NIST, NCI Bring Web Tools to Nanotechnology Standards Effort

Federal government and U.S. industry scientists say they are forging ahead with plans for an international, online collaboration to speed up creation of critically needed nanotechnology standards, including the underpinning reference materials and tests that support development of nanotech products while minimizing potential risks.

Combining efforts of materials scientists and measurement laboratories with those of biological and medical researchers, the new Internet-linked "community of interest" will exploit Web 2.0-style social networking technologies to enable creating and sharing information, as well as deliberating over technical details of in-process standards. The initial focus will be standards for characterizing the structure and properties of engineered nanoscale materials.

The global market for nanotechnology-enabled products is forecast to top $3 trillion by 2015, according to the market research firm Lux Research. This anticipated stream of nanotech innovations has spawned a backlog of standards needs.

The idea for the Web-based collaboration was strongly endorsed during an international workshop hosted by the National Institute of Standards and Technology (NIST) last Fall. Other cosponsors were the U.S. Food and Drug Administration, National Institute of Environmental Health Sciences, National Institute for Occupational Safety and Health, Oregon Nanoscience and Microtechnologies Institute, and National Cancer Institute (NCI) and its Nanotechnology Characterization Laboratory, with contributions from ASTM International.

"Engagement of the world's environmental, health and safety scientific expertise in standards development could well become a 'tragedy of the commons' in that we know standards will benefit the entire community, but there are a growing number of organizations tapping into this scientific expertise," said Clayton Teague, director of the National Nanotechnology Coordination Office, which administers the U.S. National Nanotechnology Initiative. "This finite expertise might become so overly taxed that real progress will be hindered. A community-driven initiative makes sense. Collaborative Web sites look very promising as a means to enable sustained cooperation across nations and scientific disciplines."

A prototype wiki—or collaborative Web site—was demonstrated by representatives of the National Cancer Institute's (NCI's) Advanced Biomedical Computing Center.

Now undergoing further development at NCI, the nanotechnology standards wiki will enable instantaneous dissemination (as well as archiving) of drafts, discussions, votes, and supporting materials. Wiki-related tools will help in organizing discussions, and standards developing organizations (SDOs) will be able to tap this resource to expedite drafting and validating protocols before they enter the formal approval process.

SDOs are developing standards in the fast-moving technology area, but scientists at the workshop said the overall response is not as effective or as coherent as the global challenge requires.

NCI and its partners expect a fully operational and vetted version of the site to be publicly available by early 2009.

The NCI Web site can be accessed at www.cancer.gov.

U.S., Australia, and Iceland Launch International Partnership to Promote Advanced Geothermal Technologies

Last summer, the U.S. Department of Energy's (DOE) Acting Assistant Secretary for Policy and International Affairs Katharine Fredriksen, Australia's Ambassador to Iceland Sharyn Minahan, and Iceland's Minister of Industry Energy and Tourism Ossur Skarphedinsson signed the charter of the International Partnership for Geothermal Technology (IPGT), signaling the commitment of the three countries to aggressively foster and promote cutting-edge geothermal technologies to promote energy security and address global climate change. This framework brings together international collaboration on policy and the technical aspects of enhanced geothermal systems (EGS) such as deep drilling and geothermal energy conversion.

"Enhanced geothermal systems have the potential to be the world's only ever-present form of baseload renewable energy," Fredriksen said. "This international collaborative will bind the U.S., Australia, and Iceland to work together to accelerate the development of geothermal energy, bringing this clean, domestic, and natural energy to the market in the near-term to confront the serious challenges of climate change and energy security."

The three agencies will work together to identify and encourage research, development, and deployment projects critical to widespread deployment of EGS and deep drilling technologies, exchange best practices, and support education and training programs. The IPGT will foster close working relationships among the international partners to support an accelerated evolution of geothermal technology through knowledge gained from projects in different countries and geologic settings.

In addition to establishing the IPGT, ministerial representatives held a two-day workshop bringing together experts from government, industry, and academia to discuss research, development, and deployment priorities for geothermal energy. The IPGT is open to expansion and in the future may include members from other countries with commitments to emerging geothermal energy technologies.

More information about DOE's Geothermal Technologies Program can be accessed at Web site. http://www1.eere.energy.gov/geothermal/.

ESF Workshop Explores Unique Properties of Boron to Develop New Drugs and Diagnostics

The element boron has to date far been one of biology's best kept secrets, but is now attracting fast growing research interest and investment from the pharmaceutical industry in the quest for novel drugs to tackle cancer and infectious diseases, potentially overcoming limitations and side effects of current products, according to the European Science Foundation (ESF). Europe's response to the challenges and opportunities of boron chemistry in medicine was discussed at an exploratory workshop held last year in Lodz, Poland, "Biobor—Exploring New Opportunities of Boron Chemistry Towards Medicine," sponsored by ESF.

According to the workshop convenor Zbigniew Lesnikowski, the ESF workshop set the stage for a new era of boron therapies going beyond the current application in cancer radiotherapy by boron neutron capture therapy (BNCT), in which the element is used to help translate beams of neutrons into radiation that targets tumor cells with less "collateral damage" of surrounding healthy tissue.

