

Consumer Product Safety Commission

Activities on Nanotechnology*

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About CPSC - Background

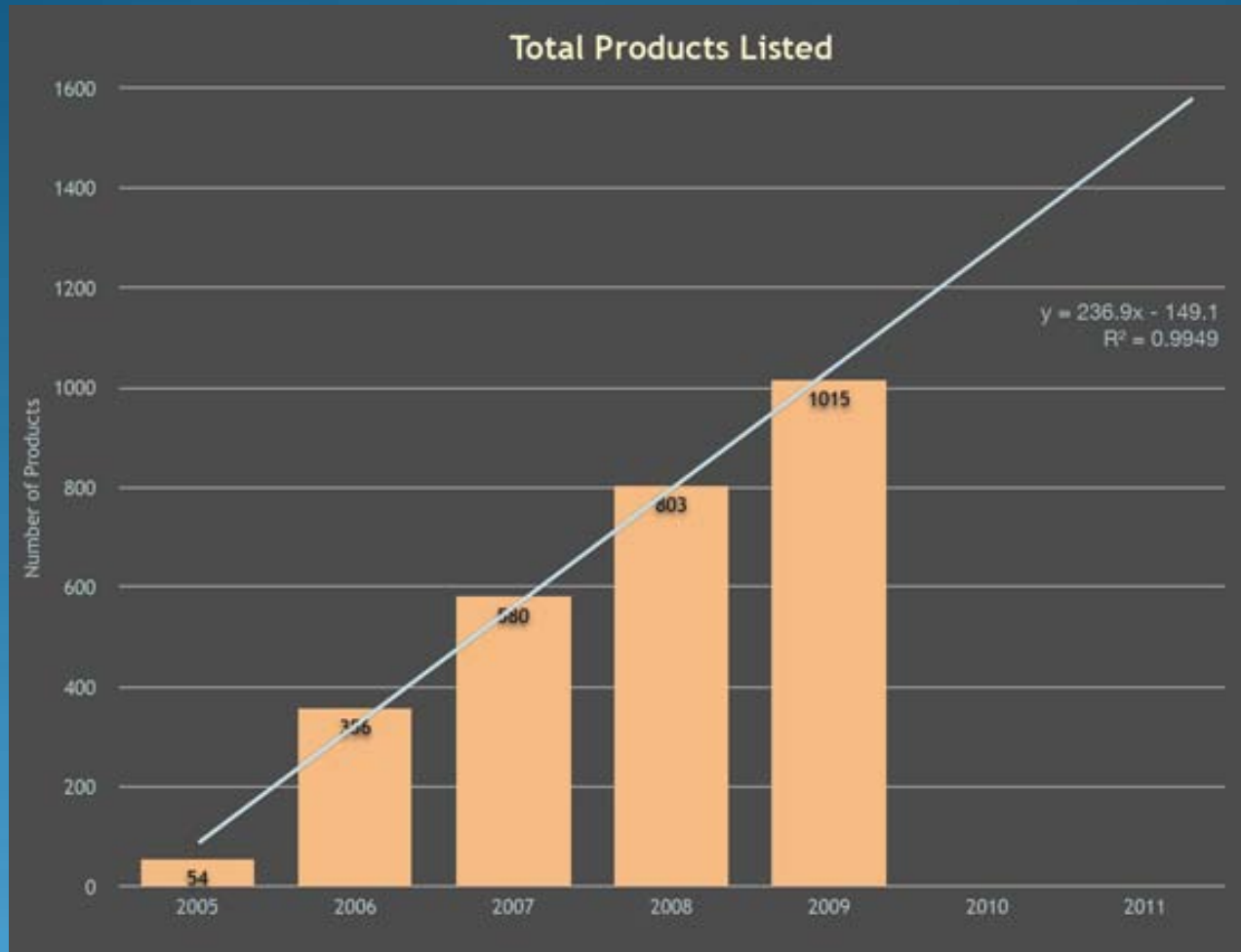
- Independent federal regulatory agency, established in 1973, under the Consumer Product Safety Act
- Laws Administered:
 - Consumer Product Safety Act (CPSA)
 - Federal Hazardous Substances Act (FHSA)
 - Flammable Fabrics Act (FFA)
 - Poison Prevention Packaging Act of 1970 (PPPA)
 - Refrigerator Safety Act (RSA)
 - Consumer Product Safety Improvement Act (CPSIA)
 - Gasoline Burn Prevention Act
 - Virginia Graeme Baker Pool and Spa Safety Act
- Four Commissioners and a Chairman, appointed by the President and approved by the Senate
- **530 Employees and a \$118M Budget**

