

Internship offer

Method development for graphene assisted transferrable III-V thin films

Starting: 02/2027 (adjustable)

Duration: 6 months

Laboratory: Center for Nanosciences and Nanotechnologies (C2N)

Address: 10 Boulevard Thomas Gobert, 91120 Palaiseau, France

Supervisor(s): Amaury Delamarre, Stéphane Collin

Phone number: 01 70 27 04 80

Send application to: amaury.delamarre@cnrs.fr,
stephane.collin@cnrs.fr



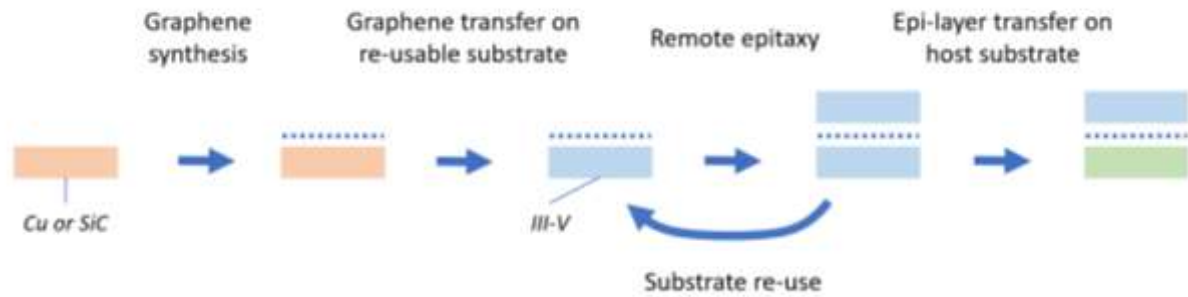
The Institute:

The Centre for Nanosciences and Nanotechnology (C2N) is a joint research unit between the CNRS and Université Paris-Saclay. The center develops research in the fields of material science, nanophotonics, nanoelectronics, and nanotechnologies, covering all the range from fundamental to applied sciences. The PhD thesis offered here will take place in the Sunlit Team where we develop innovative approaches for solar cells, aiming at high efficiencies, cost reduction and reliability of the photovoltaic devices.

Scientific project:

III-V epitaxy is normally performed on monocrystalline substrates a few hundred micrometers thick, while the active thin-film device itself is usually only a few micrometers. During the fabrication process, the substrate is either etched or retained in the structure without serving any functional purpose. In this project, we aim to detach the thin film from the substrate. This will yield semiconducting membranes that are altogether flexible, lightweight, integrable, and high-performance (both optically and electronically). These membranes have applications in numerous fields, including silicon photonics, flexible devices, and high-efficiency solar cells. Furthermore, this approach offers the opportunity to recycle the monocrystalline substrates, which are both expensive and made from critical materials, thereby reducing material consumption 100-fold.

Our strategy is to deposit a graphene layer onto the substrate before performing the epitaxy, as shown in the figure below. We have demonstrated that graphene enables the fabrication of high-quality monocrystalline material while allowing its exfoliation. The general purpose of the internship is to develop this method, which requires both exploring the fundamental physical phenomena occurring at the graphene surface during material synthesis and defining practical methodologies and quality assessment protocols for each process step. Without restrictions, we aim to fabricate ultrathin solar cells.



The intern will work on the development of the process as well as on the characterization of the obtained structures and intermediate products. He / she will propose further developments of the techniques already existing at the laboratory, as well as suggest the exploration of new methods. He / she will propose models to explain the observed phenomena, and design experiments for their validation. To complete those tasks, the intern will use his own knowledge as well as the scientific literature. The intern will take advantage of a unique collection of fabrication and characterization methods (XPS, TEM, SEM, luminescence) available in partner laboratories. This environment will provide various opportunities to tackle this project challenge and gain experience.

Profile:

The candidate must possess solid knowledges in material physics, characterization, and fabrication processes in a clean room environment. He / she must show good project management skills, for the development of technological procedures involving numerous parameters. He / she will be able to work independently and suggest innovative solutions to reach the project objectives. Collaborative work being at the core of the program, communication skills are required for team working as well as regular presentation of work progress in internal meetings.

This internship can be followed by a PhD.

Websites: <https://sunlit-team.eu>, <https://www.c2n.universite-paris-saclay.fr/en/>