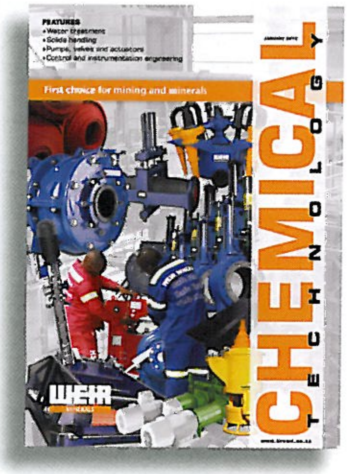

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Comment

Chemical engineers, nanotechnology and future green economy

by Dr Musee Ndeke ,CSIR, South Africa

Technological advancements have been the lifeblood of human civilization since the Stone Age. Chemical engineering has been one of the core-engine disciplines of making these enhancements to life possible.

Now, among the new 'kids on the block' of technologies is nanotechnology, envisaged to address present human needs and secure living comforts of future generations cheaply, faster, and more cleanly. To date, nanotechnology's impact on the economy and on our daily lives has been enormous.

For example, from 2005 to 2010, the number of nanoproducts (eg, cosmetics, industrial catalysts, coatings) have increased from fewer than 50 to over 1 300 (and expected to reach 3 400 by 2020 in the global markets, including South Africa). However, these benefits are accompanied by potential previously unknown nanomaterials' (NMs) risks to humans and the environment.

In South Africa, after Cabinet approval of a National Nanotechnology Strategy in 2005, the DST invested millions of rands into nanotechnology R&D. Additionally, several companies have supported nanotechnology R&D in the country, and as these technologies mature into products and industrial applications, the nanotechnology-driven economy is expected to grow. Therefore, it is imperative that as chemical engineers, we find innovative means of exploiting nanotechnology's capabilities in fields of water, energy, health, and advanced industrial manufacturing, among others, but that we also consider the potential risks.

Why is this so, you may ask. Firstly, it is easier and cost-effective to address potential risks of a given technology in its initial phases of development and of products' commercialization, in order to avoid future adverse effects and reliabilities.

Secondly, there are growing concerns globally, both perceived and real, that nanotechnology may pose risks to humans and other biological life forms in the ecological systems at scales previously unknown. For this reason, these concerns should be factored into new NMs and nanoproducts' design and development.

Thirdly, industries, particularly the insurance industry, has previously been sent to bankruptcy mode because of high claims after insuring unforeseen high risk technologies (eg, asbestos). Unsurprisingly, after the emergence of nanoproducts, two of the largest global insurance companies, Munich Re and Swiss Re, issued independent reports suggesting how the unknown risks of NMs may impact on the premiums of industries and companies dealing with nanotechnology. This means, industry and the developers of nanoproducts should generate data to show that their products are safe and not harmful to humans and the environment, otherwise insurance may become costly, or inaccessible.

Fourthly, quantities of NMs in the workplace are increasingly becoming a common occurrence as nanotechnology industry expands. However, there is no evidence to suggest that the personnel responsible for risk management and protection of workers has the necessary skills, knowledge, and tools to deal with emerging potential nanotechnology-related risks at workplace level.

Additionally, NMs appear to have challenged the traditional regulatory frameworks including the universal means of expressing risk as mass per unit volume. These challenges, amongst others, should motivate chemical engineers to incubate initiatives that would improve nanotechnology risk management at different phases of development, including finding potential new paradigms of quantifying NMs risks to humans and the environment.

As local chemical engineers prepare for the SAIChE 2012 Conference, perhaps they should also consider that, whereas nanotechnology has been probed to offer cleaner, cheaper, faster, and smarter approaches, it may also introduce a whole new range of previously unknown risks. Now is the time to act, and make safe and risk-free nanotechnology products a reality.