Designation: G113 – 16

Standard Terminology Relating to Natural and Artificial Weathering Tests of Nonmetallic Materials[1]

This standard is issued under the fixed designation G113; 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 terminology standard covers terms that relate to the durability testing of Nonmetallic Materials using natural and artificial weathering exposure techniques.

1.2 It is the intent of this terminology standard to include those weathering terms in wide use in ASTM for which standard definitions appear desirable.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D9 Terminology Relating to Wood and Wood-Based Products

D4023 Terminology Relating to Humidity Measurements (Withdrawn 2002)[3]

E41 Terminology Relating To Conditioning

E772 Terminology of Solar Energy Conversion

E973 Test Method for Determination of the Spectral Mismatch Parameter Between a Photovoltaic Device and a Photovoltaic Reference Cell

G84 Practice for Measurement of Time-of-Wetness on Surfaces Exposed to Wetting Conditions as in Atmospheric Corrosion Testing

G90 Practice for Performing Accelerated Outdoor Weathering of Nonmetallic Materials Using Concentrated Natural Sunlight

G201 Practice for Conducting Exposures in Outdoor Glass-Covered Exposure Apparatus with Air Circulation

2.2 *AATCC Method:*[4]

16 Colorfastness to Light

2.3 *ANSI Standards:*[5]

ANSI/NCSL Z540-2-1997 American National Standard for Expressing Uncertainty—U.S. Guide to the Expression of Uncertainty in Measurement

ISO 9370 Plastics -- Instrumental Determination of Radiant Exposure in Weathering Tests -- General Guidance and Basic Test Method

3. Significance and Use

3.1 This terminology is not intended to supersede the requirements of similar definitions in certain other documents, but is intended to provide a listing of terms that are in current widespread usage, and their context in relation to weathering.

4. Terminology

4.1 *Definitions:*

accelerated outdoor weathering, *n*—outdoor weathering using the sun as the source of irradiance, and where the rate of deterioration is accelerated by increasing one or more of the influencing parameters above a level obtained in the natural environment.

DISCUSSION—Examples of these types of exposures are found in Practice G90 and Practice G201.

acceleration factor, *n*—the ratio of exposure time required to produce a specified amount of change in a material by one exposure test divided by the exposure time required to produce the same change by another exposure test.

DISCUSSION—Acceleration factors must be used with great caution because they vary between materials (including different formulations of the same material) and are strongly dependent on the exposure conditions and variability of both the natural and laboratory accelerated exposures. Acceleration factors may also vary depending on the level of material property change used to determine the acceleration factor. Do not ratio irradiance in laboratory accelerated tests to irradiance in outdoor exposures, or use equivalent radiant exposures to estimate time to fail in outdoor exposures. These calculations ignore differences in temperature and moisture between the accelerated test and exterior exposures, and in the spectral power distributions of the laboratory light source and sunlight.

[1] This terminology is under the jurisdiction of ASTM Committee G03 on Weathering and Durability and is the direct responsibility of Subcommittee G03.92 on Terminology.

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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.

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

[4] Available from American Association of Textile Chemists and Colorists (AATCC), P.O. Box 12215, Research Triangle Park, NC 27709, http://www.aatcc.org.

[5] Available from National Conference of Standards Laboratories, 1800 30th St., Suite 305B, Boulder, CO 80301.

actinic radiation, *n*—the spectral region(s) of a light source responsible for the photodegradation of a particular material.

ambient temperature, *n*—the existing temperature of the air or of an object in thermal equilibrium with the surrounding atmosphere.

artificial accelerated irradiation, *n*—exposure of a material to a laboratory radiation source meant to simulate window glass filtered solar radiation or radiation from interior lighting sources and where specimens may be subjected to relatively small changes in temperature and relative humidity in an attempt to more rapidly produce the same changes that occur when the material is used in an indoor environment.

