

Seminar

The Distinct Yielding Phenomenology of Gels compared to Glasses under Athermal Cyclic Shear

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Gels and glasses are both disordered amorphous solids, yet they possess fundamentally different structures: gels exhibit spatially heterogeneous, percolated networks, while glasses are characterised by dense, homogeneous packings. Cyclic shear has been employed to study the potential energy landscape and the phenomenon of yielding in dense disordered systems such as grains and glasses. The corresponding behaviour in gels remains largely uncharted. In this study, we investigate the mechanical response of gels under athermal cyclic shear deformation and show that yielding is governed by localised bond rearrangements within the network. This results in smooth, nonsingular transitions and the persistence of bistable and multi-stable states even beyond the yield point. These behaviours stand in stark contrast to those observed in glasses, where yielding is marked by abrupt transitions, system-spanning avalanches, and the formation of shear bands. Our results highlight how structural heterogeneity intrinsic to gels fundamentally alters the nature of yielding, providing new insight into the mechanics of amorphous solids and suggesting alternative design principles for soft materials with tuneable mechanical responses.

Thursday, Jul 17th 2025

14:30 Hrs (Tea / Coffee 14:15 Hrs)

Auditorium, TIFRH