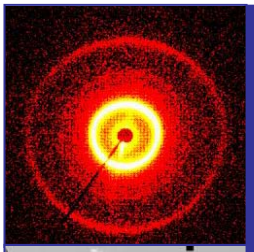
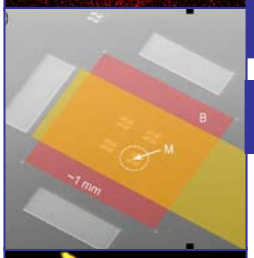
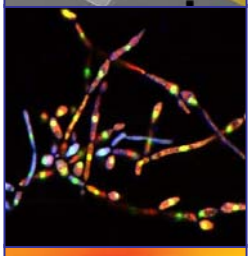
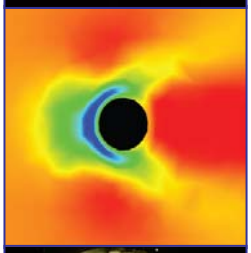
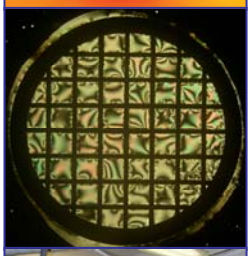
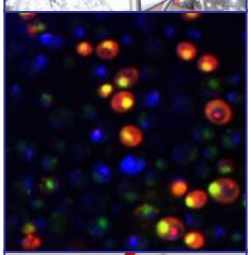
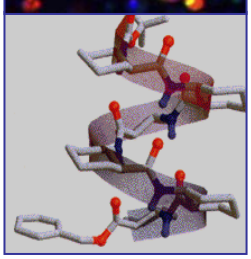



UWAMIC NEWSLETTER

Fall 2010, Volume 4, Issue 2

A Message from the Director

Welcome to the Fall 2010 UWAMIC Newsletter!

Dear Members,

Our Annual Meeting will be next month on October 6-7. The draft agenda is on the following page. This is an annual meeting you do not want to miss! This year we will have several guests and speakers from Japan as well as a preview of the industrial connections you can establish with the Wisconsin Institutes for Discovery. You should be receiving an invitation both via email and U.S. mail soon if you have not already. Please RSVP as early as possible but no later than September 28 by emailing kedebruin@wisc.edu.

Special Presentations:

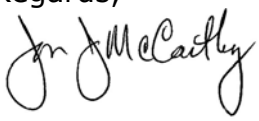
Nanotechnology Research in Japan
We will have 15 researchers from Japan in our plenary session on Thursday morning. A few of them will present an overview of nanotechnology developments at major Japanese institutions.

Industrial Opportunities at the Wisconsin Institutes for Discovery (WID)
This exciting research institute will open in December 2010. Within the building features a public Town Center and embedded laboratories that present industry a multitude of ways to connect with the public, academia and other audiences. Find out how you can participate!

We will be sending out reminder invoices for 2010 member news in the next weeks or two. Please realize that the Consortium is entirely supported by your dues; no grant funding is involved. Dues support our Annual Meeting and many valuable student activities. Our new rate schedule –check the website- is designed to offer comfortable rates in these hard economic times.

As always your feedback is welcome; just call or email us.
We hope to see you in October!

Regards,



UWAMIC Co-Director, Development

Email:uwamic@mailplus.wisc.edu•Phone:(608)262-0112•Fax:(608)265-4036

UW Advanced Materials Industrial Consortium
Annual Meeting Agenda

October 6-7, 2010
Engineering Centers Building-Research Auditorium and Lobby

Note: There will be wireless access available in ECB.

