



# Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings<sup>1</sup>

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## 1. Scope

1.1 This guide is intended to aid in the selection of the proper ASTM standard for determining the volatile and non-volatile content of paint and related coatings.

NOTE 1—Test methods for determining the composition of the volatile fraction are not covered by this guide.

1.2 The standards included are as follows:

Type of Coating	Section	ASTM Designation
Aerosol coatings	4.1	D 3062
Architectural wall coatings, interior, high performance	4.3	D 1644
Asphalt roof coatings	4.4	D 2823
Asphalt roof coatings, aluminum-pigmented	4.5	D 2824
Bitumens, emulsified	4.6	D 2939
Bleached lac varnish	4.7	D 1650
Coil coatings	4.8	D 1353 D 2697
Electrical insulation varnishes	4.9	D 115
House paints, gloss	4.10	D 2697
Industrial baking enamel	4.10	D 2697
Lacquers, clear and pigmented	4.11	D 1644 D 333
Latex paint, exterior	4.10	D 2697
Latex paint, interior	4.10	D 2697
Magnet wire enamels	4.12	D 3288
Plastics, coatings for	4.13	D 1644
Powder coatings	4.14	D 3451
Shellac varnish, orange	4.7	D 1650
Silanes, Siloxanes and Silane-Siloxane Blends	4.18	D 5095
Solvent-reducible coatings	4.2	D 2369
Traffic paints	4.15	D 2205
Varnishes	4.16	D 1644
Wall and trim enamels, interior semigloss, solvent-based	4.17	D 2697
Wall paints, flat	4.10	D 2697
Water-reducible coatings	4.2	D 236

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

<sup>1</sup> This guide is under the jurisdiction of ASTM Committee D-1 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.21 on Chemical Analysis of Paint and Paint Materials.

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## 2. Referenced Documents

### 2.1 ASTM Standards:

- D 115 Test Methods of Testing Varnishes Used for Electrical Insulation<sup>2</sup>
- D 333 Test Methods for Clear and Pigmented Lacquers<sup>3</sup>
- D 1353 Test Method for Nonvolatile Matter in Volatile Solvents for Use in Paint, Varnish, Lacquer, and Related Products<sup>4</sup>
- D 1644 Test Methods for Nonvolatile Content of Varnishes<sup>5</sup>
- D 1650 Test Methods of Sampling and Testing Shellac Varnish<sup>6</sup>
- D 2205 Guide for Selection of Tests for Traffic Paints<sup>3</sup>
- D 2369 Test Method for Volatile Content of Coatings<sup>5</sup>
- D 2697 Test Method for Volume Nonvolatile Matter in Clear or Pigmented Coatings<sup>5</sup>
- D 2823 Specification for Asphalt Roof Coatings<sup>7</sup>
- D 2824 Specification for Aluminum-Pigmented Asphalt Roof Coatings Non-Fibered, Asbestos Fibered, and Fibered without Asbestos<sup>7</sup>
- D 2939 Test Methods for Testing Emulsified Bitumens Used as Protective Coatings<sup>7</sup>
- D 3062 Test Method for Solids Content of Aerosol Coatings<sup>8</sup>
- D 3288 Test Method for Magnet-Wire Enamels<sup>9</sup>
- D 3451 Practices for Testing Polymeric Powders and Powder Coatings<sup>3</sup>
- D 5095 Test Method for Determination of the Nonvolatile Content in Silanes, Siloxanes and Silane-Siloxane Blends Used in Masonry Water Repellant Treatments<sup>3</sup>

## 3. Significance and Use

3.1 The nonvolatile content of paint and related coatings is useful to producers and users and to environmental and health and safety interests in comparing the coverage of competing

<sup>2</sup> Annual Book of ASTM Standards, Vol 10.01.

<sup>3</sup> Annual Book of ASTM Standards, Vol 06.01.

<sup>4</sup> Annual Book of ASTM Standards, Vol 06.03.

<sup>5</sup> Annual Book of ASTM Standards, Vol 06.02.

<sup>6</sup> Annual Book of ASTM Standards, Vol 04.04.

<sup>7</sup> Annual Book of ASTM Standards, Vol 15.09.

<sup>8</sup> Annual Book of ASTM Standards, Vol 10.02.

<sup>9</sup> Annual Book of ASTM Standards, Vol 06.04.

products and in estimating the volatile organic content.

#### 4. Procedure

4.1 *Aerosol Coatings*—Test Method D 3062 covers the determination of solids content (weight %) in aerosol coatings.

4.2 *Volatile Content of Coatings (Test Method D 2369)*—This test method covers the determination of the volatile content of coatings. It is considered to be applicable to most solvent-reducible and water-reducible paints.

4.3 *High Performance Interior Architectural Wall Coatings (HIPAC)*—Determine the nonvolatile content of HIPAC coatings in accordance with Test Methods D 1644. Calculate the volatile content (weight %) by difference.

