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Standard Test Method for Evaluation of Tannin Stain Resistance of Coatings[1]

This standard is issued under the fixed designation D6686; 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 an accelerated procedure to determine the effectiveness of latex coatings at preventing the migration of tannin stains from wood substrates.

1.2 The values in SI units are to be regarded as the standard. The values in parenthesis 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:*[2]

D1475 Test Method For Density of Liquid Coatings, Inks, and Related Products

D4585 Practice for Testing Water Resistance of Coatings Using Controlled Condensation

D5068 Practice for Preparation of Paint Brushes for Evaluation

3. Terminology

3.1 *Definitions:*

3.1.1 *tannin stain resistance, n*—the ability of a coating to prevent the migration of tannins or other wood-based chromospheres to the surface of a film.

4. Summary of Test Method

4.1 This test method utilizes a condensation test chamber to determine the tannin stain resistance of latex paints. The test paints are applied to substrates that contain tannin extractives and are placed on or in the test chamber. CIELAB L* and b* values as well as subjective ratings are recorded after exposure.

5. Significance and Use

5.1 Tannins and other chromophoric extractives are naturally occurring materials in wood and wood-based substrates. Tannins are prevalent to a high degree in cedar, redwood, oak and to a lesser degree in white and yellow pine. Tannins are also present in varying amounts in wood composition products. These extractives are solubilized and darkened in color by aqueous coatings, resulting in unsightly yellow or brown discolorations. This test method is designed to show the relative ability of paints to prevent tannin bleed-through. Typically cedar or redwood panels are used for this test.

6. Apparatus

6.1 *Test Chamber,* as described in Practice D4585.

6.2 *Test Substrate,* 15.2 by 121.9 cm (6 by 48 in.) substrate or of a size agreed upon by the purchaser and seller of the coating being tested.

6.3 *Paint Brush,* nylon/polyester brush of good quality.

6.4 *Spectrophotometer.*

6.5 *Electronic Balance.*

6.6 *Conditioned Room,* at 18 to 29.5°C (65 to 85°F) and 40 to 60 % relative humidity.

7. Reagents and Materials

7.1 *Wood Panels*—Such as cedar, redwood, oak, white pine, yellow pine or other substrate as agreed upon between the purchaser and the seller of the coating being tested.

7.2 *Control Paint*—An agreed-upon paint of known tannin stain resistance.

7.3 *Test Paints*—Since there are no standard panels, photographs, or paints for this test method, an agreed-upon control paint (7.2) should be included as one of the test paints.

8. Procedure

8.1 Choose a substrate with a consistent grain pattern. Patterns vary greatly from panel to panel, so try to select a board that has consistent wood grain across the length of the substrate. Results may vary from panel to panel because of different growth rates, grain angles, colors and species of wood. If necessary, panels may be sanded to remove raised grain. Substrates with areas of rough spots should be avoided,

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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.

as they will bleed through more readily. Divide substrate into strips at least 15.2 cm (6 in.) wide or as agreed upon between the purchaser and the seller and label the back of each test area with paint designation. The control paint should be placed near the middle of the panel.

8.2 Prepare the cabinet as described in Practice D4585.

8.3 Prepare paint brush as described in Practice D5068.

8.4 Prime all edges of the panels with an appropriate primer and allow to dry according to manufacturer's recommendations. The backside of the panels must also be primed if the panels are to be placed fully inside the chamber.

8.5 Measure the density of the test paint in accordance with Test Method D1475, and then using a brush, apply sufficient weight of test paints to achieve the desired spreading rate. Since dry time is critical, paints should be applied as quickly as possible, so that the average dry time is as close to the specified dry time as possible for each test paint. If a second coat (self primed) is to be applied, allow the first coat to dry in the conditioned room for four h (dry time may affect results) or as agreed upon between the purchaser and seller. If appropriate, apply second coat or topcoat over the entire substrate with enough grams to achieve the desired spread rate. Stain blocking is highly dependent of film thickness; therefore, it is essential that the test paints be weighed on accurately, particularly for small test areas. The amount of paint in grams required for a specific spread rate can be determined from the following equation:

$$g = ((A*W)/S)*3.15$$

where:

A = area, square inches,
W = weight per gallon, lb./gal, and
S = spreading rate, square feet/gal.

Or the following metric equation:

$$g = ((A_m*D)/S_m)*1000$$

where:

A_m = area, square metres,
D = density, g/mL or kg/L, and
S_m = spreading rate, square metres/L.

8.6 Allow the panels to dry in the conditioned room for 24 ± 1 h (dry time may affect results) or as agreed upon between the purchaser and seller. Immediately place the panels on the chamber with the painted sides facing toward the humidity or place backprimed panels fully inside the chamber if agreed upon between the purchaser and seller. All panels should be run similarly. If the panels are placed on the chamber, fill all spaces in the specimen rack with test boards or blanks. Close all cracks between boards to prevent water vapor loss and temperature variation. Larger cracks may be closed with tape or metal strips. If the panels are placed inside the chamber, make sure panels are placed at an angle to avoid water spotting and run off onto the test areas.

8.7 Adjust the thermostat to maintain the desired temperature of the saturated air and water vapor mixture. Cabinet temperature of 39°C (100°F) is suggested. To ensure adequate condensation on face down panels, maintain at least a 11°C (20°F) temperature differential between the room and the inside of the chamber.

8.8 After 16 ± 1 h, or an exposure time agreed upon between the purchaser and seller, carefully remove the panels and allow to dry for 24 h.

8.9 Quantitatively rate each paint using the ASTM Scoring System 0-10 with 10 being no tannin stain and 0 a severe stain.

8.10 Check CIELAB values using a spectrophotometer. Report L* and b* values. In this test b* values are most important. Lower b* values generally indicate better tannin block resistance. Higher b* values indicate a yellower or browner color. L* values, measuring whiteness versus darkness, are also important. Significant differences in either L* or b* values is 0.5 units. Five readings per test area should be taken, ranging from the top portion to the bottom part, and averaged together. The average of multiple measurements should minimize differences in grain pattern. Readings should not be taken over any obvious defect which is not a true reflection of the test area, such as a knot or any other defect.

9. Report

9.1 Report the following information:

9.1.1 Substrates used, test paints, topcoat, spreading rates, dry time of first coat, dry time of topcoat, vapor temperature and exposure time of topcoated panel to humidity. Report if the panels were placed face down or fully inside the cabinet.

9.1.2 Subjective results based on 0-10 scale.

9.1.3 L* and b* values and specify both illuminant and standard observer.

10. Precision and Bias

10.1 It is not possible to specify the precision and bias in Test Method D6686 for measuring the tannin stain resistance of coatings because of the varying degree of tannin stains present in the test substrates.

11. Keywords

11.1 stain blocking; tannin stain; wood extractives; wood stain