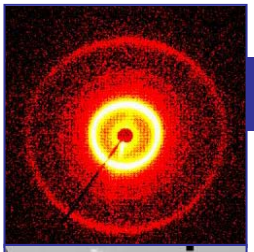
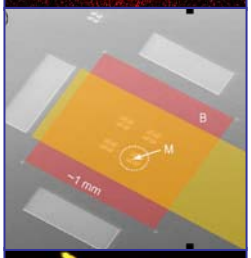
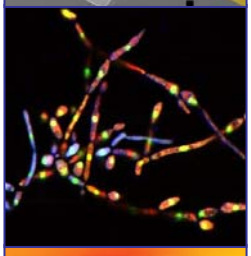
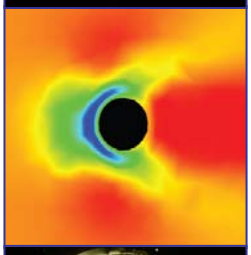
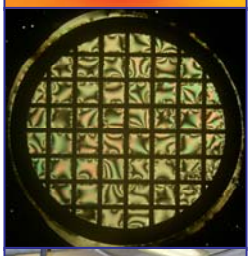
Wednesday, October 6

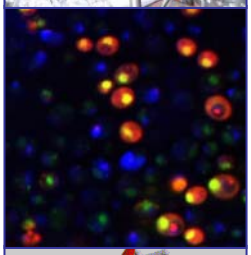
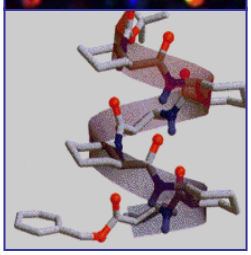
6:00 PM	Informal Reception & Poster Session	*ECB Lobby*

Thursday, October 7

AM Sessions		***ECB Research Auditorium***
7:30 AM	Continental Breakfast	*Lobby*
8:00 AM	College of Engineering Welcome	
8:10 AM	Nanoscale Science & Engineering Center (NSEC) Highlights	Paul Nealey
8:30 AM	Materials Research Science & Engineering Center (MRSEC) Highlights	Juan de Pablo
8:50 AM	Nanotechnology Research in Japan 20 minute Research Overviews by: Prof. T. Fujigaya Prof. Y. Arima Prof. A. Ohnuma	
10:00 AM	Break/ Poster Session	*Lobby*
10:30 AM	Designing and Probing Organic/Inorganic Hybrid Interfaces Relevant to Optoelectronics	Padma Gopalan
11:00 AM	Harvesting Energy Using Structure-Controlled Carbon Nanotubes	Mike Arnold
11:30 AM	Materials Science Meets Microbiology	Doug Weibel
12:00 PM	Lunch/ Student Poster Session	*Lobby*
PM Sessions		***ECB Research Auditorium***
1:30 PM	2010 Consortium Update	Jon McCarthy
2:00 PM	Industrial Opportunities at the Wisconsin Institutes for Discovery-Town Center and Embedded Labs	Laura Heisler, WARF
2:30 PM	Coffee Break	*Lobby*
3:00 PM	Applications of the UW Atomic Resolution Titan (S)TEM	Paul Voyles
3:30 PM	UWAMIC board Meeting	*1045 ECB*
4:00 PM	Adjourn	

Please RSVP by emailing kedebruin@wisc.edu no later than Tuesday, September 28.

UWAMIC in the News

Patents Proliferating for Inventor Robert Blick

If you think about a patent as the starting line for a race, you'll have some idea of the competitive fire that fuels serial inventor **Robert Blick**, Lynn H. Matthias Professor in Electrical and Computer Engineering.

With six patents assigned to Wisconsin Alumni Research Foundation and 11 more pending in the U.S. and abroad, Blick doesn't see intellectual property as his end goal. Instead, filing for a patent represents the point at which ideas can begin to compete for licensing interest, development funding and commercialization.

The finish line comes into sight when society gains a beneficial new technology, jobs are created and a stream of funding returns to the inventor to support future research.

"Some inventors want to hang on to their work and not let go, but that's not the way the business works,'' Blick says. "The real challenge comes in sharing your ideas and letting others improve on them, then turning around and using your ideas to help someone else. You can't just stand at the starting line and be impressed that you've gotten there.''

