Challenges for Environmental Health and Safety of Nanomaterials

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Presentation

Abstract: Investment in nanotech research and products continues to dwarf the funding dedicated to the environmental health and safety (EHS) implications of nanotechnology, though recently federal funding has begun to increase. With more than 800 nano-products listed on the market according to the consumer product inventory created by the Wilson Center's Project for Emerging Nanotechnologies, there are concerns regarding potential unintended consequences that might be caused by nanoparticles in food, air, water and soil. Although research findings over the past several years are not definitive, there are indications that a range of engineered nanomaterials are likely to present potential risks to human health and the environment. In response to appeals for more guidance on understanding the EHS implications of nanomaterials, the U.S. Environmental Protection Agency (EPA), the National Institute for Occupational Safety and Health (NIOSH), the National Science and Technology Council (NSTC) of the U.S. National Nanotechnology Initiative as well as state, local and international governments have begun to develop research strategy documents for nanomaterials and their safe handling in light of uncertain risks.

At the NSF-funded Nanoscale Science and Engineering Center for High-rate Nanomanufacturing (CHN), the objectives of our interdisciplinary work in responsible nanomanufacturing remain to probe and assess the issues that will have direct implications for the nanomanufacturing technologies that are under development at CHN. Results contribute to the global research strategy and will help to guide the development of a sustainable production system for nanomanufactured products. Six complementary research areas are under investigation with goals to: 1) perform fundamental research on methods to measure and control nanoparticles exposures; 2) develop robust, low cost, high-throughput screening methods for nanoparticle exposure; 3) determine the economic feasibility of manufacturing in light of EHS uncertainty and risk for scale-up of technologies; 4) investigate life cycle issues related to manufacture through end-of-life products; 5) create case studies on regulatory scenarios that affect nanomanufacturing for appropriate and effective state environmental, health, and safety approaches; 6) evaluate applications of nanotechnology on their likelihood to promote or compromise environmental and/or ethical values.

An overview of CHN research activities will be presented as an introduction to some of the subsequent talks, but more detail will be provided on the development and implementation of modeling tools to assess the economic and environmental tradeoffs in product life cycles. Results from application of process-base cost modeling techniques and life cycle assessment for a carbon nanotube electromechanical switch will be described.