William R. Wiley
EMSL
Environmental Molecular Sciences Laboratory

The William R. Wiley Environmental Molecular Sciences Laboratory (EMSL) is a U.S. Department of Energy (DOE) national scientific user facility. EMSL is the centerpiece of DOE's commitment to provide world-class research capabilities for enabling fundamental research on the physical, chemical, and biological processes that underpin critical scientific issues.

EMSL capabilities are used to address the fundamental science that will be the basis for finding solutions to national environmental issues such as cleaning up contaminated areas at DOE sites across the country and developing "green" technologies to reduce or eliminate future pollution production. The capabilities also are used to further our understanding of global climate change, environmental issues relevant to energy production and use, and health effects resulting from exposure to contaminated environments.

If you are interested in collaborating with our scientists or using the facility's resources, more information and specific procedures for becoming an EMSL user can be found at http://www.emsl.pnl.gov.

Contacts

Access to this facility is granted based on a peer-review proposal system. Scientists are welcome to submit proposals of research using an online form at http://www.emsl.pnl.gov.

For details about the resources in the EMSL Accelerator Facility, collaborative opportunities, or information on how to become a user, please contact one of the following:

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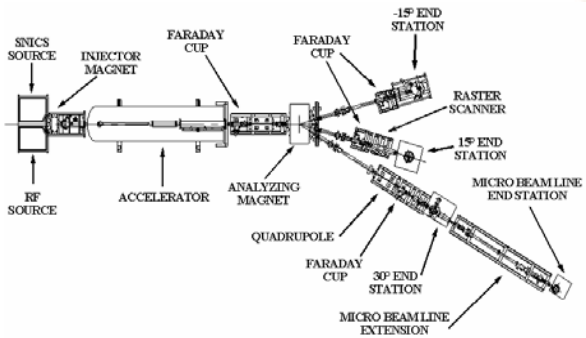

Accelerator Facility

WWW.EMSL.PNL.GOV

The W.R. Wiley Environmental Molecular Sciences Laboratory (EMSL) is a U.S. Department of Energy (DOE) national scientific user facility located at Pacific Northwest National Laboratory (PNNL) in Richland, Washington. EMSL is operated by PNNL for the DOE Office of Biological and Environmental Research.

Pacific Northwest National Laboratory
Operated by Battelle for the U.S. Department of Energy

Office of Science
U.S. DEPARTMENT OF ENERGY

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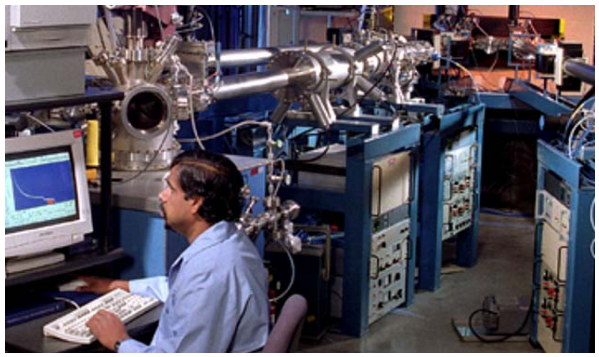
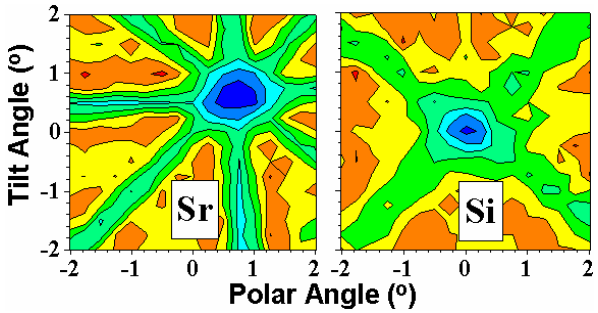
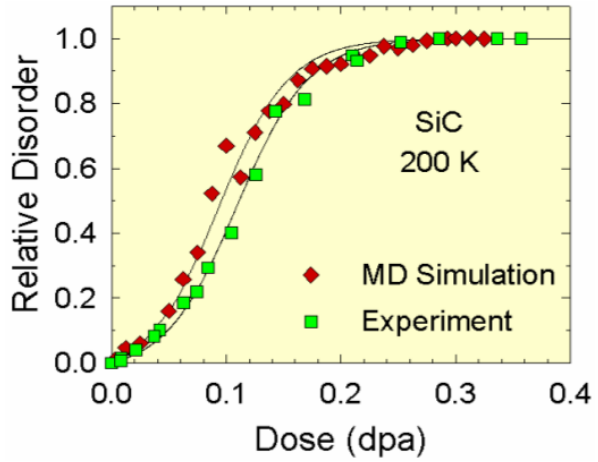


