

A Calorimetric Study of the Glass Transition in Lithium Borate Glasses over a Wide Composition Range by Modulated DSC

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Lithium borate glasses ($x\text{Li}_2\text{O}(1-x)\text{B}_2\text{O}_3$, where x is the molar fraction of Li_2O) are interesting materials to study. The physical properties of alkali borate glasses exhibit maxima or minima against their composition, the so called *borate anomaly*. The reason for this has been discussed with the additive effect of Li_2O to the glass system. The addition of Li_2O to B_2O_3 causes the structural changes of the glass networks from 2-dimensional BO_3 to 3-dimensional BO_4 , and creates many intermediate structures. Moreover, the fragility, which is an important concept in classifying glass-forming materials, of lithium borate glasses markedly changes with the increase of Li_2O . Therefore, the composition dependence of thermal properties of lithium borate glasses is interesting in the study of glass transition phenomena. In this study, we have investigated the composition dependence of the thermal properties associated with glass transitions over a wide composition range of Li_2O with a Modulated-Temperature Differential Scanning Calorimetry (MDSC). From the experiments of the MDSC, a complex heat capacity, $C_p^*(\omega, \tau)$, has been observed, from which we have determined the non-Debye parameters of the thermal relaxation function (β_{KWW}), the calorimetric glass transition temperatures (T_g) and the width of a glass transition region (ΔT). All of these quantities show strong composition dependence. In the presentation, these experimental results will be discussed from the viewpoint of the changes of the intermediate structures of the system, which are caused by the additions of Li_2O .