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**Anodizing of aluminium and its  
alloys — Terms and definitions**

*Anodisation de l'aluminium et de ses alliages — Termes et définitions*

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# Contents

|  | Page      |
|--|-----------|
| <b>Foreword</b> .....                  | <b>iv</b> |
| <b>1 Scope</b> .....                   | <b>1</b>  |
| <b>2 Terms and definitions</b> .....   | <b>1</b>  |
| 2.1 Anodized aluminium products.....   | 1         |
| 2.2 Finishes.....                      | 3         |
| 2.3 Pretreatments.....                 | 3         |
| 2.4 Anodic oxidation processes.....    | 4         |
| 2.5 Anodic aluminium oxide.....        | 5         |
| 2.6 Colouring.....                     | 6         |
| 2.7 Sealing.....                       | 7         |
| 2.8 Process operation and control..... | 8         |
| 2.9 Defects.....                       | 9         |
| 2.10 Tests.....                        | 10        |
| 2.11 Properties and performance.....   | 12        |
| <b>Bibliography</b> .....              | <b>14</b> |

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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. [www.iso.org/directives](http://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.

The committee responsible for this document is 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 7583:1986), which has been technically revised. The title has been changed and the English and French language versions are now presented as separate documents.

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# Anodizing of aluminium and its alloys — Terms and definitions

## 1 Scope

This International Standard defines terms concerning anodized aluminium.

## 2 Terms and definitions

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

### 2.1 Anodized aluminium products

#### 2.1.1

##### **anodized aluminium**

aluminium with an anodic oxidation coating produced by an electrolytic oxidation process in which the surface of the aluminium is converted to a layer, mainly of oxide, having protective, decorative or functional properties

#### 2.1.2

##### **architectural anodizing**

anodizing to produce an architectural finish to be used in permanent, exterior and static situations where both appearance and long life are important

#### 2.1.3

##### **batch anodizing**

anodizing aluminium parts by racking them together, passing them through a succession of processes including anodizing, and unstacking

#### 2.1.4

##### **bright anodized aluminium**

anodized aluminium with high specular reflectance as its primary characteristic

#### 2.1.5

##### **clear anodized aluminium**

anodized aluminium with a substantially colourless, translucent anodic oxidation coating

#### 2.1.6

##### **coil anodizing**

strip anodizing

continuous anodizing (deprecated)

anodizing aluminium coils in a continuous process comprising unwinding, passing through a succession of processes including anodizing, and rewinding

Note 1 to entry: The term “continuous anodizing” is deprecated in this usage because it can also be applied to a method of anodizing extrusions.

#### 2.1.7

##### **colour-anodized aluminium**

anodized aluminium coloured either during anodizing or by a subsequent colouring process or processes

#### 2.1.8

##### **combination-coloured anodized aluminium**

anodized aluminium coloured by electrolytic colouring or produced by integral colour anodizing either followed by absorption dyeing

**2.1.9**

**combined coating**

combined coating of an electrophoretic organic coating and an anodic oxidation coating on aluminium

Note 1 to entry: The electrophoretic organic coating is deposited onto anodized aluminium.

**2.1.10**

**decorative anodizing**

anodizing to produce a decorative finish with a uniform or aesthetically pleasing appearance as the primary characteristic

**2.1.11**

**dyed anodized aluminium**

anodized aluminium coloured by absorption of dyestuffs or pigments into the pores

**2.1.12**

**electrolytically coloured anodized aluminium**

anodized aluminium coloured by the electrolytic deposition of metal or metal oxide into the pores

**2.1.13**

**hard anodized aluminium**

anodized aluminium where the anodic oxidation coating has been produced with high wear resistance or microhardness as its primary characteristic

Note 1 to entry: Wear includes abrasive wear and erosive wear.

