Influence of low-volatile organic compounds on nanoparticles' intrinsic ROS-production capacity

Jiayuan Zhao, Michael Riediker

University of Lausanne, Rte de la Corniche 2, CH-1066 Epalinges – Lausanne, Switzerland

My work is connected to Nanotoxicology: Session 6 Hazards – human and Session 7 Hazards - environment.

The physico-chemical characteristics of nanoparticles (NPs) surface can substantially influence their toxicity, including intrinsic reactive oxygen species (ROS) generation capacity. We were interested in modifying this capacity when NPs are coated with low volatile organic compounds (LVOC). Because of their high affinity to surfaces, LVOC are likely to coat airborne NPs in environment. Thus, we developed a dynamic system to simulate this phenomenon. Airborne particle sizing measurement showed an increase of particle size after coating. The thicknesses of coating can be adjusted by controlling system parameters. Both nanotracking analyses of NPs suspended in liquid and transmission electron microscopy were used for further characterization. They suggest the system yields stable, replicable and well controlled particle coatings. Preliminary data showed modification of ROS generation after coating. This agreed with the hypothesis that chemically non-reactive coating would block reactive zones on NPs' surface and thereby decrease ROS generation while chemically reactive coatings would increase the redox activity and thereby increase ROS generation. This coating system helps understanding the influence of NPs surface function on NPs toxicity. In the future, such a NP coating system may also find interesting applications in other fields.

This project is supported by the EU 7th Framework Programme, Marie Curie Actions, Network for Initial Training NanoTOES (PITN-GA-2010-264506).