CPSC - Jurisdiction

Thousands of types of consumer products:

- Household Cleaners
- Electrical Appliances
- Combustion Appliances
- Furniture and Home Accessories
- Sports and Recreational Equipment
- Children's Toys
- Building Materials
- Flammable Fabrics, Materials, and Accessories
- Powered Equipment and Tools
- Child-resistant packaging for pharmaceuticals
- And more...

Consumer Products That May Contain Nanomaterials



Woodrow Wilson Center – Project on Emerging Nanotechnologies
http://www.nanotechproject.org/inventories/consumer/analysis_draft/

CPSC Nanomaterial Statement

- Released in 2005
- The potential safety and health risks of nanomaterials can be assessed under existing CPSC statutes, regulations, and guidelines.
- CPSC staff assesses a product's potential chronic health effects to consumers under the Federal Hazardous Substances Act (FHSA).
- The analysis may require unique exposure and risk assessment strategies.

Federal Hazardous Substances Act (FHSA)

- 15 U.S.C. § § 1261-1278
- 2(p) – Requires products that meet the definition of a “hazardous substance” to bear cautionary labeling for the safe use and storage of the product.
- 2(q) – Authorizes the Commission to ban hazardous substances through rulemaking.

FHSA Regulation

- Considers exposure and risk
- Requires case-by-case assessment
- CPSC staff evaluates a product's potential risk to the public when distributed in commerce
 - No pre-market approval
- Requires manufacturers to ensure that their products are labeled properly for safe use and storage

Research Needs

- Hazards of nanoparticles
 - Nanomaterials differ in potential health effects.
 - Determine if they are considered “hazardous substances” under the FHSA
- Dose-response assessment
 - Identify limits for exposure and uptake (acceptable daily intake (ADI)).
- Exposure characterization
 - What are the routes of exposure and who is exposed?
 - What are the methods for exposure assessment?
- Risk characterization

