TIFR Centre for Interdisciplinary Sciences
21 Brundavan Colony, Narsingi, Hyderabad 500075

Students' Annual Seminar

Length scales of heterogeneous dynamics and the breakdown of the Stokes-Einstein relation

Anshul Deep Singh Parmar

The breakdown of the Stokes-Einstein relation is a well-known phenomenon that occurs in glass forming liquids, and is generally believed to be a consequence of heterogeneous dynamics. The dynamic heterogeneity (DH) appears from the fact that local dynamics of the liquid becomes spatially more correlated as temperature decreases and results in the decoupling of various transport quantities. Although heterogeneous dynamics has been widely studied to understand growing length scales in glass forming liquids, the length scales involved in determining the breakdown of Stokes-Einstein relation are not adequately understood. We investigate the breakdown of the Stokes-Einstein relation by probing the dynamics at different length scales (wave numbers k) to identify a length scale beyond which the Stokes-Einstein relation becomes valid. The crossover length is defined by performing a systematic study of the SE relation for self intermediate scattering function ($\tau(k,T)$) and Diffusivity (D); for a considered temperature this length is estimated from the wave number k such that the SE relation breaks down for ($\tau(k,T)$) at that temperature. Our results show that the T- dependent crossover length can be identified with the heterogeneity length scale. We also show that, in the presence of the breakdown of the SE relation, the Adam-Gibbs relation applies to diffusion but not for $\tau(T)$ and thus the AG relation should be applied with caution.

Wednesday, Jan 27th 2016

4:30 PM (Tea/Coffee at 3:45 PM)

Seminar Hall, TCIS