Calorimetric studies of the crystallization process in Cu10Se90 and Cu20Se80 chalcogenide glasses

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Abstract:

The crystallization kinetics of Cu10Se90 and Cu20Se80 glasses at different heating rates have been studied by differential scanning calorimetry (DSC). The crystallization phases resulting from the DSC have been identified using X-ray diffraction (XRD). The DSC thermograms have been analyzed in terms of the activation energy, stability and dimensionality of growth by different models. Results of DSC are reported and discussed from the heating rates' dependence of values of the glass transition temperature (Tg) and the peak temperature of crystallization (Tp). The characteristic temperatures of the studied chalcogenide glasses have been used to evaluate the glass-forming ability (GFA) by using various thermal stability parameters such as Hruby's criterion (HR). The activation energy for glass (Eg) and the crystallization activation energy (Ec) are derived. The crystallization results are interpreted in terms of recent analyses developed for non-isothermal crystallization and also for the evaluation of (Ec). The average value of the Avrami exponent comes out to be 3, indicating that, the crystallization process takes place via three-dimensional growth with bulk crystallization.

Keywords:

Cu-Se glasses; Crystallization kinetics; Activation energy; Avrami exponent; Thermal analysis

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