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Post-Doctoral position in Atmospheric Chemistry

"Molecular characterization of gaseous and particulate phases of primary and secondary biomass burning emissions and understanding of their toxicity"

Nos réf. : Ineris - [CGR] - ID 2726173

Location: Verneuil-en-Halatte (60, France) - accessible by public transportation and private bus shuttle - 40 min from the North of Paris
Type de contract: Postdoctoral private law contract - 2.5 years duration - gross annual salary : 39.8 -52 K€.
To apply: click here

INERIS (515 people, 80 M€ of budget) is the French national expert institution in terms of environmental risks. Its main mission is to contribute to the prevention of risks caused by economic activities to health, environment, and the safety of people and goods.
As part of its research activities and support to public authorities (French Ministry of Environment), the unit ANAE (methods and analytical development for environmental characterization) develops analytical procedures for the characterization of various environmental matrices including air. Its research activities are strongly linked to its implication in the French national air quality monitoring laboratory (LCSQA) and are focused on the study of atmospheric aerosols including their physicochemical characterization, understanding of their sources, emission and/or formation processes, as well as their impact on air quality (toxicity) and climate.

MISSION

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 in the ambient air 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). Moreover, the toxicological potential of primary and aged biomass burning emissions, or related SOA, is also poorly understood and notably the links between biological responses and particle physicochemical properties.

In this context, the main objectives of this post-doctoral work are to study and understand the SOA formation processes from residential wood-burning appliance emissions (logwood stove) and from typically emitted SOA precursors (e.g., polycyclic aromatic hydrocarbons (PAHs) and phenolic compounds or mixture of them). To do so, logwood stove emissions, or pure precursors, will be aged using an oxidant flow reactor (OFR) under different oxidation conditions (OH or NO_3 radicals), simulating the diurnal and nocturnal atmospheric processes. A detailed physicochemical characterization of the gaseous and particulate phases will be

carried out. 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., Extractive ElectroSpray Ionization or CHARON, CHemical analysis of AeRosol ON-line) 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 a common use. Finally, analysis of potential links between the detailed physicochemical characterization of the gaseous and particulate phases and the biological responses obtained through exposure of pulmonary cells at the air-liquid interface (ALI) during a complementary work (PhD project WOODTOX), will be performed.

Your mission will focus on the following priorities:

- Operate the oxidation flow reactor (PAM-OFR) and the state of art of on-line instrumentation (SMPS, CPMA, AAC, ACSM/AMS, CI-ToF-MS + EESI and PTR-MS + CHARON) to perform the aging experiments and measure the chemical and physical properties of the gaseous and particulate phases together with related QA/QC procedures.
- Independently operate these instruments, and other instruments (e.g., gas analyzers) in the laboratory and on the INERIS biomass burning facility.
- Validate and analyze the data by these instruments and interpret the results obtained.
- Link physicochemical characterization with toxicological responses.
- Present results at scientific meetings and during international scientific conferences. Valorize the results through research project reports and publish them in peer-reviewed literature.

PROFILE

PhD in chemistry, physics, atmospheric sciences (aerosol/atmospheric chemistry/physics), environmental engineering, or a closely related field with experience in experimental sciences and data analysis including:

- Operating instrumentation such as PTR-MS/CI-ToF-MS and/or ACSM/AMS.
- Performing smog chamber or OFR experiments.
- Troubleshooting and resolving problems with instrumentation.
- Coding and analyzing complex data sets using Igor Pro.

In addition, you demonstrate the following abilities:

- Strong experimental and lab/field work interest.
- Autonomy.
- Scientific rigor.
- Adaptability.
- Teamwork.
- Synthesis and writing abilities.
- Dynamism, and stress tolerance.
- Very good written and oral English.

OTHER INFORMATION

To apply please send resume or CV with a cover letter by clicking here

This position is open to people with disabilities.