

Seminar

Institute for Plasma Research

Title: Structural and topological defects governing plasticity in amorphous solids

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Time: 10:30 A.M.

Venue: Seminar Hall, IPR

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Abstract

Understanding how disordered materials deform and relax remains a central challenge in condensed matter and soft-matter physics. Unlike crystalline solids, where plasticity is mediated by well-defined defects such as dislocations, amorphous materials lack long-range order, making it difficult to identify the structural origins of deformation. In this talk, I will discuss how structural and topological defects can be used to understand plasticity in dense colloidal suspensions, which serve as model systems for amorphous solids. Using experimentally resolved particle trajectories, we propose a structural order parameter to identify weak or defect-like regions in dense suspensions and perform experiments to demonstrate its effectiveness in pinpointing regions where particles rearrange or plastic events occur due to applied shear or thermal fluctuations. Furthermore, I will show how plastic deformation can be described in terms of interacting topological defects that emerge in the displacement field during shear. The anisotropic interactions and orientations of these defects provide insight into the microscopic mechanisms governing plastic flow in disordered systems. These ideas offer a framework for connecting structure, dynamics, and mechanical response in amorphous materials, with potential implications for a wide range of soft and biological systems.
