**Radical driven oxidation processes of isoprene degradation products in the tropospheric aqueous phase**

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Primarily emitted volatile organic compounds (VOCs) are degraded in the tropospheric gas phase by common oxidizing agents, such as hydroxyl or nitrate radicals. Isoprene is one of those VOCs, especially a biogenic volatile organic compound (BVOC), with a source strength of 520–672 Tg a-1 (Sindelarova *et al.*, 2014). The resulting products of these degradation reactions have a decreased volatility and an increased water solubility. Consequently, the first generation oxidation products, methacrolein and methyl vinyl ketone, of isoprene occur in the tropospheric aqueous phase. Their suggested oxidation products, such as 2-methyl-2-oxiranecarboxaldehyde, 1-oxiran-2-ylethanone and 2,3-dihydroxy-2-methylpropanal can also exist in the aqueous phase.

This study aims the investigation of the above mentioned methyl vinyl ketone and methacrolein oxidation products concerning their kinetics in aqueous-phase radical reactions with hydroxyl, nitrate and sulfate radicals. These radical kinetic investigations are carried out with a laser flash photolysis–long path absorption (LFP–LPA) setup to determine temperature dependent second order rate constants as well as activation parameters of these reactions. The following rate constants for the reactions of the oxidation products with sulfate radicals have been obtained at 298 K : , , .

Besides these investigations of the reaction kinetics, the product distribution of the oxidation reaction of methyl vinyl ketone and methacrolein in the aqueous phase is investigated to identify further products completing former product studies by Schöne *et al.* (2014).

The obtained data of oxidation processes of methacrolein, methyl vinyl ketone and their suggested degradation products, such as 2-methyl-2-oxiranecarboxaldehyde, 1-Oxiran-2-ylethanone and 2,3-Dihydroxy-2-methylpropanal, improve the understanding of the tropospheric oxidation mechanism of isoprene oxidation products in aqueous solution and the estimation of its contribute to the aqueous secondary organic aerosol formation. The derived kinetic parameters will be implemented into aqueous-phase atmospheric chemistry models such as the **C**hemical **A**queous **P**hase **R**adical **M**echanism (CAPRAM).

References

Schöne, L., Schindelka, J., Szeremeta, E., Schaefer, T., Hoffmann, D., Rudzinski, K. J., Szmigielski, R., and Herrmann, H. (2014). Atmospheric aqueous phase radical chemistry of the isoprene oxidation products methacrolein, methyl vinyl ketone, methacrylic acid and acrylic acid - kinetics and product studies. *Physical Chemistry Chemical Physics*, 16, 6257.

Sindelarova, K., Granier, C., Bouarar, I., Guenther, A., Tilmes, S., Stavrakou, T., Müller, J. F., Kuhn, U., Stefani, P., and Knorr, W. (2014). Global data set of biogenic VOC emissions calculated by the MEGAN model over the last 30 years. *Atmos. Chem. Phys.*, 14, 9317.