Science for Environment Policy
DG Environment News Alert Service
European Commission

20 June 2011

Towards responsible nanotextiles and coatings: a new risk approach

A new study has developed risk assessment criteria for engineered nanomaterials (ENMs) to help inform innovation and policy decisions. It illustrates that product design can influence the unintended release of ENMs and that combining knowledge about the product life cycle with a systematic assessment of the potential hazards may enable responsible choices for future product developments to be made.

Human and environmental health may be harmed by the unintended release of ENMs used in products, such as textiles and façade coatings for buildings. ENMs are finely-tuned to harness unique physical, chemical and mechanical properties that exist at very small scales, up to one ten-thousandth of a millimetre in size. They are of considerable value in the construction, medical and transport sectors for their self-cleaning, UV-resistant, flame retardant, scratch-proof and dirt-resistant properties.

As yet, very little can be confidently concluded about exposure to ENMs and their potential hazards, but because decisions have to be made today about their development, the study, partly conducted under the EU-funded *NanoHouse*[1] project, offers assessment criteria to help ensure that development is as sustainable and safe as possible, ahead of a regulatory review of nanotechnology due later this year.

The researchers assessed what is currently understood about the potential risks posed by ENMs used in nanotextiles and façade coatings with an extensive review of previous scientific studies and using new mathematical modelling of ENM behaviour and human toxicology. From this, they identified assessment criteria for the environment and human health, which included: Environmental effects; Solubility in water; Sedimentation; Stability during incineration; Impact on wastewater facilities; Human toxicity; DNA impairment; Crossing and damage of tissue barriers; Translocation effects in skin, the gastrointestinal or respiratory tracts.

Some previous research has suggested that around 90 per cent of nanosilver and most other ENMs can be removed during wastewater treatment, posing a reduced hazard to the environment; but the behaviour of nano zinc oxide has not yet been extensively investigated. Almost all types of ENM particles are likely to group together to form “agglomerates”, which sink down into the sediment with potential exposure to sediment-dwelling organism. One general conclusion from the study is that nanosilver and nano zinc oxide could pose risks to the environment, but nano titanium dioxide should also be further investigated.

Depending on the product design, a fraction of ENMs is released directly into the air, probably embedded in larger sized particles. Nano titanium dioxide is among a range of ENMs that have been linked to varying degrees of disruption to cellular functions in the brain, lungs and other vital organs. ENMs can also act as carriers for other toxic substances. The most important entry point of free nanoparticles is the lungs. Some tests have shown that ENMs can potentially lead to damage of lung tissues. However, it is important to remember that few studies have investigated the chronic toxicity of ENMs and clear conclusions cannot be drawn yet. The precise risk to human health is difficult to quantify at present and large uncertainties still exist, say the researchers. Furthermore, there are still no reliable methods or tools for assessing levels of exposure. In tests, exposure of healthy skin to different types of ENMs has not provoked any acute effects and no translocation of ENMs has been observed. The size, purity and chemical form of ENMs can also vary widely. Exposure depends heavily on the way the products are designed, used, transported, stored and recycled. It is also likely that some ENMs change over time or under particular conditions, possibly altering their toxicity.

The researchers recommend dedicated investigations of specific ENMs products, using their risk assessment criteria, to evaluate and minimise potential risks. This is particularly urgent in the building sector, as it is thought that 15 to 30 per cent of façade coatings will be based on nanomaterials by 2015.

1. NanoHouse is supported by the European Commission under the Seventh Framework Programme. See: www-nanohouse.cea.fr/home/index.htm

Source: Som, C., Wick, P., Krug, H. and Nowack, B. (2011). Environmental and health effects of nanomaterials in nanotextiles and façade coatings. *Environment International.* Doi:10.1016/j.envint.2011.02.013.
Contact: Claudia.som@empa.ch
Theme(s): Chemicals, Risk assessment