EGU22-12727
https://doi.org/10.5194/egusphere-egu22-12727
EGU General Assembly 2022


# Effect of temperature and gas species on toluene secondary organic aerosol: light absorption, chromophores, and chemical compositions

**Feng Jiang**[1,2], Harald Saathoff[1], Junwei Song[1,2], Linyu Gao[1,2], Yiwei Gong[1], Cluadia Linke[1], Leisner Thomas[1,3], and Stefen Norra[2]

[1]Institute of Meteorology and Climate Research, Karlsruhe Institute of Technology, 76344 Eggenstein–Leopoldshafen, Germany

[2]Institute of Geography and Geoecology, Working Group for Environmental Mineralogy and Environmental System Analysis, Karlsruhe Institute of Technology, 76131 Karlsruhe, Germany

[3]Institute of Environmental Physics, Heidelberg University, 69120 Heidelberg, Germany

In urban areas, secondary organic aerosol (SOA) generated from anthropogenic volatile organic compounds (AVOC) like toluene can contribute largely to the aerosol particle formation. However, it is still unclear how the temperature and gas species affect toluene SOA formation and optical properties. Therefore, we simulated toluene SOA formation in Aerosol Interaction and Dynamics in the Atmosphere (AIDA) chamber under the temperatures of 253-313K and with the addition of different gas species ($NO_2$, $SO_2$, and $NH_3$).

In all experiments, toluene SOA bulk was measured with a high-resolution time-of-flight aerosol mass spectrometer (HR-TOF-MS). Toluene and less oxygenated organic aerosol were measured with Proton Transfer Reaction Mass Spectrometry (PTR-MS) coupled with a particle inlet (CHemical Analysis of aeRosol ON-line Proton, CHARON). Furthermore, aerosol particles were collected on filters and analyzed in the laboratory. On the one hand, filter particles were extracted by pure methanol and the extracted solution was measured by AquaLog, which can investigate light absorption and fluorescence. Meanwhile, light absorption was measured with two Aethalometers (AE33 and MA200) and three-wavelength photoacoustic (PAS). On the other hand, filters were analyzed by a filter inlet for gases and aerosols coupled to a high-resolution time-of-flight chemical ionization mass spectrometer (FIGAERO-HR-TOF-CIMS), which investigate the molecular composition of oxygenated organic aerosol compounds. We will discuss the mass absorption efficiency, chromophore variations of toluene SOA in different conditions, and the absorption contribution from specific organic molecules will be studied as well.