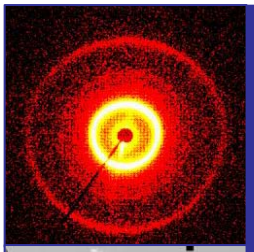
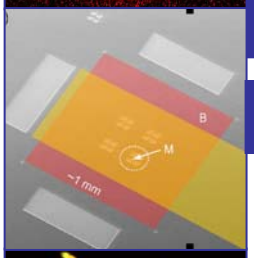
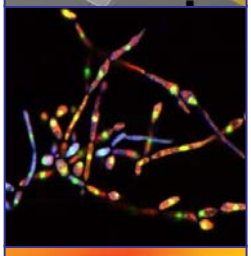
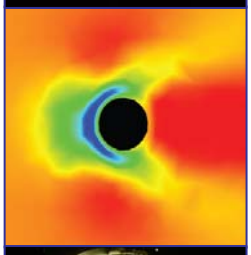
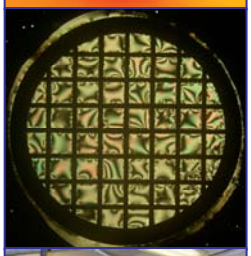
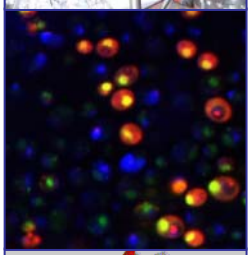
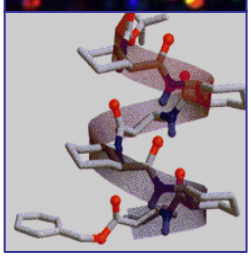



UWAMIC NEWSLETTER

Winter-Spring 2010, Volume 4, Issue 1

A Message from the Directors

Welcome to the Winter 2010 UWAMIC Newsletter!

Dear Members

This last 4 months has seen a lot of good things happen to our Centers and in our Consortium.

The NSEC was renewed last spring, but the budget finally was announced in late fall. We were funded at the current level plus a supplement for the Thrust 4 efforts on societal implications. We provide high value to the NSF and the larger science community and this funding level speaks to that in these economic times.

Similarly, the MRSEC was approved for its next two years, and is now preparing to submit the proposal for another six years of funding in 2011.

On the Consortium side, we continue to grow with 26 members this year. A number of events that bring industry together with our labs and researchers will take place in April and May, see the instrument section, below.

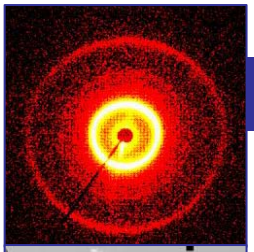
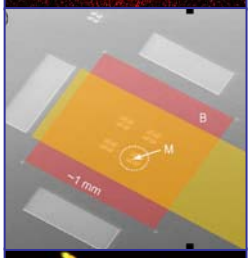
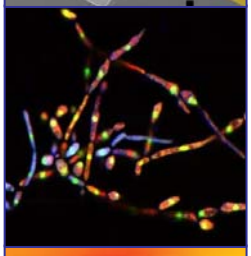
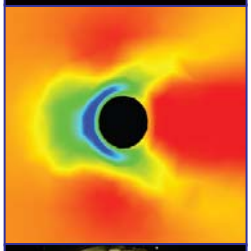
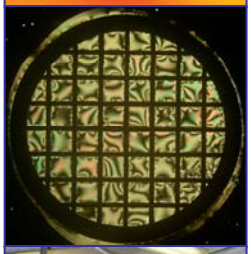
As of March, only about 30 % of our active members have paid their dues for 2010.
We will be sending out reminders, please realize that this is important to our Annual Meeting Support, and student support activities. On new rate schedule –check the website- is designed to be comfortable in these hard times.

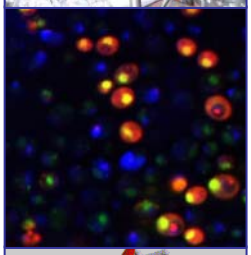
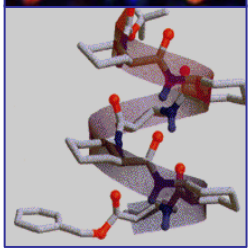
As always your Feedback is welcome, just call or email us.