To read more, visit: http://www.engr.wisc.edu/news/headlines/2010/Jul29.html

Back in Circulation: Why Certain Polymers Improve Blood Flow

With funding from the National Science Foundation, a University of Wisconsin-Madison engineer will study whether "drag-reducing" polymer molecules enhance flow through some of the tiniest blood vessels in the human body.

Smaller than the diameter of a human hair, capillaries are embedded within the body's organs and are important for distributing blood throughout the tissues.

"One of the issues is making sure that, under situations where there's a disease or injury, blood is still able to get to where it needs to be," says **Michael Graham**, Harvey D. Spangler Professor of Chemical and Biological Engineering at UW-Madison.

Drag-reducing polymers show particular promise for improving circulation in situations that involve blood loss. "Experiments in lab animals have demonstrated improvements in survival rates if the animals were resuscitated with a solution containing these polymer molecules," says Graham.

To read more, visit: http://www.engr.wisc.edu/news/headlines/2010/Jun03.html

Powerful Genome Barcoding System Reveals Large-Scale Variation in Human DNA

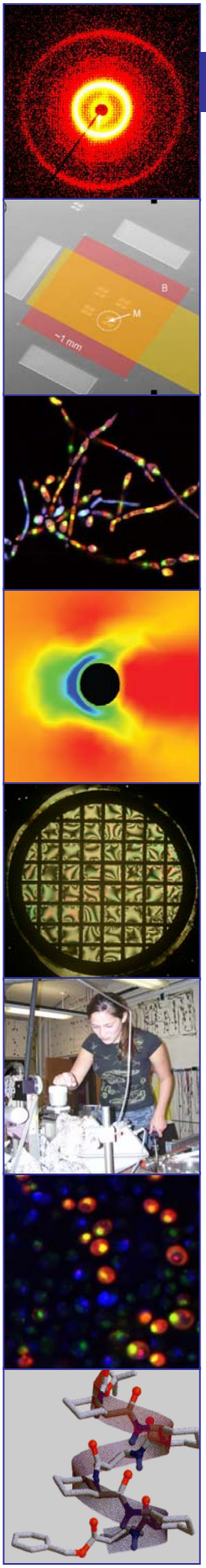
Genetic abnormalities are most often discussed in terms of differences so miniscule they are actually called "snips" — changes in a single unit along the 3 billion that make up the entire string of human DNA.

"There's a whole world beyond SNPs — single nucleotide polymorphisms — and we've stepped into that world," says Brian Teague, a doctoral student in genetics at the University of Wisconsin-Madison. "There are much bigger changes in there."

Variation on the order of thousands to hundreds of thousands of DNA's smallest pieces — large swaths varying in length or location or even showing up in reverse order — appeared 4,205 times in a comparison of DNA from just four people, according to a study published May 31 in the Proceedings of the National Academy of Sciences.

Those structural differences popped into clear view through computer analysis of more than 500 linear feet of DNA molecules analyzed by the powerful genome mapping system developed over nearly two decades by **David C. Schwartz**, professor of chemistry and genetics at UW-Madison.

To read more, visit: http://www.news.wisc.edu/18127



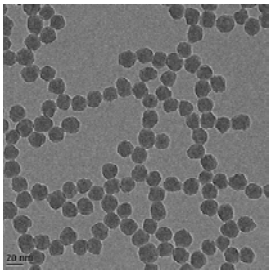
Instrumentation News

Cryo-TEM at the UW-Madison Materials Science Center

The Materials Science Center (MSC) has possessed the capability for cryogenic transmission electron microscopy (Cryo-TEM) imaging on the LEO 912 EFTEM for some time. To expand our capabilities, the MSC recently invested in sample preparation equipment that will provide complete support for soft materials, polymers and biological cryospecimens. Five groups within the MRSEC and NSEC are currently using the cryo facilities along with several other campus users from various biological science departments. Interested industrial customers are also welcomed and encouraged to use the facilities.

