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Newsletter

AIChE NSEF NANOSCALE SCIENCE & ENGINEERING FORUM

Nanoscale Science & Engineering Forum

Advancing nanoscale science & engineering

American Institute of Chemical Engineers **1st Quarter 2007**

Spotlight on NSF-funded Nanoscale Science and Engineering Centers (NSEC)

Rice University

The **Center for Biological and Environmental Nanotechnology (CBEN)** was founded in 2001 as one of the nation'sfirst Nanoscience and Engineering Centers. Its researchers – all based at Rice University - discover and develop nanomaterials that enable valuable medical and environmental technologies. Most of CBEN's programs exploit the special chemical, magnetic and optical properties of soluble nanoparticles. These materials are the same size as naturally occurring biomolecules, and can be designed for specific functions in biological and environmental systems. Successful applications require fine manipulation of the interface between inorganic nanostructures (the dry side) and biological systems (the wet side). CBEN has termed this the 'wet/dry interface' and its control is the organizing theme of the center's science and engineering research. Research focuses on three themes: the fundamental science of nanoparticle chemistry and physics; the development of nanoparticles that sense and treat disease; and the environmental applications and risk assessment of nanoparticles. For a more complete description, click here or visit http://cben.rice.edu.

University of Wisconsin – Madison

The Nanoscale Science and Engineering Center (NSEC) at the University of Wisconsin (UW) was founded in September 2004. The ***Center on Templated Synthesis and Assembly at the Nanoscale*** brings together researchers from a broad range of disciplines, including chemical engineering, chemistry, physics, genetics as well as the social sciences. Four interdisciplinary research themes (so-called thrusts) are being pursued within the center: Directed Self-Assembly and Registration of Nanoscale Chemical Architectures; Templated Chemical Synthesis of Specific Heteropolymeric Nanostructures; Driven Nano-Fluidic Self-Assembly of Colloids and Macromolecules; Social, Legal and Environmental Impacts of Engineered Nanomaterials. These thrusts explore complementary concepts that revolve around the central theme of directed assembly at the nanoscale. For a more complete description, click here or visit http://www.nsec.wisc.edu.

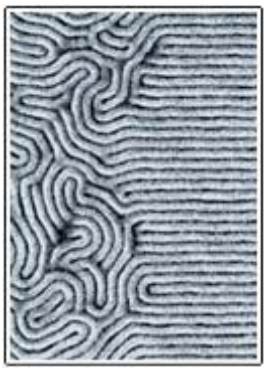

Image Caption: *Directed Assembly of Block Copolymers on Chemically Patterned Substrates. Credit: P.F. Nealey*

CHM Center for Hierarchical Manufacturing University of Massachusetts Amherst

University of Massachusetts – Amherst

The ***Center for Hierarchical Manufacturing*** at the University of Massachusetts Amherst was launched in April of 2006 as the newest of the National Science Foundation's Nanoscale Science and Engineering Centers. The mission of the CHM is to facilitate manufacturing of next generation nanotechnology-enabled devices by developing realizable processes for efficient component integration across multiple length scales. In many cases, structure at one length scale guides assembly at the next. The CHM's research focus is generation of nanoscale structures using directed self-assembly, high fidelity pattern transfer, and novel deposition techniques that can be integrated into large-scale production platforms. The processes are demonstrated for applications in computing and data storage, energy conversion, sensing and enhancements in human health. CHM efforts include both tool and process development.
For a more complete description, click here or visit http://www.umass.edu/chm.

Nanotech News

- Fluid flow at the nanoscale can be studied using carbon nanotubes, as recently reviewed in the February 2007 issue of Nature Nanotechnology. http://dx.doi.org/10.1038/nnano.2006.175
- Chemical engineers from MIT reported a new microfluidics-based method for high-throughput screening using patterned, disk-shaped particles. http://dx.doi.org/10.1126/science.1134929
- Impurities and solubilizing compounds found in carbon nanotube suspensions can complicate toxicity studies of the

nanotubes. http://www.nanowerk.com/spotlight/spotid=1600.php

- The U.S. Environmental Protection Agency released the final version of its Nanotechnology White Paper (EPA/100/B-07/001). http://www.epa.gov/osa/nanotech.htm

- Cambridge, MA is the second city after Berkeley, CA to consider regulating the use of nanomaterials. http://www.boston.com/business/technology/articles/2007/01/26/cambridge_considers_nanotech_curbs/

- The first of its kind, a large-scale study carried out by Rice University and the London Business School researchers indicate that US consumers are knowledgeable about both the risks and benefits of nanotechnology in consumer products. http://dx.doi.org/10.1038/nnano.2006.155

Society News

Deadline for NSEF Awards Nominations is Rapidly Approaching

NSEF offers two awards – the Forum Award and the Young Investigator Award. The Forum Award recognizes outstanding contributions in the advancement of nanoscale science and engineering in the field of chemical engineering through scholarship, education or service. The Young Investigator Award recognizes outstanding interdisciplinary research in nanoscience and nanotechnology by engineers or scientists in the early stages of their professional careers (within 10 years of completion of highest degree).

