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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

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www. iso. org/directives).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www. iso .org/iso/foreword. html.

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

This third edition cancels and replaces the second edition (ISO 6581:2010), which has been technically revised to add information about the test specimen.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The test described in this document 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. Therefore, care is taken when comparing the results of this test with the results of exposure to sunlight.

Considerable heat is generated by the light source and so the test is carried out in such a way that the temperature of the test specimens 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 document 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 specimens will normally reach the highest temperatures.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7583, *Anodizing of aluminium and its alloys — Terms and definitions*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7583 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Principle

Test specimens are exposed to ultraviolet light and the resulting colour changes are observed and compared with standard specimens.

5 Apparatus

5.1 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.

5.2 Cabinet

The cabinet shall be designed so that all exposed test specimens 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 specimens are placed, is suitable.

Increasing the test temperature increases the rate of fading of the test specimens 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 specimens 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 5.3) 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.

5.3 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. When using a 400 W lamp with an effective arc length of 150 mm, it should be placed at a distance of approximately 170 mm from the specimens.

NOTE The irradiance of the lamp changes at the beginning of use and near the end of life. 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.

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.

6 Test specimen

6.1 Sampling

The test specimen shall be taken from a flat significant surface of the product, and shall not include the edges because of possible distortion and/or non-uniformity.

Where it is impossible to test the product itself, a test specimen which is representative of the product may be used. In this case, the test specimen used shall be made from the same material and prepared under the same conditions of finishing as those used for the preparation of the product. The aluminium alloy, the manufacturing conditions (kind and temper of the material), and the surface condition before treatment shall be the same as those of the product. Pretreatment and anodizing shall be performed in the same bath and under the same conditions as the treatment of the product.

6.2 Size

The standard size of the test specimen should be greater than 150 mm in length by 70 mm in width.

6.3 Treatment before testing

The test specimen shall be clean, free from dirt, stains and other foreign matter. Any deposits or stains shall be removed with a clean, soft cloth or similar material which is wetted by water or an appropriate organic solvent such as ethanol. Organic solvents which can corrode the test area or generate a protective film on the test area shall not be used.

6.4 Specimen arrangement

In the cabinet of the apparatus, the test specimens shall be placed in suitable holders or on suitable supports and shall be equi-distant from the light source. The specimens shall not be shielded from the light source by the supporting column for the lamp or by glass.

7 Procedure

7.1 General

Expose the specimens to ultraviolet light in the cabinet (see 5.2) until the colour change on either the test specimen or the standard specimen reaches a predetermined level, as agreed between the customer and the anodizer. It is permissible to expose the specimens for a period of time agreed by the customer and the anodizer, and subsequently compare any colour changes.

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.

7.2 Standard specimens for control purposes

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 for control purposes standard specimens of colour anodized aluminium, which have known ultraviolet light resistance. Expose any standard specimens with the test specimens and partly mask these in a similar way.

7.3 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.

8 Expression of results

Record the exposure time required for the colour change of either the test specimen or the standard specimen to reach the predetermined level agreed between the customer and the anodizer. If the exposure was done for a period of time agreed between the customer and the anodizer, record any colour changes of either the test specimen or the standard specimen.

9 Test report

The test report shall include at least the following information:

a) a reference to this document, i.e. ISO 6581:2018;

b) the type and identification of the product tested;

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

d) the standard specimen used;

e) details of apparatus used;

f) the lamp manufacturer, model name, wattage, arc length and distance from the specimens;