Nanotech News

Carbon Nanotube Rainbows

The exhibited color of a nanoparticle can result from size dependent plasmon resonance (metallic) or the exciton energy band-gap (semiconducting). Dr. Junichiro Kono (Rice University) and colleagues demonstrate that for single-walled carbon nanotubes (SWCNTs) demonstrating the armchair configuration color is dependent on exciton properties, despite the fact that these materials are metallic in nature. Thus, these materials appear to yield excitons without exhibiting a measurable band gap.
http://pubs.acs.org/doi/full/10.1021/ja209333m

DNA Sequencing via Nanowire FETs

This quarter has been a busy time for DNA research with reports of significant advances in DNA sequencing, origami, and machines (see below). Dr. Charles Lieber (Harvard University) and colleagues combined pore-based DNA sequencing technologies with silicon nanowire field effect transistors (FETs) to yield a new technology for DNA sequencing. This technology improves upon current pore sensing technologies by using FETs to detect the very small ionic signals from DNA bases traversing through the pore. This combined technology should improve the sensitivity and speed of DNA sequencing.
http://www.nature.com/nnano/journal/v7/n2/full/nnano.2011.217.html

DNA Origami

Dr. Peng Yin (Harvard University) and colleagues reported the development of a "single-stranded DNA tile" that can be used for the self-assembly of larger superstructures. Each tile contains 4 sticky ends that can bind their neighbors and serves as a "pixel" for larger superstructure assembly. This technology allows researchers to assemble DNA into new shapes with incredibly ease and versatility.
http://www.nature.com/nature/journal/v485/n7400/full/nature11075.html

DNA Robots

Dr. George Church (Harvard University) and colleagues report a DNA robot that can transport and sense biological molecules. The robot is based on DNA aptamers that form a box structure that opened in response to a binding sequence. The box could be loaded with molecules that could be released upon activation. Robots were used to release antibodies known to halt cell growth, which was observed upon activation. This technology exemplifies advancements in the field of bionanotechnology, where biological components are being manipulated and controlled to form engineered devices.
http://www.sciencemag.org/content/335/6070/831.full

Report on the National Nanotechnology Initiative

The National Nanotechnology Initiative (NNI) was launched in 2000 to centralize and support the development of the nanotechnology industry in the US. Recently, the required biennial assessment of the NNI was released. The NNI includes over 26 agencies and programs and has contributed to making the US a leader in nanotechnology. The study emphasized that continued investment in nanotechnology, particularly the translation of research to industrial production, will be required to remain ahead of competing nations. Additionally, the need for continued assessment of the environmental, health and safety (EHS) implication of nanomaterials will be required.
http://www.whitehouse.gov/blog/2012/04/27/pcast-releases-assessment-national-nanotechnology-initiative

Toxicity of Ingested Nanoparticles

Dr. Michael Shuler (Cornell University) and colleagues have shown that a common type of nanoparticle can exhibit toxic effects in the body. Polystyrene nanoparticles produced both short-term and long-term effects in a chicken model when ingested. Specifically, particles interfered with iron transport in the intestine and may also affect the uptake of vitamins. In addition to increasing our understanding of nanoparticle toxicity, this work provides a new model to evaluate toxicity in the intestinal tract.
http://www.nature.com/nnano/journal/v7/n4/full/nnano.2012.3.html

More Study Needed to Evaluate Nanomaterial Safety

Compounding the NNI report message, the National Research Council released a report emphasizing the need for additional study on the EHS implications of nanomaterials. The current market for nanomaterials is ~$1B and is rapidly growing. As more nanomaterials enter consumer products, it is increasingly important to evaluate their impact to human consumers and the environment. However, this must be accomplished using methodologies that do not stifle innovation in the nanotechnology industry, which is expected to grow to $3T by 2015.
http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=13347

Nanoparticle Toxicity

Dr. Andre Nel (University of California, Los Angeles) and colleagues are making strides in this area by developing the first predictive model of nanotoxicity. The model correlates energy levels of nanomaterial conduction bands to cell and organism toxicity. This model provides a first principles approach to understanding nanotoxicity, comparing the ox-redox potentials of nanomaterials to those of potential cellular pathways that could lead to toxic effects.
http://pubs.acs.org/doi/abs/10.1021/nn3010087

Single Nanotube Endocytosis Observed

Nanoparticle uptake into cells (endocytosis) is an important component of drug delivery and also nanotoxicity responses. Although it is widely known that nanoparticles and nanorods can be internalized, the mechanism of this transport is still a source of study.

Dr. Hongjie Dai (Stanford University) and colleagues report the first observation of nanotube endocytosis in three dimensions (3D). Previously, endocytosis has been studied using electron microscopy of two dimensional (2D) cellular sections. However, Dai and colleagues exploited the "plasmonic ruler" effect to evaluate internalization of carbon nanotubes with ~ 10 nm precision.
http://www.nature.com/ncomms/journal/v3/n2/full/ncomms1698.html?WT.ec_id=NCOMMS-20120228

Society News

Website

Some of you may have noticed some changes to the NSEF website - and may have had some difficulty accessing it. This is due to a larger AIChE-wide effort to revamp and improve the overall AIChE site and all accompanying pages, including those associated with individual divisions and forums. The NSEF site is no exception. Please bear with us during the transition and let the officers know if you have difficulty accessing the page (we will immediately inform the AIChE Webmaster). Also, please do not hesitate to contact us if you can no longer locate information you are looking for. The site can be accessed at: http://www.aiche.org/community/divisions-forums/nsef

ICBN Recap

In June, the NSEF co-sponsored the **International Conference on Bioengineering and Nanotechnology** held at University of California, Berkeley. The conference featured speakers Dr. Shuming Nie, Dr. Joe DeSimone, Dr. Christina Smolke, Dr. Ali Khademhosseini, and Dr. Mark Saltzmann. The conference, held on the UC Berkeley conference, was organized by Dr. Matthew Tirrell and Dr. Luke Lee.

