can be obtained by liquisol-quenching. That is the reason why we decided to determine the lattice parameters of the liquisol-quenched foil. The lattice parameters of foils were determined by means of a Guinier X-ray diffraction camera, type XDC-700. These data, which are collected in table 1, can in principle be used to estimate vacancy concentrations.

Acknowledgements

The authors wish to express their cordial thanks to Professor M. Kantola for valuable discussions and comments. They also wish specially to thank Dr S. Seitsonen for his critical reading of the manuscript. Thanks are also due to Mr V. Viljanen for lattice parameter measurements.

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Received 2 July
and accepted 13 July 1971

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Residual Stresses in Glass-Crystal Composites

When a body is composed of two or more constituents that differ in their thermal expansion behaviour, internal stresses occur within and in between the constituents. Several nondestructive techniques, such as X-ray diffraction [1] and thermal deflection [2], have been widely used for measuring these stresses. Bogardus and Roy [3], and Foster and Hughes [4], measured changes in the transition temperature of crystals in glass-crystal composites and calculated the stresses using the Clausius-Clapeyron equation. The present work is aimed at determining the transition temperature of well-known crystals in glass-crystal composites that were carefully prepared to minimise any chemical reactions between the glass and the crystal.

Two glasses and two crystals were chosen for the study. Glasses having thermal expansion coefficients of 13.80 and 6.70 × 10^{-6}/°C were selected [5]. The crystals chosen were cristobalite and silver iodide: cristobalite (T_c = 260°C) because of its very high thermal expansion coefficient; and silver iodide [6] (T_c = 152°C) because of its low thermal expansion coefficient. Both crystals have transition temperatures well below the softening point of the glasses. To minimise the chemical reactions between the glass and the crystal, the glass-crystal composites were fabricated by hot pressing at high pressures (10000 psi) for short periods of time (2 min.)

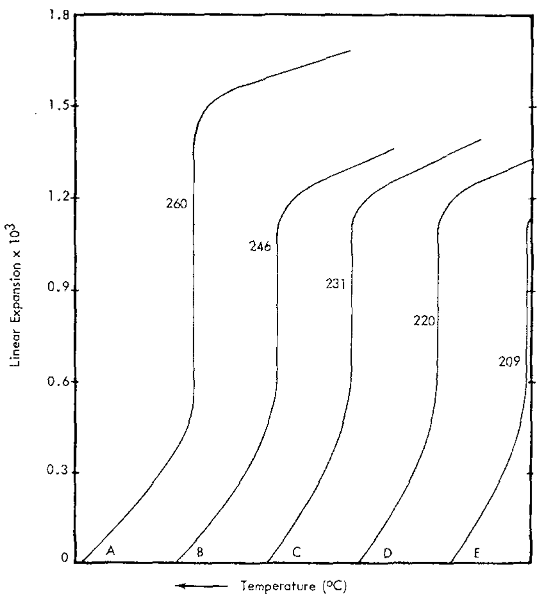

Figure 1 Dilation curves corresponding to various heating conditions imposed on a composite of cristobalite and glass I. Glass I had a thermal expansion coefficient of 13.80 (× 10^6/°C).

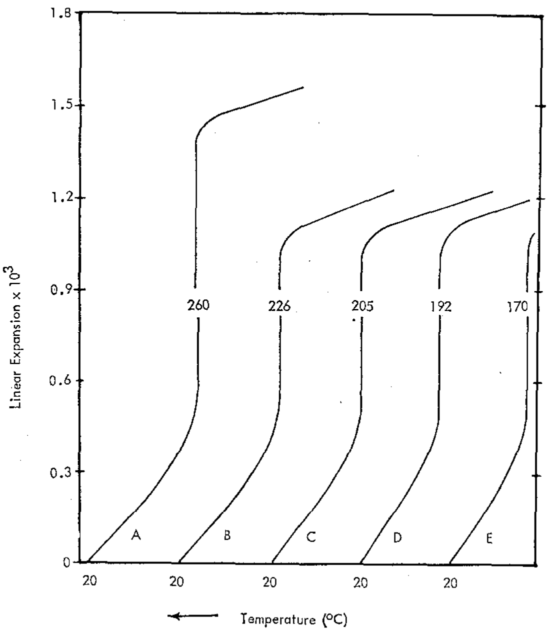

Figure 2 Dilation curves corresponding to various heating conditions imposed on a composite of cristobalite and glass II. Glass II had a thermal expansion coefficient of 6.70 ($\times 10^6$/°C).

about 50°C above the softening point of glasses. Differential thermal analyses and thermal expansion measurements were made to determine the shift in the transition temperature of crystal in glass-crystal composites. The volume fraction of crystal in composites was varied in increments of 0.2 between 0 and 0.6.

The transition temperature of cristobalite, as affected by the internal stresses, is shown for glass I (α = 13.80)-cristobalite in fig. 1, and for glass II (α = 6.70)-cristobalite composites containing 40% crystals in fig. 2. These transition temperatures of cristobalite were measured under the following conditions:

(a) By heating vitreous silica at 1500°C for 10 h.
(b) In quenched composites after 12 h at the hot pressing temperature.
(c) In quenched samples after "soaking" 50°C below the hot pressing temperature for 12 h.
(d) In composites air-cooled from hot pressing temperature.
(e) In composites slowly cooled (at about 2°C per min.) from hot pressing temperature.

