Materials Research Facilities Network (MRFN)

MRSEC Director’s Meeting
June, 2010
MRFN INITIATIVES

Maximize usage of MRSECs

Provide access to small and large universities

Establish collaborations

Teach and train students - focus on non-Ph.D. and minority serving

Remote User Access
Materials Research Facilities Network – Initial Group

2007-2008
MRFN – Expanded Group

Colorado School of Mines
Carnegie Mellon
Brandeis
Penn State
Northwestern
University of Nebraska- Lincoln
University of Pennsylvania

University of Maryland
Johns Hopkins
Brown
Princeton

MIT
University of Chicago
Yale
Washington University
Materials Research Facilities Network
Distinguishing Features of the MRFN

• Advantages of MRSEC
• Support user facilities
  • Department of Energy (DOE)
  • National Nanotechnology Infrastructure Network (NNIN)
• Established co-ordination between centers
• Varied levels of assistance and collaboration
• Large established instrument base
Current Projects

• Designed a visitation program for Faculty and their students

• FAST (Faculty and Student Training) program
  • Housing
  • Travel
  • Stipend
  • Instrumentation and training

UCSB – FAMU
- Jackson State
- Trinity University
**Current Projects**

Collaboration with Cal Poly, San Luis Obispo Materials Engineering

- Materials characterization
  - Hands on Materials Analysis course
  - Master’s Degree project
  - MS→Ph.D. transition program

- Collaborative Materials Teaching course
  - Train-To-Teach (TTT) program
  - Faculty partnership
Current Projects

Virtual Instruction Laboratories - SEM with Florida A&M and Jackson State Uni

Class can access manuals, laboratories, and view training videos at www.mrfn.org

Live question and answer dialogue

Remote session through Skype

Real time sample analysis
Current Projects

Virtual Instruction Laboratories- SIMS and XPS with CalPoly, SLO

“The first thing that I liked about this virtual experience was that every student was able to participate. I think the setup of the lab gave everyone a chance to see how XPS can be used to solve a relevant materials analysis problem.” - CalPoly graduate student
MRFN Outreach Activities
Penn State MRSEC

Outreach to Regional Universities and Colleges

Bucknell University, Lewisburg, PA
Clarion University, Clarion, PA
Dickinson College, Carlisle, PA
Lock Haven University, Lock Haven, PA
Penn State DuBois, Du Bois, PA
Saint-Vincent College, Latrobe, PA

Students from Saint Vincent College visiting the Penn State Materials Characterization Lab, February 2010
MRFN Outreach Activities
Penn State MRSEC

MRFN Summer Visiting Faculty Interns

Neyda Abreu, Penn State Dubois
Peter Sak, Dickinson College
Sinisa Vukelic, Bucknell University

Three visiting faculty are conducting research at the Penn State University Park Campus during Summer 2010, accessing the Materials Characterization Laboratory and interacting with Penn State faculty and staff.
MRFN Outreach Activities
Penn State MRSEC

Materials Characterization Workshops and Short Courses for REU Students

• 3-hour introductory characterization course, taught by MRSEC faculty Beth Dickey, integrated in the MRSEC, Physics and Materials Science summer REU programs

• REU students provided with free tuition for more in-depth one-day characterization courses
Materials Research Facilities Network (MRFN)

• Mission - to increase the visibility and usage of Center facilities within the materials, engineering, and greater scientific community
• Supports researcher exchange and materials characterization activities in the UMass MRSEC

2009/2010 activities

U.C. Santa Barbara (SIMS measurements)
U Chicago (Langmuir-Blodgett techniques for polymer/nanoparticle films at air-water interface)
Western New England College (MA) (NMR facility > visiting faculty researcher)
U South Carolina (nanocage characterization techniques)
Tulane University (cyclic polymers – molecular weight characterization)
The Scripps Institute (bionanoparticle/polymer photovoltaics)
U Texas Austin (electron microscopy on polymer-coated membranes)
Inter-MRSEC activity

Interface characterization facilities for nanoparticle-polymer composites

MRFN provided a link to research efforts in nanomaterials at interfaces (assemblies and surface instabilities)

Ka Yee Lee, U Chicago
Use of UMass MRSEC facilities for materials characterization by Scripps researchers

**Photovoltaic shared experimental facility at UMass**

MRFN provided travel support and facility use for studying self-assembled nanoparticle and bionanoparticle thin film solar cell active layers

