Phenomenology of the Glass Transition

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This article and other articles in this folder are mainly informed by [2].

1 Strong and fragile glass

Glasses are often said to be very, very thick liquid. This claim is not that correct, actually. Viscosities of liquids usually obey the Arrhenius equation [1]

$$\eta = A \exp\left(\frac{E_a}{RT}\right), \tag{1}$$

and the $\log \eta$ - T_g/T relation is a straight line. Some glasses indeed have such a behavior and we call them **strong glasses**. It should be noted, however, that glasses may *break* under a external force. Liquids do not break. They just absorb any amount of energy injected into them and exhaust the amount of energy via viscosity. Brittleness, under this view, may be regarded as the fact that the system is unable to "digest" the input energy and transform them into heat, so the system gets tore apart. So we find that a **fragile glass** usually has a smaller η compared to a similar strong glass

2

References

[1] Tandy Grubbs. Viscosities of simple liquids - temperature variation. https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Exercises%3A_Physical_and_Theoretical_Chemistry/Data-Driven_Exercises/Viscosities_of_Simple_Liquids_-_Temperature_Variation. Accessed: 2021-11-17 03:59:58.

[2] AN Li-Jia LI Yan-Wei, SUN Zhao-Yan. Glass and glass transition. *Glass and Glass Transition*, 31(3):1, 2016.

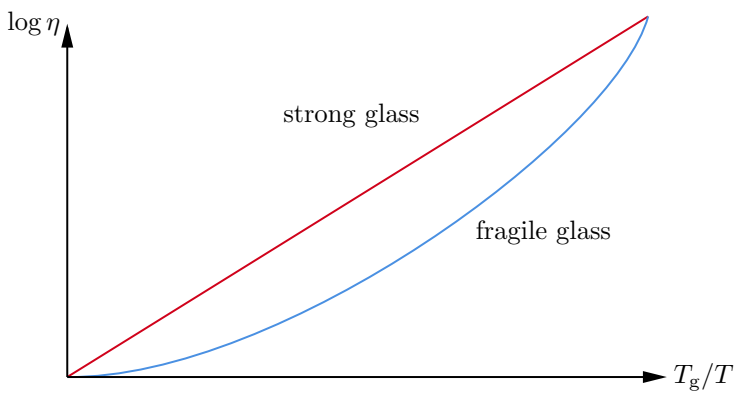

Figure 1: Viscosities of strong glasses and fragile glasses. Figure taken from Figure [2].