

# PHYSICS COLLOQUIUM

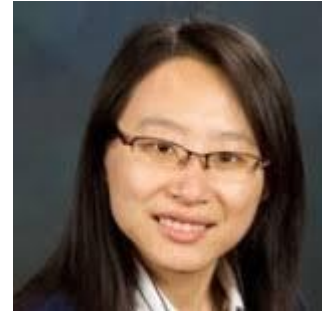
THURSDAY

OCTOBER 6, 2022

## Carrier Transport in 2D Perovskite Semiconductors and its Application in High Performance X-ray Sensing

Ruddlesden–Popper (RP) phase 2D perovskites are recent emerging materials for photovoltaics, light emitting diodes and radiation sensing. RP perovskites are nanostructured material in a naturally formed quantum well geometry, that have been integrated in functional devices, featuring with greatly extended operational lifetimes. Recently, it is found that the carrier transport properties are pretty unique in the 2D RP perovskite crystal and thin films. A luminescent “edge state” was discovered that greatly impact the carrier transport and recombination processes.

In this talk, I will first discuss the unique carrier transport properties of 2D perovskite single crystals. Using a scanning photocurrent microscopy technique, we probed an unusually long carrier diffusion length in the RP perovskite single crystals. We attributed it to the intrinsically existing shallow trap that extended the carrier lifetime via trapping/de-trapping process. Next, I will talk about the 2D RP perovskites in radiation detector applications. We integrated the quasi-2D perovskite polycrystalline film into photodiodes and achieved high X-ray sensing performance. Very interestingly, we observed an ultra-long electron lifetime in the quasi-2D perovskite films. As a consequence, a sensitivity amplification effect was observed. I will discuss the mechanism and the experimental evidences that are responsible for the observed amplifications.



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**4:00 pm - Olin 101\***

*\*Link provided for those unable to attend in person.*

Note: For additional information on the seminar  
or to obtain the video conference link, contact

[wfuphys@wfu.edu](mailto:wfuphys@wfu.edu)

**Reception at 3:30pm - Olin Entrance**



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