Regards,

Co-Director, Development

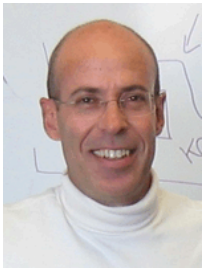
Email:uwamic@mailplus.wisc.edu•Phone:(608)262-0112•Fax:(608)265-4036

UWAMIC in the News

Models Begin to Unravel how Single DNA Strands Combine



Using computer simulations, a team of University of Wisconsin-Madison researchers has identified some of the pathways through which single complementary strands of DNA interact and combine to form the double helix.

Present in the cells of all living organisms, DNA is composed of two intertwined strands and contains the genetic "blueprint" through which all living organisms develop and function. Individual strands consist of nucleotides, which include a base, a sugar and a phosphate moiety.

Understanding hybridization, the process through which single DNA strands combine to form a double helix is fundamental to biology and central to technologies such as DNA microchips or DNA-based nanoscale assembly. The research by the Wisconsin group begins to unravel how DNA strands come together and bind to each other, says **Juan J. de Pablo**, UW-Madison Howard Curler Distinguished Professor of Chemical and Biological Engineering.

To read more, visit: http://www.news.wisc.edu/17171

Survey: Broad Support for Biofuels in Wisconsin, but Clear Partisan Differences

Although almost two-thirds of Wisconsinites support the use and production of biofuels, less than half think the government should subsidize their development, according to a new study by University of Wisconsin-Madison researchers.

The researchers also found that while about 60 percent of respondents believe the free market should provide the incentive to invest in technology to make fuels from plants or other organic materials, almost as many doubt the oil industry will go that route unless the government requires it, according to researchers **Dietram Scheufele** and Bret Shaw, both professors of life sciences communication at UW-Madison.

To read more, visit: http://www.news.wisc.edu/17179

Five Questions with Katrina Forest: Solving the World's Problems with Microbes

Bacteriology professor **Katrina Forest** once considered studying architecture—and in a way she does, albeit on a very small scale. As a protein crystallographer, she studies the three-dimensional structures of bacterial proteins on an atomic level to understand how the proteins function.

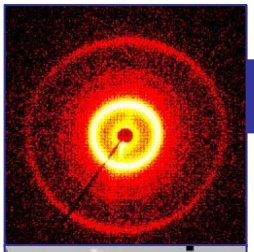
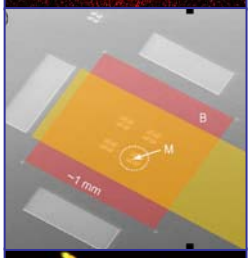
Most of her research focuses on the tiny surface protrusions called pili that bacteria use to move across surfaces and interact with other cells—including both beneficial and harmful interactions—and the molecular motor proteins that drive their movements.

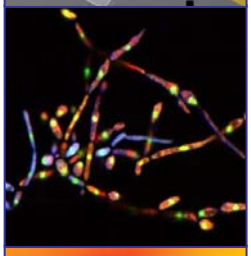
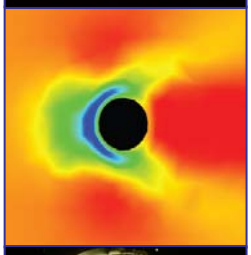
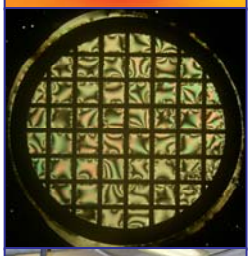
To read more, visit: http://www.news.wisc.edu/17259

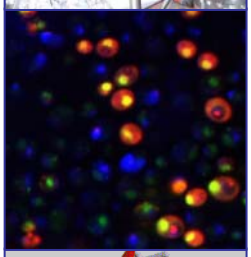
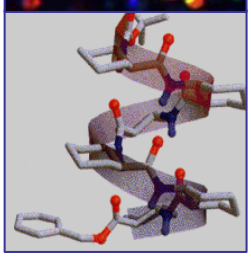
NSEC paper wins award

A paper entitled "Tracking online behavior after exposure to news of a local nanotechnology risk: A Risk Information Seeking and Processing (RISP) model approach" and co-authored by Societal Implications faculty members **Dominique Brossard** and **Dietram Scheufele** been awarded the Emerging Nanoscale Materials Specialty Group Student Merit Award at the *Society for Risk Analysis 2009 Convention* in Baltimore, Maryland.

