Newsletter

AIChE NSEF NANOSCALE SCIENCE & ENGINEERING FORUM

Nanoscale Science & Engineering Forum

Advancing nanoscale science & engineering

American Institute of Chemical Engineers **2nd Quarter 2007**

DuPont and Environmental Defense Address Nanotechnology Risks

DuPont teams up with Environmental Defense to develop a new framework to help businesses, governments, and the public evaluate the potential risks from nanomaterials. The Nano Risk Framework is a systematic process for evaluating and addressing the environmental, health and safety risks of nanomaterials across the entire lifecycle. This approach accounts for releases to the environments during the synthesis and design of nanomaterials and in the beyond-the-plant life cycle of engineered nanomaterials, which includes recycling and disposal.

The Nano Risk Framework includes the following six steps:
• Describing the material and its potential applications;
• Profiling the material's lifecycle through intended uses and accidental releases;
• Evaluating the associated risks;
• Assessing risk management options;
• Deciding and documenting further actions; and
• Reviewing new information regularly and adapting actions accordingly.

The aim of the framework is to develop potential nanotechnology applications without creating unexpected consequences. DuPont has already adapted the framework as a part of the company's mandatory product stewardship process and used it to test titanium dioxide nanoparticles, carbon nanotubes, and iron nanoparticles.

DuPont and Environmental Defense have made the framework freely available at http://www.NanoRiskFramework.com. Case studies of the three nanoscale materials tested by DuPont are also available.

Nanotech News

- Researchers have discovered that bacteria are able to collect metal nanoparticles into immobile clumps. The bacteria release proteins and polypeptides which promote aggregation. The approach may lead to innovative ways to remediate subsurface metal toxins.
  http://www.sciencemag.org/cgi/content/abstract/316/5831/1600
- Buckyballs are shown to block allergic response and basic immune system reactions. The research team believes this discovery may set the stage for the development of new therapies from the emerging field of nanoimmunology.
  http://www.jimmunol.org/cgi/reprint/179/1/665
- Nanoparticle-based medicines are able to penetrate the eye with little discomfort to the patient. The researchers believe this approach will be effective as a drug delivery device for treating glaucoma.
  http://pubs.acs.org/cgi-bin/abstract.cgi/jpccck/2007/111/i24/abs/jp067666l.html
- Silicon nanowires were embedded into embryonic stem cells from a mouse, which are especially intolerant to disturbances. The cells grew for over a month with survival rates dependent on the diameters of the nanowires. Future studies will investigate the cell response when current is applied to the nanowires.
  http://pubs.acs.org/cgi-bin/abstract.cgi/jacsat/2007/129/i23/abs/ja071456k.html
- Controlled-NOT quantum logic gate calculations are carried out on two Qubits, the building blocks of a quantum computer, using superconducting rings and quantum dots. This breakthrough allows any given quantum calculation to be realized.
  http://www.nature.com/nature/journal/v447/n7146/abs/nature05896.html
- NASA successfully tests nanosensors in space. The carbon nanotube-based sensor not only survived the harsh conditions and extreme vibrations from transit but was also still capable of sensing trace gases.
  http://www.spaceflightnow.com/news/n0706/18midstar1/

Society News

Please welcome Kirk Ziegler of the University of Florida as the new, volunteer editor of our Nano News. Kirk is replacing Michael Wong of Rice University, who has moved into the position as second Vice Chair and is also helping to launch a new initiative.

AIChE Meeting Events

2007 International Conference on Bioengineering and Nanotechnology

Register now to attend our 3rd International Conference on Bioengineering and Nanotechnology (ICBN 2007) on August 13-15, 2007 in Biopolis, Singapore. Professor Jackie Ying, head of Singapore's Institute for BioNanotechnology, is chairing the event. Leaders in the field include the following speakers:

