

CONDENSED MATTER THEORY SEMINAR

Subject: **Spins, symmetry, and structure of a two-dimensional topological semimetal**

Speaker: **Associate Professor Adam Wei Tsen (Department of Chemistry, University of Waterloo Ontario/Canada)**

Date & time: **Friday, 3rd of May 2024 at 3:15 p.m.**

Venue: **Room 01.114**

Abstract:

Low-symmetry two-dimensional (2D) topological materials such as MoTe₂ host efficient charge-to-spin conversion (CSC) mechanisms that can be harnessed for spin-orbit torque switching of nearby magnets in advanced spintronic devices. However, the nature of the various CSC mechanisms and their correlation with underlying crystal symmetries remain unsettled. I will discuss our recent results using local spin-sensitive electrochemical potential measurements to directly probe the spatially dependent nonequilibrium spin accumulation in MoTe₂ across various sample locations and thicknesses. We uncover a series of conventional and unconventional spin polarizations that develop in both the sample bulk and edges with decreasing thickness. Using ab initio calculations, we construct a unified understanding of all the observed CSC components in relation to the material dimensionality and stacking arrangement. Our findings illuminate previous CSC and spin-orbit torque results on MoTe₂ and have important consequences for the design of future spintronic devices utilizing this 2D topological material.