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Characterization of surface functional groups present on field-sampled aerosols

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The increase of exposure to PM_{10} and $PM_{2.5}$ (particulate matter with aerodynamic diameter smaller than 10 μm and 2.5 μm, respectively) has been found to be associated with a range of adverse health effects, including cancer, pulmonary and cardiovascular diseases. Surface characteristics (chemical reactivity, surface area) are considered of prime importance to understand the mechanisms which lead to harmful effects. A hypothetical mechanism to explain these adverse effects of particulate matter is the ability of some components (organics, metal ions) adsorbed on these particles to cause oxidative stress in biological systems (Donaldson, 2003).

In the framework of the present research project that focuses on occupational exposure to Diesel exhaust particulate, we have used a novel and promising method to characterize the surface functional groups present on aerosols that have been collected on suitably passivated filters (Demirdjian et al., 2005). This method makes use of a heterogeneous chemical reaction between the aerosol condensed phase and a gas-phase probe molecule. For each type of functional group present on the aerosol surface (such as carbonyl, acidic, basic and oxidizable groups), the interaction of an appropriate gaseous molecule specifically reacting with a single functional group is studied in a Knudsen flow reactor. The type and number of probe molecules taken up by a deposited aerosol sample, whose surface area has been previously measured, reveals the type and number of functional groups present on the aerosol surface.

On the poster, we will report results obtained during a field measurement campaign in several bus depots, where the aerosols have been collected on High-Volume Sampler

for subsequent interrogation by gas-phase probe molecules. Number and size distribution of the sampled aerosols will also be discussed. The results obtained during this sampling campaign indicate a high content of carbonyl functions on the sampled aerosols. Significant amounts of acidic and basic sites have also been measured.

These results will be later used to see whether there is a correlation between the exposure to Diesel exhaust particulate and the oxidative stress status.

Demirdjian B., Rossi M. J. (2005) *Atmos. Chem. Phys. Discuss.*, **5**, 607 – 654.

Donaldson K. (2003) *Occup. Environ. Med.*, **60**, 313-314.