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Webinar #26

Prof. Jian Zhou
School of Materials Science and Engineering
Xi'an Jiaotong University, China

Title: **Off-resonant Optomechanics Induced Phase Transitions: Theory and Computational Predictions**

Registration link: https://tinyurl.com/2w5jebbh
***Zoom details will be shared with the registered participants**

April 30th 2024,
11.30 am – 1.00 pm
Indian Standard Time

Short biography

Prof. Jian Zhou received his B.Sc. (2008) and Ph.D. (2013) at Peking University in Theoretical Mechanics, followed by Post doctoral Associate position at Virginia Commonwealth University and Massachusetts Institute of Technology (2013-2018). His current research interests mainly focus on first-principles calculations of nonlinear optics of condensed matter materials, photoinduced material structures, and topological phase transitions. So far, he has co-authored over 100 papers in PNAS, PRL, JACS, Nano Letters, etc. These papers have been cited ~ 7,000 times, with an h-index of 36, and was selected as "Elsevier Chinese Highly Cited Scholar" and "World's Top 2% Scientists". These works are sponsored by grants from the Chinese Young-Talent Program and National Natural Science Foundation of China.

Abstract

Optically induced phase transitions in various materials offer a great opportunity for contactless and non-invasive control of their geometries. They may be applicable in the next generation of information storage and memory technologies. While most prior works focus on resonant optical excitation (electron hopping from valence and conduction bands) of bulk and low-dimensional materials, it would be intriguing to explore off-resonant optical readout/write schemes with focused laser which is athermic. In this talk, I will discuss the potential to apply off-resonant light to trigger geometric phase transitions of ferroic and topological materials. We have developed a simple thermodynamic approach (akin to optical tweezer technique) to estimate the free energy variation of different phases under linearly polarized light. According to this theory, we apply first-principles density functional theory calculations to theoretically and computationally illustrate optomechanical strategies to inducing geometric phase transitions. Such ultrafast diffusionless martensitic phase transition holds the essence of next generation communication technology. Some of our theoretical predictions have been qualitatively and quantitatively verified in high resolution experiments.

Panelist

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Department of Chemistry, Center of Quantum Information Science and Technology (QIST)
University of Malaya
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