Centre de Radiofréquences, Optique et Micro-nanoélectronique des Alpes

# Sujet de stage

## New approach to develop selective surfaces for biosensors. Application to life sciences.

**Keywords:** Biosensor, Sensitive surface, Functionalization, Microelectronics, Optics, Nano, simulation and characterization of components.
**Location:** CROMA laboratory (UMR 5130).
**Supervisors:** Olivier Lavastre, Edwige Bano (CROMA) and Valérie Stambouli (LMGP).
**Period and duration:** Spring 2025, 6 months (for M2) or 3 months (for M1).
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**More information:** http://croma.grenoble-inp.fr/

Objectives of the work: The CROMA and LMGP laboratories are working on new micro and nano electronic devices applied to life sciences. These are new generations of biosensors for the selective detection of target biomarkers. These are metabolites or proteins of strategic interest, for example, thrombin, dopamine, the various stress or happiness hormones, etc. The key point of selectivity is to develop reactive surfaces capable of modifying the electrical response of the devices, depending on the presence or absence of the target biomarker to be detected. The classic surface modification strategy consists of functionalizing it through successive step-by-step chemical reactions on the surface of the device. However, this approach is very time-consuming and very often not 100% quantitative. Thus, the surface coverage is not homogeneous, which leads to poor selectivity and sensitivity. We wish to study a new approach without any surface chemistry. The concept is based on covering the surface with an organic film containing a specific probe (molecule, aptamer, etc.) to trap and quantify the target to be detected on the surface of the device.

Collaboration and working environment: The experiments will focus on the use and characterization of organic film that can be a polymer, a viscous liquid, a wax (not soluble in water) with adequate physicochemical properties for:

- Correct and permanent adhesion to the silicon carbide (SiC) surface
- Good dissolution and trapping of specific probe molecules
- No interference between the probe and the target
- An efficient electrical response of the surface during probe-target recognition.

Desired profile: the 6-month internship is aimed at a candidate preferably in M2 (master Nanosciences – Nanotechnologies, filière Nanochimie), or PFE (filière Nanomed ou Matériaux, Phelma) internship. Possibly, the internship can be adapted for a candidate in M1 (3-month internship).

Application: please send your application by email (see contact above), which should include a cover letter, your CV, a copy of your grades and diplomas.

References:

-Development of new High-throughput screening method to compare and to detect efficient catalysts for adhesive materials B. Colin,et al. Int. J. Adhesion and Adhesive. 2016, 68, pp.47-53.
-High-Throughput Screening of the Alkoxide/Oxime-Based Library An Alternative to Organotin Compounds for the Alkoxysilane Condensation in Adhesives and Sealants B. Colin, O. et al, ACS Combinatorial Science, 2019, ACS, 10.1021/acscombsci.8b00161.
-Progress in SiC nanowire Field-Effect-Transistors for integrated circuits and sensing applications, K. Zekentes, et al., Microelectronic Engineering 2022, Vol 255, 111704, https://doi.org/10.1016/j.mee.2021.111704

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