**PhD position in Atmospheric chemistry (2022-2025) at INERIS (France).**

***BOISSOAM: Molecular characterization of gaseous and particulate phases and understanding of primary and secondary biomass burning emission processes.***

**Keywords**
Atmospheric chemistry, Air quality, Particulate matter, Biomass burning, Reactivity, Secondary organic aerosol (SOA), Molecular chemical characterization

**Context and objectives**

The knowledge of aerosols (particulate matter, PM) in ambient air is essential to assess health and climate impacts of air pollution. Their sources, formation processes and chemical composition are still poorly known. Biomass burning accounts for a significant part of the primary emissions of fine PM notably in winter period due to wood combustion used for residential heating purposes. This source also emits large quantities of volatile and semi-volatile organic species leading to the formation, via (photo-)chemical processes, of secondary organic aerosols (SOA) accounting for a substantial part of fine PM concentrations. However, SOA formation yields from this source, or from the corresponding SOA precursors emitted, are still poorly documented in the literature especially for night-time processes (involving nitrate radical) or for potential processes observed in areas under marine influence (involving halogenated radicals based on Cl, I or Br). In addition, existing studies in the literature have mainly been conducted at low or moderate relative humidity (0-50%). They therefore do not account for existing processes at higher humidity (> 80%) whereas the SOA formation potential and the physicochemical properties of the formed particles are probably radically different, and this type of information is crucial for air quality models. In this context, the main objectives of this PhD work are to study and understand the SOA formation processes from residential wood-burning appliance emissions (wood log stove) and from typically emitted SOA precursors (e.g. polycyclic aromatic hydrocarbons (PAHs) and phenolic compounds). To do so, wood combustion emissions, or pure precursors, will be aged using an oxidant flow reactor (OFR) under different oxidation conditions ($OH^{\bullet}$, $NO_3^{\bullet}$ or $Cl^{\bullet}$ radicals), simulating the diurnal, nocturnal or under marine influence atmospheric processes, and at different relative humidity (50 and 80-90%). A detailed physicochemical characterization of the gaseous and particulate phases will be carried out in real time and using particle samples collected on filters followed by off-line analyses (notably by LC- and/or GC-HRMS). The implementation of advanced instrumentation such as a CI-ToF-MS (Chemical Ionization- Time of Flight-Mass Spectrometry), combining several ionization modes ($H_3O^+$, $NH_4^+$, $O_2^+$, $I^-$) and aerosol analysis modules (e.g. EESI, extractive electrospray ionization) will permit to determine and measure, at a molecular level, volatile and semi-volatile organic substances in real time. This will allow the study of the primary particle emission and secondary formation dynamics from the wood log stove emissions, obtained under conditions as representative as possible of an actual usage. Finally, analysis of potential links between the detailed physicochemical characterization of the gas and particulate phases and the biological responses obtained in another PhD work focusing on pulmonary toxicology (WOODTOX) which will take place jointly with the BOISSOAM PhD work, will be performed.

**Candidate profile**

- Master or equivalent in Environmental Sciences or Analytical Chemistry
- Strong experimental and lab/field work interest
- Knowledge in mass spectrometry
- Knowledge in atmospheric chemistry would be a plus
- Computer knowledge and data analysis
- Autonomy, scientific rigour, adaptability, teamwork, open mind, synthesis and writing abilities.
- Good English level.

**Useful information**

Place of PhD work: INERIS (Verneuil en Halatte, France) = 100 %

PhD in co-supervision: with University of Aix-Marseille (Barbara D'Anna).

PhD start: September - October 2022

To apply: Send CV, cover letter and any recommendation letter before 10/06/2022.

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