

Internship offer

Graphene assisted III-V substrate recycling: towards low-cost high-efficiency solar cells

Starting: 02/2025 (adjustable)

Duration: 6 months

Laboratory: Center for Nanosciences and Nanotechnologies (C2N)

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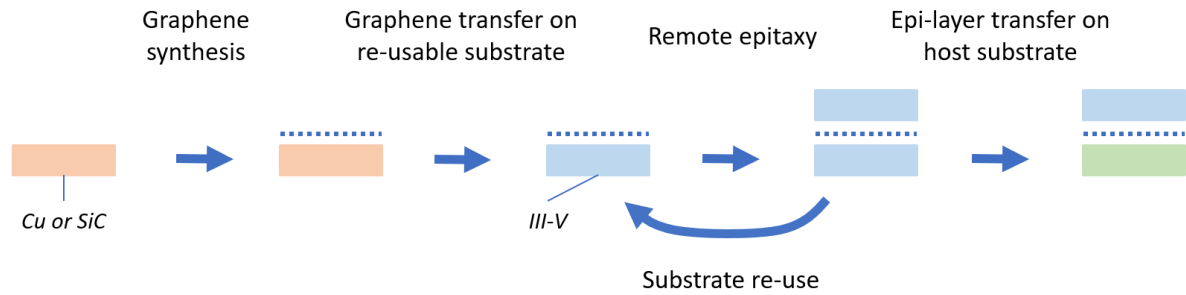
The Institute:

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, which develops innovative approaches for solar cells, aiming at high efficiencies, cost reduction and reliability of the photovoltaic devices.

Scientific project:

The photovoltaic technology is largely dominated by silicon devices ($\approx 90\%$ of the market), which present very limited progress margins today, with an efficiency intrinsically limited below 30%. It is largely agreed that the next device generation will combine several materials, beyond silicon alone. We are developing an innovating technology, to produce solar cells based on III-V materials, already presenting high efficiencies (up to 46% under concentration), with significant cost reductions.

Our strategy is to recycle the III-V substrates, which represent the largest device cost share, for several epitaxial growths. To do so, we are developing innovative processes to modify the substrate surface, so that the fabricated layers can be easily detached, leaving a surface compatible with subsequent growths. A promising route recently suggested consist in transferring a graphene layer before performing the epitaxy, as displayed in the figure below. I was shown that the graphene permits the fabrication of a monocrystalline material, while allowing its exfoliation. Developing this method requires exploring fundamental physical phenomena as well as defining practical methodologies.



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>