University of Miami, Physics Department Colloquium

Date: Wednesday, Feb 1, 2023
Time: 4:00 pm – 5:00 pm
Location: Wilder Auditorium – Rm 112, Knight Physics Building

Exploring Materials Space at the Molecular Scale for Optoelectronics, Energy, and Quantum Applications

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Abstract

Molecules - the smallest unit of matter - have been playing a pivotal role in today's materials science, nanotechnology, and quantum science. The capability to manipulate physical and chemical behaviors of single molecules and understand how they respond to external stimuli represents important opportunities for optoelectronics, energy, and quantum applications. In this colloquium, I will talk about my recent studies on developing experimental tools to probe quantum transport in molecular-scale systems and further leveraging them to address critical challenges in molecular electronics, energy conversion, and nanosensing. First, I will introduce strategies to construct molecular-scale logic devices, such as diodes and transistors. Second, I will discuss my work on developing new experimental approaches to interrogate thermoelectric energy conversion in molecular junction devices, which points to new opportunities for energy harvesting and refrigeration. Third, I will describe how single molecules can be used as nanoscopic quantum sensors to directly access plasmonic hot carriers and how the experimental approach developed in my work will enable systematic study of plasmon-driven processes in many plasmonic and nanophotonic systems. Finally, I will give an overview for my future research directions.

Bio

Dr. Kun Wang is an Assistant Professor of Physics and Chemistry at Mississippi State University. He received his Ph.D. in physics at the University of Georgia in Dec 2016 and completed his postdoctoral training at the University of Michigan in Aug 2020. His research focuses on developing experimental approaches to probe and understand quantum transport and energy conversion at the atomic and molecular scale. The goal of his research is to leverage the quantum properties of molecular-scale materials to address grand challenges in optoelectronics, energy harvesting, and sensing. He has published 45+ journal articles, with 15 of them in widely circulated journals, such as Science, Nature Nanotechnology, Nature Chemistry, Nature Communications, JACS, Angew Chem, and Adv Func Mater. He is the recipient of several prestigious awards, including the DOE Early Career Award, JMCC Emerging Investigator, MRS Communications Early Career Materials Researcher, and MRS Graduate Student Award.