

# Seminar

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## Institute for Plasma Research

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**Title :** Microscopic Origin of Shear Relaxation in a Model Viscoelastic Liquid  
**Speaker :** Dr. Ashwin Joy  
Institute for Plasma Research, Gandhinagar  
**Date :** 11<sup>th</sup> February 2015, Wednesday  
**Time :** 10.00 AM  
**Venue :** Seminar Hall, IPR

### **Abstract:**

A fundamentally important time scale in all liquids is the Maxwell shear relaxation time scale which governs a liquid's response to an external mechanical perturbation. At times much smaller than the Maxwell time scale, the response is dominantly elastic and at times much larger, the response becomes dominantly viscous. We provide an atomistic description of this shear stress relaxation in a model visco-elastic liquid through first principles molecular dynamics simulations. It is shown that the relaxation time of the excess part of the shear stress auto-correlation function provides a correct measure of the relaxation process and at temperatures higher than a certain threshold value (decided by the energy landscape), the microscopic origin of relaxation lies in the lifetime of the local atomic connectivity. Below this threshold temperature, the local atomic connectivity fails to account for shear stress relaxation. Our results can help provide a better fundamental understanding of visco-elastic behavior in a variety of strongly coupled systems such as dusty plasmas, colloids and non-Newtonian fluids.

Reference: J. Ashwin and Abhijit Sen, Physical Review Letters (114) 055002 (2015)

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