

# Secondary organic aerosol formation in the ozonolysis of biogenic volatile organic compounds performed in a laminar flow reactor

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The oxidation of Biogenic Volatile Organic Compounds (BVOC) emitted by vegetation, such as monoterpenes ( $C_{10}H_{16}$ ) or sesquiterpenes ( $C_{15}H_{24}$ ) is an important source of Secondary Organic Aerosol (SOA). Because of their large global emissions and high reactivity with the major atmospheric oxidants (Atkinson and Arey, 2003) – and particularly with ozone ( $O_3$ ) – they are believed to be the dominant contributors to global SOA formation (Kanakidou *et al.*, 2005).

$\alpha$ -Pinene and limonene are two of the three most important BVOC emitted in the atmosphere (Griffin *et al.*, 1999), with conifers as major sources (Geron *et al.*, 2000, Pokorska *et al.*, 2012). These two BVOC (especially limonene) are also emitted in indoor air by air fresheners and cleaning products such as kitchen cleaners and dishwashing detergents (Huang *et al.*, 2011). It has been highlighted in previous studies that their reactions with ozone could produce SOA (Chen *et al.*, 2011, Waring *et al.*, 2011, Bernard *et al.*, 2012) either in atmospheric or indoor environments, and could then lead to significant climate (Myhre *et al.*, 2001) and health (Gaschen *et al.*, 2010) effects.

In the present work, the ozonolysis reactions of limonene and  $\alpha$ -pinene have been investigated at room temperature and atmospheric pressure using a laminar flow reactor newly developed in our laboratory (Figure 1, Duncianu *et al.*, 2012), which allows the monitoring of the first steps of ozonolysis reactions (typically ~30 seconds to 5 minutes) providing complementary data to more widely performed smog chamber experiments.

The rate coefficients have been measured under pseudo first-order conditions in excess of the BVOC. The decay of ozone has been monitored with an  $O_3$  analyser while BVOC concentrations have been determined using online sampling onto adsorbent cartridges followed by thermodesorption and subsequent analysis in a GC/FID-MS system. Specific experiments have been performed to identify and quantify both gas-phase and particulate products using a TD/GC/FID-MS system, a SMPS and a HR-ToF-AMS, respectively.

Results will be further discussed and compared to literature data.

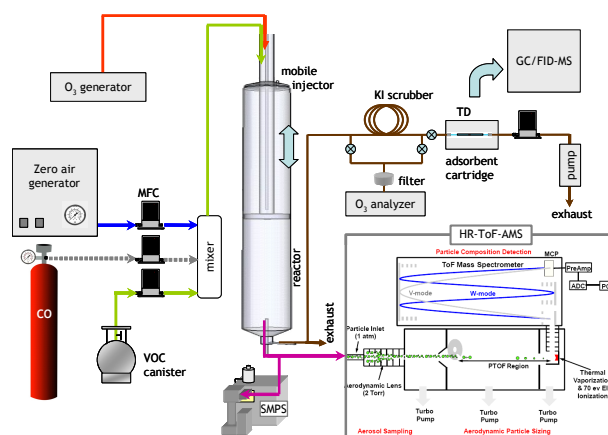


Figure 1. Schematic of the experimental setup and instrumentation (MFC: mass flow controller) (adapted from Duncianu *et al.*, 2012).

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