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 recipients 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:
Metrology of Materials, Surfaces, and Processes for Semiconductor Advanced Packaging

The work will entail:
We are seeking a highly motivated researcher to advance measurement science for next-generation hybrid advanced packaging. This role will contribute to the development of novel surface and materials metrology methods that enable predictive control of bonding processes and heterogeneous integration. The successful candidate will work within the Nanophotonics project to help establish the quantitative foundations needed for reliable, high-density microelectronic assembly, supporting national efforts to strengthen U.S. leadership in semiconductor manufacturing and advanced packaging technologies.

The main responsibilities are:

- Fabricate Si, SiO_2, SiN chips for flip-chip fusion and hybrid bonding experiments.
- Optimize and maintain fabrication processes, including chip handling and cleaning protocols.
- Perform surface and thin film characterization of chips used for flip-chip bonding experiments. Characterization techniques include AFM, optical inspection, IR transmission microscopy, spectroscopic ellipsometry, SEM and others.
- Closely coordinate with teams performing materials characterization, bond strength testing and modeling.

<u>Qualifications</u>

Necessary Qualifications:

- PhD in physics, electrical engineering, materials science, or a related field.
- Significant experience, including process development, in semiconductor device fabrication, including wafer cleaning and handling, lithography mask layout, optical or electron beam lithography, RIE, ICP RIE, PVD, CVD, ALD, wet etching, as well as characterization techniques such as ellipsometry, profilometry, optical microscopy, SEM and AFM.
- Proficiency in programming languages, such as Python, Java or Matlab.
- Excellent communication skills and ability to work effectively in a team.

Desirable Qualifications:

- Experience with flip-chip fusion and/or hybrid bonding processes
- Experience with XPS, UPS, FTIR, Raman, photoluminescence, other relevant modalities of spectroscopy

- Familiarity with silicon electronic, photonic or optoelectronic device processing
- Experience with custom infrared microscopy and optical measurement setups.
- Experience with III-V compound semiconductor process development and device fabrication.
- Experience with optoelectronic (e.g. semiconductor lasers, detectors, multi-functional photonic integrated circuits, etc) device characterization.
- Experience with photonic and optoelectronic device simulation software, such as Lumerical, Tidy3d, or COMSOL.
- US citizenship strongly preferred

The successful candidate will work in a highly collaborative research environment and have access to state-of-the-art facilities for device fabrication and characterization. The position is available immediately, and the initial appointment is for two years, with the possibility of extension based on performance and availability of funding.

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 the 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.