Sabyasachi Sen

Title: *Structural Aspects of Relaxational Dynamics in Glasses and Supercooled Liquids*

Abstract: The structure of a liquid in equilibrium undergoes rapid rearrangement with time. The structural rearrangement processes, however, drastically slow down with decreasing temperature in a glass-forming liquid as the glass transition temperature T_g is approached from above and the liquid falls out of thermodynamic equilibrium. This kinetic slowdown is typically exemplified by the variation in the transport properties such as viscosity (or diffusivity) that can easily increase (or decrease) by ~ 15 orders of magnitude on cooling the liquid from $T \approx 3*T_g$ to $T \approx T_g$. It is also at the very heart of nucleation and crystallization of a supercooled liquid and control the technological utility of glass and glass-ceramics. The dynamical processes associated with the viscous/diffusive transport have been treated in the literature principally as macroscopic phenomena within the framework of phenomenological models and often interrogated using bulk relaxation (volume, enthalpy, shear, dielectric, photon echo) experiments that typically lack a *direct* microscopic understanding of the atomic scale processes that accompany structural relaxation. On the other hand, the unique combination of the timescale associated with dynamical NMR spectroscopic techniques (□s to s) and the accompanying structural information, is ideally suited for probing the mechanistic aspects of the relaxational dynamics at atomic/molecular level in glasses and viscous liquids. In this talk I will present an overview of the work from our laboratory in the recent years involving the application of such spectroscopic techniques to address *the nature and timescales of the various thermally driven configurational changes in a wide variety of inorganic and organic glasses and supercooled liquids and their relationship to macroscopic relaxation and transport processes.*

Biography: Sabyasachi Sen obtained his PhD in Geochemistry in 1996 from Stanford University where he was also a post-doctoral fellow until 1997. He then joined the faculty of the dept. of physics at the University of Wales, Aberystwyth in UK where he remained until 1999. Subsequently, he joined the R&D in Corning Inc. in NY, USA as a senior research scientist in the Glass Research group. He moved to the University of California at Davis in 2004 to join the faculty of the department of materials science and engineering as Associate Professor and was promoted to Professor in 2010. He has authored/co-authored more than 150 scientific papers and 7 US patents. He currently serves on the editorial boards of Journal of Non-Crystalline Solids, Materials Research Express and Earth and Planetary Materials. His current research interests include the application of state-of-the-art spectroscopic and diffraction techniques in understanding structure and dynamics in amorphous materials including glasses and glass-forming liquids, fast ion conduction in crystalline solid oxide electrolytes, battery materials and ionic liquids.