NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

School of Materials Science and Engineering

Seminar Topic:
Giant Photostriction in $MAPbI_3$ and Ferroelectric Photovoltaic Effect

Professor Wang Junling

Abstract

The past few years witnessed the explosion of research in photovoltaic cells based on hybrid lead halide perovskites, in particular, $CH_3NH_3PbI_3$. Despite tremendous progress in device performance, much less is known about the underlying mechanisms, except that carrier lifetime and diffusion lengths are astonishingly long in both thin films and single crystals.

We recently observed a giant photostrictive response, i.e., light-induced dimension change of more than 1200 ppm in $CH_3NH_3PbI_3$. This is very similar to what has been observed in conventional ferroelectric oxides. However, hybrid lead halide perovskites are not ferroelectric despite the large dipole of the CH_3NH_3 group. On the other hand, in conventional oxide perovskites, such as $BiFeO_3$ with strong ferroelectricity, we observed that photovoltaic response can be significantly improved by destabilizing the polarization. Combining these observations, we propose a model to explain the photostriction of $CH_3NH_3PbI_3$ and suggest a strategy to improve the photovoltaic property of conventional ferroelectric materials

Biography

Professor Wang Junling obtained his B.S. degree from Nanjing University in 1999 and Ph.D. degree from the University of Maryland, College Park in 2005. After spending about 2 years at Pennsylvania State University as a postdoctoral fellow, he joined Nanyang Technological University, Singapore as an Assistant Professor in 2006. In 2011, he was promoted to Associate Professor with Tenure.

Professor Wang Junling's research activities focus on multifunctional thin films and their applications in nanoelectronic and spintronic devices. In particular, he is interested in perovskites with the chemical formula of ABX_3. These materials possess a wide range of exotic properties, ranging from highly insulating to superconducting, from dielectric to ferroelectric and multiferroic. His pioneering work on multiferroic $BiFeO_3$ has attracted much attention in the field. His recent work also includes 2D layered materials which possess ferroelectric and/or magnetic properties. He has published over 120 papers in high impact journals, including Science, Nature Communications, NPG Asia Materials, Advanced Materials, PRB and APL, which have been cited more than 8000 times.

Through materials processing, structural analysis and electrical/magnetic characterization, he tries to understand the fundamental physics of perovskite materials at low dimensions to develop new materials/devices for next generation nanotechnology.

Wednesday, 7 February 2018 ǁ Time: 2:00 pm – 3:00 pm
Venue: MSE Meeting Room (N4.1-01-28)
Hosted by: Assistant Professor Tan Kwan Wee

Office of Associate Chair (Research)
Email: vd-mse@ntu.edu.sg
www.ntu.edu.sg/mse