



PhD Offer



Improvement of a Chemical Amplifier for measuring peroxy radicals in the atmosphere – Application to the quantification of ozone production rates

IMT Lille Douai (<http://imt-lille-douai.fr/en/>) is one of the largest graduate schools of engineering located at the crossroad of Europe, one hour from Paris, one hour and a half from London and thirty minutes from Brussels. The Atmospheric Sciences and Environmental Engineering (SAGE, <http://sage.imt-lille-douai.fr/>) research unit of the Energy and Environment Centre (CERI EE) has ongoing research activities focused on atmospheric chemistry, air quality and the impacts of human activities on the composition of the atmosphere. CERI EE has currently a staff of about 75 people including 27 full-time faculty members. Research projects aim at a better understanding of the physical and chemical processes involved in the formation, transport and aging/transformation of gaseous and particulate pollutants in the outdoor or indoor atmosphere.

One of the scientific issues addressed at the laboratory of Physics and Chemistry of the Atmosphere (LPCA, <http://lpcu.univ-littoral.fr>) of the Université du Littoral Côte d'Opale leans on fundamental and applied research in molecular physico-chemistry and instrumentation dedicated to the study of physico-chemistry of the atmosphere through spectroscopic understanding and monitoring of molecular species of atmospheric interest. The research focuses on development of photonic instrumentation and innovative modeling tools by optical metrology and environmental spectroscopy.

SAGE and LPCA are looking for a motivated PhD student to conduct scientific research in the field of atmospheric chemistry. The proposed work seeks to improve our understanding of radical and ozone production rate measurements in the atmosphere, which will ultimately help improving our understanding of the fast tropospheric photochemistry. This project will involve instrumental development, laboratory testing and field measurements.

Project description:

A complete understanding of chemical transformations occurring in the atmosphere is important to tackle fundamental issues related to air quality and climate change. However, there is increasing evidence that our understanding of the oxidative capacity of the atmosphere is incomplete, leading to uncertain estimations of the lifetime of primary emitted trace gases and the production rates of secondary pollutants. In this context, hydroperoxy (HO_2) and organic peroxy (RO_2) radicals are important species due to their role in sustaining the oxidative capacity of the atmosphere via propagation reactions to the hydroxyl radical (OH) and the formation of byproducts such as ozone.

The main objectives of this work are to (i) improve a Chemical Amplifier designed to measure peroxy radicals in ambient air and (ii) develop a procedure to quantify ozone production rates on the basis of the peroxy radical measurements.

The successful applicant will work at the LPCA laboratory under the supervision of Pr. Weidong Chen to build a photoacoustic spectrometer (PAS). The applicant will then work at the SAGE laboratory to couple the PAS to a chemical amplifier already developed for the measurement of peroxy radicals. In addition, the improved chemical amplifier will be used to test and validate a procedure allowing the quantification of ozone production rates in ambient air. This work will be performed under the supervision of Dr. Sébastien Dusanter and Pr. Alexandre Tomas.

The PhD student will be trained on developing state of the art instrumentation and will assemble and characterize the chemical amplifier. The PhD student will also be in charge of disseminating his work through national and international conferences and several peer-reviewed publications in scientific journals.



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Keywords: Atmospheric sciences, radical chemistry, peroxy radicals, ozone, instrumentation, field campaign

Candidate profile: The successful applicant will hold a master degree in a relevant area of atmospheric sciences and will exhibit excellent communication and interpersonal skills. Skills and knowledge in analytical chemistry and atmospheric chemistry will be an asset for this position. Good proficiency in English is a prerequisite.

Establishments : IMT Lille Douai (IMT LD) and Université du Littoral Côte d'Opale (ULCO)

Laboratories: CERI EE/SAGE and LPCA

Academic supervision: Dr. Sebastien Dusanter (IMT LD/SAGE), Pr. Alexandre Tomas (IMT LD/SAGE), Pr. Weidong Chen (ULCO/LPCA)

PhD location, duration and starting date: The PhD fellowship is a fixed-term position available for a total duration of 3 years with a starting date expected on 1 November 2020. Research work time will be shared between the two institutions.

The graduate student will be awarded a PhD degree from the Université du Littoral Côte d'Opale if the work is successfully conducted to completion.

Job application: Applicants are invited to send their Curriculum Vitae, a cover letter, a transcript of their Master's grades and two reference letters to:

Dr. Sebastien DUSANTER: sebastien.dusanter@imt-lille-douai.fr

Pr. Alexandre TOMAS: alexandre.tomas@imt-lille-douai.fr

Pr. Weidong CHEN: chen@univ-littoral.fr