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Anodizing of aluminium and its alloys — Rating system for the evaluation of pitting corrosion — Grid method

Anodisation de l'aluminium et de ses alliages — Système de cotation de la corrosion par piqûres — Méthode par quadrillage

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Foreword

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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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 8994 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 8994:1989), which has been technically revised.

Anodizing of aluminium and its alloys — Rating system for the evaluation of pitting corrosion — Grid method

1 Scope

This International Standard specifies a grid rating system that provides a means of defining levels of performance of anodic oxidation coatings on aluminium and its alloys that have been subjected to corrosion tests.

This rating system is applicable to pitting corrosion resulting from

— accelerated tests,

— exposure to corrosive environments, and

— practical service tests.

This International Standard takes into account only pitting corrosion of the basis metal resulting from penetration of the protective anodic oxidation coating.

NOTE 1 ISO 8993[3] describes a similar rating system based on defined chart scales.

NOTE 2 The grid rating system is frequently used for rating the results of short-term corrosion tests for relatively thin anodic oxidation coating, such as those used in the automotive industry.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
significant surface
part of the article covered or to be covered by the coating, for which the coating is essential for serviceability and/or appearance

NOTE 1 Adapted from ISO 2064:1996[1], definition 3.1.

NOTE 2 The edges of an article are not normally included in the significant surface.

2.2
corrosion pit
surface corrosion defect at which the anodic oxidation coating is penetrated

NOTE Discoloration or other surface defects which do not penetrate the anodic coating do not count as corrosion pits.

3 Procedure for rating

3.1 Sample preparation

A sample area of more than 5 000 mm^2 is required.

Use one of the following methods to remove corrosion products or deposits on the surface so that corrosion pits may be clearly discerned:

a) wipe with a slurry of fine pumice to abrade away corrosion products and dirt, then rinse in clean water and air dry;

or

b) dip for 5 min to 10 min in 30 % nitric acid, prepared by diluting 1 volume of concentrated nitric acid (ρ_{20} = 1,40 g/ml) with 1 volume of water at 20 °C to 25 °C; rinse and dry as indicated in a);

or

c) dissolve the anodic oxidation coating in a hot phosphoric acid/chromic acid mixture; rinse and dry as indicated in a) so that pitting in the aluminium substrate may be discerned;

NOTE 1 ISO 2106[2] describes the preparation and use of this reagent for the purposes of dissolution of the anodic oxidation coating.

NOTE 2 This method is particularly useful for dark-coloured anodic oxidation coatings.

WARNING — Chromium(VI) is toxic and shall be handled properly. Chromium(VI) solutions are hazardous to the environment and severely hazardous to waters.

or

d) wipe with soft textile gauze dipped in dilute hydrochloric acid solution (100 ml of 35 % to 37 % HCl, made up to 1 000 ml with distilled water or deionized water) to remove deposited copper, then rinse and dry as indicated in a).

3.2 Determination of grid rating

Place a preprinted transparent grid with an area of at least 5 000 mm^2, and with grid squares of 5 mm × 5 mm, over a selected area of the significant surface of the prepared test specimen. Count the number of grid squares occupied by one or more pits, disregarding effects on the edges of samples. Calculate the percentage of defective squares, i.e. grid squares containing pits, using Formula (1):

$$\frac{N}{N_t} \times 100 \quad (1)$$

where

N is the number of defective squares;

N_t is the total number of squares.

Determine the grid rating from Table 1.

Table 1 — Conversion of percentage of defective squares to grid rating

Frequency of defective squares %	Defective squares, N, of 200 squares, N_t	Rating number
0	0	0
⩽0,5	1	1
>0,5 to 1	2	2
>1 to 2	3 or 4	3
>2 to 4	5 to 8	6
>4 to 8	9 to 16	12
>8 to 16	17 to 32	25
>16 to 32	33 to 64	50
>32 to 64	65 to 128	100
>64	>128	200
NOTE The greater the number of squares, the more discriminating is the performance level.		

4 Expression of results

Express the result of the examination as the grid rating and/or the percentage of defective squares, as appropriate.

5 Test report

The test report shall include at least the following information:

a) a reference to this International Standard;

b) the type and identification of the product tested and, where appropriate, the anodizing, exposure and corrosion test procedure;

c) the method of sample preparation used (see 3.1);

d) the grid rating and/or the percentage of defective squares (see Clause 4);

NOTE The acceptable grid rating will normally be specified in the relevant corrosion test or product specification.

e) the date of the test.

Bibliography

[1] ISO 2064:1996, *Metallic and other inorganic coatings — Definitions and conventions concerning the measurement of thickness*

[2] ISO 2106, *Anodizing of aluminium and its alloys — Determination of mass per unit area (surface density) of anodic oxidation coatings — Gravimetric method*

[3] ISO 8993, *Anodizing of aluminium and its alloys — Rating system for the evaluation of pitting corrosion — Chart method*

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