

Webinar

Yielding and Mechanical Memory in Active and Passive Complex Systems

Rashmi Priya

TIFR, Hyderabad

Glasses are rigid solids with a liquid-like structure, arrested out of equilibrium. Their preparation protocol sets the degree of annealing and, consequently, their stability, memory, and mode of failure. Well-annealed or ultrastable glasses can exhibit brittle failure through a single system-spanning shear band. Using molecular dynamics simulations, I show that doping such glasses with active particles suppresses the abrupt stress drop, causing the system to yield gradually through a network of shear bands. This response is governed by the interplay among the inverse strain rate, the persistence time of the activity, and the shear-band propagation time. I then uncover a nontrivial compensatory relation between shear rate and active forcing.

These results connect naturally to memory effects in glasses under unidirectional shear. There, I find the inverse Bauschinger effect, a directional-memory signature not previously reported in amorphous materials, and identify plastic healing of the shear-band network as its governing mechanism. After demonstrating the effect in active-doped ultrastable glasses, I will establish its generality in passive amorphous solids through a phase diagram spanning preparation temperature, strain rate, and deformation history. I will conclude by exploring aspects of yielding in rod-like particles that form liquid-crystalline phases.

Tuesday, Jul 28th 2026

16:00 Hrs

