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400 COMMONWEALTH DRIVE WARRENDALE PA 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 3684A
Superseding AMS 3684

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RESIN, POLYIMIDE, SEALING
High-Temperature Resistant, 315°C (600°F)
Unfilled

1. SCOPE:

1.1 Form: This specification covers a single-component, unfilled, heat-reactive, thermosetting, aromatic system which thermally cures to form a polyimide polymer structure.

1.2 Application: Primarily as a resin sealer coating for parts requiring long-term exposure up to 315°C (600°F) and short-term exposure up to 370°C (700°F).

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 SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods
AMS 2825 - Material Safety Data Sheets

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

ASTM D882 - Tensile Properties of Thin Plastic Sheeting
ASTM D1824 - Apparent Viscosity of Plastisols and Organosols at Low Shear Rates by Brookfield Viscometer
ASTM D1963 - Specific Gravity of Drying Oils, Varnishes, Resins, and Related Materials at 25/25°C

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

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Printed in U.S.A.

2.3.1 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

3. TECHNICAL REQUIREMENTS:

3.1 Material: Shall be an uncured, film-forming, unfilled, single-component, heat-reactive, thermosetting, aromatic polymer, completely dissolved in a solvent system of N-methylpyrrolidone (NMP) and aromatic hydrocarbons, which cures to form a polyimide polymer structure.

3.2 Storage Life: The resin solution, stored in unopened, airtight containers at not higher than 7°C (45°F), shall meet the requirements specified herein when tested at any time up to 6 months from date of manufacture or 30 days from date of receipt by purchaser when stored at a temperature not higher than 38°C (100°F).

3.3 Properties: Resin shall conform to the following requirements:

3.3.1 Uncured Resin: Resin, as-received, shall have the following properties; tests shall be performed on the resin supplied and in accordance with specified test methods:

3.3.1.1 Viscosity: Shall be 35 - 70 poises (3.5 - 7 Pa·s), determined in accordance with ASTM D1824, using a Brookfield Viscometer, Model LVF, with a No. 3 spindle at 12 rpm, or equivalent.

3.3.1.2 Resin Solids: Shall be 15.5 - 17.5% by weight, determined in accordance with 4.5.1.

3.3.1.3 Specific Gravity: Shall be 1.15 - 1.18, determined in accordance with ASTM D1963 using a Hubbard type pycnometer.

3.3.2 Cured Resin: Resin, cast to form a film and cured in accordance with 4.5.2, shall have the following properties; tests shall be performed in accordance with specified test methods on specimens cut from the film:

3.3.2.1 Tensile Strength and Elongation: Shall be as follows, determined in accordance with ASTM D882, Method A, at 25°C ± 3 (77°F ± 5):

	Tensile Strength		Elongation, %
	psi	(MPa)	
Minimum Average	12,000	(82.5)	15.0
Individual Minimum	10,800	(74.5)	13.5

3.4 Quality: Resin, as received by purchaser, shall be uniform in quality and condition and free from foreign materials and from imperfections detrimental to usage of the resin.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the resin shall supply all samples for vendor's tests and shall be responsible for performing all Ø required tests. Results of such tests shall be reported to the purchaser as required by 4.6. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the resin conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for Ø viscosity (3.3.1.1), resin solids (3.3.1.2), and specific gravity (3.3.1.3) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Preproduction Tests: Tests to determine conformance to all technical requirements of this specification are classified as preproduction tests Ø and shall be performed prior to or on the initial shipment of resin to a purchaser, when a change in material or processing, or both, 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 Ø requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be as follows:
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4.3.1 For Acceptance Tests: Each lot shall be sampled at random to provide Ø sufficient resin to perform all required tests. The number of specimens for each test shall be as specified in the applicable test procedure or, if not specified therein, not less than three.

4.3.1.1 A lot shall be all resin produced in a single production run from the same batches of raw materials under the same fixed conditions and Ø submitted for vendor's inspection at one time. An inspection lot shall not exceed 1000 gal (3800 L) of resin and may be packaged in small quantities and delivered under the basic lot approval provided the lot identification is maintained.

4.3.1.2 A batch shall be the quantity of material run in a reactor or mixer at one time.

4.3.1.3 When a statistical sampling plan and acceptance quality level (AQL) have Ø 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 4.6.1 shall state that such plan was used.

4.4 Approval:

4.4.1 Sample resin shall be approved by purchaser before resin for production use is supplied, unless such approval be waived by purchaser. Results of tests on production resin shall be essentially equivalent to those on the approved sample.

4.4.2 Vendor shall use ingredients, manufacturing procedures, and methods of inspection on production resin which are essentially the same as those used on the approved sample resin. If necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, vendor shall submit for reapproval a statement of the proposed changes in material or processing, or both, and, when requested, sample resin. Production resin made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Test Methods:

4.5.1 Resin Solids: Shall be determined by heating a 2-g sample of as-received resin in an aluminum weighing dish in a forced draft oven at 315°C ± 5 (600°F ± 9) for 60 min. ± 5 and calculating the weight of solids remaining as a percentage of the initial sample weight.

4.5.2 Test Film Preparation: Resin shall be cast to form a film having a thickness, after curing, of approximately 0.001 in. (0.03 mm); the film shall be cured as follows:

Time	Temperature	
min ± 0.1	°C ± 5	(°F ± 9)
5	120	(250)
20	150	(300)
3	400	(750)

4.6 Reports:

4.6.1 The vendor of the resin shall furnish with each shipment three copies of a report showing the results of tests to determine conformance to the acceptance test requirements and stating that the product conforms to the other technical requirements of this specification. This report shall include the purchase order number, AMS 3684A, vendor's material designation, lot number, date of manufacture, and quantity.

4.6.1.1 A material safety data sheet conforming to AMS 2825 or equivalent shall be supplied to each purchaser prior to, or concurrent with, the report
Ø of preproduction test results or, if preproduction testing be waived by purchaser, concurrent with the first shipment of resin for production use. Each request for modification of resin formulation shall be accompanied by a revised data sheet for the proposed formulation.