National Institute of Standards & Technology

Certificate

Standard Reference Material 1416

Aluminosilicate Glass for Liquidus Temperature

(In Cooperation with the American Society for Testing and Materials)

This Standard Reference Material (SRM) is a mixed alkaline earth aluminosilicate glass that is certified for the liquidus temperature. It is for use in checking test methods and in calibrating equipment specified in ASTM 829 Standard Practices for Measurement of Liquidus Temperature by the Gradient Furnace Method. Each SRM unit consists of 22 lengths of approximately 12.7 cm (5 in) of glass tubing totalling approximately 250 g.

The certified value for the gradient liquidus temperature is:

$$1147 \pm 4\ °C$$

The certified value is the interlaboratory mean of results. The expanded uncertainty of the certified value was computed according to the NIST uncertainty policy, as described in NIST Technical Note 1297 [1, 2]. It is the root sum of squares of the within and between-laboratory standard uncertainties, 0.66 and 1.29 °C respectively, expanded by a t-multiplier based on five degrees of freedom. The certified value and expanded uncertainty give a 95% confidence interval for the mean.

Glass for this SRM was supplied by Corning, Inc., Corning, NY. NIST technical coordination for this SRM was performed by M.J. Cellarosi, Ceramics Division. The ASTM coordination of cooperative analyses leading to certification was performed by H.E. Hagy, Chairman, and A.C. Siefert, Research Associate, of ASTM C14.91 Subcommittee on Standard Reference Materials.

Statistical analysis of the certification data was performed by L.M. Oakley 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 J.S. Kane.

Instructions for Use: The glass tubing provided must be crushed with a clean mortar and pestle and sieved to obtain particles finer than 0.85 mm (#20 sieve) for measurement, as specified in ASTM C829. The method specifies preparation of 70 g of glass for a measurement sequence. The crushed glass is hygroscopic, and therefore should be stored in a desiccator if measurements are not made immediately.

An index-matching fluid with refractive index of 1.54 should be used to help in detecting the presence of crystals and thereby in determining the position of the crystalline boundary in a known temperature gradient zone. For optimum detection of the crystalline boundary, it is recommended that the initial temperature be set for 1 h at 20 °C above the temperature range of interest, after which the temperature should be lowered to the zone containing the liquidus temperature.

Gaithersburg, MD 20899
May 17, 1994

Thomas E. Gills, Chief
Standard Reference Materials Program

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Homogeneity and Certification Measurements: Homogeneity of the glass was established at NIST, based on measurement of the liquidus temperature on several lengths of glass tubing randomly selected from the total lot. Total variability of the measurements was less than the method repeatability criterion of ± 10 °C, indicating that the glass is homogeneous for this measurement.

Certification analyses were performed by the following cooperating laboratories:

NIST, Ceramics Division, M. Cellarosi.

Corning, Inc., Corning, NY, T.J. Cooper, M. Gheorghiu.

Monarch Inc., Toledo, OH, R.W. Beiswenger.

Owens Corning Fiberglas Corp., Granville, OH., R. Shafer.

PPG Industries Inc., Pittsburgh, PA, C.A. Richards.

Osram Sylvania, Inc., Danvers, MA, R. Marlor.

The following additional (uncertified) information on the glass is provided:

Index of refraction (N_D line) = 1.542.

Nominal composition:

SiO_2	60.43 Wt. %
Al_2O_3	14.52
CaO	11.50
SrO	0.24
BaO	13.11
As_2O_3	0.15
MgO	0.05

REFERENCES

[1] ISO, *Guide to the Expression of Uncertainty in Measurement*, prepared by International Organization for Standardization Technical Advisory Group 4 (TAG 4), Working Group 3 (WG 3), (1993).

[2] Taylor, B.N. and Kuyatt, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results", NIST Technical Note 1297, (1993).