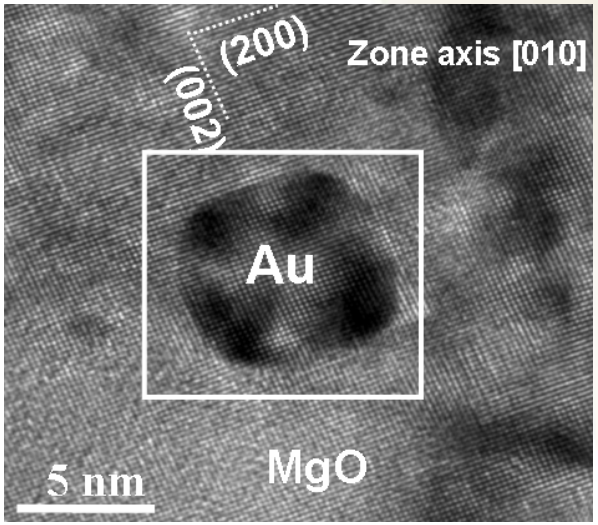
The accelerator facility at EMSL is equipped with two ion sources, a Pelletron NEC 9SDH ion accelerator, three beam lines (+30°, +15° and –15°), and four end stations. The end station on the +30° beam line is equipped with surface science capabilities, including low energy electron diffraction (LEED), x-ray photoelectron spectroscopy (XPS), oxygen plasma source, sputter cleaning, and thin film deposition capabilities, in addition to conventional ion beam capabilities such as Rutherford backscattering spectrometry (RBS)/channeling, nuclear reaction analysis (NRA), and elastic recoil detection analysis (ERDA). The microbeam end station is also equipped with conventional ion beam techniques, including RBS, NRA, and proton induced x-ray emission (PIXE). This end station is connected via the +30° beam line and has beam sizes of 20 microns or better. Since the +15° beam line is equipped with raster-scanner capability, the end station at this beam line has ion implantation capabilities in addition to the conventional ion beam techniques. The sample manipulators can heat samples up to 1300 K or cool them down to 60 K. The –15° end station is designed to carry out routine analytical and atmospheric aerosol studies. The manipulator is designed to accommodate the analysis of atmospheric aerosols in 8-inch-long strips using PIXE, proton elastic scattering analysis (PESA) and transmission ion microscopy (TIM) with the spatial resolution of 0.5 mm.



Ion channeling maps of $SrTiO_3$ thin film and Si substrate. $SrTiO_3$ film is tilted ~1 degree from the surface normal of the Si substrate.



Ion-beam disorder in SiC measured by ion channeling and predicted by molecular dynamics simulations.



Ion beam synthesized epitaxial gold nanoclusters in an MgO single crystal

Research

The resources at the accelerator facility are most effectively used for collaborative research, where access to unique combinations of characterization tools, computational facilities and ion beam capabilities, as well as interaction with experienced staff members to develop customized research strategies, can be advantageously utilized to address scientific and technological challenges. Some of the research areas are listed below:

- Thin film analysis
- Buried interface analysis
- Radiation effects in solids
- Ion beam synthesis of nanostructures
- Atmospheric aerosol characterization
- Theoretical modeling using atomistic simulations