



Designation: ~~F1349-98 (Reapproved 2003)~~ Designation: **F 1349 – 08**

## Standard Test Method for Nonvolatile Ultraviolet (UV) Absorbing Extractables from Microwave Susceptors<sup>1</sup>

This standard is issued under the fixed designation F 1349; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This test method covers the determination of nonpolar and relatively polar ultraviolet (UV) absorbing components that may migrate from microwave susceptor packaging into food simulants, such as corn oil and Miglyol 812.

1.2 This test method has been collaboratively studied using bilaminate susceptors constructed of paperboard, adhesive, and a layer of polyethylene terephthalate polymer (PETE) susceptor. Adhesive and PETE related compounds were quantitated using this test method.

~~1.3 The values stated in SI units are to be regarded as the standard.~~

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

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.* Specific warning statements are given in 4.3.2.3.

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

F 874 Test Method for Temperature Measurement and Profiling for Microwave Susceptors

F 1317 Test Method for Calibration of Microwave Ovens

### 3. Apparatus and Reagents

3.1 *Microwave Oven*, 700  $\pm$  35 W, calibrated. Refer to Test Method F 1317.

3.2 *High-Pressure Liquid Chromatograph (HPLC)*, consisting of:

3.2.1 *Pump*, capable of 1.5 mL/min with flow precision  $\pm$  2 %.

3.2.2 *Injector*, loop-type, equipped with 20- $\mu$ L loop.

3.2.3 *Guard Column*, C<sub>8</sub>, 5  $\mu$ m.

3.2.4 *Analytical Column*, C<sub>8</sub>, 5  $\mu$ m, 250 by 4.6 mm.

3.2.5 *Detector-UV Absorbance*, set for 254 nm. Adjust sensitivity to give a 70 to 100 % of full scale peak for the 5- ppm dimethylterephthalate DMT standard.

3.2.6 *Gradient Program*, 4 to 60 % Mobile Phase B in 8 min; 60 to 70 % B in 9 min; 70 to 100 % B in 7 min; 100 % B for 11 min; 100 to 4 % B in 5 min; 4 % B for minimum of 5 min. Where Mobile Phase A (v/v) is 85 + 15 + 0.25 % water:acetonitrile:acetic acid, and Mobile Phase B (v/v) is 15 + 85 % water:acetonitrile.

3.2.7 *Peak Area Integration System*—Initialize data acquisition or integration system, or both, from 5 to 35 min during the separation.

3.3 *Hexane*, LC/UV grade.

3.4 *Acetonitrile*, LC/UV grade.

3.5 *Corn Oil*—Obtain corn oil that is as pure and fresh as possible to minimize peaks in nonvolatiles extractables chromatogram. Alternatively, Miglyol 812 (a fractionated coconut oil) or synthetic fat simulant HB 307 can be used as a substitute for corn oil.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee F02 on Flexible Barrier Materials and is the direct responsibility of Subcommittee F02.15 on Chemical/Safety Properties.

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<sup>2</sup> This test method is under the jurisdiction of ASTM Committee F02 on Flexible Barrier Packaging and is the direct responsibility of Subcommittee F02.15 on Chemical/Safety Properties.

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<sup>3</sup> Miglyol 812 is a product of Dynamit Nobel Chemicals, available from HULS America, Inc., 80 Centennial Ave., PO Box 456, Piscataway, NJ 08855-0456.

<sup>4</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3.6 Dimethylacetamide (DMAC), LC/UV grade.

3.7 Conical Bottom Test Tubes, 50 mL, graduated.

3.8 Bishydroxyethyleneterephthalate (BHET).

3.9 Diethylterephthalate (DET).

3.10 Dimethylterephthalate (DMT).

3.11 Fluoroptic Thermometry System.

3.12 Temperature Probes, four, high temperature.

3.13 Glass Beads, 3 to 4 mm, clean thoroughly by rinsing with methylene chloride followed by soaking for 30 min in acetonitrile. Dry thoroughly before using.

3.14 Recommended Microwave Nonvolatile Extraction Cell—Waldorf Polytetrafluoroethylene cell.<sup>3</sup> (See Figs. 1-3). This cell must be constructed by a machine shop experienced in working with polytetrafluoroethylene (PTFE). After microwaving oil in the cell, the cell should be rinsed with methylene chloride to remove residual oil and prevent carry-over.

