Seemingly small research funding cuts could hinder progress in nanotechnology

April 8 2013

Cuts in federal funding of nanotechnology research threaten to slow progress toward some of the field's greatest promises, including commercialization of sustainable new energy sources that do not contribute to global warming, an international authority in the field cautioned here today.

Speaking at the 245th National Meeting & Exposition of the American Chemical Society, A. Paul Alivisatos, Ph.D., expressed concern that the cuts come when nanotechnology is poised to deliver on those promises. He told the meeting, which continues through Thursday, that ill-conceived cuts could set back America's progress in nanotechnology by decades.

"The National Science Foundation announced that they will issue a thousand fewer new grants this year because of sequestration," said Alivisatos, referring to the across-the-board mandatory federal budget cuts that took effect on March 1. "What it means in practice is that an entire generation of early career scientists, some of our brightest and most promising scientists, will not have the funding to launch their careers and begin research properly, in the pathway that has established the United States as leader in nanotechnology research. It will be a setback, perhaps quite serious, for our international competitiveness in this key field."

Alivisatos described applications of nanotechnology that can help reduce fossil fuel consumption and the accompanying emissions of carbon

dioxide, the main greenhouse gas. He is professor of chemistry and materials science and the Larry and Diane Bock Professor of Nanotechnology at the University of California at Berkeley, director of the Lawrence Berkeley National Laboratory and co-editor of the ACS journal *Nano Letters*. Nanoparticles of various substances already have been incorporated into solar panels, rechargeable batteries and other clean-energy solutions. These particles are so small that 1,000 to 100,000 could fit across the width of a human hair. When size diminishes to that scale, gold, silver, copper and other substances take on physical properties vastly different from lumps of bulk material.

Although nanotechnology remains a science in its infancy, it already has had a major impact on many other industrial segments, ranging from consumer products to national security and defense. By one estimate, more than 600 nanotechnology-enabled consumer products already are on the market, including mobile phones, cosmetics, music systems and clothing. Forecasts suggest that the global market for such products will increase by more than 10 percent annually in the years ahead.

Alivisatos expressed concern, however, that cuts in federal funding will take a heavy toll on the still-emerging field. He explained that the reductions stand to affect scientists at almost every stage of making contributions to society. Young scientists, for instance, will find it more difficult to launch research programs in new and promising fields. Established scientists will have to trim research programs, and may not have the money to explore promising new leads.

"We haven't been able to communicate adequately with the public and policymakers, and explain the impact of what may sound like small and unimportant cuts in funding." Alivisatos said. "A 5 percent reduction in funding—well, to the public, it seems like nothing. In reality, these cuts will be applied in ways that do maximal damage to our ability to be globally competitive in the future."

In his talk, Alivisatos highlighted some of nanotechnology's successes in reducing the amount of carbon humans are adding to the atmosphere. For example, lithium iron phosphate batteries, a type of rechargeable lithium-ion battery, are being used in vehicles, electronics and the solar-powered pathway lamps often seen in yards and gardens. These batteries rely on nanoparticles to safely store and release energy. Similar rechargeable batteries might be part of future "smart" electrical grids that use electricity more efficiently, reducing the amount of fossil fuels power companies must burn.

Another promising field is the conversion of natural gas—the supply of which has burgeoned in recent years with advances in hydraulic fracturing, or "fracking," techniques—to liquid petroleum products. Natural gas is widely seen as a cleaner energy source than other fossil fuels like coal and petroleum. Alivisatos described nanoparticle-based technologies that promise to improve existing conversion processes.

More information: Abstract

Anthropogenic gas emissions and land use changes are increasingly perturbing the global carbon cycle. A major focus of energy research is to seek ways to establish a future balanced carbon cycle while providing energy to the world's population, including those in developing economies. The advent of nanoscience has created a new foundation for the design and manufacture of energy conversion systems, and nanoscience will be a key component in the effort to establish a balanced carbon cycle. This talk will describe the opportunities as well as challenges for this ambitious agenda.

Provided by American Chemical Society