Plastics — Methods of exposure to laboratory light sources —

Part 2:

Xenon-arc lamps

塑料---实验室光照老化测试 第二部分---氙弧灯

1 Scope

This part of ISO 4892 specifies methods for exposing specimens to xenon-arc light in the presence of moisture to reproduce the weathering effects (temperature, humidity and/or wetting) that occur when materials are exposed in actual end-use environments to daylight or to daylight filtered through window glass.

此ISO 4892标准中介绍了将试样暴露在氙灯及雨淋环境中，通过模仿自然光或有窗户玻璃过滤状态下的自然环境，以确定终端客户在使用材料时受到自然气候的影响（温度，湿度/或受潮）。

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

特殊材料试样的制备以及结果评价参考其他国际标准。

General guidance is given in ISO 4892-1.

通则见ISO 4892-1

NOTE Xenon-arc exposures of paints and varnishes are described in ISO 11341.

注：涂料及清漆的氙灯老化见 ISO 11341

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4582, *Plastics — Determination of changes in colour and variations in properties after exposure to daylight under glass, natural weathering or laboratory light sources*

ISO 4892-1, *Plastics — Methods of exposure to laboratory light sources — Part 1: General guidance*

ISO 9370, *Plastics — Instrumental determination of radiant exposure in weathering tests — General*

guidance and basic test method

3 Principle

3 原理

3.1 A xenon arc, fitted with filters, is used to simulate the relative spectral irradiance of daylight in the ultraviolet (UV) and visible regions of the spectrum.

3.1 配置了合适的滤光器的氙弧灯，其产生的辐射类似于地面日光的紫外和可见区的光谱能量分布。

3.2 Specimens are exposed to various levels of light, heat, relative humidity and water (see 3.4) under controlled environmental conditions.

3.2 将试样暴露于不同水平的光线，热度，相对湿度以及水淋等受控的环境条件下

3.3 The exposure conditions are varied by selection of

a) the light filter(s);

b) the irradiance level;

c) the temperature during exposure to light;

d) the relative humidity in the chamber during light and dark exposures, when exposure conditions requiring control of humidity are used;

e) the way the test specimens are wetted (see 3.4);

f) the water temperature and wetting cycle;

g) the relative lengths of the light and dark periods.

3.3 暴露的条件可有多种选择：

a）滤光器

b）辐射等级

c）光照时的温度

d）当暴露条件要求控制湿度时，测试箱在日光及无光照射时的相对湿度

e）试样加湿的方式

f）水浴温度计加湿循环周期

g）光照及非光照的周期时长

3.4 Wetting is produced by spraying the test specimens with demineralized/deionized water, by immersion in water or by condensation of water vapour onto the surfaces of the specimens.

试验片的加湿是通过喷射去矿物水/去离子水，浸入水中或在试样表面冷凝水汽来实现的。

3.5 The procedure includes measurements of the UV irradiance and UV radiant exposure in the plane of the specimens.

3.5 程序应包含测量试验片平面上受到的UV辐射度及UV辐射曝量。

3.6 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.

3.6 建议同时放置一个已知性能的材料用做测试样品的比对标准。

3.7 Intercomparison of results obtained from specimens exposed in different apparatus should not be made unless an appropriate statistical relationship has been established between the apparatuses for the particular material exposed.

3.7 试样暴露于不同的装置得到的结果可相互比较，

4 Apparatus

4.1 Laboratory light source 实验光源

4.1.1 General

The light source shall comprise one or more quartz-jacketed xenon-arc lamps which emit radiation from below 270 nm in the ultraviolet through the visible spectrum and

into the infrared.

4.1.1 石英套管的氙弧灯的光谱范围包括波长大于270nm的紫外光、可见光和红外辐射

In order to simulate daylight, filters shall be used to remove short-wavelength UV radiation (method A, see Table 1).

为了模拟直接的自然暴露，辐射光源必须过滤，以便提供与地球上的日光相似的光谱能量分布（方法A，将表1）

Filters to minimize irradiance at wavelengths shorter than 310 nm shall be used to simulate daylight through window glass (method B, see Table 2).

采用可减少波长310nm以下光谱福照度的滤光器来模拟透过窗户玻璃绿光后的日光（方法B，见表2）

In addition, filters to remove infrared radiation may be used to prevent unrealistic heating of the test specimens, which can cause thermal degradation not experienced during outdoor exposures.

总之，当加热试样对光化学反应速度有不利影响，或在自然暴露下并不会引起热老化时，可以使用附加的滤光器来减少非光化作用的红外能量。

NOTE Solar spectral irradiance for a number of different atmospheric conditions is described in CIE Publication No. 85. The benchmark daylight used in this part of ISO 4892 is that defined in Table 4 in CIE No. 85:1989.

