Satyendra Nath Bose National Centre for Basic Sciences

Azadi Ka Amrit Mahotsav

Visitor, Associates and Students' Programme (VASP) presents Webinar Series on

Quantum Materials & Devices

19 OCT 2022
04:00 PM (IST)

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TITLE

Ionic Gating of 2D Semiconductors

ABSTRACT

In my talk I will discuss different classes of experiments performed in my group, in which we apply ionic gating to different 2D semiconductors. First, I will discuss in detail how ionic gating can be used as a precise quantitative spectroscopic technique, to measure band gaps of 2D semiconductors, as well as band offsets between different atomically thin materials. I will then present very recent experiments in which we succeeded to realize double gated ionic transistors, providing independent control of the accumulated charge density and of the applied perpendicular electric field. These devices allow an electric field to be applied perpendicularly to atomically thin 2D semiconductors that is so large (in excess of 3 V/nm) to completely quench the 1.6 eV band gap of bilayer WSe2. Our measurements show that, in the presence of such a large field, the conductance and valence band overlap, transforming the semiconductors in a semimetal (and possibly –according to theory –in a quantum spin Hall system). Depending on time, I will also discuss in some detail the use and the performance of solid state electrolytes for ionic gating.

SPEAKER

Professor Alberto Morpurgo, *University of Geneva*

Prof. Alberto Morpurgo is an expert in the investigation of the electronic properties of materials through the study of transport in nano-fabricated devices. He received his PhD in 1998 from the University of Groningen, where he worked on mesoscopic superconducting proximity effect and other aspects of mesoscopic physics (for which he was awarded the Miedema Prize for the best Dutch PhD thesis in condensed matter physics). After a two-year postdoctoral stay at Stanford University –where he mainly worked on carbon nanotubes- he moved to Delft University where he remained nearly nine years and became Associate Professor. In this period, next from starting his research on organic semiconductors, he worked on different aspects of quantum transport (Cooper pair splitting, Rashba two-dimensional electron gases, spintronics with carbon nanotubes) and started a successful research line on graphene electronics in 2006, just after the discovery of this material. Since Septembber 2008, Prof. Morpurgo is Professeur Ordinaire at the University of Geneva, where he is continuing his work on organic semiconductors and graphene, and starting new activities in the areas of topological insulators, oxide hetersostructures, and ionic liquid gating. - nanocomposites.

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