

Seminar

Vibrational Anomalies and Elastic Response in Amorphous Materials

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Amorphous materials, unlike crystals, lack long-range order, and their mechanical stability arises from disordered networks of force-balanced constituents and quenched internal stresses. In this talk, I will discuss how these features influence the low-frequency vibrational density of states (VDoS) and the elastic properties of amorphous solids. Using simulations of zero-temperature glasses obtained by rapid quenching, I examine how boundary conditions and frozen-in internal stresses shape the low-frequency VDoS. Near the unjamming transition, I explore how disorder leads to a heterogeneous mechanical response, governed by a broad distribution of local elastic moduli. I also study spatial correlations among these moduli, revealing that non-affine responses linked to non-phononic modes give rise to long-range elastic correlations. Finally, I present a stress-based theoretical framework that captures key aspects of elastic response and internal stress correlations, and validate its predictions against numerical results. These findings provide new insights into the mechanical behaviour and vibrational anomalies of disordered solids.

Thursday, Aug 14th 2025

16:00 Hrs (Tea / Coffee 15:45 Hrs)

Auditorium, TIFRH