

# Seminar

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## Institute for Plasma Research

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**Title :** Surface properties of ultrathin films

**Speaker:** Dr. Arup Sarkar

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Research (IISER), Berhampur

**Date :** 11th February 2020 (Tuesday)

**Time :** 3.30 PM

**Venue :** Seminar Hall, IPR

### **Abstract :**

In two-dimension ultrathin films (typically thickness  $< 10$  nm) of organic molecules (such as biological molecules), surface properties are known to play very important roles not only for technological applications but also for basic understanding of biological processes which can be helpful to combat diseases in future. In this presentation, I shall discuss the preparation of ultrathin films of cholesterol, cholesteryl esters and new types of synthesised cholesteryl dimers at the interfaces by using Langmuir and Langmuir-Blodgett techniques and their self-assembly properties at the interfaces. Also, the surface properties of metal phthalocyanine, phthalocyanine, graphene oxide and nanotetrapod will be discussed.

Further, I shall describe our experimental results on nanoscale tunneling current measurements by using a technique called current sensing atomic force microscopy (CSAFM). We observed a transition in tunneling mechanism in ultrathin film of cholesterol/ graphene oxide systems. Negative differential resistance (NDR) is an important phenomenon for device applications. I shall demonstrate the NDR effect observed in our systems of metalphthalocyanine caused by the molecular resonant tunneling. It will be shown that how the voltages corresponding to the negative differential resistance can be lowered which is a crucial requirement for the device applications. Devices made of quantum tunneling can be very promising for future applications in computer and laptop where the unwanted Joule heating can be avoided to reduce the global warming effect.

In a nutshell, my presentation will describe about our experimental investigations on the surface properties of ultrathin films of various types of molecular systems.

### **References**

- 1) Arup Sarkar and K. A. Suresh, The Journal of Chemical Physics 146, 214702 (2017).
  - 2) Arup Sarkar and K. A. Suresh, Journal of Applied Physics 123, 155501 (2018).
  - 3) Arup Sarkar, K. A. Suresh and H. N. Gayathri, Materials Today: Proceedings 11(2), 645 (2019)
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