Meeting the challenge of solar energy

RESEARCH PRIORITIES

The US Department of Energy's Office of Science has identified the key research challenges if solar energy is to provide a significant fraction of our energy needs by the middle of the century. Their report, *Basic Research Needs for Solar Energy Utilization*, is the result of a workshop held earlier in the year and attended by 200 scientists.

World demand for energy is expected to double by 2050, and finding sufficient supplies of clean energy is an ever more pressing problem. "The huge gap between our present use of solar energy and its enormous undeveloped potential defines a grand challenge in energy research," the report notes.

Although large improvements in present technology will be required, the report points to progress in nanoscience, in particular, as a reason to be optimistic. "Powerful new methods of nanoscale fabrication, characterization, and simulation create new opportunities for understanding and manipulating the molecular and electronic paths of solar energy conversion."

Thirteen priority research directions have been identified in three areas: solar cells; systems that convert sunlight into thermal energy; and conversion of solar energy into chemical fuels, e.g. biomass and artificial mimics of photosynthesis. A number of challenges are common to all three areas, including coaxing cheap materials to perform as well as expensive ones, developing new paradigms for solar cell design, finding catalysts for the efficient conversion of solar energy into chemical fuels, and developing novel transparent conductors and thermal management materials.

Jonathan Wood

Database gathers findings on nanoparticle effects

NANOTECHNOLOGY

An online public database of scientific findings related to the benefits and risks of nanotechnology has been launched by the International Council on Nanotechnology (ICON) and the Center for Biological and Environmental Nanotechnology (CBEN) at Rice University. The environmental health and safety database aims to integrate the diverse literature available on the impact of nanoparticles 1-100 nm in size. It represents the combined efforts of the US Department of Energy, industry, and Rice researchers.

Currently, the resource contains peer-reviewed papers from journals, but a separate archive of policy reports and commentaries will be added later. The project will also provide analyses for both the research community and nontechnical audiences.

"There is tremendous added value in structuring the database so that anyone with a web browser, regardless of their level of scientific training, can grasp the current state of scientific understanding regarding this rapidly evolving field," says Kristen Kulinowski, executive director of CBEN and ICON, which is a coalition of academic, industrial, and governmental organizations.

While there is a significant body of research on the effects of incidental nanoparticles – those that occur as the unintentional byproduct of another process such as combustion – only a few engineered nanomaterials have been studied in this way. This makes it difficult to make general statements about the potential hazards for living organisms. One of the hopes is that this project will help in targeting research efforts.

"An informed decision about how to ensure the safety of nanomaterials requires a comprehensive review of where we are," says Jack Solomon, chair of the Chemical Industry Vision2020 Technology Partnership. "By gathering findings that are scattered throughout the literatures of biomedical application developers, toxicologists, environmental engineers, and nanomaterials scientists, we are helping researchers and government-funding agencies to see the big picture."

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Rewarding research

PEOPLE & PLACES

• The 25 winners of the European Young Investigator (EURYI) Award for 2005 have been announced by the European Heads of Research Councils. The prize, worth up to $1.5 million, will help the recipients to establish independent research groups at institutions of their choice across Europe. The winners include Angelos Michaelides, who will go to the Fritz Haber Institute in Berlin; Igor Gornyi who joins the Institute for Theory of Condensed Matter at the University of Karlsruhe; Andrei Khlobystov at the University of Nottingham, UK; and Adrian Bachtold of ENS Paris, France and CSIC/CNM Barcelona, Spain.

• The 2005 Dirac Medal has been awarded to Sir Samuel F. Edwards of the University of Cambridge, UK and Patrick A. Lee of the Massachusetts Institute of Technology. The $5000 prize recognizes significant contributions to physics and is presented annually by the Abdus Salam International Centre for Theoretical Physics. Edwards has contributed to many areas of condensed matter physics, including polymer physics, spin glass theory, and granular matter. Lee's work has advanced the understanding of strongly interacting many-body systems.

• The IBM Research team of Hiroshi Ito and C. Grant Willson, now at the University of Texas at Austin, have been named as Heroes of Chemistry at the 230th National Meeting of the American Chemical Society (ACS). Ito and Willson developed chemically amplified photoresist materials that allowed photolithography technology to move to smaller feature sizes. The result has been smaller and denser computer chips and microprocessors. The ACS honored a total of 18 heroes of chemistry.

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