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Standard Practice for DETERMINATION OF ISOSTATIC COLLAPSE STRENGTH OF HOLLOW GLASS MICROSPHERES¹

This Standard is issued under the fixed designation D 3102; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal.

1. Scope

1.1 This practice covers the determination of the percent void volume collapse of hollow glass microspheres of the type used in syntactic foam buoyancy materials.

2. Applicable Documents

2.1 ASTM Standards:

D 2841 Sampling Hollow Microspheres²

3. Summary of Practice

3.1 This practice consists of placing about 3 to 6 cm³ of the material under test in a small rubber balloon along with a slight excess of glycerin or isopropyl alcohol, then sealing and placing it into the hydraulic oil of a pressure chamber to which isostatic pressure can be applied. As pressure is applied the pressure and volume, converted to electrical output, are recorded on an x-y recorder as a curve of pressure *versus* volume.

4. Significance and Use

4.1 This practice for isostatic collapse strength of hollow microspheres is important because this property is directly related to the isostatic collapse and uniaxial compressive strengths of foam in which it is a component.

4.2 Along with density, the strength of hollow glass microspheres is a most important property for the syntactic foams in which they are used.

5. Definitions

5.1 *syntactic foam*—a material consisting of hollow sphere filler in a resin matrix.

5.2 *microspheres*—spheres 1 mm or smaller in diameter.

6. Interferences

6.1 Air should be excluded from the rubber balloon in which the microsphere sample and glycerin or isopropyl alcohol are sealed.

6.2 Leaks in the pressure system will cause false readings of volume collapse and therefore the system should be checked before each series of pressure tests. To check for leaks at a given pressure, follow the operating procedure without a sample. When the pressure in question is reached, stop the piston advance and determine if the pressure decreases. If the pressure holds constant at a number of pressures and the pressure-volume curve is identical to previous checks, it may be concluded that there are no leaks and the system has not been altered.

6.3 This method does not include a volume correction for gases released due to microsphere collapse.

7. Apparatus

7.1 *Isostatic Pressure Testing Apparatus* (Fig. 1) consisting of the following:

7.1.1 *Pressure Chamber* with a capacity of 140 MPa (20 000 psi).

7.1.2 *Pressure Sensor*³ with a capacity of 140 MPa (20 000 psi).

¹ This practice is under the jurisdiction of Committee D-20 on Plastics, and is the direct responsibility of Subcommittee D20.22 on Cellular Plastics.

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² *Annual Book of ASTM Standards*, Part 36.

³ Pressure Sensor, Type STD, Catalog No. 203637 as manufactured by the BLH Electronics Inc., Waltham, Mass., has been found satisfactory for this purpose.