Designation: D1483 – 12 (Reapproved 2016)

Standard Test Method for Oil Absorption of Pigments by Gardner-Coleman Method[1]

This standard is issued under the fixed designation D1483; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This test method covers the determination of oil absorption of pigments by the Gardner-Coleman procedure.[2]

1.2 The values stated in SI units are to be regarded as 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.*

2. Referenced Documents

2.1 *ASTM Standards:*[3]

D281 Test Method for Oil Absorption of Pigments by Spatula Rub-out

3. Summary of Test Method

3.1 A soft paste is formed by the dropwise addition of linseed oil to the gently stirred pigment. The amount of oil required to form the paste is used to calculate an oil absorption value.

4. Significance and Use

4.1 The oil absorption value obtained by this test method provides information about the vehicle demand of the pigment when it is used in a pigment paste. Oil absorption values can be used to characterize batches of a given pigment.

4.2 This test method differs from Test Method D281 in that D281 requires a vigorous rubbing action whereas this test method involves only a gentle stirring and folding of the pigment. Because the end points are different, the values obtained from the two test methods generally differ.

5. Apparatus and Materials

5.1 *Balance,* capable of weighing to 0.01 g.

5.2 *Glass Container,* round-bottom, having a capacity of 250 mL (½ pt), or a low-form 250-mL beaker.

5.3 *Buret,* graduated in 0.1-mL divisions.

5.4 *Spatula,* sharp-edged steel, having a blade 15 or 20 by 100 mm (½ or ¾ by 4 in.).

5.5 *Linseed Oil,* raw, conforming to the following specification:

Specific Gravity	0.926 – 0.931
Boiling Point	>149°C
Acid Number	3 ± 1
Saponification Value	185 – 196
Iodine Value	170 minimum
Gardner Color	13 maximum

6. Procedure

6.1 The weight of pigment used should correspond to a pigment volume of 3.0 ± 0.6 mL. Determine the weight needed by multiplying 3.0 ± 0.6 mL by the specific gravity of the pigment being tested. For example, a 20 g specimen normally is used for zinc oxide (3.6 mL × 5.6 g/mL = 20.2 g). Transfer the amount, weighed to 0.01 g, to the glass container.

6.2 Add oil from the buret at the rate of about 1 drop per second, stirring and "folding" the pigment continuously with the spatula during the addition. Try to provide dry pigment for the oil to strike. Do not rub or grind; as the particles of pigment become wetted, they collect in small lumps that gradually coalesce. As the coalescence proceeds, reduce the rate of oil addition by at least half. The end point is reached when the lumps, with a rolling action from the spatula, collect into a single ball or the excess of oil smears the wall of the container.

7. Calculation

7.1 Calculate the oil absorption, *A*, as follows:

$$A = \frac{M \times 0.93}{P} \times 100 \quad (1)$$

[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 D01.24 on Physical Properties of Liquid Paints and Paint Materials.

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[2] See Gardner, H. A. and Coleman, R. E., "Oil Absorption of Pigments," *Scientific Section Circular 85*, Paint Manufacturers' Assoc. of the United States, February 1920.

[3] 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.

where:

M = oil, mL, and
P = pigment, g.

0.93 represents density of oil (in grams per millilitre). Express as grams of oil per 100 g of pigment.

8. Report

8.1 Report the oil absorption of the pigment as grams of oil per 100 grams of pigment.

9. Precision and Bias

9.1 On the basis of an interlaboratory study of this test method in which one operator in each of 5 laboratories tested 5 pigments with a broad range of oil absorption levels, the within-laboratory coefficient of variation was 3.4 % at 25 df and the between-laboratory coefficient of variation was 5.3 % at 20 df. Based on these coefficients, the following criteria should be used to judge the acceptability of results at the 95 % confidence level:

9.1.1 *Repeatability*—Two results obtained by the same operator should be considered suspect if they differ by more than 9.9 % relative.

9.1.2 *Reproducibility*—Two results obtained by different operators in different laboratories should be considered suspect if they differ by more than 15.3 % relative.

9.2 *Bias*—Since there is no accepted reference material suitable for determining bias for the procedure in this test method, bias cannot be determined.

10. Keywords

10.1 Gardner-Coleman Method; oil absorption; pigments (general properties)