



IMT Lille Douai
École Mines-Télécom
IMT-Université de Lille

PhD position in Atmospheric Chemistry



MAX-PLANCK-INSTITUT
FÜR CHEMIE

Analytical developments for ambient measurements of total OH reactivity

The Department of "Atmospheric Sciences and Environmental Engineering" (SAGE) of IMT Lille Douai, France (<http://www.mines-douai.fr/>, <http://sage.mines-douai.fr/>), has ongoing research activities focused on atmospheric chemistry, air quality and the impacts of human activities on atmospheric composition. SAGE is currently composed of a staff of about 50 persons including 15 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 indoor and outdoor atmospheres.

The Max Planck Institute for Chemistry (MPI-C), in Mainz, Germany (<http://www.mpic.de/>) is one of 80 research institutes of the Max Planck society dedicated to fundamental research. A total of 266 persons are employed at the MPI-C, including 66 scientists and 89 junior scientists, all focussed on atmospheric science. The institute has extensive, well-equipped laboratories, hosts a research school and has close links with the University of Mainz. The MPI-C is active in many aspects of atmospheric science ranging from laboratory kinetics, through atmospheric observations, to molecule-to-global scale modelling.

The SAGE department from IMT Lille Douai and the ORSUM group from MPI-C are looking for a motivated Ph.D. student to conduct scientific research in the field of atmospheric chemistry. The proposed work seeks to (i) mature our understanding of the Comparative Reactivity Method (CRM) for OH reactivity measurements in the atmosphere and to (ii) improve the performances of existing CRM instruments. This project will involve both instrumental development and field testing.

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, the lifetime of the OH radical, the main atmospheric oxidant during daytime, seems to be not well described by atmospheric models. Indeed, several studies highlighted that the total OH reactivity measured during intensive field campaigns, which represents the inverse of the OH lifetime, cannot be accounted for by concomitant measurements of OH-coreactants, i.e. most ambient trace gases. These studies highlighted the so-called missing OH reactivity that has been puzzling for more than a decade.

The main objective of this work is to move forward one of the techniques used to measure total OH reactivity in the atmosphere. The Comparative Reactivity Method (CRM) was first proposed in the literature by the ORSUM group as an alternative to expensive laser-based techniques. However, CRM requires a complex procedure to process the measurements and is less performant than laser-based instruments. The successful applicant will spend 18 months at IMT Lille Douai under the supervision of Dr. Sébastien Dusanter and another 18 months at the Max Planck Institute für chemie under the supervision of Pr. Jonathan Williams. The recruited student will implement new ideas on CRM instruments built in the two institutions to improve the accuracy and the precision of OH reactivity measurements. This work is expected to greatly improve the performances of CRM instruments.

The Ph.D Student will be trained on developing state of the art instrumentation, will assemble and characterize analytical instruments, and will be in charge of their optimization and their use in the field. The Ph.D student will also be in charge of disseminating this work through national and international conferences and several peer-reviewed publications in scientific journals.



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Keywords: Atmospheric sciences, instrumentation, field campaign, hydroxyl radical, OH reactivity

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 in analytical chemistry, atmospheric chemistry, and previous experience of field measurements will be an asset for this position. Good proficiency in English is a prerequisite.

Laboratories: SAGE (IMT Lille Douai, France) and ORSUM (MPI-C, Germany)

Academic supervision: Dr. Sebastien DUSANTER (SAGE) – Prof. Jonathan WILLIAMS (ORSUM)

Doctoral Schools: Sciences de la Matière, du Rayonnement et de l'Environnement (SMRE), Université de Lille, France ; Max Planck Graduate Center, Mainz, Germany.

Salary: Approximately 1450 € net / month

PhD location, duration and starting date: The Ph.D fellowship is a fixed-term position available for a total duration of 3 years with a starting date on 1 October 2017.

The graduate student will be awarded a Ph.D. degree from IMT Lille Douai or the Max Planck Graduate Center depending on the doctoral school chosen for enrolment and if the work is successfully conducted to completion.

SAGE, Mines Douai:

<http://sage.mines-douai.fr/>

ORSUM, Max Plank Institute for Chemie:

<http://www.mpic.de/en/research/atmospheric-chemistry/williams-group.html>

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@mines-douai.fr

Pr. Jonathan WILLIAMS: jonathan.williams@mpic.de