AEROSPACE MATERIAL SPECIFICATION

AMS2454™

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Plating, Electroless Nickel, Codeposited with Polytetrafluoroethylene (PTFE)

RATIONALE

This specification establishes the requirements for an electroless nickel plate that is codeposited with polytetrafluoroethylene (PTFE). This plating has been demonstrated to meet Code "T" of MIL-DTL-38999.

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:

   - AMS2454, Service Class (Table 1), Grade Number (Table 2), Grade Letter (Table 3), Type (Table 4).
   - 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).
   - Optional: Pre-plate stress relief to be performed by plating processor (time and temperature), if different from 3.1.1.
   - 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 8.14).
   - Optional: Specific requirement(s) and 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: Periodic testing, if required (4.2.2.2), for Corrosion Resistance (3.4.3), 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.
- Optional: Shot peening, if required, on steel parts having a hardness of 40 HRC or above (8.11).
- Optional: Requirement and test method for corrosion testing of plated parts, when applicable (8.16).
- Optional: Requirement for control of maximum plating thickness (total plating buildup), when applicable (8.17).
- Optional: Requirement and test method for wear resistance, when applicable (8.18).
- Optional: Requirement(s) and test method(s) for control of PTFE particle size and/or distribution, when applicable (8.19).
- Optional: Requirement and test method for electrical conductivity, when applicable (8.20).
- Optional: Requirement and test method for internal stress, when applicable (8.21).

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. See 8.2.

1. SCOPE

1.1 Purpose

This specification covers the requirements for electroless nickel plate that is codeposited 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 8.16.

1.2.2 This plating is not specifically intended for applications requiring premium solderability or adhesive bondability. See 8.15.

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 8.16)

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 8.16.

1.3.2 Grade Designates Thickness (See 3.4.1 and 8.16)

TABLE 2 - PTFE-NICKEL COMPOSITE LAYER THICKNESS (MINIMUM)

Grade [1]	Inches	Micron
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 by purchaser

TABLE 3 - UNDERPLATE LAYER [1] THICKNESS (MINIMUM)

Grade [2]	Inches	Micron
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 by purchaser

1.3.3 Type Designates Phosphorus Content of Plating (See 3.4.6, 8.8, and 8.16)

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

1.3.4 Class Designates Thermal Treatment (See 3.3.2, 3.4.4, 8.6, and 8.12)

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.