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FOR BASIC SCIENCES
Block JD, Sector III, Salt Lake, Kolkata 700 106

DEPARTMENTAL SEMINAR

Chemical, Biological & Macro-Molecular Sciences

26th April, 2022 **4.00 PM** **FERMION / ONLINE**

SPEAKER

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S.N.B.N.C.B.S

TITLE OF THE TALK

Deep Eutectic Solvents: New Excitements and Our Understanding

ABSTRACT

A eutectic system 1 is defined as a mixture of multicomponent solids that forms, upon heating, a homogeneously molten phase at a temperature (eutectic temperature) lower than the individual melting temperature of the mixture components. This is different from solute-induced depression of freezing point of solutions discussed in connection to colligative properties because eutectics correspond to mixtures at unique compositions that completely avoid incongruous melting. Borax ($Na_2B_4O_7$, $10.H_2O$; Sohaga) is known to substantially lower down the melting temperature of gold when mixed at the eutectic composition. The 'deep' in deep eutectic solvents (DESs) refers to deep depression of freezing point of mixtures with respect to the individual component melting points. This idea has been applied to prepare a variety of DESs employing organic and inorganic (both covalent and ionic) solid compounds. Several DESs provide stable liquid phase at temperatures within ±50K of room temperature at 1 atm. pressure. These are termed as room temperature DESs. While the phenomenon of frustration-promoted liquid phase in DESs relate to room temperature ionic liquids (RTILs), the extensive inter-species interactions, on the other hand, connect multi-component mixtures of common solvents as a distant neighbour.

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Recent frenetic activities with DESs is mainly driven by the possibility of generation of less toxic (relative to common solvents and RTILs) and cost-effective reaction media for controlled synthesis of important and useful materials. 2-3 Our calorimetric measurements on several ionic and non-ionic DESs suggest that these are fragile materials with thermodynamic glass transition temperature, =200 ±20K. 4-5 Time-resolved fluorescence (TRF) measurements, frequency dependent dielectric relaxation (DR) experiments and computer simulations - all reveal heterogeneous structure and dynamics that persist even at temperatures ~100-150K above the. In addition, our DR measurements combined with computer simulations provide a resolution to the longstanding debate on colossal static dielectric constant for some ionic DESs. 6-8 In this talk I would make an attempt to give an overview of these exciting findings and highlight our contributions toward the fundamental understanding of these metastable room temperature ‘supercooled’ systems.

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