To read more, visit:
http://birenheide.com/sra/2009AM/program/singlesession.php3?sessid=W1-I

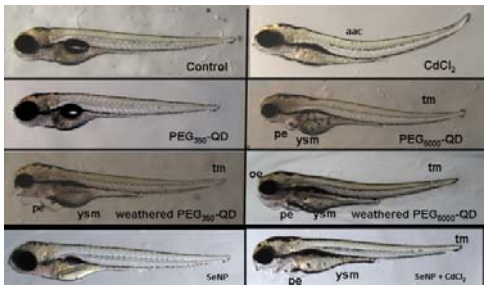




Research Highlights

Toxicity of Oxidatively Degraded Quantum Dots

Environmental conditions have the potential to alter nanoparticles (NPs) in a variety of ways (e.g., aggregation/agglomeration, dissolution, acquisition of coatings, redox transformations) making it unlikely that organisms will be exposed to NPs solely in their as-synthesized form. Few NP toxicity studies, however, have focused on environmentally altered NPs. We previously examined the oxidative stability of PEGylated CdSecore/ZnSshell quantum dots (QDs) under conditions representative of the extracellular environment of lignolytic fungi. Exposure of QDs to these conditions resulted in dissolution of the ZnS shell, release of Cd from the core, and production of amorphous Se-containing aggregates. We used embryonic zebrafish as a model to investigate changes in toxicity between as- synthesized and weathered QDs. Following 5-day exposure, weathered QDs were more potent (lower LC50) in causing mortality than as-synthesized QDs. Interestingly, both as-synthesized and weathered QDs were more potent in causing early life stage toxicity than equivalent concentrations of dissolved Cd. Although morphological endpoints of toxicity were the same for as-synthesized and weathered QDs (e.g., pericardial and yolk sac edema, curved spine, craniofacial malformations and tail malformation), weathered QDs had higher potency. Additionally, the severity of some morphological endpoints increased following exposure to weathered QDs. To simulate the Se-containing aggregates produced by the assay, we synthesized elemental selenium NPs (SeNPs). Zebrafish embryos/larvae exposed to SeNPs alone showed minimal mortality and no morphological endpoints of toxicity. However, embryos/larvae co-exposed to SeNPs and dissolved Cd recapitulated the profile of toxicity endpoints observed following exposures to weathered QDs. The Se-containing aggregates produced following assay exposure likely modulate the toxicity of the weathered QDs. Thus, environmental weathering is capable of increasing the potency of QD-induced developmental toxicity to an aquatic vertebrate.



http://nsec.wisc.edu/NS--Nugget.php?ID=57

Narrowing the Nano Discourse? The Web Changes How And What Citizens Learn About Emerging Technologies

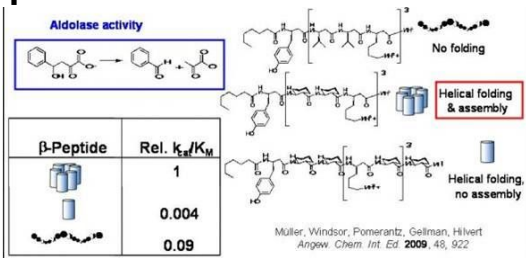
Audiences for science and technology news in traditional news outlets are shrinking, and recent data suggest that citizens increasingly turn to online sources for information about emerging technologies, such as nanotechnology. This raises a number of related questions. How do they approach this wealth of online information about nanotechnology, i.e., what kinds of keywords searches are most frequently used by citizens? And what kinds of content are they likely to encounter, based on these searches?

