AEROSPACE MATERIAL SPECIFICATION

AMS2454™	REV. A

Issued 2012-04
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Revised 2021-12

Superseding AMS2454

(R) Plating, Electroless Nickel-Phosphorus, Co-Deposited with Polytetrafluoroethylene (PTFE)

RATIONALE

AMS2454A is the result of a Fire-Year Review and update of this specification with changes to ordering information corresponding to changes in the document, added Type VI to be specified to Table 4, updated stress relief per GAB19AA (3.1.1), updated contact locations per GAB19AB (3.1.2, 4.4.3), added direct dimensional inspection of thickness (3.4.1), added minimum force to hardness testing to increase accuracy (3.4.3), clarified wording for composition (3.4.6), added paragraph dealing with acceptable imperfections in coating applied to casting and forgings (3.5.3), revised adhesion test requirements per GAB14AA (4.2.2, Table 5, 4.3.2, 4.3.3.6), moved and updated plating solution controls from 4.2.2.1 to 4.2.2.2, added 4.2.2.4 suspension of periodic testing for when plating is not performed, for preproduction tests (4.2.3) added that test are dependent of type of coating specified, updated Lot definition per GAB16AA (4.3.1), for corrosion testing added AMS4037 for specimen material (4.3.3.3) to align with other AMS's changed plating thickness to a minimum for hydrogen embrittlement test (4.3.3.4), and revised notes 8.7, 8.15, 8.17, 8.20, and 8.21.

NOTICE

ORDERING INFORMATION: The following information shall be provided to the plating processor by the purchaser.

1. Purchase order shall specify not less than the following:

   - AMS2454A, service class (Table 1), thickness grade number (Table 2), thickness grade letter (Table 3), and phosphorous type (Table 4).
   - Optional: Plating thickness and underplate thickness other than that stated in Table 2 and Table 3 (see Table 2, Note 1 and Table 3, Note 2).
   - Optional: Class of thermal treatment (1.3.4).
   - Special features, geometry, or processing present on parts that requires special attention by the plating processor.
   - Quantity of pieces to be plated.
   - Basis metal to be plated.
   - Tensile strength or hardness of the basis metal (applicable to steel alloys only).

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724 776 4970 (outside USA)

SAE WEB ADDRESS:

For more information on this standard, visit
ds/content/AMS2454A

- If pre-plate stress relief is to be performed by plating processor and if different from 3.1.1, time and temperature are to be specified.
- If steel parts were machined, ground, cold formed, or cold straightened after heat treatment (3.1.1).
- If steel parts have been shot peened (8.10), specify if required stress relief has been completed (3.1.1.3).
- Optional: Requirement to prohibit hexavalent chromium use, when applicable (3.2.4).
- Optional: Hydrogen embrittlement relief to be performed by plating processor, if different from 3.3.1.
- Optional: Requirement to remove residual PTFE particles, if applicable, and method of removal, if desired (3.3.3, 3.5.1, and 8.13).
- Optional: Specific requirement(s), test method(s) for color and/or gloss, when applicable (3.5.2).
- Optional: Requirement for adhesion testing of parts by chisel-knife or other method, and frequency of test, if required (3.4.2.2 or 3.4.2.3).
- Optional: Additional test requirements, when specified (e.g., see 8.17 through 8.20), including test and acceptance criteria.
- Optional: Periodic testing, if required (4.2.2.2), for hardness of Class 2 plating (3.4.4), coefficient of friction (3.4.7), and/or adhesion testing of parts (3.4.2.1 or 3.4.2.2) and periodic test sample quantity, if different than 4.3.2.

2. Part manufacturing operations such as heat treating, forming, joining, and media finishing can affect the condition of the substrate for plating, or if performed after plating, could adversely affect the plated part. The sequencing of these types of operations should be specified by the cognizant engineering organization or purchaser and is not controlled by this specification.

