



Title: Development of a prototype in vitro diagnostic device based on the detection of pathogenic agents using functionalized nanoparticles via electrochemical measurement

Scientific and Technological Context:

The rapid and reliable detection of biomarkers in biological fluids is a major challenge for medical diagnostics and public health. Conventional approaches are often time-consuming, costly, or require highly qualified personnel.

The project aims to design a next-generation in vitro diagnostic medical device (IVD), portable, reusable, multiplex, high-performance and with rapid detection, based on functionalized nanomaterials and electrochemical signal transduction. The objective is to explore an innovative detection methodology combining biological specificity and measurement sensitivity, in order to offer a compact and high-performance alternative to current systems.

The internship will contribute to the experimental validation of a detection concept, the development of a prototype, and the analysis of its performance (sensitivity, reproducibility, speed). The detailed technical aspects of the device cannot be disclosed for reasons of confidentiality and intellectual property, but the underlying physical and instrumental principles will be addressed within the research work.

Internship Objectives:

The intern will participate in the development of an experimental proof of concept for the device, integrating the identified technological challenges:

- 1) Design and fabrication of an electrochemical detection cell prototype integrating appropriate electrodes.
- 2) Implementation and validation of impedance and/or resistance measurements to test the reproducibility, sensitivity, robustness and speed of the obtained signal.
- 3) Contribution to exploratory tests with bi-functionalized nanoparticles.
- 4) Proposals for solutions aimed at optimizing the system towards a multiplex and miniaturized architecture.

Expected Work:

- Targeted literature review on the concept of the described medical device.
- Design and assembly of a first prototype (mechanical and electronic). Electrochemical measurements (impedance, resistance) and performance analysis (specificity, sensitivity, reproducibility, speed).
- Active participation in discussions with the various project partners with a view to continuous improvement of the device.
- Reflection on the evolution of the device towards a multiplex and miniaturized system.

Candidate Profile:

- Master 2 or engineering school student with a specialization in electronics, instrumentation, physical measurements, bioelectronics or related disciplines.
- Interest in multidisciplinary projects at the interface of physics, chemistry and biology.
- Practical skills in electronic assembly, prototyping and experimental data analysis are desirable.
- B2 level in English required for the literature review.

Supervision and Environment:

The internship will be jointly supervised by Morgan Groux (founder of the project), the IMS laboratory (Yannick Deshayes) and the ICMCB laboratory (Stéphane Mornet). This internship is part of a multidisciplinary collaboration (physicists, chemists, biologists). The student will benefit from a stimulating scientific environment, with a clear objective of obtaining a functional and validated prototype. The intern will be based at the IMS laboratory at the University of Bordeaux. Occasional visits to the ICMCB laboratory at the University of Bordeaux may take place. No travel outside Bordeaux is expected.

Duration: 6 months (starting first semester 2027)

Remuneration: Internship gratification (statutory rate)

⚠ Note: The application deadline is 30/09/2026.

Contacts

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