注：一些列不同大气环境下日光光谱福照度在CIE No.85中有进行刊登。本标准ISO 4892中使用的日光基准见CIE No.85:1989表4规定。

4.1.2 Spectral irradiance of xenon-arc lamps with daylight filters

4.1.2 经过日光滤光器的氙弧灯光谱辐照度

Filters are used to filter xenon-arc emissions in order to simulate daylight (CIE Publication No. 85:1989,Table 4). The minimum and maximum levels of the relative spectral irradiance in the UV wavelength range are given in Table 1 (see also Annex A).

为模仿自然光需使用滤光器来过滤氙弧光谱（CIE No.85:1898表4）。紫外光谱的最大及最小辐照水平见表1

Table 1 — Relative spectral irradiance of xenon-arc lamps with daylight filtersab **(method A)经滤光的氙弧灯相对光谱辐照度（方法A）**

Spectral passband (λ = wavelength in nm)	Minimum[c] %	CIE No. 85:1989, Table 4[de] %	Maximum[c] %
$\lambda < 290$			0,15
$290 \leq \lambda \leq 320$	2,6	5,4	7,9
$320 < \lambda \leq 360$	28,2	38,2	39,8
$360 < \lambda \leq 400$	54,2	56,4	67,5

a This table gives the irradiance in the given passband, expressed as a percentage of the total irradiance between 290 nm and 400 nm. To determine whether a specific filter or set of filters for a xenon-arc lamp meets the requirements of this table, the spectral irradiance must be measured from 250 nm to 400 nm. The total irradiance in each wavelength passband is then summed and divided by the total irradiance from 290

nm to 400 nm. Typically, this is done in 2 nm increments.

a 此表给出了固定波段的辐照度，以290-400nm之间的全部辐照度百分比来表示。根据此表的要求来决定是否需要特殊的滤光器或设定来过滤氙弧光，必须测量250-400nm光谱辐照度。各个波段总的光谱辐照度求和并除以290-400nm的总光谱福照度。其典型的增量为2nm。

b The minimum and maximum limits in this table are based on more than 100 spectral irradiance measurements with water- and air-cooled xenon-arc lamps with daylight filters from different production lots and of various ages,[3] used in accordance with the recommendations of the manufacturer. As more spectral irradiance data become available, minor changes in the limits are possible. The minimum and maximum limits are at least three sigma from the mean for all the measurements.

b 此表的最小及最大限度基于超过100个不同产品批次及各种时段的光谱辐射度测量。测试条件为加水、空气冷凝、日光过滤器经过的氙弧光照。[3]用于推荐的制造商。由于可获得更多的光谱辐射数据，这个限度是会有细微变化的。最大最小限度至少在测量均值的3西格玛以内。

c The minimum and maximum columns will not necessarily sum to 100 % because they represent the minima and maxima for the measurement data used. For any individual spectral irradiance, the percentages calculated for the passbands in this table will sum to 100 %. For any individual xenon-arc lamp with daylight filters, the calculated percentage in each passband shall fall within the minimum and maximum limits given. Exposure results can be expected to differ if obtained using xenon-arc apparatus in which the spectral irradiances differ by as much as that allowed by the tolerances. Contact the manufacturer of the xenon-arc apparatus for specific spectral irradiance data for the xenon-arc lamp and filters used.

C 最小最大数列总和不一定为100%，因其只代表测量数据的最小最大值。对于任何一个光谱辐照度，从此表格的波段中计算总和均为100%。任何一个经过日光过滤器过滤的氙弧光，其每个波段的百分比计算应落在给定的上下限区间内。如果使用不同的氙弧光装置，此装置的光谱辐射度应尽可能的在允许的偏差之内，其曝光结果可期望有所不同。可联络制造商使用氙弧灯及过滤器获得特殊的光谱辐射度。

d The data from Table 4 in CIE Publication No. 85:1989 is the global solar irradiance on a horizontal surface for an air mass of 1,0, an ozone column of 0,34 cm at STP, 1,42 cm of precipitable water vapour and a spectral optical depth of aerosol extinction of 0,1 at 500 nm. These data are target values for xenon-arc lamps with daylight filters.

