



AEROSPACE MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AMS3870B

Superseding AMS 3870A

Issued 1-15-61
Revised 1-15-77

CERAMIC MOLDINGS AND EXTRUSIONS Dense, Ultra-High Alumina (99% Al_2O_3)

1. SCOPE:

- 1.1 Form: This specification covers dense, ultra-high alumina in the form of moldings and extrusions.
- 1.2 Application: Primarily for high-temperature, low-electrical-loss radomes, microwave windows, and spacers.

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 the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

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

ASTM C373 - Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products

ASTM D116 - Testing Vitrified Ceramic Materials for Electrical Applications

ASTM D150 - A-C Loss Characteristics and Dielectric Constant (Permittivity) of Solid Electrical Insulating Materials

ASTM D256 - Impact Resistance of Plastics and Electrical Insulating Materials

- 2.3 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 Material: Shall be a vitrified ceramic containing not less than 99% alumina (Al_2O_3).

- 3.1.1 Color: Shall be predominantly white.

- 3.1.2 Metallizing: When specified, the product shall be receptive to being metallized in accordance with procedures and requirements agreed upon by purchaser and vendor.

SAE Technical Board rules provide that: "All technical reports, including standards, approved and practices recommended, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no agreement to adhere to any SAE standard, recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."

3.2 Properties: The product shall conform to the following requirements; tests shall be performed at 70° - 85° F (21° - 30° C) unless otherwise specified, on the product supplied and in accordance with specified ASTM methods:

3.2.1 Compressive Strength, min	250,000 psi (1724 MPa)	ASTM D116
3.2.2 Flexural Strength, min	40,000 psi (276 MPa)	ASTM D116
3.2.3 Impact Strength (1/2 in. (12.7 mm) diameter rod), min	7.0 in.-lb (0.791 N·m)	ASTM D256
3.2.4 Specific Gravity, min	3.8	ASTM C373
3.2.5 Water Absorption, max	0.015%	ASTM D116
3.2.6 Dielectric Strength, 1/4 in. (6.4 mm) diameter electrodes, average, min	260 V per mil (10.24 kV/mm)	ASTM D116
3.2.7 Dielectric Constant at 1 MHz, max	9.5	ASTM D150
3.2.8 Loss Factor, max		ASTM D150
At 1 MHz	0.005	
At 10 GHz	0.002	
At 10 GHz at 932° F $\pm$ 10 (500° C $\pm$ 5)	0.003	

3.3 Quality: The product shall be uniform in quality and condition and free from foreign materials and from internal and external imperfections detrimental to performance of parts.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product 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 ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to flexural strength (3.2.2), specific gravity (3.2.4), water absorption (3.2.5), and dielectric strength (3.2.6) requirements are classified as acceptance tests.

4.2.2 Qualification Tests: Tests to determine conformance to all technical requirements of this specification are classified as qualification tests.

4.2.2.1 For direct U.S. Military procurement, substantiating test data and, when requested, qualification test material shall be submitted to the cognizant qualification agency as directed by the procuring activity, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be as follows; a lot shall be all product from a single production run made from the same batch of raw materials under the same fixed conditions and submitted for vendor's inspection at one time:

4.3.1 Acceptance Tests: One specimen from each lot for the following requirements:

Requirement	Paragraph Reference
Flexural Strength	3.2.2
Specific Gravity	3.2.4
Water Absorption	3.2.5
Dielectric Strength	3.2.6

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

4.4 Approval:

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

4.4.2 Vendor shall use ingredients, manufacturing procedures, processes, and methods of inspection on production material which are essentially the same as those used on the approved sample material.

Ø If any change is necessary 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 material. Production material made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Reports:

4.5.1 The vendor of the product shall furnish with each shipment three copies of a report showing the results of tests made on the product 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, material specification number and its revision letter, vendor's material designation, form and size or part number, and quantity.

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

4.6 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the product 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 product 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 Packaging shall be accomplished in such a manner as to ensure that the product, during shipment and storage, will not be permanently distorted and will be protected against damage from exposure to weather or any normal hazard.