SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS3970/4 REV. A

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Superseding AMS3970/4

(R) Carbon Fiber Fabric Repair Prepreg, 120 °C (250 °F) Vacuum Curing
Part 4 - Purchasing Specification for Film Adhesive

RATIONALE

AMS3970/4 is revised to include the relevant PRI documentation references and the PRI rules to manage the qualification material process through the CACRC Qualified Products Group (QPG).

FOREWORD

This Purchasing Specification (PS), AMS3970/4 belongs to the Technical Specification system explained in AMS3970.

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TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
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http://www.sae.org/technical/standards/AMS3970/4A

1. SCOPE

AMS3970/4 specifies the batch release and delivery requirements for film adhesive used for repair. This specification is applicable only when the film adhesive is used as part of the prepreg system as defined in AMS3970 and AMS3970/1.

1.1 Limitation

This specification relates to qualified adhesive films listed in the associated PRI QPL AMS3970.

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 724-776-4970 (outside USA), www.sae.org.

AMS3970 Carbon Fiber Fabric Repair Prepreg, 120 °C (250 °F) Vacuum Curing Part 0 - Introduction

AMS3970/1 Carbon Fiber Fabric Repair Prepreg, 120 °C (250 °F) Vacuum Curing Part 1 - General Requirements

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 3530/D 3530M Standard Test Method for Volitile Content of Composite Material Prepreg

ASTM D 3531/D 3531M Standard Test Method for Resin Flow of Carbon Fiber-Epoxy Prepreg

ASTM D 3776 Standard Test Method for Mass per Unit Area (Weight) of Fabric

ASTM D 4440 Standard Practice for Rheological Measurement of Polymer Melts Using Dynamic Mechanical Procedures

ASTM E 1252 Standard Practice for General Techniques for Qualitative Infrared Analysis

2.3 EN Publications

Available from CEN-comite, European de Normalisation, Secretatiat Central, Rue de Stassart 36, B-1050 Bruxelles, Belgium or www.cenorm.be.

EN 2557 Aerospace Series: Carbon Fibre Preimpregnates, Test Method for the Determination of Mass per Unit Area

EN 2558 Aerospace Series: Carbon Fibre Preimpregnates, Test Method for the Determination of the Percentage of Volatile Matter

EN 2560 Aerospace Series: Carbon Fibre Preimpregnates, Test Method for the Determination of the Resin Flow

EN 6040 Aerospace Series: Analysis of Non-Metallic Materials (Uncured) by High Performance Liquid Chromatography (HPLC)

EN 6041 Aerospace Series: Analysis of Non-Metallic Materials (Uncured) by Differential Scanning Calorimetry (DSC)

EN 6042 Aerospace Series: Analysis of Organic Compounds by Infrared Spectroscopy

EN 6043 Aerospace Series: Fiber Reinforced Plastics, Determination of Gel Time and Viscosity

2.4 ISO Publications

Available from International Organization for Standardization, 1, rue de Varembe, Case postale 56, CH-1211 Geneva 20, Switzerland, Tel: +41-22-749-01-11, www.iso.org.

ISO 11357-2 Plastics - Differential Scanning Calorimetry (DSC) - Part 2: Determination of Glass Transition Temperature - First Edition

ISO 11357-5 Plastics - Differential Scanning Calorimetry (DSC) - Part 5: Determination of Characteristic Reaction-Curve Temperatures and Times, Enthalpy of Reaction and Degree of Conversion

2.5 SACMA Publications

Available from American Composites Manufacturers Association, 1010 North Glebe Road, Suite 450, Arlington, VA 22201 or www.acmanet.org.

SACMA SRM 20R-94 High Performance Liquid Chromatography of Thermoset Resins, Issued 1994

2.6 PRI Publications

Available from Performance Review Institute, 161 Thorn Hill Road, Warrendale PA 15086-7527, Tel: 724-772-1616, www.pri-network.org.

PRI QPL AMS3970 Qualified Product List of AMS3970

3. DEFINITIONS

Refer to AMS3970/1.

