

National Bureau of Standards Certificate

Standard Reference Material 1820

Refractive Index Glass

This standard was prepared from a selected portion of a commercial borosilicate glass^[1] that is homogeneous, stable, and has a high optical quality. It is designed for both the calibration of refractometers and the determination of refractive indexes of microscope immersion liquids. The standard consists of two rectangular slabs: a slab which is polished on two faces, intended for checking the performance of refractometers; and an unpolished slab, which can be broken into fragments, intended for microscopic determination of the refractive indexes of immersion liquids.

Wavelength in Micrometers, μm	Spectral Source	Refractive Index n
0.70652	Helium	1.48398
.66781	Helium	1.48499
.65628	Hydrogen, C	1.48532
.64385	Cadmium	1.48569
.58926 ^a	Sodium, D ₁ , D ₂	1.48755
.58756	Helium	1.48762
.54607	Mercury	1.48939
.50858	Cadmium	1.49136
.48613	Hydrogen, F	1.49275
.47999	Cadmium	1.49316
.46781	Cadmium	1.49404
.43583	Mercury	1.49669
.40466	Mercury	1.49994

^a Intensity-weighted mean of doublet, D₁, D₂

The research and technical measurements leading to the certification were performed in the Optical Physics Division of the National Bureau of Standards by I. H. Malitson, assisted by M. J. Dodge, J. Cooke and J. M. Guyton.

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The homogeneity of the glass was established by measuring the refractive index of contiguous rectangular slabs and prisms that were cut from bars of glass. The prisms were used to determine refractive index at 13 wavelengths. These indexes were measured by the classical minimum deviation method[2] on a calibrated precision spectrometer. Statistical evaluation of averaged data for six prisms yielded uncertainties in refractive index that are within 5×10^{-6} . Each rectangular slab was measured at 2 wavelengths ($0.58926 \mu\text{m}$ and $0.64385 \mu\text{m}$) on a calibrated refractometer and agreed within 1×10^{-5} with the corresponding spectrometer values. Because of the established homogeneity of this glass, it is believed that the index variance at the other wavelengths is within the stated uncertainty. All refractive index measurements were carried out in a temperature controlled laboratory--the temperature varied not more than $0.3 \text{ }^\circ\text{C}$. The values of refractive index are referred to $20 \text{ }^\circ\text{C}$ and a pressure of 101,325 pascals (760 mm Hg).

Information only: The temperature coefficient of refractive index, dn/dT , over a temperature range of $20\text{-}80 \text{ }^\circ\text{C} \approx + 4.0 \times 10^{-6}/^\circ\text{C}$ at sodium D_1 , D_2 . The density of the glass $\approx 2.292 \pm 0.001 \text{ gm/cm}^3$ at $24 \text{ }^\circ\text{C}$, 50% humidity, and a pressure of 99,442 pascals (746 mm Hg).

[1] Information on the glass manufacturer and composition are given in NBS Miscellaneous Publication 260-23, Viscosity of a Standard Borosilicate Glass, by A. Napolitano and E. G. Hawkins.

[2] F. A. Jenkins, H. E. White, Fundamentals of Optics (McGraw-Hill Book Co., Inc., 1957), Third Edition, pp. 20-23.