3.15 Solvent Concentration Apparatus—Kuderna-Danish evaporative concentrator, rotary evaporator; or Zymark TurboVap at a nitrogen pressure of 30 psi and a water bath temperature of 50°C.

#### 4. Procedure

##### 4.1 Temperature Measurement:

4.1.1 Refer to Test Method F 874 to determine the time and water load specifications.

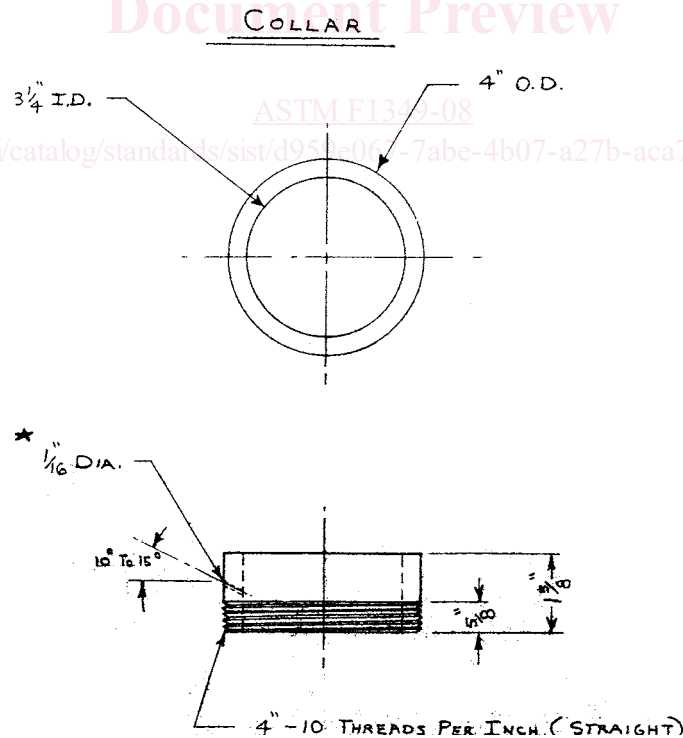
##### 4.2 Sample Preparation and Microwave Heating:

NOTE 1—Always be sure the microwave oven is at ambient temperature before starting any temperature measurement or heating procedure to ensure consistency of output. Cooling of the microwave oven can be expedited by using ice in beakers or crystallization dishes or by using cold packs such as “blue ice.”

4.2.1 Select a representative piece of the susceptor sample to be tested. If the susceptor is part of a package, trim excess material from around susceptor. Determine the area of the active susceptor material. The susceptor should be cut to fit into a Waldorf PTFE

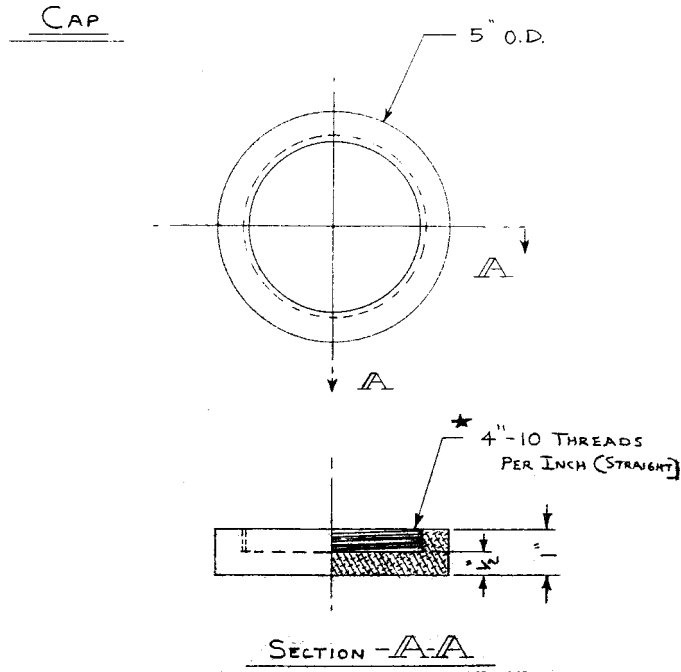
<sup>2</sup> Annual Book of ASTM Standards, Vol 15.09.

<sup>3</sup> The sole source of supply of the apparatus known to the committee at this time is Read Plastics, 12331 Wilkins Ave., Rockville, MD 20852. 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, which you may attend.