D 在CIE No.85:1989表4中发布的数据为地球日光光谱照在水平平面上，此环境空气质量为1.0，臭氧柱0.34cm，标准温度压力下1.42cm的降水量以及500nm光谱深度下的喷雾降解。这些数据都是加了日光过滤器的氙弧灯的目标值。

e For the solar spectrum represented by Table 4 in CIE No. 85:1989, the UV irradiance (between 290 nm and 400 nm) is 11 % and the visible irradiance (between 400 nm and 800 nm) is 89 %, expressed as a percentage of the total irradiance between 290 nm and 800 nm. The percentage of the UV irradiance and that of the visible irradiance incident on specimens exposed in xenon-arc apparatus might vary due to the number of specimens being exposed and their reflectance properties.

E CIE No.8:1989表4中描述的太阳光谱，紫外光谱（290-400nm）为11%，可见光（400-800nm）为89%，表示为290-800nm之间的总光谱辐照百分比。由于暴露的试验片的数量及其反射性能而引起试样在氙弧光源照射下的紫外光谱和可见光谱百分比发生变化。

4.1.3 Spectral irradiance of xenon-arc lamps with window glass filters

4.1.3 通过窗户玻璃过滤的氙弧灯光谱

Filters are used to filter the xenon-arc lamp emissions in order to simulate daylight which has passed through window glass. The minimum and maximum levels of the relative spectral irradiance in the UV region are given in Table 2 (see also Annex A).
必须使用过滤器来过滤氙弧灯辐射，以便能够模仿透过窗户玻璃的自然光。紫外光谱的相对最大最小水平见表2

Table 2 — Relative spectral irradiance for xenon-arc lamps with window glass filters[ab] **(method B)**

Spectral passband (λ = wavelength in nm)	Minimum[c] %	CIE No. 85:1989, Table 4, plus effect of window glass[de] %	Maximum[c] %
λ < 300			0,29
300 ≤ λ ≤ 320	0,1	≤ 1	2,8
320 < λ ≤ 360	23,8	33,1	35,5
360 < λ ≤400	62,4	66,0	76,2

4.1.4 Irradiance uniformity

4.1.4 辐射均匀度

The irradiance at any position in the area used for specimen exposure shall be at least 80 % of the maximum irradiance. Requirements for periodic repositioning of specimens when this requirement is not met are described in ISO 4892-1.
试样任何位置受到的辐照量至少为最大辐照量的80%。当不满足标准ISO 4892-1中描述的要求时需要定期重新放置试样。

NOTE For some materials of high reflectivity, high sensitivity to irradiance and temperature, periodic repositioning of specimens is recommended to ensure uniformity of exposures, even when the irradiance uniformity in the exposure area is within the limits so that repositioning is not required.
注：对于某些高反射率，辐照度及温度高度敏感的材料，甚至当暴露在辐射区域内的均匀性在界限内以至于不需要重新放置试样的情况，为确保曝光的均匀性都要求定期的重新放置试样。

4.2 Test chamber 试验箱

The design of the test chamber may vary, but it shall be constructed from inert material. In addition to the controlled irradiance, the test chamber shall provide for control of temperature.
试验箱的设计应当是多样化的，但是可以用惰性材料建造。除了可控辐照度外，试验箱还需要能够提供温度控制的功能。

For exposures that require control of humidity, the test chamber shall include humidity-control facilities that meet the requirements of ISO 4892-1. When required by the exposure used, the apparatus shall also include facilities for the provision of water spray or the formation of condensate on the surface of the test specimens, or for the immersion of the specimens in water. Water used for water spray shall meet the requirements of ISO 4892-1.
为了能够控制暴露的湿度，试验箱还应包括湿度控制设备以便满足ISO 4892-1的要求。当暴露环境有要求时，实验设备应包含能够提供水喷雾或能在试验表面形成冷凝水的装

置。用于水喷雾的水应满足ISO 4892-1的要求。
The light source(s) shall be located, with respect to the specimens, such that the irradiance at the specimen surface complies with 6.1.
光源定位应使得试样表面的辐照度遵守6.1要求
NOTE If the lamp system (one or more lamps) is centrally positioned in the chamber, the effect of any eccentricity of the lamp(s) on the uniformity of exposure can be reduced by using a rotating frame carrying the specimens or by repositioning or rotating the lamps.
注：如果照射系统（一个或多个光源）位于试验箱的中心，可以通过旋转放置试验片的支架或重新放置试样或旋转光源来减少光源的偏离对暴露均匀度的影响。
Should any ozone be generated from operation of the lamp(s), the lamp(s) shall be isolated from the test specimens and operating personnel. If the ozone is in an air stream, it shall be vented directly to the outside of the building.
操作光源时应当有少量的臭氧产生，光源应当与试验片和操作人员隔离。如果有臭氧泄露到空气中，应当立即将其排出到室外。

