National Institute of Standards and Technology

Certificate of Analysis

Standard Reference Material® 1827b

Lead Silica Glass Mass Density Standard

This Standard Reference Material (SRM) is intended for use as a mass density reference in the determination of the density of solids and liquids. This SRM consists of a square or arc-shaped block of lead silica glass nominally 25 mm x 25 mm x 12 mm. The certified mass density was determined by means of hydrostatic weighing [1,2].

Certified Mass Density Value at 20 °C

3593.800 kg/m^3 ± 0.033 kg/m^3

The certified value is directly traceable to the base unit of mass and derived unit of volume as defined by the International System of Units (SI) [3]. This certified value applies to the specimen as a whole, the microhomogeneity of the specimen has not been evaluated. The expanded uncertainty, which was computed according to the ISO Guide [4], includes the uncertainty due to the weighing procedure, and the densities of air and water. The expanded uncertainty defines a range of values for the certified value within which the true density is believed to lie at a level of confidence of approximately 95 %.

Expiration of Certification: Assuming proper use and storage, the certification for this SRM is valid indefinitely. However, if cracks become visible in the glass, the density measurement may be compromised thus invalidating the SRM.

The SRM specimen surfaces bear fine machining marks and occasional small chips. Through evaluation it was determined that these do not influence the density measurement. The user may polish the specimen for cosmetic purposes if desired. Such polishing will not affect the certified value.

$$\rho(\mathrm{t'}) = \frac{\rho_{\mathrm{cv}}}{1 + 3\alpha(\mathrm{t'} - 20)}$$

Density at 20 °C is related to the certified mass density as follows:

where $\rho(t')$ is the density at temperature t'
ρ_{cv} is the certified value for density at 20 °C
α is the coefficient of linear expansion (α= 8.9 x 10^{-6} per °C)

The samples for this SRM were donated by Corning Inc. through ASTM Committee C 14, and have the same composition as SRM 711, Lead-Silica Glass and SRM 1414, Lead-Silica (Resistivity).

The technical direction and physical measurements leading to certification were provided by R.M. Schoonover and W.E. Crupe of the NIST Automated Production Technology Division.

Statistical consultation and analysis were provided by S.B. Schiller of the NIST Statistical Engineering Division.

The technical and support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by R.J. Gettings.

Gaithersburg, MD 20899
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SUPPLEMENTAL INFORMATION

The nominal composition of the glass, its index of refraction, and dispersion for the sodium D line are provided for information only, and are not certified. The values listed below are reported as mass fractions [3].

Lead Nominal Composition

Constituent	Mass Fraction (in %)
SiO_2	46.0
PbO	45.3
K_2O	5.6
Na_2O	2.5
R_2O_3	0.6

Index of Refraction N_D = 1.61822
Dispersion V_D = 36.6

REFERENCES

[1] Schoonover, R.M., Hwang, M.S., and Nater, R., "The Determination of Density of Mass Standards; Requirements and Method," NISTIR 5378, (1994).
[2] Bowman, H.A. and Schoonover, R.M., "Procedure for High Precision Density Determinations by Hydrostatic Weighing," NBS Journal of Research, Vol. **71C**, (1967).
[3] Taylor, B.N., "Guide for the Use of the International System of Units (SI)," NIST Special Publication 811, 1995 Ed., (April 1995).
[4] *Guide to the Expression of Uncertainty in Measurement*, ISBN 92-67-10188-9, 1st Ed. ISO, Geneva, Switzerland, (1993).