



COLLEGE OF ENGINEERING
UNIVERSITY OF WISCONSIN-MADISON

UW Madison Advanced Materials Industrial Consortium

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Agenda

- Consortium Mission
- Member Benefits and Opportunities
- Research Overview
- Consortium Resources
 - NSF supported Centers
 - Shared Instrumentation Centers
- Contact Information
- Questions?



UWAMIC Mission

The Advanced Materials Industrial Consortium gives commercial partners **ACCESS** to students and faculty in advanced materials research across the UW–Madison campus. The consortium facilitates interaction with the unique resources of a level 1 research university to solve problems that may not otherwise be addressed with local resources.

- What AMIC does not do:
 - Compete with Industry
 - Replace Local or UW-System resources
 - License IP - that's is a WARF responsibility

UWAMIC includes over 40 faculty members and 80 students
From 15 departments and two Colleges in Madison



General Benefits:

- Members can:
 - **Attend Annual meetings** that overview the entire research program
 - **Assured access** to faculty, students and research via Consortium Development Director
 - **Identify potential employees** through early and continued contact with students
 - **Influence research directions** through the Industrial Advisory board which meets several times per year
 - Leverage over \$5M in annual materials research and >\$60M in instrumentation investment
 - Obtain initial **discounted fees** at shared instrument facilities
 - Obtain access to **services at Wendt Library**



Member Opportunities

- Members have access to:
 - Opportunity for **student and postdoctoral internships** in industry
 - Information on current related research
 - **Consultation** on specific problems of interest to the member
 - **Members-only access** to student and research results at the UWAMIC website
 - Dedicated research opportunities with via the **Industrial Fellows Program**
 - The opportunity for **sponsored research** on campus



Samples of Current Research

- **Fundamental Issues in Materials Integration on Silicon**
 - Development of vastly enhanced and totally new electronic devices
 - Nano-transistors-> higher density, cheaper memory
 - Flexible TFT for low power displays
- **Functional Organic-Inorganic Electronic Interfaces.**
 - Now critical to many areas of science and technology, impact in diverse areas as
 - efficient solid-state lighting,
 - consumer electronics
 - chemical/biological sensing
- **Nanostructured Materials as Interfaces to Biology.**
 - materials for rapid identification of viral pathogens (e.g. for biosensors)
- **Directed Self-Assembly of Nanoscale Structures.**
 - the processes of self-assembly and the resulting products are plagued by defects.
 - These defects preclude the use of the resulting structures where perfect order is required (e.g. electronic devices or memory).



A very Important Issue

- Social, Legal and Environmental Impacts of Engineered Nanomaterials
 - *Many expect nanotechnology to affect the lives of ordinary citizens as profoundly as did the Industrial Revolution.*
 - Concerns:
 - environmental and health risks of emerging nanotechnologies,
 - the adequacy of government regulations to address these risks,
 - opportunities for citizens to influence decision-making.



Unique Research Centers

- Access to these internationally recognized NSF supported research and education centers:
- NSF Materials Science and Engineering Center (MRSEC). www.mrsec.wisc.edu
- NSF Nanoscale Science and Engineering Center (NSEC). www.nsec.wisc.edu
- NSF-sponsored Synchrotron Radiation Center (SRC) and CNTech
 - www.src.wisc.edu
 - www.nanotech.wisc.edu



Shared Instrumentation Facilities

- Materials Science Center (MSC)
 - 3 SEMs, 3 TEMs, XPS, Auger, Imaging microRAMAN, Optical profilometry, AFM, SAXS
- Wisconsin Center for Applied Microelectronics (WCAM)
 - Completely functional Cleanroom with Class 10 space and all instrumentation for MEMS, Nanotechnology development, and device fabrication
- Center for Nano Technology at the Synchrotron
- GLOW- Multi-node computational power, Grid Laboratory of Wisconsin cluster
- Polymer Characterization Laboratory



**WCAM (Wisc Center for Appl.
Microelectronics)**

Nanoimprint Lithography
Dry etch RIE
Photolithography
Wet chemical
Ion implantation
Assembly
Deposition tools

Materials Science Center

Confocal Raman Microscope
ZYGO Profilometer
X-ray diffraction
SEM
AFM
FIB
ESCA,SAM
TEM
STEM



**UW Advanced Materials
Industrial Consortium
Shared User Facilities**

CNTech Facilities

E-beam
EUV-SUS XRS-200/2M Stepper
SAL XRS 200/Mod4 Stepper
CNTech cleanrooms & beamlines
Reactive Ion Etch System
Aladdin Electron Storage Ring

GLOW (Grid Lab of Wisc)

Large scale computing clusters

SRC (Synchrotron Radiation Ctr)

