
# Laura BERNARD

Ph.D. thesis (2023-2026)
LGP2 (A.Denneulin; N. Reverdy)
CEA-Leti DTIS (P. Mailley; P. Marcoux)


## Printed electronics for early detection of bloodstream infections

Electronique imprimée pour le dépistage rapide des infections sanguines

**FunPrint**

## Context / Objectives

### Bloodstream infections

- 48,9 million cases 2017
- 11 million deaths in 2017 (20% of worldwide deaths)
- Increase in antibiotic resistance, leading to the leading cause of death by 2050.

### Handmade to a standardized product

Previous work have been made by manual deposit of ink. This PhD study various parameters to standardized the process of manufacture. Requirements :

- Autoclave-proof (130°C/18 min/2 bar)
- Rigid, resistant to breakage during septum perforation
- Biocompatible
- Electrically insulating
- Electrochemical sensor

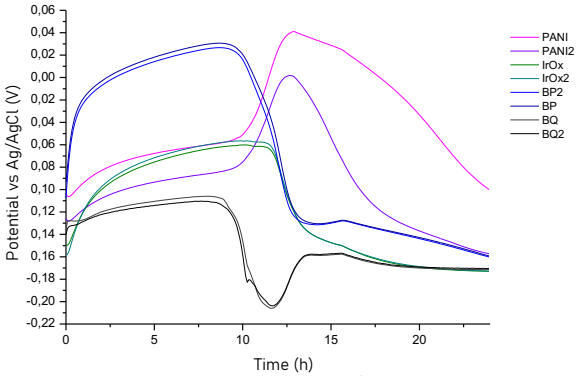

Funded by: anr, cea leti, CHU Grenoble Alpes

In collaboration with LGP2


## Methods

### Electrochemistry-based

pH-sensitive ink: acidification of ph detected initially then hypothesis of ink reduction by bacteria measured by a potentiostat (OCP method)




*Working electrodes potential vs Ag/AgCl reference electrode during bacteria growth in Bact/Alert culture medium*

### Printing processes of sensor

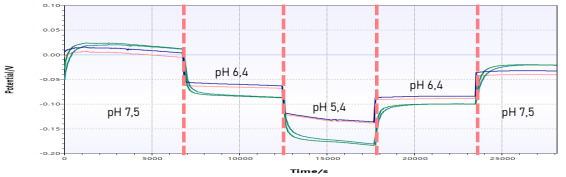
Print on PCB sensor with 2 techniques :

- Screen-printing of viscous ink
- Manual deposit of liquid inks

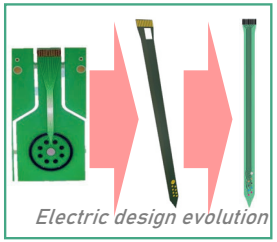
## Results

### Electrochemical analysis by bacterial growth

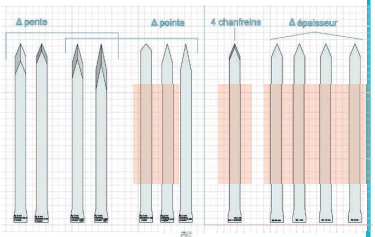
- Results differ from those expected due to major changes compared to previous work




### Electrical design and shape optimizations



*Electric design evolution*




3D printed prototypes to ***test de penetration*** of sensor through septum. Add, modify and test of : thickness, tip & inclination angles and chamfers

*Shape optimization and perforation test*