IMT Nord Europe
École Mines-Télécom
IMT-Université de Lille

PhD fellowship

Emissions and reactivity of asphalt pavements, and impacts on urban air quality

Discipline : Atmospheric chemistry, Analytical chemistry

Line Manager : E. ROMANIAS and F. THEVENET

Workplace : CERI EE, 941 rue charles bourseul 59500 douai

Type of contract and duration : CDD, 36 months

CONTEXT : Air pollution is one of the major challenges facing our society, causing more than 4 million deaths per year, 30% of which are in urban areas. Although certain sources of pollutants have been well characterized over the past few decades, a considerable lack of studies persists, particularly at the level of the interaction, reactions, and transformations of pollutants in contact with urban surfaces (construction materials, asphalt pavements, etc.) and the consequences of these processes on urban air quality. In urban areas, asphalt pavements cover about 40 to 50% of surfaces, they constitute permanent and significant sources and sinks of pollutants. Therefore, this thesis has a double objective: (i) experimentally determine the capacity of asphalt pavements to emit volatile and semi-volatile organic compounds, their capacity to trap important atmospheric pollutants and to form secondary organic aerosols (SOA), and ii) implement the experimental results in a city-scale model and assess the impact of macroscopic surfaces on urban air quality. The thesis will be based on the knowledge already acquired within the framework of national and regional projects, and the methods already developed. To carry out this work, this thesis project brings together: IMT Nord Europe, the National Observation of Athens and Route de France, who wish to join forces with the Haut de France Region to finance the EBAIR thesis project.

Public establishment belonging to IMT (Institut Mines-Télécom), placed under the supervision of the Ministry of Industry, IMT Nord Europe has three main objectives: providing our students with ethically responsible engineering practice enabling them to solve 21st century issues, carrying out our R&D activities leading to outstanding innovations and supporting territorial development through innovation and entrepreneurship. Ideally positioned at the heart of Europe, 1 hour away from Paris, 30 min from Brussels and 1h30 from London, IMT Nord Europe has strong ambitions to become a main actor of the current industrial transitions, digital and environmental, by combining education and research on engineering and digital technologies.

Located on two main campuses dedicated to research and education in Douai and Lille, IMT Nord Europe offers research facilities of almost 20,000m² in the following areas:

- Digital science,
- Processes for industry and services,
- Energy and Environment,
- Materials and Processes.

For more details, visit the School's website : www.imt-nord-europe.fr

The position is available at the Centre for Education, Research and Innovation in Energy Environment (CERI EE). It has currently a staff of more than 100 people including 27 full-time faculty members. The main research activities of CERI EE deals with experimental atmospheric chemistry and physics of indoor and outdoor environments, by means of laboratory studies and field measurements. The center has a significant expertise in the study of pollutant's degradation in the gas and heterogeneous phases deploying photochemical reactors,

atmospheric simulation chambers and indoor experimental rooms, as well as pollutant and particle monitoring in outdoor and indoor environments. **CERI EE is included in the list of Shanghai with top universities/research centers working in atmospheric science domain. European topical center unit for reactive trace gases in-situ measurement (CiGas) within ACTRIS, equipped with cutting edge instrumentation for air pollutants monitoring, particles characterization, and a unique expertise in analytical development and methods evaluation. The necessary analytical equipment for the characterization of samples, properties, emissions, reactivity are available in CERI EE.** Furthermore, CERI EE has been successful in obtaining funding from both national and European sources and takes part in many regional and multidisciplinary projects related with air quality and climate change, e.g. Labex CaPPA, CPER CLIMIBIO.

Missions /activities:

The successful candidate will carry out the following activities:

- Use cutting edge analytical instrumentation coupled with atmospheric simulation chambers to determine the emissions of real-world asphalt pavements.
- Investigate heterogeneous processes involving the interaction of pollutants with macroscopic urban surfaces using various and complementary reactors coupled with spectrometric (chemical ionization and electron impact mass spectrometry) and spectroscopic (infrared) analytical techniques.
- Synthetize and interpret the results obtained and write progress reports
- Present the results to the research group, to national and international conferences, and publish them in high-level peer-review journals.
- Ensure a continuous bibliographic review
- Supervise bachelor and/or master students.

REQUIRED PROFILE :

- Master in analytical chemistry, physical chemistry, atmospheric sciences or in relevant fields.
- Extensive and solid background in analytical chemistry, kinetics and heterogeneous physical chemistry.
- Experience in mass spectrometry and infrared spectroscopy.
- Experience in processing datasets using at least one of the following softwares: Excel, Origin, IgorPro.
- High level of communication and interpersonal skills are required, and an ability to adapt to a multicultural/international environment is required.
- Proficiency in spoken and written English and/or French.

Additional skills that would be considered as an advantage:

- Experience in working with atmospheric simulations chambers will be much appreciated.
- Background in surface characterization techniques.
- Background in vacuum technology.

CONDITIONS :

The job is to be filled as to 01/11/2022 for a period of 36 months (temporary contract).

INFORMATION AND APPLICATION METHODS :

For any information on the missions, please contact E. ROMANIAS (emmanouil.romanias@imt-nord-europe.fr) or F. THEVENET (frederic.thevenet@imt-nord-europe.fr).

For any administrative information, please contact the Human Resources Department: jobs@imt-nord-europe.fr

To apply, please connect to our recruitment platform via the following link:

DEADLINE DATE FOR SUBMISSIONS : 31/07/2022