



Designation: D 1939 – 94

AMERICAN SOCIETY FOR TESTING AND MATERIALS

1916 Race St. Philadelphia, Pa 19103

Reprinted from the Annual Book of ASTM Standards Copyright ASTM
If not listed in the current combined index, will appear in the next edition

Standard Practice for Determining Residual Stresses in Extruded or Molded Acrylonitrile-Butadiene-Styrene (ABS) Parts by Immersion in Glacial Acetic Acid¹

This standard is issued under the fixed designation D 1939; 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 practice covers the evaluation of residual stresses in extruded profiles, as extruded, or in molded ABS parts, as molded. Residual stresses are indicated by the presence of cracking of the specimen upon immersion in glacial acetic acid.

1.2 *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 precautionary statements are given in Section 7.

NOTE 1—There is no equivalent ISO standard.

2. Referenced Documents

2.1 ASTM Standards:

D 883 Terminology Relating to Plastics²

D 1600 Terminology for Abbreviated Terms Relating to Plastics²

D 4673 Specification for Acrylonitrile-Butadiene-Styrene (ABS) Molding and Extrusion Materials³

3. Terminology

3.1 *General*—Definitions are in accordance with Terminology D 883 and abbreviations are in accordance with Terminology D 1600, unless otherwise indicated.

4. Significance and Use

4.1 This practice is applicable for distinguishing between specimens that are highly stressed and specimens that are not, provided that other conditions are the same.

4.2 No direct correlation has been established between the results of the acetic acid immersion test and other properties. For this reason, acetic acid immersion is not recommended as a substitute for other tests, nor is it intended for use in purchasing specifications. However, despite this limitation, this practice does yield information of value in indicating the presence of residual stresses in extruded and molded ABS parts.

4.3 This practice is useful for extruders and molders who

wish to evaluate residual stresses in ABS parts. This can be accomplished in two ways: (1) by visual examination after immersion in glacial acetic acid to see whether or not cracking occurs, and (2) by determining the time necessary to develop cracks. Stresses will relax rapidly after molding or extrusion. Accordingly, both immersion in the test medium and visual comparison must be made at identical times and conditions after processing.

5. Apparatus

5.1 *Container*, of sufficient size to ensure complete immersion of specimen(s).

6. Reagent

6.1 *Acetic Acid*, glacial, American Chemical Society Reagent grade, 99.7 % assay.

NOTE 2—An uncovered container may allow absorption of sufficient moisture to lower the concentration and affect results.

7. Safety Precautions

7.1 Glacial acetic acid may cause severe skin burns. Protective equipment and clothing should be utilized to avoid contact with the skin or eyes. Use adequate ventilation to remove noxious or toxic fumes, or both.

8. Test Specimen

8.1 *Size of Specimen*—The specimen shall be a complete molding or a cut piece of the extrusion or molding of sufficient size to not influence the stresses being observed. Twisting and breaking must be avoided in separating the cut pieces since the slightest amount changes stresses and may cause false results.

9. Procedure

9.1 Test at a temperature of $23 \pm 2^\circ\text{C}$ ($73.4 \pm 3.6^\circ\text{F}$). (See precautions in section 7.)

9.2 At a fixed time after the actual molding or extrusion operation, immerse the specimen in glacial acetic acid for 30 s. At the end of this time, remove and rinse the specimen at once in running water, wipe dry, and carefully examine for cracking. Rate the degree of cracking as follows: no cracking, slight cracking, moderate cracking, extensive cracking.

NOTE 3—Fixed time, meaning whatever time after production is convenient for the individual operation. Time should be consistent from test to test.

NOTE 4—Slight cracking is defined here as cracking that is perceptible with difficulty. Moderate cracking is cracking that is readily

¹ This practice is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.15 on Thermoplastic Materials (Section D20.15.03).

Current edition approved June 15, 1994. Published August 1994. Originally published as D 1939 – 62. Last previous edition D 1939 – 84 (1989)^{ε1}.

² *Annual Book of ASTM Standards*, Vol 08.01.

³ *Annual Book of ASTM Standards*, Vol 08.03.