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Mass spectrometers for the chemical analysis of organic substances (MS-CHAOS) in the gas and aerosol phase

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A detailed understanding of the chemical composition of secondary organic aerosol (SOA) is important to achieve, both to better understand the processes that are occurring in the ambient atmosphere as well as to better describe SOA in atmospheric models. Recent work has highlighted the importance of oligomeric molecules within SOA. The existence of oligomers in SOA has significant implications for the physical behavior of the SOA particles in the atmosphere, as well as for their behavior in atmospheric models. Supported by the EU-projects ACCENT and EUROCHAMP seven research groups gathered at the PSI smog chamber to perform joint experiments. The goal of this effort was to investigate the formation of oligomers in secondary organic aerosols (SOA) and to test the potential of various mass spectrometric techniques for that purpose. Emphasis was put to gain information on the chemical composition on a molecular level of SOA and the gas phase in an on-line manner with very little to no preconditioning before analysis. The following instruments/systems were involved: TSI Single particle aerosol TOFMS (ATOF-MS); Aerodyne AMS (EI ionization, quadrupole); Aerodyne AMS (C-TOF) with EI and VUV ionization; Aerodyne AMS (V-TOF, W-TOF) with EI ionization and electron attachment; Proton-transfer-reaction MS (PTR-MS) for gas analysis; PTR-TOF-MS for gas analysis; GC-PTR-MS for gas analysis; IC-MS coupled to a wet effluent diffusion denuder-aerosol collector for organic acids in the gas and aerosol phase. The presentation will give an overview of the measurement campaign and present first results. The aerosol mass spectrometers show exciting new possibilities for on-line characterisation of oligomers in SOA. The TSI-ATOFMS is capable to measure on-line large molecular masses and has the potential to derive oligomerisation-rates. Lowering the temperature of the aerosol vaporizer in the Aerodyne-AMS improves the detection capability of oligomers for the quadrupole-AMS. The V-TOF-AMS with electron impact ionization is able to mea-

sure large molecular masses because of much better detection limits compared to the quadrupole-AMS. The high resolution AMS (W-TOF) allows the observation of exact masses and follow their time evolution. This provides the possibility to determine C/N/O ratios.