

Diabologic: Nanotech? Get the Facts!

by Frank Dolinar

I've been a bit dumbfounded lately by people who react negatively to the mere mention of nanotechnology. Although it has been under development for over twenty years, and most people have at least heard the word, it's equally true that most people don't understand its basic concepts or its growing importance.

As research makes its way from the lab to real world products and processes, we are challenged to understand the latest nanotech news and its implications. Much of the news is very good indeed. Which suggests that the negative responses must come from lack of information.

Nanotechnology is not a "what," it is a "how."

The best definition I've yet found is "the three-dimensional positional control of molecular structure to create materials and devices to molecular precision." This ability is expected to fundamentally change and dramatically improve our manufacturing industries, among others.

The chemistry and physics at the nano-scale differ in fundamental and valuable ways from the properties of atoms and molecules in bulk matter. Nanotech research is directed toward understanding these differences, with subsequent development working to create improved materials, devices, and systems that exploit these new properties. The goal is to create products and processes that are better, cleaner, more reliable, and less expensive than those available using today's existing technologies.

There are many products incorporating nanotech materials and/or processes, including: ceramic-based clear coat for automobiles; electronics; cosmetics; fabrics; paints; and sporting goods. Soon to come will be stronger and lighter materials for aircraft and autos, dramatic improvements in solar energy, and medical therapies that are non-invasive and non-toxic as well as being significantly less expensive.

The current state of nanotechnology, for all of its capability and growing sophistication, is very early in its development, much like the world's electronics industry was in the early 1960s with transistor-based circuits just making their way into consumer products. There was no way, at that time, to predict that further development would produce the cell phone, the laptop computer, the Internet, communications satellites, and instant worldwide communication. Fifty years ago, these tools – that we rely upon so heavily in 2007 – would have been magic.

New technologies can be risky, particularly during the initial stages of development, which is where we are with nanotech. It would be foolish to think that nanotech has no risks. It would be even more foolish to assume that nanotech is nothing but risk.

Earlier this year, the National Institute for Occupational Safety and Health (NIOSH) and QuantumSphere, a manufacturer of nano metals and alloys, announced completion of a baseline assessment and facility review on potential nanomaterial exposure in the workplace. The goal of this study is the development and implementation of standards, methods, and practices to ensure zero injuries, illnesses, and environmental incidents for employees working with nanoscale materials.

The news release is available at http://www.qsinano.com/news/newsletters/2007_03/f2.php on QuantumSphere's website. For further information, visit <http://www.qsinano.com> or phone 714-545-6266.

Data from this study will become the basis for an approach to Environmental Health and Safety (EH&S) that uses a two pronged approach:

- (1) eliminate the risk of material loss from operational processes through the voluntary use of OSHA's Process Safety Methodology (PSM), and
- (2) continuously identify and eliminate potential worker exposure opportunities by the application of appropriate engineering controls, administrative controls, and the use of appropriate personal protective equipment for process operations.

More studies are underway around the world.

A very readable paper is the Trudy E. Bell's excellent "[Understanding Risk Assessment of Nanotechnology](#)" recently published by the National Nanotechnology Initiative, which clearly describes the major issues and explains why they are issues. The link to the paper, which downloads as a PDF, is available at the top of this paragraph.

Here are some other recent developments:

- The United States and the European Union have agreed to share information about potential environmental risks from nanomaterials and nanotech processes. The areas of information sharing were identified in a document released on April 30, 2007, by the White House Press Office titled "[Framework for Advancing Transatlantic Economic Integration Between the United States of America and the European Union](#)".
- In February of this year, the National Institute for Occupational Safety and Health (NIOSH) released a report, *Progress Toward Safe Nanotechnology in the Workplace*. The report details advancements made by the [NIOSH](#), through its internal, multidisciplinary Nanotechnology Research Center, in scientific knowledge toward understanding the occupational safety and health implications of nanomaterials. The document is available at: <http://www.cdc.gov/niosh/docs/2007-123/>.
- In December of 2003, the National Nanotechnology Initiative, the Nanoscale Science, Engineering, and Technology Research Center of the U.S. Department of Energy, and the National Science Foundation issued a report titled, "*Nanotechnology: Societal Implications – Maximizing Benefits for Humanity*" that discusses likely impacts of current and future advances of nanoscience and nanotechnology on the economy, quality of life, national security, education, public policy, and society at large. The paper is available from the page reached by this link: http://www.nano.gov/html/society/home_society.html

The biggest problem with nanotech isn't the technology itself, it's having individuals or organizations confuse actual risk with perceived risk and then act as if the perceived risk is the reality – without support of research.

Learn what you can about nanotechnology now. The future is coming sooner than you think.

For more information on nanotechnology see:

- The National Nanotechnology Initiative <http://www.nano.gov>
- The Woodrow Wilson Center for International Scholars *Project on Emerging Nanotechnologies* <http://nanotechproject.org> and <http://www.wilsoncenter.org/nano>
- The Center for Nanoscale Science & Technology at Rice University <http://cnst.rice.edu>
- The United States Environmental Protection Agency <http://www.epa.gov>