The Good, the Badand the Unknown:Nanotechnology

Expert Andrew Maynard shares his ideas on responsible development and workplace safety

Hailed by some as the next technological revolution, nanotechnology is poised to alter every aspect of life. However, concerns about the potential human health and environmental impact of the technology have made studying the effects of this new technology a top priority for industry experts. One such expert, Dr. Andrew Maynard, chief science advisor for the Woodrow Wilson International Center for Scholars Project on Emerging Nanotechnologies, will be discussing the potential hazards and how to deal with them at the American Society of Safety Engineers' Fall Symposium this November. Maynard, an internationally recognized research leader and lecturer in the fields of aerosol characterization and the implications of nanotechnology to occupational health, trained as a physicist at Birmingham University in the UK. After completing his doctorate in ultrafine aerosol analysis at Cambridge University's Cavendish Laboratory, he joined the aerosols research group of the UK Health and Safety Executive. In 2000, he moved to the National Institute for Occupational Safety and Health in the U.S., where he focused on addressing nanoparticle exposure in the workplace. His role in occupational safety and health makes him the quintessential candidate to discuss how nanotechnology may impact the health of those who work with nanoparticles. "The workplace is where there is the highest potential for exposures as people handle the raw materials before they are packaged into a new nanoproduct," Maynard says. Here, he gives a preview of his ASSE lecture and shares his knowledge of nanotechnology risks and how to avoid them in the workplace. By Joy LePree Q: It seems that new potential nanotechnology hazards are making headlines daily. Is the situation really this grim? A: At the moment, there are red flags, meaning some studies do indicate potential risks in certain applications. Despite the headlines, though, there is really very little evidence of a clear and immediate danger. What we do know is that people are engineering new materials with nanostructures. They are doing this because it allows them to create new materials and devices with new and unique properties. Obviously, the question becomes, could these new and unique nanomaterial properties lead to a new and unique health hazard and environmental risk. Based on a range of experiments, we know that it is the structure of some of these materials, as well as their chemistry, which determines the biological impact or potential to cause harm. That includes the size of the particle, the barrier, chemistry and shape of the materials. There's a list of characteristics that could potentially cause these materials to be hazardous, which can't be captured in a conventional way of understanding risks associated with new materials. In other

words, we don't know if the risks are real because we currently don't have a way to quantify the risks and the potential impact. Q: What has to be done to figure all this out? A: People like me are working on understanding and managing the potential risks of newly engineered nanoparticles and materials as well as addressing science policy associated with the topic. Science policy includes making sure the right research is done to develop a method to study nanomaterials and to understand what the risks might be, as well as to understand how to manage the potential risks effectively. Beyond government research and industry research, science policy also includes making sure the relevant research communities are coming together to manage the technology safely. And, it goes beyond this and includes provisions to ensure that good systems and practices are in place to protect those who handle the materials. Q: It sounds like it will take a while to get definitive answers to the questions. In the meantime, how can industry responsibly approach development of the technology for their workers, consumers and the environment? A: The first thing is to be cautious and be aware that these new materials may provide unanticipated impacts. Industry needs to make sure they are asking the right questions. There has been a tendency in industry not to ask critical questions about whether the structure and chemistry of these new materials can lead to new hazards. Doing so, treating these materials like conventional materials and ignoring the uniqueness, is a bad approach. The good approach is to ask questions, such as "What is new and unique and what will we do differently if we are trying to develop safe working practices?" Then, they need to use all available information and a healthy dose of caution to develop methods of working with and handling these materials in a way that is safe and responsible, and that means going back to good occupational hygiene practices. Industry needs to put systems in place for dealing with nanotechnology based on good practical knowledge while we continue doing research so that we can develop practices that will allow us to use the materials as safely as possible in the future. Q: Regarding good occupational hygiene practices, what cautionary steps should industry consider? A: There are some fairly basic steps like making sure there aren't any unnecessary exposures. Use reasonable protective equipment like gloves, goggles, overalls and respirators if there's a possibility of inhaling the materials. That's the practical advice. There is something else, as well. Right now everyone is feeling around in the dark trying to develop their own methods for handling these materials. What they don't realize is there is a fair amount of advantage in working together and sharing experiences and information. Industry as a whole needs to share information on best practices and work together to develop methods for dealing with and using these materials. *Joy LePree is a contributing writer for CHEM.INFO. She has worked as a journalist for 13 years, covering a variety of issues and trends involving chemicals, processing, engineering and maintenance.*