

1.009 An On-line Monitor of the Oxidative Capacity of Airborne Particulate Matter (o-MOCA).

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Abstract:

The chemical properties of airborne particles have been associated with the ability of aerosols to generate cellular oxidative stress. Thus, rapid changes in the chemical composition may result in a significant variation of the oxidative potential of these particles. To better understand the ability of particles to exert oxidative stress and identify the particle properties responsible, we have developed an on-line, field-deployable instrument for the time-resolved quantification of the capacity of airborne particles to generate reactive oxygen species (ROS). Our approach adapts the widely accepted dithioerythritol (DTT) redox assay to on-line analysis of concentrated samples of airborne particles collected directly into sub-milliliter volumes of liquid using condensationally-enhanced particle collection technology. The concentrated nature of the suspension allows measuring the oxidative potential of particulate matter with time resolution of a few hours. The on-line Monitor of the Oxidative Capacity of Airborne Particulate Matter (o-MOCA) consists of a liquid collector coupled to a chemical module where the DTT analysis is conducted in-situ. The standard DTT assay has been modified for fast (30 min) analysis and coupled to the liquid collector for programmed sample transfer.

The chemical module has been built using reliable and cost-effective components. A new detection system has been custom built using single wavelength light-sources for signal and reference measurements and an Ocean Optics spectrometer. The DTT module will be easily coupled with the particle collector for field deployment. The system performance and robustness has been tested in the laboratory using the 9,10-Phenanthroquinone (PQ) as our standard compound.