Soft-Pinning: Experimental Validation of Static Correlations in Supercooled Molecular Glass-forming Liquids

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Enormous enhancement in the viscosity of a liquid near its glass transition is generally connected to growing many-body static correlations near the transition, often coined as 'amorphous ordering'. Estimating the length scales of such correlations in different glass-forming liquids is very important to unravel the physics of glass formation. Experiments on molecular glass-forming liquids become pivotal in this scenario as the viscosity grows several folds (~10^{14}), simulations or colloidal glass experiments fail to access these required long-time scales. Here we design an experiment to extract the static length scales in molecular liquids using dilute amounts of another large molecule as a pinning site. Results from dielectric relaxation experiments on supercooled glycerol with different pinning concentrations of Sorbitol and Glucose, as well as the simulations on a few models glass-forming liquids with pinning sites indicate the versatility of the proposed method, opening a plethora of opportunity to study the physics of glass transition in other molecular liquids.

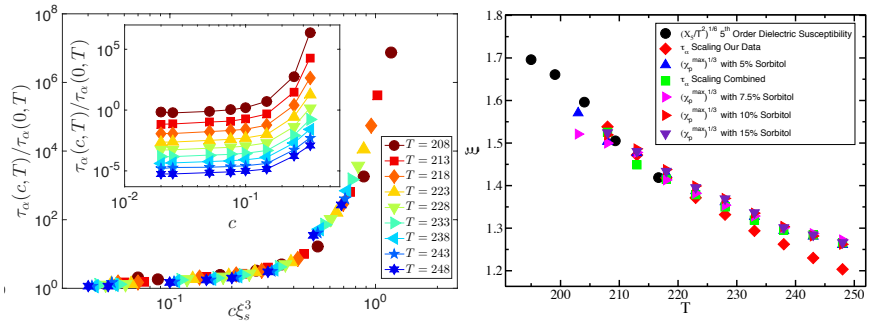

Figure 1: Scaling collapse of relaxation times for Glycerol and Sorbitol mixture using static length scale.

REFERENCES

1. Soft-pinning: experimental validation of static correlations in supercooled molecular glass-forming liquids - R Das, BP Bhowmik, AB Puthirath, TN Narayanan, **Smarajit Karmakar**, PNAS Nexus 2023 (in press).