PREP Research Associate

This position is part of the National Institute of Standards and Technology (NIST) Professional Research Experience Program (PREP). NIST recognizes that its research staff may want to collaborate with researchers at academic institutions on specific projects of mutual interest and, therefore, requires those institutions to be recipients of a PREP award. The PREP program involves staff from a wide range of backgrounds conducting scientific research across various fields. Individuals in this position will perform technical work supporting the collaboration's scientific research.

Research Title:
Scanning probe instrumentation and metrology specialist

The work will entail:
This work is on the frontier of experimental condensed matter physics, and combines several experimental modalities, including scanning tunneling microscopy, atomic force microscopy, electron transport, and electron spin resonance. For more information about the group, see: https://www.nist.gov/pml/nanoscale-device-characterization-division/nanoscale-processes-and-measurements-group/scanning.

U.S. Citizen Preferred

Key responsibilities will include but are not limited to:

- Develop novel and cutting-edge instrumentation for scanning probe microscopy.
- Support ongoing operations of scanning probe microscopy experiments.
- Presenting results at internal meetings, and occasional meetings with external stakeholders.
- Ensuring that results, protocols, software, and documentation have been archived or otherwise transmitted to the larger organization.

Qualifications

- A PhD degree in experimental condensed matter physics, or a related field.
- Five years of experience in designing and building scanning tunneling microscopes (STM) and atomic force microscopes (AFM) operating in ultra-low temperatures (10 mK), ultra-high vacuum (UHV), and high magnetic fields (0-15 T). This experience should include the following sub-fields:
  A. Building piezo-electric motors and piezo-electric scanners operating from 10 mK to 300 K.
  B. Designing and building multi-contact sample and probe holders.
  C. Assembling AFM qPlus sensors.
  D. Preparation of atomically sharp probe tips for STM and AFM measurements.
  E. Characterization and treatment of STM probe tips by using a field ion microscope (FIM).
  F. Detailing wiring of STM and AFM modules with thorough documentation of assembly and wiring details.
  G. Experience in testing and debugging STM and AFM instruments with respect to electrical and vibrational noise.
- Five years of experience in integrating multi-modal measurements in a single system, including STM, AFM, and electrical transport measurements in a single system operating at ultra-low temperatures and in UHV.

- Five years of experience in the design and construction of cryogenic preamplifiers for STM and AFM measurements.
- Five years of experience in designing and building UHV vacuum chambers and UHV transfer systems.
- Five years of experience in the wiring and operation of dilution refrigerators.
- Five years of experience in building gas handling systems for dilution refrigerators.
- Five years of experience in design, fabrication, and testing of Radio Frequency (RF) filters to operate in a dilution refrigerator at ultra-low temperatures and in UHV.
- Five years of experience in molecular beam epitaxy growth of materials, including 2D materials, van der Waals materials, and superconductor materials.
- Research experience in 2D materials, including graphene-based heterostructures and related materials, with at least one related publication.
- Research experience in superconducting materials with at least one related publication.
- Five years of experience in developing and programming LabVIEW VIs for spectroscopic mapping of STM and AFM measurements on the Nanonis SPM control system platform.
- Five years of experience in developing and programming LabVIEW VIs for instrument control, including dilution refrigerator and superconducting magnet systems.
- Five years of experience in Python programming for instrumentation control and data analysis.
- Five years of experience in 3D CAD design using Creo Elements Direct Modeling software.
- Five years of experience in maintaining helium recovery systems and in the operation and maintenance of helium liquefiers.
- Five years of experience in handling cryogens, including liquid helium transfer.
- Five years of experience in 2D and 3D scientific illustration for publication in journals and public media.

Privacy Act Statement

Authority: 15 U.S.C. § 278g-1(e)(1) and (e)(3) and 15 U.S.C. § 272(b) and (c)

Purpose: The National Institute for Standards and Technology (NIST) hosts the Professional Research Experience Program (PREP) which is designed to provide valuable laboratory experience and financial assistance to undergraduates, post-bachelor's degree holders, graduate students, master's degree holders, postdocs, and faculty.

PREP is a 5-year cooperative agreement between NIST laboratories and participating PREP Universities to establish a collaborative research relationship between NIST and U.S. institutions of higher education in the following disciplines including (but may not be limited to) biochemistry, biological sciences, chemistry, computer science, engineering, electronics, materials science, mathematics, nanoscale science, neutron science, physical science, physics, and statistics. This collection of information is needed to facilitate administrative functions of the PREP Program.

Routine Uses: NIST will use the information collected to perform the requisite reviews of the applications to determine eligibility, and to meet programmatic requirements. Disclosure of this information is also subject to all the published routine uses as identified in the Privacy Act System of Records Notices: NIST-1: NIST Associates.

Disclosure: Furnishing this information is voluntary. When you submit the form, you are indicating your voluntary consent for NIST to use of the information you submit for the purpose stated.