Characterization of secondary organic aerosol molecular markers for air quality assessment

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Impact of particulate matter (PM) (aerosols) on air quality and health is now well recognized. If aerosols are formed of a complex mixture, organic matter (organic aerosol, OA) represents a large fraction of the total mass of the fine particles in the atmosphere. OA sources, formation processes and chemical composition remain quite unknown. Organic compounds directly emitted in particulate phase in ambient air are defined as primary organic aerosol (POA). Besides, a large fraction of organic aerosol, secondary organic aerosol (SOA, 80 to 90% of total OA in some locations) is produced by homogenous and heterogeneous reactions of volatile organic compounds (VOCs) as well as aging of organic aerosol. Unlike primary particles, directly emitted into the atmosphere from characterized sources, secondary aerosols cannot be regulated. In this context, the discrimination of POA and SOA sources is fundamental. SOA molecular markers from specific VOCs (e.g. SOA-biogenic: pinic acid, pinonic acid, 2-methylthreitol, 2-methylerythritol, β-caryophyllinic acid, MBTCA; SOA-anthropogenic: DHOPA, phthalic acid, SOA-Biomass Burning: methyl-nitrocatetchols...) can provide insights into the processes and sources influencing SOA formation and spatiotemporal distribution. The main objective of this work is to characterize SOA markers from gas and particulate phase samples collected during the ACROSS field campaign (June-July 2022, https://across.cnrs.fr/) in different sampling locations (Rambouillet forest, Paris city center). The quantification of several SOA markers will be performed by GC-MS. Furthermore, source apportionment of the SOA fraction observed during the campaign will be performed using the so-called SOA-tracer method. In such context, an evaluation of the stability towards atmospheric oxidants of the SOA markers will be performed in collaboration with EPOC (University of Bordeaux) using ambient air samples exposed to different oxidants (O3, OH, NO2...).

This work will be performed at INERIS (40 min from Paris, http://www.ineris.fr) in the operational unit ANAE (Analytical Methods and Developments for the Environment).

Student profile
- Master or equivalent in Environmental chemistry or Analytical Chemistry.
- Research work interest.
- Knowledge in analytical chemistry (GC-MS, derivatization).
- Knowledge in atmospheric chemistry/air quality is a plus.
- Autonomy, adaptability, communication and writing abilities.
- Good English level.
- Beginning February-March 2023 for 6 months