Designation: D3312 – 04 (Reapproved 2013)

Standard Test Method for Percent Reactive Monomer in Solventless Varnishes[1]

This standard is issued under the fixed designation D3312; 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 percent of volatile reactive monomer having a vapor pressure exceeding 13.3 Pa (0.1 Torr) at 25°C in an uncatalyzed solventless varnish. Experience has shown this method does not accurately determine percent reactive monomer when the vapor pressure is less than 13.3 Pa (0.1 Torr).

1.2 The values stated in SI units are 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 and health practices and determine the applicability of regulatory limitations prior to use.* For a specific precaution, see Section 5.

NOTE 1—There is no similar or equivalent ISO/IEC standard.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1711 Terminology Relating to Electrical Insulation

D5423 Specification for Forced-Convection Laboratory Ovens for Evaluation of Electrical Insulation

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *reactive monomer, n—in solventless electrical varnish*, a substance, that, when added to a resin, will combine chemically with that resin under specified conditions.

3.2 See Terminology D1711 for definitions of other terms relating to electrical insulation.

4. Significance and Use

4.1 The percent of reactive monomer in solventless varnishes will affect the viscosity, the handling, and the processing properties of the uncured resin. The percent of reactive monomer will possibly affect the degree of hardness and shrinkage which in turn will affect the physical and electrical properties of the cured resin.

5. Safety Precautions

5.1 It is unsafe to use varnish at temperatures above the flash point without adequate ventilation, especially if the possibility exists that flames or sparks are present. Store varnish in sealed containers.

6. Apparatus

6.1 *Balance,* capable of weighing to nearest 0.0001 g.

6.2 *Thermometer*—A glass thermometer having a range from 0 to 200°C (30 to 400°F) and accurate within ±1°C (±2°F).

6.3 *Oven*—A forced-draft constant-temperature oven conforming to Specification D5423, Type II.

6.4 *Bottle and Drying Dishes*—A stoppered bottle and flat-bottom aluminum drying dish. having an inside diameter of approximately 70 mm (2¾ in.) and a depth of 8 mm (5⁄16 in.).

6.5 *Desiccator*—A suitable desiccator containing anhydrous calcium chloride ($CaCl_2$).

7. Test Specimens

7.1 *Preparing Specimens*—Place a portion of the uncatalyzed solventless varnish in a stoppered bottle and weigh. Transfer a specimen weighing between 0.2 and 0.3 g from the weighed stoppered bottle to a weighed drying dish, which has been previously heated for 30 min at 150°C (300°F) and cooled in a desiccator. Weigh the stoppered bottle with the remaining contents again. Determine the exact weight of the specimen transferred to the drying dish by the difference in weight of the stoppered bottle. Prepare two specimens from the contents of the stoppered bottle.

8. Procedure

8.1 *Dilution of Specimens*—Add 5 ± 1 mL of methyl isobutyl ketone (MIBK) to each specimen in the drying dish.

[1] This test method 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] 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.

Mix the specimen and the MIBK by moving the drying dishes in a circular direction. Mixing on a hot plate at temperatures below 65°C (150°F) is permissible. Take care to prevent any loss of solvent or specimen by spillage.

8.2 *Drying Specimens*—Place the specimens in constant-temperature oven which has been stabilized at 150°C (300°F) within 15 min after mixing. Keep the specimens in the 150°C (300°F) oven for 15 min.

8.3 *Weighing Dried Specimens*—At the termination of the 15-min heating period, remove the specimens to a desiccator and cool to room temperature. Weigh each specimen immediately upon removal from the desiccator.

9. Calculation

9.1 Calculate the percentage of monomer by weight as a ratio of the weight loss of the dried specimen to the weight of the specimen in the original state, expressed as a percentage, as follows:

$$\%\ monomer = (weight\ loss/original\ sample\ weight) \times 100 \quad (1)$$

10. Report

10.1 Report the following information:

10.1.1 Identification of the solventless varnish, and

10.1.2 Percent reactive monomer.

11. Precision and Bias

11.1 *Precision*—The interlaboratory standard deviation calculated from the results of testing in six laboratories is as follows:[3]

Monomer	Interlaboratory Standard Deviation (%)
Styrene	0.365
Vinyl toluene	0.163
t-butyl styrene	1.61
Diallyl phthalate	1.99

11.2 *Bias*—This test method has no bias, since the value for percent reactive monomer is determined solely in terms of this test method.

12. Keywords

12.1 monomer (See reactive monomer); reactive monomer; reactive monomer, %; solventless varnish; varnish

[3] Supporting data are available from ASTM Headquarters. Request RR:D09-1013.