

Michigan State University
Science at the Edge
Engineering Seminar

November 13th, 2015

11:30 a.m., Room 1400 Biomedical and Physical Sciences Building

Refreshments served at 11:15 a.m.

Ali Javey

Electrical Engineering and Computer Sciences
University of California, Berkeley

2D Semiconductor Electronics: Advances, Challenges and Opportunities

Abstract

Two-dimensional (2-D) semiconductors exhibit excellent device characteristics, as well as novel optical, electrical, and optoelectronic characteristics. In this talk, I will present our recent advancements in defect passivation, contact engineering, surface charge transfer doping, and heterostructure devices of layered chalcogenides. We have developed a defect repair/passivation technique that allows for observation of near-unity quantum yield in monolayer MoS₂. The work presents the first demonstration of an optoelectronically perfect monolayer. Forming Ohmic contacts for both electrons and holes is necessary in order to exploit the performance limits of enabled devices while shedding light on the intrinsic properties of a material system. In this regard, we have developed different strategies, including the use of surface charge transfer doping at the contacts to thin down the Schottky barriers, thereby, enabling efficient injection of electrons or holes. We have been able to show high performance n- and p-FETs with various 2D materials. Additionally, I will discuss the use of layered chalcogenides for various heterostructure device applications, exploiting charge transfer at the van der Waals heterointerfaces. I will also present progress towards achieving tunnel transistors using layered semiconductors.

Bio

Professor Ali Javey is the Conexant Systems Distinguished Professor at the University of California, Berkeley. He received a Ph.D. degree in chemistry from Stanford University in 2005, and was a Junior Fellow of the Harvard Society of Fellows from 2005 to 2006. He then joined the faculty of the University of California at Berkeley where he is currently a professor of Electrical Engineering and Computer Sciences. He is also a faculty scientist at the Lawrence Berkeley National Laboratory where he serves as the program leader of Electronic Materials (E-Mat). He is an associate editor of ACS Nano. He is the co-director of Berkeley Sensor and Actuator Center (BSAC), and Bay Area PV Consortium (BAPVC).

Professor Javey's research interests encompass the fields of chemistry, materials science, and electrical engineering. His work focuses on the integration of nanoscale electronic materials for various technological applications, including 2D electronics, flexible circuits and sensors, and energy generation and harvesting. His awards include Nano Letters Young Investigator Lectureship (2014); UC Berkeley Electrical Engineering Outstanding Teaching Award (2012); APEC Science Prize for Innovation, Research and Education (2011); Netexplorateur of the Year Award (2011);

IEEE Nanotechnology Early Career Award (2010); Alfred P. Sloan Fellow (2010); Mohr Davidow Ventures Innovators Award (2010); National Academy of Sciences Award for Initiatives in Research (2009); Technology Review TR35 (2009); NSF Early CAREER Award (2008); U.S. Frontiers of Engineering by National Academy of Engineering (2008); and Peter Verhofstadt Fellowship from the Semiconductor Research Corporation (2003).

For further information please contact Prof. Richard Lunt, Department of Chemical Engineering and Materials Science at
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Persons with disabilities have the right to request and receive reasonable accommodation. Please call the Department of Chemical Engineering and Materials Science at 355-5135 at least one day prior to the seminar; requests received after this date will be met when possible.