MSE-Colloquium@NTU

10 December 2014, 4.00pm (refreshments will be served at 3.30pm)
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0D imperfections in 2D and 3D semiconductors

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About the Talk

Most functionalities of semiconductors are enabled by introduction of selected imperfections such as dopants and native defects. The understanding and database of the behavior of imperfections are relatively established for electronic properties of bulk semiconductors, but much less for non-electronic properties and in low-dimensional semiconductors. We seek to understand the behavior of point defects generally applicable to, for example, 2D semiconductors, as well as thermal, optical and thermoelectric properties.

In this presentation I will highlight some of our recent work in this area. In the first part I will discuss a general defects model that describes the electronic effects of native defects in semiconductors, followed by extension of the model to thermal and thermoelectric properties. In this context I will show the possibility of enhancing thermoelectric performance by intentionally introducing point defects. The second part will focus on effects of imperfections in the recently discovered 2D (monolayer) semiconductors, specifically, atomic vacancies and their interactions with gas molecules. It will be shown that again imperfections can be engineered to drastically improve certain materials performance.

About the Speaker

Professor Junqiao Wu received a B.S. from Fudan University and a M.S. from Peking University, China, both in Physics. He obtained a Ph.D. degree in Applied Physics from the University of California, Berkeley for work on nitride semiconductors and highly mismatched semiconductor alloys. He did postdoctoral research in the Department of Chemistry at Harvard University on phase transitions in transition metal oxide nanomaterials. He began his faculty appointment in the Department of Materials Science and Engineering at the University of California, Berkeley in 2006, and was promoted to tenured Associate Professor in 2012. His honors include the Berkeley Fellowship, the 29th Ross N. Tucker Memorial Award, the Berkeley Presidential Chair Fellowship, the U.S. NSF Career Award, the U.S. DOE Early Career Award, and the U.S. Presidential Early Career Award for Scientists and Engineers (PECASE). He has published more than 100 widely cited papers. The Wu group explores novel properties and applications of strongly correlated electron materials with reduced dimensions, phase transitions at the nanoscale, and optoelectronic, thermal and thermoelectric properties of semiconductor alloys and interfaces.

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