Responsible Development

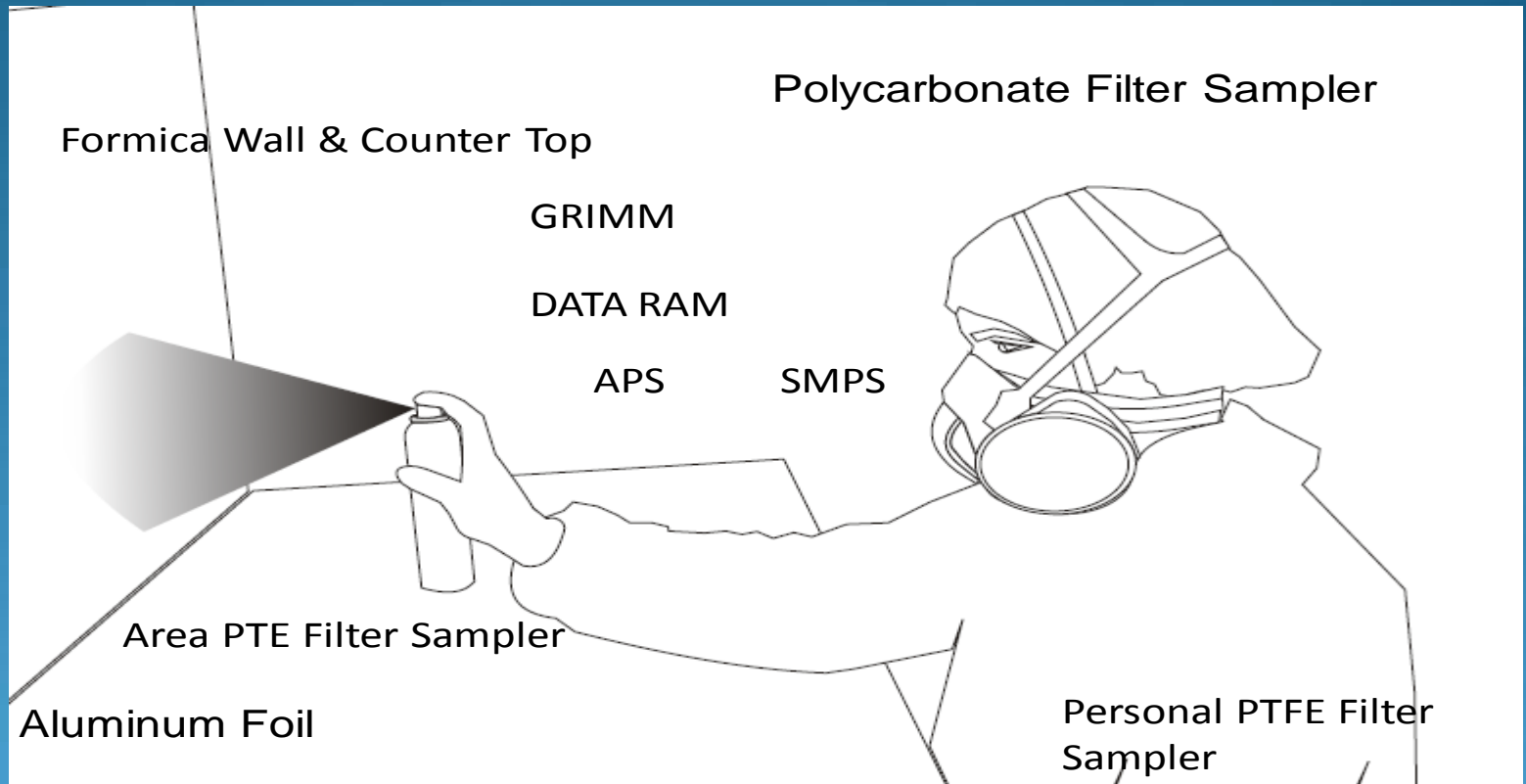
- National Nanotechnology Initiative (NNI) – Sustainable Nanomanufacturing – Thrust 1
 - In collaboration with NIOSH/NIST/EPA, develop the research, requirements, rules, and procedures for safe handling and use of nanomaterials across the product lifecycle
- Understanding the hazards and the extent of the hazards leads to good risk management practices.
- CPSC staff is working with federal partners to provide information to support good management practices.

CPSC Staff Activities

2008 Release of Nanomaterials from Aerosol Sprays

- Interagency Agreement (IAG) with the National Institute for Occupational Safety and Health (NIOSH)
- Study emission of nanoscale titanium dioxide (TiO₂) from selected consumer products
- Success at identifying nanomaterials in the product
 - Developed methods for industry to use for product testing
 - Published methods in peer-reviewed journal
- Followed up with additional research to refine methods for other nanomaterials

CPSC Interagency Agreement (IAG) with NIOSH Particulate Aerosol Generation During Use of Spray Product Containing Titanium Dioxide (TiO₂) Nanoparticles

