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THERMAL PROPERTIES AND DEVITRIFICATION KINETIC STUDIES OF LOW PHONON ENERGY HALIDE GLASSES

M.D. Baro, A. Otero, S. Surinach
Dept. Fisica, Universitat Autonoma de Barcelona, Spain
A. Jha, S. Jordery
Dept. Materials Technology, Brunel University, Uxbridge, UK
M. Poulain
Centre d'Etude des Materiaux Avances, Universite de Rennes, France
R.S. Deol, D.W Hewak, D.N Payne
Optoelectronics Research Centre, University of Southampton, UK

New halide glasses with considerably lower phonon energy than well-known flourozirconate glasses have been studied for their application as infrared fibre optic materials. These glasses have extended infrared absorption wavelength situated at the edge of far infrared. For infrared fibre optic application, it is necessary to fabricate fibres with minimum attenuation of photonic energy.

The origin of this attenuation in optical fibres is dissolved impurities in glass preforms, gas bubbles, inclusions, and above all crystals. The former three could be minimized by careful material preparation, handling, melting and casting procedures; however, the nucleation and growth of crystals cannot be suppressed completely. The understanding of the devitrification of glass and melt crystallisation is important from the point of view of controlling the total number of scattering centres in the glass preforms and drawn fibres.

This work deals with the results obtained on the thermal properties and crystallisation kinetics of low phonon-energy glasses by the means of DSC. The characteristic temperatures such as the glass-transition (T_g), crystallisation (T_x) and melting (T_m), have been systematically evaluated from isochronal experiments. The glass-forming and stability parameters have been defined and evaluated from these characteristic temperatures. The kinetics of devitrification of glass has been studied by combining both isothermal and isochronal heating rate techniques. The thermal stability of glasses studied is interpreted in terms of the derived values of kinetic barrier for devitrification. The results obtained are compared with a standard fluorozirconate ZrF_4-52mol%, BaF_2-19mol%, NaF-20mol%, LaF_3-4.5mol%, AlF_3-4.5mol% (ZBLAN) glass, a fluoride glass currently developed for fibre optic applications.

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