

# Physics Department Seminar

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Tuesday February 4th, 2025  
3pm, MC H313

### Preparation and Polarized Raman Scattering Characterization of a Vanadium Based Misfit Chalcogenides

Compounds  $[(MX)_{1+\delta}]_m[(TX_2)_n]$  are two-dimensional misfit layer dichalcogenides characterized by alternating layers of MX (Rock Salt structure) and  $TX_2$  (Transition metal dichalcogenide) where M can be elements such as Sn, Pb, Bi or rare earth metals; X can be S or Se; and T can be Ti, V, Nb, Ta or Cr. This study focuses on synthesizing single crystals of  $[(SnSe)_1 + \delta]_m[(VSe_2)_n]$  using chemical vapor transport with anhydrous  $NH_4Cl$  as the transport agent. Among the various by-products, mixed crystals containing thin layers of  $[(SnSe)_{1 + \delta}]_m[(VSe_2)_n]$  were successfully created, displaying monolayer, bilayer, and trilayer misfit compounds. Topographical and elemental analysis using Scanning Electron Microscopy (SEM) and Energy-Dispersive X-ray spectroscopy (EDS) confirmed the stoichiometry of the synthesized compounds from which their layering arrangement was deduced. Further, the polarization-dependent vibrational modes of the parent compound  $VSe_2$  and monolayered  $[(SnSe)_1 + \delta]_m[(VSe_2)_n]$  ( $m, n = 1$ ) were investigated through optical Raman spectroscopy measurements.