4.3 Radiometer 辐射表

When a radiometer is used, it shall comply with the requirements outlined in ISO 4892-1 and ISO 9370.
如果使用了辐射表，必须遵守ISO 4892-1以及ISO9370的要求。

4.4 Black-standard/black-panel thermometer

4.4 黑色-标准温度计或黑板温度计

The black-standard or black-panel thermometer used shall comply with the requirements for these devices given in ISO 4892-1.
黑色-标准温度计或黑板温度计的使用必须遵守ISO 4892-1中关于这些设备的要求
The preferred maximum surface temperature device is the black-standard thermometer. The relevant cycles are described in Table 3 and Table B.1.
首先最大表面温度装置为黑色-标准温度计，相关的周期见表3和表B.1

4.5 Wetting and humidity-control equipment

4.5 加湿及湿度控制设备

4.5.1 General

4.5.1 通则

Specimens may be exposed to moisture in the form of water spray or condensation, or by immersion.
试验片应当通过水喷雾或凝结或浸渍的方式进行加湿。
Specific exposure conditions using water spray are described in Table 3 (see also Table B.1) and Table 4(see also Table B.2).
使用水喷雾的特殊暴露条件见表3和表4
If condensation, immersion or other methods are used to expose the specimens to moisture , details of the procedures and exposure conditions used shall be included in the exposure report.
如果通过凝结，浸渍或其他方法来对实验片进行加湿，详细的流程以及暴露条件应当展示在报告中。
Table 3 and Table 4 also describe exposure conditions in which the relative humidity is controlled.

表3和表4同样描述了控制相对湿度的暴露条件。
Table B.1 and Table B.2 describe exposure conditions in which humidity control is not required.
表B.1和表B.2 描述了不控制相对湿度的暴露条件。
NOTE The relative humidity of the air can have a significant influence on the photodegradation of polymers.
注：空气的相对湿度会对聚合物的光化降解产生重大作用。

4.5.2 Relative-humidity control equipment

4.5.2 相对湿度控制设备

For exposures where relative-humidity control is required, the location of the sensors used to measure the humidity shall be as specified in ISO 4892-1.
当暴露要求控制相对湿度时，测量湿度的传感器的定位需要安照ISO4892-1的规定实施

4.5.3 Spray system

4.5.3 喷淋系统

The test chamber may be equipped with a means of directing an intermittent water spray onto the fronts or backs of the test specimens under specified conditions. The spray shall be uniformly distributed over the specimens.
按照规定的条件，试验箱需要安装一个有定向间歇性对试样前面或后面进行水喷雾的装置。喷雾应当均匀分布覆盖试验片。
The spray system shall be made from corrosion-resistant materials that do not contaminate the water employed.
喷淋系统应当使用耐腐蚀材料制造以防对使用水造成污染。
The water sprayed onto the specimen surfaces shall have a conductivity below 5 µS/cm, contain less than 1 µg/g dissolved solids and leave no observable stains or deposits on the specimens.
喷淋于试验片表面的水，其传导率应低于5 µ S/cm，含有溶解性固体低于1 µ g/g，且不能在试验片上留下明显的污渍或沉积物。

Care shall be taken to keep silica levels below 0,2 µg/g. A combination of deionization and reverse osmosis can be used to produce water of the desired quality.
需严格控制硅含量低于0.2µg/g。结合去离子以及反渗透作用可制造出期望纯度的水。

4.6 Specimen holders

4.6 样品架

Specimen holders may be in the form of an open frame, leaving the backs of the specimens exposed, or they may provide the specimens with a solid backing. They shall be made from inert materials that will not affect the results of the exposure, for example non-oxidizing alloys of aluminium or stainless steel.
Brass, steel or copper shall not be used in the vicinity of the test specimens. The backing used might affect the results, as might any space between the backing and the test specimen, particularly with transparent specimens, and shall be agreed on between the interested parties.
样品架可以是开放式的，留下试验片的背面暴露，或给试验片提供一个固体的背板。应当使用惰性材料制备以防影响暴露的测试结果，例如非氧化的铝合金或不锈钢。黄铜，

钢材或镀铜均不能在试验片附近使用。衬背会对结果造成影响，衬背与试验片之间可能有一些间距，特别是通透的试样，需要得到相关方的同意。

4.7 Apparatus to assess changes in properties
4.7 评价性能改变的装置
If an International Standard relating to the determination of the properties chosen for monitoring the changes in properties exists (see, in particular, ISO 4582), the apparatus specified by the International Standard concerned shall be used.
如果国际标准中有相关监控性能变化的属性选择存在（特别是 ISO 4582），装置有关于国际标准的说明应注明。