1. SCOPE

1.1 Purpose

This specification covers the requirements for electroless nickel-phosphorus plate that is co-deposited with polytetrafluoroethylene (PTFE) over other materials.

1.2 Application

This deposit has been used typically to provide a uniform build-up on intricate shapes for improvement of wear resistance, low reflectivity, and/or as an electrically conductive finish with improved corrosion resistance, but usage is not limited to such applications. The deposit is generally dark and nonreflective. The deposit has been used in service up to 500 °F (260 °C), although wear and/or corrosion resistance may degrade as service temperature increases.

1.2.1 Corrosion resistance is a function of substrate material and the type and thickness of underplate and the electroless nickel PTFE composite surface layer. See 8.15.

1.2.2 This plating is not specifically intended for applications requiring premium solderability or adhesive bondability. See 8.14.

1.2.3 Application of electroless nickel PTFE composite plating to steel parts having a hardness of 46 HRC (ultimate tensile strength of 220 ksi [1517 MPa] or higher) shall not be performed unless authorized by the design documentation or specific approval has been received from the cognizant engineering organization.

1.3 Classification

The cognizant engineering organization may assign one or more of the following classifications to specify plating requirements:

1.3.1 Service Class Designates Corrosion Resistance (see 3.4.3 and 8.15)

Table 1 - Corrosion resistance(1)

Service Class	Duration of Salt Spray Test (Hours)
SC0	Not required
SC1	48
SC2	100
SC3	192
SC4	500
SC5	1000
SC6	2000

(1) Specifying a service class requires appropriate decisions for grade and type. See 8.15.

1.3.2 Grade Designates Thickness (see 3.4.1 and 8.16)

Table 2 - PTFE-nickel composite layer thickness (minimum)

Grade(1)	Inches	Microns
1	0.0001	2.5 µm
2	0.0003	7.6 µm
3	0.0007	18 µm

(1) Other thickness requirements shall be as-specified.

Table 3 - Underplate layer(1) thickness (minimum)

Grade(2)	Inches	Microns
A	0.00005	1.25 µm
B	0.0001	2.5 µm
C	0.0002	5.0 µm
D	0.0003	7.5 µm
E	0.0005	12.5 µm
F	0.0007	17.5 µm
G	0.0010	25.0 µm
H	0.0014	30.0 µm

(1) Multiple underplate layers may be applied, as determined by plating processor.
(2) Other thickness requirements shall be as-specified.

1.3.3 Type Designates Phosphorus Content of Plating (see 3.4.6, 8.7, and 8.15)

Table 4 - Phosphorus content of plating

Type	Phosphorus, % by Weight
I	No requirement
II	1 to 3
III	3 to 5
IV	5 to 9
V	9 and above
VI	Other (range must be specified)

1.3.4 Class Designates Thermal Treatment (see 3.3.2, 3.4.4, 8.5, and 8.11)

Class 1: Except for hydrogen embrittlement relief, no post plating thermal treatment.

Class 2: Thermal treatment at 450 °F (232 °C) to harden the deposit.

Class 3: Thermal treatment at 375 °F (191 °C).

Class 4: Thermal treatment at 250 °F (121 °C).

Unless a specific class is specified, Class 1 or Class 4 may be supplied.

1.4 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 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 issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2430	Shot Peening
AMS2432	Shot Peening, Computer Monitored
AMS2546	Laser Peening
AMS2750	Pyrometry
AMS2759/9	Hydrogen Embrittlement Relief (Baking) of Steel Parts
AMS4037	Aluminum Alloy, Sheet and Plate, 4.4Cu - 1.5Mg - 0.60Mn (2024; -T3 Flat Sheet, -T351 Plate), Solution Heat Treated
ARP1917	Clarification of Terms Used in Aerospace Metals Specifications
ARP4992	Periodic Test for Process Solutions
AS2390	Chemical Process Test Specimen Material

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B117	Operating Salt Spray (Fog) Apparatus
ASTM B374	Terminology Relating to Electroplating