



secondary organic aerosol from the ozonolysis of aromatic compounds: smog chamber experiments and multi-tools particle-phase chemical analysis

B. Picquet-Varrault (1), L. Chiappini (1), G. Eyglunent (2), A. Leperson (3), N. Marchand (2), W. Mellouki (3), E. Perraudin (1), G. Solignac (3)

(1) Laboratoire Interuniversitaire des Systemes Atmospheriques, Universities of Paris 7 and Paris 12, UMR-CNRS 7583, Creteil, France, (2) Laboratoire de Chimie et Environnement, University of Provence, Marseille, France, (3) Laboratoire de Combustion et Systemes Reactifs, UPR CNRS 4211, Orleans, France (picquet@lisa.univ-paris12.fr / Fax : +33 1 45 17 15 64)

Volatil Organic Compounds (VOC) are emitted to the troposphere from anthropogenic and biogenic sources. Once emitted into the atmosphere, they undergo photochemical transformations initiated by OH, NO₃ and ozone oxidation. These processes yield oxygenated and nitrated products that, depending on their properties, may partition between the gas and particulate phases, resulting in secondary organic aerosol (SOA) formation (*Kanakidou et al., 2004*). Aromatics compounds are an important class of anthropogenic organic compounds which are widely emitted by combustion exhausts and by evaporation during their use in industrial activities for decades. Moreover, these compounds are known to be very efficient precursors of SOA (*Grosjean, 1992*).

In the atmosphere, organic aerosols can directly and indirectly influence climate by filtering incoming solar radiation and by significantly contribute to the mass of CCN (cloud condensation nuclei) particles (*IPCC, 1995, Novakov and Corrigan, 1996*). Moreover, even if the organic fraction of the aerosol is not well characterized, several types of highly toxic compounds such as polycyclic aromatic hydrocarbons have been detected in the particulate phase (*Turpin et al., 2000*).

In order to understand the processes that lead to the atmospheric formation of SOA and to evaluate their impacts on health and environment, a good knowledge of their chemical composition is needed. Hence, the goal of this study is to assess aromatic

photooxidation mechanisms by identifying gas and particulate phases products.

Aromatic compounds ozonolysis experiments were carried out in a simulation chamber (LCSR, Orleans, France). Gas phase chemical composition was monitored using *in situ* FTIR spectrometer and chemical composition of the particulate phase was explored using three complementary techniques: Filter sampling followed by Supercritical Fluid extraction coupled to GC/MS, Filter sampling followed by LC/MS and on-line APCI/MS. The two first techniques have the advantage to be very sensitive and the last one allows to have a high temporal resolution. Hence, this study is one of the first intercomparison of particulate-phase chemical analysis techniques. Moreover, the number and distribution size of particles were determined by a Scanning Mobility Particle Sizer (made of a condensation particle counter TSI 3022A and a differential mobility analyzer TSI 3081).

Experiments performed on the SOA formation by the ozonolysis of indene and 2-methyl-styrene are presented here. From the results, oxidation schemes are proposed.

This study has been supported by the French Ministry of Ecology and Sustainable Development.

References

Grosjean, D. Atmos. Environ., 26A, 6, 953-963 (1992).

Intergovernmental Panel on Climate Change, Cambridge Univ. Press (1995).

Kanakidou, M., J.H. Seinfeld, S.N. Pandis, I. Barnes, F.J. Dentener, et al., Atmos. Chem. Phys. Discuss., 4, 5855-6024 (2004).

Novakov, T. And C.E. Corrigan, Geophys. Res. Lett., 23, 16, 2141-2144 (1996).

Turpin, B.J., P. Saxena and E. Andrews, Atmos. Environ., 34, 2983-3013 (2000).