

INTERNSHIP OFFER EN

Design and optimisation of printed electrochemical sensors for healthcare applications

Location of the internship

HOST Laboratory: LGP2 Laboratory – *Laboratory of process engineering for biorefinery, bio-based materials and functional printing - FunPrint ResearchTeam*

461 rue de la Papeterie - Domaine Universitaire - 38 400 St Martin d'Hères

<https://lgp2.grenoble-inp.fr/en>

Aurore Denneulin / Nadège Reverdy-Bruas

PARTNER Laboratory

DTIS CEA-Leti – *Department of Innovative Health Technologies - Laboratory for Optical Instrumentation and Information Processing for In Vitro Imaging (L4IV)*

17 avenue des martyrs – 38000 Grenoble

<https://www.cea.fr/>

Laura Bernard

Duration of the internship: 5 to 6 months. Start: February/ April 2026

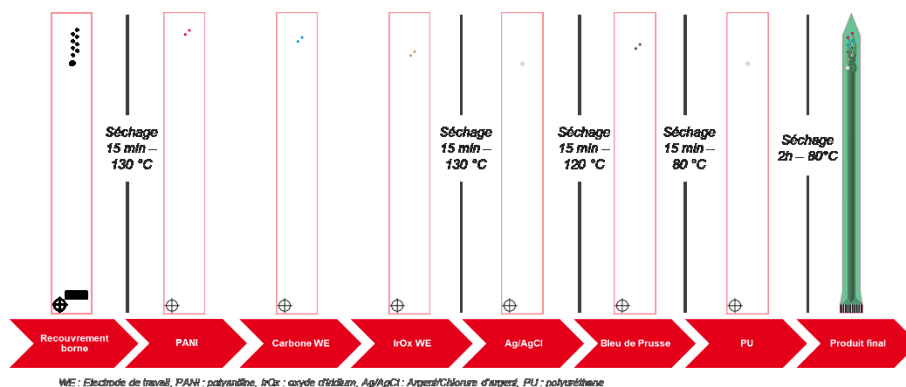
Internship tutors: Laura Bernard – Aurore Denneulin – Nadège Reverdy-Bruas

Contexte et objectifs du projet/Background and objectives of the project

This internship will take place in a national collaborative project called EMOC that aims at the development of a screen-printed sensors for the detection and identification of bacteria in case of bloodstream infection.

Bloodstream infections, mostly bacterial in origin, represent a major public health challenge. In 2017, nearly 48.9 million cases were reported worldwide, causing approximately 11 million deaths, or 20% of world-wide deaths. These latest data illustrate the seriousness of this disease, especially since the chances of survival for a patient with septicaemia decrease dramatically with each passing hour. This therapeutic emergency requires rapid and reliable detection of pathogens, enabling antibiotic therapy to be adapted as soon as possible, while limiting the unjustified use of antibiotics in the face of the growing challenge of antibiotic resistance. The present diagnosis is based essentially on blood culture, a sensitive but relatively slow method. This diagnosis consists of detecting the CO₂ produced by bacterial growth using colorimetric methods (e.g. BACT/ALERT VIRTUO) or manometric methods (e.g. VersaTREK). These instruments are also expensive and not accessible to all patients.

A preliminary study has led to the development of an electrochemical sensor able to detect the presence of bacteria in the blood and identify the bacterial species. This device, which is portable and can be used as soon as the blood is introduced into the blood culture bottle, offers significant potential for improving the time to diagnosis. The sensor incorporates an Ag/AgCl reference electrode covered by a polyurethane membrane, and four types of working, each of which is present in duplicate. The aim is to offer a standardised solution for equipping commercial blood culture bottles (BACT/ALERT – bioMérieux, and BACTEC – BD) with this electrochemical sensor, using manufacturing process transposable at industrial scale: screen printing. This would improve the repeatability and reproducibility of the sensors, facilitating their large-scale integration.



Internship objectives

The main objective of this internship will be to optimise the deposit method for polyurethane membranes, which is presently done by hand. The polyurethane solution is prepared from PU granules dissolved in THF at 60°C overnight. The internship will aim to explore different formulations and/or deposit methods in order to improve the reproducibility, homogeneity and performance of the membranes.

The deposits obtained will be characterised from a morphological (surface energy, surface tension, roughness, etc.) and electrochemical (pH sensitivity measurements by OCP) point of view. Particular attention will be paid to determining the optimal amount of PU, in order to prevent the membrane from being too insulating or, conversely, from providing insufficient protection for the Ag/AgCl reference electrode.

This internship will be based on an experimental approach combining formulation, deposition and characterisation, with the ultimate goal of proposing a robust and reproducible method. A basic knowledge of electrochemistry would be an asset, but is not essential.

Required skills

A taste for multidisciplinary projects, as well as motivation will be important selection criteria. An interest in the printed electronics sector is an asset. The desired skills for the candidate are:

- ▷ Autonomy / Rigor
- ▷ Interest in applied research, and innovation
- ▷ Taste for experimental work
- ▷ Materials Science Knowledge
- ▷ Fluency in English

For any further information and to apply for this offer, please send a CV with a cover letter to laura.bernard@cea.fr, aurore.denneulin@grenoble-inp.fr, nadege.reverdy-bruas@grenoble-inp.fr

Deadline to apply: December 10th 2025