Designation: D1239 – 14

Standard Test Method for Resistance of Plastic Films to Extraction by Chemicals[1]

This standard is issued under the fixed designation D1239; 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 for resistance of plastic films to chemicals covers the measurement of the weight loss of film after immersion in chemicals.

NOTE 1—There is no known ISO equivalent to this standard.

NOTE 2—Film is defined as sheeting having nominal thickness not greater than 0.25 mm (0.010 in.), in accordance with Terminology D883.

1.2 The values stated in SI units are to be regarded as standard. The values stated in other units are nominal values given 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]

D543 Practices for Evaluating the Resistance of Plastics to Chemical Reagents

D882 Test Method for Tensile Properties of Thin Plastic Sheeting

D883 Terminology Relating to Plastics

D6899 Guide for Laboratory Cyclic Corrosion Testing of Automotive Painted Steel (Withdrawn 2010)[3]

3. Terminology

3.1 *Definitions*—For definitions of technical terms pertaining to plastics used in this test method, see Terminology D883.

4. Significance and Use

4.1 This test method is intended to be a rapid empirical test to determine the loss of the plasticizer or other extractable components from the plastic film when immersed in liquids commonly used in households.

5. Apparatus

5.1 *Balance*—An analytical balance, capable of weighing to 0.0001 g.

NOTE 3—An analytical balance capable of weighing to 0.001 g can be used when the specimen thickness is greater than 0.05 mm (0.002 in.) and the extracted weight loss of the specimen exceeds 0.005 g.

5.2 *Containers*—Pint jars or cans with a diameter of at least 65 mm (2.5 in.) (one container for each specimen).

6. Materials

6.1 *Distilled Water*—Freshly prepared distilled or deionized water.

6.2 *Soap Solution* (1 %)—Dissolve 12 g of dehydrated pure white soap flakes (dried for 1 h at 105°C) in 1200 mL of distilled water. This is sufficient solution to test three specimens.

6.3 *Cottonseed Oil*—Household cooking grade.

6.4 *Mineral Oil, USP*—Heavy grade, sp gr 0.875 to 0.905.

6.5 *Kerosine*.

6.6 *Ethyl Alcohol* (50 %) as described in Test Method D543.

6.7 Any other standard or supplementary reagent listed in Test Method D543.

7. Test Specimen

7.1 The test specimens for plastic films shall be in the form of squares 50 ± 0.25 mm (2 in.) on each side. At least three specimens of each sample shall be tested with each chemical reagent.

7.2 Nothing in this test method precludes the use of specimens of other dimensions or the making of other tests on the same specimens after they have been exposed to the chemicals. Another acceptable specimen is a disk 50 ± 0.25 mm (2 in.) in diameter (total area 41.5 cm^2), or a tension specimen 100 by 25 mm (4 by 1 in.) as prescribed in Test Methods D882. For such specimens, use a proportionate amount of chemical and container of appropriate dimensions so that the specimen can be immersed in a completely vertical position during the test. The

[1] This test method is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.19 on Film, Sheeting, and Molded Products.

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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.

[3] The last approved version of this historical standard is referenced on www.astm.org.

***A Summary of Changes section appears at the end of this standard**

amount of chemical used shall be approximately 8 mL/cm^2, counting the area of both sides of the specimen.

NOTE 4—Direct comparison of values should not be made between samples of different thicknesses, since percentage weight loss is a function of thickness.

8. Conditioning

8.1 *Conditioning*—Condition the test specimens at 23 ± 2°C (73.4 ± 3.6°F) and 50 ± 10 % relative humidity for not less than 40 h prior to test for those tests where conditioning is required. In cases of disagreement, the tolerances shall be ±1°C (±1.8°F) and ±5 % relative humidity.

8.1.1 Note that for some hygroscopic materials, such as nylons, the material specifications (for example, Specification D6899) call for testing "dry as-molded specimens." Such requirements take precedence over the above routine preconditioning to 50 % relative humidity and require sealing the specimens in water vapor-impermeable containers as soon as molded and not removing them until ready for testing.