**2.1.14**

**integral-colour anodized aluminium**

self-colour anodized aluminium

aluminium anodized using an appropriate (usually organic acid based) electrolyte which produces a coloured finish during the anodizing process itself

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**2.1.15**

**interference-coloured anodized aluminium**

multi-coloured anodized aluminium

electrolytically coloured anodized aluminium exhibiting colours attributed to optical interference effects

Note 1 to entry: The optical mechanisms are not fully understood

**2.1.16**

**preanodized aluminium**

aluminium anodized before a forming process is applied

**2.1.17**

**protective anodizing**

anodizing to produce a finish where protection against corrosion or wear is the primary characteristic and appearance is secondary or of no importance

**2.1.18**

**two-step process**

process that produces electrolytically coloured anodized aluminium

**2.1.19**

**type I anodized aluminium**

anodized aluminium produced by chromic acid anodizing

**2.1.20**

**type II anodized aluminium**

anodized aluminium produced by sulfuric acid anodizing

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**2.1.21****type III anodized aluminium**

anodized aluminium produced by any process that forms a heavy, dense coating of specified thickness

**2.2 Finishes****2.2.1****finish**

characteristic of the surface of a product

**2.2.2****matt finish**

diffuse finish typically produced by etching, blasting, rolling or brushing the aluminium before anodizing

**2.2.3****satin finish**

fine-textured matt finish generally produced by etching or by rolling with specially ground rolls

**2.2.4****scratch-brushed finish**

matt or satin finish produced by abrasion with rotating wire brushes

**2.2.5****texture**

<finish> characteristic of the appearance of the surface of a product

**2.3 Pretreatments****2.3.1****bright dipping**

brief immersion in a solution used to produce a bright surface

**2.3.2****brightening**

production of a bright surface by chemical or electrochemical polishing

**2.3.3****chemical brightening**

chemical treatment to improve the specular reflectivity of a surface

**2.3.4****chemical polishing**

polishing of an aluminium surface by immersion in a solution of chemical reagents

**2.3.5****cleaning**

removal of substances including oxide, pick-up, oil and grease from the surface of aluminium, which can negatively affect a subsequent surface treatment

EXAMPLE The cleaning of aluminium coils is often carried out in an acid solution.

**2.3.6****degreasing**

cleaning (deprecated)

removal of substances including oil and grease from the surface of aluminium, which can negatively affect a subsequent surface treatment

EXAMPLE Degreasing is often carried out by the use of an aqueous detergent.

### 2.3.7

#### **desmutting**

removal of loosely adhering “smut” from an aluminium surface

EXAMPLE Smut consisting of intermetallic compounds insoluble in alkaline etch solutions can be removed by immersion in suitable acidic solutions such as nitric acid.

### 2.3.8

#### **electrobrightening**

electrochemical treatment to improve the specular reflectivity of a surface

### 2.3.9

#### **electrograining**

electrochemical treatment of aluminium normally in a hydrochloric or nitric acid solution using an alternating current to etch the surface

EXAMPLE This process is used before anodizing in the production of lithographic plates.

### 2.3.10

#### **electrolytic etching**

roughening of an aluminium surface by overall or selective dissolution in an acid or alkaline media with the aid of an electric current

### 2.3.11

#### **electropolishing**

polishing of an aluminium surface by making it anodic in an appropriate electrolyte

### 2.3.12

#### **etching**

selective dissolution of the surface of aluminium in an aqueous solution to produce the required finish, improve the surface appearance or prepare the surface for further treatment or for inspection

### 2.3.13

#### **pickling**

removal of oxides or other compounds from the surface by chemical action

Note 1 to entry: The term is not normally used in the aluminium surface treatment industry except in the aerospace industry

### 2.3.14

#### **pretreatment**

surface treatment process or processes carried out before the anodic oxidation process

### 2.3.15

#### **tunnel etching**

electrochemical treatment of aluminium normally in a hydrochloric acid solution using an alternating current to etch the surface and produce an array of crystallographic tunnels

EXAMPLE This process is used before anodizing in the production of electrolytic capacitors.

## 2.4 Anodic oxidation processes

### 2.4.1

#### **a.c. anodizing**

process to produce anodized aluminium using an alternating current

### 2.4.2

#### **anodizing**

anodic oxidation of aluminium by applying an electric current



**2.4.3****barrier film anodizing**

barrier layer anodizing (deprecated)

anodizing process that produces a thin, non-porous anodic oxidation coating on aluminium

EXAMPLE This process is generally used in the production of electrolytic capacitors.

**2.4.4****basket anodizing**

barrel anodizing

anodizing of small parts (eg rivets) in a perforated basket

Note 1 to entry: The aluminium parts are pressed into the basket to form the anode and the acid electrolyte circulates between the parts.

**2.4.5****chromic acid anodizing**

anodizing in a chromic acid electrolyte

EXAMPLE This process is mainly used for aerospace applications.

