Designation: D 5200 – 03

Standard Test Method for Determination of Weight Percent Volatile Content of Solvent-Borne Paints in Aerosol Cans[1]

This standard is issued under the fixed designation D 5200; 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 is for the determination of the weight percent volatile organic compounds of solvent-borne paints in aerosol cans. It offers a unique way to obtain paint specimens from aerosol cans.

1.2 *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.* A specific hazard statement is given in Note 1.

2. Referenced Documents

2.1 *ASTM Standards:*

E 145 Specification for Gravity-Convection and Forced-Ventilation Ovens[2]

E 180 Practice for Determining the Precision of ASTM Methods for Analysis and Testing of Industrial and Specialty Chemicals[3]

2.2 *Other Standard:*

Method 35 Determination of Percent Volatile Organic Compounds (VOC) in Solvent Based Aerosol Paints[4]

3. Summary of Test Method

3.1 A designated quantity from an aerosol coating is sprayed into an adapter glass tube assembly and heated in an oven at 110 ± 5°C for 60 min. The percent volatile is calculated from the loss in weight.

4. Significance and Use

4.1 This test method is the procedure of choice for determining the volatile content in aerosol coatings under specified test conditions modeled after Method 35[4]. The inverse value, nonvolatile, is used to determine the weight percent solids content. This information is useful to the paint producer, user, and to environmental interests for determining the grams of volatile organic compounds per gram of solids emitted from aerosol cans.

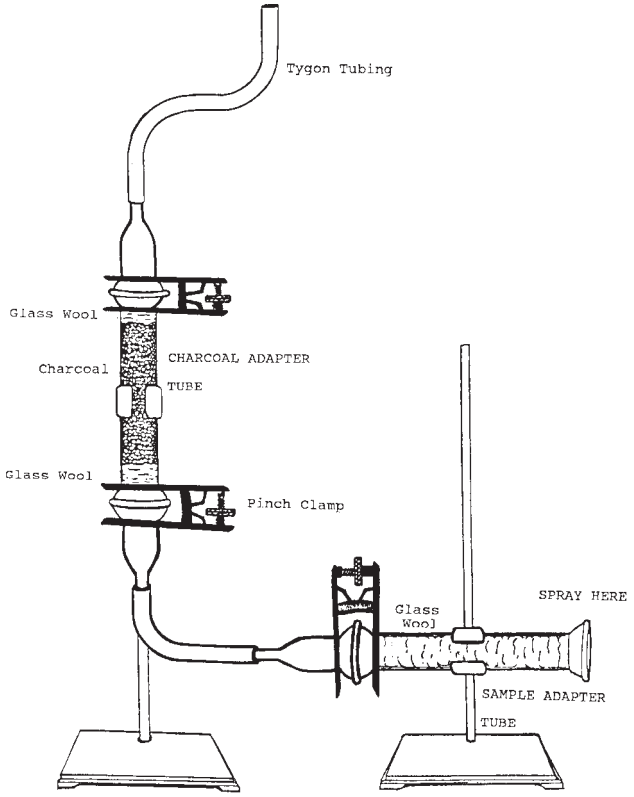

FIG. 1 Adapter Glass Tube Assembly

5. Apparatus

5.1 *Adapter Glass Tube Assembly*, (Fig. 1).

5.1.1 *Sample Adapter Tube*, straight connecting with 35/25 spherical joints. Loosely fill with glass wool and precondition for 30 min in an oven at 110 ± 5°C and store in a dessicator prior to use.[5,6]

[1] This test method is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.21 on Chemical Analysis of Paints and Paint Materials.

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[2] *Annual Book of ASTM Standards*, Vol 14.04.

[3] *Annual Book of ASTM Standards*, Vol 15.05.

[4] Bay Area Air Quality Management District, (BAAQMD) *Manual of Procedures*, Vol III, 939 Ellis St., San Francisco, CA 94109.

[5] The sole source of supply of the adapter tube, No. 5035-35 known to the committee at this time is Ace Glass Inc., P.O. Box 688, 1430 Northwest Blvd., Vineland, NJ 08360.

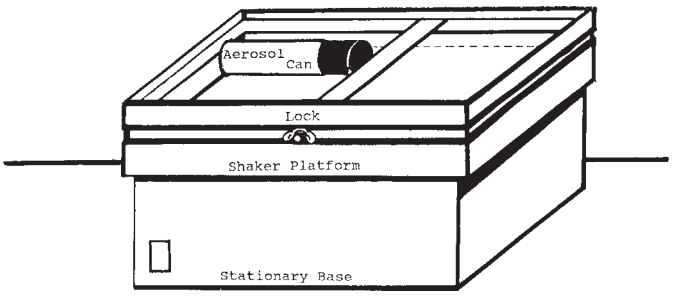

FIG. 2 Aerosol Can on Eberbach Shaker

5.1.2 *Charcoal Adapter Tube*, straight connecting with 35/25 spherical joints. Fill with activated charcoal and plug both ends with glass wool. This tube is used to prevent the solvent vapors from contaminating the vacuum pump.[6,7]

5.1.3 *Adapters*, connecting hose with 35/25 socket joints.[6,8]

5.1.4 *Adapter*, [6,9] connecting hose with 35/25 ball joint.

