PREP Research Associate
CHIPS Funded Project

This position is part of the National Institute of Standards (NIST) Professional Research Experience (PREP) program. NIST recognizes that its research staff may wish to collaborate with researchers at academic institutions on specific projects of mutual interest, and thus requires that such institutions be the recipient of a PREP award. The PREP program requires staff from a wide range of backgrounds to work on scientific research in many areas. Employees in this position will perform technical work that underpins the scientific research of the collaboration.

Research Title:
Reliability Testing and Failure Analysis for Advanced Semiconductor Packaging

The work will entail:
The Infrastructure Materials Group at the National Institute of Standards and Technology seeks a researcher with demonstrated knowledge of reliability testing and failure analysis for advanced semiconductor packaging, with strength in polymeric materials and multilayer interfacial mechanics relevant to CHIPS applications. The successful candidate will integrate reliability modeling with experimental techniques to investigate how environmental stressors accelerate aging, property degradation, and failure mechanisms in complex package architectures. The position requires expertise in mechanical characterization of thin-film and multilayer interfaces, including adhesion and failure onset, as well as a deep understanding of polymer structure-property relationships and failure analysis.

If selected, the researcher will play a significant role in NIST projects focused on reliability testing and failure analysis for advanced packaging. Collaborating with NIST staff and external partners, the researcher will design and execute experimental research to assess the impact of stress on the mechanical and thermal properties of polymeric materials and interfaces used in advanced packages. The research will aim to identify and quantify failure mechanisms, such as interfacial delamination, cohesive cracking, and fatigue damage, and generate high-quality datasets for model calibration and validation. These datasets will, in turn, inform the development of more accurate long-term reliability prediction frameworks. Ultimately, the outcomes of this research will provide a scientific foundation for the development of test methods, materials selection, and quality assurance protocols for the semiconductor packaging industry, driving advancements in product reliability and performance.

Key responsibilities will include but are not limited to:
- Develop and validate new test methods for multilayer adhesion in advanced packaging assemblies.
- Characterize the thermal and mechanical properties of materials and interfaces before, during, and after accelerated aging.
- Conduct in-situ environmental digital image correlation (DIC) to quantify package/assembly deformation during thermal cycling.
- Develop advanced failure-analysis methods using microscopic and X-ray-based techniques for complex package structures.
- Perform finite element analysis to simulate package deformation/warpage under thermo-mechanical loading, informing the development of more accurate reliability models.

- Create comprehensive datasets of material and interface properties, both pre- and post-aging, to support reliability modeling.
- Communicate results through conference presentations, peer-reviewed publications, and technical reports.

Qualifications

- Live in the United States
- Ph.D. in Materials Science / Mechanical Engineering / Electrical Engineering /Physics/Chemical Engineering/Chemistry
- Strong oral and written communication skills
- Experience in polymeric thin film adhesion
- Experience in advanced semiconductor packaging is preferred
- U.S. citizenship is preferred

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. By applying to a CHIPS-funded PREP opportunity, you also acknowledge that participation in the project requires signing a Non-Disclosure Agreement (NDA) prior to beginning any work.