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AEROSPACE MATERIAL SPECIFICATION

AMS 2418C
Superseding AMS 2418B

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COPPER PLATING

1. SCOPE:

1.1 Purpose: This specification covers the engineering requirements for electrodeposition of copper on metals and the properties of the deposit.

1.2 Application: Primarily to provide an anti-seize surface, to prevent carburizing of surfaces on which carburizing is neither required nor permitted, to prevent decarburization, or to provide a source of copper for furnace brazing.

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

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 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 Thickness by Microscopical Examination of a Cross Section
ASTM B499 - Measurement of Coating Thicknesses by the Magnetic Method: Nonmagnetic Coatings on Magnetic Basis Metal
ASTM B504 - Measurement of the Thickness of Metallic Coatings by the Coulometric Method
ASTM E376 - Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electrometric) Test Methods

2.3 Government Publications: Available from Commanding Officer, Naval Publications 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 All welding and brazing (except when copper plate is used as a source of copper for brazing) shall be completed before parts or assemblies are plated.

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

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. If ø parts are to be plated all over, contact points shall be located where specified or where agreed upon by purchaser and vendor. If parts are not required to be plated all over, contact points shall be located in areas on which plating is not required or is optional.

3.2 Procedure:

3.2.1 Copper shall be electrodeposited from a conventional copper cyanide solution directly on the metal part or from a high speed copper plating solution following a "copper strike", except that a preliminary flash of nickel or other suitable metal is permissible on parts made from corrosion-resistant and heat-resistant steels or alloys.

ø 3.2.2 The plated parts shall be removed from the plating solution, thoroughly rinsed, and dried.

3.3 Post Treatment: After plating, rinsing, and drying, all parts having hardness higher than 40 HRC that are not to be subsequently carburized, heat treated, or brazed, shall be suitably heated to relieve possible embrittlement. Temperatures to which parts are heated shall be such that maximum embrittlement relief is obtained without reducing the hardness of parts below drawing limits but shall be not lower than 300°F (149°C) for not less than 1 hour.

3.4 Properties:

3.4.1 Thickness: Shall be as specified on the drawing and as follows, determined on representative parts ø or test panels in accordance with ASTM B487, ASTM B499, ASTM B504, ASTM E376, or other suitable method agreed upon by purchaser and vendor:

3.4.1.1 AMS 2418 shall designate plate thickness of 0.0005 - 0.0007 in. (12.7 - 17.8 μ m).

3.4.1.2 Other plate thicknesses may be specified by this specification number and a suffix number designating the minimum thickness in ten thousandths of an inch (2.5 μ m). A tolerance of +0.0002 in. (+5.1 μ m) will be allowed unless otherwise specified. Thus, AMS 2418-1 designates a thickness of 0.0001 - 0.0003 in. (2.5 - 7.6 μm), AMS 2418-6 designates a thickness of 0.0006 - 0.0008 in. (15.2 - 20.3 μ m).

3.4.1.3 Where "copper flash" is specified, the thickness of copper shall be approximately 0.0001 in. (2.5 μm).

3.4.1.4 If internal surfaces or surfaces of small holes and deep recesses are required to be plated, notes on drawings will so specify but minimum plate thickness requirements will be waived except when such surfaces can be touched by a sphere 0.75 in. (19.0 mm) in diameter. When plating of such surfaces is specified, external surfaces may have plate thickness greater that that specified, but this will not be cause for rejection if dimensions of parts are within specified tolerances.

3.5 Quality: Copper plate shall be smooth, continuous, adherent to basis metal, uniform in appearance, and not coarsely crystalline, and shall be free from pin holes, porosity, blisters, nodules, pits, and other harmful imperfections. Slight staining or discoloration is permissible.

ø 3.5.1 Double plating and spotting-in after plating are not permitted, unless otherwise specified.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The processing vendor shall supply all samples and shall be responsible ø 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 perform such confirmatory testing as he deems necessary to ensure that processing conforms to the requirements of this specification.

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests.

4.2.1 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:

4.3.1 Thickness: Three parts for each consecutive 8 hr of operation of the same set of solutions, except as specified in 4.3.3.

4.3.2 Quality: 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 test specimens cleaned, plated, and post-treated with the parts represented may be used. Specimens shall be panels of low-carbon steel spproximately 0.032 x 4 x 1 in. or 1 x 100 x 25 mm or shall be bars approximately 0.5 in. or 10 mm in diameter and 4 in. or 100 mm long.

4.4 Approval:

4.4.1 Plated parts shall be approved by purchaser before parts for production use are supplied, unless such approval be waived. Results of tests on production parts shall be essentially equivalent to those on the approved sample parts.

4.4.2 Vendor shall use manufacturing procedures, processes, and methods of inspection on production parts which are essentially the same as those used on the approved sample parts. If any change is necessary in type of equipment or in established composition limits and operating conditions of process solutions, vendor shall submit for reapproval of the process a statement of the proposed changes in processing and, when requested, sample parts, test panels, or both. Production parts plated by the revised procedure shall be not shipped prior to reciept of reapproval.

4.5 Reports: The processing vendor shall furnish with each shipment three copies of a report stating that the parts have been processed and tested in accordance with the requirements of this specification and that they conform to the technical requirements. This report shall include the purchase order number, this specification number and its revision letter, part number, and quantity.

4.6 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the parts may be based on the results of testing three additional specimens for each original nonconforming specimen. Except as specified in 4.6.1, failure of any retest specimen to meet the specified requirements shall be cause for rejection of the parts represented and no additional testing shall be permitted. Results of all tests shall be reported.

4.6.1 If any part fails to meet the specified requirements, either on the original sampling as in 4.3 or upon resampling as in 4.6, the parts in that lot may be stripped by a method approved by purchaser which does not roughen, pit, or embrittle the basis metal, replated, post treated, and retested.

5. PREPARATION FOR DELIVERY:

5.1 Identification: Plated parts shall be identified as agreed upon by purchaser and vendor. The markings shall have no deleterious effect on the coated parts or their performance and shall be sufficiently stable to withstand normal handling.

5.2 Packaging:

5.2.1 Parts shall be handled and packaged in such a manner as will ensure that the required physical characteristics and properties of the plating are preserved.

5.2.2 Packages of parts shall be prepared for shipment in accordance with commercial practice to ensure Ø carrier acceptance and safe transportation to the point of delivery. Packaging shall conform to carrier rules and regualtions applicable to the mode of transportation.

5.2.3 For direct U. S. Military procurement, packaging shall be in accordance with MIL-STD-794, Level A Ø or Level C, as specified in the request for procurement. Commerical packaging as in 5.2.2 will be acceptable if it meets the requirements of Level C.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS: Parts on which the plating does not conform to this specification or to authorized modifications will be subject to rejection.

8. NOTES:

8.1 Marginal Indicia: The phi (Ø) symbol is used to indicate technical changes from the previous issue of this specification.

8.2 A plating thickness of 0.0007 - 0.002 in. (17.8 - 50.8 μm) is recommended for preventing carburizing.

8.3 Copper plating shoud not be specified in small holes or recesses where the depth to hole diameter ratio is greater than 1:1.

8.4 For direct U.S. Military procurement, purchase documents should specify the following:

Title, number, and date of this specification
Plate thickness desired
Quantity of pieces to be plated
Applicable level of packaging (See 5.2.3).