detector*—Either a thermal conductivity or flame ionization detector may be used.

5.3 *Sample Valve*—Either a constant-volume gas sampling valve or a liquid sampling valve may be used. If a gas sampling valve is used, greater care must be taken to ensure that the vaporized butylenes that are injected into the chromatograph are a true representation of the sample.

5.3.1 If the liquid sample valve is used, the sample cylinder must be pressured up to at least 1100 kPa (160 psig) with an inert gas, such as nitrogen or helium (**Warning**—Compressed gas under high pressure. Gas reduces oxygen available for breathing.). Also a valve must be installed in the purge line downstream of the liquid sample valve to ensure the butylenes sample in the sampling valve is entirely in the liquid phase prior to injection into the column (**Warning**—Extremely flammable liquefied gas under pressure. Vapor reduces oxygen available for breathing.).

5.4 *Column*—Any chromatographic column may be used, providing the components listed in the scope can be separated sufficiently for the accurate determination of component concentration. Resolution between peaks must afford a resolution such that the depth of the valleys between peaks are no less than 50 % of the peak height of the lesser component. A list of satisfactory columns is given in [Appendix X1](#).