Centre DE Nanosciences & DE Nanotechnologies

Internship proposal for a second-year master student

Title :	**Development of ultra-sensitive environmental sensors based on graphene.**
Duration :	The duration of the internship is expected to be between four and six months.
Salary :	600 €/month
Supervisor :	Antonella CAVANNA
Laboratory :	Centre for Nanoscience and Nanotechnology (C2N), U. Paris-Saclay, CNRS, U. Paris Cité 10 boulevard Thomas Gobert – 91 120 Palaiseau FRANCE
Web :	https://www.c2n.universite-paris-saclay.fr/fr/
Contact :	antonella.cavanna@cnrs.fr

Graphene has electrical, optical, and mechanical properties that make it particularly attractive for quantum technologies, as well as for quantum computing, metrology, and information transmission. We are more specifically interested in its electrical properties, which we exploit in devices such as gas sensors.

Within the Materials Elaboration Facilities (POEM) of Centre of Nanosciences and Nanotechnology (C2N) in Palaiseau, we study the synthesis of graphene on copper and germanium for applications in environmental sensors and acoustic filters. We propose to improve the sensitivity of our gas sensors by exploring the synthesis of graphene on less conventional substrates. The internship will focus on developing chemical vapor deposition (CVD) growth on these substrates, as well as on establishing a transfer method to an insulating substrate in order to fabricate devices.

The first part will involve optimizing growth parameters such as pressure, gas flow rates, temperature, and deposition time. A study of substrate pretreatment prior to growth may also be explored following a literature review. The second part will consist of optimizing the graphene transfer protocol onto an insulating substrate in order to determine its electrical properties and fabricate the device. Systematic characterizations by optical microscopy and Raman spectroscopy will first be carried out to establish the material synthesis process. Particular attention will be paid to determining the Dirac point, charge carrier density, and carrier mobility through Hall effect and Van der Pauw measurements. The internship will take place in a controlled environment in the C2N cleanroom, within the POEM platform.

Candidate profil : an M2 student in Physics, materials science, engineering or related discipline. Ability to work in groups, interest for experimental work in clean room.

Application procedure : for additional information about the project, please contact Antonella Cavanna (antonella.cavanna@cnrs.fr). The candidate should include a CV.