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Aerospace — Anodic treatment of titanium and titanium alloys — Sulfuric acid process

Aéronautique et espace — Traitement anodique du titane et de ses alliages — Traitement à l'acide sulfurique

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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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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 ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 18, *Materials*.

This second edition cancels and replaces the first edition (ISO 8080:1985), which has been technically revised.

The main changes compared to the previous edition are as follows:

— the solution temperature has been changed from (21 ± 2) °C to (20 ± 5) °C (see 4.1.3);

— the use of alternative chemical products for the pickling solution has been allowed (see 4.1.7);

— higher duration for etching has been allowed (see 4.2.5);

— an alternative mechanical activation has been allowed (see 4.2.6);

— voltage cycle has been provided only as a recommendation (see 4.3.1).

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.

Aerospace — Anodic treatment of titanium and titanium alloys — Sulfuric acid process

1 Scope

This document specifies the requirements for producing and testing an unsealed anodic coating on titanium and titanium alloys. The anodic coating is produced by the sulfuric acid process.

The coating is used with solid film lubricants for protection of titanium fasteners against galling, for limited protection of less noble metals against galvanic corrosion when in contact with titanium or for other approved uses.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

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 Technical requirements

4.1 Process details

4.1.1 The anodizing solution shall consist of technical grade sulfuric acid in water with a nominal composition in the range from 200 g/l to 400 g/l of H_2SO_4. The solution shall be maintained at a composition within ±10 % of the nominal composition chosen. The chloride content, measured as NaCI, shall not exceed 0,2 g/l. Provided agreement is obtained from the purchaser, the chemical composition of the solution may be changed if the coating obtained meets all other requirements of this document.

4.1.2 The dissolved metal content of the solution, calculated as titanium, shall not exceed 20 g/l.

4.1.3 The solution shall be used at a temperature of (20 ± 5) °C. The temperature control equipment shall be capable of maintaining the solution temperature within ±5 °C of the control set point.

4.1.4 The solution shall be contained either in a corrosion resistant steel tank or a steel tank lined with a suitable acid resistant material. Except in cases where tanks are lead-lined, lined tanks require auxiliary cathode plates made from a material which will not contaminate the solution.

4.1.5 A variable direct current (v.d.c.) power source and associated controls and instrumentation for reading applied voltage and current are required.

4.1.6 All fixtures, such as wire, hooks, clamps and racks used to suspend the parts, shall be made from titanium or titanium alloy.

4.1.7 The following pickling solution containing a mixture of nitric and hydrofluoric acids at the following concentrations can be used as a reference:

— 280 g/l to 560 g/l of $HN0_3$ (690 g/kg);

— 15 g/l to 25 g/l of HF (700 g/kg).

Nitric and hydrofluoric acids concentrations can be changed, or alternative chemical products can be used, when agreed between the OEM and the processor, provided that anodic layer meets all requirements of this document.

4.2 Preparation for anodizing

4.2.1 Parts shall be thoroughly alkaline cleaned to ensure that all surfaces are free from contaminants such as grease, oil and mill markings.

4.2.2 Chlorinated solvents and methyl alcohol shall not be used for degreasing.

4.2.3 Parts shall be firmly attached to the racking device. Contact areas shall be kept as small as possible and, when practicable, shall be on a surface not required to be coated. When parts are to be coated on all surfaces, contacts shall be located on areas indicated on the drawing.

4.2.4 Parts shall be oriented so as to minimize gas entrapment during processing.

4.2.5 After cleaning, parts shall be etched for a minimum duration to guarantee surface activation in an acid pickling solution (see 4.1.7) and then rinsed thoroughly in cold running water. Heavily scaled parts which do not provide a clean, bright surface after the treatment outlined above may require fine alumina gritblasting or pretreatment in an oxidizing alkaline solution prior to etching.

NOTE Surface activation is correct when the surface is visually clean and bright.

4.2.6 As an alternative, a mechanical activation can be used for surface preparation if agreed between the original equipment manufacturer (OEM) and the processor.

4.3 Anodizing procedure

4.3.1 The parts shall then be immersed in the anodizing solution. The parts shall be made the anode and the tank, or auxiliary plates, the cathode. Current shall be applied to reach the desired coloration. Recommended voltage cycle: from 15 V to 20 V for a period of 15 min or until the desired coloration has been achieved. The recommended initial current density should be approximately 0,2 A/dm^2, with a reduction to an approximate value of 0,05 A/dm^2 over the greater part of the anodizing cycle.

4.3.2 During processing of intricate parts, the solution should be agitated in order to minimize entrapment of gas in pockets and blind holes. If necessary, parts should be repositioned periodically to bring the electrolyte into contact with uncoated areas and to prevent attack at the liquid/gas interface in pockets and blind holes.

4.3.3 After completion of the anodizing cycle, parts shall be rinsed thoroughly in cold, running water, then rinsed in clean, hot water and dried.

4.3.4 If subsequent surface treatments are to be applied, parts should be handled and stored in such a manner as to avoid them being contaminated.