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

Seminar

Topological Defect Mediated Plasticity in Colloidal Glasses

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Plastic deformation in amorphous materials lacks the defect based description that underpins our understanding of crystalline solids. Recent theoretical work has proposed a framework for glasses in which plasticity is mediated by topological defects identified as singularities in the displacement field. However, experimental demonstration in glasses has so far been lacking. Using a model two-dimensional colloidal glass driven by an optical vortex, we provide direct experimental evidence that plastic deformation and subsequent relaxation following the cessation of shear are governed by the dynamics of well-defined topological defects, vortices (+1) and anti-vortices (-1), identified in the particle displacement field. By resolving the motion of colloidal particles, we quantitatively characterise the creation, annihilation, and interactions of defects governing the mechanical response of glasses.

Monday, Mar 23rd 2026

11:30 Hrs (Tea / Coffee 11:15 Hrs)

Auditorium, TIFRH