



Standard Test Methods for Rubber Raw—Determination of Ethylene Units in EPM (Ethylene-Propylene Copolymers) and EPDM (Ethylene-Propylene-Diene Terpolymers)¹

This standard is issued under the fixed designation D 3900; 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 infrared test methods cover the determination of the proportion of ethylene and propylene units in ethylene-propylene copolymers (EPM) and ethylene-propylenediene terpolymers (EPDM) over the range from 35 to 85 mass % ethylene. Four test methods are needed to encompass the variety of commercial polymers that contain additives or polymerized diene units that interfere with the various infrared peaks. Except when interferences are present, all four test methods should give similar results. The test methods appear in the following order:

1.1.1 Pressed Film Test Methods:

	Sections
<i>Test Method A</i> —For EPM and EPDM between 35 and 65 mass % ethylene	8-13
<i>Test Method B</i> —For EPM and EPDM between 60 and 85 mass % ethylene, except for ethylene/propylene/1,4-hexadiene terpolymers	14-18
<i>Test Method C</i> —For all EPM and EPDM polymers between 35 and 85 mass % ethylene, using near infrared	19-23

1.1.2 Cast Film Test Methods:

<i>Test Method D</i> —For all EPM and EPDM polymers between 35 and 85 mass % ethylene, except for ethylene/propylene/1,4-hexadiene terpolymers	24-31
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1.2 These test methods are not applicable to oil-extended EPDM unless the oil is first removed in accordance with Test Method D.

1.3 The values stated in SI units are to be regarded as the standard.

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.*

2. Referenced Documents

2.1 ASTM Standards:

¹ These test methods are under the jurisdiction of ASTM Committee D11 on Rubber and are the direct responsibility of Subcommittee D11.11 on Chemical Analysis.

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D 297 Test Methods for Rubber Products—Chemical Analysis²

D 3568 Test Methods for Rubber—Evaluation of EPDM (Ethylene Propylene Diene Terpolymers) Including Mixtures with Oil²

D 4483 Practice for Determining Precision for Test Method Standards in the Rubber and Carbon Black Industries²

E 168 Practices for General Techniques of Infrared Quantitative Analysis³

3. Summary of Test Methods

3.1 *Test Method A*—Pressed films are measured for their infrared absorbance ratios at 8.65/13.85 μm (1156/722 cm^{-1}), and mass percent ethylene is read from a calibration obtained from standard polymers.

3.2 *Test Method B*—Thin pressed films are measured for their infrared absorbance ratios at 7.25/13.85 μm (1379/722 cm^{-1}), and mass percent ethylene is read from a calibration obtained from standard polymers.

3.3 *Test Method C*—Pressed films are measured for their infrared absorbance ratios at 8.65/2.35 μm (1156/4255 cm^{-1}) using near infrared, and mass percent ethylene is read from a calibration obtained from standard polymers.

3.4 *Test Method D*—Ultra-thin cast films on a salt plate are measured for their infrared absorbance ratios at 7.25/6.85 μm (1379/1460 cm^{-1}), and mass percent ethylene is read from a calibration obtained from standard polymers.

4. Significance and Use

4.1 These test methods can be used for determining which EPDM polymers are evaluated in the different compounds in Test Methods D 3568.

4.2 Differences in ethylene sequence distribution cause differences in crystallinity and green strength at the same ethylene content. Since these are important variables in EPM and EPDM processability and end-use properties, the ethylene content of the rubber should not be used as the sole measurement to determine the suitability of a particular rubber for an intended purpose.

² *Annual Book of ASTM Standards*, Vol 09.01.

³ *Annual Book of ASTM Standards*, Vol 03.06.