Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad – 500 046

Webinar

Structural, Dynamical and Mechanical Properties of Active Glasses

Kallol Paul

TIFR, Hyderabad

Activity driven glassy dynamics, while ubiquitous in collective cell migration, intracellular transport, dynamics in bacterial and ants colonies etc., also extends the scope and extent of the, as yet mysterious, physics of glass transition. We study the different dynamical, structural and mechanical properties such as dynamical slowing down, fragility, dynamical heterogeneity and ductility of non-equilibrium glasses through theoretical and computational techniques. We show that though the relaxation dynamics of an active glass can be equilibrium-like at an effective temperature, an active glass is fundamentally different from its equilibrium counterpart. Dynamical heterogeneity and the associated length scale at a similar time scale grow dramatically due to activity. Activity decreases the kinetic fragility of a glass forming liquid and make a fragile glass stronger. This fragility is controlled by the static length scale which also grows due to activity. We also performed uni-axial extensile deformation simulations of confined two and three dimensional model glasses. The different types of failure mechanisms are governed by the sample geometry, temperature and strain rate. Activity decreases the ductility of the system and there is a clear signature of ductile to brittle transition in presence of activity.

Monday, June 3rd 2024

16:00 Hrs