DISCUSSION—These exposures have been commonly referred to as fading or lightfastness tests.

artificial accelerated weathering, *n*—exposure of a material in a laboratory weathering device to conditions which may be cyclic and intensified over those encountered in outdoor or in-service exposure. This involves a laboratory radiation source, thermal stress, and moisture (in the form of relative humidity, and/or water spray, condensation, or immersion) in an attempt to more rapidly produce the same changes that occur in long term outdoor exposure.

DISCUSSION—The device may include means for control and/or monitoring the light source and other weathering variables. It may also include exposure to special conditions, such as acid spray to simulate the effect of industrial gases.

azimuth angle, *n*—an angle of a plane to the horizon measured clockwise to the object.

backed exposure, *n*—a technique of weathering in which the test specimens being exposed are mounted onto a solid backing material, of sufficient strength to hold the specimen. When the specimen and the backing are in direct contact the backing material must be of a type that will not contaminate the specimen. When two materials are intimately joined together to form one composite, the materials below the top surface are not considered as a backing.

DISCUSSION—The backing is typically plywood which has the effect of increasing specimen temperature and wet time during exposure, compared to exposure unbacked.

black box, *n*—a thin metal box painted flat black on the outside only exclusive of the bottom surface with an open top where the flat test specimens to be exposed constitute the top surface of the box; the box is equipped with mounting strips to hold the test specimens firmly in place; the top surface of the box must be completely filled at all times; any blank spaces on the top surface must be occupied by flat black "dummy" panels to maintain correct operating condition.

black box under glass, *n*—a glass covered enclosure or cabinet of any convenient size. It shall be constructed of corrosion resistant metal and be enclosed to prevent ambient air from circulating over the samples. Exterior non-glass surfaces shall be painted black. The interior shall remain unpainted.

black panel thermometer, *n*—a temperature measuring device consisting of a metal panel, having a black coating which absorbs all wavelengths uniformly, with a thermal sensitive element firmly attached to the center of the exposed surface. The black panel thermometer is used to control an artificial weathering device and to provide an estimate of the maximum temperature of samples exposed to a radiant energy source.

climatological types, *n*—major regions of significantly different recurring weather patterns. In weathering, several distinct climatological types are used to evaluate the atmospheric durability of materials. Within any single climatological variation, at a specific geographic location, short term weather patterns may fluctuate significantly. This may cause variability in short term exposures. Major climatic variations that are used for the study of weathering are:

warm, moist climate,—subtropical climate distinguished as warm and humid year round, with frequent rain showers.

hot, dry climate,—desert climate distinguished as sunny, hot, and dry year round, with rare scattered showers.

control, *n*—**in weathering**, the term control has three current widespread uses:

1. A material which is of similar composition and construction to the test material used for comparison, exposed at the same time.

DISCUSSION—A reference material can often be used as the control.

2. A portion of the material to be tested which is stored under conditions in which it is stable, and is used for comparison between exposed and original state.

DISCUSSION—This definition is deprecated in favor of "File Specimen."

3. A portion of the exposed specimen which is protected from light exposure by masking.

DISCUSSION—This definition is deprecated in favor of "Masked Area."

daylight , *n*—as used in weathering, the term equivalent to "sunlight". It refers to the full spectrum of solar irradiance, that is, ultraviolet through infrared, and includes both diffuse sky and direct solar irradiance.

DISCUSSION—This definition differs from CIE (Commission Internationale de l'Eclairage) Publication No 17.4 which defines daylight as "the visible par of global (sun plus sky) radiation.

direct weathering, *n*—a technique of weathering in which the test specimens are exposed to all prevailing elements of the atmosphere.

dry-bulb temperature, *n*—the temperature of the ambient air; for example, the temperature that is measured by the dry-bulb thermometer of a psychrometer. D4023

durability, *n*—in weathering, the ability of a material to maintain a defined property in a defined application as a function of its end use exposure conditions and time.

enclosed carbon arc, *n*—a light source in which an arc is produced across a pair of carbon rods by a high energy electrical source, such that a high intensity light is emitted. The carbons are enclosed in an inverted glass dome which