EVALUATION OF CRYSTAL NUCLEATION AND GROWTH FROM KINETICS AND VISCOSITY DATA OF NEW FLUORIDE GLASSES

A. Jha, S. Jordery
Dept. Materials Technology, Brunel University, UK

M.D. Baró, A. Otero, S. Suriñach
Dept. Física, Universitat Autònoma de Barcelona, Spain

M. Poulain, A. Sousiane
Centre d'Etude des Matériaux Avancés, Université de Rennes, France

R.S. Deol, D.N. Payne
Optoelectronics Research Centre, University of Southampton, UK

The understanding of glass devitrification and melt crystallization has received considerable interest from the point of view of controlling the total number of scattering centres in drawn fibers and glass preforms. In recent investigations [1] on bulk glass thermal properties we have evaluated the stability and the devitrification kinetic parameters, by means of differential scanning calorimetry (DSC). The results obtained by the use of isothermal techniques are in good agreement with those obtained by continuous heating procedures. The thermal caracteristics indicate that the glasses have a good combination of casting and devitrification properties and are expected to be suitable for high quality glass preform and fibre fabrication.

The aim of this work is the calculation of the viscosity of the glass-forming melts and its dependence on temperature, by using an appropriate model; and also the use of the kinetics data to construct the temperature-heating rate-transformation curves (T-HR-T), which will account for the heating cycle of a glass preform in a fibre drawing furnace.

The classical theory of crystal nucleation and simultaneous three dimensional crystal growth models have been used in the Johnson-Mehl-Avrami-Erofe'ev equation for transformation kinetics to calculate the time-temperature-transformation curves. The significance of the stability parameters is interpreted in the context of the nucleation, crystal growth and transformation kinetics. We also report on the comparison of measured crystal growth rate in one of the types of cadmium mixed halide glasses (CdF_2-BaF_2-NaCl) with the theoretically predicted value.

[1] M.D. Baró et al., this Conference.

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