



CENTER FOR HYBRID, ACTIVE,
AND RESPONSIVE MATERIALS

CHARM
at the UNIVERSITY OF DELAWARE

CHARM's interdisciplinary research groups work towards harnessing the integrated power of computational design, innovative synthetic and manufacturing processes, and nanoscale characterization to unlock the substantial promise of complex, synthetic materials at multiple length and time scales.

IRG1: PAMs



Peptide Active Materials

IRG1 looks to harness the complexity of polyaminoacid macromolecules. With their exquisitely folded nanostructure, these proteins produce specific function encoded in the amino acid sequence. The restricted toolbox of natural and mutated structures, however, limits design of non-natural materials. IRG1 envisions using computational design to overcome this challenge, allowing for the creation of synthetic peptides that fold and assemble into rigid, protein-like building blocks to produce designed nanostructure (Aim 1), motion (Aim 2), and simple machines (Aim 3).

IRG2: HQ-METs



Hybrid Quantum Materials

Terahertz (THz) electromagnetic radiation could be a powerful tool for applications like biomedical and security screening. However, the development of THz technologies faces a materials challenge: there is no single material that is simultaneously a good source, detector, and carrier of THz frequency excitations. IRG2 aims to understand and control materials integration to allow for the transduction of THz excitations across interfaces (Aim 1), the control of emergent THz functionality (Aim 2), and the creation of hybridized states with fundamentally new properties (Aim 3).



CHARM is a hub of interdisciplinary integration and infrastructure development to drive cross-cutting materials innovation. Using its materials science platform at the University of Delaware, CHARM is committed to training a new generation of innovators with focused K-12 and undergraduate education programming.

FORGES OUTREACH



Foundations for Outreach & Recruitment of Great Engineers & Scientists

CHARM hosts a summer High School program that is open to all local high school students interested in STEM. For **one week**, students rotate through various science departments and industry partners at the University of Delaware, participating in hands-on STEM activities. FORGES participants also tour labs, observe demonstrations, and discuss career and academic paths with undergraduates, graduate and faculty.

REU OPPORTUNITIES



Materials Research Experiences for Undergraduates

Our REU program is a full-time, 10-week summer research opportunity in innovative materials science and engineering. Participants in this highly collaborative, interdisciplinary program stay on UD's main campus and are fully immersed in the research laboratories of CHARM faculty, including labs from the Departments of Materials Science & Engineering, Chemistry & Biochemistry, Chemical & Biomolecular Engineering, and Physics & Astronomy.