SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS2516 | REV. E

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Superseding AMS2516D

Polytetrafluoroethylene (PTFE) Resin Coating
High Build, 698 to 752 °F (370 to 400 °C) Fusion

RATIONALE

Change the acceptance test requirements to reflect industry practice.

1. SCOPE

1.1 Purpose

This specification establishes the engineering requirements for producing thick coatings of polytetrafluoroethylene (PTFE) resin on parts and the properties of such coatings.

1.2 Application

Primarily to provide dry lubrication, high heat stability, and corrosion protection on parts which operate at not higher than 527 °F (275 °C) for limited periods or not higher than 473 °F (245 °C) for extended periods. This coating is usually smoother than that of AMS2515. This coating may also be used as a release film for molds.

1.3 Safety – Hazardous Material

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 sole 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 form 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.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
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SAE WEB ADDRESS: **http://www.sae.org**

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMS2516E

2.1 SAE Publications

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

AMS5045 Steel Sheet and Strip, 0.25 max Carbon, Hard Temper

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 A 108 Steel Bars, Carbon, Cold-Finished, Standard Quality

ASTM B 117 Salt Spray (Fog) Testing

2.3 U.S. Government Publications

Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, http://assist.daps.dla.mil/quicksearch/.

MIL-STD-202 Test Methods for Electronic and Electrical Component Parts

3. TECHNICAL REQUIREMENTS

3.1 Material

The coating materials (primer and finish coating) shall be dispersions of polytetrafluoroethylene (PTFE) resin solids with a small amount of coalescing resin in a water medium. The primer may be either pigmented or unpigmented. The finish resin coating material shall be unpigmented unless colored material is specified by purchaser.

3.2 Preparation

3.2.1 Cleaning: Surfaces, other than anodized aluminum, to be coated shall be degreased, chemically cleaned or lightly abrasive blasted, cleaned to remove abrasive particles, and air dried. Anodized aluminum surfaces need only be degreased and dried.

3.2.2 Preheating: Immediately prior to coating, metals shall be preheated to 752 °F ± 9 (400 °C ± 5) to produce a light oxide film and remove any organic contamination and air cooled. Preheating of aluminum, magnesium, and copper is not required (See 8.2).

3.3 Coating

3.3.1 Primer: A primer resin coat of 0.0002 to 0.0007 inch (5 to 18 µm) dry film thickness shall be applied to the prepared surfaces and fused as in 3.4.

3.3.2 Finish: The finish resin coating material shall be applied to the primed surfaces as required to yield the specified total dry film thickness. Thickness of each coat shall be 0.002 to 0.003 inch (51 to 76 µm) for the first few coats but should gradually be decreased to approximately 0.001 inch (25 µm) as total coating thickness increases toward 0.040 inch (1.02 mm). Each coat shall be fused as in 3.4 before application of the succeeding coat.

3.3.2.1 For best corrosion resistance, coated surfaces shall be sanded with 300 to 400 grit paper and cleaned between coats.

3.4 Fusing

The resin coating shall be air-dried to a dry, non-glossy appearance or forced-heat dried at 149 to 203 °F (65 to 95 °C) for 5 to 10 minutes. Each intermediate coat shall be fused at 572 to 626 °F (300 to 330 °C). The final dried coating shall be fused at 698 to 752 °F (370 to 400 °C) until fusing is complete. Fusing is complete when the milk-white (for unpigmented material), air-dried film changes to a clear, fused film. Fusing time will vary depending on the mass of metal being coated. Unless otherwise permitted by purchaser, the fused coating shall be quenched in cold water, after the final fusing cycle, to provide maximum coating toughness. Adequate ventilation shall be provided in furnace areas to prevent inhalation of toxic fumes.

3.5 Repair of Damaged Areas

Damaged areas shall be sanded to a feather edge. If basis metal is exposed, a new primer coat shall be applied. As many coats as required to build the film to its original thickness shall be applied, observing the coating thickness requirements of 3.3.2. Each coat shall be fused before application of the subsequent coat. Care shall be taken to remove any overspray of primer from the original top coat and to apply the resin coating well beyond the perimeter of the damaged area. After air drying, reworked areas shall be fused by means of an open flame. In fusing, heating to a temperature above that at which the coating changes to a clear, fused film shall be avoided; bright, glowing spots in the film are evidence of overheating and decomposition of the resin. Flame fusing shall be performed only under a hood or forced draft ventilation.

