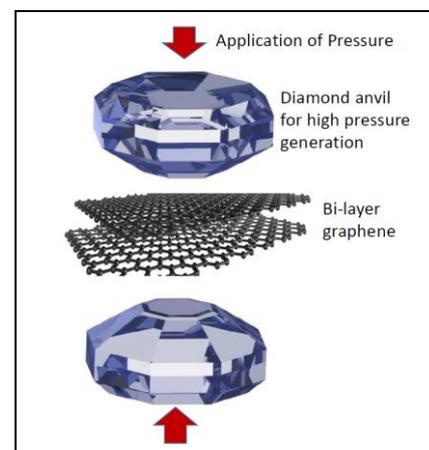


High order magic angles in twisted bilayer graphene

General Scope:

Twisted bilayer graphene (TBG) has shown to offer amazing electronic properties at the magic twist angle: strong correlations physics, superconductivity and Mott Insulator transitions. These quantum properties rely on the particular localization effects at the first magic angle ($\sim 1^\circ$ for TBG). An important open question remains: what are the properties and new physics emerging at the higher order magic angles? One way to reach them is by changing the interlayer coupling which can be experimentally performed by application of high pressure.

The main objective of this PhD project is to reach such magic angles using high pressure in diamond anvils cell. The PhD student will perform Raman spectroscopy and electron transport measurements in diamond anvils cells, using cryogenic systems. He/She will work at Néel Institute in collaboration with two teams, one expert in 2D materials for fabrication and their electronic and vibrational properties, the other expert in high pressure and strong correlations physics. Superconductivity will be checked in particular, and the role of phonons and strong correlations on this unconventional superconductivity will be investigated.



Research topic and facilities available:

The subject of the internship will consist in a first stage in the adaptation, for its assembly in the high-pressure cells, of the graphene double layer samples. Good results have already been obtained on this process. The student will thus acquire a solid experience in nanofabrication. He/She will proceed then to make Raman measurements as a function of pressure to track higher order magic angles, and then electron transport measurements at low temperature are envisioned.

Possible collaboration and networking:

Networking: ANR project obtained in 2019. Teams of the Néel Institute, Institut Lumière Matière (Lyon), Sorbonne University (Paris).

Possible extension as a PhD: YES

Required skills: Good knowledge of condensed matter physics, curiosity, taste for delicate experiments

Starting date: 2022-2023

Contact: Laëtitia Marty and Marie-Aude Méasson

Institut Néel - CNRS

e-mail: laetitia.marty@neel.cnrs.fr; marie-aude.measson@neel.cnrs.fr

More information: <http://neel.cnrs.fr>