5 Test specimens
Make reference to ISO 4892-1. 参考ISO 4892-1.

6 Exposure conditions
6.1 Radiation
Unless otherwise specified, control the irradiance at the levels indicated in Table 3 (see also Table B.1) and Table 4 (see also Table B.2). Other irradiance levels may be used when agreed on by the interested parties.
除非另有规定，按表3及表4的指示对辐照度进行控制.如果取得相关方同意的情况下也可以选用其他的辐照等级。
The irradiance, and the pass band in which it was measured, shall be included in the exposure report.
辐照等级以及被测量的波段均应当包含在报告中。

6.2 Temperature
6.2 温度
6.2.1 Black-standard and black-panel temperature
6.2.1 黑标准以及黑板温度
For referee purposes, Table 3 and Table B.1 specify black-standard temperatures. For normal work, blackpanel thermometers may be used in place of black-standard thermometers (see Table 4 and Table B.2).
出于公正目的，表3及表B.1制定了黑标准温度。通常状态下，黑板温度计会代替黑标准温度计来工作
The black-panel temperatures specified in Table 4 and the black-standard temperatures specified in Table 3 are those most commonly used, but have no relationship to each other. Therefore, test results obtained with the two tables might not be comparable.
最常用的黑板温度、黑标准温度分别在表4及表3中有说明，但两者并没有什么关联性。因此，使用两个表所对应的检测结果并没有可比性。
NOTE 1 If a black-panel thermometer is used, the temperature indicated will be 3 °C to 12 °C lower than that indicated by a black-standard thermometer under typical exposure conditions.
If a black-panel thermometer is used, then the panel material, the type of temperature sensor and the way in which the sensor is mounted on the panel shall be included in the exposure report.
注1：如果使用黑板温度计，温度设定应在3-12℃。这个温度应当低于使用黑标温度计的典型暴露条件。如果使用了黑板温度计，应当将板材、温度传感器的型号以及传感器

在板上安装的方式体现在报告中。

NOTE 2 If higher temperatures are used as specified in Table 3 and Table 4 for special exposures, the tendency for specimens to undergo thermal degradation will increase and this might affect the results of such exposures.

Other temperatures may be used when agreed on by the interested parties, but shall be stated in the exposure report.

注2：对于特殊的暴露需要用到表3以及表4中的高温，试验片受热降解的趋势将会增加最终对此类暴露结果有造成一定的影响。

其他被相关方认可的温度条件也可使用，但需要在报告中注明。

If water spray is used, the temperature requirements apply to the end of the dry period. If the thermometer does not reach a steady state during the dry period after the short water-spray part of the cycle, check whether the specified temperature is reached during a longer dry period, and consider using this longer dry period.

如果用到水喷雾，温度要求适用于干燥过程的最后阶段。如果在整个循环中短暂的水喷雾后干燥过程中，温度计不能达到一个稳定状态，可以通过一个长一点的干燥时间来确认是否达到规定温度，并考虑使用这个长一点的干燥时段。

NOTE 3 During the water-spray part of the cycle, the black-standard or black-panel temperature will be close to that of the water used.

注3：循环过程中水喷雾时，黑标或黑板温度应接近水温。

NOTE 4 The additional measurement of a white-standard/white-panel temperature with a white-standard/white-panel thermometer in accordance with ISO 4892-1 gives important information on the range of surface temperatures of differently coloured test specimens.

注4：关于使用白标/白板温度计测量白标/白板温度的测量可以参照ISO 4892-1，其标准中给出了关于不同颜色试验片的表面温度范围的重要信息。

6.2.2 Chamber air temperature 试验箱空气温度

Exposures can be run either with the chamber air temperature controlled at a specified level (see Table 3 and Table 4) or allowing the air temperature to find its own level (see Table B.1 and Table B.2).

暴露可以在指定的试验箱空气温度等级下进行也可以允许空气温度自动发现其等级

NOTE The possible specimen surface temperature has as its lower limit the temperature of the air surrounding the specimens (i.e. the chamber temperature) and as its upper limit the black-standard temperature specified. It is assumed that the actual specimen temperature lies somewhere between these two limits.

注：合适的试验片表面温度是试样周围空气温度作为其下限值，规定的黑标温度作为其上限值。据推测实际的试验片温度介于这两个限度之间。

6.3 Relative humidity of chamber air 试验箱空气的相对湿度

Exposures can be conducted either with the relative humidity controlled at a specified level (see Table 3 and Table 4) or allowing the relative humidity to find its own level (see Table B.1 and Table B.2).

