

## Abstract:

Effectively dissipating the excess heat generated by electronic devices is crucial to protect critical components from thermal damage. Micro-sized air gaps, caused by surface roughness between mechanically mated surfaces, hinder heat dissipation by preventing physical contact and thus impeding heat conduction. To address this, thermal interface materials with high thermal conductivity and good mechanical flexibility are used to fill these gaps. This project aims to develop graphene-based thermal interface materials that offer high thermal conductance, flexibility, and resistance to acids and high temperatures for NASA's electronic devices and power systems. The team employs advanced numerical modeling to optimize the hierarchical structure of graphene, achieving superior thermal and mechanical performance.