3.6 Properties

The fused coating shall conform to the following requirements, determined on representative test panels or on parts chosen at random to represent the lot:

3.6.1 Coating Thickness: Shall be as specified on the drawing, determined by micrometer measurement, thickness gage, or other method agreed upon by purchaser and vendor.

3.6.2 Adhesion: A representative coated 0.250-inch (6.35-mm) diameter ASTM A 108 low-carbon steel rod, processed with each lot of parts, shall show no evidence of chalking, blistering, or loss of adhesion, determined by cycling in accordance with MIL-STD-202, Method 102, Condition C, except that the cycling temperature range shall be -76 to +500 °F (-60 to +260 °C).

3.6.3 Coefficient of Friction: Shall be not higher than 0.1, determined on a Timken tester at 68 to 86 °F (20 to 30 °C), a speed of 25 feet/minute ± 2 (125 mm/s ± 10), and a load of 10 pounds force ± 0.1 (45 N ± 0.4).

3.6.4 Corrosion Resistance: A representative part or test panel of AMS5045 low-carbon steel processed to a dry film thickness of 0.003 to 0.004 inch (76 to 102 µm) shall withstand, without evidence of deterioration of the coating or corrosion of the basis metal, exposure for not less than 168 hours to salt spray corrosion test conducted in accordance with ASTM B 117.

3.6.5 Water Vapor Resistance: A panel of AMS5045 low-carbon steel, processed to a dry film thickness of 0.0045 to 0.0060 inch (114 to 152 µm), shall show no blisters in the film and no incipient rusting of the basis metal after exposure to boiling water vapor for not less than 96 hours. Specimens shall be placed horizontally, with coated side down, across the top of a 400-mL beaker maintained approximately half-full of gently boiling water (See 3.6.5.1).

3.6.5.1 By starting with the beaker somewhat more than half full, properly regulating the boiling rate, and allowing the water level to drop somewhat below the half-full point, the test of 3.6.5 can run unattended for approximately eight hours.

3.7 Quality

Coating on parts, as received by purchaser, shall be smooth, uniform, and free from craters, pin holes, sags, runs, bubbles, heavy edges, foreign materials, and other imperfections detrimental to performance of the coating.

3.7.1 When multiple coatings are applied, each coat shall be free from cracks after fusing, determined by examination under 40X magnification.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The vendor of coated parts shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the coated parts conform to the requirements of this specification.

4.2 Classification of Tests

4.2.1 Acceptance Tests: Tests for, adhesion (3.6.2) and water vapor resistance (3.6.5), are acceptance tests and shall be performed on each batch. Tests for thickness (3.6.1) and appearance (3.7.1) are acceptance tests and shall be performed on each lot.

4.2.2 Preproduction Tests: Tests for all technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of coated parts to a purchaser, when a change in ingredients and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.2.1 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, contracting officer, or request for procurement.

4.3 Sampling and Testing

Shall be as follows:

4.3.1 For Acceptance Tests: Sufficient coated parts or specimens shall be selected at random from each lot to perform all required tests. The number of determinations for each requirement shall be as specified in the applicable test procedure or, if not specified therein, not less than three.

4.3.1.1 A batch shall be a matched set of primer and finish coat material batches. One primer batch shall be matched with one finish coat batch and batch testing shall be performed on the matched set. Change of the primer or the finish coat shall constitute a new batch.

4.3.1.2 A lot shall be all parts coated with the same batch of coating material processed under the same fixed conditions and run through the final fusion process at one time. Equipment shutdown shall constitute the termination of the lot.

4.3.1.3 When a statistical sampling plan has been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1 and the report of 4.5 shall state that such plan was used.

4.3.2 For Preproduction Tests: As agreed upon by purchaser and vendor.

4.4 Approval

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