Designation: C 693 – 93 (Reapproved 2003)

Standard Test Method for Density of Glass by Buoyancy[1]

This standard is issued under the fixed designation C 693; 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 reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the determination of the density of glasses at or near 25°C, by buoyancy.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appppropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

E 12 Terminology Relating to Density and Specific Gravity of Solids, Liquids, and Gases[2]

3. Terminology

3.1 *Definition:*

3.1.1 *density of solids*—the mass of a unit volume of a material at a specified temperature. The units shall be stated as grams per cubic centimetre (see Terminology E 12).

4. Significance and Use

4.1 Density as a fundamental property of glass has basic significance. It is useful in the physical description of the glass and as essential data for research, development, engineering, and production.

5. Apparatus

5.1 *Analytical Balance*, with sensitivity and accuracy of 0.1 mg.

5.2 *Beaker*, of convenient capacity (250 to 750 cm^3) to fit inside the balance chamber and allow immersion of the basket or wire loop specimen holder in distilled water.

5.3 *Thermometers*, calibrated (20 to 30°C), sensitive to 0.1°C for determining air and water temperatures.

5.4 *Nickel-Chromium-Iron or Platinum-Alloy Wire*, less than 0.2-mm diameter for suspending the specimen either in a basket or a loop made of the same wire. The suspension wire shall be cleaned by degreasing or heating in a vacuum.[3] An acceptable alternative method of cleaning the platinum-alloy wire is to heat in an oxidizing gas flame until there is no longer any color emitted from the gases passing around the wire.

5.5 *Weights*, with accuracy of 0.1 mg.

5.6 *Barometer*, with sensitivity of 1-mm Hg (optional, see Note 3).

6. Reagent

6.1 *Distilled Water*, fresh, boiled, and used within 24 h, allowed to stabilize at balance air temperature for at least 2 h in the beaker.

7. Test Specimen

7.1 Specimens weighing about 20 g, with a minimum of seeds or other inclusions (Note 1), shall be taken or cut from the sample object, preferably in cylindrical or rectangular bar form with smooth, slightly rounded surfaces having no cracks or sharp edges.

NOTE 1—For a specimen of 20 g with a density of approximately 2.5 g/cm^3, a gaseous void of diameter 2 mm will cause an error in measured density of 0.05 %.

7.2 The specimens shall be cleaned, handling them with tweezers throughout subsequent operations, by immersion preferably in an ultrasonic bath of hot nitric acid, chromic-sulfuric acid, or organic degreasing solvent, followed by a rinsing in alcohol and distilled water. For samples only soiled by ordinary handling or exposure, adequate cleaning may be

[1] This test method is under the jurisdiction of ASTM Committee C14 on Glass and Glass Products and is the direct responsibility of Subcommittee C14.04 on Physical and Mechanical Properties.

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[2] Discontinued—Replaced by E 1547, *Annual Book of ASTM Standards*, Vol 15.05.

[3] Bowman, H. A., and Schoonover, R. M., "Procedure for High Precision Density Determinations by Hydrostatic Weighing." *Journal of Research*, National Bureau of Standards, Vol 71C, No. 3, July–August 1967, pp. 179–198.