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Standard Test Method for Abrasion Resistance of Petroleum Wax Coatings[1]

This standard is issued under the fixed designation D 3234; 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 determination of the abrasion resistance of glossy smooth coatings of petroleum wax or wax-based blends applied to paper and paperboard.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are provided 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:*

C 190 Test Method for Tensile Strength of Hydraulic Cement Mortars[2]

D 1834 Test Method for 20° Specular Gloss of Waxed Paper[3]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.2 *abrasion resistance of a wax coating*—the resistance to change in gloss when that coating has been subjected to an abrading action by a hard external object.

4. Summary of Test Method

4.1 Sixty grams of sand are dropped at a controlled rate on a very small area of a coating under fixed conditions. Gloss is measured with a 20° specular glossmeter before and after this abrading action by the falling sand.

5. Significance and Use

5.1 A test method to measure the abrasion resistance of petroleum wax coatings on paper and paperboard helps predict the resistance to change in gloss that coatings may undergo. An example of a critical wax coated material is a waxed frozen food carton, which must resist change in gloss when the packaging material is handled progressively by the following: the supplier of the packaging material, the manufacturer or packager who combines his product with the packaging material, the wholesaler, the retailer and eventually the consumer.

6. Apparatus

6.1 *Tube*, of glass 25.4 mm (1 in.) in inside diameter and 305 mm (12 in.) in length. It shall support a No. 12 U.S. Standard Sieve 76 mm (3 in.) from the top of the tube. (The screen can be supported by four indentations in the inner glass wall, by means of sandwiching the screen between two washers which fit tightly inside the glass, or by any other means.)

6.2 *Separatory Funnel*, 500-mL globular type with a stopcock of size T4.[4] The stem must be cut off just below the stopcock.

6.3 *Standard Sand*, [5] of 20 to 30 mesh meeting Test Method C 190. The reuse of sand is permitted provided there is no appreciable contamination with foreign particles. Screen through a 20-mesh screen to remove coarse impurities.

6.4 *45° Specimen Holder*, of wood, with a precise 45° inclined plane on which the test specimen can be held firmly at this angle.

6.5 *Spotlight Source*, such as a flashlight or a microscope illuminator, such as Bausch and Lomb's Nicholas illuminator.

6.6 *20° Specular Glossmeter*, as used in TAPPI T653-os-70, Specular Gloss of Waxed Paper (20°), or Test Method D 1834.

7. Sampling and Test Specimen

7.1 For each sample, prepare three specimens each a minimum of 76 mm (3 in.) by 152 mm (6 in.). The specimens shall be so prepared that the abrading by the dropping sand will be along the coating machine direction if known. If unknown, use the same orientation for all the specimens.

8. Procedure

8.1 Set up the apparatus as shown in Fig. 1 (a). To locate the exact position for making glossmeter readings, use the following procedure:

8.1.1 Place a plumb line through the tube and adjust the tube so that it is perfectly vertical.

8.1.2 Place a spotlight source directly above the glass tube and shine the light through the tube and onto the coated side of the specimen held firmly on the 45° specimen holder. With a

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[2] *Annual Book of ASTM Standards*, Vol 04.01.

[3] *Annual Book of ASTM Standards*, Vol 05.01.

[4] Corning No. 6340, 500-mL capacity, or equivalent.

[5] Available from Ottawa Silica Co., Ottawa, IL. 61350.

