Université de Lille

Area Cross Disciplinary Project Lille

Aerosol at the heaRt of the Earth/Atmosphere system

## Master 2 - Research Training – 01/02 to 30/06/2026

Laboratory: IMT NORD EUROPE, CERI EE, 941 rue Charles Bourseul, 59500 Douai

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AREA Work Package: 2

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# Urban surfaces reactivity with atmospheric pollutants.

Abstract.

Air pollution is one of the major issues that concern our society nowadays. The intensive human activities related to industrial production, fossil fuel burning for transportation and heating produce a variety of primary and secondary pollutants that degraded the air quality. The air quality degradation is getting more and more important in large cities (i.e. urban environments) where pollutant concentrations often exceed the limits settled by environmental protection agencies. Although significant progresses have been performed by the scientific community along the past decades to improve our understanding about the fate of pollutants, there are still many open questions to be addressed. For instance, there is a significant lack of studies dealing with the interaction/reaction of pollutants with common surfaces existing in cities (e.g. building construction materials, asphalt concrete etc.).

Therefore, the purpose of the internship is to investigate the heterogeneous interaction/reaction of key urban pollutants, i.e. $NO_2$, $O_3$, VOCs, with urban macroscopic surfaces, such as asphalt pavements. The experiments will be carried out inside highly instrumented atmospheric simulation chambers that can mimic the real conditions existing in the atmosphere (i.e. temperature, humidity, sunlight). A wide variety of analytical techniques, including state-of-the-art mass spectrometers (SIFT-MS) and spectroscopic instrumentation (FTIR, various types of analyzers) will be used to monitor in real time the gas phase concentrations of pollutants. Consequently, crucial kinetic parameters (uptake coefficients) and surface properties (surface coverage, partitioning coefficients) will be determined.

The successful candidate should have a strong background in physical chemistry, and mass spectrometric techniques. Good computer skills and knowledge of data treatment software (Excel, Origin Pro, Igor) will be required. Motivation and good communication skills will be appreciated. The candidate will have the opportunity to be trained in state-of-the-art analytical techniques, and work close to a dynamic international team of researchers.

Keywords: Urban surface, Heterogeneous reactivity, Urban pollutant