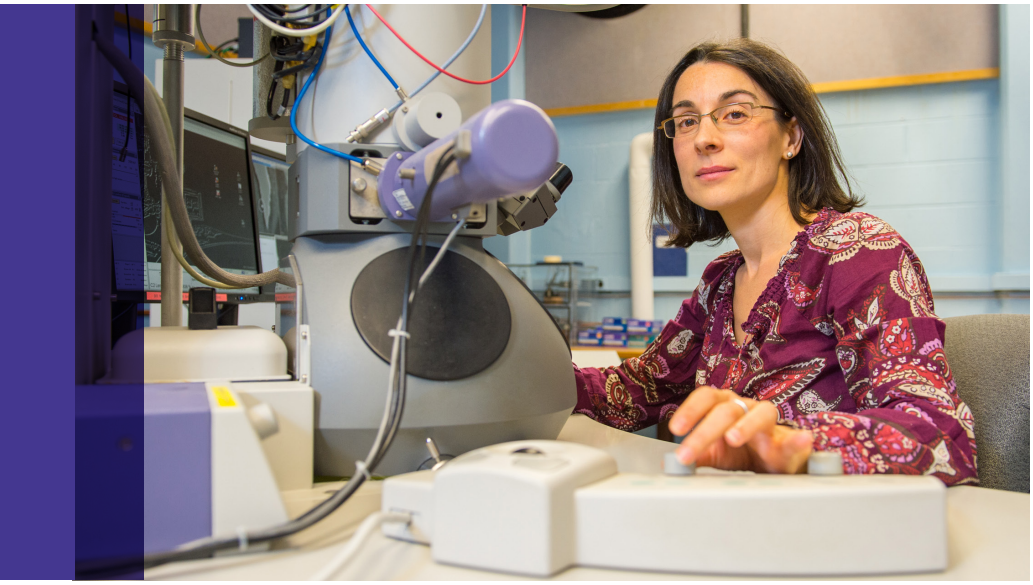
Argonne NATIONAL LABORATORY

DEVELOPING PREDICTIVE SURFACE MODELS

Characterization at core of SLIDE mission



SLIDE's Cinta Lorenzo Martin uses the group's transmission electron microscope to gain an enhanced understanding of structural and chemical characterizations of materials and surface interactions.

As surfaces in motion come into contact, their properties—such as microstucture, chemistry, roughness and hardness—change. Understanding how these surface interactions alter a material's properties over time is critical for predicting performance across a range of energy-related technologies.

In their efforts to reduce friction and increase efficiency, tribologists at Argonne National Laboratory have formed the Surfaces and Lubrication Interaction Discovery and Engineering (SLIDE) program to develop unique methods for characterizing surfaces with predictive fidelity in order to bring novel coatings and lubricants to market faster and cheaper.

SLIDE researchers apply tailored scientific approaches to advance the state-of-the-art in surface characterization by:

- Conducting mechanistic modeling to understand and predict tribological behavior
- Predicting the formation, structure and behavior of tribofilms
- Quantifying changes in surface morphology and mechanical properties

MECHANISTIC MODELING

Useful models need data, and lots of it. SLIDE's unique combination of expertise and state-of-the-art equipment enables the collection of data to predict and quantify both performance and failure, providing partners with a critical roadmap to optimization for their most pressing tribological problems.

TRIBOFILM FORMATION, STRUCTURE AND BEHAVIOR

With Argonne's advanced materials characterization tools, SLIDE researchers are able to measure critical tribofilm properties such as thickness and engineer novel surface layers by correlating tribofilm structure with friction and wear.

QUANTIFYING SURFACE MORPHOLOGY

The interactions of surfaces lead to significant changes in material morphologies and mechanical properties. By quantifying the aging process and revealing how components grow over time, SLIDE researchers enable their partners to control surface properties for both improved component performance and prolonged life. SLIDE's characterization capabilities include:

- Electron microscopy for high-resolution images and chemical and structural mapping of tribofilms
- Nano-indenter tool for nano-mechanical properties of tribofilms and bulk materials

In their quest to model the interactions of surfaces with unprecedented accuracy, SLIDE researchers also use Argonne's Advanced Photon Source (APS), which offers several capabilities especially applicable to tribology including X-ray diffraction, microflourescence and absorption.

PARTNER WITH SLIDE

Since its inception in 1983, Argonne's tribology researchers have authored more than 300 peer-reviewed journal articles and won six *R&D 100 Awards*.

This rich history, when combined with the group's unique range of expertise and comprehensive suite of customizable equipment, allows SLIDE to provide complete solutions for today's most complex tribological research questions.

CONTACT

Cinta Lorenzo Martin
Phone: 630-252-8577
Email: lorenzo-martin@anl.gov

U.S. DEPARTMENT OF ENERGY

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