Designation: D3079 – 94 (Reapproved 2009)ε1

Standard Test Method for Water Vapor Transmission of Flexible Heat-Sealed Packages for Dry Products[1]

This standard is issued under the fixed designation D3079; 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.

ε1 NOTE—Units information was revised editorially in May 2009.

1. Scope

1.1 This test method covers the determination of the amount of water vapor transmission for flexible heat-sealed packages under specified conditions of exposure.

NOTE 1—Adequate heat-seal efficiency should be determined prior to this test method.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

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]

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

3. Terminology

3.1 *Definitions:*

3.1.1 *water vapor transmission of a desiccant-filled package*—the increase in mass after exposure to a specified humid environment (90 ± 2 % relative humidity, 37.8 ± 1.1°C). The mass increase may be divided by a time unit to give a rate (for example, grams per 30 days). It is assumed that this mass increase is due to water vapor transmission (through the package) from the test environment to the desiccant.

4. Summary of Test Method

4.1 Test samples are filled with desiccant and after sealing are exposed to 37.8 ± 1.1°C and 90 ± 2 % relative humidity for at least 1 month. Measurements of mass are taken at intervals to determine the average rate of mass change. Controls are used to monitor mass gain of package materials.

5. Significance and Use

5.1 This test method determines the water vapor barrier properties of the package. With proper precautions and background experience, reproducible results can be obtained to aid in the selection of proper package materials required to provide the product shelf-life desired. This test method may be used to establish a performance specification.

6. Apparatus

6.1 *Weighing Balance*—Analytical balance accurate to 1 mg.

6.2 *Test Chamber*—A test room or cabinet provided with conditioned air that is continuously circulated around the specimens under test. The conditions in the chamber shall be such that no condensation occurs on the specimens.

7. Materials

7.1 *Desiccant*—Anhydrous calcium chloride in the form of small lumps is recommended for this test method. This should pass a No. 8 (2.36-mm) sieve, and be free of fines that will pass a No. 30 (600-µm) sieve. The desiccant should be dried for at least 24 h at 200°C prior to use.

8. Test Specimens

8.1 Test specimens shall be representative of the packages being tested, and shall be closed and sealed in the normal manner.

8.2 Review the precision and bias statement to determine the number of samples required to meet requirements. Generally, three to five samples have been found to be sufficient for most applications.

8.3 Each test specimen should be half full of desiccant up to 100 g of desiccant. If the half-full capacity is greater than 100

[1] This test method is under the jurisdiction of ASTM Committee F02 on Flexible Barrier Packaging and is the direct responsibility of Subcommittee F02.10 on Permeation.

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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.

g of desiccant, the package shall be less than half full, but each shall contain approximately the same quantity of desiccant.

8.4 If more than one type of package is tested for comparison purposes, all types should have the same (as close as possible) surface area and shape, and should contain the same quantity of desiccant.

8.5 An appropriate number of identical control packages shall be prepared, containing no desiccant.

9. Procedure

9.1 Place the selected quantity of the desiccant inside the test specimen with no other contents, but with a suitable liner, if the package normally requires a liner, so that the package can be handled with the regular automatic packaging machinery. Close and seal the specimens and controls in exactly the same manner that packages with normal contents are closed and sealed. This test method may be applied to hand-sealed packages, but take great care to ensure a complete seal. Note the use of the hand seal in the report.

9.2 Prewarm the sealed packages slowly to a temperature of approximately 37.8°C.

9.3 Place the warmed specimens and controls inside the test room or cabinet in a position where free access of the conditioned circulating air is provided on all surfaces of the packages.

9.4 Make successive weighings of the packages and controls at suitable intervals and plot on arithmetical graph paper the mass gained against time after subtracting the average mass gain of the controls. Accuracy of the test is adversely affected by too frequent weighings. For highly permeable packages, a minimum weighing frequently of 3 days is recommended. For packages having a low rate of permeability, a weighing frequency of bi-weekly to monthly is recommended. All weighings shall preferably be made without removing the specimen from the test chamber. In instances where this is not possible, remove the specimens and controls from the test chamber and allow them to equilibrate for 1 h in the weighing area. Weigh in the same sequence each time. Specimens should not be out of the test chamber for more than 3 h at a time. Continue until a constant rate of gain is attained as indicated by at least three successive points in a straight line. The slope of this portion of the curve will furnish a measure of water vapor transmission.

10. Report

10.1 Report the following information:

10.1.1 Identification of the package including data on films, heat seal equipment, liners, etc.,

10.1.2 Desiccant used and quantity,

10.1.3 Temperature and relative humidity at which the test was conducted. If the tolerance of ±2 % relative humidity or ±1.1°C temperature is exceeded, the variation shall be specified.

10.1.4 Number of specimens tested and number of controls,

10.1.5 Weighing frequency,

10.1.6 Water vapor transmission reported as grams of water per 30 days for the period of constant rate of gain,

10.1.7 Data on any previous tests to which the specimens might have been subjected, and

10.1.8 A statement to the effect that all tests were made in accordance with this test method.

11. Precision and Bias

11.1 *Precision*—This round-robin study was carried out in accordance with Practice E691. Six laboratories participated in a round-robin study determining weight gain (moisture) for heat-sealed packages. Three materials were used in the study as follows:

11.1.1 30# MG Bleached Pouch Stock/22# LDPE extrusion coated,

11.1.2 2.2 mil coextrusion 87 % HDPE/13# EVA-MDPE, and

11.1.3 25# MG Bleached Kraft Paper/7# LDPE/0.00030 in. Aluminum Foil/22# LDPE extrusion coated.

11.2 *Bias*—Since there is no accepted reference material suitable for determining bias for the procedure in this test method, bias has not been determined.

12. Keywords

12.1 flexible packages; water vapor transmission