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Materials Physics Department - 8756

Sarah Allendorf
Manager
swallen@sandia.gov
(925) 294-3379

Tara Hartley
Office Management Assistant
thartle@sandia.gov
(925) 294-3438

The Materials Physics department at Sandia National Labs in Livermore, CA consists of a highly collaborative combination of theory and experiment. Our goal is to produce innovative, world-class science that impacts both energy security and national security. We emphasize discovering and elucidating the fundamental mechanisms that govern the behavior and properties of materials. Our core research areas are (1) surface structure and dynamics, (2) grain boundaries and other internal interfaces, (3) electronic transport in nano-structures. Our emerging research areas include thermoelectric materials and diamond-based neutron detectors.

Our major capabilities include a 48-node Beowulf computer cluster, a high-resolution transmission electron microscope (HRTEM), a three-dimensional atom probe microscope (3DAP), a TEM optimized for 3D tomography, a low-energy electron microscope (LEEM), and a variable-temperature scanning tunneling microscope (STM).

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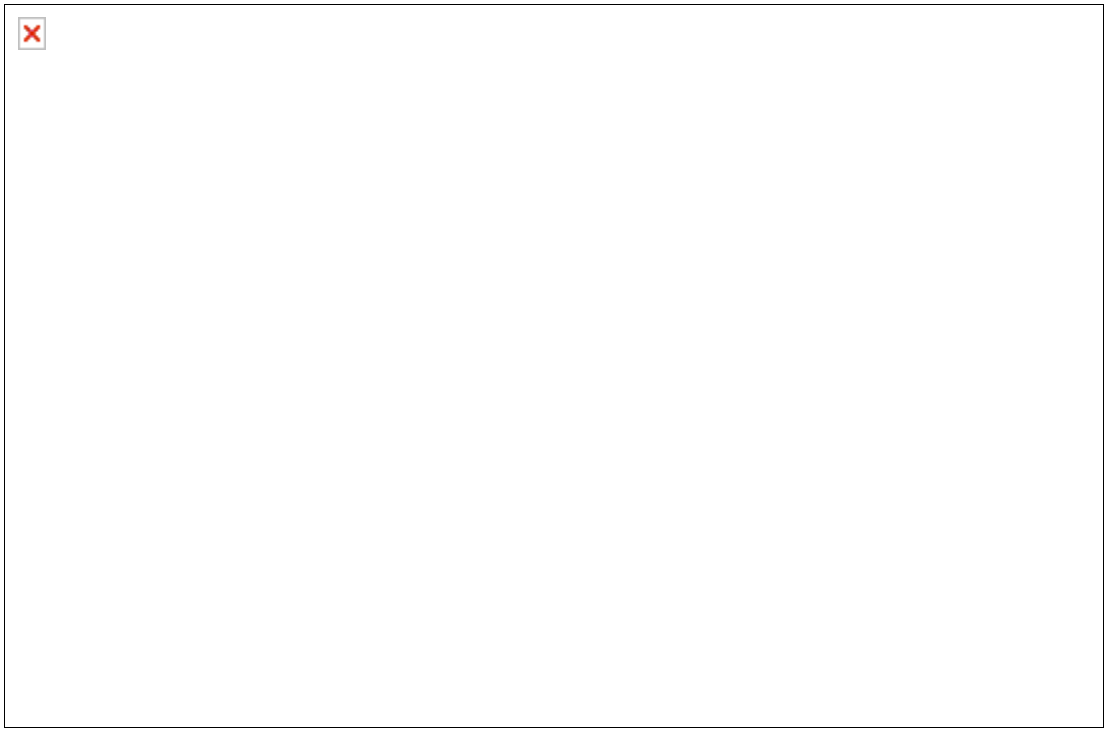
Projects

- Surface Dynamics: Quantifying the fundamental atomic processes governing the dynamics of surface structure and morphology.
  - Film Wetting and De-wetting

    - Bulk/Surface Exchange
    - Self-Assembly at Surfaces
    - Metal Oxidation
    - Surface Alloying
- Metallic Interfaces and Dislocations: Establishing the fundamental principles that underpin the structure and behavior of interfaces in metals.
    - Interfacial Structural Transitions
    - Accomodation of Interfacial Coherency Strains
    - Interfacial Reconstructions
    - Role of Dislocations During Phase Separation
    - First Principles Calculations Using the GW Approach
    - Computational Modeling of Pd-on-Au Nanoparticle Catalysts
- Nanoelectronics: Discovering and exploiting the unique properties of nanostructures for electronics applications.
    - Experimental
    - Theoretical and Modeling
- Thermoelectric Materials: Improving fundamental understanding of how thermoelectric alloys form and the mechanisms by which the thermoelectric properties are enhanced.
- Neutron Detection Heteroepitaxial Diamond: Developing heteroepitaxial, chemical-vapor-deposited diamond as a sensor material for fission-spectrum neutrons.

Capabilities

- High-Resolution Transmission Electron Microscopy (HRTEM)
- Scanning Tunneling Microscopy (STM)
- Low-Energy Electron Microscopy (LEEM)
- Three-Dimensional Atom Probe Microscope (3DAP)
- TEM Optimized for 3D Tomography



Organization 8756. Front to back, left to right: Roland Stumpf, Diego Kienle, Ilke Arslan, Michelle Hekmaty, Chip Steinhaus, Sarah Allendorf, Tara Hartley, Konrad Thuermer, John Hamilton, Dick Anderson, Kevin McCarty, François Léonard, Mark Homer, Obioma Uche, Sergey Faleev, Norm Bartelt, Josh Sugar and Doug Medlin.

Recent journal articles published by the staff of 8756 through June 2007.

For more information, please contact Sarah Allendorf, (925) 294-3379, swallen@sandia.gov