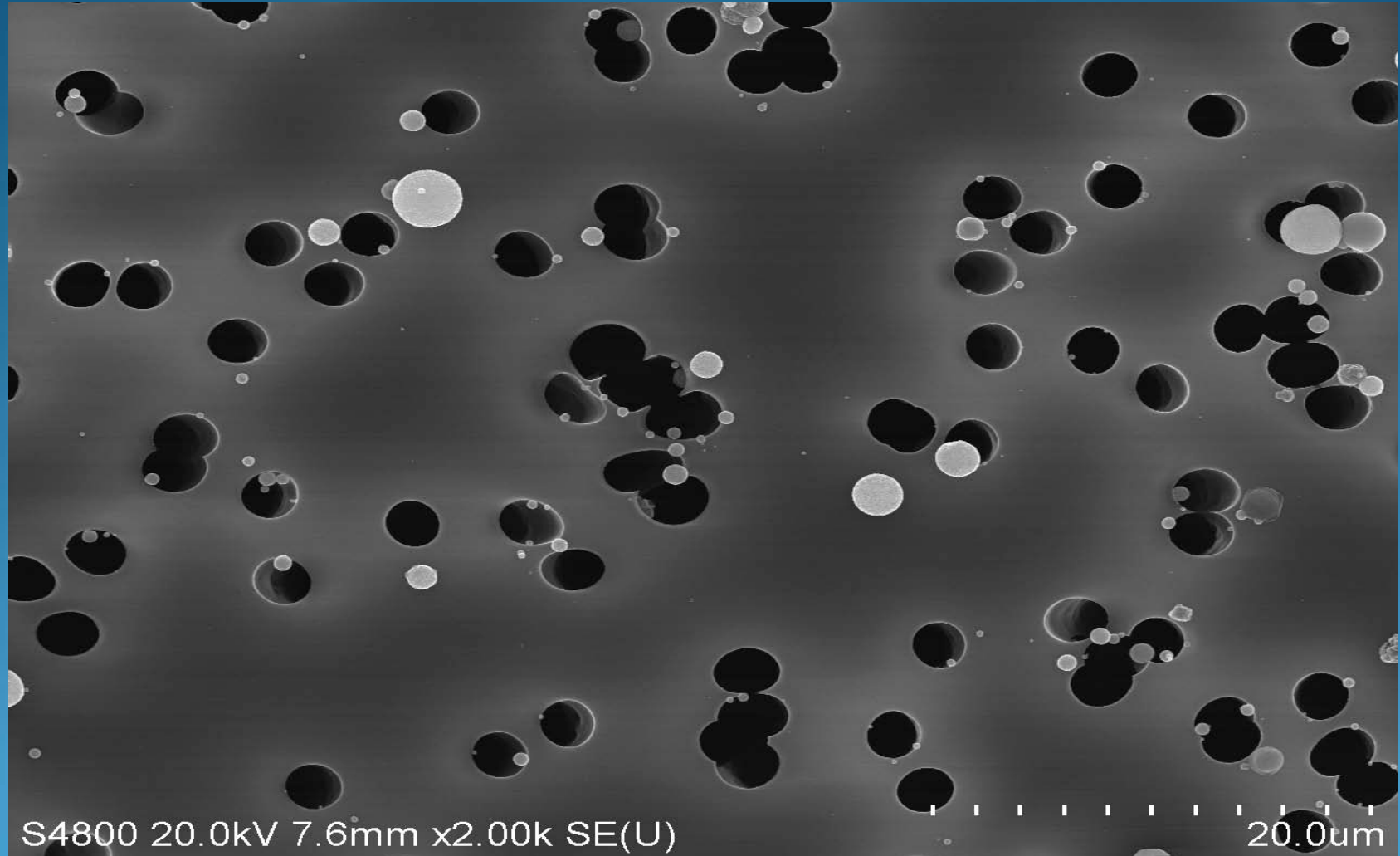


Chamber Testing

Air source
 Pressure Regulator
 Dryer
 Rota meter
 Computer controlled solenoid actuator
 TIO2 Spray Can
 Cap for installing TIO2 CAN
 Data RAM
 Gravimetric Filter
 Polycarbonate Filter
 SMPS
 HEPA Filter
 Observation Window
 12" PVC tubing Covered with a thin layer of Stainless Steel
 Stainless Steel HEPA Filter Cone
 Computer control unit



