Title *

Conceptual models of ultrafine particles from combustion sources – Benefits from integrating studies of ultrafine particles with nanotoxicology

Abstract *

Exposure to ultrafine carbonaceous particles (soot/black carbon) from combustion sources has been linked to adverse health effects in the population. Relationships between particle physico-chemical properties and toxicological effects have been investigated in more detail in nanotoxicological studies of engineered nanoparticles. There are clear benefits from integrating these today rather separated disciplines.

This presentation will start out from our recent experimental work on emissions from solid fuel combustion (wood log and pellet stoves) and vehicular exhaust (including renewable fuels). Examples of results relevant for toxicology will include combustion conditions leading to strongly elevated emissions of Polycyclic Aromatic Hydrocarbons (Nielsen et al. 2017) and the occurrence of fullerenic soot with altered surface properties in combustion emissions (Malmborg et al. 2017).

The results will be summarized into simplified conceptual models of the major particle types occurring in emissions from these sources. The considered properties include: size, chemical composition, morphology and solubility. Major particle types include those dominated by insoluble black carbon, those dominated by soluble organics and those dominated by ash components. Black carbon dominated particles from combustion sources are commonly covered with a coating consisting of semi-volatile organics, in contrast to engineered carbon blacks. The composition of this organic layer vary strongly between sources and is also transformed upon particle aging in the atmosphere.

Finally, approaches to systematically vary the properties of ultrafine particles from real world sources and the relevance of using carbon blacks and simplified soot generators as models in toxicological studies will be discussed.

Malmborg VB et al. Env. sci. & techn., 51, 1876-1885.
Nielsen IE et al. Atmos. env. *In Press,* DOI: 10.1016/j.atmosenv.2017.06.033
Stone V et al. Environ Health Perspect; DOI:10.1289/EHP424

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