Department of Materials Science and Engineering

Thesis Defense

May 30th 2025, at 12.00 pm

Location: Hill Conference Room

drexel.zoom.us/j/7643698135

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Infrared properties and characterization of MXenes

Abstract

Two-dimensional MXenes have emerged as a class of promising materials with a wide range of potential applications, driven by their unique properties such as tunable surface chemistry, excellent electronic conductivity, and exceptional mechanical strength. While their electronic and mechanical properties have been extensively studied, a comprehensive understanding of their infrared (IR) properties remains relatively unexplored. The work aims to investigate the fundamental IR properties of MXenes, including their absorption, reflection, and emissivity, enabling the rational design of MXenes with tailored IR properties for diverse applications. The research will employ a multi-pronged approach, and various IR techniques to understand vibrational dynamics, chemical reactivity, and interfacial phenomena in MXenes and use predictive models to link MXene composition to the observed IR behavior. By systematically investigating the influence of key factors such as MXene composition (transition metal, number of layers, surface terminations), and environmental conditions on their IR behavior, the findings of the research will significantly advance understanding of the fundamental IR properties of MXenes, paving the way for their integration into a wide range of IR-based technologies and contributing to the development of novel materials with enhanced IR functionalities.