AN AMERICAN NATIONAL STANDARD

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400 Commonwealth Dr., Warrendale, PA 15096

# AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 2429

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Revised

## BRONZE PLATE MASKING

1. SCOPE:

1.1 Purpose: This specification covers the engineering requirements for electrodeposition and removal of bronze (90Cu, 10Sn) plate.

1.2 Application: For use as a maskant to prevent nitriding of surfaces on which nitriding is neither required nor permitted.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM B487 - Measurement of Metal and Oxide Coating Thicknesses by Microscopical Examination of a Cross Section
ASTM B499 - Measurement of Coating Thicknesses by the Magnetic Method; Nonmagnetic Coatings on Magnetic Basis Metals
ASTM B504 - Measurement of Thickness of Metallic Coatings by the Coulometric Method
ASTM B567 - Measurement of Coating Thicknesses by the Beta Backscatter Method
ASTM E290 - Semi-Guided Bend Test for Ductility of Metallic Materials
ASTM E376 - Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Test Methods





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2.2 (Continued):

ASTM E478 - Chemical Analysis of Copper Alloys
ASTM F519 - Mechanical Hydrogen Embrittlement Testing of Plating Processes and Aircraft Maintenance Chemicals

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publication and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

3. TECHNICAL REQUIREMENTS:

3.1 Preparation:

3.1.1 Processing tanks, bus bars, meters, electrical contacts, and other equipment used for bronze plating shall be cleaned as often as required to prevent the buildup of dust, dirt, chemicals (spillage), sludge, oxides, or other contaminants. All tanks and equipment shall be monitored to ensure that the tanks are free from dirt, sludge, or foreign materials and that the equipment is operating satisfactorily.

3.1.2 Prior to immersion in the plating solution, parts shall have chemically clean surfaces prepared with minimum abrasion, erosion, or pitting.

3.1.3 Electrical contacts between the parts and power source shall be made in such a manner as will 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.

3.1.4 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 steel 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 heat resistant and corrosion 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 1 hr at 375°F + 10 (190°C ± 5) or shall be started in the nitride cycle within 4 hr after plating.

3.3.1 The bronze plate shall be stripped from parts after nitriding 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 F519, Methods 1a, 1c, or 2a.

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

3.4.1 Thickness: Shall be not less than 0.0005 in. (12.5 μm) on all surfaces, determined on representative parts or test panels in accordance with ASTM B487, ASTM B499, ASTM B504, ASTM B567, ASTM E376, or other method agreed upon by purchaser and vendor.

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

3.4.2 Composition: The tin content of the bronze plate shall be 5 - 15% by weight, determined by wet chemical methods in accordance with ASTM E478 or by spectrographic or other analytical methods approved by purchaser.

3.4.3 Adhesion: Specimens as in 4.3.3 shall not show separation of the plating from the basis metal, when examined at approximately 4X magnification, after being bent rapidly at room temperature, in accordance with ASTM E290, through an angle of 180 deg around a diameter equal to the nominal thickness of the specimen. Formation of cracks which do not result in flaking or blistering of the plating is acceptable.

3.4.4 Porosity: Bronze plate shall be sufficiently nonporous to not give a blue color when tested for 5 min. with potassium ferricyanide solution made up as follows:

potassium ferricyanide 10 g
sodium chloride 5 g
deionized water 100 mL

3.5 Quality: Plated bronze 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: The processing vendor shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.5. 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 to determine conformance to requirements for thickness (3.4.1), adhesion (3.4.3), porosity (3.4.4), and quality (3.5) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for composition (3.4.2) and tests of cleaning and plating solutions to ensure that the deposited metal will conform to the requirements of this specification are classified as 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 to determine conformance to all technical requirements of this specification are classified as preproduction tests and shall be performed prior to or on the initial shipment of plated parts to a purchaser, when a change in material, processing, or both requires reapproval as in 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, the contracting officer, or the request for procurement.

4.3 Sampling: 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 8-hr period, and presented for vendor's inspection at one time:

4.3.1 For Acceptance Tests:

4.3.1.1 Thickness and Adhesion: Three parts from each lot, except as specified in 4.3.3.

4.3.1.2 Porosity: One part from each lot.

4.3.1.3 Quality: Each part.

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 adaptable to the specified tests, separate specimens cleaned, plated, and post-treated with the parts represented may be used. For adhesion tests, such specimens shall be panels of annealed, low-carbon steel approximately 0.032 x 4 x 1 in. (1 x 100 x 25 mm) and for thickness and quality tests shall be panels of the same size and type or shall be bars approximately 0.5 in. (10 mm) in diameter and 4 in. (100 mm) long.