INTERNATIONAL STANDARD

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Anodizing of aluminium and its alloys — Determination of the comparative fastness to ultraviolet light and heat of coloured anodic oxidation coatings

Anodisation de l'aluminium et de ses alliages — Détermination de la solidité comparée à la lumière ultraviolette et à la chaleur des couches anodiques colorées

Reference number
ISO 6581:2010(E)

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

ISO 6581 was prepared by Technical Committee ISO/TC 79, *Light metals and their alloys,* Subcommittee SC 2, *Organic and anodic oxidation coatings on aluminium.*

This second edition cancels and replaces the first edition (ISO 6581:1980), which has been technically revised.

Introduction

The test described in this International Standard represents severe exposure to ultraviolet light and, because of its severity, provides a very rapid determination of the comparative light-fastness of coloured anodic oxidation coatings.

It has to be realized, however, that the light emitted by the mercury vapour source used in the test has a discontinuous spectrum and a high content of ultraviolet radiation. Care must therefore be taken in comparing the results of this test with the results of exposure to sunlight.

Considerable heat is generated by the light source, and the test needs to be carried out in such a way that the temperature of the test pieces during the test does not exceed 100 °C.

Anodizing of aluminium and its alloys — Determination of the comparative fastness to ultraviolet light and heat of coloured anodic oxidation coatings

1 Scope

This International Standard specifies a comparative method for the determination of the fastness of coloured anodic oxidation coatings to ultraviolet (UV) light and heat.

The method is not suitable for testing coloured anodic oxidation coatings that are heat sensitive.

NOTE Dark-coloured test pieces will normally reach the highest temperatures.

2 Principle

Test pieces are exposed to ultraviolet light and the colour changes taking place are observed and compared with standard or control specimens.

3 Apparatus

3.1 General

The apparatus consists of a cabinet made from suitable heat-resistant material with a source of ultraviolet light and an arrangement of specimen holders or supports placed at an equal distance from the light source.

3.2 Cabinet

The cabinet shall be designed so that all exposed test pieces can be positioned at equal distances from the lamp.

NOTE A cylindrical cabinet with the lamp placed vertically in the centre, or a cabinet of rectangular cross-section with the lamp placed horizontally above a support on which the test pieces are placed, is suitable.

Increasing the test temperature increases the rate of fading of the test pieces and their surface temperature in the test cabinet shall not be allowed to exceed 100 °C during any part of the test. In some cases, this will require the cabinet and test pieces to be cooled by means of a suitable fan. Care shall be taken to avoid over-cooling the lamp itself as this may affect the arc, and the lamp manufacturer's advice on this aspect should be followed.

WARNING — The cabinet shall be totally enclosed or suitably baffled to eliminate any possibility of ultraviolet light escaping, since certain ultraviolet wavelengths can damage the eyes. A micro-switch shall be fitted to the opening part of the cabinet, such that the light source is automatically switched off when the cabinet is opened.

Many ultraviolet light sources produce ozone under the conditions of testing (see 3.3) and this can also constitute a health hazard. If ozone is produced by the action of the lamp, it is desirable to have

forced air circulation and it is essential that the air from the cabinet is ducted to a point outside the building. If in doubt, consult the manufacturer.

3.3 Ultraviolet light source

The ultraviolet lamp shall be a medium-pressure mercury arc-lamp with a silica envelope, controlled by a suitable transformer and switch. The lamp shall not be glass shielded, as this would eliminate most of the ultraviolet light.

The power of the lamp and its arc length shall be such that the approximate intensities shown in Table 1 are recorded at a distance of 190 mm from its centre.

Table 1 — Approximate UV light intensities at 190 mm from the centre of the lamp

Wavelength nm	**Intensity** $\mu W/cm^2$
254	500 to 150
265	800 to 400
297	600 to 400
303	1 000 to 800
313	1 350 to 1 200
365	1 500 to 1 700
405	800 to 1 000
436	1 300 to 1 600

NOTE A convenient arrangement has been found to be a 500 W lamp with an effective arc length of 120 mm, placed at a distance of approximately 190 mm from the specimens.

Most lamps have a recommended life of about 1 000 h and during use there will be a decrease in output, especially at wavelengths below 313 nm. It is therefore desirable to use an intensity regulator for the lamp, which will compensate, to some extent, for this decrease.

Care should be taken to avoid handling the silica envelope of the lamp as this can cause it to devitrify.

Although ozone has little effect on the test results, it is desirable that the lamp used does not produce ozone, as this avoids the necessity for ducting the air outside.

3.4 Specimen arrangement

The apparatus shall be arranged so that specimens can be placed in suitable holders or on a suitable support and are equidistant from the light source. Care shall be taken to ensure that the specimens are not shielded from the light source, by the supporting column for the lamp or by glass.

4 Procedure

4.1 General

Expose the specimens to ultraviolet light in the cabinet (see 3.2) until the colour change on either the test piece or the control specimen reaches a predetermined level, as agreed between the customer and the anodizer.

NOTE The time of exposure required depends upon the apparatus used and the coloured anodized finish being assessed. This test is severe by comparison with other light-fastness tests, and most coloured anodized finishes will show significant colour changes in exposure times of less than 100 h.

In order to facilitate the detection of colour changes, partly mask the exposed surface of the specimens by a material opaque to ultraviolet light.

4.2 Control specimens

Because of the severity of the test and the fact that it is intended to be used for comparative purposes, it is preferable to use standard coloured anodized specimens of known ultraviolet light resistance for control purposes. Expose any control specimens with the test pieces and partly mask these in a similar way.

4.3 Effect of ozone production

The presence of ozone has very little effect on the colour change of coloured anodized specimens. However, if a light surface bloom forms on the surface of specimens tested in an ozone-containing atmosphere, remove this with a mild abrasive cleaner before specimen evaluation.

5 Expression of results

Record the exposure time required for the colour change of either the test piece or the control specimen to reach the predetermined level agreed between the customer and the anodizer.

6 Test report

The test report shall contain at least the following information:

a) a reference to this International Standard;

b) the type and identification of the product tested;

c) the colour and, where known, the method of production of the test piece;

d) the control specimen used;

e) details of apparatus used and time(s) of exposure (see Clause 3);

f) the colour change observed in the test piece compared to the masked area and/or control specimen;

g) any deviation, by agreement or otherwise, from the procedure specified;

h) the date of the test.

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