EU project tackles engineered nanomaterials risk

The unintentional release of ENMs used in products is affecting our planet

EU-funded scientists have developed risk assessment criteria for engineered nanomaterials (ENMs) that will help support experts in making innovation and policy decisions. An outcome of the NANOHOUSE ('Life cycle of nanoparticle-based products used in house coating') project, which is backed with EUR 2.4 million under the 'Nanosciences, nanotechnologies, materials and new production technologies' (NMP) Theme of the EU's Seventh Framework Programme (FP7), findings reveal that product design can affect the unintentional release of ENMs. Making responsible decisions about future product development will be possible by bringing together product life-cycle knowledge with a systematic evaluation of what hazards could emerge. The NANOHOUSE team suggest that their risk assessment criteria should be used to assess and minimise potential risks. This would benefit those working in the building sector in particular, because it is estimated that nanomaterials will be used to develop 15 % to 30 % of façade coatings within the next 4 years.The study is presented in the journal Environment International.

Experts say the unintentional release of ENMs used in products, including facade coatings for buildings, could play havoc on both the environment and human health. Researchers tweak ENMs to exploit physical, chemical and mechanical properties that exist at significantly small scales. Various sectors such as medical, construction and transport depend on them because of their special properties: ultraviolet (UV)-resistant, flame-retardant, dirt-resistant, scratch-proof and self-cleaning.

Led by the France-based organisation Commissariat à l'énergie atomique et aux

énergies alternatives (CEA), the NANOHOUSE team comprises researchers and industry actors from Belgium, France, Italy, the Netherlands and Switzerland. The assessment criteria they provide can be used to assure that development of products is not only safe but sustainable as well. This is good news as a regulatory review of nanotechnology is scheduled in 2011.

The NANOHOUSE partners evaluated data from past research studies to shed light on what people know about the potential risks posed by ENMs used in nanotextiles and facade coatings. They also performed novel mathematical modelling of ENM behaviour and human toxicology.

Based on this work, the team singled out a number of assessment criteria for human health and the environment: environmental effects; solubility in water; sedimentation; stability during incineration; human toxicity; DNA (deoxyribonucleic acid) impairment; impact on wastewater facilities; damage of tissue barriers; and translocation effects in skin, the gastrointestinal or respiratory tracts.

Former studies found that it is possible to remove some 90 % of ENMs like nanosilver from wastewater. Doing so helps reduce environmental hazards. Most ENM particles could form 'agglomerates' (collections/groups of masses) that drop into the sediment with potential exposure to sediment-dwelling organisms. The NANOHOUSE team postulates that nanosilver, for instance, can have a negative impact on the environment, but more research must be carried out to find out about nano-structured titanium dioxide.

The direct release of ENMs into the air depends on the design of the product, according to the partners. This fraction of ENMs is most likely embedded in larger-sized particles, they add. Researchers have linked titanium oxide to varying degrees of disruption to cellular functions in the brain, lungs and other important organs. ENMs can also act as carriers for other toxic substances.

It should be noted that current methods to quantify the precise risk to human health is not yet a simple task. And researchers say no reliable methods or tools are available on the market.