Designation: D925 – 14

Standard Test Methods for Rubber Property—Staining of Surfaces (Contact, Migration, and Diffusion)[1]

This standard is issued under the fixed designation D925; 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 These test methods cover techniques to evaluate three types of staining that rubber may cause when in contact with, or in proximity to, another surface that may be light colored.

1.2 The test methods also describe how to qualitatively evaluate the degree of staining produced under the conditions of exposure to heat alone or heat and light.

1.3 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 *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]

D1148 Test Method for Rubber Deterioration—Discoloration from Ultraviolet (UV) or UV/Visible Radiation and Heat Exposure of Light-Colored Surfaces

D3182 Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets

D3183 Practice for Rubber—Preparation of Pieces for Test Purposes from Products

E145 Specification for Gravity-Convection and Forced-Ventilation Ovens

G151 Practice for Exposing Nonmetallic Materials in Accelerated Test Devices that Use Laboratory Light Sources

G154 Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials

G155 Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *stain, contact*—discoloration of a product by another material or product in the area of direct contact.

3.1.1.1 *Discussion*—A test for direct surface discoloration of rubber is covered by Test Method D1148.

3.1.2 *stain, diffusion*—discoloration of a light colored veneer or coating, caused by the diffusion of staining materials from the rubber through the veneer or coating.

3.1.2.1 *Discussion*—The veneer or coating is in direct intimate contact with the underlying rubber.

3.1.3 *stain, migration*—discoloration, caused by constituents of a rubber, that occurs on any portion of the surface of any object in the proximity of or adjacent to but not in direct contact with the rubber causing the stain.

4. Summary of Test Methods

4.1 The test methods are as follows:

4.1.1 *Method A*—Contact Stain.

4.1.2 *Method B*—Migration Stain.

4.1.3 *Method C*—Diffusion Stain.

4.2 *Method A*—Specimens to be tested for *contact* staining are sandwiched between two metal panels. The metal panels are furnished with a desired light colored organic finish, which is in contact with the rubber. The assembly is exposed to elevated temperatures for a specified length of time and the specimens are then removed from the metal. The degree of staining of the surface that was in contact with the rubber is rated against a reference standard and a control panel (a metal plate without rubber) which are simultaneously tested with the specimen.

4.3 *Method B*—Specimens to be tested for *migration* staining are placed on a metal plate with a desired light colored organic finish, and exposed to either fluorescent UVA-340 lamps or filtered xenon arc radiation for a specified period of time. The degree of staining beyond the area that was in contact with the specimens is then rated against a reference standard

[1] These test methods are under the jurisdiction of ASTM Committee D11 on Rubber and are the direct responsibility of Subcommittee D11.15 on Degradation Tests.

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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.

and a control panel (a metal plate without rubber) which are simultaneously tested with the specimen.

4.4 *Method C*—Diffusion staining is tested on specimens provided with a light colored rubber veneer or organic coating, deposited from organic solvent or water base. The specimens are exposed to either fluorescent UVA-340 lamps or filtered xenon arc radiation, with their veneer or coated side up, for a specified period of time. Any staining of the light colored veneer or organic coating is considered *diffusion* staining and rated against a reference standard and a control sample of the veneer or organic coating without the staining rubber.

4.5 Specimens used in *all three staining tests* shall include one or more reference samples of known staining characteristics. In addition, the contact and migration staining tests shall include a metal panel, without rubber samples, to establish the effect of the test conditions on the finished metal surface. The diffusion staining test shall include, as controls, a vulcanized sample of the rubber veneer by itself or a sample of the coating applied to aluminum foil.

5. Significance and Use

5.1 Rubber in contact with light colored organic finishes may stain the surfaces in contact with the rubber (contact staining) and surfaces adjacent to or beyond the rubber (migration staining), especially under conditions of heat, pressure, or sunlight. When a light colored rubber veneer or organic coating covers a staining rubber compound, the staining ingredients can diffuse through the veneer or coating and stain the surface (diffusion staining). This staining of light colored surfaces is objectionable to the consumer.

5.2 These test methods provide a means of evaluating staining characteristics of rubber compounds but may not necessarily duplicate the effects of natural exposure conditions.

5.3 Results obtained should not be treated as being equivalent to any natural exposure, unless the degree of quantitative correlation has been empirically established for the material in question.

5.4 These test methods may be used for producer-consumer acceptance, referee purposes, and research and development work.

5.5 The two types of exposures (Fluorescent UV and Xenon Arc) are not equivalent and may produce different test results.

METHOD A—CONTACT STAIN

6. Apparatus

6.1 *Circulating-Air Oven*—The oven shall meet the requirements of Specification E145, Type 11 B.

7. Materials and Manufacture

7.1 Metal panels 50 mm (2 in.) square shall be cut from sheet metal of approximately 0.9 mm (20 gauge) in thickness that has been coated with a desired organic finish. When these test methods are used to determine compliance with specifications, the panels may be supplied by the purchaser and the type of finish used may be the subject of agreement between the purchaser and the seller. The panels shall be aged for at least 48 h after finishing and before use in this test.

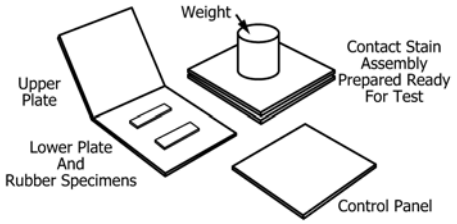

FIG. 1 Method A—Contact Stain Test Assembly

NOTE 1—It is recommended that acrylic enamel be employed as an organic coating for the metal panels (Delstar Acrylic Enamel—DAR 2185 white, in conjunction with Satin Primer DPE-1338, light gray-nonsanding).[3]

8. Test Specimen

8.1 The test specimen shall be prepared from a vulcanized production part or from a test sheet in accordance with Practices D3182 and D3183. The specimen shall be rectangular in shape, 25 by 12 mm (1 by 0.5 in.) and of uniform thickness. If a specimen of this size cannot be prepared from a production part, a modification of this size may be used, when agreed upon between the purchaser and the seller. The specimen shall be tested as received, but extraneous contamination and debris may be removed, without abrading the surface, by washing with a mild soap solution or by mechanical means.

9. Procedure

9.1 Place two rubber specimens from the same material between two metal plates, as shown in Fig. 1, with the finished surfaces of the panels in contact with the rubber.

9.1.1 Place the metal panel-rubber "sandwich" thus formed in the oven maintained at a temperature of 70 ± 2°C (158 ± 4°F). Place a 0.5 kg (1 lb) mass on top of the sandwich (or an adjusted mass, if nonstandard specimens are being tested).

9.1.2 Expose the assembly to the oven temperature for a specified time; time intervals frequently used are 6, 24, 48, and 96 h. In lieu of a specified time, 48 h shall be used as the default time interval. Take care that no other volatile or vapor producing materials that might produce staining are in the test chamber.

9.1.3 After the aging period, remove the assembly from the oven and separate the specimens cleanly from the sandwich. Then wash the panels with mild soap solution.

9.2 Simultaneously test a metal control panel without a rubber specimen to check the effect of the test conditions on the finish itself. Expose no control panel more than once.

9.3 One or more reference assemblies using rubber materials of known staining characteristics shall be included in the test.

[3] The sole source of supply of the apparatus known to the committee at this time is PPG Industries, Inc., Ditzler Automotive Finishes, Troy, MI 48084. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.