

Ecole Doctorale des Sciences Fondamentales

Title of the thesis: Photochemistry of organic pollutants on the surface of green roofs

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Summary :

A green roof, or rooftop garden, is a vegetative layer grown on a rooftop. In recent years, the use of green roofs has become increasingly popular due to their multiple potential benefits such as mitigation of urban heat islands, reduced energy use, enhanced stormwater management and water quality and reduced air pollution. All these benefits are in line with the development of sustainable cities. However, few experimental studies have evaluated the depollution efficiency of green roofs and their impact on environmental fate of air pollutants such as PAHs (polycyclic aromatic hydrocarbons), NO_x and pesticides.

The aim of this PhD research project is to study the photochemistry of model pollutants at the surface of typical plants used in green roofs such as sedum and sempervivums. The study will be conducted first at a bench scale in the lab using an irradiation chamber and small kits of green roofs. The effect of experimental factors such as the interaction plant/light/pollutant, the composition of soil and atmosphere (presence or absence of NO_x and Ozone) on the kinetics and degradation products will be examined. A particular attention will be given to the development of analytical methods using spectroscopy and chromatography-mass spectrometry techniques for the analysis of surface photoproducts as well as gaseous products emitted by the plants. Validation of the laboratory data by comparing with real scale experiment at the surface of green roofs installed on a building will also be performed.

This PhD thesis offers the possibility of conducting an interdisciplinary research combining analytical chemistry, photochemistry and environmental chemistry. The applicant should have a Master in physical or analytical chemistry, a good knowledge of analytical techniques and a strong interest in experimental research.