



Designation: D8554 – 24

Standard Test Method for Determination of the Degree of Unsaturation of Butyl Rubber by FTIR and Multivariate Analysis¹

This standard is issued under the fixed designation D8554; 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 the degree of unsaturation of butyl rubber as a molar percentage of the total sample. It is applicable to degrees of unsaturation from 1.00 to 2.40 mol% range.

1.2 The values stated in SI units of measurement are to be regarded as the standard. The values given in parentheses are for information only.

1.3 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

[D8321 Practice for Development and Validation of Multivariate Analyses for Use in Predicting Properties of Petroleum Products, Liquid Fuels, and Lubricants based on Spectroscopic Measurements](#)

[E168 Practices for General Techniques of Infrared Quantitative Analysis](#)

[E932 Practice for Describing and Measuring Performance of Dispersive Infrared Spectrometers](#)

[E1421 Practice for Describing and Measuring Performance of Fourier Transform Mid-Infrared \(FT-MIR\) Spectrometers: Level Zero and Level One Tests](#)

[E1655 Practices for Infrared Multivariate Quantitative Analysis](#)

[E2977 Practice for Measuring and Reporting Performance of Fourier-Transform Nuclear Magnetic Resonance \(FT-NMR\) Spectrometers for Liquid Samples](#)

3. Terminology

3.1 Definitions:

3.1.1 *butyl rubber, n*—a synthetic rubber, a copolymer of isobutylene and isoprene.

3.1.2 *calibration transfer, n*—a method of applying a multivariate calibration developed on one analyzer to a different analyzer by mathematically modifying the calibration model or by instrument standardization.

3.1.3 *estimate, n*—the value for a component concentration or property obtained by applying the calibration model for the analysis of an absorption spectrum.

3.1.4 *multivariate calibration, n*—process of creating a model that relates component concentrations or properties to the absorbances of a set of known reference samples at more than one wavelength or frequency.

3.1.5 *reference material (RM), n*—a material, sufficiently homogeneous and stable with respect to one or more specified properties, which has been established to be fit for use as the method calibration or validation samples. RMs are used to develop accurate methods of analysis, calibrate, and validate the method, institute quality control, determine performance characteristics, or measure a property at the state-of-the-art limit.

3.1.6 *reference method, n*—the analytical method that is used to estimate the reference component concentration or property value which is used in the calibration and validation procedures.

3.1.7 *reference values (RV), n*—the component concentrations or property values for the calibration or validation samples which are measured by the reference analytical method.

3.1.8 *standard error of validation (SEV), n*—a measure of the performance of a multivariate model obtained by analyzing a set of model validation samples and comparing the specified values to predicted measured values.

¹ This test method is under the jurisdiction of ASTM Committee D11 on Rubber and Rubber-like Materials and is the direct responsibility of Subcommittee D11.11 on Chemical Analysis.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.