Based on analyses of Google Keyword data, Google Suggestions data and nano related Web sites content data, our results suggest that the terms audiences search for and the content they encounter during these searches increasingly shift the public debate about nanotechnology away from economic or scientific considerations. Instead, the web is directing the public toward a framing of the issue around health and medical considerations. This may have an impact on public's perception of the science and the range of its applications. In 2009, Google users are searching less for economic terms relating to nanotechnology than they were in 2008, and current Google suggestions highlight more health-related than economic terms. Plant biotechnology experienced a similar trend as U.S. media coverage initially focused on technological and economic development, but, by the late 1990s, focused on health and ethical risks. Although this shift in frames did not affect regulatory policy, it slowed industry growth. The trend we are seeing in online searching and content of nanotechnology could adversely affect future investments in nanotechnology in a similar fashion.

http://nsec.wisc.edu/NS--Nugget.php?ID=55

Catalysis from Directed Assembly of β-Peptide Nanorods

The UW-Madison NSEC is exploring directed assembly of nanorods designed based on biomimetic principles. In collaboration with scientists in Switzerland, we have recently discovered that such assemblies can be efficient catalysts of a chemical reaction. This findi ng suggests a new and general strategy for mimicking the powerful catalytic activities of natural enzymes. Ultimately, such catalysts might be useful for production of valuable molecules or for chemical sensing.



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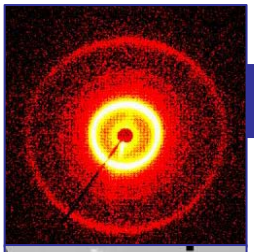
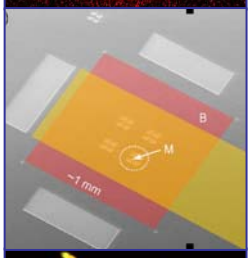
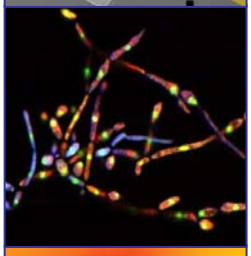
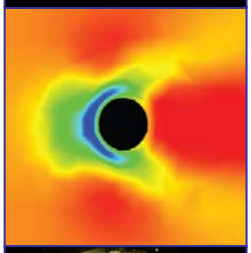
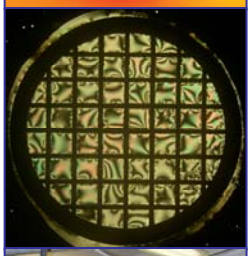
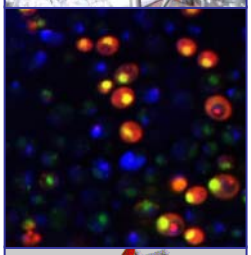
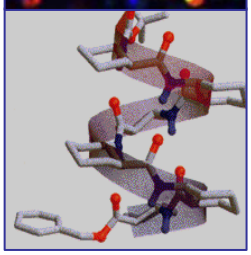






Instrumentation News

Events in April open to our Members: Please Sign UP through the link provided.
The MSC invites all UWAMIC to a series of events celebrating the

Opening of our Titan (S)TEM Laboratory.

SIGN UP NOW!
(printable PDF)

Microanalysis in aberration corrected STEM

THURSDAY, MARCH 25, 2010, 4 PM
Materials Science and Engineering
Room 264
1509 University Avenue

Masashi Watanabe is an Associate Professor at Department of Materials Science and Engineering in Lehigh University. Masashi's research emphasizes materials characterization using various electron microscopy approaches involving analysis via X-rays and energy-loss electrons in analytical electron microscopes (AEMs).

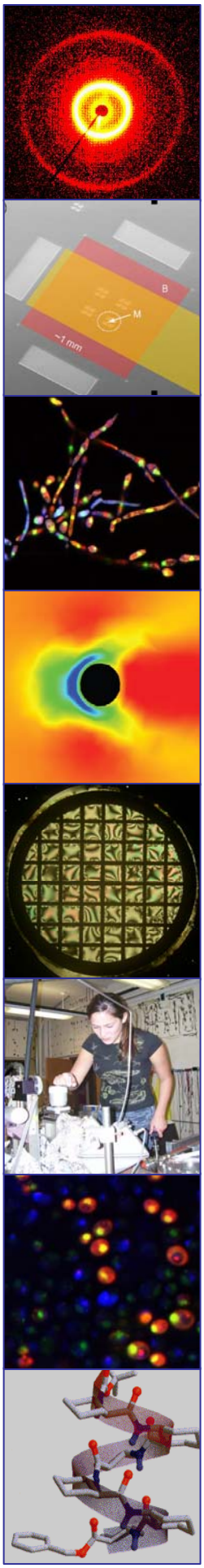
Grand Opening:
FEI Titan Laboratory

THURSDAY, APRIL 29, 2010
Begins at 1:30 PM
Engineering Centers Building
Room 1025
1550 Engineering Drive

