Open Talk

13th May, 2019 **4:00 PM** **Fermion**

SPEAKER

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TITLE OF THE TALK

Temperature Dependent Dielectric Relaxation Study in Some Complex Systems

ABSTRACT

This work reports the temperature dependent dielectric relaxation (DR) dynamics of acetamide based three deep eutectic systems (DESs) in the frequency regime, $0.2 \leq \nu$ (GHz) ≤ 50 and theirpossible origin. DESs have been prepared by mixing three electrolytes, lithium bromide (LiBr),lithium nitrate (3 LiNO) and lithium perchlorate (4 LiClO), with acetamide in 22:78 molar ratio.The dielectric spectra for these DESs have been recorded over a temperature regime,$293 \leq T(K) \leq 336$. The simultaneous fitting of the real (ε') and imaginary (ε'') part of the collected dielectric responses demands a sum of four Debye (4-D) type relaxation processes to provide a qualitative description for the DR dynamics of theses DESs. DR relaxation times, obtained from fitting, are spread over picosecond to nanosecond regime. Simulated collective reorientational functions and H-bond relaxation dynamics suggest that the slowest DR time component can be correlated qualitatively with the structural H-bond relaxation dynamics of the H-bonded acetamide molecules; however it is noteworthy that due to our frequency limitation a substantial part of the DR dynamics, both in lower and higher frequency side, remains inaccessible in our measurements. We have constructed the average time constant (av τ) for each DESs at different temperatures from both experimental and simulated time components and subsequently, we estimate the corresponding activation energies (a E). Interestingly, it has been found that all these systems follow an Arrhenius type temperature dependence and the estimated experimental DR a E for them, including molten acetamide, are spread over 18-30 kJ/mol; while for simulation it is in between 13-25 kJ/mol. What is even more interesting is that, unlike most of the conventional solvents, the value of the estimated static dielectric constants (0 ε) for these solvents increases with increasing temperature, we think, it could be due to inadequate frequency coverage of our instrument in the lower frequency side, even though the estimation of exact value of 0 ε is very difficult for these conducting viscous liquids.

We further report the concentration ($0 \leq W\% \leq 35$) and temperature ($293 \leq T / K \leq 315$) dependent dynamical changes in aqueous solution of a tri-block copolymer (pluoronic P123) using dielectric relaxation spectroscopy (DRS) technique, covering a frequency regime, $0.2 \leq \nu$ /GHz ≤ 50. Notable existence of restricted water molecules, along with bulk water molecules, has been detected in our DR measurements, which is further supported via differential scanning calorimetric (DSC) data and subjected to explore the impact of polymer concentration and temperature in the dynamics of this system. Signature of gelation (~11.0 W%, 293 K) and temperature induced extensive dehydration for the P123 molecules are observable in our results.

HOST FACULTY

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&

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