TiO₂ Particle Characterization



CPSC Staff Activities

2009 Nanotechnology Research

Flame-Retardant Nanomaterials

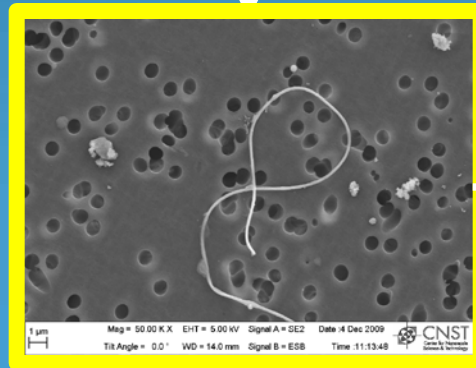
- IAG with the National Institute of Standards and Technology (NIST)
- Evaluate the flammability performance and exposure potential of selected nanomaterials that may be used as flame retardants in mattress and upholstered furniture components

Research Questions

Could layer-by-layer (LbL) nanoparticle coatings allow soft furnishings to comply with national fire performance regulations?



Could stressing cause nanoparticles to be released from soft furnishings?



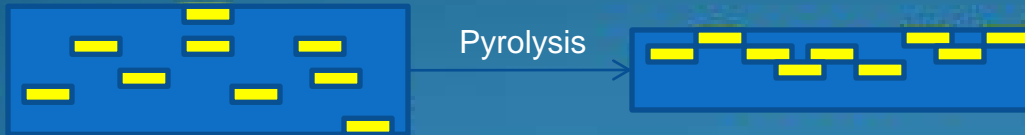
Could the release of nanoparticles impact fire performance of soft furnishings?

Layer-by-Layer (LbL) Assembly

Why LbL with Carbon Nanofibers, Multiwalled Carbon Nanotubes, and Sodium Clay?

1. These nanoparticles (NP) can significantly enhance fire performance.
2. These NP are at the surface, which improves fire performance (see illustration below).
3. LbL is a commercially viable process for foam and textile manufacturers (actually has been commercialized by a foam manufacturer).

Embedded Nanoparticles



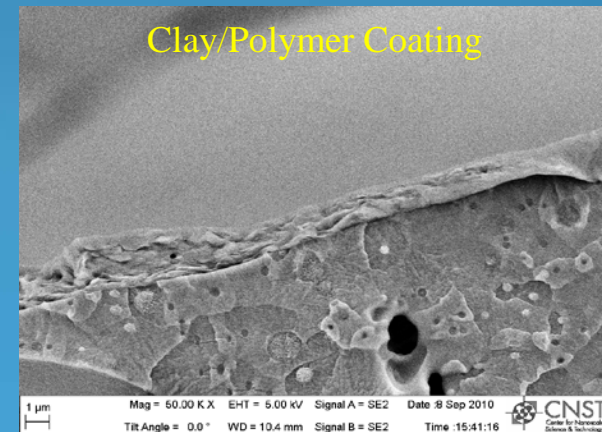
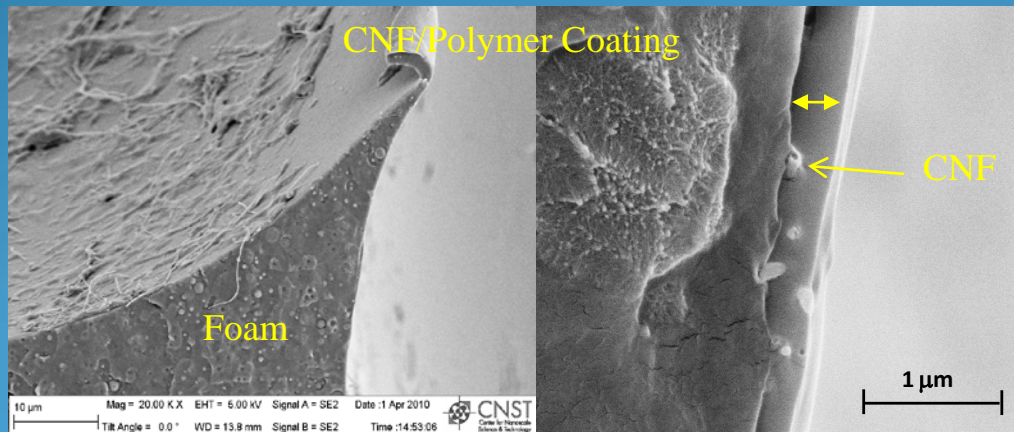
Protective layer of nanoparticles created as nanoparticles “rise” with gas bubbles, and others “fall” as substrate pyrolyzes.

