Society of Automotive Engineers, Inc.
TWO PENNSYLVANIA PLAZA, NEW YORK, N.Y. 10001

AEROSPACE MATERIAL SPECIFICATION

AMS 3751

Issued March 1, 1974
Revised

MICROSPHERES, HOLLOW GLASS

1. SCOPE:

1.1 Form: This specification covers hollow glass microspheres.

1.2 Application: Primarily as a filler material in syntactic foam shapes or parts for dielectric applications.

1.3 Classification: The hollow glass microspheres are classified according to nominal bulk density and designated as 100 times the weight in grams of a cubic centimetre of the microspheres.

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 Society of Automotive Engineers, Inc., Two Pennsylvania Plaza, New York, New York 10001.

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, Pennsylvania 19103.

ASTM D1214 - Sieve Analysis of Glass Spheres
ASTM D2840 - Average True Particle Density of Hollow Microspheres
ASTM D2841 - Sampling Hollow Microspheres
ASTM D3100 - Alkalinity of Hollow Glass Microspheres
ASTM D3101 - Bulk Density and Packing Factor of Hollow Glass Microspheres

3. TECHNICAL REQUIREMENTS:

3.1 Material: The hollow microspheres shall be manufactured from high purity glass, forming hollow spheres 1.00 mm (0.0394 in.) in diameter or smaller.

3.2 Properties: The product shall conform to the requirements of Table I; tests shall be performed on the product supplied and in accordance with test methods specified herein.

3.3 Quality: The product shall be uniform in quality and condition, clean, smooth, and free from foreign materials and from imperfections detrimental to fabrication, appearance, or 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 4.6. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to assure 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 bulk density, size distribution, sinkers, and quality requirements are classified as acceptance or routine control tests.

4.2.2 Qualification Tests: Tests to determine conformance to all technical requirements of this specification are classified as qualification or periodic control tests and may be the basis for approval of the product (See 4.4.1).

4.3 Sampling:

4.3.1 Sampling Schedule: Acceptance tests shall be performed on each lot of material. Test samples shall be taken in accordance with ASTM D2841 at random throughout the lot and in sufficient quantity to permit three determination on each lot for each requirement.

4.3.2 Lot: A lot shall be all material in a single production run made from the same batch of raw materials under the same fixed conditions and submitted for inspection at one time.

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. If any change is necessary in ingredients, in type of equipment for processing, or in manufacturing procedures which could affect quality or properties of the material, vendor shall submit samples for reapproval unless purchaser grants written approval after review of a detailed statement of materials and processing used on the approved sample and those proposed. No production material made by the revised procedure shall be shipped prior to receipt of approval of such procedure.

4.5 Test Methods: Shall be as follows; sinker determination shall be as in 4.5.1:

Bulk Density	ASTM D3101
Particle Density	ASTM D2840
Size Distribution, Sieve Analysis	ASTM D1214
Surface Alkalinity	ASTM D3100

4.5.1 Sinker Determination:

4.5.1.1 Pour a sample of the material, taken in accordance with ASTM D2841, into a 100 cm^3 graduate. Tap the graduate and add material until the level remains constant at the 50 cm^3 mark.

4.5.1.2 Add water to the 100 cm^3 mark.

4.5.1.3 Shake the graduate without losing material until all glass microspheres have been completely wetted. Add additional water to 100 cm^3 mark if necessary and reshake the graduate.

4.5.1.4 Allow the graduate to stand undisturbed for 10 min. $\pm$ 1.

4.5.1.5 Read the volume of the spheres that have settled to the bottom of the graduate; these are the "sinkers".

4.5.1.6 Calculate the volume of the sinkers as a percentage of the original volume of spheres, as follows:

$$\text{Sinker Volume, \%} = \frac{\text{sinker volume, } cm^3}{50} \times 100$$

4.5.1.7 Report the average of three determinations.

4.6 Reports: 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 a statement that the product conforms to all other technical requirements of this specification. This report shall include the purchase order number, material specification number, vendor's material designation, lot number, date of manufacture, and quantity.

4.7 Resampling and Retesting: If any sample 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 samples for each original nonconforming sample. Failure of any retest sample 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 The product shall be packed in sealed, moisture-resistant plastic bags.

5.1.2 Each package shall be identified using characters of such size as to be clearly legible and which will not be obliterated by normal handling. The markings shall show the following information:

HOLLOW GLASS MICROSPHERES, _____ g/cm^3 NOMINAL BULK DENSITY
AMS 3751
MANUFACTURER'S MATERIAL DESIGNATION _____
PURCHASE ORDER NUMBER _____
DATE OF MANUFACTURE _____
LOT NUMBER _____
QUANTITY _____

5.1.3 Individual bags shall be packed in an exterior container capable of protecting the product adequately, during shipment and storage, from damage and exposure to weather or any normal hazard.

5.1.4 Each exterior shipping container shall be legibly marked with the following information in such a manner that the markings will not smear or be obliterated during normal handling or use.

HOLLOW GLASS MICROSPHERES, _____ g/cm^3 NOMINAL BULK DENSITY
AMS 3751
MANUFACTURER'S MATERIAL DESIGNATION _____
PURCHASE ORDER NUMBER _____
DATE OF MANUFACTURE _____
LOT NUMBER _____
QUANTITY _____

5.1.5 Containers shall be prepared for shipment in accordance with commercial practice to assure carrier acceptance and safe transportation to the point of delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.

7. REJECTIONS: Material not conforming to this specification or to authorized modifications will be subject to rejection.

8. NOTES: None.