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AEROSPACE MATERIAL SPECIFICATION

SAE AMS 2429A

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Superseding AMS 2429

Submitted for recognition as an American National Standard

MASKING, BRONZE PLATE
Nitriding Stop-off
90Cu - 10Sn

1. SCOPE:

1.1 Purpose:

This specification covers the engineering requirements for electrodeposition and removal of bronze plate.

1.2 Application:

This process has been used typically as a maskant to prevent nitriding of surfaces on which nitriding is neither required nor permitted, but usage is not limited to such applications.

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 applicable issue of referenced publications shall be the issue in effect on the date of the purchase order.

2.1 ASTM Publications:

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

ASTM B 487 Measurement of Metal and Oxide Coating Thicknesses by Microscopical Examination of a Cross Section
ASTM B 499 Measurement of Coating Thicknesses by the Magnetic Method; Nonmagnetic Coatings on Magnetic Basis Metals
ASTM B 504 Measurement of Thickness of Metallic Coatings by the Coulometric Method
ASTM B 567 Measurement of Coating Thicknesses by the Beta Backscatter Method
ASTM B 571 Adhesion of Metallic Coatings
ASTM E 376 Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Test Methods
ASTM E 478 Chemical Analysis of Copper Alloys
ASTM F 519 Mechanical Hydrogen Embrittlement Testing of Plating Processes and Aircraft Maintenance Chemicals

2.2 U.S. Government Publications:

Available from Standardization Documents Order 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 Preparation:

3.1.1 (R) Prior to immersion in the plating solution, parts shall be clean and free of water break, prepared with minimum abrasion.

3.1.2 Electrical contacts between the parts and power source shall be made to ensure that neither chemical or immersion deposition nor electrical arcing or overheating will occur. Contact points shall be located in areas on which plating is not required or is optional.

3.1.3 (R) Auxiliary anodes shall be used as necessary to ensure proper plate thicknesses in holes, recesses, and closed-end deep bores on parts to be protected against nitriding. Metal plugs, that are compatible with the basis metal, may be used to protect difficult-to-plate small holes.

3.2 Procedure:

3.2.1 Parts shall be plated by electrodeposition of copper-tin alloy (bronze) from a suitable bronze plating solution. A preliminary strike of copper or, for corrosion and heat resistant steels, of nickel is permissible.

3.2.2 After plating, the parts shall be thoroughly rinsed in running water to remove plating solution, dipped in hot water, and dried. Parts shall be oiled to protect against corrosion, if necessary.

3.3 Post Treatment:

After plating, rinsing, and drying, all parts having hardness higher than 40 HRC shall be baked for not less than one hour at 375 °F ± 10 (191 °C ± 6) or shall be started in the nitride cycle within four hours after plating.

3.3.1 After nitriding, the bronze plate shall be stripped from parts with an alkaline copper stripper that will not cause pitting or other damage to the basis metal. The bronze stripping solution shall not cause hydrogen embrittlement, determined in accordance with ASTM F 519, Types 1a, 1c, or 2a.

3.4 Properties:

The deposited copper-tin alloy shall conform to the following requirements:

3.4.1 (R) Thickness: Shall be not less than 0.0005 inch (12.7 μm) on all surfaces of representative parts or test panels cleaned and plated with the parts represented, determined in accordance with ASTM B 487, ASTM B 499, ASTM B 504, ASTM B 567, and ASTM E 376.

3.4.1.1 Where "copper strike" or "nickel strike" is specified, the thickness of the strike shall be approximately 0.0001 inch (2.5 μm).

3.4.2 (R) Composition: The tin content of the bronze plate shall be 5 to 15% by weight, determined by wet chemical methods in accordance with ASTM E 478, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

3.4.3 (R) Adhesion: Shall be tested on parts using the heat quench test for copper in accordance with ASTM B 571.

3.4.4 (R) Porosity: Bronze plated low-alloy steel panels, plated with the parts represented, shall be sufficiently nonporous to not give a blue color when tested for five minutes with potassium ferricyanide solution made up in accordance with Table 1. Alternate tests, providing equal sensitivity, may be used when approved by purchaser and vendor.

TABLE 1 - Ferricyanide Test Solution

Ingredient	Amount
Potassium ferricyanide	10 grams
Sodium chloride	5 grams
Deionized water	100 mL

3.5 Quality:
(R)

Plating, as received by purchaser, shall be continuous, adherent to basis metal, uniform in appearance, and essentially free from blisters, nodules, pits, and other surface imperfections. Slight staining or discoloration is permissible. Standards for acceptance shall be as agreed upon by purchaser and vendor.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:
(R)

The processing vendor shall supply all samples for vendor's tests and shall be responsible for performing all required tests. 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 (3.4.1), adhesion (3.4.3), porosity (3.4.4), and quality (3.5) are acceptance tests and shall be performed on each lot.
(R)

4.2.2 Periodic Tests: Tests for composition (3.4.2) and tests of cleaning and plating solutions to ensure that the deposited metal will conform to the specified requirements are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.
(R)

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 plated parts to a purchaser, when a change is made in material and/or processing, 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:
(R)

Shall be not less than the following; a lot shall be all parts of the same part number plated to the same specified thickness range, processed in a continuous operation or within an eight-hour period, and presented for vendor's inspection at one time:

4.3.1 For Acceptance Tests: Shall be as shown in Table 2.
(R)

TABLE 2 - Sampling for Acceptance Tests

Lot Size	Quality	Thickness Porosity Adhesion	Destructive Test (if required)
Up to 7	All	3	0
7 to 15	7	4	0
16 to 40	10	4	1
41 to 110	15	5	2
111 to 300	25	6	3
301 to 500	35	7	4
Over 500	50	8	5

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

4.3.3 When plated parts are of such configuration or size as to be not readily
(R) adaptable to the specified tests, separate specimens made of an alloy of the same class as the parts represented, cleaned, plated, and post-treated with the parts represented may be used. For adhesion tests, specimens shall be panels approximately 0.032 x 1 x 4 inches (0.81 x 25 x 102 mm) and for thickness tests shall be panels of the same size and type or shall be bars approximately 0.5 inch (13 mm) in diameter and 4 inches (102 mm) long.

4.4 Approval:

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

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

4.4.3 Control factors for the process shall include, but not be limited to, the
(R) following:

Surface preparation method(s)
Composition and temperature limits of the plating bath
Testing frequency for plating bath composition
Frequency of periodic test