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Development of a chiral separation method for the enantiomers of two atmospheric oxidation products of α-pinene

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Aerosols play an important role in the chemistry and physics of the atmosphere. Hence, they have a direct as well as an indirect impact on our climate. Depending on their formation one distinguishes between primary and secondary aerosols.[1] Important groups within the secondary aerosols are the secondary organic aerosols (SOAs). Those low-volatile organic compounds are formed by the reaction of oxidative substances, e.g. ozone, NO_3- or OH-radicals, with volatile organic compounds (VOCs), such as monoterpenes, which are emitted for example by trees, at high temperatures and intensive radiation.

α-Pinene is one of the most commonly emitted monoterpenes, which reacts with ozone for example to pinic- or pinonic acid.[2] Although a lot of SOA particles are generated from chiral precursors and are therefore chiral too, the enantiomers are measured together in most studies.[3] The determination of the ratio of enantiomers in SOA is a new approach concerning the characterization of VOC oxidation products.

Four different enantiomers for each pinonic- and pinic acid are possible. However, only two are formed during the oxidation process of α-pinene with ozone, because the cyclo-butane ring of α-pinene is preserved and solely the cis-configuration of the acid occurs.

To separate the two enantiomers of the mentioned acids a method using liquid chromatography with a chiral stationary phase (CSP) and UV/Vis-detection has been developed. The CSP consists of amylose-tris-(3,5-dimethylphenylcarbamate), which is a commonly used separation media in chiral separation techniques. The separation is based on normal phase conditions with mixtures of n-heptane and 2-propanol as mobile phase.

The method including sample preparation was optimized separately for the enantiomers of pinic- and pinonic acid. In a second step both substances were combined and the separation was performed in one step. Furthermore the detection limits for both substances were determined.

Ref.:

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[3] N. Yassaa et al, Atmos. Meas. Tech., **2010**, 3, 1615-1627