"Do Probe Molecules Alter Host Dynamics in Glassy Systems?"

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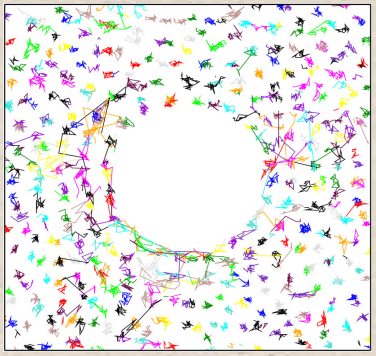
The research undertaken has begun to clarify subtleties involved in extracting dynamics from experiments that follow the rotational dynamics of single fluorophores embedded in small molecule glass formers just above the glass transition temperature. In this temperature regime, the very interesting but poorly understood slow dynamics are believed to be related to spatiotemporal heterogeneities. SM experiments hold the potential to directly assess the size and time scales associated with the persistence of these heterogeneities.

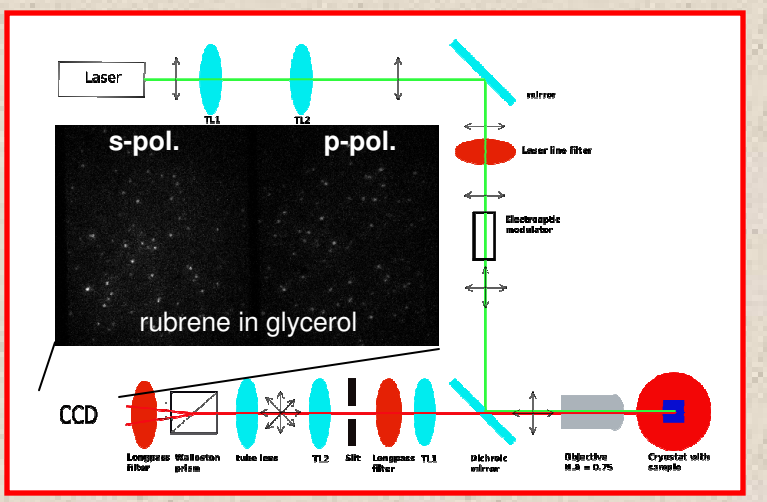


Particles speed in up presence of large, smooth probes

Because molecular dynamics simulations we performed suggested large probes may alter the dynamics of surrounding particles comprising a supercooled system in an unintuitive manner, we suggested that static and dynamic heterogeneities as potentially measured in single molecule experiments must be examined carefully for evidence of probe alteration of host dynamics, as the probe could set up persistent heterogeneities not representative of host dynamics in the absence of the probe.

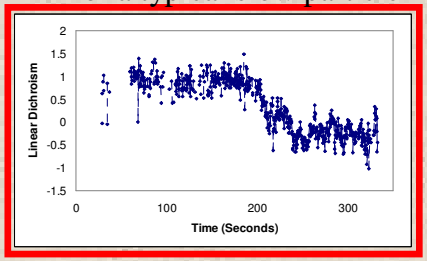
Single molecule experiments performed in an epi-fluorescence configuration provide fluctuating signals in orthogonal polarization channels, giving direct information on probe molecule rotations through the linear dichroism.

$$\text{Linear Dichroism} = \frac{Ip - Is}{Ip + Is}$$

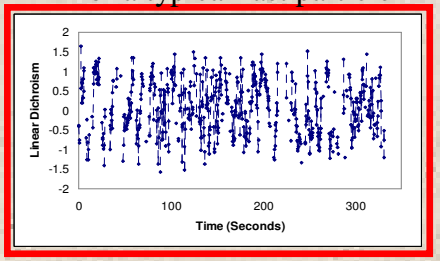


We find rubrene in glycerol experiences both spatial and dynamic heterogeneity

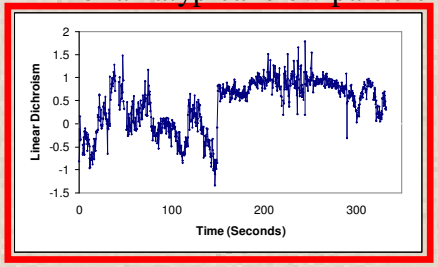
LD of a typical slow particle



LD of a typical fast particle



LD of an atypical slow particle



Probe dependence studies currently underway will reveal the temperature dependence of the breadth of spatial heterogeneities and degree of dynamic heterogeneities.