

Reactivity of γ -Terpinene with NO_3 radicals: experimental approach for kinetic and mechanistic study.

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Biogenic Volatile Organic Compounds (BVOC) are highly emitted by vegetation and play a key role in atmospheric chemistry. They are very reactive with atmospheric oxidants (OH, NO_3 , ozone) and significantly contribute to the formation of Secondary Organic Aerosol (SOA) at the global scale [1]. In addition, night-time chemistry initiated by NO_3 radicals leads to the formation of organic nitrates which behave as reservoirs for reactive nitrogen. However, the reactivity of NO_3 radical with BVOCs other than isoprene and α - and β -pinene, remains poorly understood.

Among the BVOCs, γ -Terpinene is one of the most emitted by forest [2] [3]. Two kinetic works were previously published on γ -Terpinene [4] [5], but mechanistic has never been studied. Thus, the aim of this work is to study the reactivity of γ -Terpinene with NO_3 by performing experiments in simulation chambers. Kinetic, mechanism and SOA yield will be investigated. For this purpose, two different simulation chambers have been used:

- First one, consisting of a Pyrex reactor of 1 m³ [6] coupled to a long path *in situ* FTIR spectrometer and a Proton Transfer Reaction Time of Flight Mass Spectrometer (PTR-ToF-MS) in NO^+ mode which was internally developed in LISA, to measure organic nitrates concentration.
- Second one, the CESAM chamber (<http://cesam.cnrs.fr>) [7] is a 4.2 m³ stainless steel chamber which permits to conduct SOA experiments at different temperature and relative humidity. *In situ* FTIR and PTR-ToF-MS are used to measure gaseous concentrations, and a SMPS was used to characterize particulate phase.

Kinetic and mechanistic results will be discussed and compared with the literature values.

References

- [1] Brown S. S., Stutz J., *Nighttime radical observations and chemistry*. Chem. Soc. Rev. (2012) 41, 6405–6447
- [2] Helmig D., Klinger L.F., et al., *Biogenic volatile organic compound emissions (BVOCs) I. Identifications from three continental sites in the U.S.* Chemosphere. (1999), Vol. 38, No. 9, pp. 2163-2187.
- [3] Li R., Jiang Z., *Chemical composition of the essential oil of Cuminum cyminum L. from China* Flavour and Fragrance Journal. (2004), Volume 19, Issue 4, pages 311–313.
- [4] Atkinson, R., Aschmann, S. M., Winer, A. M., and Pitts, J. N., *Env. Sci. Tech.* (1985) 19, 159-163.
- [5] Martínez, E., Cabañas, B., Aranda, A., Martín, P., and Salgado, S., *J. Atmos. Chem.* (1999) 33, 265- 282.
- [6] J.-F. Doussin, D. Ritz, A. Monod, R. Durand-Jolibois, P. Carlier, *Design of an environmental chamber for the study of atmospheric chemistry : new developments in analytical device*, Analusis. (1997) 25, 236-242.
- [7] Wang, J., et al., *Atmos. Measur. Tech.* (2011) 4, 2465-2494.