Sandia National Laboratories

Sandia CINT Summer Research Program: 2022 Needs

The CINT Summer Research Program provides undergraduate and graduate students with hands-on exposure to Sandia research and facilities. This summer, Sandia is looking to fund students who can support projects in the areas listed below:

Quantum Materials Systems

1. **QMS-1 Assessing ion irradiation effects on materials and devices through electrical measurements:** Device fabrication and electrical measurements on ion irradiated VOx devices for neuromorphic computing
   CINT scientist: T.-M. Lu
2. **QMS-2 Understanding the roles of defects in transition metal dichalcogenide materials and devices:** Measuring and quantifying defects in 2D materials using electron spin resonance.
   CINT scientist: T.-M. Lu
3. **QMS-3 Quantum-sensed NMR for localized spin sensing:** Develop a custom low temperature electron spin resonance (ESR) capability and to use ESR to characterize quantum materials at ultra-low temperatures
   CINT scientist: M. Lily

Soft/bio Nanomaterials

1. **SBCN-1 Self-Healing Polymers Using van der Waals Interactions:** Molecular dynamics simulations and analysis of self-healing highly branched polymers using a coarse-grained model.
   CINT scientist: A. Frishknecht
2. **SBCN -2 Understanding a protein lanmodulin that is capable of selective binding of different Ln series elements, and recapitulating those key features into a synthetic system that can be used to harvest rare Earth elements:** Engineering and expressing mutants of the protein to better understand how the nanoscale chemistry enables the high selectivity and binding.
   CINT scientist: G. Bachant
3. **SBCN -3 Protein carbonic anhydrase and its application in carbon sequestration technologies:** Characterize the performance of various mutant enzymes for the either ability to work at high temperatures and in the presence of gases associated with coal fire emissions.

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CINT scientist: G. Bachant

4. **SBCN-4 Molecular electronic structure database for machine learning:** Perform data mining on molecular structures using machine learning.
   CINT scientist: M. Stevens
5. **SBCN-5 Gas uptake and flow through zeolites:** Running gas adsorption experiments on nanostructured zeolites and automating data acquisition with LabView programming
   CINT scientist: J. Greathouse

Nanophotonics and optical nanomaterials

1. **NPON-1 Nanoantenna designs**
   CINT scientist: W. Luk
2. **NPON -2 Nanoscale long-wavelength infrared detector development:** This project involves a micro/nanofabrication, and electrical, thermal, and mechanical system design. We're predicting device behavior and performance using FEA simulations, and we're fabricating devices and testing them.
   CINT scientist: T. Harris
3. **NPON -3 Superconducting electronic devices, for quantum information processing.**
   CINT scientist : T. Harris
4. **NPON -4 Topological photonics: Approximations by generalized atomic limits for finite systems with non-trivial local** topology. This will involve modifying proofs in operator theory about almost commuting matrices to respect symmetries that corresponds to sublattice or time-reversal symmetry.
   CINT scientist: A. Cerjan
5. **NPON -5 Topological photonics: Structured matrix functions to analyze topological Floquet systems.**
   CINT scientist: A. Cerjan

In-situ Nanomechanics

1. **ICNM-1 Informing Component Response to Combined Environmental Extremes by a Platform Redesign:** Analysis of SEM and TEM data utilizing both conventional of AI/ML techniques
   CINT scientist: K. Hattar
2. **ICNM -2 Informing Component Response to Combined Environmental Extremes by a Platform Redesign:** Experimental studies exploring coupled extreme environments utilizing the one-of-a-kind tools for nanoscale studies of high temperature, mechanical testing and radiation environments, as well as the development of new advanced in-situ SEM and TEM techniques for coupled environments.
   CINT scientist: K. Hattar
3. **ICNM -3 Combining EBSD/TKD and nanomechanical testing as tools to explore nanomechanical behaviors.**
   CINT scientist: B.L. Boyce
4. **ICNM -4 AFM-based testing of 2D materials:** Performing AFM-based testing of the mechanical response of 2D materials
   CINT scientist: F. Delrio
5. **ICNM -5 Phase transformation in 2D materials:** Performing atomistic modeling of 2D materials to develop an understanding of load-induced phase transformations.
   CINT scientist: F. Delrio
6. **ICNM -6 Machine learning for microscopy data of energetics materials:** Quantitative analysis of energetic material microstructures based on scanning electron microscope images. Characterization changes in various microstructure metrics with differences in processing to support development of preparation-structure-property relationships.
   CINT scientist: R. Dingreville