Follow the instructions on the AIChE Award Form to nominate a colleague (http://www.aiche.org/Nano/index.aspx). The original and 8 copies are required. You may send PDF files to: nano@aiche.org. Hard copies can be mailed to: Ms. June C. Wispelwey, AIChE, 3 Park Ave, 19th Floor, New York, NY 10016. **The deadline is April 30, 2007**.

NSEF Best Poster Awards from 2006 AIChE Annual Meeting

Poster presentation awards were given to three graduate students.

1st prize - Abhijit Chatterjee (University of Delaware), *Generation of Kinetic Phase Diagrams for Self-Assembled Nanopattern Formation in Heteroepitaxy Hierarchical Multiscale Modeling*

2nd prize - David B. Asay (Pennsylvania State University), *Direct Force Balance Method for AFM Lateral Calibration*

3rd prize - Bilge Yilmaz (Northeastern University), *Controlling the Quantum Wire Quality in Crystalline Titanosilicates ETS-4 and ETS-10*

Poster Winners with Nick A.

Watch out for the Following Enhancements to the NSEF Website

1. Express your opinion, and convey your suggestions to NSEF through the NSEF “suggestion box” soon to be added to the NSEF web site. We welcome your input on how NSEF can better serve its members.

2. Get the latest news on advances in nanotechnology from the NSEF web site through RSS feeds available at the web site.

3. Get published in the NSEF quarterly newsletter. If you have items of news that you think would be of interest to the members of NSEF, please submit them via the NSEF portal for consideration for publication in the NSEF newsletter. Examples of appropriate items include current affairs related to nanotechnology, job openings, and new nanotechnology-based products or processes.

4. Want to receive the NSEF newsletter? Visit the NSEF web site to submit your request for a free subscription.

5. Participate in discussions on nanoscience and nanotechnology via the on-line NSEF community soon to be accessible (for NSEF members only) via a portal at the NSEF web site. Questions can be posed, and then discussed by NSEF members.

AIChE Meeting Events

Meeting Events

The 3rd SBE International Conference on Bioengineering and Nanotechnology will be held on August 12-15, 2007 in Biopolis, Singapore. The Call for Papers can be viewed at http://www.icbn2007.com/index.php?page=Call_For_Papers&linkid=16. Student travel awards are available.

Comments and Feedback

Please let us know what you think of NSEF, its newsletter, or provide us with your suggestions by emailing: nano@aiche.org. Visit our website: http://www.aiche.org/DivisionsForums/ViewAll/NSEF.aspx

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Hielscher USA, Inc.: Ultrasonic Dispersing, Deagglomeration and Milling Equipment Nanomaterials are currently on the way from lab to production. Very small powders and particles are available for materials, such as metal oxides, nanotubes or nanoclays. Often these materials need to be mixed into liquid formulations. This is where agglomeration and aggregation blocks surface area from contact with other matter. In particular very fine powders and carbon nanotubes are very cohesive and hard to disperse. As surface activity is a key aspect of nanomaterials, only well dispersed or single-dispersed particles allow utilization of the full potential of the nanomaterials. In result good dispersing reduces the quantity of nanomaterials needed to achieve the same effects. Conventional processing devices, e.g. high-shear or rotor-stator mixers, high-pressure homogenizers or colloid and disk mills fall short in separating the nanoparticles into discrete particles.

Ultrasonic cavitation is very effective in breaking agglomerates, aggregates and even primaries. When ultrasound is being used for the milling of high concentration batches, the liquid jets streams resulting from ultrasonic cavitation make the particles collide with each other at velocities of up to 1000km/h. This breaks van der Waals forces in agglomerates and even primary particles (milling).

Hielscher manufactures ultrasonic devices for the efficient dispersing, deagglomeration and milling of nanomaterials in lab, bench-top and production level. With devices from 50 to 16,000 watts you can select the appropriate device for quantities from 1mL to several tons/hour. There is more information available at: http://hielscher.com/ultrasonics/nano.htm

Rohm and Haas: A specialty materials company with sales of $7 billion, Rohm and Haas Company is one of the world's largest manufacturers of technologically sophisticated materials. Most Rohm and Haas products are not seen directly by consumers; our customers however are well known companies that produce better-performing, high quality end-products and finished goods with Rohm and Haas technologies and materials working behind the scenes. These materials find their way into applications in a variety of major markets, improving the quality and functionality of everything from semiconductor chips to house paint. We serve markets as diverse as building and construction, personal care, consumer electronics, transportation, paper and packaging, pharmaceuticals, computer hardware, and electronic devices. Rohm and Haas is a responsible company that operates at the highest levels of integrity and ethics. We have an excellent reputation among our customers, our suppliers and our communities. We are a global company with more than 17,000 employees at over 100 locations in 26 countries. Our worldwide headquarters located on historic Independence Mall in the heart of Philadelphia, Pennsylvania, reaches out to offices in every major city in the world.

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