



Old Dominion University

Department of Physics

Colloquium

Tuesday February 27, 2018

"Hyperbolic phonon polaritons in hexagonal boron nitride"

Siyuan Dai

University of Texas at Austin

Abstract: Hyperbolic systems where principal components of the permittivity tensor have opposite signs enable a series of advances in nanophotonics including negative refraction, subdiffractional imaging and super-Planckian thermal emission. While hyperbolicity was previously achieved with metamaterials by artificial fabrication, we discovered natural hyperbolicity in hexagonal boron nitride (hBN) due to anisotropic phonons in the mid-infrared. The hyperbolicity in phononic hBN is immune to electronic losses as directly revealed in nano-imaging of highly confined and low-loss hyperbolic phonon polariton waves. These virtues allow subdiffractional focusing and imaging via hBN slab with a record high resolution. By stacking hBN and graphene in the form of van der Waals heterostructure, we have demonstrated the dynamic tuning of hyperbolic response through plasmon-phonon hybridization. Furthermore, we have accomplished a high degree manipulation and steering of polaritonic waves as well as imaging concealed inner structure in a fashion of polariton tomography.

Biosketch: Siyuan Dai received his B.S. degree from University of Science and Technology of China in 2011 and Ph.D. from University of California, San Diego in 2017. He is now a Postdoc Research Fellow at the University of Texas at Austin. His current research focuses on nanophotonics & light-matter interactions in low dimensional materials.

Presentation: **OCNPS 200 @ 12:30 pm**
Refreshments: **OCNPS Atrium @ 12:15 pm**

All interested persons are cordially invited to attend.