暴露可以在指定的试验箱空气相对湿度等级下进行也可以允许空气相对湿度自动发现其等级

Table 3 — Exposure cycles with temperature control by black-standard thermometer

表 3—使用黑标温度计控制温度的老化循环

(BST)a

Method A — Exposures using daylight filters (artificial weathering)						
Cycle No.	Exposure period	Irradiance[b]		Black-standard temperature °C	Chamber temperature °C	Relative humidity %
		Broadband (300 nm to 400 nm) W/m²	Narrowband (340 nm) W/(m²·nm)			
1	102 min dry 18 min water spray	60 ± 2 60 ± 2	0,51 ± 0,02 0,51 ± 0,02	65 ± 3 —	38 ± 3 —	50 ± 10[c] —
Method B — Exposures using window glass filters						
Cycle No.	Exposure period	Irradiance		Black-standard temperature °C	Chamber temperature °C	Relative humidity %
		Broadband (300 nm to 400 nm) W/m²	Narrowband (420 nm) W/(m²·nm)			
2	Continuously dry	50 ± 2	1,10 ± 0,02	65 ± 3	38 ± 3	50 ± 10[c]
3	Continuously dry	50 ± 2	1,10 ± 0,02	100 ± 3	65 ± 3	20 ± 10

NOTE 1 The ± tolerances given for irradiance, black-standard temperature and relative humidity are the allowable fluctuations of the parameter concerned about the given value under equilibrium conditions. This does not mean that the value may vary by plus/minus the amount indicated from the given value.

注1：给定的福照度的±偏差，黑标温度以及相对湿度的参数与平衡条件下给定值相关，允许其存在波动。但这并不是说这个值可以从指定值上进行加/减数量。

NOTE 2 For exposures in which the chamber temperature and humidity are not controlled (see Table B.1), it could be useful to report the measured values of both in the exposure report.

注2：试验箱的温度和相对湿度不受控制时，将暴露时该条件的测量值写入报告中是十分有用的。

a This table gives the conditions for exposures conducted with daylight filters (method A) and with window glass filters (method B) using a black-standard thermometer, whereas in Table 4 temperature control is by means of a black-panel thermometer.

此表给出了相应的测试条件，如在日光过滤器以及使用了黑标温度计的窗户玻璃过滤器的分析，然而表4温度控制是借助于黑板温度计。

b The irradiance values given are those that have historically been used. In apparatus capable of producing higher irradiances, the actual irradiance might be significantly higher than the stated values, e.g. up to 180 W/m2 (300 nm to 400 nm) for xenon-arc lamps with daylight filters or 162 W/m2 (300 nm to 400 nm) for xenon-arc lamps with window glass filters.

给出的辐照度值应当为曾经使用过的。能够产生高辐射量的设备，其实际辐照量可能明显高于设定值，例如使用了日光过滤器的氙弧灯达到108W/㎡（300-400nm）或使用了窗户玻璃过滤的氙弧灯达到162w/㎡（300-400nm）

c For materials sensitive to humidity, the use of (65 ± 10) % RH is recommended.

对于湿度敏感的材料，推荐 60±10%RH

6.4 Spray cycle 喷雾周期

The spray cycle used shall be as agreed between the interested parties, but should preferably be that in Table 3 (or Table B.1) for method A and Table 4 (see also Table B.2) method A.

喷雾周期应当取得相关方同意，但更适合表3和表4中的方法A

6.5 Cycles with dark periods

6.5 黑暗周期

The conditions in Table 3 and Table B.1 (see also Table 4 and Table B.2) are valid for continuous presence of radiant energy from the source. More complex cycles may be used. These could include dark periods that might involve high humidity and/or the formation of condensate on the surfaces of the specimens.

表3和表B.1的条件，适用于连续光照的试验。更为复杂的循环周期也可使用，如具有较高相对湿度的黑暗周期和/或在试样表面形成凝结水

Such programmes shall be given, with full details of the conditions, in the exposure report.

此类方案应当包含全部测试条件的细节并在报告中列出。

Table 4 — Exposure cycles with temperature control by black-panel thermometer (BPT)

Method A — Exposures using daylight filters (artificial weathering)						
Cycle No.	Exposure period	Irradiance[a]		Black-panel temperature °C	Chamber temperature °C	Relative humidity %
		Broadband (300 nm to 400 nm) W/m²	Narrowband (340 nm) W/(m²·nm)			
4	102 min dry 18 min water spray	60 ± 2 60 ± 2	0,51 ± 0,02 0,51 ± 0,02	63 ± 3 —	38 ± 3 —	50 ± 10[b] —
Method B — Exposures using window glass filters						
Cycle No.	Exposure period	Irradiance[a]		Black-panel temperature °C	Chamber temperature °C	Relative humidity %
		Broadband (300 nm to 400 nm) W/m²	Narrowband (420 nm) W/(m²·nm)			
5	Continuously dry	50 ± 2	1,10 ± 0,02	63 ± 3	38 ± 3	50 ± 10[b]
6	Continuously dry	50 ± 2	1,10 ± 0,02	89 ± 3	65 ± 3	20 ± 10

NOTE 1 The ± tolerances given for irradiance, black-panel temperature and relative humidity are the allowable fluctuations of the parameter concerned about the given value under equilibrium conditions. This does not mean that the value may vary by plus/minus the amount indicated from the given value.

