



UWAMIC NEWSLETTER

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Upcoming Events

- UW MRSEC Breakthrough Research Education Workshop (BREW) September 27, 2013
- UW AMIC Annual Meeting October 28-29th, 2013

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A Message from the UWAMIC Director

Hello,

The purpose of a newsletter is to provide specialized information to you our members. As you can see this year we have started with a fresh look. We also have taken a fresh look at our content. This year we will include more information from the College and the University as a whole. We know that we are just one point of contact with the University of Wisconsin Madison and want to let you know more about the many exciting events and discoveries on in this campus community. We welcome your feedback on the new format.

We also invite you to attend this year's Annual Meeting on October 28 and 29 in the Tong Auditorium in the Engineering Centers Building. Look for a registration form and complete agenda in your email in the next two weeks, and be sure to register ASAP.

Sincerely,

Jon McCarthy



UWAMIC Director
Jon McCarthy

Top News in the MRSEC/NSEC. the university and the campus

Five questions... about manufacturing systems engineering education

Mechanical Engineering Associate Professor Frank Pfefferkorn (pictured right) discusses today's manufacturing challenges and how UW-Madison graduates are prepared to solve them. [More...](#)



Innovation institute to broaden U.S. palette of advanced materials

With expertise in manufacturing; materials science, engineering and processing; and computer science and engineering, the University of Wisconsin-Madison is tackling today's materials challenges through the interdisciplinary Wisconsin Materials Innovation Institute, or WIMII. On June 24, 2013, the White House named UW-Madison a partner institution in its Materials Genome Initiative for Global Competitiveness, a national effort to double the speed with which the country discovers, develops and manufactures new materials. [More...](#)

UW-Madison makes top universities lists

World University Rankings, "Fiske Guide to Colleges" value ranking, and Livability.com's top college towns. Forbes and the Princeton Review have also weighed in [More...](#)

Highlights and Research Publications

MRSEC Research Highlights

Colloid-in-Liquid Crystal Gels Formed via Spinodal Decomposition

MRSEC Publications

Kim, T. W.; Garrod, T. J.; Kim, K.; Lee, J. J.; LaLumondiere, S. D.; Sin, Y.; Lotshaw, W. T.; Moss, S. C.; Kuech, T. F.; Tatavarti, R.; Mawst, L. J.; "Narrow band gap (1 eV) InGaAsSbN solar cells grown by metalorganic vapor phase epitaxy", *Applied Physics Letters* 100 (12), 121120 (19 March 2012) [link](#)

Kim T.; Garrod T.; Kim K.; Lee J.; Mawst L.J.; Kuech T. F.; LaLumondiere S. D.; Sin Y.; Lotshaw W. T.; and Moss S. C.; "Characteristics of bulk InGaAsN and InGaAsSbN materials grown by metal organic vapor phase epitaxy (MOVPE) for solar cell application," *Proceedings of the SPIE - The International Society for Optical Engineering*, 8256 (82561D), (2012) [link](#)

Lee, Y. L. ; Morgan, D., "Ab initio and empirical defect modeling of LaMnO3 +/-delta for solid oxide fuel cell cathodes," *Physical Chemistry Chemical Physics*, 14(1), 290-302. (2012) doi: 10.1039/c1cp22380a [link](#)

NSEC Highlights

Density Multiplication and Improved Lithography by Directed Block Copolymer Assembly

Catalysis from Directed Assembly of β -Peptide Nanorods

Diffusion of Nanoparticles in Liquid Crystalline Systems

NSEC Publications:

Widin, J. M.; Schmitt, A. K.; Schmitt, A. L.; Im, K.; Mahanthappa, M. K., "Unexpected Consequences of Center Block Polydispersity in ABA Triblock Copolymer Self-Assembly," *J. Amer. Chem. Soc.*, (2012) 134, 3834-3844. [\[Link\]](#)

Mondal, J.; Mahanthappa, M. K.; Yethiraj, A. J., "Self-Assembly of Gemini Surfactants: A Computer Simulation Study," *Phys. Chem. B*, in press as manuscript #jp304933k (2012). [\[Link\]](#)

Abras, D.; Pranami, G.; Abbott, N. L., "The mobilities of micro- and nano-particles at interfaces of nematic liquid crystals," *Soft Matter*, 8(6), 2026-2035 (2012). [\[Link\]](#)

Bar-Ilan, O.; Louis, K.; Yang, S.; Pedersen, J.A.; Hamers, R.J.; Peterson, R.]E.; Heideman, W., "Titanium dioxide nanoparticles produce phototoxicity in the developing zebrafish," *Nanotoxicol.* 6, 670-679 (2012). [\[Link\]](#)

New in the Facilities

Since last May, three new instruments have been installed and are being used in the Materials Science Center. The new tools offer new capabilities compared to the tools that we replaced. All are available for use by our AMIC industrial partners.

