Sub-Tg Enthalpy Relaxation and its Impact on Crystallization in a Hyperquenched Poor Oxide Glass former

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SUB-T_g ENTHALPY RELAXATION AND ITS IMPACT ON CRYSTALLIZATION IN A HYPERQUENCHED POOR OXIDE GLASS FORMER

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Abstract: In this work we present some new results about the sub-T_g enthalpy relaxation in a hyperquenched glass, which is obtained from an oxide melt with extremely low glass-forming ability (GFA). The low GFA is reflected by a very sharp exothermic peak that occurs slightly above the glass transition temperature. We also show how the sub-T_g annealing affects crystallization during dynamic heating process. This study is conducted by using the differential scanning calorimetry (DSC) and x-ray diffraction. We have observed a non-monotonic trend of both the enthalpy recovered during the first DSC upscan and the isobaric heat capacity (C_p) measured during the second upscan with sub-T_g annealing time. By analyzing the relaxation patterns of the C_p curve, we confirm that both α- and β-relaxations are involved in the sub-T_g annealing. Furthermore, the crystallization peak of the samples annealed even for short time shifts to higher temperature compared to the as-hyperquenched glass. This implies that the atoms in local structual regions is rearranged as a consequence of annealing in the manner that more ordered domains appears, which makes nucleation more readily. In summary, the glass under study has a high degree of structural heterogeneity, and hence, to a strong tendency to crystallization.

Topic:_Glass transition and Relaxation phenomenon_Number of topic: 1

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