# Nanoparticle aerosols in workplace environments: From source to dose

***Martin SEIPENBUSCH***
***Karlsruhe Institute of Technology, Karlsruhe, Germany***

Gas-phase processes have a number of advantages for the synthesis of nanoscaled objects. They allow good control over the structural parameters of particles, high purity of the materials and their surfaces and are commonly continuous processes, easily scalable from the small scale production of high value materials to the large scale for high volume commodity synthesis. Examples range from noble metal catalyst materials on the high end and soot on the lower end in terms of product value. In comparison with liquid phase methods, aerosol processes however have a higher inherent potential for the release of free nanoparticles into the environment.

Nanoparticle aerosols can be emitted by a broad spectrum of potential sources varying in concentration, temporal release characteristics and particle size. One way of classifying these emitters is by following the process chain of nanoparticles in production and application. A primary source then releases particles directly from a synthesis process or a welding operation for instance, wherever particles are formed immediately prior to emission. Nanoparticle release from powders during bagging or handling can be classified as a secondary source. In the application and use of nanoparticle containing materials such as filled polymers a tertiary release of particle aerosols is eventually possible, e.g. during sanding or grinding.

The exposure a worker is subjected to depends on the source characteristics as well as on transport, determining the time scales, and aerosol dynamics altering the relevant parameters, particle size and concentration. Eventually, however, the hazard potential is linked to the dose reaching a target organ. The link between exposure and dose is therefore an important part of risk assessment of aerosol nanoparticles in workplaces.

In this presentation the major mechanisms from the emission of nanoparticles from relevant sources to transport and aerosol mechanics related changes in the particle characteristics, to alterations of these in the human lung and the eventual assessment of the particle dose will be discussed.