Tata Institute of Fundamental Research
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Seminar

Numerical and Experimental Study of Dynamical and Mechanical Properties of Glass Forming Liquids

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When a liquid is cooled with a high cooling rate, it retains its liquid structure below the melting temperature and enters into a metastable state, called as a supercooled liquid. Upon further cooling, at a certain temperature Tg, the glass transition occurs where liquid becomes so viscous that it is not possible to observe the dynamics at laboratory time scale. If the liquid is brought to a temperature which is much lower than Tg it becomes a solid without any long-range structural order. This solid is called amorphous solid. Under externally imposed deformation, amorphous solids behave similar to its crystalline counterpart. For small deformation, the response is linear and mostly reversible but at large deformation it is nonlinear and material starts flowing. Despite of considerable amount of research, the microscopic mechanism responsible for this phenomena is not clearly understood. We have studied the mechanical response of amorphous solids in presence of impurities (in the form of particle pinning) using numerical simulation and in this talk, I will present some of our findings. On the dynamical aspect of the glass-forming liquids, we have studied dynamic heterogeneity, growth of amorphous order and breakdown of Stokes-Einstein relation, which are the main characteristic features associated with the glass transition. The first two can be realised by introducing the concept of length scale. In this talk, I will discuss two new methods to extract the desired length scales associated with dynamics heterogeneity and amorphous order and how particle pinning can help us to understand the breakdown of Stokes-Einstein relation.

Thursday, Jun 25th 2019

4:00 PM (Tea/Coffee at 3:30 PM)

Auditorium, TIFR-H