

# The nanotechnology revolution

Technology at its smallest looks likely to change many key aspects of our lives. It also throws up new challenges for the insurance world.

**Alex Wright** takes a close-up look

**N**anotechnology holds enormous promise; however the risks associated with these new processes and materials are still largely unknown.

The insurance industry is only now beginning to assess the liability issues surrounding the coming explosion of innovative products that operate at microscopic levels. Many experts have gone as far as to describe nanotechnology as the 'new asbestos', with huge implications for all types of business.

In fact, insurers need to act now to protect their bottom lines from potentially catastrophic losses from nanotechnology, but a lack of coverage availability could stifle innovation and slow the introduction of valuable new products, according to a report by insurance research analysts Advisen. Environmental, property, product and professional liability lines, as well as workers' compensation, medical malpractice and directors' and officers' insurance could all be at risk from the effects of nanotechnology.

It is a vast area of technology, with spending on public research reaching more than \$3 billion worldwide, while private sector spending is even higher. The market for nanotechnology is already comparable in size with the biotechnology sector, and much higher growth rates expected in coming years.

Nanotechnology has the potential for higher agricultural yields, reduced pollution, renewable energy sources and cheaper water filtration systems. Its applications range from strengthening the material used in golf clubs and bicycle frames, creating stain and water repellent clothing and wear-resistant paints and coatings to manufacturing materials, computer chips, medical diagnosis and health care, energy, biotechnology, space exploration and security.

In the long-term, nanotechnology could

ultimately be used for everything from more effective diagnosis and treatment of cancer and other diseases to alternate fuel sources.

And according to Lux Research, sales of emerging nanotechnology products are estimated to rise from less than 0.1 percent of global manufacturing output today to 15 percent in 2014, totalling \$2.6 trillion, or 10 times more than biotechnology revenues and about the size of the information technology and telecom industries combined.

Research analysts predict that through 2009, commercial breakthroughs will unlock nanotechnology innovations, with electronic and IT applications dominating the industry as microprocessors and memory chips built using new Nanoscale processes come onto the market.

Nanotechnology will then become commonplace in manufactured goods, as health care and life sciences applications become significant as nano-enabled pharmaceuticals and medical devices emerge from lengthy trials from 2010 onwards.

Dr. Robert Blaunstein, president of the Nanotechnology Risk Management, who recently addressed delegates at the International Reinsurance Summit held at the Fairmont Hamilton Princess Hotel, said the rise of nanotechnology would challenge the insurance sector to deal with a wide range of new risks that will impinge on almost all lines of business.

He believes that by 2015 nanotechnology goods and services will account for about \$1 trillion worth of business.

"Looking back, most technologies take about 10 years to become really big," Dr. Blaunstein said. "Nanotechnology is in about year five. So based on history, it will be about five years before it's out there in all its glory.

"But the insurance industry has to be ready

for the speed at which this technology is moving. In America, Japan, Russia and Europe, they're moving very quickly on this and within two years we'll be seeing a lot about it everywhere. There are already about 1,000 products out there that entail nanotechnology."

The advantages of nanotechnology, said Dr. Blaunstein, included the use of less raw material and a reduction in the amount of waste, bringing savings in terms of energy, labour and natural resources.

He said nano-materials could benefit healthcare by carrying medicines into the body and targeting a specific area, like a tumour, while the insurers could reap the rewards of stronger and more adaptive materials, producing cars that fare better in collisions and buildings that better resist the effects of earthquakes and hurricanes, for example.

But he warned that nanotechnology would also bring with it new risks, such as the effect of stray nanoparticles entering the human body and potentially interfering with biological processes, with a lack of historical data, unanticipated side effects and the potential for a similar scenario to that which unfolded with asbestos.

"If you look at asbestos, it was all over before we knew what the problem was," said Dr. Blaunstein.

A study published in *Nature Nanotechnology* in May 2008 raised the issue of the analogy between the possible ill effects from exposure to nanotechnology and those of asbestos exposure, suggesting that nanotubes, a type of nano-engineered material comparable in shape to asbestos, may pose health risks similar to those resulting from asbestos contamination.