4.3.1 *Method A*—3 h at 105°C for paints with nonsolvent components that decompose at higher temperature.

4.3.2 *Method B*—10 min at 149°C for most paints with nonsolvent components that are reasonably stable at 149°C.

4.4 *Asphalt Roof Coatings*—Determine the nonvolatile content (weight %) of asphalt roof coatings of brushing or spraying consistency in accordance with 8.2 of Specification D 2823.

4.5 *Aluminum-Pigmented Asphalt Roof Coatings*—The nonvolatile content (weight %) of asphalt-based aluminum roof coatings suitable for application to roofing or masonry surfaces by brush or spray is determined in accordance with 8.2 of Specification D 2824.

4.6 *Emulsified Bitumens Used as Protective Coatings*—Section 8 of Test Methods D 2939 contains a method for determining residue by evaporation (weight %) of emulsified bitumens used in relatively thick films as protective coatings for metals and built-up roofs.

4.7 *Shellac Varnish*—Determine the nonvolatile matter in orange shellac and bleached lac varnishes in accordance with Sections 14 through 16 of Methods D 1650.

4.8 *Coil Coatings*—Although stated to be for solvents, determine the nonvolatile matter (weight %) in accordance with Test Method D 1353. Determine volume solids in accordance with Test Method D 2697.

4.9 *Electrical Insulation Varnishes*:

4.9.1 Sections 18 through 22 of Methods D 115 on nonvolatile matter by weight, are applicable to the following classifications of varnishes used for electrical insulation: alcohol-soluble varnishes, oxidizing air-drying varnishes, thermosetting varnishes, oxidizing baking varnishes, air-drying asphaltic varnishes, silicone varnishes, and thermo-setting laminating varnishes.

4.9.2 Determine nonvolatile matter in electrical insulating varnishes intended for electrical equipment operating at 180°C and above in accordance with Methods D 115 except that the temperature used shall be  $275 \pm 5.5^\circ\text{F}$  ( $135 \pm 3^\circ\text{C}$ ) or at a temperature agreed upon between the producer and the user.

4.10 *Volume Nonvolatile Matter in Clear or Pigmented Coatings (Test Method D 2697)*—This test method is applicable to the determination of the volume nonvolatile matter of coatings. A gloss enamel, a flat wall paint, a gloss house paint,

an industrial baking enamel, an interior latex paint, and an exterior latex paint included in formal collaborative studies of this test method.

4.11 *Lacquer Coatings*—Determine the nonvolatile content of clear and pigmented lacquers as described in Test Methods D 1644. As an additional requirement, the specimen shall be reheated and reweighed until the weight is constant to within 1 mg. Method A of Test Methods D 1644 is preferred since Method B is potentially dangerous when used with lacquers.

4.12 *Magnet Wire Enamels*—Sections 17 through 23 of Test Method D 3288 cover the determination of nonvolatile content (weight %) in magnet wire enamels.

4.13 *Coatings for Plastics*—Determine nonvolatile matter in clear and pigmented coatings designed for use on rigid or semirigid plastic substrates in accordance with Test Methods D 1644.

4.14 *Polymeric Powders and Powder Coatings*—Determine nonvolatile content (weight %) in accordance with Section 12 of Practices D 3451. Determine volatile content at baking or fusion temperature in accordance with Section 13 of Practices D 3451.

4.15 *Traffic Paints*—Determine the nonvolatile content of traffic paints, ready-mixed, of spraying consistency of the premix, drop-in, or combination type in accordance with Test Methods D 1644, and state any necessary larger specimen size for beaded paint. Either of the two methods can be used as follows:

4.15.1 *Method A*—3 h at 105°C for paints with nonsolvent components that decompose at higher temperature.

4.15.2 *Method B*—10 min at 149°C for most paints with nonsolvent components that are reasonably stable at 149°C.

4.16 *Varnishes*—Nonvolatile content (weight %) of varnishes is determined using Test Methods D 1644. These test methods may give high results due either to incomplete elimination of volatile matter or to absorption of oxygen by oxidizing-type varnishes.

4.17 *Solvent-Based Interior Semigloss Wall and Trim Enamels*—Use Test Method D 2369 to determine volatile content. Volume nonvolatile matter is determined in accordance with Test Method D 2697.

4.18 *Silanes, Siloxanes and Silane-Siloxane Blends Used in Masonry Water Repellent Treatments*—Test Method D 5095 describes a procedure for the determination of the nonvolatile content of silanes, siloxanes and the blended silane-siloxane materials used in masonry water repellent treatments and is applicable to both solvent and water-borne materials.

#### 5. Precision

5.1 Some of the referenced ASTM standards have precision limits. Reference to the individual standards for precision statements is recommended.

#### 6. Keywords

6.1 nonvolatile content of paints and related coatings; volatile content of paints and related coatings

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