



Standard Practice for Heat Aging of Plastics Without Load¹

This standard is issued under the fixed designation D3045; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This practice is intended to define the exposure conditions for testing the resistance of plastics to oxidation or other degradation when exposed solely to hot air for extended periods of time. Only the procedure for heat exposure is specified, not the test method or specimen. The effect of heat on any particular property may be determined by selection of the appropriate test method and specimen.

1.2 This practice should be used as a guide to compare thermal aging characteristics of materials as measured by the change in some property of interest. This practice recommends procedures for comparing the thermal aging characteristics of materials at a single temperature. Recommended procedures for determining the thermal aging characteristics of a material at a series of temperatures for the purpose of estimating time to a defined property change at some lower temperature are also described.

1.3 This practice does not predict thermal aging characteristics where interactions between stress, environment, temperature, and time control failure occurs.

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.*

NOTE 1—ISO-2578 is considered to be technically equivalent to this practice.

2. Referenced Documents

2.1 ASTM Standards:²

D618 Practice for Conditioning Plastics for Testing
D883 Terminology Relating to Plastics

¹ This practice is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.50 on Durability of Plastics.

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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.

D1870 Practice for Elevated Temperature Aging Using a Tubular Oven (Withdrawn 1998)³

D1898 Practice for Sampling of Plastics (Withdrawn 1998)³

E145 Specification for Gravity-Convection and Forced-Ventilation Ovens

E456 Terminology Relating to Quality and Statistics

2.2 ISO Standard:

ISO 2578 (1974) Determination of Time-Temperature Limits After Exposure to Prolonged Action of Heat⁴

3. Terminology

3.1 The terminology given in Terminology D883 and Terminology E456 is applicable to this practice.

4. Significance and Use

4.1 The use of this practice presupposes that the failure criteria selected to evaluate materials (that is, the property or properties being measured as a function of exposure time) and the duration of the exposure can be shown to relate to the intended use of the materials.

4.2 Plastic materials exposed to heat may be subject to many types of physical and chemical changes. The severity of the exposures in both time and temperature determines the extent and type of change that takes place. A plastic material is not necessarily degraded by exposure to elevated temperatures, but may be unchanged or improved. However, extended periods of exposure of plastics to elevated temperatures will generally cause some degradation, with progressive change in physical properties.

4.3 Generally, short exposures at elevated temperatures may drive out volatiles such as moisture, solvents, or plasticizers, relieve molding stresses, advance the cure of thermosets, and may cause some change in color of the plastic or coloring agent, or both. Normally, additional shrinkage should be expected with loss of volatiles or advance in polymerization.

4.4 Some plastic materials may become brittle due to loss of plasticizers after exposure at elevated temperatures. Other

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

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.