A Framework for Responsible Nanotechnology

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ABSTRACT

DuPont, a global science company, and Environmental Defense, an environmental non-profit organization, are working together to develop a framework for the responsible development, production, use and disposal of nano-scale materials. Our presentation will: 1) describe our goals for this framework, 2) outline the principles guiding the development of the framework, 3) share some of the initial basic elements of the framework and 4) seek input from conference attendees on how to maximize its applicability and value for a wide range of stakeholders.

DuPont and Environmental Defense will apply our technical and policy expertise to develop a framework that can serve as a timely and useful model. We will engage a broad range of stakeholders for input and feedback as they develop a framework that is proactive, practical, and adaptable. We envision a framework that will allow users to revise decisions and practices in the face of new or additional information, data or concerns. The framework is intended to be relevant to a broad range of materials and applications, so that it can be accepted, endorsed, and adopted or adapted for use internationally by a wide range of stakeholders, including other companies, other public interest groups, academia and government agencies.

Keywords: environment, health, safety, risk, guidance

1 PROJECT GOALS

Nanotechnology is the design and manipulation of materials at the atomic scale such that novel properties emerge. Engineered nanomaterials hold great promise for new applications in materials, energy, medicine and other fields, but more needs to be known to ensure that their benefits are maximized while their potential risks are effectively assessed and managed. Governments and industry around the world are spending billions of dollars to develop and promote nanotechnology, yet there has been far less effort to understand and manage the potential environmental and health risks of this new technology. History has shown us that widely commercializing a new technology before appropriately identifying and managing its risks can result in serious adverse consequences to human health and the environment, as well as costly remediation, litigation, and liability. Current regulations, designed for a world before nanotechnology, should be reassessed and changed as needed to account for the novel properties of nanomaterials. Business and government may need new approaches to make sure workers, consumers, the public and the environment are adequately protected.

DuPont and Environmental Defense want to ensure that nanotechnology's benefits are maximized while the potential risks are effectively assessed and managed. We believe that it is in the best interests of industry, academia, the public, and the environment for companies to proactively develop, in advance of government regulations, a framework for responsible nanotechnology standards. As noted by DuPont's Chairman and CEO Chad Holliday and Environmental Defense's President Fred Krupp in the June 14, 2005 edition of *The Wall Street Journal*: "An early and open examination of the potential risks of a new product or technology is not just good common sense – it's good business strategy." [1]

DuPont and Environmental Defense will apply our technical and policy expertise to develop a framework that can serve as a timely and useful model for both industry and government. The intent of this framework is to define a systematic and disciplined process that can be used to identify, manage and reduce potential health, safety and environmental risks of engineered nanomaterials across all lifecycle stages. This framework will then be pilot-tested on specific nano-scale materials or applications of commercial interest to DuPont. The development and adoption of such a framework can promote safe development, facilitate public acceptance, limit potential liabilities, and support the development of a practical model for reasonable government policy on nanotechnology safety.

2 GUIDING PRINCIPLES

DuPont and Environmental Defense have agreed to apply the following key principles in the development of this framework:

Integrity	Proactivity
Timeliness	Practicality
Inclusivity	Sustainability
Transparency	Verification
Humility	Adaptability
Safety	Applicability

Comprehensiveness

We will explore these principles in greater detail during our presentation at the NSTI Nanotechnology Conference and Trade Show.

3 INITIAL FRAMEWORK ELEMENTS

Environmental Defense and DuPont are working to develop a framework that can integrate as seamlessly as possible into a typical product development cycle, providing relevant information to guide decisions on whether and how to proceed at each stage of product development. We will apply a lifecycle approach to consider the hazard and exposure issues for a product or material throughout development, production, use and disposal. The framework will consider similarities and differences between nano and bulk materials in assessing the characteristics and potential hazards and exposure scenarios of a material or product. We intend to allow for interplay between different elements of process so that a lack of information on one aspect of potential risk may be addressed by more comprehensive information on another aspect (for example, lack of hazard data could be addressed by minimizing exposure until a better understanding of hazard is developed). The framework will include a process for periodic reviews to determine the accuracy of risk characterization and evaluate effectiveness of risk management systems. Through these reviews, the framework will allow companies to update their risk management decisions and processes in the face of new information.

As we develop this framework, Environmental Defense and DuPont are working to address the following basic elements:

Risk Identification – determine what tests are appropriate at what stage of development and for what applications (e.g., nanoparticles used in dispersive applications may require more extensive risk data than those used in controlled applications).

Risk Management – determine how nanomaterials will be handled at different stages (e.g., assume to be hazardous prior to full risk identification; after risks have been identified, establish appropriate manufacture, use and disposal guidelines).

Transparency and Accountability – determine how internal and external stakeholders (e.g., customers, consumers, public, government) should be informed of risk identification and risk management decisions and results (e.g., what labeling and reporting is appropriate).

Feedback, Evaluation and Adaptability – determine appropriate systems to track implementation and ensure efficacy of risk identification and risk management steps and to adjust risk management systems as new information is developed.

4 KEY ISSUES AND QUESTIONS

Environmental Defense and DuPont would like input on how to maximize its applicability and value for a wide range of stakeholders. Some of the key questions that we are considering are:

- What information, tools, and methods are needed to establish a *basic understanding* for assessing the physical-chemical properties, environmental fate, bioaccumulation, and toxicity of engineered materials?
- What information is needed to properly assess the potential risks of a *specific* material or application? Is there a base set of data necessary regardless of material or application? Are there criteria or a decision process to guide what data are necessary?
- What processes or guidance should be followed in developing the *risk characterizations* for materials or products?
- How should companies identify and communicate their *initial assumptions* for risk management?
- How should *responsibility* for risk characterization, risk assessment and risk management be shared across the value chain and among various stakeholders?

REFERENCES

[1] C. Holliday and F. Krupp, "Let's Get Nanotech Right," *The Wall Street Journal*, p. B2, June 14, 2005.