



Society of Automotive Engineers, Inc.
TWO PENNSYLVANIA PLAZA, NEW YORK, N. Y. 10001

AEROSPACE MATERIAL SPECIFICATION

AMS 2515C

Superseding AMS 2515B

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POLYTETRAFLUOROETHYLENE RESIN COATING Low Build, 700° - 750° F (371° - 399° C) Fusion

1. SCOPE:

- 1.1 Purpose: This specification establishes the engineering requirements for producing thin coatings of polytetrafluoroethylene resin on parts and the properties of such coatings.
- 1.2 Application: Primarily to provide dry lubrication, high heat stability, and good corrosion protection on parts which operate at temperatures not higher than 525° F (274° C) for limited periods or 475° F (246° C) for extended periods.

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., Two Pennsylvania Plaza, New York, New York 10001.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

AMS 5040 - Carbon Steel Sheet and Strip, Deep Forming Grade

- 2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.

ASTM B117 - Salt Spray (Fog) Testing

- 2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.

2.3.1 Military Standards:

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 resin solids 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.

3.2 Preparation:

- 3.2.1 Cleaning: Surfaces to be coated shall be degreased and then shall be chemically cleaned or lightly abrasive blasted, cleaned to remove abrasive particles, and air dried, except that anodized aluminum need only be degreased and dried.

- 3.2.2 Preheating: Immediately prior to coating, metals, other than aluminum, magnesium, and copper shall be preheated to 750° F $\pm$ 10 (398.9° C $\pm$ 5.6) to produce a light oxide film and remove any organic contamination and then air cooled. Preheating of aluminum, magnesium, and copper is not required.

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3.3 Coating:

- 3.3.1 Primer: A primer resin coat of 0.2 - 0.4 mil (0.005 - 0.010 mm) dry film thickness shall be applied to the oxidized metal surfaces and fused as in 3.3.3.
- 3.3.2 Finish: The finish resin coating material shall be applied to the primed surfaces in increments not greater than 1.0 mil (0.025 mm) as required to yield a total dry film thickness not greater than 6.0 mils (0.152 mm). Each coat shall be fused as in 3.3.3 before application of the succeeding coat.
- 3.3.2.1 For best corrosion resistance properties, coated surfaces shall be sanded and cleaned between coats.
- 3.3.3 Fusing: The resin coating shall be air-dried to a dry, non-glossy appearance or forced-heat dried at 180° - 200° F (82.2° - 93.3° C) for 5 - 10 minutes. The dried coating shall be fused at 700° - 750° F (371.1° - 398.9° 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.
- 3.3.4 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 1-mil (0.03-mm) coats as required to build the film to its original thickness shall be applied. 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, repaired 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.
- 3.4 Properties:
- 3.4.1 Coating Thickness: Shall be as specified on the drawing, determined by micrometer measurement, thickness gage, or other means agreed upon by purchaser and vendor.
- 3.4.2 Adhesion: A representative coated 0.250-in. (6.35-mm) diameter 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 -80° F (-62.2° C) to +500° F (+260° C).
- 3.4.3 Coefficient of Friction: Shall be not higher than 0.1, determined on a Timken tester at a temperature of 68° - 86° F (20° - 30° C), a speed of 25 fpm $\pm$ 2 (127 mm/s $\pm$ 10), and a load of 10 lb $\pm$ 0.1 (44.5 N $\pm$ 0.4).
- 3.4.4 Corrosion Resistance: A representative part or test panel processed to a dry film thickness of 3.0 - 4.0 mils (0.076 - 0.102 mm) shall withstand exposure for not less than 168 hr to salt spray without evidence of deterioration of the coating or corrosion of the basis metal; test shall be conducted in accordance with ASTM B117.
- 3.4.5 Water Vapor Resistance: A panel of low carbon steel, AMS 5040 or equivalent, processed to a dry film thickness of 4.5 - 6.0 mils (0.114 - 0.152 mm) 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 5 hours. Specimens shall be placed horizontally, with coated side down, across the top of a 400-cm³ beaker maintained approximately half-full of gently boiling water.
- 3.5 Quality: The coating shall be smooth, uniform, and free from craters, pin holes, sags, runs, bubbles, heavy edges, foreign materials, and other imperfections detrimental to performance of parts.

- 3.5.1 Appearance: 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 and shall be responsible 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 assure that processing conforms to the requirements of this specification.

4.2 Classification of Tests:

- 4.2.1 Acceptance Tests: Tests to determine conformance to thickness (3.4.1), adhesion (3.4.2), water vapor resistance (3.4.5), and appearance (3.5.1) requirements are classified as acceptance or routine control tests.

- 4.2.2 Qualification Tests: Tests to determine conformance to coefficient of friction (3.4.3) and corrosion resistance (3.4.4) requirements are classified as qualification or periodic control tests.

- 4.3 Sampling: Shall be as follows; a lot shall be all parts of the same part number coated to the same film thickness with the same material and presented for inspection at one time.

- 4.3.1 Acceptance Tests: One specimen per lot for each test.

- 4.3.2 Qualification Tests: As agreed upon by purchaser and vendor.

4.4 Approval:

- 4.4.1 To assure adequate performance characteristics, coated parts shall be approved by purchaser before parts for production use are supplied.

- 4.4.2 Vendor shall use manufacturing procedures including repair methods, coating materials, and methods of inspection on production parts which are essentially the same as those used on the approved sample parts. If any change in coating or inspection procedures or in coating materials is necessary, vendor shall submit for reapproval of the process a detailed statement of the revised operations and, when requested, sample coated parts. No production parts coated by the revised procedure shall be shipped prior to receipt of reapproval.

- 4.5 Reports: The vendor of coated parts shall furnish with each shipment three copies of a report stating that the parts have been processed and tested in accordance with this specification. This report shall include the purchase order number, this specification number and its revision letter, coating materials designations, 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. 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.

5. PREPARATION FOR DELIVERY:

5.1 Packaging:

- 5.1.1 Parts of each different part number shall be packed in separate suitable containers each marked with the part number, purchase order number, lot number, vendor's identification, and quantity.

- 5.1.2 Containers of parts shall be prepared for shipment in accordance with commercial practice to assure carrier acceptance and safe transportation to the point of delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.