



Investigation of formation and ageing of biogenic secondary aerosols by soft ionization aerosol mass spectrometry

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The knowledge of the chemical composition of secondary organic aerosol is one essential key to understand the significance and fate of SOA in the atmosphere. However, the chemical evolution of SOA, from the very first condensing/nucleating molecules to the final oxidation products is still insufficiently understood and object of current research [1-3].

Consequently, the formation and photochemical ageing of secondary organic aerosol (SOA) was investigated in a series of reaction chamber experiments by applying on-line aerosol mass spectrometry (atmospheric pressure chemical ionization mass spectrometry (APCI/MS)) as well as off-line high performance liquid chromatography mass spectrometry (HPLC-MS). In a set of experiments, performed in the large outdoor reaction chamber SAPHIR (Jülich, Germany), SOA was generated from a boreal mixture of biogenic VOCs. During a two-day experiment the generated biogenic SOA was exposed to OH-radicals and the temporal evolution of the chemical composition was characterized. The applied on-line MS method not only provides highly time resolved chemical information (such as an AMS) but also allows molecular identification/quantification of specific marker compounds. Several first and higher generation BSOA products were identified. Among the higher generation products, especially a tricarboxylic acid (3-methyl-1,2,3-butanetricarboxylic acid) [2] was observed as an eye-catching oxidative processing marker. A more detailed investigation of hydroxyl radical induced SOA aging at the AIDA chamber facility in Karlsruhe, again using terpenes as SOA precursors, clearly showed that the formation of the tricarboxylic acid takes place in the gas phase by the reaction of semivolatile first generation products and hydroxyl radicals. Actually, there were no indications for OH induced oxidation of compounds in the condensed phase. The consequences of these results will be discussed in the contribution.

1. Rudich, Y., N.M. Donahue, and T.F. Mentel (2007) *Annual Review of Physical Chemistry* 58: 321-352
2. Szmigielski, R., J.D. Surratt, Y. Gomez-Gonzalez, P. Van der Veken, I. Kourtchev, R. Vermeylen, F. Blockhuys, M. Jaoui, T.E. Kleindienst, M. Lewandowski, J.H. Offenberg, E.O. Edney, J.H. Seinfeld, W. Maenhaut and M. Claeys (2007) *Geophysical Research Letters* 34(24)
3. Jimenez, JL, et al. (2009) *Science* (326), 1525-1529