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400 COMMONWEALTH DRIVE. WARRENDALE. PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 2423B
Superseding AMS 2423A

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NICKEL PLATING
Hard Deposit

1. SCOPE:

1.1 Purpose: This specification covers the engineering requirements for electrodeposition of a hard nickel and the properties of the deposit.

1.2 Application: Primarily to provide good wear resistance to metal parts which may operate in service up to 450°F (232°C). Diffusion heat treatment of the deposit is not required.

1.2.1 Omission of post-plating thermal treatment may cause parts to be susceptible to hydrogen embrittlement; caution should be exercised in use of this plating on parts heat treated to tensile strength of 200,000 psi (1380 MPa) or higher.

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 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 the Thickness of Metallic Coatings by the Coulometric Method
ASTM B530 - Measurement of Coating Thicknesses by the Magnetic Method: Electrodeposited Nickel Coatings on Magnetic and Nonmagnetic Substrates
ASTM E92 - Vickers Hardness of Metallic Materials
ASTM E376 - Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Test Methods

2.3 U.S. 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 forming, machining, heat treating, brazing, and welding shall be completed before parts are plated.

3.1.2 Surfaces to be plated shall be smooth and substantially free from blemishes, pits, tool marks, and other surface irregularities.

3.1.3 Parts having hardness higher than 40 HRC and which have been ground after heat treatment shall be suitably stress-relieved before cleaning for plating. Temperature to which parts are heated shall be such that maximum stress relief is obtained without reducing hardness of parts below drawing limits.

3.1.4 Parts shall have chemically clean surfaces, prepared with minimum abrasion, erosion, or pitting, prior to immersion in the plating solution. Treatments which may produce hydrogen embrittlement shall be avoided.

3.1.5 Parts shall be within drawing limits after plating, unless otherwise specified.

3.1.6 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 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 Nickel shall be electrodeposited from a chloride, sulfate/chloride, or sulfamate solution containing addition agents to produce the specified hardness. Unless otherwise specified, nickel shall be deposited directly on the basis metal without a prior flash coating of metal other than nickel, except that a preliminary chemical coating, immersion plate, and/or metal flash is permissible on aluminum, magnesium, and their alloys.

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

3.3 Properties: Plating shall conform to the following requirements:

3.3.1 Thickness: Shall be as specified, determined on representative parts or Ø test panels in accordance with ASTM B487, ASTM B499, ASTM B504, ASTM B530, ASTM E376, or other suitable method agreed upon by purchaser and vendor.

3.3.1.1 The plate shall be substantially uniform in thickness on significant surfaces except that slight build-up at exterior corners or edges will be permitted provided finished drawing dimensions are met.

3.3.1.2 No requirements are established for minimum plate thickness for surfaces of holes, recesses, internal threads, contact areas of parts plated all over, and other areas where a controlled deposit cannot be obtained under normal plating conditions but such areas shall not be masked to prevent plating. Unless otherwise noted on drawings, resultant thickness shall be considered only when such surfaces of parts can be touched by a sphere 0.75 in. (19.0 mm) in diameter.

3.3.2 Hardness: Shall be not lower than 400 HV or equivalent, determined in accordance with ASTM E92 on deposits 0.004 in. (0.10 mm) and over in thickness.

3.3.3 Stress: Shall be within the range 0 - 15,000 psi (0 - 105 MPa) in compression, determined at plate thickness of 0.0003 in. (0.008 mm) by calculation from spiral contractometer reading (Ref. 35th Annual Proceedings, American Electoplaters Society, p. 53-78) or other instrument agreed upon by purchaser and vendor.

3.3.4 Adhesion: Plated metal shall be firmly and continuously bonded to the basis metal, determined by a method agreed upon by purchaser and vendor.

3.4 Quality: Plated surfaces shall be smooth, continuous, uniform in appearance, and essentially free from frosty areas, pin holes, porosity, blisters, nodules, pits, and other imperfections detrimental to fabrication or to performance of parts. Slight staining or discoloration will be permitted. Standards for acceptance shall be as agreed upon by purchaser and vendor.

3.4.1 Double plating and spotting-in after plating are not permitted, unless Ø otherwise approved by purchaser.

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 Ø 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 Ø thickness (3.3.1), hardness (3.3.2), and quality (3.4) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for stress (3.3.3) and adhesion (3.3.4) and tests of cleaning and plating solutions to Ø 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 plating processor 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 first-article shipment of plated parts to a purchaser, when a change in bath composition and/or processing 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 Ø one size and shape plated in one bath to the same specified plating thickness range within one 24 hr period and submitted for vendor's inspection at one time:

4.3.1 For Acceptance Tests: