



Standard Test Method for Determination of Volatile Organic Compound (VOC) Content of Electrical Insulating Varnishes¹

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1. Scope

1.1 This test method is used to determine the amount of volatile organic compounds emitted during cure of electrical insulating varnishes.

1.2 The values stated in SI units are the standard.

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. See Section 7 for specific precautions.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 115 Test Methods for Testing Solvent Containing Varnishes Used for Electrical Insulation²

D 1711 Terminology Relating to Electrical Insulation²

D 3960 Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings³

D 4733 Test Methods for Solventless Electrical Insulating Varnishes⁴

D 5423 Specification for Forced-Convection Laboratory Ovens for Evaluation of Electrical Insulation⁴

3. Terminology

3.1 *Definition of Term Specific to This Standard:*

3.1.1 *varnish, electrical insulating, n*— a liquid resin system that is applied to and cured on electrical components providing electrical, mechanical, and environmental protection.

3.1.1.1 *Discussion*—There are two types of electrical insulating varnish: solvent-containing and solventless. The solvent-containing varnish is a solution, dispersion, or emulsion of a polymer or mixture of polymers in a volatile, nonreactable liquid. The solventless type is a liquid resin system free of volatile, nonreactable solvents.

¹ This standard is under the jurisdiction of ASTM Committee D09 on Electrical and Electronic Insulating Materials and is the direct responsibility of Subcommittee D09.01 on Electrical Insulating Varnishes, Powders, and Encapsulating Compounds.

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² *Annual Book of ASTM Standards*, Vol 10.01.

³ *Annual Book of ASTM Standards*, Vol 06.01.

⁴ *Annual Book of ASTM Standards*, Vol 10.02.

3.1.2 For definitions of other terms pertaining to this test method, refer to Terminology D 1711.

4. Significance and Use

4.1 This test method determines the volatile organic content of an electrical insulating varnish. It utilizes a procedure where dishes containing a known amount of varnish are baked and the amount of volatile organic compound is measured. Calculations are performed to express this in g/L or lb/gal. This test method is applicable to all types of varnishes. However, waterborne varnishes while baked under the same conditions need to have water content determined and calculations performed in accordance with Practice D 3960.

4.1.1 During the cure of electrical insulating varnishes some organic material is volatilized. A determination of the amount that is volatilized is useful for estimating the amount of cured varnish on electrical units and volatile organic emissions from a manufacturing facility.

5. Interferences

5.1 The amount of volatile organic content determined by this test method is known to be affected by the rate of air exchange in the baking oven.

6. Apparatus

6.1 *Weighing Dishes*, aluminum, approximately 60 mm (2 $\frac{3}{8}$ in.) in diameter and 15 mm ($\frac{5}{8}$ in.) high on the sides.

6.2 *Forced-Convection Oven*, see Specification D 5423-Type II.

6.3 *Desiccator*.

7. Hazards

7.1 **Precaution**—Do not use varnish at temperatures above the flash point when inadequate ventilation, and the possibility of flames or sparks exist. Store varnish in sealed containers.

8. Procedure

8.1 Weigh three aluminum dishes to the nearest 0.01 g.

8.2 Add approximately 2 to 10 g of the varnish to be tested to each dish.

8.3 Weigh each dish and varnish to the nearest 0.01 g.

8.4 Roll the resin around in the dishes to ensure an even coating.

8.5 Place the dishes in a forced-convection oven at 150° \pm