NEXAFS
IR



The Materials Science Center

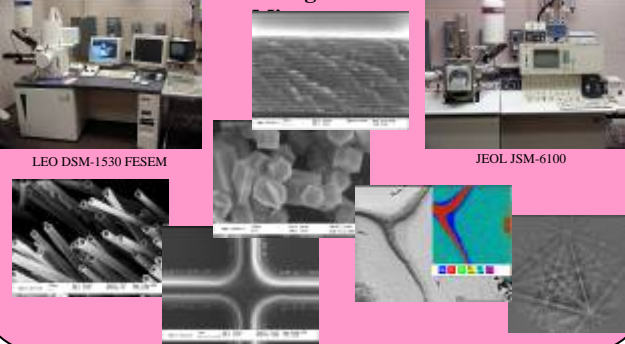
The Materials Science Center provides instrumentation and expertise for the characterization of solid materials. A variety of instruments are available to measure composition and structure down to the nanoscale. Most of the center's analytical techniques are based on the interaction of electrons and/or photons with the electronic structure of the sample being measured.

Major instruments include transmission and scanning electron microscopes, a focused ion beam mill, Auger and photoelectron spectrometers, x-ray diffractometers, and an atomic force microscope. Ancillary techniques include electron energy loss spectroscopy, energy dispersive spectroscopy, electron back scattered diffraction, ion sputter depth profiling, and electron beam lithography.

Sample preparation facilities include tripod polishing stations, dimplers, ion mills, general grinding and polishing stations, a small sample sputter coater, and a high vacuum coating system.

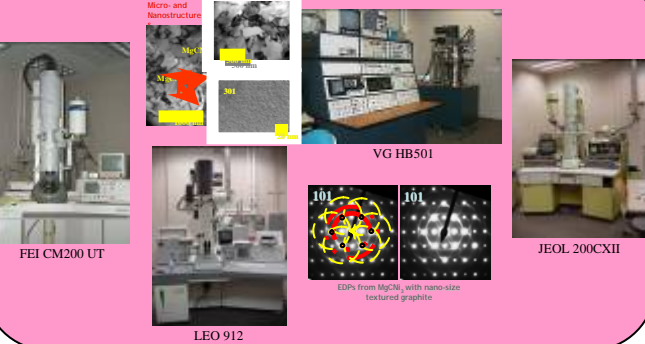
The primary users of the facility are faculty, staff and students involved in UW research. The center's specialized capabilities are also available to Wisconsin industry.

Scanning Electron



LEO DSM-1530 FESEM JEOL JSM-6100

Transmission Electron Microscopes



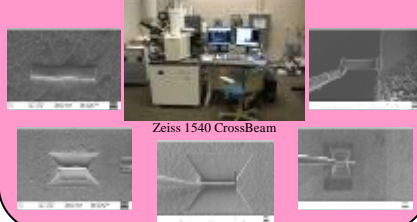
FEI CM200 UT VG HB501 JEOL 200CXII

LEO 912

Micro- and Nanostructure


ESPs from h-BN, with nano-size textured graphite

Focused Ion Beam



Zeiss 1540 CrossBeam


X-ray Diffraction



STOE Dual X-ray Diffractometer Siemens X-ray Diffractometer

Panalytical X'pert MRD


Sample Preparation



SBT Dimpler Denton Coater VCR Ion Mill

Tripod Polishing Station Fischione Ion Mill

Surface Science



PHI 5400 ESCA Digital Instruments Nanoscope IV

PHI 670 SAM

Facilities





WCAM Cleanroom Data

www.engr.wisc.edu/centers/wcam

- Cleanroom
 - Class 10 640 sq. ft.
 - Class 100 3376 sq. ft.
 - Class 1,000+ 2040 sq. ft.
 - Service space 3200 sq. ft.
- Non-Clean
 - Non-clean Labs 960 sq. ft.
 - Support Space 1064 sq. ft.
- Research Hatcheries
 - Six individual labs 1980 sq. ft. (330 sq. ft. each)
- **8 Instrument Bays, one devoted to teaching.**





Consortium - Membership

- **Industrial Board Members**

Cargill, 3M, Bemis, Spectrum Brands, Bruker-AXS, Thermo Electron, Advanced Diamond Technologies, Alfalight, Npoint, Imago, Platypus, Promega, Venture Investors LLC

- **UWAMIC members**

Established: Stratatech, SRC (AMD, Intel, IBM, Freescale Semiconductor, LSI Logic Corporation, TI)

Committed members: Cargill, Bemis, Spectrum Brands, Bruker-AXS, Thermo Electron, Alfalight, Npoint, Imago, Platypus, Venture Investors LLC



Contact UWAMIC

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Questions?

