Master 2: Research Training 2023-2024

Laboratory: PC2A

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Eventually CaPPA Work Package: WP-1 From gas phase to aerosols

Processes and impact of tire wear products in the atmosphere

Abstract

Chemical emissions from tire wear become an emerging environmental concern because tires are made of a complex mixture of rubber and various chemical additives. As tires wear down, these compounds can be released into the environment. Some of these compounds can have toxic or harmful effects on organisms in aquatic ecosystems. While N-(1,3-Dimethylbutyl)-N'-phenyl-p-phenylenediamine (6PPD) used in tires has caused environmental concern, antioxidants used in tires keep tires strong, flexible, and long-lasting and are essential for the safety of vehicles. Antioxidants added in tires can prevent the rubber from degrading due to oxidation, which can cause the rubber to become brittle and weak, resulting in premature tire failure and road safety issues. The group of p-phenylene-diamine antioxidants (PPDAs) are less well studied in terms of their environmental fate processes (transport and transformation) and impact.

The overall objective of this internship is to explore the chemistry (reactivity, reaction pathways and kinetics) related to the effectiveness of the chemical function in PPDAs and environmental risks after being released to the environment.

This project will also aim to contribute to a larger research program devoted to the study of atmospheric processes (Labex CaPPA, CPER Ecrin). The work will take place at PC2A laboratory, Lille University.

Key words: molecular simulations, atmosphere, tire wear, reactivity