

Topic for Master 2 internship – Academic year 2024-2025

Growth of graphene by chemical vapor deposition, transfer on photovoltaics cells and related characterizations

General Scope :

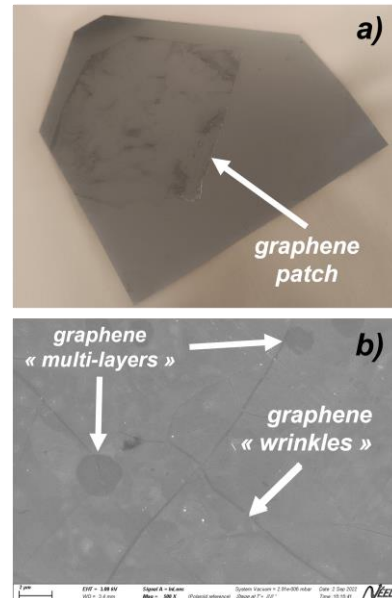
Two-dimensional (2D) materials are strongly studied nowadays for two main reasons: i) the variety of materials that can be synthesized and transferred to interesting “host” substrates ii) the new specific features that can be induced by such materials and their related functional properties.

In this context, graphene is known to form a stable, continuous and gas-impermeable membrane, including in its monolayer form. It also presents several outstanding physical and chemical properties (strong electronic conductivity, high optical transparency, ...). Graphene forms a continuous monatomic layer that can however present several defects (grain boundaries, wrinkles, ...) that may significantly modify their related properties.

Research topic and facilities available :

Current photovoltaics (PV) cells production uses a significant amount of Indium-based transparent conductive oxide (TCO) layers. In a context of In scarcity projections, a possible route aims at substituting In-based TCO by graphene as a transparent conductive layer. Graphene, in addition to being made of earth-abundant carbon and thus not critical, can feature very good optical transparency and electrical properties.

The main objectives of this internship will be to synthesize high-quality graphene monolayers using chemical vapor deposition (CVD) and transfer them by a wet process onto PV precursors cells. Institut Néel has a CVD equipment dedicated to the growth of graphene and suitable environments (chemistry rooms, clean rooms, ...) to achieve both transfer and characterization of this material on "host" substrates.



a) Photo and b) SEM image of a transferred graphene on solar cell precursor

Possible collaboration and networking : NO, but interactions with different teams from Institut Néel with various skills and expertise

Possible extension as a PhD : NO

Required skills :

Master 2 in Materials Science, Physics, Chemistry, ...

This internship will be essentially experimental and will require the handling of a CVD equipment as well as related wet transfer processes and characterization tools (SEM, Raman spectroscopy, ...).

Work in chemistry room and clean room is required to develop and optimize the wet transfer processes.

Starting date : ≈ February to June 2025 (possible duration from 4 to 5 months)

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