Relaxation features of both strong and fragile glass systems

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Relaxation features of both strong and fragile glass systems

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In this paper I review our recent findings about the features of relaxation in glass systems with different fragility. Firstly, we have found several striking anomalies of enthalpy relaxation in hyperquenched (HQ) SiO_2 and GeO_2 glasses (the strongest systems known so far) during annealing. The HQ strong glasses exhibit a symmetrical peak in the excessive heat capacity versus temperature curve. With the degree of annealing below T_g, the peak becomes smaller, but does not shift on the temperature axis. In case of the HQ fragile glasses, the low temperature cutoff of the excessive heat capacity peak shifts to higher temperature with the degree of annealing. The differences in relaxation pattern between strong and fragile systems are discussed in terms of the potential energy landscape, the glass structure, and the relative contributions from both primary and secondary relaxations. Secondly, We have found that unlike fragile glasses the strong glasses relax in a manner that all the secondary relaxation units contribute to the primary relaxation. Thirdly, we have established a new stretching function for the distribution of relaxation times, and found the substantial broadening of the glass transition region due to the hyperquenching process. Based on these findings and the modified TNM model we have succeeded in modeling the enthalpy response of HQ glasses to both dynamic heating and static aging.