SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS2491 REV. E

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Superseding AMS2491D

(R) Surface Treatment of Polytetrafluoroethylene (PTFE) Preparation for Bonding

RATIONALE

This specification has been revised to explicitly allow the variations in color typically resulting from this surface treatment process. Acceptance test sampling has been defined and numerous editorial changes have been made.

1. SCOPE

1.1 Purpose

This specification covers the engineering requirements for preparing surfaces of polytetrafluoroethylene (PTFE) for bonding and the properties resulting from the treatment.

1.2 Application

This process has been used typically for rendering surfaces of parts capable of supporting a high strength adhesive bond. The bonding preparation can affect the electrical properties of the PTFE and this should be considered before using it for treatment of electronic components.

1.3 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 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 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.

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/AMS2491E

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.

AMS3690 Adhesive Compound, Epoxy, Room Temperature Curing

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 D 897 Tensile Properties of Adhesive Bonds
ASTM D 1002 Apparent Shear Strength of Single Lap Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal to Metal)

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/.

FED-STD-313 Material Safety Data, Transportation Data, and Disposal Data for Hazardous Materials Furnished to Government Activities

3. TECHNICAL REQUIREMENTS

3.1 Material

The surface treating agent shall be a solution of sodium or other alkali metal in anhydrous liquid ammonia or tetrahydrofuran-naphthalene or other suitable solvent.

3.1.1 Safety Precaution

Sodium metal reacts violently with water. Tetrahydrofuran solvent is highly flammable. Therefore, it is recommended that personnel performing the etching process and handling these materials should be trained and experienced in their use. Preparation of the surface activation solution must be carried out in a properly vented area.

3.2 Preparation

Parts to be treated shall be cleaned free from dirt, grease, oil, and other contamination. Cleaned parts shall be thoroughly dried prior to surface treatment.

3.3 Procedure

The clean, dry parts shall be exposed to the surface treating agent until all surfaces to be bonded meet the color requirements of 3.5.1.

3.4 Post-Treatment

The treated parts shall be cleaned and thoroughly dried. A suitable cleaning technique involves immersion of parts in acetone, a water rinse, followed by a final rinse with clean, anhydrous acetone.

3.4.1 Treated parts which are not to be bonded immediately shall be packaged in heat-sealed polyethylene bags in a manner which will prevent exposure to ultraviolet light and surface contamination.

3.5 Properties

Treated parts shall conform to the following requirements:

3.5.1 Color

The etched surface(s) shall exhibit complete coverage. Treated surfaces of parts shall have a dull, dark brown-to-black color. Variations in color, typically referred to as mottling, shall be permitted provided all areas meet the color requirements of this specification.

3.5.2 Tensile and Shear Strengths

Representative specimens of PTFE, surface-treated on both sides using the same process as the parts represented and bonded to the applicable aluminum specimens with an epoxy adhesive compound conforming to AMS3690, shall meet the requirements of 3.5.2.1 and 3.5.2.2. Where tape material is supplied, the tensile sample may be the thickness of material as skived and surface treated.

3.5.2.1 Tensile Strength

Shall be not lower than 1000 psi (6.90 MPa) at 70 to 75 °F (21 to 24 °C), determined in accordance with ASTM D 897 on specimens prepared by bonding a treated polytetrafluoroethylene disc, approximately 0.030 inch (0.76 mm) thick, between the two halves of a standard aluminum alloy tensile specimen.

3.5.2.2 Shear Strength

Shall be not lower than 1000 psi (6.90 MPa) at 70 to 75 °F (21 to 24 °C), determined in accordance with ASTM D 1002 on specimens prepared by bonding a treated polytetrafluoroethylene strip, not greater than 0.030 inch (0.76 mm) in thickness, between standard aluminum alloy lap shear plates.

3.6 Quality

Surfaces of treated parts, as received by purchaser, shall exhibit complete coverage, shall meet the color requirements of this specification, and shall be free from imperfections detrimental to usage of the treated parts.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The processor shall supply all specimens for processor's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the processing conforms to the specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Color uniformity (3.5.1), shear strength (3.5.2.2), and quality (3.6) are acceptance tests and shall be performed to represent each lot.

4.2.2 Periodic Tests

Tensile strength (3.5.2.1) is a periodic test and shall be performed at a frequency selected by the processor unless frequency of testing is specified by purchaser.

4.2.3 Preproduction Tests

All technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of treated parts by the processor, when a change in material and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.3 Sampling

Sampling shall be as follows: A lot shall be all parts treated in a single production run under the same fixed conditions and presented for processor's inspection at one time.

4.3.1 For Acceptance Tests

The number of parts sampled shall not be less than shown in Table 1.

TABLE 1 – SAMPLING FOR ACCEPTANCE TESTING

Number of Parts in Lot	Color and Quality	Shear Strength
Up to 7	all	3
8 to 15	7	4
16 to 40	10	4
41 to 110	15	5
111 to 300	25	6
301 to 500	35	7
Over 500	50	8

4.3.1.1 Skived Tape

Two samples for shear strength testing in accordance with 3.5.2.2 shall be prepared from every 50 feet (15.2 m), or portion thereof, of the treated tape material. Where samples cut from a continuous run may adversely affect a production run, purchaser may waive this requirement and instead specify samples to be taken from the beginning and end of a continuous, uncut run of tape material. Where tape material is required to have only one side surface treated, a suitable length of material shall be cut from each end to allow samples to be prepared and both sides surface treated at the same time as the production run of material.

4.3.2 For Periodic Tests

Frequency shall be at the discretion of the processor unless otherwise specified by the purchaser.

4.4 Approval

4.4.1 The process and control factors or a preproduction part, or both, whichever is specified, shall be approved by the cognizant organization before production parts are supplied.

4.4.2 The processor shall make no significant change to materials, processes, or controls from those on which the approval was based, unless the change is approved by the cognizant engineering organization. A significant change is one which in the judgement of the cognizant engineering organization could affect the properties of the parts.

4.4.3 Control factors shall include, but not be limited to, the following process treatment parameters.

Part surface cleaning
Control of surface active agent
Rinsing, drying, and packaging for storage
Periodic test plan