The spread and use of nanoparticles on the manufacturing process may represent a health hazard and create corresponding (re) insurance claims

Nanotechnology

Nanotechnology is a multidisciplinary science and technique with substantial contributions from cluster-, surface-, and semiconductor physics, surface chemistry, materials science, engineering sciences, pharmaceutics, medical science, food industry and many others. Nanotechnology deals with all aspects of knowledge of scientific and industrial techniques that are developed or used to design, manufacture, analyse or apply materials and devices of nanometre dimensions.

Governments boost the expansion of nanotechnology by directing large amounts of money to research and development. The transfer of money is reflected by a worldwide disproportional high increase of nanotechnology patents. Industries are expecting great market potentials for nanomaterial based products. The potential benefits of nanotechnology are immense. However, concerns about the potential adverse human health effects of this technology must also be addressed. Scientists and authorities around the world are working in structured and multi-year research programmes to further explore the open questions about the safety of nanomaterials. One example is the EU framework programme for research and innovation “Horizon 2020”, where several research projects are dedicated to environment, health and safety aspects of nanotechnology.

Small particles can be divided in fractions according to technical and biological important properties. Below 10µm air-dispersed particles („dusts“) belong to a fraction PM10 and are called thoracic fraction, being able to enter deeper (thoracic) parts of the airways. Of this fraction particles below 2.5µm (PM 2.5) are fine particles, of which the fraction below 0.1µm (PM 0.1) is called ultra-fine and referred to as nano-particles. From the asbestos disaster, it is well known that particles of certain size and geometry (below 10µm) are capable of entering deeper parts of the airways. Interaction of insoluble particles with the body can lead to chronic illness and cancer.

Carbon nanotubes are carbon atoms folded into a cylinder form. They are produced as single tubes or as a series of concentric cylinders (known as multi-walled nanotubes). Due to their higher strength and light weight, carbon nanotubes are already used in a variety of products, where they replace conventional carbon fibres (made from graphite) in compound materials.

The long, thin shape of carbon nanotubes probably poses the greatest health risk. Due to their length to width relation and size, they much resemble asbestos fibres. Like asbestos fibres, carbon nanotubes are chemically stable (insoluble) in the body. Studies revealed the asbestos-like qualities of carbon nanotubes and their potential ability to cause mesothelioma (a lung-cancer caused by asbestos exposure).

Continuous dissemination of artificial nano-particles throughout the environment bears a pertinent risk for the (re-)insurance industry. A variety of claims is conceivable. The most relevant areas are chemical industry for the production and/or processing of nanomaterials, potentially posing workers at risk. Other producing industries using nanomaterials in their production lines may face consumer class action claims due to alleged damages from nanomaterials released from surfaces (nanoparticle containing lacquers, cleaning processes) or directly brought into the body (pharmaceuticals, medical devices). Transport of nanomaterials may accidentally lead to pollution and subsequent claims. Agriculture and food-industry may be affected by nanoparticles from fertilizers, animal medicine or pollution that may lead to accumulation and increase hazardous potential to crop, life-stock or humans. Human health may be impaired by accumulation of nanoparticles through air and food chain. Depending on the properties of the particles and the prevalence of use, several years to decades may pass before the first signs and symptoms of overloading with insoluble particles become apparent. The current evidence is inconclusive. Various risk assessment models and frameworks are currently being developed to make sense of and evaluate the available data on the health effects of nanomaterials.