But existing regulations may prove to be inadequate in addressing safety concerns over the development and application of nanotechnology,

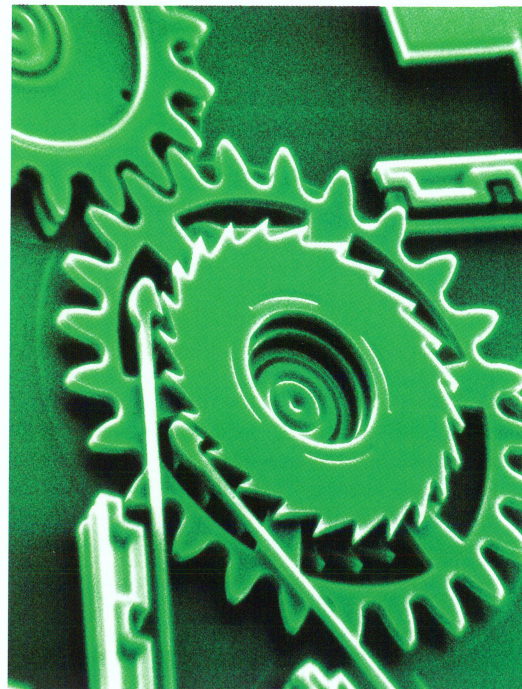


Illustration by David Skinner



with the implications of the special properties of nanoparticles in respect to health and safety not yet being taken into account by regulators and no meaningful regulatory policy or standards in place to deal with the risks posed by potentially dangerous nano products.

While future regulatory standards in areas such as medical products and the environment will need to account for nano products, nanotechnology as an industry may defy efforts at regulation. A recent editorial in *Nature* magazine, in fact, went as far as to say: "There may be dangers in nanotechnology as in any emerging area of research. But nanotechnology is a diverse field, united only by the factor of scale. So it is not even clear how one would go about regulating nanotechnology in a manner unique to the discipline."

The current exposure to manufactured nanoparticles is mainly concentrated in workers in nanotechnology companies and research, with estimates of around 20,000 researchers employed in that field and, according to the Institute of Occupational Medicine, approximately 2,000 staff working in new nanotechnology companies and universities in the UK where they may potentially be exposed to nanoparticles.

However, a report released by the International Council on Nanotechnology concludes that only about one in three manufacturers of nanotechnology monitored themselves for exposure to substances.

The fact that nanotechnology is such an unknown quantity is borne out in the statistics from a Yale University study, which reported that 80 percent of Americans had never heard of it.

Furthermore, a number of businesses in the consumer market do not advertise whether their products contain nanoengineered materials because they do not want bad publicity, with the fear of a consumer backlash from informing the public.

However, experience has shown that the introduction of new technologies in consumer products must be coupled with an assessment of possible risks arising from their use, while the importance of communicating such risks well to consumers has been highlighted in order to gain the public's trust and ensure the successful introduction of nanotechnology to the market.

Above all, the study published in *Nature Nanotechnology* comparing nanotubes and asbestos among others, is worrisome for the insurance industry, with asbestos contamination in the past resulting in large employee claims and class action suits, resulting in large losses for asbestos producers and contractors, as well as their insurers.

While such an outcome is not yet predicted for nanomaterials, the unknown consequences of exposure and the uncertainty surrounding delayed reporting of large claims underscores some of the risks of the new technology.

Underwriters will increasingly be compelled to address the risks related to nanotechnology,

## A small measure

Nanoscale materials are generally less than 100 nanometres in diameter (one nanometre is one billionth of a metre), compared to a sheet of paper, which is 100,000 nanometres thick. They possess useful physical capacity for storing and transferring heat and can even modify biological properties. Certain nanomaterials are able to interact with biomolecules, enabling them to improve medical diagnosis and tissue and organ replacement.

balancing an assessment of those dangers posed with the consideration that not all uses of nanotechnology are equally likely to lead to human health or environmental hazards.

The lines of insurance potentially impacted by nanotechnology range from workers' compensation, where coverage for employees involved in developing, synthesising and processing engineered materials is concerned, as well as workers using engineered nanomaterials in their jobs, to general and products liability, which carries with it the risk of exposure to loss from users of products containing or releasing nanomaterials.

Other applications could include product recalls and environmental liability, in the form of damage caused to the environment by engineered nanomaterials released intentionally or accidentally.

Property may be affected by the fine particle size of engineered nanomaterials with the potential to cause ignitable dust to form, while medical malpractice might come into play for physicians and hospitals using nanoengineered medical products facing possible liability for errors and unforeseen negative outcomes.

From the underwriters' perspective, few are familiar with nanotechnology products or processes, while it is difficult to assess and quantify risk because they have no long-term experience of the new technology.

In that it is similar to asbestos liability, there could be a significant delay between exposure and damage, with the cause and effect between the two stages difficult to establish, as well as a potential for substantial accumulation of losses across industries and different countries.

So, while some insurers are likely to be innovators in coverages addressing nanotechnology exposures, it is expected that many insurance companies will wait to see how the claim trends develop before assessing their potential involvement, some looking for market segments or niches in which to find a comfort zone they technically understand and in which they have confidence.

Given the expected prevalence of nanoengineered products in the near future, it is unlikely that any commercial lines insurers will be able to avoid confronting the risks which are posed by nanotechnology.

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