



Seminar

2D Materials, Heterostructures and Devices: Opportunities and Challenges

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10:00

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Abstract

Two-dimensional layered materials (2DLMs), such as graphene or molybdenum disulfide, represent an ideal 2D material system for exploring fundamental chemistry and physics at the limit of single atomic thickness. The covalently bonded atomic layers in 2DLMs are bound weakly to each other through van der Waals interactions, which offers considerable flexibility to isolate, mix and match individual atomic layers without the constraints of lattice and processing compatibility. It can therefore open up vast possibilities for nearly arbitrarily combining multiple materials and integrating distinct properties at the atomic scale, and thus enabling entirely new opportunities beyond the reach of existing materials. Here I will focus my discussion on exploring these 2D materials and their heterostructures as new platforms for the creation of a wide of electronic and optoelectronic devices with unique functions or unprecedented performance. Examples discussed include: high-speed transistors; a new design of vertical transistors for ultra-flexible electronics; and a series of of tunable photonic devices.

About the speaker

Dr. Duan received his B.S. Degree from University of Science and Technology of China in 1997, and Ph.D. degree from Harvard University in 2002. He was a Founding Scientist and then Manager of Advanced Technology at Nanosys Inc., a nanotechnology startup founded based partly on his doctoral research. Dr. Duan joined UCLA with a Howard Reiss Career Development Chair in 2008, and was promoted to Associate Professor in 2012 and Full Professor in 2013. Dr. C research interest includes nanoscale materials, devices and their applications in future electronics, energy technologies and biomedical science. A strong emphasis is placed on the hetero-integration of multi-composition, multi-structure and multi-function at the nanoscale, and by doing so, creating a new generation of integrated nanosystems with unprecedented performance or unique functions to break the boundaries of traditional technologies. Dr. Duan has published over 180 papers in leading scientific journals, and holds over 40 issued US patents. For his pioneer research in nanoscale science and technology, Dr. Duan has received many awards, including MIT Technology Review Top-100 Innovator Award, NIH Chdb New Innovator Award, NSF Career Award, Alpha Chi Sigma Glen T. Seaborg Award, Herbert Newby McCoy Research Award, US Presidential Early Career Award for Scientists and Engineers (PECASE), ONR Young Investigator Award, DOE Early Career Scientist Award, Human Frontier Science Program Young Investigator Award, Dupont Young Professor, Journal of Materials Chemistry Lectureship, International Union of Materials Research Society and Singapore Materials Research Society Young Researcher Award, the Beilby Medal and Prize, and Nano Korea Award.