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Reduction potential as an indicator for H_2O_2 productivity of organic aerosols

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Exposure to fine particulate matter with size of $\leq$2.5 μm ($PM_{2.5}$) may cause respiratory inflammation and diseases upon generating excessive reactive oxygen species (ROS) in the lung (Pöschl and Shiraiwa 2015). As one of the most important ROS, H_2O_2 can be generated upon interactions of redox active $PM_{2.5}$ components with water and antioxidants (Lakey et al., 2016). Due to a lack of understanding of the organic aerosol (OA) composition (Noziére et al. 2015) and complex interactions between different constituents of the particles (Charrier et al., 2014; Wang et al., 2018), the formation mechanism and yield of H_2O_2 by OA in physiological conditions are largely unknown. Therefore, we measured the H_2O_2 yields of a selection of atmospherically relevant oxygenated and nitro-polycyclic aromatic compounds (e.g., quinones) in a surrogate lung fluid as well as the dithiothreitol (DTT) depletion behavior in a respective assay. We found that both parameters for the investigated compounds had a good correlation with their reduction potential, which describes the tendency of a molecule to acquire electrons (de Heer, 1950). Based on this correlation, we suggest that a database of reduction potentials can be used to estimate the H_2O_2 yield of different redox active components in OA. Finally, the reduction potential may become a useful indicator to describe the capacity to form other types of ROS, beyond H_2O_2 and thereby deplete antioxidants.

Pöschl, U., and Shiraiwa, M. *Chem. Rev.*, 115, 4440-4475, 2015.

Lakey et al., *Sci Rep*, 6, 32916, 2016.

Noziére et al., *Chem. Rev.*, 115, 3919-3983, 2015.

Charrier et al., *Environ. Sci. Technol.*, 48, 7010-7017, 2014.

Wang et al., *Atmos. Chem. Phys.*, 18, 3987-4003, 2018.

de Heer, J.: A Quantum Mechanical Study of the Oxidation-reduction Potentials of Quinones, $D.B.$ *Centen*, 1950.