This instrument is configured with a CEOS probe-side aberration corrector, which provides revolutionary performance in STEM imaging and microanalysis. It also has a new column design and electronics optimized to make the most of the new optics. Detectors are available for bright-field, low-angle annular dark-field, and high-angle annular dark-field STEM imaging, electron energy-loss spectroscopy, energy-filtered imaging, energy-filtered diffraction, energy-dispersive x-ray spectroscopy, and high-resolution TEM imaging.

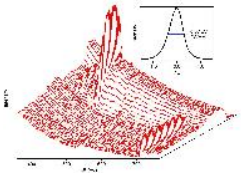
1:30 Biological applications in HRTEM — Richard Gursky, FEI Company

2:30 Sample Preparation for HRTEM, MicroCleave(TM) technique for HRTEM, Ion Milling in HRTEM — speakers to be announced.
3:30 Break
4:00 Materials Science Seminar, Materials applications of the Titan — Paul Voyles, UW Madison
5:00 Live Demo of the UW Titan

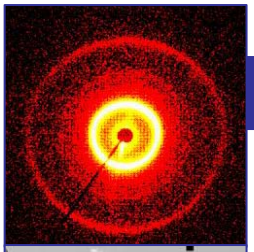
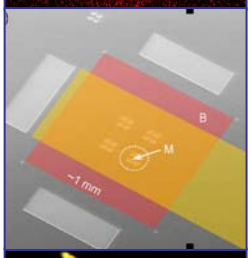


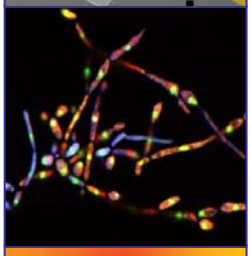
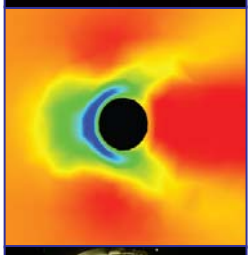
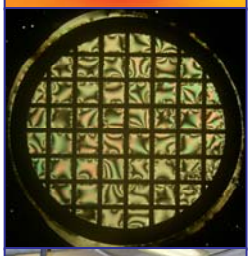
EELS Workshop

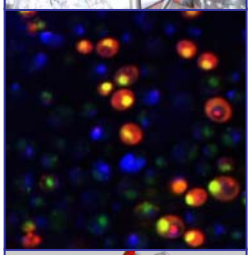
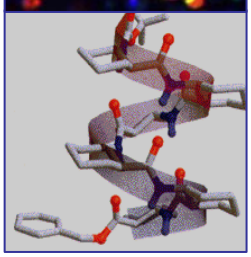
THURSDAY/FRIDAY, APRIL 22-23, 2010
9 AM to 4 PM each day
Engineering Centers Building, Room 1025
1550 Engineering Drive



Learn how the Gatan GIF on the Titan can be used for Materials Characterization. Join Ray Twesten from Gatan for a 2-day EELS workshop.

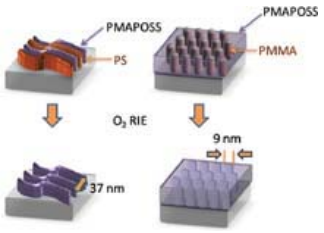



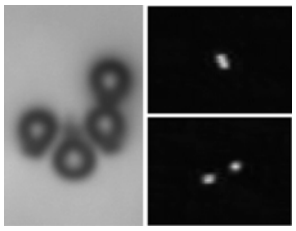
Recent Publications

One-Step Direct-Patterning Template Utilizing Self-Assembly of POSS-Containing Block Copolymers



