Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad - 500107

Colloquium

Charge transport at Electrode|Molecule interface: From Molecular Electronics to energy research applications

Veerabhadrarao Kaliginedi

Institute of Materials, EPFL, Lausanne

The idea of building electronic devices using single molecule as an active component was first proposed by Aviram and Ratner in the early seventies. Indeed, molecules are of great interest for application in electronic devices because of their small size, recognition properties, ability of self-organization, possibility of chemical modification and customisation. Thus, the ability to measure and control charge transport across metal|molecule|metal junction is of considerable fundamental interest and represents a key step towards the development of molecular electronic and spintronics devices.

In addition to the applications in molecular electronics and spintronics research, studying charge or electron transport properties at metal|molecule interfaces under the influence of external stimuli like light, temperature, electrochemical potential or magnetic field will have a variety of applications in other research fields like (i) energy research (for example, solar cells, where the charge or electron transfer at metal|molecule interfaces plays a crucial role in determining the efficiency of the solar cell); (ii) photocatalysis and electrocatalysis (activity of a catalyst depends on the effective charge transport at electrode|catalyst interface); (iii) Sensors (sensitivity and selectivity of a sensor may depend on the effective charge transport at electrode|sensor moiety interface) etc.

In the first part of my presentation, I will introduce working principle of measurement techniques [i.e. STM break junctions (STM-BJ), mechanically controllable break junction (MCBJ) and conducting probe AFM (CP-AFM) techniques] and data analysis procedures used to extract conductance properties of molecular junctions. Using the results from several case studies, I will try to demonstrate a frame work for building structure-property correlations of metal|molecule|metal junctions at single and multi-molecular level. In the later part of my presentation, I will discuss the molecular conductance measurement results which will have direct consequences in electrocatalysis and energy research.

Thursday, Jul 5th 2018

11:30 AM (Tea/Coffee at 11:00 AM)

Auditorium, TIFR-H