Weather Resistance: UV Light and Moisture Exposure

Developed in 1999 by AATCC Committee RA64; revised 2000; editorially revised and reaffirmed 2001; reaffirmed 2006.

1. Purpose and Scope

1.1 This test method provides a procedure for the exposure of textile materials of all kinds, including coated fabrics and products made thereof, in a laboratory artificial weathering exposure apparatus employing fluorescent UV lamps as a light source and using condensing humidity and/or water spray for wetting.

2. Principle

2.1 Specimens are exposed to a fluorescent UV light source and to periodic wetting under controlled conditions. Resistance to degradation is rated in terms of a comparison standard and the exposure criteria, percent loss in strength or percent residual strength (breaking or bursting as appropriate) and/or color change of the material when evaluated under standard textile conditions.

3. Terminology

3.1 **breaking strength,** n.—the maximum force applied to a specimen in a tensile test carried to rupture.

3.2 **bursting strength,** n.—the force or pressure required to rupture a textile by distending it with a force, applied at right angles to the plane of the fabric, under specified conditions.

3.3 **fluorescent UV lamp,** n.—a lamp in which radiation at 254 nm from a low-pressure mercury arc is transformed to longer wavelength UV by a phosphor.

3.4 **irradiance,** n.—radiant power per unit area as a function of wavelength expressed as watts per square meter, W/m^2.

3.5 **radiant energy,** n.—energy traveling through space in the form of photons or electromagnetic waves of various lengths.

3.6 **spectral energy distribution,** n.—the variation of energy due to the source over the wavelength span of the emitted radiation.

3.7 **standard atmosphere for testing textiles,** n.—air maintained at 21 ± 1°C and 65 ± 2% relative humidity.

3.8 **ultraviolet radiation**, n.—radiant energy for which the wavelengths of the monochromatic components are smaller than those for visible radiation and more than about 100 nm.

NOTE: The limits of the spectral range of ultraviolet radiation are not well defined and may vary according to the user. Committee E-2.1.2 of the CIE distinguishes in the spectral range between 400 and 100 nm:

UV-A	315-400 nm
UV-B	280-315 nm
UV-R	280-400 nm

3.9 **UV-A Type Fluorescent UV lamp,** n.—a fluorescent UV lamp where radiant emission below 300 nm is less than 2% of its total light output.

3.10 **UV-B Type Fluorescent UV lamp,** n.—a fluorescent UV lamp where radiant emission below 300 nm is more than 10% of its total light output.

3.11 **weather,** n.—climatic conditions at a given geographic location, including such factors as sunlight, rain, humidity and temperature.

3.12 **weather resistance,** n.—ability of a material to resist degradation of its properties when exposed to climatic conditions.

4. Safety Precautions

NOTE: These safety precautions are for information purposes only. The precautions are ancillary to the testing procedures and are not intended to be all inclusive. It is the user's responsibility to use safe and proper techniques in handling materials in this test method. Manufacturers MUST be consulted for specific details such as material safety data sheets and other manufacturer's recommendations. All OSHA standards and rules must also be consulted and followed.

4.1 Good laboratory practices should be followed. Wear safety glasses in all laboratory areas.

4.2 Do not operate the test equipment until the manufacturer's operating instructions have been read and understood. It is the responsibility of whoever operates the test equipment to conform to the manufacturer's directions for safe operation.

4.3 The test equipment contains high intensity lamps. Do not look directly at the light source. The door to the test chamber must be kept closed when the equipment is in operation.

4.4 Before servicing the light sources, allow 30 min for cool-down after the lamp operation has been terminated.

4.5 When servicing the test equipment, shut off both the "off" switch on the front panel and the main power disconnect switch. When equipped, ensure that the main power light on the machine front panel goes out.

5. Uses and Limitations

5.1 The use of this procedure is intended to simulate the deterioration caused by the UV energy in sunlight and water. Exposures are not intended to simulate the deterioration caused by localized weather phenomena, such as atmospheric pollution, biological attack and salt water exposure.

5.2 Cautions. Variation in results may be expected when operating conditions are varied within the accepted limits of this procedure. Therefore, no reference shall be made to results from the use of this procedure unless accompanied by a report detailing the specific operating conditions in conformance with the section on Report.

5.3 Results obtained from this procedure can be used to compare the relative durability of materials subjected to the specific test cycle used. Comparison of results from specimens exposed in different types of apparatus should not be made unless correlation has been established among devices for the material to be tested. Variations in results may be expected when operating conditions vary within the limits of this procedure. Because of the variability in results obtained using this practice and the variability in results from exterior exposures, use of a single "acceleration factor" that relates hours of an accelerated exposure to a specific period of outdoor exposure is not recommended. Because of possible variations in results, no reference should be made to results obtained from tests conducted in the apparatus using this procedure unless accompanied by the information required in the section on Report.

5.4 There are a number of factors that may decrease the degree of correlation between accelerated tests using laboratory light sources and actual use exposures.

5.4.1 Differences in the spectral distribution between the laboratory light source and sunlight.

5.4.2 Shorter than normal wavelength exposures are often used to obtain faster failure rates in laboratory accelerated exposure tests. For outdoor exposures, the cut-on for short wavelength UV radiation is generally considered to be 300 nm. Exposures to UV radiation of wavelengths less than 300 nm, may produce degradation reactions, which do not occur when the material is used outdoors. If a laboratory light source used in an accelerated test contains UV radiation of wave-