Nanoparticle Coating



With LbL, the nanoparticles already are concentrated at the surface to create the protective shell around the substrate.

The NP fire protection “armor” has an extremely high NP concentration (~60 mass fraction %), but is very thin (~400 nm), so that the physical attributes of the foam are maintained.



CPSC Staff Activities

2010 Nanosilver in Consumer Products

- IAG with NIOSH to evaluate potential exposures and assess potential health effects to consumers from use of nanosilver-enabled products
- Exposure associated with silver varies with the chemical form (metallic, salt) and the route of exposure (ingestion, inhalation, and dermal contact)
- Reliable methods for a variety of product matrices
- Increased understanding of exposure potential from use of nanosilver-enabled products by the public and workers

Proposed CPSC Staff Activities for 2011 and Beyond

- Inhalation Effects of Nanomaterials in Aerosol Products
 - Continue IAG with NIOSH to study specific health effects of these compounds
 - Characterize nanomaterials used in new aerosol products and quantify releases from these products
 - Develop and improve laboratory methods
- Airborne Nanoparticles from Consumer Products
 - Collaboration with NIST
 - Characterize nanoparticle releases into the indoor air from a variety of products
 - Develop measurement protocols to characterize these particle emissions or to assess the properties of particles
 - Size, shape, and composition
 - Quantify exposure to human occupants

Proposed CPSC Staff Activities for 2011 and Beyond

Carbon Nanotubes in Consumer Products

- Nanomaterials used in products are reported to improve the performance and durability of these products.
- Sports and safety equipment, such as baseball bats, knee pads and mountain bikes, may contain carbon nanotubes.
- Can nanomaterials, such as carbon nanotubes, be used to produce improved safety equipment (e.g., helmets, kneepads) and enhance performance and safety features without creating other hazards?

Proposed CPSC Staff Activities 2011 and Beyond

Exposure and Risk Assessment of Nanomaterials in Consumer Products

- National Science Foundation (NSF) and other federal agencies
 - University-based centers focus on the environmental and public health implications of nanotechnology.
 - Develop innovative techniques to characterize nanomaterials in selected consumer products and quantify exposures to humans
 - A project will also synthesize data to develop a risk assessment framework for nanomaterials used in consumer products.

Proposed CPSC Staff Activities for 2011 and Beyond

International Grant Solicitation - Nanotechnology Research on Nanomaterial Exposure, Risk and, Consumer Products

- Congress has requested that the federal agencies participating in the NNI, collaborate on international nanotechnology research.
- The U.S. Environmental Protection Agency (EPA) and similar agencies within the United Kingdom agreed to solicit proposals for research on the potential environmental and public health impacts of nanomaterials and to fund the most relevant studies.
- CPSC staff participated in the grant selection process.
 - Proposal underway to quantify exposure to consumers and develop risk models to predict potential health effects.
- Consider other funding solicitations with the EPA and other federal agencies

Nanotechnology Applications

Nanotechnology may be used to reduce injuries and deaths.

- Improve safety equipment
- Improve (chemical) sensor technologies
- Enhance fire suppression/prevention materials and/or technologies
- Contribute to advances in green chemistry applications to consumer products
 - Less toxic materials with superior performance

Conclusions

- Nanotechnology may be used to improve public safety and health.
 - New opportunities for innovation and research
- Responsible development is crucial for public acceptance.
- CPSC staff is working with federal partners on a number of projects to assess the possible health and safety implications of nanomaterial use in consumer products.
- Manufacturers also have a responsibility to ensure the safety of their products.

Thank You

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