8.2 *Test Conditions*—Conduct tests in the standard laboratory atmosphere of 23 ± 2°C (73 ± 3.6°F) and 50 ± 10 % relative humidity, unless otherwise specified in the material specification or by customer requirements. In cases of disagreements, the tolerances shall be ±1°C (±1.8°F) and ±5 % relative humidity.

9. Procedure

9.1 Maintain the chemical reagent at the test temperature for at least 4 h before the specimens are immersed in it.

9.2 After weighing them, immerse the specimens in the liquids, one specimen to each container. Each jar shall contain 400 mL of the liquid. Suspend the specimen freely in a vertical position (Note 5), but fully covered by the liquid.

NOTE 5—To prevent each specimen from floating or curling, it may be necessary to attach small weights, such as paper clips.

9.3 Cover the jars containing the specimens and keep at the test temperature for the specified time. The standard conditions of test shall be 24 h at 23°C. Alternative conditions suggested are 4 h at 23°C, or either 4 or 24 h at 40°C.

NOTE 6—The maximum weight loss by extraction is generally limited to approximately 50 % of the plasticizer content. If, in a comparison of materials, one or several samples have a weight loss greater than 15 %, tests should be made on all samples at a lower temperature or for less time.

9.4 Remove the specimens from the liquids and gently wipe with a soft cloth or absorbent tissue. Specimens taken from water or volatile solvents like acetone or gasoline require no rinsing, but simply wipe dry as directed; rinse specimens tested in salt solutions, soaps, acids, or alkalis, with water before wiping to dryness.

9.4.1 Specimens tested in nonvolatile oils require special consideration. These specimens are to be rinsed with a solvent, which is volatile and which is a poor solvent for the film, but a good solvent for the oil. If such a solvent is used, it is important to make sure that this solvent itself does not cause weight loss from the film. There can be problems in those cases where both the film and the nonvolatile oil are nonpolar. Possible solvents to be considered are hexane, heptane, and petroleum ether.

9.5 It is realized that if the immersion chemical is not volatile, has good adhesion to the film, and does not attack the film, there may be an increase in weight of the specimen at the end of the test. Determine a weight correction by conditioning another sample of the same film, before immersion, in the same manner as for the standard test, but immerse the specimens in the particular chemical for only 5 min and then rinse and wipe dry. Add the average percentage weight gain of this blank sample to the average percentage weight loss; if the blank sample has a weight loss by this procedure, do not make any correction. If a sample gains more weight than its blank, report the difference as a percentage weight gain.

10. Calculations

10.1 The percentage loss in weight from extraction, expressed as percentage weight loss compared to the original specimen weight, shall be calculated as follows:

$$\text{Weight loss, \%} = [(W_1 - W_2)/W_1] \times 100 \quad (1)$$

where:

W_1 = weight of specimen after the conditioning period, and

W_2 = weight of specimen at the end of the test.

Adjust this weight loss as described in 9.5.

10.2 The values obtained for the three specimens for percentage weight loss shall be averaged and this value reported as the percentage weight loss of the sample being tested.

11. Report

11.1 The report shall include the following:

11.1.1 Complete identification of material tested, including type, thickness, source, manufacturer's code number, and previous history,

11.1.2 The length of time and temperature for each test,

11.1.3 The average and range of percentage weight loss or gain for all specimens from a given sample at each test condition, including identification of the chemical, and

11.1.4 Any observation as to change in appearance of the specimens.

12. Precision and Bias

12.1 Attempts to develop a precision and bias statement have not been successful. For this reason, data on precision and bias cannot be given. Anyone wishing to participate in the development of precision and bias data should contact the Chairman, Subcommittee D20.15, ASTM, 100 Barr Harbor Dr., W. Conshohocken, PA 19428.

13. Keywords

13.1 alcohol; chemicals; extraction; film; oil; plastics; soap; water

SUMMARY OF CHANGES

Committee D20 has identified the location of selected changes to this standard since the last issue (D1239 - 07) that may impact the use of this standard. (May 15, 2014)

(1) Revised Note 1 to meet requirements of Guide D4968.
(2) Revised 8.1 and 8.2, and added 8.1.1 to bring conditioning and testing statements up to specific conditions.
(3) Made minor editorial changes to 9.2 and 10.1.
(4) Revised 9.4 and added 9.4.1 to clarify the particular needs when using nonvolatile oils.