

UCSD NANOENGINEERING/CHEMICAL ENGINEERING
Virtual **SEMINAR SERIES**

Wednesday, November 17, 2021

Seminar Presentation: 11:00am - 12:00pm PDT

Zoom Seminar

See link below to register

“Light-Matter Interaction in Flatland: Excitonic Physics in 2D”**Sufei Shi, PhD***Associate Professor**Chemical and Biological Engineering Department
Rensselaer Polytechnic Institute*

Abstract: The emergence of the two-dimensional (2D) transition metal dichalcogenides (TMDCs) ushers in a new chapter in excitonic physics. In monolayer TMDCs, the reduced screening enhances the Coulomb interaction and gives rise to strongly bound excitons with the binding energy of hundreds of meV. In addition, the valley degree of the freedom of the exciton is robust and can be accessed through chiral light. For the past few years, we have advanced our understanding of the valley contrasting excitonic physics in monolayer WSe₂ and associated van der Waals (vdW) heterostructures. In this talk, I will discuss our identification of biexciton, charged biexciton, dark exciton, dark trion, exciton-phonon replica, and emerging exciton-phonon interaction in BN encapsulated monolayer WSe₂. By applying a large out-of-plane magnetic field, we have also investigated the Landau quantization of exciton and exciton-phonon interaction in monolayer WSe₂. With a newly developed photocurrent spectroscopy technique, we were able to resolve the Rydberg exciton state up to 11s in WSe₂. We have also studied van der Waals heterostructure devices based on TMDCs, demonstrating a tunable exciton annihilation to exciton funneling transition in the MoSe₂/WS₂ hetero-bilayer device and giant Zeeman splitting of singlet and triplet exciton in the MoSe₂/WSe₂ hetero-bilayer device. Recently, we have identified various correlated insulating states in the WS₂/WSe₂ heterostructure, including Mott insulating state and generalized Wigner crystal states. We are currently exploring this fascinating platform to understand and control the correlated states in 2D.

Biosketch: Sufei Shi is currently an Associate Professor in the Chemical and Biological Engineering Department at Rensselaer Polytechnic Institute. He obtained his Ph. D with Prof. Dan Ralph in Physics from Cornell University in 2012, and he did his postdoc work with Prof. Feng Wang at UC Berkeley from 2011 to 2015. He was awarded ACS Petroleum Research Fund Doctoral New Investigator award in 2018 and the NSF Career award in 2020.

Register to receive a zoom link the day of the seminar:

<https://docs.google.com/forms/d/1O7wWxX7-UAFJZ4IHTtGyp2vC0U2luSFLopX3KY9kdnE>