

NNI-Chemical Industry Consultative Board for Advancing Nanotechnology (NNI-ChI CBAN)

Jack Solomon, Chemical Industry Vision2020
Jack_Solomon@praxair.com

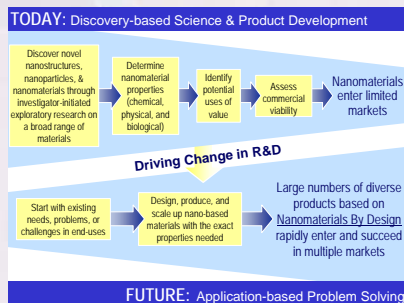
Don Anthony, Council for Chemical Research
danthony@ccrhq.org

The Nanomaterials Roadmap

Vision: Nanomaterials By Design

2020

The U.S. chemical industry will offer a "library" of diverse, high-quality nanomaterial building blocks with well-characterized compositions, stable architectures, and predicted properties. Safe, reproducible, cost-effective, and clearly defined manufacturing and assembly methods will be available to incorporate nanomaterials into systems and devices designed to perform specified functions while retaining nanoscale attributes.



Implementing the Roadmap

NNI-ChI CBAN

- ◆ Partnership established in March 2004 by
 - National Nanotechnology Initiative
 - Council for Chemical Research
 - Chemical Industry Vision2020
- ◆ Purpose to focus on R&D planning and implementation
 - Joint planning and support of collaborative activities in key R&D areas
 - Identify and promote new R&D for exploratory areas
 - Expand nanotechnology R&D
 - Periodical joint meetings and reports
 - Exchange information
- ◆ Consultative Board
 - NNI: Mike Roco (NSF), Jim Murday (DOD), Robert Shull (NIST), Brian Valentine (DOE)
 - Chemical Industry: Don Anthony (CCR), John Carberry (DuPont), Katie Hunt (Rohm and Haas), Jack Solomon (Vision2020/Praxair)

Working Group Recommendations

R&D Priorities for Nanotechnology Commercialization

Nanotechnology Fundamentals

- Develop understanding of structure-function-property relationships at nanoscale
- Develop methods for synthesizing nanomaterials
 - Wet chemistry techniques
 - Self-assembly
 - Gas phase methods
 - Manipulation of solids

Computational Tools

- Extend atomistic/molecular models to predict properties of nanomaterials
- Develop tools to predict properties of macroscale systems when nanomaterials are added
- Combine molecular modeling tools with process simulation packages to accelerate process design and scale-up

Manufacturing

- Develop unit operations and scale-up methods
 - Synthesis of nanomaterials
 - Self-assembly processes
 - Separations and solids handling
- Develop optimal processes for formulating nanomaterials

Characterization

- Develop real-time analytical tools for measuring and characterizing nanomaterials
 - Online and in-process analytical tools for process control
 - Robust measurement tools for quality control

Environment, Safety, and Health

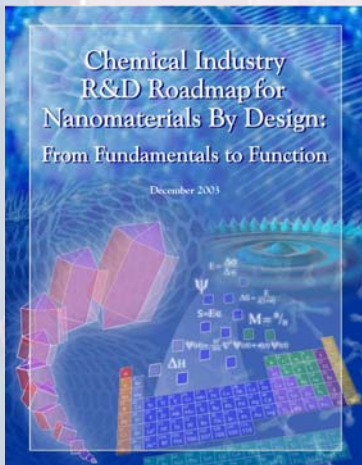
- Detailed recommendations developed in three areas:
 - Toxicity of Nanomaterials
 - Measurement and Detection of Nanomaterials
 - Worker Protection and Industrial Hygiene

Roadmap Areas

- Fundamental Understanding & Synthesis
- Manufacturing & Processing
- Characterization Tools
- Modeling & Simulation
- Environment, Safety, & Health
- Standards & Informatics
- Knowledge & Technology Transfer
- Education & Training
- Infrastructure & Enabling Resources

Working Groups

- ◆ ES&H Issues for Nanotechnology
 - Leads: Emory Ford (MTI) and Barbara Karn (EPA)
 - Participants from: Air Products and Chemicals, Inc., American Chemistry Council, Ciba Specialty Chemicals Corporation, Dow Chemical Company, E.I. DuPont de Nemours and Company, Inc., Intel Corporation, Materials Technology Institute, National Institute of Standards and Technology, National Nanotechnology Coordination Office, National Institute for Occupational Safety and Health, National Science Foundation, Oak Ridge National Laboratory, Praxair, Inc., Rohm and Haas Company, U.S. Department of Energy, U.S. Environmental Protection Agency, U.S. Food and Drug Administration, U.S. International Trade Commission.
- ◆ Focus Areas for Nanotechnology Research
 - Leads: Don Anthony (CCR) and Jim Murday (DOD)
 - Participants from: American Chemical Society, BP, Ciba Specialty Chemicals Corporation, Council for Chemical Research, E.I. DuPont de Nemours and Company, Inc., General Electric Company, Honeywell, National Institute of Standards and Technology, National Nanotechnology Coordination Office, National Science Foundation, Oak Ridge National Laboratory, Praxair, Inc., Rohm and Haas Company, U.S. Department of Defense, U.S. Department of Commerce, U.S. Department of Energy, U.S. International Trade Commission.



<http://www.chemicalvision2020.org/nanomaterialsroadmap.html>

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