- Takuzo Aida, *University of Tokyo*
- Moungi Bawendi, *Massachusetts Institute of Technology*
- C. Jeffrey Brinker, *University of New Mexico*
- James Bryers, *University of Washington*
- James Heath, *California Institute of Technology*
- Allan Hoffman, *University of Washington*
- I-Ming Hsing, *Hong Kong University of Science and Technology*
- Yu-Chen Hu, *National Tsing Hua University*
- Kazuhiko Ishihara, *University of Tokyo*
- Klavs Jensen, *Massachusetts Institute of Technology*
- Kazunori Kataoka, *University of Tokyo*
- Thomas A. Kost, *GlaxoSmithKline*
- Gil Lee, *Purdue University*
- Kam Leong, *Johns Hopkins University*
- Benjamin List, *Max Planck Institute*
- D. Tyler McQuade, *Cornell University*
- Vladimir Mironov, *Medical University of South Carolina*
- Teruo Okano, *Tokyo Women's Medical University*
- Buddy Ratner, *University of Washington*
- Myron Spector, *Harvard Medical School*
- Galen Stucky, *University of California, Santa Barbara*
- Gordon Wallace, *University of Wollongong*
- David Weitz, *Harvard University*
- Feng-Shou Xiao, *Jilin University*
- Shuguang Zhang, *Massachusetts Institute of Technology*
- Dongyuen Zhao, *Fudan University*.

Register now.

2007 Annual Meeting – NSEF Programming

NSEF is dedicated to bringing top quality nanotechnology-related programming to the chemical engineering community. This fall, NSEF will sponsor or co-sponsor over 50 sessions dedicated to nanoscale science and engineering. We encourage you and your colleagues to attend the 2007 Annual Meeting in Salt Lake City and take advantage of the rich content that we offer.

Related special events will include:
- NSEF Awards Lectures for the Forum Award and Young Investigator Award
- NSEF Poster Session
- NSEF Luncheon & Planning Meeting

The preliminary sessions are listed below.

NSEF Core Programming
Poster Session: Nanoscale Science and Engineering
Nanoscale Science and Engineering Award Lectures
Chemical Engineering Principles for Nanotechnology
Templated Assembly of Inorganic Nanomaterials
Nanofabrication and Nanoscale Processing
Self and Directed Assembly at the Nanoscale I, II
Nanoelectronic Materials
Commercialization of Nanotechnology
Education Issues in Nanotechnology
Nanoscale Structure in Polymers I: Self-organization of Polymers at Surfaces and Interfaces
Nanoscale Structure in Polymers II: Nanostructured Polymeric Materials
Nanoscale Structure in Polymers III: Polymer Nanocomposites
Nanoscale Structure in Polymers IV: Polymer Nanocomposites

Carbon Nanotubes
Carbon Nanotubes I: Synthesis
Carbon Nanotubes II: Characterization, Functionalization, and Applications
Carbon Nanotubes III: Adsorption and Transport
Carbon Nanotubes IV

Nanowires
Nanowires I: Synthesis
Nanowires II: Modeling, Integration Strategies and Applications
Nanowires III: Applications to Photovoltaics or Renewable Energy

Topical 5: Nanomaterials for Energy Applications
Nanomaterials for Hydrogen Production and Fuel Cells
Nanomaterials for Photovoltaics
Nanomaterials for Energy Storage

Topical 6: Environmental and Regulatory Policy Issues in Nanotechnology
Regulation of Environmental Releases from Nanotechnology Product Manufacture and Use
Environmental Effects On Nanomaterials
Regulation of Nanotechnology Product Sale and Use
The Toxicology of Nanomaterials

Topical 8: Bionanotechnology
Bionanotechnology: Plenary Sessions I, II, III
Nanostructured Scaffolds for Tissue Engineering
Nanostructured Biomimetic and Biohybrid Materials and Devices
Polymers as Functional Components of Micro- and Nanodevices
Nanotechnology and Nanobiotechnology for Sensors I, II, III
Nanoscale Science and Engineering in Biomolecular Catalysis I, II, III
Nanotechnology for Biotechnology and Pharmaceuticals Industries
Self-Assembled Biomaterials
Nanomagnetics for Bioseparation
Applications of Magnetic Nanoparticles in Biotechnology and Biomedicine
Bionanotechnology for Gene and Drug Delivery I, II
Nanotechnology for in Vivo and in Vitro Imaging
Micro- and Nanodevices for Targeted Therapeutics
Sensors And Bio-Imaging Contrast Agents At The Cellular Level

Comments and Feedback

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

Gold Level Sponsors

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

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