Southern Illinois University Carbondale

Department of Physics

PHYSICS DEPARTMENT SEMINAR

Sujoy Ghosh

- "SYNTHESIS, ELECTRONIC AND OPTO-ELECTRONIC TRANSPORT PROPERTIES OF ATOMICALLY THIN 2D LAYERS OF MoS_2, WSe_2 and $CuIn_7Se_{11}$"

Friday, October 21, 2016

4:00-5:00 p.m.

Neckers 440

- With the growing demand on enhanced functionality, and hence, size, speed, and power consumption becoming the most crucial factors for the next generation nano-electronic devices, innovation in materials synthesis and modification becomes imperative. Till date, the unabated growth of electronic technology has been mainly achieved by dimensional scaling of the conventional complementary metal-oxide-semiconductor (CMOS) technology. However, as the device scaling continues to grow further, it is becoming more and more challenging to overcome the enhanced short channel effects such as high leakage currents. Therefore, the conventional "Moore's Law" cannot be maintained further only by improving the conventional scaling technology alone, and eventually, additional new materials and transistor geometries are needed to address these challenges.
- In this regard, two-dimensional nanomaterials (such as graphene, h-BN etc.) , by the virtue of their ultrathin body thickness, not only provide the possibility of viable solutions to the above mentioned problems, but also pave the way for the actual realization of future generation proof-of–concepts devices such as ultrafast photo detectors, ultrathin field effect transistor(FETs), spin transistor etc. Transition metal dichalcogenides (TMDs), such as MoS_2, WSe_2, $MoSe_2$ and many others belong to this class of materials. In this presentation, I will talk about the overall electronic and opto-electronic transport properties of atomically thin MoS_2 synthesized via several different techniques such as mechanical exfoliation, CVD and chemical exfoliation. Further, I will present similar results on some other TMDs e.g. WSe_2 and finally I will also present a comprehensive comparison of these properties with the newly emerging group III-VI based ternary $CuIn_7Se_{11}$ based devices, which we are exploring.