NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

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Plastics - Methods of exposure to laboratory light sources - Part 3: Fluorescent UV lamps

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1 Scope

This Document specifies methods for exposing specimens to fluorescent UV radiation, heat and water in apparatus designed to simulate the weathering effects that occur when materials are exposed in actual end-use environments to global solar radiation, or to solar radiation through window glass.

This Document is applicable to the specimens that are exposed to fluorescent UV lamps under controlled environmental conditions (temperature, humidity and/or water). Different types of fluorescent UV lamp can be used to meet all the requirements for testing different materials.

Specimen preparation and evaluation of the results are covered in other Standards for specific materials.

General guidance is given in ISO 4892-1.

NOTE: Fluorescent UV lamp exposures for paints, varnishes and other coatings are described in GB/T 23987-2009.

2 Normative References

The provisions in following documents become the essential provisions of this Document through reference in this Document. For the dated documents, only the versions with the dates indicated are applicable to this Document; for the undated documents, only the latest version (including all the amendments) is applicable to this Document.

ISO 4582 Plastics - Determination of Changes in Color and Variations in Properties after Exposure to Glass-Filtered Solar Radiation, Natural Weathering or Laboratory Radiation Sources

NOTE: GB/T 15596-2021 Plastics - Determination of Changes in Color and Variations in Properties after Exposure to Glass-Filtered Solar Radiation, Natural Weathering or Laboratory Radiation Sources (ISO 4582:2017, IDT)

ISO 4892-1 Plastics - Methods of Exposure to Laboratory Light Sources - Part 1: General Guidance

NOTE: GB/T 16422.1-2019 Plastics - Methods of Exposure to Laboratory Light Sources - Part 1:

General Guidance (ISO 4892-1:2016, IDT)

3 Terms and Definitions

For the purposes of this Document, the terms and definitions given in ISO 4892-1 apply.

4.1 Fluorescent UV lamps, when following the manufacturer's recommendations for lamp

maintenance and/or rotation, may be used to simulate the spectral irradiance of global solar radiation in the short wavelength ultraviolet (UV) region of the spectrum.

4.2 Specimens are exposed to various levels of UV radiation, heat and moisture (see 4.4) under

controlled environmental conditions.

4.3 The exposure conditions may be varied by selection of the following:

a) type of fluorescent UV lamp;

b) irradiance level;

c) temperature during the UV exposure;

d) type of wetting (see 4.4);

e) wetting temperature and cycle;

f) timing of the UV/dark cycle.

4.4 Wetting is usually produced by condensation of water vapor on to the exposed specimen

surface or by spraying the test specimens with demineralized/deionized water.

4.5 The procedure(s) may include measurement of the irradiance and the radiant exposure in

the plane of the specimen.

4.6 It is recommended that a similar material of known performance (a control) be exposed

simultaneously with the test specimens to provide a standard for comparative purposes.

4.7 Intercomparison of results obtained from specimens exposed in different types of apparatus

or to different types of lamps should not be made unless an appropriate statistical relationship has been established between the different types of equipment for the material to be tested.

5.1.1 Fluorescent UV lamps are fluorescent lamps in which radiant emission in the ultraviolet

region of the spectrum, i.e., below 400 nm, makes up at least 80 % of the total light output.

There are three types of fluorescent UV lamp used in this Document.

- UVA-340 (type 1A) fluorescent UV lamp: these lamps have a radiant emission below 300 nm of less than 1 % of the total light output, have an emission peak at 343 nm, and are more commonly identified as UVA-340 for simulation of global solar radiation from 300 nm to 340 nm (see Table 1). Figure A.1 is a graph of spectral irradiance from 250 nm to 400 nm of a typical UVA-340 (type 1A) fluorescent lamp compared to global solar radiation.

- UVA-351 (type 1B) fluorescent UV lamp: these lamps have a radiant emission below 310 nm of less than 1 % of the total light output, have a peak emission at 353 nm, and are more commonly identified as UVA-351 for simulation of the UV portion of solar radiation behind window glass (see Table 2). Figure A.2 is a graph of spectral irradiance from 250 nm to 400 nm of a typical UVA-351 (type 1B) fluorescent UV lamp compared to global solar radiation filtered by window glass.

- UVB-313 (type 2) fluorescent UV lamp: these lamps are more commonly identified as UVB-313 and have a radiant emission below 300 nm that is more than 10 % of the total output and a peak emission at 313 nm (see Table 3). Figure A.3 is a graph of the spectral irradiance from 250 nm to 400 nm of two typical UVB-313 (type 2) fluorescent lamps and FS40 fluorescent lamps compared to global solar radiation. UVB- 313 (type 2) lamps may be used only by agreement between the parties concerned. Such agreement shall be stated in the test report.

- Four different UV lamps used as one combination: these four different UV lamps are used together as one combination with a suited filter. See Figure A.4.

NOTE 1: UVB-313 (type 2) lamps have a spectral distribution of radiation, which peaks near the 313 nm mercury line and can emit radiation down to lambda = 254 nm, which can initiate ageing processes that never occur in end-use environments.

NOTE 2: The solar spectral irradiance for a number of different atmospheric conditions is described in CIE Publication No. 85. The benchmark global solar radiation used in this Document is from CIE Publication No. 85:1989, Table 4.

5.1.2 Unless otherwise specified, UVA-340 (type 1A) fluorescent UV lamps shall be used to

simulate the UV part of global solar radiation (see Table 4, method A). Unless otherwise specified, UVA-351 (type 1B) lamps shall be used to simulate the UV part of solar radiation through window glass (see Table 4, method B). The four-lamp UV combination may be used