

IN FOCUS

glass analyses

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Determination of the viscosity of glass in the low T range by the fibre elongation method



Method description

From a glass fibre the elongation velocity caused by a constant force at constant temperature is measured. The elongation velocity is measured at six different temperatures. The various T [$\log \eta$] values are determined from graphical interpolation. In the dynamic mode, according to the ASTM method, the elongation velocity is measured at continuously increasing temperature.

Measured Quantity

Viscosity η in dPa.s

Derived Quantity

Strain Point: T [$\log \eta = 14.5$]
Annealing point: T [$\log \eta = 13.0$]
Philips softening Point: T [$\log \eta = 12.4$]
Softening Point: T [$\log \eta = 7.6$]

Measuring Range

$T = 200-1000^\circ\text{C}$,
 $\eta = 10^8 - 10^{12}$ dPa.s

Precision

Strain Point: $\sigma = 2^\circ\text{C}$
Annealing Point: $\sigma = 2^\circ\text{C}$
Philips softening Point: $\sigma = 2^\circ\text{C}$
Softening Point: $\sigma = 2^\circ\text{C}$

Accuracy

Depends on the accuracy of the reference materials NBS standards. Measurements on NBS standards deviate less than 2°C from the stated values.

Possible Errors

In the range $\log \eta > 12$, viscosity increases with time. In the static method the determined values represent equilibrium conditions. Measurements in the dynamic mode generally result in somewhat lower values. Practical values also are non-equilibrium values and therefore generally will be somewhat lower.

Sampling

2 cm^3 material should be available. Special attention should be given to the fact that the sample is representative for the batch.

Calibration

Against reference materials, NBS standards.

Measuring time

0.5 day.

Cost aspect

2 man hours.