**Dissertation Defense Announcement**

**Candidate**: Zhipeng Ye

**Chair of Committee**: Dr. Rui He

**Committee Members**: Dr. Hongxing Jiang, Dr. Jingyu Lin

**Title of Dissertation**: Raman spectroscopy of bulk and thin layers of van der Waals magnet CrI3

# Abstract:

Van der Waals (VDW, 2D) magnets have drawn a lot of attention because of their exotic fundamental properties and significant potential applications in spintronic devices and data storage. Among various family members of 2D magnets, chromium triiodide (CrI3) is interesting because it hosts Ising ferromagnet down to the monolayer limit and it shows interlayer antiferromagnetism in few-layer crystals. In this dissertation research, we use linear and circularly polarized Raman spectroscopy, combined with temperature and magnetic field dependent Raman measurements, to probe lattice, charge, and spin excitations in three-dimensional (3D) bulk and few-layer (2D) CrI3. We revealed a new combined state of layered antiferromagnetic (AFM) and ferromagnetic (FM) that coexist in 3D bulk CrI3 below the magnetic onset temperature that the layered AFM exists in the surface layers, and the FM exists in the deeper bulk layers. We discovered magnetism-related phonons with anti-symmetric Raman tensors and from Davydov-splitting of Ag phonon in monolayer CrI3. We proposed a distinctive layered-magnetism-assisted Raman effect in *N*-layer CrI3. We observed periodic broad modes went up to the 8th order in Raman spectra from 2D CrI3, which are attributed to the polaronic character of excitons. Our studies developed Raman methods for studies of diverse 2D magnetic materials.

**Date: February 21, 2022**

**Time: 2:00-3:00pm Central Time**

**Room No. ELECE 221**

**Zoom Link:**

https://texastech.zoom.us/j/96893597797?pwd=R2l4ajV1Q05rZzdhdDM5aE8ycVBkdz09

Meeting ID: 968 9359 7797

Passcode: 527618