Ecole Doctorale - 104

Sciences de la Matière, du Rayonnement et de l'Environnement

EDSMRE

ESTABLISHMENT : University of Lille, FST

Laboratory(ies) of affiliation : LASIRE UMR CNRS 8516

Scientific field, Speciality: **DS4 | Theoretical, Physical and Analytical Chemistry**

Thesis director: *Visez Nicolas, MCF, nicolas.visez@univ-lille.fr*

Co-director:

Co-supervisor (non HDR): *Tobon Yény, MCF, yeny.tobon-correa@univ-lille.fr*

Affiliate programme(s): *Labex Cappa, CPER ECRIN*

Planned (co)-funding: ANR AF2OM (obtained)+ ED (in progress)

Title of the thesis **:**

Atmospheric fate of aerosols containing the First-generation Oxidation products of Monoterpenes.

Terpenes are complex organic compounds emitted in large quantities from vegetation.[1] Terpenes react with atmospheric oxidizing species such as O_3, $HO^\bullet$ and $NO_3^\bullet$ forming oxygenated first-generation terpene oxidation products (FGTOP). These compounds are semi-volatile and can produce Secondary Organic Aerosols (SOA) or condense on pre-existing particles. [2,3]. It is known that FGTOP react with atmospheric oxidants in the gas phase.[4,5,6] However, reactions of FGTOP in condensed phases are lacking in the literature. Thus, through their reactivity, FGTOP can affect air quality, climate change and cloud formation.

During this PhD project in the LASIRE laboratory, the student will study the heterogeneous oxidation of FGTOP-containing particles with O_3 and $HO^\bullet$, at the single particle scale, in order to understand the physicochemical processes during the transport of these particles in the atmosphere. In addition, the role of the relative humidity on the oxidation reactions and the effect of reactivity on the hygroscopic properties of the particles will also be investigated.

To undertake such a study, the PhD student will have access to state-of-art approaches combining non-contact techniques (optical and acoustic levitation) coupled with optical and spectroscopic characterization. Levitation systems are equipped with environmental cells that permits environment and humidity control.[7,8] Composition and morphology of single droplets will be studied *in-situ* as a function of the reaction time.

This thesis will provide elements for understanding the oxidation of individual particles containing FGTOP, oxidation mechanisms, the influence of humidity on these reactions and, ultimately, a new insight into aerosol aging and heterogeneous FGTOP removal processes.

Candidates must hold or be in the process of obtaining a Master's degree or diploma allowing registration in a Doctoral School on October 1, 2023 in chemical physics or atmospheric sciences. The candidate must be highly motivated and rigorous and be able to communicate in English (oral + writing). Experience in microscopy and vibrational spectroscopy will be appreciated.

LASIRE cnrs Université de Lille

Expected date of recruitment : 01/10/2023

Contact (e-mail address): yeny.tobon-correa@univ-lille.fr / nicolas.visez@univ-lille.fr

Additional remarks/comments: Candidates are invited to send the CV, cover letter, Master 1 and 2 records and ranking before 10 May 2023.

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