Existing LEO 912: expanded capability for Cyro-sample work

Cryo-Tem is a useful method for directly obtaining real-space images of native surfactant nanostructures in aqueous solutions. This powerful technique requires that aqueous solutions of surfactants be cryogenically fixed as thin films (~100-300 nm thick) on TEM sample grids that can be imaged at -196 °C using the cryogenic sample holder associated with the existing LEO 912 EFTEM in the MSC core facility. Thermal fixation of the samples requires rapid vitrification of the aqueous solution in liquid ethane to prevent water crystallization that will destroy the self-assembled surfactant aggregates and preclude imaging due to strong interactions of electrons with crystalline ice domains.



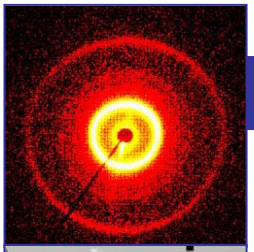
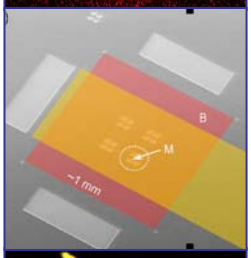
Cryo-TEM of poly(vinyl alcohol)-derived polymer micelles

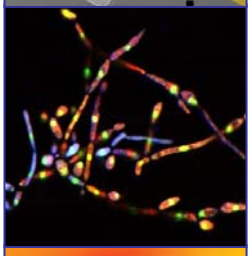
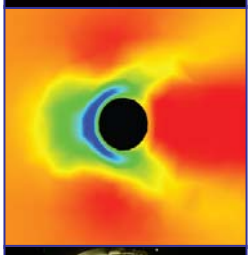
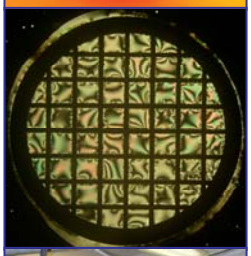
As an example, Dr. Schmitt of the in the Mahanthappa group examined samples of a poly-vinyl-alcohol-derived block copolymer surfactant in aqueous solution as part of an ongoing project (see figure to right). Vitrified Cryo-TEM specimens were prepared by placing a 5 µL droplet of a polymer surfactant solution (1 wt %) on a lacy carbon-coated copper grid (Ted Pella, Inc.) in the Vitrobot using a -2 mm blotting offset, a 1 second blot time, and a 15 second drain time for sample equilibration.

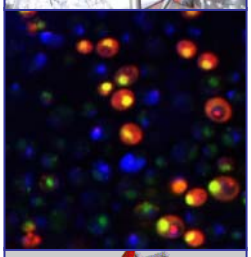
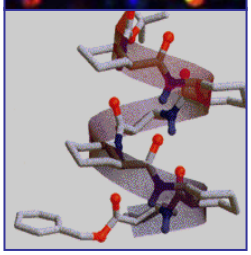
LEFT: The Leica EM UC7 Ultramicrotome provides easy preparation of semi- and ultrathin sections.

RIGHT: The FEI Vitrobot is used for vitrification of aqueous suspensions on grids; it is fully automated for reproducibility.

Email:uwamic@mailplus.wisc.edu•Phone:(608)262-0112•Fax:(608)265-4036

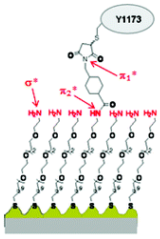



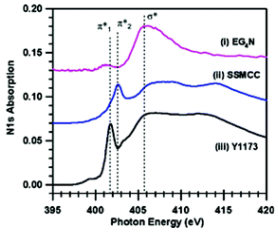




Recent Publications

Characterization of Surfaces Presenting Covalently Immobilized Oligopeptides Using Near-Edge X-ray Absorption Fine Structure Spectroscopy