4. REQUIREMENTS

The film adhesive to be delivered shall meet the general requirements in accordance with AMS3970/1 and the requirements of this PS and Appendix of PRI QPL AMS3970 the material to be purchased.

4.1 Defects

Defects are defined in AMS3970/1.

Each defect shall be identified and flagged with colored mark positioned on the roll.

A continuous defect shall be identified with a colored mark at the start and with a different colored mark at the end of the defect.

Each roll shall have a defect record attached, recording the type, location and length of each defect (if any) in that roll.

4.2 Defect Credit

Defective areas as defined in AMS3970/1 shall not be considered as part of the total length of the roll or its weight. The purchaser shall not be charged for any defective area. In addition, credit shall be given to the purchaser by the film adhesive manufacturer for any manufacturing defect of the delivered material discovered during use that had not been previously identified and credited.

5. RELEASE TESTING

5.1 General

Products shall be manufactured in accordance with the manufacturing schedule of qualification and revisions agreed to by the PRI.

5.2 Release Testing

Release testing shall consist of tests given in Table 1 and Table 2. The test results shall demonstrate compliance with the technical requirements of this PS and the relevant MS and Appendix of PRI QPL AMS3970.

Release testing shall be the responsibility of the manufacturer. The test samples extracted should be representative of the entire film adhesive batch delivered in accordance with this specification. Refer to 5.8 for the number of samples required based on the size of the batch.

The purchaser reserves the right to perform any of the inspections and/or tests required by this specification and may reject any material which fails to meet the requirements. When required, the manufacturer shall inform the purchaser or his chosen agent of the planned dates for the extraction of samples and release testing, in order that these operations may be witnessed.

TABLE 1 - BATCH RELEASE FOR UNCURED ADHESIVE - PHYSICAL AND PHYSIOCHEMICAL PROPERTIES

id	Property	Number of Samples Per Unit[1]	Test Method
1.1	Mass per Unit Area	3	EN 2557 or ASTM D 3776
1.2	Volatile Content	3	EN 2558 or ASTM D 3530/ ASTM D 3530M
1.3	Resin Flow	3	EN 2560 or ASTM D 3531/ ASTM D 3531M
1.4	DSC - uncured	3	EN 6041 or ISO 11357-2 and -5
1.5	HPLC	3	EN 6040 or SACMA 20R-94
1.6	Infrared	3	ASTM E 1252 or EN 6042
1.7	Viscosity	3	ASTM D 4440 or EN 6043 Test conditions to be agreed at the onset of the screening and qualification program between the manufacturer and the CACRC-QPG

[1] Number of units to be tested is dependent on the number of rolls in the batch and is defined in 5.8.
NOTE: Test results shall meet the requirements specified in the relevant Appendix of PRI QPL AMS3970.

5.3 Release Test Certificate

The manufacturer shall provide the purchaser with a test report certifying that the film adhesive batch meets the general requirements in accordance with AMS3970/1 and the requirements of this PS and Appendix of PRI QPL AMS3970 of the material to be purchased.

The film adhesive release test report shall contain at least the following:

Specification
Manufacturer's batch number and production date
Manufacturer's identification
Material and delivery condition
Quantity in batch
Test results

5.4 Retest

If batch release test data fails to meet the requirements of this PS and/or Appendix of PRI QPL AMS3970, a review of all test results, test procedures, specimen manufacturing and test specimen(s) shall be performed. If a cause for discrepancy is found, retests shall be performed on the same roll and either the preceeding or the next roll. The material may be retested one time. The results of the original test, together with those of the retest and the reasons for the first failure shall be included in the test report.

When failure cannot be attributed to faulty testing, or test piece preparation, additional test samples shall be selected at twice the original frequency from products on which the incorrect results were obtained unless already withdrawn by the manufacturer after suitable identification of the cause of failure. If all retest results are satisfactory, the batch shall be accepted. If one or more retest results are unsatisfactory, the batch shall be:

a. rejected, or

b. 100% retested and the conforming products accepted

5.5 Rejection

Any failure of the film adhesive to meet the batch release requirements of this specification shall be cause for rejection of the material. Any defect not detected during acceptance inspection, but which becomes apparent during the subsequent use of the material, shall be cause for rejection of the unused portion of the batch, provided such a defect is cause for rejection under the requirements of the specification.