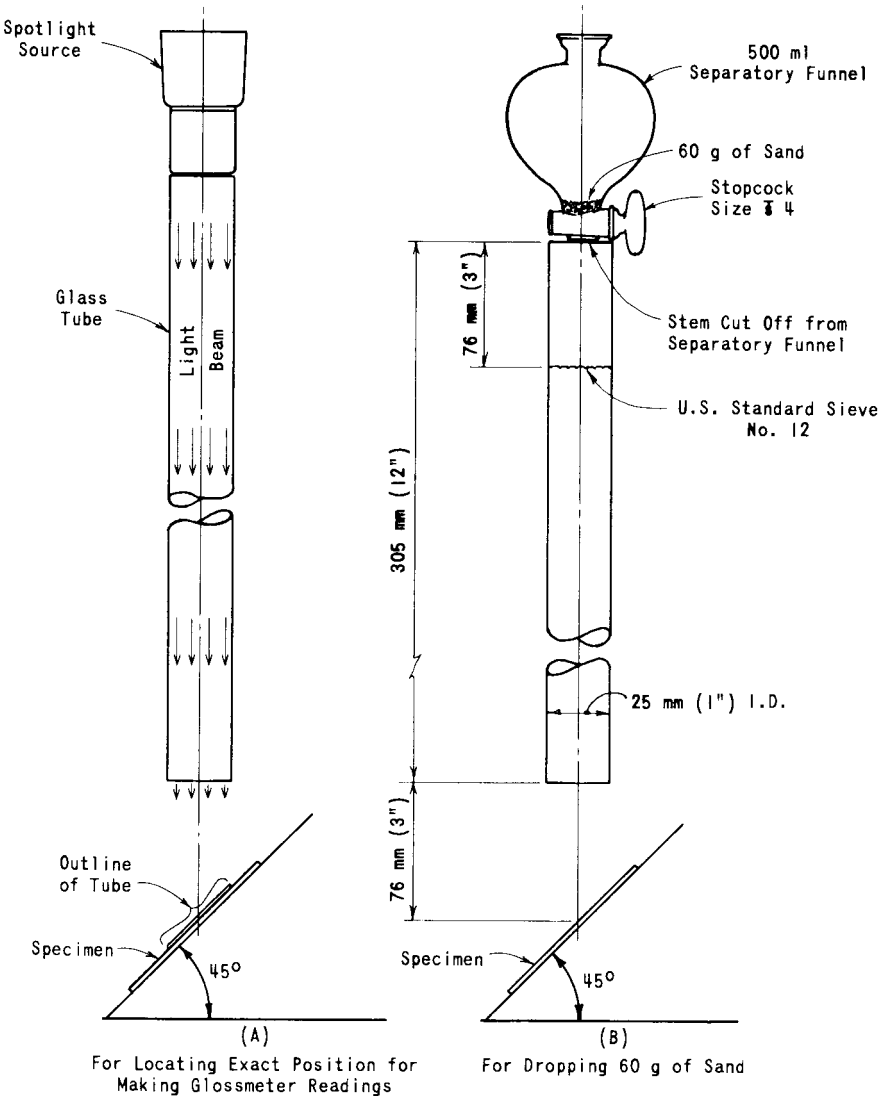

FIG. 1 Apparatus for Measuring Abrasion Resistance of Wax Coatings

pen or pencil trace the outline of the tube on the specimen. This will give an outline of an oval.

8.2 Place the specimen on the glossmeter so that the beam of light from the lamp of the glossmeter hits within the outlined oval on the coating. Observe the precise position where the beam of light from the lamp of the glossmeter hits the outlined oval on the coating. Read the glossmeter to the nearest whole number.

8.3 Relocate the specimen on the 45° specimen holder and adjust the position of the specimen so that the outlined oval on the coating coincides with the outline of the tube given by the spotlight source.

8.4 To abrade the specimen, use the following procedure. Remove the spotlight source from the tube and place in the separatory position. Put 60 ± 0.05 g of sand into the separatory funnel with its stopcock full open.

8.5 After all the sand has been dropped, transfer the specimen to the glossmeter. Use the previous method of locating the exact position on the specimen and read the glossmeter to the nearest whole number. It is important that this final reading is made at the precise position on the coating where the initial reading was made.

9. Calculation

9.1 Calculate the percent gloss retention to the nearest whole number as follows:

$$\text{Gloss Retention, \%} = (F/I) \times 100 \quad (1)$$

where:

F = final glossmeter reading, and
I = initial glossmeter reading.

9.1.1 Repeat the procedure two more times on two more specimens of the same sample. Average the three values of percent gloss retention.

10. Report

10.1 Report the following information:

10.1.1 Average percent gloss retention of the sample to the nearest whole number in percentage.

11. Precision and Bias

11.1 The precision of the test method as determined by statistical examination of interlaboratory results is as follows:

11.1.1 *Repeatability*—The difference between two test results, obtained by the same operator with the same apparatus under constant operating conditions on identical test material, would in the long run, in the normal and correct operation of the test method, exceed the following values only in one case in twenty:

5 % gloss retention

11.1.2 *Reproducibility*—The difference between two single and independent results obtained by different operators working in different laboratories on identical test material would, in the long run, in the normal and correct operation of the test method, exceed the following values only in one case in twenty:

6 % gloss retention

11.2 The above precision data were obtained in round-robin testing among seven laboratories on three samples with an initial gloss between 66 and 85 and a gloss retention between 39 and 60.

11.3 The procedure in this test method has no bias because the value of abrasion resistance can be defined only in terms of a test method.

12. Keywords

12.1 abrasion; abrasion resistance; petroleum wax coating; wax coating