



Designation: D 5437 – 93

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 Weathering of Plastics Under Marine Floating Exposure¹

This standard is issued under the fixed designation D 5437; 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 experimental conditions for exposure of plastics to marine environments. Although intended particularly for marine exposure, the methodology might be used with outdoor brackish water and fresh-water exposures as well. This practice is specifically intended for plastic materials of specific gravities lower than that of seawater that are therefore positively buoyant in seawater. Plastic products such as sections of fishing gear and packaging materials, as well as film or laminate samples of plastics, might be tested by this practice.

1.2 The exposure methodology in this practice is particularly applicable to enhanced-degradable plastics (or controlled-lifetime plastics) in which the environmental degradation under marine-floating exposure is expected to be accelerated relative to that of regular plastic materials.

1.3 This practice is limited to a description of the method by which the exposure and sampling is conducted and the general precautions to be observed in conducting such exposures. Depending on the objective of the exposure study and the end-use of the plastic material in question, suitable means for evaluating the extent of degradation must be selected.

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

1.5 *This standard does not purport to address all of the safety problems, 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:

- D 638 Test Method for Tensile Properties of Plastics²
- D 882 Test Methods for Tensile Properties of Thin Plastic Sheeting²
- D 883 Terminology Relating to Plastics²
- D 1435 Practice for Outdoor Weathering of Plastics²
- D 3593 Test Method for Molecular Weight Averages and Molecular Weight Distribution of Certain Polymers by Liquid Size-Exclusion Chromatography (Gel Permeation Chromatography (GPC) Using Universal Calibration³

¹ This practice is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.96 on Environmentally Degradable Plastics.

Current edition approved July 15, 1993. Published September 1993.

² Annual Book of ASTM Standards, Vol 08.01.

³ Annual Book of ASTM Standards, Vol 08.02.

D 3623 Method of Testing Antifouling Panels in Shallow Submergence⁴

D 5272 Practice for Outdoor Exposure Testing of Photodegradable Plastics⁵

E 772 Terminology Relating to Solar Energy Conversion⁶

3. Terminology

3.1 *Definitions*—The terminology relating to degradable plastics given in Terminology D 883 is applicable to this practice.

3.1.1 *enhanced-degradable plastic*—a plastic formulation that has been designed to undergo environmental breakdown at a faster rate, relative to regular plastic materials.

4. Significance and Use

4.1 The exposure methods described in this practice may be used to determine the stability of plastic materials under marine-floating-exposure conditions. Under such exposure, the plastic material is exposed simultaneously to sunlight, oxygen, a microbial environment, and seawater. Depending on the nature of the plastic, all or some of these factors may result in the degradation or deterioration of the material. The relative contribution of different environmental factors in bringing about degradation or deterioration, or both, of the plastic material depends on the nature of the plastic and the characteristics of the marine exposure site.

4.2 This practice should be used for studying the weathering of enhanced-degradable plastic materials under marine-floating exposure. Assuming that the degradative mechanisms that allow these plastics to disintegrate at a rapid rate in inland outdoor-weathering exposure also function under marine-exposure conditions, the material is likely to break down on a much faster time-scale compared to that for regular plastics. Plastics generally disintegrate much slower when exposed outdoors at sea relative to non-marine outdoor exposure. However, the test results often depend on the marine site used and the season of the year in which the exposure is conducted. Furthermore, the sample surface exposed to seawater is typically colonized by marine algae and invertebrates yielding a foulant layer. Surface fouling of the sample shields it from sunlight and provides a microbe-rich environment to the sample, affecting the rate of its disintegration. The variability in test data due to the natural variation in these environmental factors can be quite significant. Repeated testing at the same location and at different seasons is recommended to obtain reliable test results.

4.3 Exposure studies of the type described herein are best

⁴ Annual Book of ASTM Standards, Vol 06.02.

⁵ Annual Book of ASTM Standards, Vol 08.03.

⁶ Annual Book of ASTM Standards, Vol 12.02.