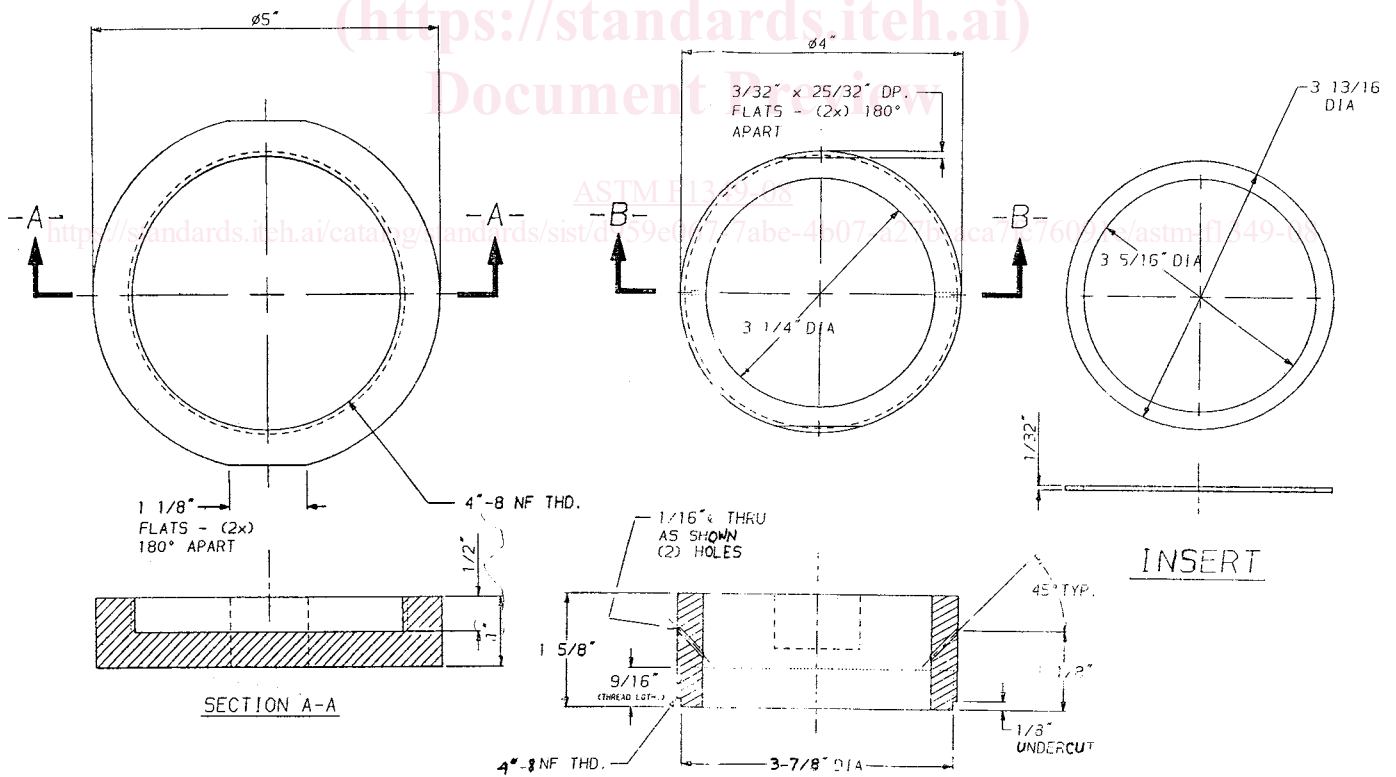


NOTE 1—The 1/16-in. (1.6-mm) diameter hole is for a Luxtron MIW temperature sensing probe. Number of holes and location may vary by application.

FIG. 1 Collar Section of Waldorf Polytetrafluoroethylene Microwave Nonvolatile Extraction Cell<sup>2</sup>



NOTE 1—Relieve thread at bottom. Collar must seal to bottom of cap.  
**FIG. 2 Cap Section of Waldorf Polytetrafluorethylene Nonvolatile Extraction Cell**



**FIG. 3 Suggested Modifications to Waldorf Cell**

Cell with the screw seal ring firmly seated against the susceptor surface. Use of the Waldorf PTFE cell reduces the risk of spilling hot oil and in addition, gives a reproducible surface area (53.5 cm<sup>2</sup>) for extraction. Alternatively, cut a 13 by 18-cm rectangular piece of the active susceptor material, form an extraction boat with sides 1.5 cm high (boat configuration = 1.5 by 10 by 15 cm, approximately 150 cm<sup>2</sup> of surface area). Staple the corners of the boat securely.