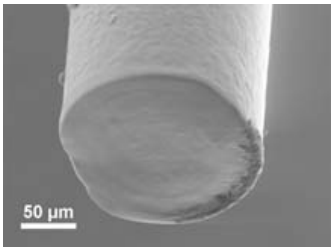




Y. Bai, X. Liu, P. Cook, N. L. Abbot, F. J. Himpsel
Langmuir **26** (9), 6464-6470 (2010)

Abstract: This study addresses the need for methods that validate the surface chemistry leading to the immobilization of biomolecules and provide information about the resulting structural configurations. We report on the use of near-edge X-ray absorption fine structure spectroscopy (NEXAFS) to characterize a widely employed immobilization chemistry that leads to the covalent attachment of a biologically relevant oligopeptide to a surface. The oligopeptide used in this study is a kinase substrate of the epidermal growth factor receptor (EGFR), a protein that is a common target for cancer therapeutics. By observing changes in the π* and σ* orbitals of specific nitrogen and carbon atoms (amide, imide, carbonyl), we are able to follow the sequential reactions leading to immobilization of the oligopeptide. We also show that it is possible to use NEXAFS to extend this characterization method to submonolayer densities that are relevant to biological assays. Such an element-specific chemical characterization of small peptides on surfaces fills an unmet need and establishes NEXAFS as useful technique for characterizing the immobilization of small biomolecules on surfaces.
http://pubs.acs.org/doi/abs/10.1021/la101101a

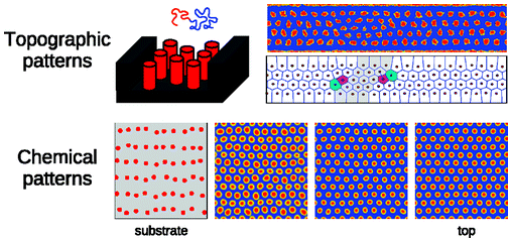
Reactive Layer-by-Layer Assembly of Suspended Thin Films and Semipermeable Membranes at Interfaces Created Between Aqueous and Organic Phases



M. Buck, D. Lynn
Advanced Materials **22** (9) 994-998 (2010)

Abstract: Thin films of polymer suspended across the openings of pores, channels, and microcavities are of interest in a broad range of fundamental and applied contexts. A "reactive" layer-by-layer approach is demonstrated for the fabrication of suspended thin films and semipermeable membranes that makes use of liquid/liquid interfaces created between immiscible aqueous and organic phases as templates for film fabrication (see image).
http://onlinelibrary.wiley.com/doi/10.1002/adma.200903054/abstract

Directed Assembly of a Cylinder-Forming Diblock Copolymer: Topographic and Chemical Patterns



F. Detcheverry, P. F. Nealey, J. J. de Pablo
Macromolecules **43** (15), 6495-6504 (2010)

Abstract: Using simulations of a coarse-grained model, we examine the ability of topographic and chemical patterns to direct the self-assembly of thin films of copolymers into a defect-free array of vertical cylinders. The topographic pattern is a trench where the diblock is confined, whereas the chemical pattern consists of spots that interact preferentially with the minority block. The self-assembly process is described with Monte Carlo simulations of the standard model of block copolymers. While fully three-dimensional, the simulated systems can include over a hundred domains. By analyzing top views and cross sections of thin films, it is possible to determine the degree of ordering and the properties of individual domains. First, the influence of confinement on ordering perfection is examined. By focusing on the influence of trench width and sidewall selectivity, one can identify conditions that yield defect-free arrays with a high reliability and for which domains exhibit a high degree of uniformity across the trench. Second, we consider chemical patterns. While patterns matching the block copolymer morphology and characteristic dimensions yield defect-free self-assembly, we study the tolerance of directed self-assembly against deviations from this optimal case. We first explore the effect of a mismatch between the spacing of the pattern and the diblock characteristic dimensions, and then we examine the interpolation of domains on an incomplete pattern, where half of the rows are missing. By introducing placement error in the position of the spots, we assess to what extent the diblock can rectify the noise of a substrate pattern. The results of simulations are discussed in the context of a variety of experimental observations.
http://pubs.acs.org/doi/abs/10.1021/ma1006733