Ecole Doctorale - 104

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

EDSMRE

ESTABLISHMENT : Université de Lille

Laboratory(ies) of affiliation : LGCgE

Scientific field, Speciality: the speciality of the thesis must be one of those of the thesis (co)-director

- ❒ **DS2 Dense media, materials and components**
- ❒ **DS2 | Diluted media and fundamental optics**
- ❒ **DS3 | Earth and Universe Sciences**
- ❒ **DS3 | Earth, fluid envelopes**
- ❒ **DS4 | Theoretical, Physical and Analytical Chemistry**
- ❒ **DS4 | Organic, Inorganic and Industrial Chemistry**
- ❒ **DS4 | Materials chemistry**
- ❒ **DS5 | Molecular and Cellular Aspects of Biology**
- ❒ **DS8 | Energy, heat, combustion**
- ❒ **DS8 | Mechanics of solids, materials, structures and surfaces**
- ❒ **DS10 | Food Biotechnology, Food Science, Physiology**
- ☒ **DS10 | Biology of the environment, organisms, populations, ecology**
- ❒ **DS10 | agronomics sciences**

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Affiliate programme(s): *ex. labex, ERC, Horizon Europe, etc*

Planned (co)-funding *(mention: in progress/obtained)* **:** ADEME & RECORD (*in progress*)

Laboratoire de Génie Civil et géo-Environnement

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Title of the thesis : Ecotoxicological and toxicological effects of particles from different braking modes and materials

THESIS SUBJECT (ABOUT 1/2 PAGE)

Air pollution by atmospheric particles is a major public health issue. The health and ecological impact of these particles is now widely recognised (RECORD, 2020; ANSES, 2024). Fine particles (FP) and ultrafine particles (UFP), from a variety of sources, are omnipresent in the urban environment. In addition, national and international instances, such as the *United Nations World Forum for Harmonization of Vehicle Regulations*, are warning of the need for better control of brake particle emissions and to encourage the development of less emissive systems and materials (ANSES, 2015; UNECE, 2014).

In this context, where information on particulate matter is mainly focused on emission sources, levels in the air and size, the project aims to improve knowledge on :

(i) the nature and intensity of braking particle emissions as a function of braking conditions, vehicle types (car, train) and the materials used;
(ii) the physico-chemical characteristics of these particles, focusing on parameters that are rarely measured but which could play an essential role in the expression of toxicity, such as elemental composition or specific surface area;
(iii) the associated biological effects, through toxicological tests on human lung cells and ecotoxicological tests on bryophytic models.

To this end, newly acquired equipment (exposure chamber connected to a braking bench financed as part of the ECRIN CPER) will enable direct (*on-line*) exposure of biological models and *off-line* exposure to particles collected in the exposure chamber and precisely characterised from a physicochemical point of view.

Ultimately, the scientific question is to consider the biological effects observed in relation to particles and, above all, the parameters that characterise them. The challenge is to identify critical characteristics, beyond size alone, that are likely to contribute to the effects observed. Cross-analysis of the results from complementary biological models will support a body of evidence and highlight any convergence. Depending on the results obtained, their robustness and the ease with which they can be interpreted, this new knowledge could help to develop health and environmental risk assessment methodologies.

Bibliography

ANSES, 2015. Pollution chimique de l'air des enceintes de transports ferroviaires souterrains et risques sanitaires associés chez les travailleurs (Rapport d'expertise collective).

UNECE, 2014. Non-exhaust particle emissions from vehicles.

Expected date of recruitment : 01/09/2025

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Additional remarks/comments: Applications are due by May 7

The application must include at least the following documents:

¬ Candidate's CV (in French)

¬ Candidate's letter of motivation (in French and English)

¬ University diplomas (Licence, Master 1...)

¬ Master 2 (attestation de réussite ou certificat de scolarité...)

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