**MBraun inert atmosphere triple-glovebox series containing:**

- Fabrication system:
  - spin coater
  - metal deposition

- Solar cell characterization:
  - Keithley 2400 sourcemeter with 1.5G-filtered irradiation (100 mW-cm²) from a 1kW Oriel Solar Simulator

Kurt Breitenkamp of M.G. Finn laboratories
U Mass / Western New England College

Use of UMass MRSEC facilities to support NMR characterization of organic materials research at Western New England College (Springfield, MA)

~5,000 student body, primarily undergraduate, teaching mission
MRFN provides research facility outlet to nearby undergraduate institutions

MRFN provided NMR facility use.
Resulted in visiting scholar appointment for
WNEC Assistant Professor Angela Sauers in MRSEC research on polymer synthesis (Summer 2010)
UNIVERSITY OF MINNESOTA

Materials Research Science
and Engineering Center
MRFN at Minnesota

- 33 research groups have utilized Shared Facilities at Minnesota via MRFN
- 26 Institutions and over 50 graduate students and postdocs
Participating Institutions

★ **Minnesota**: Augsburg College, Carleton College, College of St. Scholastica, Hamline University, Macalester College, Minnesota State University-Mankato, St. Cloud State University, University of St. Thomas

★ **Neighboring States**: Iowa State University, Luther College, North Dakota State University, Northland College, South Dakota School of Mines & Technology, South Dakota State University, University of South Dakota, University of Wisconsin

★ **National**: Clemson University, Colorado State University, Emory University, Kansas State University, Pacific Lutheran University, Rice University, University of California Santa Barbara, University of Southern Mississippi, University of Tennessee, Wayne State University
Shared Facilities

Institute of Technology
• Characterization Facility
• Nanofabrication Center
University
• Minnesota Supercomputer Institute

Focused Facilities
• Magnetic Microscopy Center
• Molecular Beam Epitaxy Facilities
• Molecular Characterization Facilities
• Polymer Characterization Facility
• Polymer Synthesis Facility

Principles
• *Instruments housed in well-staffed user facilities*
• *Maximize use and access*
• *Foster hands-on training, access to in-house expertise*
• *Competitive pricing structure to encourage use, while sustaining operating costs and staff compensation*
Cryogenic Transmission Electron Microscopy

Assistant Professor Elizabeth Wright, Dr. Ricardo Guerro-Ferreira, Dr. Jens Holl, Emory University
Polymer Synthesis Facility

Dean Waldow, Pacific Lutheran, and Dvora Perahia, Clemson, practice anionic polymerization with Sayeed Abbas, UMN graduate student.
Sample Testimonials

★ “Thank you for your support...my undergraduate program could not continue without it” – Bill Ojala, University of St. Thomas

★ “The student who has worked with me using these funds has completed an honors thesis and presented the research at two speaking competitions (and actually won both!)” – Bruce Bolon, Hamline

★ “…the ability to access the instrumentation for cryo-TEM, as well as the expertise of the MRSEC staff at U.Minn. was critical for us to fully understand these systems. The images that we recently received are GREAT and is simply something that we could not have obtained at UCSB or through other means.” – Benjamin Taft, UCSB
CharFac

- Staffing of 16 (11 FTEs)
- 11 Ph.D. scientists
- 80% of costs covered by user fees
- > 600 individual users per year

Dr. Greg Haugstad
Director
http://www.charfac.umn.edu/

Major instrument groups
- 10 X-ray instruments
- 10 electron microscopes
- 8 proximal probes (AFM, SPM, nanoindenters)
- Ion beam analysis (RBS, FRES, PIXE, NRA)
- Optical and infrared spectroscopy and microscopy
Program Promotion

The MRSEC Facilities Network is a nationwide partnership of NSF supported MRSEC centers designed to provide support to researchers in the broad area of Materials Research in academic, government and industrial laboratories around the world. NSF MRSEC centers are geographically spread throughout the United States at major research universities which greatly enhances the ability for researchers from other institutions to gain access to the wide array of instrumentation and facilities presently available. The goal of the Facilities Network is to provide users with unprecedented access to instruments, techniques and collaborators in order to enhance their studies of the synthesis.

Virtual Education:
- Instrument Modules
- Instrumentation Remote Access
- Media Instruction

www.mrfn.org
Program Promotion

C&EN, November 9, 2009
Program Promotion

Ask for acknowledgement in publications:

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YouTube videos (metric – downloads)
Thank You