5.1.5 *Clamps*, pinch type, with screw-locking device.[6,10]

5.1.6 *Glass Wool*, medium-fine silk.

5.1.7 *Activated Charcoal*, coconut, 8 to 12 mesh.

5.1.8 *Tygon Tubing*.

5.1.9 *Iron Stands*.

5.1.10 *Utility Clamps*.

5.2 *Vacuum Pump*.

5.3 *Forced Draft Oven*, Type II A or Type II B as specified in Specification E 145.

5.4 *Actuators (Valves)*, with extension tubes.

5.5 *Top-Loading Balance*, capable of weighing to 0.01 g.

5.6 *Shaker*, similar to the Eberbach shaker in Fig. 2.

6. Procedure

6.1 Mix the aerosol can thoroughly using a shaker, similar to the Eberbach shaker in Fig. 2, for 15 min at the low-speed setting. It is essential that the samples be well mixed to obtain valid results.

6.2 Weigh accurately to 0.01 g, a preconditioned sample adapter tube. Use a pair of gloves at all times when handling the adapter glass tube.

6.3 Remove the cap and actuator from the mixed can. Replace the actuator with one having an extension tube.

6.4 Test actuator and extension tube fit by spraying some contents out for about 5 s. This step also clears the dip tube in case a separation has occurred. If a leak is observed, replace with a better fitting actuator or extension tube.

6.5 Weigh the aerosol can with the actuator to the nearest 0.01 g. Spray 3 to 5 g of aerosol into the adapter tube assembly, spreading out the coating by moving the extension tube around the wall of the adapter tube. The spraying is done with the vacuum on.

6.6 Obtain the specimen weight by difference by weighing the aerosol can again to 0.01 g after spraying out the specimen.

6.7 Place the sample adapter tube in the drying oven for 60 min at 110 ± 5°C.

NOTE 1—**Warning:** Provide adequate ventilation, consistent with accepted laboratory practice, to prevent solvent vapors from accumulating to a dangerous level.

6.8 Remove the adapter tubes from the oven, place immediately in a dessicator, cool to ambient temperature, and weigh to 0.01 g.

7. Calculations

7.1 Calculate the weight percent nonvolatile content (NV), in the aerosol can as follows:

$$NV, \% = (W_2/W_1) \times 100 \quad (1)$$

where:

W_1 = weight of aerosol can before spraying sample minus weight of aerosol can after spraying sample, g, and

W_2 = weight of sample adapter tube with solids minus weight of sample adapter tube, g.

7.2 The weight percent organic volatiles (WO), in the aerosol can may be calculated by the difference as follows:

$$WO, \% = 100 - NV \quad (2)$$

where grams of organic volatiles/grams of solid equal WO/NV.

8. Precision and Bias

8.1 *Precision*—Estimates are based on an interlaboratory study in which 1 operator in each of 3 laboratories analyzed in duplicate on two different days 3 samples of solvent-borne aerosol coatings containing 63.04 to 77.53 % organic volatiles. The coatings were commercially supplied. The results were analyzed statistically in accordance with Practice E 180. The within laboratory coefficient of variation was found to be 0.51 % relative at 9 df and the between laboratory coefficient of variation was 1.04 % relative at 6 df. Based on these coefficients, the following criteria should be used for judging the acceptability of results at the 95 % confidence level:

8.1.1 *Repeatability*—Two results, each the mean of duplicate determinations obtained by the same operator on different days, should be considered suspect if they differ by more than 1.62 % relative.

8.1.2 *Reproducibility*—Two results, each the mean of duplicate determinations obtained by operators in different laboratories should be considered suspect if they differ by more than 3.59 %.

8.2 *Bias*—Bias cannot be determined because there are no accepted standards for volatile content of solvent-borne content of paints in aerosol cans.

9. Keywords

9.1 aerosols; solvent-borne paints; volatile content

[6] If you are aware of alternative suppliers, please provide this information to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.

[7] The sole source of supply of the charcoal adapter tube, No. 5035-3 known to the committee at this time is Ace Glass Inc.

[8] The sole source of supply of the adapters (socket joints) No. 5217-35 known to the committee at this time is Ace Glass Inc.

[9] The sole source of supply of the adapter (ball joint) No. 5216-35 known to the committee at this time is Ace Glass Inc.

[10] The sole source of supply of the clamps, No. 7669-14 known to the committee at this time is Ace Glass Inc.