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400 COMMONWEALTH DRIVE. WARRENDALE. PA 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 3731

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Revised

POTTING COMPOUND, EPOXY
Bisphenol A-Type

1. SCOPE:

1.1 Form: This specification and its supplementary detail specifications cover epoxy resin formulations based on diglycidyl ether of bisphenol A with an epoxide equivalent of 175 - 195. When properly mixed and cured, these resins produce a rigid or flexible product.

1.2 Application: Primarily for cast shapes; for encapsulation of electronic parts, transformers, coils, and conductors; and for sealing.

1.3 Classification: The resin system shall be classified by application and processing criteria as shown in each detail specification.

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 Specification:

AMS 2350 - Standards and Test Methods
AMS 2825 - Material Safety Data Sheets
AMS 3751 - Microspheres, Hollow Glass

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

ASTM D149 - Dielectric Breakdown Voltage and Dielectric Strength of Electrical Insulating Materials at Commercial Power Frequencies
ASTM D150 - A-C Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulating Materials
ASTM D256 - Impact Resistance of Plastics and Electrical Insulating Materials
ASTM D257 - D-C Resistance or Conductance of Insulating Materials
ASTM D570 - Water Absorption of Plastics
ASTM D635 - Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
ASTM D648 - Deflection Temperature of Plastics Under Flexural Load
ASTM D695 - Compressive Properties of Rigid Plastics
ASTM D696 - Coefficient of Linear Thermal Expansion of Plastics
ASTM D790 - Flexural Properties of Plastics and Electrical Insulating Materials
ASTM D792 - Specific Gravity and Density of Plastics by Displacement
ASTM D1002 - Strength Properties of Adhesives in Shear by Tension Loading (Metal-to-Metal)
ASTM D1674 - Testing Polymerizable Embedding Compounds Used for Electrical Insulation
ASTM D1824 - Apparent Viscosity of Plastisols and Organosols at Low Shear Rates by Brookfield Viscometer
ASTM D2240 - Rubber Property - Durometer Hardness

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

2.3.1 Military Standards:

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

3. TECHNICAL REQUIREMENTS:

3.1 Detail Specifications: The requirements for a specific compound shall consist of all the requirements specified herein in addition to the requirements specified in the applicable detail specification. In the case of conflict between the requirements of this basic specification and an applicable detail specification, the requirements of the detail specification shall govern.

3.2 Material: Shall be on an epoxy-based polymer with a curing agent. Each may contain fillers or other ingredients necessary to yield compounds meeting the requirements of 3.3.

3.2.1 Storage Life: The resin base and hardener shall meet the requirements of 3.3 at any time up to one year from date of receipt by purchaser when stored below 38°C (100°F) in the original unopened containers.

3.3 Cured Properties: The components, mixed and cured in accordance with the manufacturer's instructions, cast into appropriate shapes as required for testing, and cured as recommended by the manufacturer, shall produce products which conform to the following requirements and those of the detail specification; tests shall be performed at 20° - 30°C (70° - 85°F), unless otherwise specified, and in accordance with test methods specified in 4.5.

3.3.1 Dielectric Strength, step by step, min	300 V per mil (11,800 V/mm)
3.3.2 Hydrolytic Stability	
3.3.2.1 Hardness After Conditioning	Not more than 10% reduction in number of points from original value

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

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the compound shall supply all samples for vendor's tests and shall be responsible for performing all 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 compound conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for flexural strength and hardness where applicable, mixed viscosity, heat deflection temperature, and quality (3.4) 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 and shall be performed on the initial shipment of a compound to a purchaser, when a change in material and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.2.1 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, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be as follows:

4.3.1 For Acceptance Tests: Each lot shall be sampled at random to provide sufficient compound 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 compound produced in a continuous production run from the same batches of raw materials under the same fixed conditions and submitted for vendor's inspection at one time. A lot shall not exceed 6000 lb (2700 kg) of compound and may be packaged in smaller quantities as noted in 5.1.1 under a basic lot approval as long as the lot identification is maintained.