Bruker D8 DISCOVER DIFFRACTOMETER:

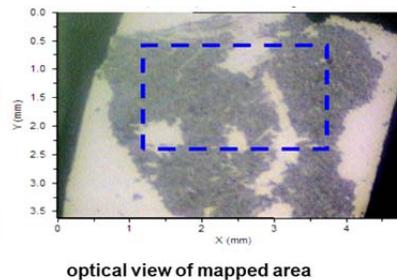
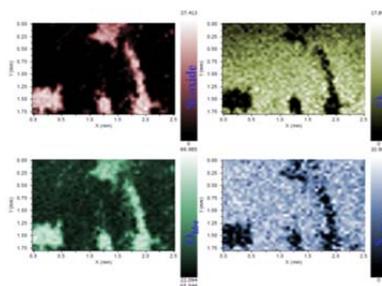


The D8 DISCOVER is an all purpose X-ray analyzer which can be configured for all diffraction-based material research applications, including qualitative and quantitative phase analysis, structure analysis, high-resolution X-ray diffraction, reflectometry, reciprocal space mapping, grazing incidence diffraction (in-plane GID), grazing incidence small angle X-ray scattering (GISAXS), stress and texture analysis, and micro-diffraction. This unit is equipped with a micro-focus source, the latest area detector, and an automated X-Y stage mounted on the goniometers. It replaces the aging Siemens Hi-STAR diffractometer.

Imaging X-ray Photoelectron Spectrometer:

15 Groups from all over campus supported the proposal for New XPS instrument with <30um spot size and Chemical mapping Capability. Sample data was gathered on polymer and ceramic data from each of two vendors being considered and a Thermo Scientific K-Alpha-2 was selected. It replaces our 20 year old machine, a PHI 5400, which has a spot size is close to .5 mm (500um!) Chemical Maps of a thin film sample are shown along with a video image where the blue box represents the spot size of our PHI 5400. So these maps would have about 12 pixels on the PHI versus 128 by 96 pixels in the new machine. No details of elemental segregation would be visible.

The machine will also be remotely accessible, and is the first unit in the USA equipped with a cluster argon ion sputter system, that can be used to depth profile thin organic films with no chemical modification of the film. Older sputter guns would destroy or severely alter soft material samples.



Research Experience for Undergraduates (REU) Program at UW-Madison, a Summer Success

This year's REU program brought together 34 students from all over the United States, Puerto Rico and China. The students worked with a lab mentor on a research project during their 10 week stay at UW-Madison. Participants were involved in a variety of programs and disciplines on campus: MRSEC; NSEC; Center for Renewable Energy, Forest Products Laboratory, Chemical & Biological Engineering, Materials Science Engineering, Engineering Physics, Chemistry and 3M.

RET Program at UW-Madison teaches engineering topics to local middle/high school teachers

by Anne Lynn Gillian-Daniel

This June, UW MRSEC hosted six middle and high-school teachers in their Research Experience for Teachers (RET) program, which gives teachers an opportunity to learn about cutting-edge materials science and engineering topics. Each teacher worked in the laboratory of a MRSEC researcher for six weeks performing basic research and developing an activity that they will use in their classroom during the academic year. Some of the activities developed by the RET fellows included: a liquid crystal sensor for salts, a board game that demonstrates how computers can be used to model diffusion, a crystal pudding that demonstrates how crystals are made by diffusion, a microfluidic chamber that demonstrates bacterial chemotaxis, an activity to calculate the thickness of thin films using flashlights, and an experiment exploring the properties of graphene. The MRSEC education group (IEG) directs the program and will post the activities on the newly redesigned MRSEC education website (www.education.mrsec.wisc.edu).



RET Teachers making Crystals