T. Hirai, M. Leolukman, C.-C. Liu, E. Han, Y. J. Kim, Y. Ishida, T. Hayakawa, M. Kakimoto, P. F. Nealey, P. Gopalan
Advanced Materials **21** (43), 4334-4338 (2009)
Abstract: We report the self-assembly of organic-inorganic block copolymers (BCP) in thin-films by simple solvent annealing on unmodified substrates. The resulting vertically oriented lamellae and cylinders are converted to a hard silica mask by a single step highly selective oxygen plasma etching. The size of the resulting nanostructures in the case of cylinders is less than 10 nm.
http://www3.interscience.wiley.com/journal/122465548/abstract

Characterization of the Reversible Interaction of Pairs of Nanoparticles Dispersed in Nematic Liquid Crystals



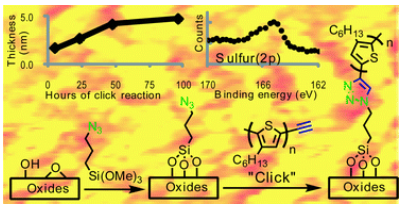
G. M. Koenig, J. J. de Pablo, N. L. Abbott
Langmuir **25** (23), 13318–13321 (2009)
Abstract: Observations of reversible interactions between pairs of chemically functionalized nanoparticles dispersed in nematic liquid crystals (LCs) are reported. In contrast to the irreversible association of microparticles in nematic LCs, by using gold nanoparticles and darkfield microscopy, particle tracking reveals the pairwise interactions of the nanoparticles in nematic LCs to be long-ranged and reversible. The measured range and strength of the pairwise interaction of the nanoparticles in the LCs was found to differ substantially from past theoretical predictions of nanoparticle interactions in LCs. The observation of reversible interactions between nanoparticles in LCs suggests that nematic LCs may provide new routes to spontaneous formation of ordered nanoparticle arrays. http://pubs.acs.org/doi/abs/10.1021%2Fla903464t

Diffusive Transport in Quasi-2D and Quasi-1D Electron Systems

I. Knezevic, E. B. Ramayya, D. Vasileska, S. M. Goodnick
Journal of Computational and Theoretical Nanoscience **6** (8) 1725-1753 (2009)
Abstract: Quantum-confined semiconductor structures are the cornerstone of modern-day electronics. Spatial confinement in these structures leads to formation of discrete low-dimensional subbands. At room temperature, carriers transfer among different states due to efficient scattering with phonons, charged impurities, surface roughness and other electrons, so transport is scattering-limited (diffusive) and well described by the Boltzmann transport equation. In this review, we present the theoretical framework used for the description and simulation of diffusive electron transport in quasi-two-dimensional and quasi-one-dimensional semiconductor structures. Transport in silicon MOSFETs and nanowires is presented in detail.
http://www.ingentaconnect.com/content/asp/jctn/2009/00000006/00000008/art00002;jsessionid=b8dqaj2hnip0k.alexandra

Grafting of Poly(3-hexylthiophene) Brushes on Oxides using Click Chemistry

P. Paoprasert, J. W. Spalenka, D. L. Peterson, R. E. Ruther, R. J. Hamers, P. G. Evans, P. Gopalan
Journal of Materials Chemistry (2010)



Abstract: Poly(3-hexylthiophene) (P3HT) brushes on silicon dioxide (SiO_2) were prepared using a click reaction between ethynyl-terminated P3HT and an azide self-assembled monolayer (SAM). Regioregular ethynyl-terminated P3HT with molecular weight of 5900 g mol^{-1} and polydispersity of 1.2 was synthesized by catalyst-transfer polycondensation using Grignard metathesis mediated by a nickel-based catalyst. The azide SAM was prepared from bifunctional molecules containing azide and siloxane as click reaction precursor and surface linker, respectively. The P3HT brushes were characterized by atomic force microscopy, ellipsometry, X-ray photoelectron spectroscopy, infrared reflection absorption spectroscopy, and UV-visible spectroscopy. The grafting of P3HT brushes was studied as a function of click reaction time and the growth of the brushes is governed by a diffusion-controlled process. P3HT brushes were prepared on pre-fabricated field-effect transistor structures in order to probe the electrical properties of the brushes. The versatile synthetic methodology developed in this work can be generalized to prepare a wide variety of semiconducting conjugated polymer brushes on oxide surfaces relevant to organic electronic devices.
http://www.rsc.org/Publishing/Journals/JM/article.asp?doi=b920233a