



NanoSafety – We Need You!

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Nanotechnology is becoming increasingly ubiquitous from consumer products and food to electronics and communication. The benefits of nanotechnology arise from the fact that nanomaterials exhibit behavior different from the corresponding macroscopic form. It is also possible to engineer nanostructured materials which exhibit novel properties hitherto unseen in nature. Because of these properties, nanotechnology is gaining commercial applications. There are currently over 200 nanotechnology based products available commercially in the global market. These products are being used in electronic, magnetic, biomedical, cosmetic, energy, chemical and material application areas. As these commercial applications increase, there is growing concern about the health, safety and environmental (HSE) risks associated with these materials.

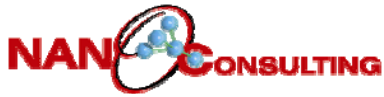
More specifically, the following HSE related concerns are to be understood:

1. What is the exposure potential for nanomaterials in different parts of its life cycle?
2. What are the risks that the nanomaterial will cause harm to exposed persons or ecosystems?
3. What is the impact of these materials on biological systems at different dosages? Is the effect transient or permanent? What is the potential for other hazards such as fire and explosions?
4. How much of an exposure is required for how long before the impact is felt? How many times should the exposure be before impact is felt?
5. How can exposure be minimized or eliminated? For example, can a more toxic nanomaterial be replaced by a less toxic one without affecting performance?

Understanding the risks and managing them well is an imperative to effectively commercialize nanotechnology based products and realize their potential. At present although we know that there are potential risks to health and environment from manufacture and use of nanoparticles, we do not fully understand what these risks are and how to deal with them. Also, while we understand that potential for exposure of people and environment is high due to increased use of nanomaterials in processes and products, there is not enough information available on toxicity, exposure and risk involved.

A recent EMERGNANO report (March 2009) by Institute of Occupational Medicine summarized the current status of nanomaterial HSE as follows:

1. Progress has been made in identifying candidate materials to develop characterized nanoparticles for toxicology.
2. Filters such as those used in respiratory protective equipment and in air cleaning systems are highly effective in removing nanoparticles from the air.



3. There is very little data relating systemic exposure of nanoparticles to toxicity outside of the lungs, hence limiting our ability to study the effect of these particles on liver or blood components.
4. There is considerable progress being made in understanding the kinetics of nanoparticles in invertebrate and vertebrate models and their relationship to toxicity. There is also increasing understanding of nanoparticle impact on microorganisms.
5. There is sufficient evidence to show that carbon nanotubes may have adverse effect on human health; and that silver and titanium dioxide nanoparticulates are detrimental to the environment.

Providing impetus to the HSE efforts around the world is the development of standards by ISO/TC229 standardization committee. This committee is developing standards related to:

- terminology and nomenclature standards provide a common language for scientific, technical, commercial and regulatory processes
- measurement and characterisation standards provide an internationally accepted basis for quantitative scientific, commercial and regulatory activities
- health, safety and environmental standards improve occupational safety, and consumer and environmental protection, promoting good practice in the production, use and disposal of nano-materials, nanotechnology products and nanotechnology-enabled systems and products. – an effort led by USA

The committee expects that many of the documents produced by it will be anticipatory and become change agents to guide the market and research in these areas.

Nanosafety related work in Singapore is largely limited to academic institutions and research institutes in Singapore. As a technology that has impact on all major manufacturing sectors in Singapore, nanotechnology and its safety implications should be a matter of concern to all industry players here. However, to date very little has been done to address this critical area. To address this gap, NanoConsulting Pte. Ltd. is coordinating between the different government bodies, industry players and academic institutions in Singapore to define how Singapore should address this area of nanosafety. As a first step, we are organizing a focus group discussion in the middle of September with all interested parties to identify the industry needs in this area. If you are interested in participating, please send an email to hiranvedam@nanoconsulting.com.sg and we will send further details on the event soon.