Overview of the ACMCC particulate organonitrates (pON) intercomparison

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Introduction

Particulate organonitrates (pON) account for significant fraction (5-80% by mass) of total OA in ambient air. They are formed from the reactions of volatile organic compounds (VOCs) with atmospheric oxidants (OH/NO_3 radicals) and NO_x. Their quantification can be achieved using aerosol mass spectrometry (AMS), based on the characteristic mass fragment ratio (NO_2^+/NO^+) allowing the distinction from inorganic nitrate. However, the accuracy of the low-resolution aerosol chemical speciation monitor (ACSM) to determine pON has not yet been evaluated. At the Aerosol Chemical Monitor Calibration Centre (AMCC), an intercomparison for the measurements of pON has been performed in order to obtain a stable and constant generation of pON, so to compare simultaneously the response of nine different AMS/ACSM systems (long-TOF-AMS vs ACSMs; Quads vs TOFs; standard vs capture vaporizers), as well as to investigate the pON physical properties and chemical composition.

Methods

pON were generated in a Potential Aerosol Mass (PAM) oxidation flow reactor from the reaction of NO_3 radical, produced on demand (O_3 + NO_2), with single VOC precursors. Two biogenic (limonene and β-pinene) and two anthropogenic (acenaphthylene and guaiacol) pON precursors were investigated. For the determination of AMS/ACSM relative ionization efficiencies (RIE), a particle size and mass selection were achieved by combining an aerodynamic aerosol classifier (AAC) and centrifugal a particle mass analyser (CPMA). pON size distribution and total particle number concentration were monitored by a scanning mobility particle sizer (SMPS) and a condensation particle counter (CPC) allowing the characterization of the pON density (Figure 1). In order to get insights into the pON optical properties, as well as their chemical composition and formation processes, measurements also included cavity-enhanced absorption spectroscopy (NO_3 radical by IBB-CEAS), proton-transfer-reaction MS (PTR-MS), multi-wavelengths aethalometer (AE33), as well as filter samplings for further high-resolution MS off line analyses (GC and LC/Q-TOF-MS).

An overview of the set-up and the experiments performed will be presented together with preliminary key results.

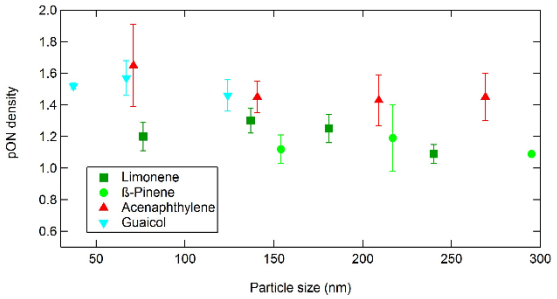

Figure 1. Evaluation of the pON density.

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