5.6 Warranty

Each production batch or shipment, whichever is smaller, of the qualified material submitted to this PS shall be warranted through a release test certificate by the manufacturer and/or supplier to meet the requirements of this PS and the relevant MS and Appendix of PRI QPL AMS3970.

The manufacturer and/or supplier shall also warrant that the raw materials and processes used in manufacture of the subsequent production batches or shipment are the same in type, form and quality as those used for the qualification.

5.7 Audit

PRI retains the right to audit the manufacturing process of a qualified product at certain intervals. Audits will be performed in accordance with the Appendix of PRI QPL AMS3970. The manufacturer shall make available all necessary documents, records and supporting information with regard to the material manufacture for inspection by representatives of PRI. A non-disclosure agreement can be established between the PRI and the manufacturer if required.

5.8 Sampling

5.8.1 Sampling for Physical Tests

For inspection and test purposes each batch of film adhesive shall be divided into units of one roll (as delivered).

5.8.2 Sampling for Physico/Chemical Tests

Physico/chemical tests shall be performed on the first and last unit of each batch of film adhesive.

6. PREPARATION FOR DELIVERY

6.1 Packing

6.1.1 General

Film adhesive shall be packaged in clean, dry, shipping containers so constructed as to ensure acceptance by common or other carrier for safe transportation to the place of delivery specified by purchase order or contract and to retain the requirements of the TS and this PS.

6.1.2 Film Adhesive Rolls

Each roll shall be individually packaged in a sealed moisture-proof bag of non-contaminating material (polyethylene or equivalent) with minimum thickness of 0.15 mm. The packaging shall be such that the material shall not deform under its own mass and shall meet the requirements of this specification after delivery. Each individual roll shall be accompanied with its defect log. Each package or container shall contain a sachet of silica gel as a desiccant if required by the relevant Appendix of PRI QPL AMS3970.

6.1.3 Support Tube

The requirements for the support tube are:

The film adhesive shall be wound on a cardboard tube or equivalent sufficiently rigid so as not to be deformed by the weight of the film adhesive.

The outside diameter of the tube shall be at least 75 mm.

The length of the tube shall be 50 to 200 mm greater than the width of the film adhesive.

6.2 Marking

6.2.1 Film Adhesive

Each roll of film adhesive shall be legibly and durably marked by means of a securely attached tag in such a manner and location that it remains in place until all film adhesive has been used.

Each roll shall be marked with items a through h as a minimum:

a. Specification

b. Manufacturer's name, identification and manufacturing plant

c. Manufacturer's batch number

d. Date of manufacturer

e. Roll number in sequence of production

f. Roll characteristics (weight, length and width)

g. Storage conditions and time

h. Expiration date

6.2.2 Release Film Material

The release film material shall be marked every 250 mm in the length direction with the following information:

a. manufacturer’s designation

b. batch number

c. purchaser's designation derived from the Appendix of PRI QPL AMS3970 (if required)

6.2.3 Marking for Shipment

Each shipping container and package shall be legibly and durably marked in such a manner and location that it remains in place during shipping and receiving. Markings shall include as a minimum the following information:

a. Specification

b. Manufacturer's name, identification and manufacturing plant

c. Manufacturer's batch number

d. Date of manufacture

e. Roll number in sequence of production

f. Roll characteristics (weight, length and width)

g. Storage conditions and time

h. Expiration date

i. Top side of shipping containers

j. Shipping storage

k. Each container shall be clearly marked with “Do not stand on end”

6.3 Shipment

The responsibility for shipping shall be agreed to between the purchaser and material manufacturer.

Film adhesive materials shall be expedited with dispatch from the manufacturer to the delivery site specified on the purchase order or contract, with a minimum stopover and/or delay.