



Standard Test Method for Butylene Analysis by Gas Chromatography¹

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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 Note 1 and Note 2.*

2. Referenced Documents

2.1 ASTM Standards:

E 260 Practice for Packed Column Gas Chromatography²

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 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**—See Note 1). 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**—see Note 2).

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.

5.5 *Recorder*—A recorder with a full-scale response of 2 s or less and a maximum rate of noise of ± 0.3 % of full scale.

NOTE 1—**Warning:** Compressed gas under high pressure. Gas reduces oxygen available for breathing.

NOTE 2—**Warning:** Extremely flammable liquefied gas under pressure. Vapor reduces oxygen available for breathing.

6. Preparation of Apparatus

6.1 Set up the chromatograph in accordance with the manufacturer's recommendations. Install the analytical column and adjust the carrier gas flow and column temperature so that the components will elute within the time desired for the analysis.

7. Calibration

7.1 A standard blend containing the components to be

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² *Annual Book of ASTM Standards*, Vol 14.02.