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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 2514

Issued JAN 1995

Submitted for recognition as an American National Standard

ANODIC COATING ON ALUMINUM ALLOYS
Sulfuric Acid Process, Resin-Sealed

1. SCOPE:

1.1 Purpose:

This specification covers the engineering requirements for producing an anodic coating on aluminum and aluminum alloys which are subsequently sealed with an organic resin.

1.2 Application:

This coating has been used typically to increase corrosion resistance and provide surfaces which will ensure adhesion of subsequent organic finishes, but usage is not limited to such applications. This process is applicable to all forms and alloys of aluminum. Coatings produced through resin-seal anodizing cannot be subsequently dyed. This process is not suitable for parts which contain joints or recesses in which the solutions utilized in the anodizing process may be retained.

1.3 Safety - Hazardous Materials:

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 4037 Aluminum Alloy Sheet and Plate, 4.4Cu - 1.5Mg - 0.60Mn (2024; -T3 Flat Sheet, -T351 Plate), Solution Heat Treated

2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM B 117 Salt Spray (Fog) Testing
ASTM B 487 Measurement of Metal and Oxide Coating Thicknesses by Microscopical Examination of a Cross Section
ASTM B 567 Measurement of Coating Thickness by the Beta Backscatter Method

2.3 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-2073-1 DOD Materiel, Procedures for Development and Application of Packaging Requirements

3. TECHNICAL REQUIREMENTS:

3.1 Solutions:

3.1.1 Shall be an aqueous solution of sulfuric acid of suitable concentration, nominally 15% by weight. The anodizing solution shall be maintained at a temperature within the range 68 to 72 °F (20 to 22 °C).

3.1.2 Neutralizing Rinse: Shall be an aqueous solution of 4 to 6% by weight commercial grade sodium bicarbonate maintained at a temperature below 80 °F (27 °C) or other suitable neutralizing solution. Water used for solution preparation shall meet the requirements of 3.2.4.

3.1.3 Sealer: Shall be a colloidal suspension in water of a suitable resin concentrate. The resin concentrate shall be diluted with water and maintained in accordance with manufacturer's instruction.

3.2 Procedure:

3.2.1 Preparation: All fabrication-type operations, such as heat treatment, machining, forming, brazing, welding, and perforating, shall be completed before parts are anodized.

3.2.2 Cleaning: Parts shall be cleaned to a water-break-free surface and deoxidized prior to anodizing. Acid or alkaline etching may be used to enhance surface preparation or coating adhesion. The etchants shall be suitably inhibited against intergranular attack.

3.2.3 Anodizing: Direct current shall be applied as required to maintain an anode current density of 10 to 15 amperes per square foot (110 to 160 A/M^2) at a voltage of 6 to 14 volts. Time of anodizing shall be that required to produce a coating which meets the requirements of 3.3. Other conditions of voltage, current density, electrolyte concentration, temperature, and time may be used when acceptable to purchaser.

3.2.4 Rinsing: After anodizing, parts shall be rinsed in cold, running tap water for not less than five minutes. Demineralized water shall be used for all rinsing after anodizing when water with 50 parts per million (ppm) or less total solids content is not available. The total chloride content of the water shall not exceed 25 parts per million. After water rinsing, parts, other than castings, shall be immersed for not less than ten minutes in the neutralizing rinse of 3.1.2. Casting alloys shall be held in the neutralizing rinse for not less than 30 minutes. After rinsing in the neutralizing rinse, parts shall be rinsed in water for an additional five minutes or longer.

3.2.5 Resin Sealing: Following water rinsing, parts, while still wet, shall be totally immersed in the resin sealer for the time recommended by the sealer manufacturer. The resin seal tank shall remain covered for the time the parts are immersed. On completion of sealing, parts shall be removed from the resin seal tank and left untouched on the processing racks for not less than two hours. Tear dropping of resin is permissible but teardrop areas shall not be used in determining coating thickness. Resin sealed parts shall not be handled or top coated until sealer has been cured in accordance with manufacturer's instructions.

