

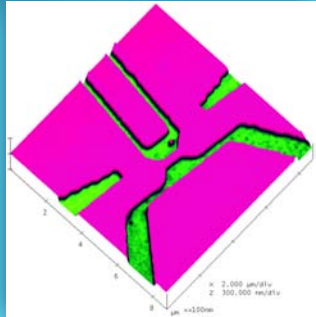


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Schematic of a chemical AFM of lithographically carved thin film for an electronic nanochip.

Samarth Group
Penn State

Credit R. Malek



A LEADER IN INTERDISCIPLINARY RESEARCH



MATERIALS CHARACTERIZATION LABORATORY



"In today's budget-conscious, competitive environment, the demands and expectations are high, but the resources lean. By using the technical resources of the Penn State Materials Characterization Laboratory, we hope to gain insight into microstructural information that up to now has been beyond our reach."

David M. Stumpf
Analytical Research and Services
The Hershey Company
Technical Center

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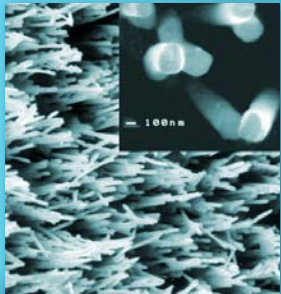
WORLD-CLASS FACILITIES

The Materials Characterization Laboratory (MCL) offers state-of-the-art analytical instrumentation and more than 20 highly trained technical staff to help researchers identify and understand the properties of novel materials. Users learn through analyzing their own samples under the guidance of the technical staff members and/or by participating in short courses and seminars offered throughout the year.

Offsite users are welcome to travel to the facility to perform their own analyses or work remotely in close concert with the technical staff members to achieve their analytical objectives.

MCL provides:

- ◊ World-class equipment
- ◊ Dedicated lab space for materials characterization and materials processing
- ◊ Opportunities to become educated in materials characterization
- ◊ Full-time professional staff

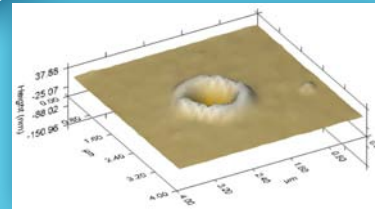


Through electrodeposition of metals into porous membranes, researchers are able to fabricate nanowires of a wide variety of metals with diameters as small as 6nm, high aspect ratio, and controllable crystalline order. The superconducting characteristics of these nanowires have been studied by means of transport and thermodynamic measurements down to 0.05K.

Chan Group
Penn State



Short courses and seminars are held throughout the year providing in-depth training on characterization techniques and analytical tools available.



The Hysitron TribolIndenter has the capability of taking *in situ* Atomic Force Microscope images using the same diamond tip that was used to carry out the indentation. The image to the right shows one such *in situ* AFM image of a 6500mN load controlled indent on the air side of 6mm thick commercial float glass.

Muhlstein Group
Penn State

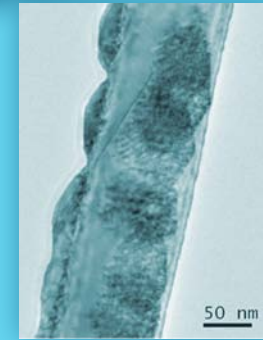


An MCL analyst studies an image of the scattering pattern for corundum from a Microfocus X-Ray Diffractometer, one of the specialized characterization tools.

STATE-OF-THE-ART EQUIPMENT

Capabilities include:

Microscopy – scanning electron microscopy, transmission electron microscopy, focused ion beam microscopy and lithography, atomic force microscopy, near-field scanning optical microscopy, orientation imaging microscopy, optical profilometry



Bright-field TEM image of germanium islands deposited on a silicon nanowire. The growth of 3D Ge islands around Si nanowires could open up a new opportunity for integrating quantum dots with semiconductor nanowires for nanoscale electronics.

Redwing Group, Dickey Group
Penn State

Surface Analysis – Auger electron spectroscopy, X-ray photoelectron spectroscopy

Optical Spectroscopy – FT-IR microscopy, ultraviolet-visible spectroscopy, confocal Raman spectroscopy

Physical Property Determination – electrical characterization, particle analysis, thermal analysis, mechanical testing, nanoindentation

Structural Analysis – X-ray diffraction, small angle X-ray scattering

Chemical Analysis – electron probe microanalysis, energy dispersive X-ray spectroscopy, inductively-coupled plasma atomic emission spectrometry, and inductively-coupled plasma mass spectrometry

Materials Processing – sputter coater, sintering furnaces, hot press, hot isostatic press, cold isostatic press, machine shop, sample preparation and polishing