The oxidation of alpha-pinene and limonene in a flow tube, investigated using the CI-APi-TOF

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The oxidation of alpha-pinene and limonene were studied in a Pyrex flow tube reactor using nitrogen (N_2) or synthetic air (N_2 and O_2) as the bath gas. The products of the reactions investigated were detected using a novel CI-APi-Tof (Chemical Ionization Atmospheric Pressure interface Time-of-flight mass spectrometer) technique with a nitrate ion (NO_3^-) based detection scheme (Jokinen *et al.* 2012). The detection scheme and the measurement routines have been described previously (Ehn *et al.* 2010, Jokinen *et al.* 2012, Junninen *et al.* 2010).

The setup used has three major advantages in studying oxidation reactions with atmospheric relevance: (i) the design of the atmospheric pressure interface (APi) allows the studies to be performed at ambient pressure, regardless of the mass spectrometric detection method – which significantly decreases uncertainties associated with extrapolating research results into atmospherically relevant conditions. (ii) The chemical ionization method is a fairly sensitive ionization method, and hence, enables the detection of molecular clusters that can provide insight into atmospheric new particle formation. (iii) Time-of-flight technique measures the whole mass spectrum at a time, up to a finite maximum mass, which helps in the product identification tremendously

In the experiments, alpha-pinene and limonene were exposed to differing levels of oxidants (O_3 and OH) in a flow tube coupled to the mass spectrometer. By varying the levels of oxidizers, the amount of organic precursor, their residence time in the reactor, as well as the water content, the important steps of the oxidation processes can be tracked.

The aim of the present experiments was to study the formation of highly oxidized molecules - HOMs – (Ehn *et al.* 2012) from two biogenic terpenes [terpene = organic hydrocarbon molecule with a chemical formula $(C_5H_8)_n$] limonene and alpha-pinene. The HOMs have recently started to attract considerable attention due to their possible relevance in the atmospheric new particle formation. Hence, the two reaction systems were investigated with the CI-APi-Tof, in order to gain insight into these processes.

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