Nebraska Center for Materials and Nanoscience

2019 Fall Seminar Series

Professor Wei Bao

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Nano-photonic in the visible: imaging, trapping, and BEC lasing

The ability to probe and control photon at the nanometer scale not only advances frontiers of fundamental science, but also provides critical prerequisites to applications in imaging, sensing, catalysis, energy harvesting, and more. Exploiting and enhancing the originally weak light-matter interactions via novel photonic structures, we will be able to sense chemical species at single molecule levels, to devise better imaging tools, to transfer data more efficiently at higher speed.

In this talk, I will first describe a simple and general nano-optical device developed during my Ph.D., called campanile probe, which lay groundwork for generally-applicable nano-optical studies. Two examples will be discussed, where we cross the boundary from insufficient to sufficient spatial resolution beyond optical diffraction limit and perform optical hyperspectral imaging of luminescence heterogeneity along InP nanowires and synthetic monolayer MoS2. Then I will move further and finish the imaging efforts by showing our newly developed hyperbolic metamaterials approach for fast imaging of biological samples with nanometer resolution. Next, I will focus on our recent experimental demonstration of stable Casimir equilibia, where the quantum fluctuation induced electromagnetic fields between two surfaces is utilized to achieve the first of the kind stable Casimir quantum trapping with zero input energy. Last but not the least; I will discuss how to use high quality optical cavities to enhance the strength of light-matter interaction into the strong coupling regime. The formation of the coherently coupled cavity exciton-polariton as well as the Bose Einstein condensation of these bosonic quasiparticles will be shown.

Dr. Wei Bao is an Assistant Professor in University of Nebraska-Lincoln. He was a postdoctoral researcher in Prof. Xiang Zhang's lab at the University of California, Berkeley from 2015-2019. Previously he earned B.S. in Physics (minor in Chemistry) at Peking University in 2009 and M.S. in Mechanical Engineering at UCLA in 2010. Wei received Ph.D. in Materials Science and Engineering at University of California, Berkeley under the supervision of Prof. Miquel Salmeron and Prof. P. James Schuck in 2015. His Ph.D. work in nanoscale spectroscopic imaging of optoelectronic materials has led to several awards including MRS Graduate Student Gold Award, Dorothy M. and Earl S. Hoffman Scholarships, Ross N. Tucker Memorial Award, and a R&D 100 Award. His postdoc research focused on a broad spectrum of the nano-photonic areas such as metamaterials for bioimaging, quantum Casmir trapping, quantum polaritonic materials and devices.

NCMN

September 25, 2019 | 4 p.m. | 136 Jorgensen Hall
Refreshments in 1st floor vending area at 3:45
Host: Christian Binek
Department of Physics & Astronomy