3.3 Properties:

Resin sealed anodic coated parts shall conform to the following properties.

3.3.1 Coating Thickness: Parts shall be processed to obtain a final coating thickness of 0.0003 to 0.0005 inch (7.6 to 12.7 mm). Other coating thicknesses may be specified by purchaser.

3.3.1.1 Thickness of coating shall be determined on representative parts or specimens (4.3.3) in accordance with ASTM B 487, ASTM B 567, or other method acceptable to purchaser. Coating thickness shall not apply to blind holes, recesses with depth greater than twice the diameter, or in open holes with depth greater than seven times the diameter unless a specific thickness is specified in those areas.

3.3.2 Corrosion Resistance: Coated and sealed panels of AMS 4037 aluminum alloy sheet shall withstand exposure for not less than 500 hours to salt spray corrosion testing in accordance with ASTM B 117 except that the significant surface shall be inclined approximately 6 degrees from vertical. The exposed panels shall show no more than a total of 15 scattered spots or pits, none larger than 1/32 inch (0.8 mm) in diameter, in a total of 150 square inches (968 cm^2) of test area grouped from five or more test pieces, or more than five scattered spots or pits, none larger than 1/32 inch (0.8 mm) in diameter, in a total of 30 square inches (194 cm^2) from one or more test pieces. Areas within 1/16 inch (1.6 mm) from identification markings, and at electrode contact marks remaining after processing, need not be included.

3.4 Quality:

The coating, as received by purchaser, shall be continuous, uniform in color, shall not exhibit evidence of arcing or burning, and shall be free from powdery areas and other imperfections detrimental to usage of the coating.

4. QUALITY ASSURANCE PROVISION:

4.1 Responsibility for Inspection:

The processor shall supply all samples for processor's tests and shall be responsible for performing all required tests. Where parts are to be tested, such parts shall be supplied by purchaser. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that processing conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests for thickness (3.3.1) and quality (3.4) are acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests for corrosion resistance (3.3.2) and tests of cleaning and processing solutions to ensure that the coating will conform to specified requirements are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.2.3 Preproduction Tests: Tests for all technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of processed parts to a purchaser, when a change in material and/or processing requires reapproval by the cognizant engineering organization (See 4.4.2), and when purchaser deems confirmatory testing to be required.

4.2.3.1 For direct U.S. Military procurement, substantiating test data and, when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, contracting officer, or request for procurement.

4.3 Sampling and Testing:

Shall be not less than the following; a lot shall be all parts of the same part number, processed in the same processing solutions in a continuous series of operations in not longer than eight consecutive hours, and presented for processor's inspection at one time:

4.3.1 For Acceptance Tests: As shown in Table 1.

TABLE 1 - Sampling for Acceptance Testing

Number of Parts in Lot	Quality	Thickness
Up to 7	All	0
8 to 15	7	1
16 to 40	10	1
41 to 110	15	2
111 to 300	25	3
301 to 500	35	6
Over 500	50	8

4.3.1.1 A statistical sampling plan, acceptable to purchaser, may be used in lieu of sampling in 4.3.1.

4.3.2 For Periodic Tests: As agreed upon by purchaser and processor.

4.3.3 When coated parts are of such configuration or size as to be not readily adaptable to the specified tests, separate test specimens made of the same generic class of alloy as the parts represented, cleaned, coated, and sealed with the parts represented may be used.

4.4 Approval:

4.4.1 The process and control factors, a preproduction sample, or both, whichever is specified by purchaser, shall be approved by the cognizant engineering organization before production parts are supplied.

4.4.2 The processor shall make no significant change to materials, processes, or control factors from those on which the approval was based, unless the change is approved by the cognizant engineering organization. A significant change is one which, in judgment of the cognizant engineering organization, could affect the properties or performance of the parts.