注1：给定的福照度的±偏差，黑标温度以及相对湿度的参数与平衡条件下给定值相关，允许其存在波动。但这并不是说这个值可以从指定值上进行加/减数量。

NOTE 2 For exposures in which the chamber temperature and humidity are not controlled (see Table B.2), it could be useful to report the measured values of both in the exposure report. a The irradiance values given are those that have historically been used. In apparatus capable of producing higher irradiances, the actual irradiance might be significantly higher than the stated values, e.g. up to 180 W/m2 (300 nm to 400 nm) for xenon-arc lamps with daylight filters or 162 W/m2 (300 nm to 400 nm) for xenon-arc lamps with window glass filters.

给出的辐照度值应当为曾经使用过的。能够产生高辐射量的设备，其实际辐照量可能明显高于设定值，例如使用了日光过滤器的氙弧灯达到108W/㎡（300-400nm）或使用了窗户玻璃过滤的氙弧灯达到162w/㎡（300-400nm）

b For materials sensitive to humidity, the use of (65 ± 10) % RH is recommended.

对于湿度敏感的材料，推荐使用 60±10%RH

6.6 Sets of exposure conditions

6.6 老化条件的设定

Table 3 (see also Table B.1) and Table 4 (see also Table B.2) lists various sets of conditions for exposures conducted with daylight filters (method A) and those conducted with window glass filters (method B).

表3和表4中列出了各种使用日光过滤器和穿户玻璃过滤器的老化设定条件

If no other exposure conditions are specified, use cycle No. 1 (BST control) or cycle No. 4 (BPT control).

如果没有规定其他老化条件，使用周期1或4；

Table 3 specifies three exposure cycles in which the black-standard temperatures are controlled (for additional cycles, see Table B.1). In Table 4 (for additional cycles see Table B.2), black-panel temperatures are given.

表3制定了黑标温度控制下的3中老化周期。表4（附加周期见B.2）给出了黑板温度。

The black-panel temperatures specified in Table 4 and Table B.2 and the black-standard temperatures specified in Table 3 and Table B.1 are the ones most commonly used, but have no relationship to each other. The exposure results might therefore not be comparable.

最常用的黑板温度、黑标准温度分别在表4及表3中有说明，但两者并没有什么关联性。因此，使用两个表所对应的检测结果并没有可比性。

Black-standard thermometers may also be used instead of black-panel thermometers to ensure that the temperature requirements in Table 4 and Table B.2 are met. However, in this case the actual temperature difference between the different types of thermometer shall be determined and the temperature measured by each shall be used as the equivalent set point temperature to compensate for the differences in the thermal conductivity between the two thermometer types.

黑标温度计可以用来替代黑板温度计来确保温度要求满足表4以及表B.2。然而，此类情况下因为温度计型号不同而造成实际温度的偏差应被规定，并且使用的各个温度计测量值应等同于设定温度用以弥补因不同型号温度计热导率差异引起的偏差。

7 Procedure

7.1 General

7.1 通则

It is recommended that at least three test specimens of each material evaluated be exposed in each run to allow statistical evaluation of the results.

一般建议每款材料至少测试3个试验片，允许对结果进行统计学评价。

7.2 Mounting the test specimens

7.2 安装试验片

Attach the specimens to the specimen holders in the equipment in such a manner that the specimens are not subject to any applied stress. Identify each test specimen by suitable indelible marking, avoiding areas to be used for subsequent testing. As a check, a plan of the test-specimen positions may be made.

