Title *

Online detection of the oxidative potential of ambient particulate matter by electron paramagnetic resonance spectroscopy

Abstract *

Inhaled particulate matter (PM) has been implicated in adverse health effects including chronic obstructive pulmonary disease, cardiovascular disease and lung cancer. Toxicological studies have identified oxidative stress as a key mode of action and the ability of PM to generate oxidants, e.g. reactive oxygen species (ROS), has therefore been proposed as an improved dose metric in air pollution monitoring. Traditional techniques to analyse the Oxidative Potential (OP) of particles are labour-intense and often with poor sensitivity and temporal resolution as well as significant delays between aerosol sampling and data availability. Thus, an online approach to quantify particle-associated ROS would be highly beneficial in PM monitoring strategies. So far, such online techniques are available on research level for OP detection methods that use the 2'7'-dichlorofluorescein (DCFH) and dithiothreitol (DTT). An alternative detection method to determine the OP involves spin trapping based electron paramagnetic resonance (EPR) spectroscopy, and was previously demonstrated to predict the inflammatory and (geno)toxic properties of PM towards lung cells. Within the current project this EPR approach will be further developed and extended using an automated measuring method for the detection of PM-OP. For this purpose, the coupling of a Particle-Into-Liquid Sampler (PILS) with a reaction stage, a classical redox potential measurement and an EPR spectrometer with a time resolution of at least 4h is planned. The approach is being developed and tested in the laboratory and will be subsequently evaluated in an environmental monitoring campaign. Results from this ongoing study, especially the laboratory proof of concept of the online-EPR analysis approach will be presented on the poster.

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