**2.4.6****constant voltage anodizing**

anodizing at a constant electrical potential

**2.4.7****d.c. anodizing**

process to produce anodized aluminium using a direct current

**2.4.8****phosphoric acid anodizing**

anodizing in a phosphoric acid electrolyte

EXAMPLE This process is sometimes used as a pretreatment before the application of an organic coating.

**2.4.9****plasma anodizing**

plasma electrolytic oxidation

PEO

micro-arc oxidation

MAO

spark anodizing

anodizing where dielectric breakdown constitutes an essential part of the mechanism of coating formation

**2.4.10****sulfuric acid anodizing**

anodizing in an electrolyte based on sulfuric acid

**2.5 Anodic aluminium oxide****2.5.1****anodic aluminium oxide**

AAO

anodic oxidation coating either attached to or separated from its aluminium substrate

Note 1 to entry: This term is often used in nanotechnology applications.

**2.5.2**

**anodic oxidation coating**

anodic oxide film

anodic oxide coating

anodic film

coating composed mainly of aluminium oxide formed on the surface of aluminium by anodically polarizing the metal in a suitable electrolyte

**2.5.3**

**barrier layer**

non-porous part of the morphology of a porous anodic oxidation coating that separates the pores from the aluminium metal and has a thickness proportional to the bath voltage

**2.5.4**

**morphology**

structure (deprecated)

<anodic oxidation coating> cells, pores and barrier layer of a porous anodic oxidation coating

Note 1 to entry: The term “structure” generally refers to the crystalline structure of a material and is therefore deprecated in the usage of this subclause.

**2.5.5**

**oxide cell**

unit of the morphology of a porous anodic oxidation coating that contains at its centre a single pore and has a diameter proportional to the bath voltage

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**2.5.6**

**pore**

unit of the morphology of a porous anodic oxidation coating that extends through the thickness of the coating and opens at its outer surface

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**2.5.7**

**porosity**

ratio of the volume of the pores in a given thickness of anodic oxidation coating to the total volume of the coating in that thickness

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**2.5.8**

**porous layer**

part of the morphology of a porous anodic oxidation coating between the barrier layer and the outer surface of the coating

**2.6 Colouring**

**2.6.1**

**bleaching**

destruction of a dyestuff or colouring compound in an anodic oxidation coating by a chemical treatment

Note 1 to entry: A solution of nitric acid can be used for this purpose.

**2.6.2**

**bleeding**

loss of colour by dissolution from dyed anodic oxidation coatings

Note 1 to entry: This can occur during sealing.

**2.6.3**

**colour limit**

colour tolerance

permitted deviation of a colour from a given colour standard when compared using a suitable instrumental method or under specified conditions of illumination and viewing

#### 2.6.4 fixing

exposing to an aqueous solution that minimizes the bleeding of dyestuffs from an anodic oxidation coating

Note 1 to entry: Solutions of nickel sulfate are often used for this purpose.

#### 2.6.5 limit samples

samples demonstrating colour limits

#### 2.6.6 reactivation

treatment of an anodic oxidation coating with acids to increase its absorption capacity for dyestuffs

### 2.7 Sealing

#### 2.7.1 ageing

modification of the structure and properties of an anodic oxidation coating resulting from the slow continuation of a sealing process under ambient conditions

#### 2.7.2 antismut additive

chemical additive to a sealing solution that prevents or inhibits the formation of sealing smut

#### 2.7.3 cold sealing

cold impregnation

sealing process carried out using an aqueous solution at a temperature no higher than 35 °C

Note 1 to entry: Solutions with nickel fluoride as the main active constituent are often used for cold sealing.

#### 2.7.4

#### hydrothermal sealing

either steam sealing not below the saturated steam temperature or sealing in an aqueous solution at a temperature no lower than 95 °C

#### 2.7.5

#### intermediate layer

surface layer of fully hydrated anodic oxidation coating material, which is formed by some sealing processes

#### 2.7.6

#### medium temperature sealing

sealing process carried out using an aqueous solution at an intermediate temperature generally no lower than 60 °C

#### 2.7.7

#### nickel sealing

sealing process using a aqueous solution containing nickel salts at an elevated temperature

Note 1 to entry: Nickel acetate is typically used for this purpose.

#### 2.7.8

#### sealing

treatment applied to an anodic oxidation coating on aluminium to reduce its porosity and absorption capacity