International Standard 8080

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

1 Scope and field of application

This International Standard 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 Technical requirements

2.1 Process details

2.1.1 The anodizing solution shall consist of technical grade sulfuric acid in water with a nominal composition in the range from 200 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 NaCl, 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 International Standard.

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

2.1.3 The solution shall be used at a temperature of 21 ± 2 °C. The temperature control equipment shall be capable of maintaining the solution temperature within ± 2 °C of the control set point.

2.1.4 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.

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

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

2.1.7 The pickling solution shall contain a mixture of nitric and hydrofluoric acids at the following concentrations:

280 to 560 g/l of HNO_3 [69 % (m/m)]

15 to 25 g/l of HF [70 % (m/m)]

2.2 Preparation for anodizing

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

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

2.2.3 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.

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

2.2.5 After alkaline cleaning, parts shall be etched for 5 to 20 s after the commencement of gassing in the nitric-hydrofluoric acid pickling solution 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 grit-blasting or pretreatment in an oxidizing alkaline solution prior to etching.

2.3 Anodizing procedure

2.3.1 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, with the voltage being raised to a value within the range from 15 to 20 V for a period of 15 min or until the desired coloration has been achieved. The initial current density shall 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.

2.3.2 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.