

PHD POSITION OFFER

Use of a passive sampling method coupled with non-target analyses and bioassays to characterize water samples

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Location: Verneuil-en-Halatte (60), FRANCE - 40 minutes north of Paris (accessible by public transports)

Type of contract: PhD position

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CONTEXT AND OBJECTIVES

Many micropollutants are present in the aquatic environment and can be harmful to ecosystems. They reach the aquatic environment both via diffuse sources of contamination and via point sources such as the outlets of urban and industrial wastewater treatment plants. Despite those treatments, effluents still contain a large number of molecules that are potentially toxic to ecosystems, some of which were formed during treatment and may still be unknown. A very large majority of the molecules present in these discharges are currently not considered by conventional analytical approaches, which are based on targeted chemical analyses of priority substances. A better characterization of these wastewaters, using more integrative (bio)analytical approaches, could allow a better description of the contamination of these complex mixtures and, in the long term, the mapping of various persistent molecules according to sectors of activity, particularly regarding their toxicity.

To this end, the aim of the thesis work is to propose an integrated, innovative and more exhaustive method for characterizing wastewaters. This method is based on the coupling between an innovative passive sampler, non-targeted chemical analysis and *in vitro* bioassays. In order to adapt to the particularity of the matrix of interest, the Prebio cell (AdScientifique) was chosen as a passive sampler since its operation is based on the development of a biofilm for which wastewaters, by their composition, seem to be a well-adapted medium. This passive sampler, consisting of a calibrated medium, increases the temporal representativeness of the samples from which the chemical and biological analyses will be carried out and contributes to the added value of the characterization method. The implementation of non-targeted analysis will allow for a more exhaustive characterization of the diversity of molecules accumulated by this biofilm (chemical characterization) than the targeted analysis methods. The bioassays will make it possible to characterize the biofilm samples with regard to the presence of molecules with endocrine disrupting and dioxin-like activities (bio-analytical characterization) and, via an EDA (effect-directed analysis) approach, the substances responsible for the effects observed will be identified.

The Prebio cell has a strong potential to be used as a passive sampler of pollutants in contaminated aqueous media, however the mechanisms of biofilm development, and their influence on pollutant accumulation and performance of the sampler are still poorly understood. The coupling of this tool to the two analytical methods also needs to be optimized to be able to propose this integrated method to better characterize discharges.

Thus, the different steps of this thesis will be:

- (1) To gather more knowledge on the functioning of the Prebio cell by deploying this device under different conditions
- (2) To develop and optimize the methods used to prepare the recovered biofilm for subsequent non-targeted analysis and bioassays, with the aim of maximizing the amount of information collected while ensuring the reliability of these methods
- (3) To deploy Prebio cells on different sites and implement the optimized coupling to characterize several types of discharges and identify substances or markers of interest with an endocrine disrupting effect

The completion of this work will provide a new and innovative method for the comprehensive characterization of micropollutants in wastewater.

PROFILE

- Master or Engineer degree in Environmental Chemistry or Analytical Chemistry
- Strong interest in experimental work
- Analytical chemistry skills (sample preparation, chromatography, mass spectrometry) Knowledge in non-targeted analysis and/or passive sampling would be a plus
- Knowledge in environmental chemistry (sampling techniques, micropollutants, water quality). Additional knowledge regarding in vitro bioassays would be a plus
- Knowledge in statistics and data analysis
- Autonomy, scientific rigor, adaptability, teamwork
- Ability to write reports and good level of oral and written English. Notions in French are a plus.

APPLICATION

This PhD thesis is one of the 15 theses funded by the IN2AQUAS European project. The PhD position is open to applicants of all nationalities who, at the date of recruitment, have NOT resided in France for more than 12 months in the 3 years immediately prior to recruitment, and have NOT carried out her/his main activity (work, studies, etc.) in France. More information is available [here](#).

Please apply for the thesis (DC1) [here](#).