



Deadline for application: 29/05/2020

**Title:** Development of a biosensor for pesticide detection

**Thesis abstract:** The main objective of the proposed PhD project is the development of an aptamer-based biosensor for on-site and real time electrochemical quantitative analysis of pesticides. Aptamers selection against pesticides of interest, their surface tethering and the development of an electrochemical platform based on screen-printed electrodes will be explored over the time course of this PhD project.

**Key words:** Pesticides, aptamers, polymers, biochemistry, electrochemistry, biosensing, monitoring

**Funding:** This PhD position is funded by the region Nouvelle Aquitaine and the Université de Pau et des Pays de l'Adour (UPPA) with the support of Novaptech (<https://novaptech.com>), being all entities located in France

**Working conditions:**

**Hosting laboratory:** Institute of Analytical Sciences and Physical Chemistry for Environment and Materials (IPREM), UMR CNRS 5254. Since the aptamer selection will be conducted in close collaboration with Novaptech, the PhD candidate will spend about a year of the thesis duration in Bordeaux (France), 200 km north of Pau.

**Localisation address:** Technopôle Helioparc, 2 avenue Pierre Angot, 64053 Pau Cedex 9, France

**Laboratory expertise:** The Institute of Analytical Sciences and Physical Chemistry for the Environment and Materials (IPREM) is a mixed research unit of the National Research Centre for Science (CNRS) and of the UPPA (UMR 5254). Research activities focus on the development of fundamental knowledge in physical chemistry, analytical chemistry and microbiology, in relation to applications concerning the structure of living matter, environmental monitoring and the functional properties of different classes of materials. Analytical strategies, modelling, physicochemical approaches, fine studies of structures and reactivity, development, characterization and implementation at different length scales are the major skills available in the institute, which enable an original positioning in several fields of application and in various industrial sectors at both national and international levels. IPREM is located on 4 different sites: Pau (Helioparc and UPPA Campus), Anglet and Mont de Marsan.

**Thesis Director:** Corinne Nardin

**Starting Date:** as early as possible

**Duration:** 3 years

**Gross salary:** 1768 € / month (which excludes extra gratification for teaching duties – 32 h per year, to be discussed)

**Mission - Main activities:**

**Scientific framework**

A wide variety of organic pollutants is present in natural and treated water sources, in particular pesticides. The conventional method for their detection and quantification is mass spectrometry, often in combination with gas or liquid chromatography. Since these are expensive, time-consuming, require a skilled labour, and are not suitable for on-site and real time analyses, current research efforts are

devoted to develop cost effective disposable sensors based on specific targeting coupled to optical or electrochemical detection. However, an emerging method involving nucleic acid aptamers for pollutant detection is currently explored. These nucleic acids have been widely used as recognition elements in biosensor development, especially in the detection of pathogens (*Escherichia coli*), drugs (cocaine), hormones ( $\beta$ -oestradiol), organic pollutants (bisphenol-A), etc.

**Purpose(s)**

Along this line, the main objective of the proposed PhD project is therefore the development of an aptamer-based biosensor for on-site and real time quantitative electrochemical analysis of pesticides. Aptamers selection against pesticides of interest, their surface tethering and the development of an electrochemical platform based on screen-printed electrodes will be explored over the time course of this PhD project.

**Expected results**

The first year of this PhD project will thus be devoted to the selection of specific aptamers against the pesticides of interest. The activities conducted during the second year will be related to the electrode surface modification to achieve specific and sensitive aptamer-based electrochemical detection of the analyte whereas during the last year, the efficiency of the biosensor will be evaluated to eventually achieve on-site and real time quantitative electrochemical analysis of pesticides (voltammetry, impedance spectroscopy).

**Applicant 's profile:**

The ideal candidate has a master degree in general chemistry or in related disciplines such as analytical chemistry, polymer physical chemistry or material science. He/She is passionate for identifying solutions to environment related concerns and for multidisciplinary research. The candidate is rigorous and highly motivated. A previous experience in either aptamer selection, biochemistry, polymer physical chemistry or electrochemistry would be a plus. The candidate must have a good English level and the capacity to work autonomously.

**Application - Evaluation criteria:**

Application file assessment: Selection committee

Candidates will first be selected based on their application file.

Those selected after this first step, will then be interviewed: the candidate, through a five minutes presentation in English, will introduce his/her education, the main outcomes of his/her master thesis and his/her motivation for the proposed project.

Application files will be evaluated based on the following criteria:

- Grades and ranking during the Master degree, steadiness in the academic background
- English language proficiency
- Candidate's ability to present her/his work and results

Work experience similar to an internship in a laboratory – or likewise; previously achieved research work (reports, publications).

**Application will include:** *(in a single pdf file)*



- A motivation letter (max 2 pages)
- CV (max 2 pages) including the publication list when applicable
- Record of bachelor and master grades
- Name and e-mail addresses of 2 references

Application must be sent to the following email address with the title “Doctoral application”:  
[corinne.nardin@univ-pau.fr](mailto:corinne.nardin@univ-pau.fr)

For more details, please visit our website: <https://iprem.univ-pau.fr/en/institute.html>

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