添加试验片使其固定在支架上，确保试验片不受到任何附加应力。确保每个试验片在其非测试区域都有不可消除的标识。便于确认，最好事先计划好试验片的位置。

If desired, in the case of specimens used to determine change in colour and appearance, a portion of each test specimen may be shielded by an opaque cover throughout the exposure.
This gives an unexposed area adjacent to the exposed area for comparison. This is useful for checking the progress of the exposure , but the data reported shall always be based on a comparison with file specimens stored in the dark.
必要时，当试验片被用于测定颜色或外观变化的情况时，在整个试验期间可用不透明物遮盖每个试样的一部分，以比较遮盖面与暴露面，这对于检查试样的老化过程是很有用的。但实验结果应以试样暴露面与保存在黑暗处的对照试样的比较为准。

7.3 Exposure

Before placing the specimens in the test chamber, be sure that the apparatus is operating under the desired conditions (see Clause 6). Programme the apparatus with the selected conditions to operate continuously for the required number of cycles at the selected exposure conditions.
7.3 老化
在试样投入试验箱之前，应确保设备是在选定的条件下运转（见第6章）。调整装置至选定的条件，整个过程应当保持恒定。
Maintain these conditions throughout the exposure, keeping any interruptions to service the apparatus and to inspect the specimens to a minimum.
Expose the test specimens and, if used, the irradiance-measuring instrument for the specified period.
如果需要，可将辐照测试装置同时暴露。
Repositioning of the specimens during exposure is desirable and might be necessary. Follow the guidance in ISO 4892-1.
If it is necessary to remove a test specimen for periodic inspection, take care not to touch the exposed surface or alter it in any way. After inspection, return the specimen to its holder or to its place in the test chamber with its exposed surface oriented in the same direction as before.
最好经常变换试样的位置以减少任何暴露的局部不均匀性。变换试样的位置时应保持试样初始固定时的取向。如果需要取出试样作定期检查，应注意不要触摸或破坏试样表面。检查后，试样应按原状放回各自试验架或试验箱，保持试验表面的取向与检查前一致。

7.4 Measurement of radiant exposure 曝辐量的测量

If used, mount and calibrate the radiometer so that it measures the irradiance at the exposed surface of the test specimen.
必要时，安装并校准辐射计来测量试验片表面所受到的辐照度。
When radiant exposures are used, express the exposure interval in terms of incident radiant energy per unit area of the exposure plane, in joules per square metre (J/m^2), in the wavelength band from 300 nm to 400 nm, or in joules per square metre per nanometre [$J/(m^2 \cdot nm)$] at the wavelength selected (e.g. 340 nm).
对于所选择的波段，在暴露周期内的辐照度，通过暴露在平面上单位面积的入射光谱辐射能量表示，单位J/m^2

7.5 Determination of changes in properties after exposure

7.5 老化后性能变化的测定

These shall be determined as specified in ISO 4582 in as far as possible. Other properties may be used if agreed upon by all interested parties.

应当参考ISO 4582的相关规定实施。如有其它相关方同意的情况下可引用其它内容。

8 Exposure report

Make reference to ISO 4892-1.

8 报告

参考 ISO 4892-1

9.1 试样描述

A）试验片完整的描述以及其来源；

B）复合物说明，预处理时间、适当的温度

C）完整的测试试验片准备的方法的描述

注：如果老化测试是有代理商承包分析的，试验片通常指定编码。这种情况下，原始实验室有责任在最终的老化报告中提供试验片的完整描述。

9.2 参照 ISO 4892 第 2,3 或 4 章描述老化测试，包含：

A） 老化装置以及光源的描述，包含：

①装置以及光源的型号

②滤光器使用的描述

③有要求时，试验片表面受到的辐照度（包含测量的辐射带通）

④老化开始优先使用的滤光器以及光源的使用时数

B）如果黑/白板温度传感器并不在试验片暴露区域时，其装置的型号及其安装的位置

C）要求时，测量相对湿度的设备型号

D）暴露周期的完整描述，包含以下光照以及黑暗周期的信息：

①使用黑板温度传感器记录的温度，及其均值和公差范围

②通过试验片的空气的相对湿度的均值以及公差

③测试有水喷雾过程时，报告水喷雾的时长以及是否水喷雾喷试验片暴露的表面，或者背面，或者同时两面均有；若喷淋水的固体总含量超过 1 μ g/g，报告高其硅酸盐成分

④如果测试选择在试验片表面凝结，报告整个凝结过程的时长

⑤每个光照以及黑暗周期的时长

E）描述试验片安装在暴露支架上的方法，包含试验片背板使用的材料

F）适当时，试验片重置的流程

G）测量光子能量的辐射计的描述，需要时

9.3 测试结果

A）任何性能报告的测量的测试流程的完整描述

B）测试结果，参考 ISO 4582 提出的，包含：

①测试试验片性能测试的结果

②受控试样性能测试的结果

③未暴露试验片的性能测试的结果，如果有指定的情况；

④暴露周期（时间、辐射能量 J/㎡、测量的带通）

9.4 测试日期