Awardees

The NSEF is extremely grateful to **Shell** for sponsoring the student poster awards at this year's Annual meeting. Please join us for this poster session year's poster session to be held 6-8 pm on Tuesday, October 30th in Hall B of the Convention Center.

Elections

By now, all NSEF members should have received an email from AIChE announcing elections for 2013 - 2014 offices. We have a slate of nominees to fill three separate elected offices. Please go to the link provided in the email or to the NSEF Website and cast your vote for the following:

Vice Chair - the vice chair serves a two-year term and then succeeds the chair for another two years. Nominees:

Dr. Jessica Winter
Dr. Zach Hilt

Director - there are four candidates to fill two director positions. Please submit your votes for two candidates. Nominees:

Dr. Tom Mensah
Dr. Placidus Amama
Dr. Hebab A. Quazi
Dr. Alberto Striolo

Secretary/Treasurer - We have one very capable nominee whom is running unopposed:

Dr. Virginia Davis

Member Highlights

The NSEF is thrilled to announce our 2012 award winners. The 2012 NSEF Young Investigator award goes to **Dr. Virginia Davis**. Dr. Davis is the Mary and John H. Sanders Associate Professor in the Chemical Engineering Department of Auburn University. Her research to assemble cylindrical nanomaterials into larger functional materials has been previously recognized by a Presidential Early Career Award for Scientists and Engineers and a National Science Foundation CAREER Award.

The 2012 NSEF Forum Awardee is **Dr. Michael Strano**. Dr. Michael Strano is the Charles and Hilda Roddey Associate Professor of Chemical Engineering at the Massachusetts Institute of Technology. His research on carbon nanotubes has been recognized by the Allen P. Colburn Award, the Outstanding Young Investigator Award from the Materials Research Society, and Alfred P. Sloan Foundation Research Fellowship. Please join us at the NSEF Plenary session, Monday October 29th at 8:30 in Pittsburgh, where both recipients will deliver talks highlighting their work.

The editorial board of the NSEF newsletter is finalizing a proposed Frontiers of Nanotechnology book to be published by Wiley. This book will focus on commercialization of nanotechnology. If you are interested in possibly submitting a chapter, contact nsef@aiche.org.

If you have a recent publication, honor, or award that you would like to have **highlighted in the NSEF newsletter** please submit these to the editors at nsef@aiche.org.

Conference Updates

NSEF is directed toward engineers and scientists who share interests in research and technology development at the atomic, molecular, or macromolecular levels. The Forum includes a general plenary (1) Chemical Engineering Principles for Nanotechnology (Plenary) and two Bionanotechnology Plenary Sessions I and II. There will be a poster session and a Bionanotechnology Graduate Student Award Session.

Highlights you will learn about:

- Medical and Biological Applications
    - Magnetic Nanoparticles In Biotechnology and Medicine I and II
    - Nanotechnology for Biotechnology and Pharmaceuticals
    - Bionanotechnology for Gene and Drug Delivery I, II, and III
    - Nanostructured Biomimetic and Biohybrid Materials and Devices
    - Nanostructured Scaffolds for Tissue Engineering
    - Nanotechnology for In Vivo and In Vitro Imaging
    - Self-Assembled Biomaterials
- Nanotubes, Nanowires and Nanoparticles
    - Synthesis of Graphene and Carbon Nanotubes: Kinetics, Mechanisms and Reactor Design
    - Graphene and Carbon Nanotubes: Characterization, Functionalization, and Dispersion
    - Graphene and Carbon Nanotubes: Absorption and Transport Processes
    - Graphene and Carbon Nanotubes: Applications
    - Graphene- and Carbon Nanotube-Based Electronic Materials
    - Nanowires: Synthesis and Modeling
- Catalyst Applications
    - Nanoscale Science and Engineering In Biomolecular Catalysis I, II, and III
- Environmental Applications
    - Environmental Applications of Nanotechnology and Nanomaterials
    - Environmental Implications of Nanomaterials: Biological Interactions
    - Environmental Implications of Nanomaterials: Fate and Transport
    - Environmental Health and Safety (EHS) Concerns of Nanomaterials
- Electronics
    - Nanoelectronic Materials
    - Nanoelectronic Materials and Devices I and II
- Polymers
    - Nanoscale Structure In Polymers I: Nanostructured Polymeric Materials
    - Nanoscale Structure In Polymers I and II
- Other
    - Self and Directed Assembly at the Nanoscale
    - Nanofabrication and Nanoscale Processing
    - Templated Assembly of Inorganic Nanomaterials I, II
    - Nanotechnology and Nanobiotechnology for Sensors
    - Functional Nanoparticles and Nanocoatings on Particles I

- Structure, Properties and Characterization of Nanocomposites

Comments?

NSEF's newsletter is edited by Drs. Jessica Winter and Thomas Mensah. Contact us at nsef@aiche.org.