

**Invited Lecture**  
**Inter-Disciplinary Explorations in Chemistry (I-DEC 2018)**

**New Insight of Position Dependent Polarity, Energy Transfer and Hydration Dynamics at Lipid/Water Interfaces**

Sobhan Sen\*

*Spectroscopy Laboratory, School of Physical Sciences*

*Jawaharlal Nehru University, New Delhi 110067*

(E-mail: sens@mail.jnu.ac.in)

**Abstract:** Understanding the role of environment polarity, hydration and dynamics on the electrostatics of lipid/water interfaces is of paramount importance because they regulate many vital processes within and across cell-membrane. Several small molecules have been used to study static and dynamic properties of lipid/water interfaces. However, most of them have dealt with lipid/water interfaces of fluid (liquid-crystalline) phase, while the knowledge about the interfacial properties of rigid gel-phase lipid/water interfaces remains limited primarily because of the fact that most existing ESR and fluorescent probes are found to be excluded out of gel-phase bilayer and/or perturb the lipid-packing. This talk will discuss results utilizing a new class of 4-aminophthalimide-based fluorescent molecules (4AP-Cn; n = 2-10, 12) adsorbed at lipid/water interfaces formed by gel- and fluid-phases of lipid bilayers [1]. It will be shown how 4AP-Cn molecules probe a peculiar stepwise polarity ( $E_T^N$ ), hydration and dynamic profiles as well as energy transfer rates between interfacial molecules at gel-phase DPPC/water interface, while the same molecules are shown to probe only subtle but continuous change of polarity, solvation dynamics, and energy transfer rates at fluid-phase DOPC/water interface [1,2]. Extensive molecular dynamics simulation results support experimental results, which provide information about relative position, angle distributions and hydration of 4AP-Cn at the two interfaces. These results suggest that 4AP-Cn probes are better suited, compared to other existing probes, to study solvation properties and energy transfer process at lipid/water interfaces of gel- and fluid-phase simultaneously.

**References and Notes:**

1. Singh, M. K.; Shweta, H.; Khan, M. F.; Sen, S. *Phys. Chem. Chem. Phys.* **2016**, *18*, 24185.
2. Singh, M. K.; Khan, M. F.; Shweta, H.; Sen, S. *Phys. Chem. Chem. Phys.* **2017**, *19*, 25870.

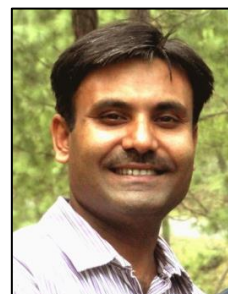
**Invited Lecture**  
**Inter-Disciplinary Explorations in Chemistry (I-DEC 2018)**

**Bio-Sketch of Speaker**

**Dr. Sobhan Sen**

*Associate Professor*

School of Physical Sciences  
Jawaharlal Nehru University  
New Delhi 110067  
Contact Number: +91-11-26738803  
e-Mail: sens@mail.jnu.ac.in



Dr. Sobhan Sen is currently working as an Associate Professor at the School of Physical Sciences, Jawaharlal Nehru University, New Delhi. He joined School of Physical Sciences, JNU in 2007 after finishing his Ph.D. from Indian Association for the Cultivation of Science (IACS) Kolkata in 2003 (Supervisor: Prof. Kankan Bhattacharyya) and subsequent postdoctoral research from University of South Carolina, USA (2003-2005 with Prof. Mark Berg) and from RIKEN, Wako, Japan (2005 – 2007 with Prof. Tahei Tahara).

His main research interests are the study of ultrafast dynamics in DNA and lipid bilayer using experimental and simulation methods, as well as study of molecular diffusion and interactions using single molecule spectroscopy, especially the Fluorescence Correlation Spectroscopy. He has published several important papers in these fields and delivered several invited talks in India and abroad. He is recipient of the Asian and Oceanian Photochemistry Association Young Scientist Prize -2012 and JSPS postdoctoral fellowship (in 2003).