

Title: Molecular Engineering of 2D Nanomaterials for Functional Interfaces**Abstract:**

Two-dimensional (2D) nanomaterials, such as MXenes, have emerged as highly versatile candidates for applications ranging from sensing to energy storage, due to their unique electronic properties and tunable surfaces. A key challenge is to bridge their excellent nanoscale properties into functional thin films and hybrid systems. This internship project will explore general strategies for tailoring interfacial interactions in layered 2D materials through molecular approaches. Students will gain insight into how simple chemical modifications influence stability, structure, and basic electronic properties of nanomaterial films. The work connects concepts from chemistry, physics, and materials science and introduces participants to the interdisciplinary field of functional nanomaterials.

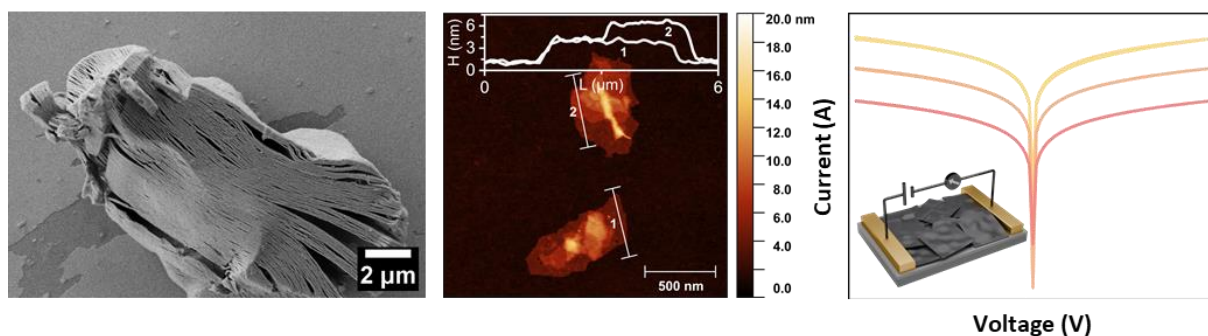


Figure: (left) Scanning electron micrograph (SEM) of neat MXenes; (middle) Atomic force micrograph (AFM) of single and bi-layer functionalized MXenes; (right) current-voltage curves of MXene-based thin-films.

Skills that you should already have:

- knowledge in physical chemistry, physics, and or materials science
- Interest in nanomaterials and thin films.
- Willingness to work in an interdisciplinary laboratory environment

Skills that you will acquire during the internship:

- Introduction to MXenes and their surface chemistry
- Experience with common materials processing and thin film preparation techniques
- Training in structural and electronic characterization methods
- Understanding of the link between molecular design and macroscopic material properties