4.3.1.2 When a statistical sampling plan and acceptance quality level (AQL) for the compound have 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.

4.3.2 For Preproduction Tests: As agreed upon by purchaser and vendor. The sample size is normally not less than one gallon (4 L).

4.4 Approval:

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

4.4.2 Vendor shall use ingredients, manufacturing procedures and processes, and methods of inspection on production compound which are essentially the same as those used on the approved sample compound. If necessay 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 and processing, and, when requested, sample compound. Production compound made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Test Methods: Shall be in accordance with the following:

Requirement	Test Method
Flexural Strength	ASTM D790
Izod Impact Strength	ASTM D256
Compressive Strength	ASTM D695
Insulation Resistance	ASTM D257
Dielectric Strength	ASTM D149
Dielectric Constant	ASTM D149
Dissipation Factor	ASTM D150
Heat Deflection Temperature	ASTM D648
Coefficient of Linear Expansion	ASTM D696
Water Absorption	ASTM D570
Specific Gravity	ASTM D792
Thermal Shock Resistance	ASTM D1674
Hardness	ASTM D2240
Flammability	ASTM D635
Hydrolytic Stability	4.5.1
Bond Strength to Aluminum	4.5.2
Peak Exotherm Temperature	4.5.3
Viscosity	4.5.4

4.5.1 Hydrolytic Stability: Hardness shall be determined in accordance with ASTM D2240 and insulation resistance in accordance with ASTM D257 on specimens as cured and after aging at 71°C ± 2 (160°F ± 4) and 95% ± 5 relative humidity. The aged specimens shall be cooled to, and held at, 23°C ± 2 (73°F ± 4) and 50% ± 5 relative humidity for 2 hr ± 0.25 prior to being tested. The specimens shall be tested for instantaneous hardness, using a Type D Durometer on rigid or semirigid products and a Type A Durometer on flexible products, and for insulation resistance after 0, 28, 56, 84, and 120 days. The specimens for insulation resistance shall be approximately 4 in. (100 mm) in diameter and 1/8 in. (3 mm) thick. The specimens for hardness testing shall be approximately 2 in. (50 mm) in diameter by 1/4 in. (6 mm) thick.

4.5.2 Bond Strength to Aluminum: Shall be determined in accordance with ASTM D1002. No primer shall be used for this test. Tests shall be run on grit blasted aluminum specimens with a nominal 1/2 in. (12 mm) overlap. Grit size shall be 100 - 200 mesh (150 - 75 µm).

4.5.3 Peak Exotherm Temperature: A 100 mL paper cup shall be filled with the mixed resin and hardener. A thermocouple shall be inserted at the geometric center of the mass and connected to a recorder. The highest temperature recorded shall be the peak exotherm temperature.

4.5.4 Viscosity: Shall be determined in accordance with ASTM D1824 with the following exceptions: the sample quantity shall be taken from a container of compound in a homogeneous state. The samples shall be brought to the test temperature and shall be stirred to fully disperse filler and to combine all ingredients immediately before being tested. The spindle shall be at the test temperature when the test is started. The viscosity reading shall be taken during the 10th revolution of the spindle.

4.6 Reports:

4.6.1 The vendor of the compound 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 compound conforms to the other technical requirements of this specification. This report shall include the purchase order number, AMS 3731 and the applicable detail specification number, 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 of preproduction test results or, if preproduction testing be waived by purchaser, concurrent with the first shipment of compound for production use. Each request for modification of proposed formulation shall be accompanied by a revised data sheet for the proposed formulation.

4.6.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, AMS 3731 and the applicable detail specification number, contractor or other direct supplier of compound, supplier's material designation, part number, and quantity. When compound for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of compound to determine conformance to the requirements of this specification, and shall include in the report a statement that the compound conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.

4.7 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the compound 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 compound represented and no additional testing shall be permitted. Results of all tests shall be reported

5. PREPARATION FOR DELIVERY:

5.1 Packaging and Identification:

5.1.1 The base compound and the correct amount of curing agent shall be packaged in individual containers.