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Glass — Viscosity and viscometric fixed points —

Part 8 :
Determination of (dilatometric) transformation temperature

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 7884-8 was prepared by Technical Committee ISO/TC 48, *Laboratory glassware and related apparatus.*

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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0 Introduction

International Standard ISO 7884, *Glass — Viscosity and viscometric fixed points*, consists of the following separate parts :

Part 1 : Principles for determining viscosity and viscometric fixed points.

Part 2 : Determination of viscosity by rotation viscometers.

Part 3 : Determination of viscosity by fibre elongation viscometer.

Part 4 : Determination of viscosity by beam bending.

Part 5 : Determination of working point by sinking bar viscometer.

Part 6 : Determination of softening point.

Part 7 : Determination of annealing point and strain point by beam bending.

Part 8 : Determination of (dilatometric) transformation temperature.

1 Scope

This part of ISO 7884 specifies a method of determining the (dilatometric) transformation temperature t_g of a glass by means of the thermal expansion method. This temperature characterizes a certain glass transition range from the elastic brittle (low temperature) state to the viscous (high temperature) state of glass. The transformation temperature has been found useful for specifying cooling programmes and estimating the upper temperature limit of applicability of the respective glassware.

NOTE — The more direct viscometric method of annealing point and strain point determination (see ISO 7884-7) serves similar purposes. The determination of the transformation temperature t_g might be convenient if a suitable device for determining the coefficient of thermal expansion is available in the laboratory.

2 Field of application

This method is applicable to all glasses of normal bulk-production compositions. Generally, the transformation temperature t_g falls in the range from 350 to 800 °C, depending on the type of glass.

3 References

ISO 7991, *Glass — Determination of coefficient of mean linear thermal expansion.*

IEC Publication 584-1, *Thermocouples — Part 1 : Reference tables.*

4 Definition

For the purposes of this part of ISO 7884, the following definition applies.

transformation temperature t_g of glass : The temperature corresponding to the point of intersection of two tangents, drawn from the low-temperature branch and the high-temperature branch of the dilatometer curve (see clause 5 and figure 1).

NOTE — The transformation temperature t_g corresponds to a dynamic viscosity of the order of $10^{13,3}$ dPa·s*. No exact relation exists between t_g and the fixed points ϑ_{f3} and ϑ_{f4} according to ISO 7884-7.

For usual silicate glasses, ϑ_{f3} is 5 to 10 °C higher than t_g. For some special cases (e.g. borosilicate glasses with high SiO_2 content) ϑ_{f3} is up to 30 °C higher than t_g. However, ϑ_{f3} can be up to 20 °C lower than t_g (e.g. in the case of crown glasses having an La_2O_3 content). In these extreme cases the annealing point ϑ_{f3} is the more appropriate information about cooling programmes required and the temperature limit of applicability of the respective glassware.

* $1\ \text{dPa·s} = 1\ \frac{\text{dN·s}}{\text{m}^2} = 1\ \text{P}$

(P is the symbol for poise)