

## Elaboration and characterization of plasmonic microsensors dedicated to the measurement of NO<sub>2</sub> and O<sub>3</sub> for air quality control

### Administrative information:

Starting date: **01/09/2019**

Financial support: **ANR - project ANR-18-CE04-0008 "CAPTAIN"**

Main supervisor: **Dr Jérôme BRUNET – MCF HDR**

Co-supervisor: **PR Yves JOURLIN**

Position: **Axe PHOTON thème MINAMAT**

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University: **Université Jean MONNET – St-Etienne**

**Objectives:** The project ANR-18-CE04-0008 - CAPTAIN « Optical sensors for the monitoring of air quality (NO<sub>2</sub>, O<sub>3</sub> pollutants) is focused on the development of a new generation of optical sensors dedicated to the monitoring of gaseous pollutants for the control of outdoor and indoor pollution level. The quantification of very low concentrations of NO<sub>2</sub> and ozone O<sub>3</sub>, with a high degree of selectivity and repeatability, represents the scientific lock we aim to overcome. The elaboration of microsensors highly sensitive to the targeted pollutants, robust, miniature, low cost, with low-power consumption represents the technical challenge that we want to address.

**Scientific strategy:** Microsensors developed in the context of this project are based on optical transduction and exploit the grating excitation of surface plasmons, which have widely demonstrated their detection potential in chemical, biologic and gas sensing applications. The selectivity is performed by functional sensitive nanolayers deposited onto the microstructured optical transducers. Materials are selected because of their preferential interactions with each targeted pollutant as well as their ability to be layered by means of simple technologies to be easily transferrable to the industrial project partners.

**PhD topic:** The missions of the PhD are multidisciplinary:

- Elaboration and optical characterizations of metallic and functional material nanolayers;
- Elaboration of the optical characterization platform under pollutants (opto-electronic instrumentation);
- Programming of control interfaces with LabVIEW;
- Quantification of metrological performances of sensing devices; Influence of interfering analytes;
- Modelling of gas/material/transducer interactions, performances optimization;

### Profile of applicant:

The candidate must have a Master 2 or an engineering degree in Photonic & Optics (Plasmonic, Nanophotonics) or Material Science obtained with excellent marks/rank.

The applicant must also have skills in instrumentation, LabVIEW development and basic knowledge about sensors. Because this project include academic and industrial partners, communication, listening skills as well as good English level will be highly appreciated.

### Application form:

Please send cover letter + CV + summary of the master thesis (or topic) + master marks to:

[jerome.brunet@uca.fr](mailto:jerome.brunet@uca.fr)