Similarly, the transition temperature of silver iodide, as affected by the internal stresses for

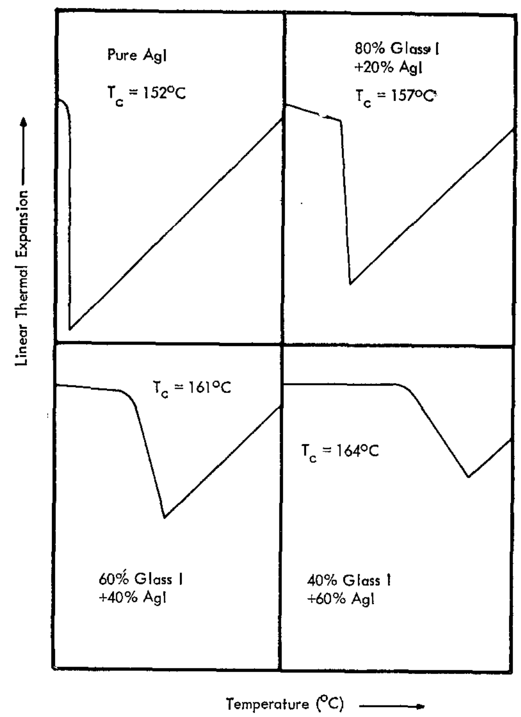

Figure 3 Transition temperature of AgI in Glass I-AgI composites.

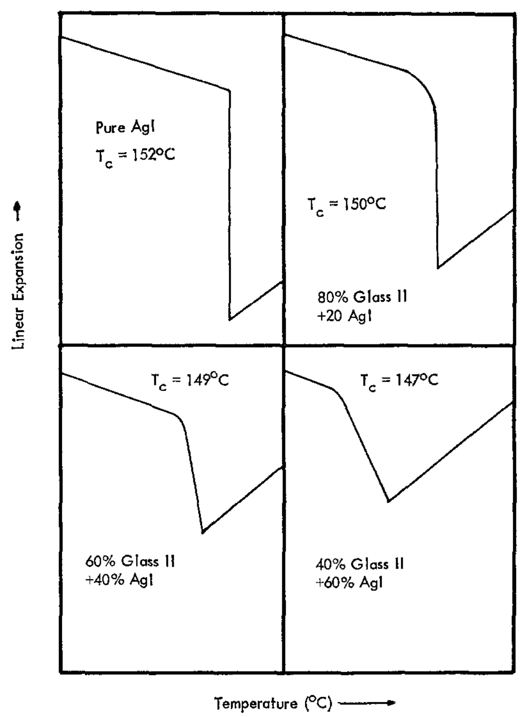

Figure 4 Transition temperature of AgI in glass II-AgI composites.

glass I–silver iodide, is shown in fig. 3; and for glass II – silver iodide composites in fig. 4. It is apparent from figs. 3 and 4 that the transition temperature of silver iodide was lowered in glass II – silver iodide composites and raised in glass I – silver iodide composites, thus confirming the prediction of the Clausius-Clapeyron equation. However, since there is some doubt regarding the applicability of the Clausius-Clapeyron equation for calculating internal stresses from changes in the transition temperature of crystals [7], stress calculations were not made.

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Received 26 July and accepted 13 August 1971.

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Short Notices

The Application of Modern Physical Techniques to Tribology

T. F. J. Quinn

Newes-Butterworth. p. 253 £3·60

Dr Quinn's approach in this book is to seek to show how the process of wear may be studied by modern physical techniques so that a better understanding of this process will lead to improved design of bearings and more accurate forecasting of their useful life. After the opening chapter in which the author discusses the elastic and plastic deformation of surfaces and the various hypotheses of wear there are four chapters devoted to specific techniques such as electron microscopy, X-ray crystallography, electron diffraction, electron microprobe analysis and scanning electron microscopy, that have been employed in tribological research. The author's approach in these chapters is particularly pleasing as he outlines quite fully the theory and limitations of each technique and then devotes a substantial part of the chapter to a discussion of the application of the technique to specific tribological investigations. The results of these investigations are so presented that the reader will be able to judge for himself whether or not the technique will be of value in his own studies.

Although the book is written for those engaged in teaching, studying or doing research in tribology, it should appeal to a much wider readership as it seeks to show how these modern techniques can be used to solve real problems and provide information not available from any other source.

R.A.F.

Gallium Arsenide and related compounds

Proceedings of the 3rd International Symposium, Aachen, October 1970

Editor: K. Paulis

Pp. vii + 297 (Institute of Physics, 1971) £6·25.

This volume is a compendium of 33 original papers on gallium arsenide, other III-V and mixed III-V compounds presented at the 1970 International Symposium. The papers cover two general areas, materials preparation and device technology. With the exception of one or two review papers there is little introductory material, which necessarily means a specialised