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Measurement of high-molecular weight compounds in the organic fraction of aerosol by high resolution PTR-TOFMS

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Various experimental approaches have contributed to the current understanding of the secondary organic aerosol (SOA) formation. However the composition of SOA on a molecular level is difficult to analyse, and traditional studies are only able to resolve a small fraction of the entire organic particle mass. In particular compounds of higher molecular weight (semi-volatile organic compounds and oligomers) exhibit an analytical challenge. Time resolved quantification of well identified organic compounds in both the gas phase and the aerosol are playing a key-role in understanding the transition from gaseous organic precursors to eventually formed SOA.

A recently developed high resolution proton transfer reaction time of flight mass spectrometer (HR PTR-TOFMS) was employed in a smog chamber studying the photooxidation of trimethylbenzene under low NOx conditions. The high mass resolving power of the PTR-TOFMS allows for the assignment of exact mass and isotope pattern to individual organic compounds and thus strongly improves the identification capabilities compared to a standard PTR-MS.

In addition to volatile organic compounds (VOC) in the gas phase SOA mass collected on Teflon filters was analysed. Aerosol sampling periods were ten minutes. The filters were put into an oven and the temperature was ramped up in order to thermally desorb semi-volatile compounds from the aerosol. Information on both the molecular weight and the volatility of the SOA constituents was acquired. The resulting mass spectra comprise quantitative signals up to a mass range of m/z = 447u indicating the occurrence of high molecular weight compounds in the SOA. It may be pointed out that

PTR-TOFMS has virtually no upper mass range limit and the instrument sensitivity increases with increasing m/z. In this paper first results will be discussed.

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