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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Test Method for Rubber—Compositional Analysis by Thermogravimetry (TGA)¹

This standard is issued under the fixed designation D 6370; 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 provides a thermogravimetric (TGA) technique to determine the amounts of organics (oil, polymer), carbon black and ash (filler) in a rubber compound.

1.2 The amount of plasticizer/oil may be determined separately using Test Method D 297.

1.3 This test method utilizes previously calibrated, manual or computer assisted TGA instrumentation.

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:

D 297 Test Methods for Rubber Products—Chemical Analysis²

D 1566 Terminology Relating to Rubber²

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

D 6085 Practice for sampling in Rubber Testing—Terminology and Basic Concepts²

E 473 Terminology Relating to Thermal Analysis³

E 1953 Practice for Description of Thermal Analysis Apparatus⁴

3. Terminology

3.1 Definitions:

3.1.1 The definitions relating to rubber appearing in Terminology D 1566 shall be considered applicable to this test method.

3.1.2 The terminology relating to sampling appearing in Practice D 6085 shall be considered applicable to this test method.

3.1.3 The definitions for thermal analysis appearing in

Terminology E 473 shall be considered applicable to this test method.

3.1.4 The description of thermal analysis equipment appearing in Practice E 1953 shall be considered applicable to this test method.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *ash, n*—nonvolatile additives (fillers), such as zinc oxide, talc, etc.

3.2.2 *carbon black, n*—carbon black.

3.2.3 *organics, n*—rubber (polymer), noncarbon black organic additives, such as oil, plasticizer, antioxidants, etc.

4. Summary of Test Method

4.1 The mass of the rubber test sample, heated at a controlled, specified rate in a controlled, specified environment is recorded as a function of temperature. The mass loss over the specified temperature range provides a compositional analysis of the sample.

5. Significance and Use

5.1 This test method is intended for use in quality control, material screening, and related problem solving where a compositional analysis, or comparison to a known material, is desired.

5.2 The parameters described are guidelines and may be altered to suit the analysis of other rubber compounds.

5.3 This test method is not suitable for rubber compounds containing filler materials which decompose in the temperature range of 50°C to 800°C, for example, CaCO₃, Al(OH)₃(3H₂O), etc. Analysis of compounds containing fillers of this type requires knowledge of the filler type and some correction for mass loss.

6. Apparatus

6.1 *Thermogravimetric Analyzer*—A system of related instruments that are capable of continuously weighing a test sample, at a sensitivity of $\pm 2 \mu\text{g}$, and recording the change in mass of the test sample under atmospheric control over a specified temperature range.

7. Reagents and Materials

7.1 An inert compressed gas, such as argon or nitrogen, and a reactive gas, such as air or oxygen.

¹ This test method is under the jurisdiction of ASTM Committee D-11 on Rubber and is the direct responsibility of Subcommittee D11.11 on Chemical Analysis. Current edition approved Jan. 10, 1999. Published April 1999.

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

³ *Annual Book of ASTM Standards*, Vol 14.02.

⁴ Supporting data for the precision evaluation program of this test method are available from ASTM headquarters. Request RR-D11-1089