"Yes, it became obvious during the workshop that there is now sufficient knowledge and enough compounds to support a broad program of screening in the quest for new antiviral and anticancer drugs containing essential boron components," said Lesnikowski. There was also scope for improving the application of BNCT to cancer, but besides these two therapeutic avenues, boron also has vast potential as the basis for compounds in diagnosis and biosensing, and also for novel bioorganic materials, said Lesnikowski.

The applications in biosensing, biomaterials, and drug development all spring from the fundamental chemical

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properties of boron. Boron compounds share some similarities with carbon but also have important differences. It is the combination of these similarities and differences that give boron its unique potential in medicine, according to workshop participants.

Apart from lack of knowledge over the potential, development of boron compounds for medicine has been held back until now by the high cost of catalysts and boron-based intermediate compounds used in the synthesis. Another important recent development therefore was availability of lower cost intermediates in the synthesis processes, according to Lesnikowski.

Singapore Opens Second Major R&D Hub

Singapore's Prime Minister Lee Hsien Loong joined more than 400 international leaders in science, technology, and business last Fall to celebrate the opening of Fusionopolis, the country's second major research and development (R&D) hub. Its first major hub, Biopolis, opened five years ago.

The Fusionopolis, which will be developed over six phases, is the country's icon for R&D in the interactive media, physical sciences, engineering, and technology. It is part of a larger development called one-north, which is developed to be a focal point for R&D and "technopreneurial" activities in Singapore.

"Fusionopolis offers a unique and powerful model for research and innovation," said Lim Chuan Poh, chair of the multi-agency Fusionopolis Steering Committee and also chair of A*STAR (Agency for Science, Technology and Research), a public research agency in Singapore whose science and engineering research institutes will be located at Fusionopolis.

Altogether, there will be 800 scientists, engineers, and game developers at Phase 1 of Fusionopolis. This number will increase to 2400 by 2012 when Phase 2 of the development is ready.

Anchoring the development is A*STAR's science and engineering research institutes with capabilities in data storage, materials science, infocomm, microelectronics, chemical synthesis, high-performance computing, and manufacturing technologies. The Institute for Infocomm Research (I^2R), the Institute of High Performance Computing (IHPC), and part of the Data Storage Institute (DSI) have moved into Phase 1 of the development. The remaining laboratories of DSI, the Institute of Materials Research and Engineering (IMRE), the Institute of Microelectronics (IME), and the Singapore Institute of Manufacturing Technology (SIMTech) will move into Phase 2 of Fusionopolis in 2011, whereby they will form multidisciplinary teams tackling research that require a melding of skills. A*STAR's seventh science and engineering research institute, the Institute of Chemical and Engineering Sciences, will remain at its current location in Jurong Island, which is a 30-minute drive away from Fusionopolis.

The research institutes will be joined by at least 13 corporate laboratories, which are located at Phase 1 of the development. These include Vestas—a wind turbine company, and Nitto Denko—an electronics and advanced materials company. More corporate laboratories will move into the subsequent phases of the development.

Charles Zukoski, who chairs A*STAR's Science and Engineering Research Council (SERC), said, "With Fusionopolis, we are trying to create a new model of doing research that cuts across many different borders. This mixing of different interests and backgrounds will lead to unexpected solutions to problems about which society cares." Zukoski is a member of the U.S.-based National Academy of Engineering and is the William and Janet Lycan Professor in the Department of Chemical and Biomolecular Engineering at the University of Illinois at Urbana-Champaign.

The Fusionopolis research community can also draw on the biomedical research expertise at Biopolis, which is located half a mile away and is home to A*STAR's 14 biomedical research institutes, consortia, and centers. A*STAR has been encouraging collaborations between its 1500 physical sciences researchers and engineers, and 1000 biomedical researchers.

The opening of Fusionopolis comes as Singapore recorded the highest Gross Domestic Expenditure in R&D (GERD) of SGD$6.3 billion in 2007, based on the preliminary results of the country's national R&D survey conducted by A*STAR. The amount was an unprecedented increase of 26% from the 2006 GERD, and double the amount of SGD$3 billion recorded in 2000. GERD as a percentage of GDP rose to 2.61% in 2007, up from 2.31% in 2006 and 1.88% in 2000. Two thirds of this expenditure comes from the private sector.

The A*STAR Web site can be accessed at www.a-star.edu.sg.

Australia Launches Nanotechnology Research Center

Senator Kim Carr, Australia's Minister for Innovation, Industry, Science and Research, announced the launch of a AUD$100-million collaborative research facility last Fall that will provide Australia's researchers with laboratories and expert support to undertake world-leading research into micro- and nano-fabrication. The new Australian National Fabrication Facility brings together state-of-the-art equipment distributed between seven university-based centers around the country.

Carr said, "[The center] will boost national research capacity in many other disciplines that depend on these building block technologies. This type of infrastructure is essential to support the national innovation system to maintain Australia's competitive position internationally; but it also links centers of expertise and opens their research to industry."

The Australian government has provided $41 million in funding to the facility through the National Collaborative Research Infrastructure Strategy.

"Micro- and nano-fabrication offer important technologies that will contribute solutions to national and global challenges including safe drinking water, better health diagnostics, and energy storage," Carr said. The facility has 17 member institutions and has attracted co-investments from the Victorian, New South Wales, Queensland, and South Australian governments to assist in establishing nodes in their states.

More information about the facility can be accessed at Web site www.anff.org.au. □

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