

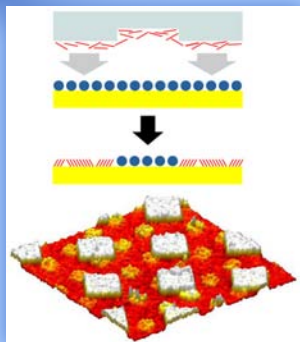


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Schematic of a chemical pattern fabricated by microdisplacement printing. This technique creates precisely proximate and complex multi-molecule structures.

Weiss Group
Penn State



A LEADER IN INTERDISCIPLINARY RESEARCH



"The capabilities available at the Nanofab have allowed us to use a state-of-the-art tool to screen new and novel chemical precursors, which can be quickly translated to our customers. Having this capability at Penn State has enabled Air Products and Chemicals to run programs which we might not otherwise have run, and has resulted in at least one material which has been successfully transferred to a customer."

I have found the Nanofab staff to be very knowledgeable, professional, and helpful. This project has been productive for Air Products and we hope to continue our relationship with the Nanofab."

Ray Vrtis, Ph.D., Chemist
Air Products and Chemicals Inc.
Allentown, PA

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THE
NANOFABRICATION
LABORATORY

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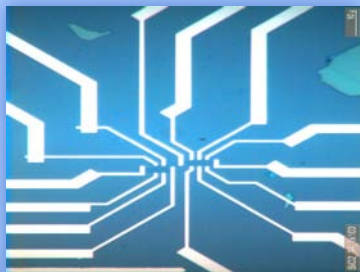
More than 400 researchers from Penn State, other universities, government labs, and industry take advantage of the expertise and world-class facilities of the Nanofabrication Laboratory.

For faculty and students, the Nanofab provides the opportunity to do hands on research with some of the world's most sophisticated instruments for the fabrication and characterization of materials at the nanoscale.

The Nanofab Lab provides:

Class 10 and 100 clean room space, 50-plus specialized instruments (some one of a kind or one of only a few in the nation), and a dozen scientific and technical staff on the associate to Ph.D. level.

The Nanofabrication Lab has cross-disciplinary expertise in the areas of spectroscopy, biology, chemistry, physics, optics, electrical engineering, and engineering science.



Graphene field effect transistors in Hall bar geometry on mechanically cleaved graphene tiles using RIE and e-beam lithography.

Zhu Group
Penn State

Capabilities include:

Wet Chemical Etching – Dedicated wet bench area for extensive wet chemical processing

Lithography – Patterning 20nm to macro-scale features on small pieces to full 8-inch wafers with micron to mm thickness

Film Deposition/Growth – Metal, dielectrics, and polymer materials, controlled film morphology and stress, thermal and electron beam evaporation, sputtering, dual-beam focused ion beam, spin-on dielectrics



Hybrid nanolithographic strategies combine molecular rulers and conventional fabrication methods to produce metallic structures with precise proximal placement.

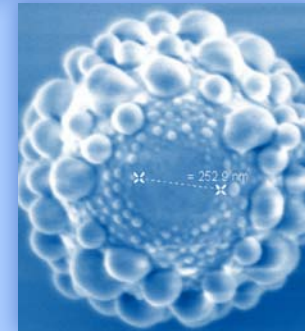
Horn Group, Weiss Group
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Dry Etching (Reactive Ion Etching) – Plasma etching of microscale structures

Material Modification and Characterization – Focused ion beam, thermal annealing, atomic force microscopy, scanning tunneling microscopy, field emission scanning electron microscopy, electron spectroscopy, ellipsometry, profilometry, Auger spectroscopy, and optical microscopy

About NNIN @ Penn State

Supported by the National Science Foundation, the National Nanotechnology Infrastructure Network (NNIN) offers a geographically dispersed network of user facilities to enable rapid advancements in science, engineering, and technology at the nanoscale. The 13 NNIN sites provide access to technological expertise and



FESEM image of 1 nm diameter amine-functionalized silica with an inner coating of sulfate functionalized polystyrene latex particles and an outer coating of sulfate functionalized polystyrene particles.

Velegol Group
Penn State

nanotechnology instrumentation that would otherwise be out of reach for many researchers in industry and academia.

Each NNIN site has specific areas of technical expertise. At the Penn State NNIN site, our areas of focus are chemical nanofabrication and the fabrication and processing of complex oxides.

The NNIN provides funding to help support the Nanofabrication Laboratory, purchase equipment, and provide support for external users. NNIN support helps the Nanofab keep user fees affordable.

For more information:
www.mri.psu.edu/facilities/NNIN/

