POST-DOC POSITION

Boron nitride- epigraphene epitaxial heterostructure for nanoelectronics

This project concerns the development of graphene/boron nitride (BN) epitaxial hetero-structures, to study the electronic properties of a novel generation of electronic devices. The underlying physical concept is the waveguide-type electronic transport that was recently discovered [1] in epigraphene* nanostructures [2] showing room temperature quantized ballistic conductance up to tens of microns. These exceptional properties reveal topologically protected edge state conductance and are related to the graphene ground state at the charge neutrality point. Epigraphene gives access, for the first time, to this singular state that has remained elusive so far.

We have recently demonstrated that large-scale BN/epigraphene/SiC heterostructures produced by metalorganic vapor phase epitaxy [3] are of high structural quality and present the clean BN/graphene interface required to preserve graphene pristine properties. Electronic devices will be built directly from these heterostructures and measured.

This project combines the expertise of the hosting group, with 20 years of experience in developing graphene for electronics, and the nitride research team at CNRS/Metz, the 2D material microscopy experts at ONERA – Paris, and the graphene surface group at CNRS/ Institut Néel in Grenoble. The project is developed in strong collaboration with the Georgia Institute of Technology in Atlanta, with which extended collaborative exchanges will be organized.

*Epigraphene is graphene grown (wafer-scale) on semiconducting single-crystal wafers of silicon carbide.

[1] *Electronic confinement and coherence in patterned epitaxial graphene,* C. Berger et al, **Science** 312, 1191 (2006); *Ultrathin Epitaxial Graphite: 2D electron gas properties and a route toward graphene-based nanoelectronics,* C.Berger et al, **J Phys Chem B** 108, 19912 (2004).
[2] *Boron nitride/epigraphene Van der Waals films on silicon carbide by lateral epitaxial deposition*, J. Gigliotti et al, **ACS Nano** 14, 12962 (2020).
[3] *Exceptional ballistic transport in epitaxial graphene nanoribbons*, J. Baringhaus, et al, **Nature** 506, 349 (2014).
[4] *Protected transport in the epigraphene edge state*, V. Prudkovskiy et al, **arXiv**:1910.03697.

Keywords: Two-dimensional materials, graphene, boron nitride, epitaxial growth, nanoelectronics, ballistic transport, topological transport.

Candidate profile: PhD degree. Experimentalist with a solid background in condensed matter physics or material science, experienced in low temperature electronic transport measurements. Prior experience in device fabrication techniques, or in material surface characterization /deposition techniques is welcome.

Starting date: the position is available immediately. Funding available for 2 years

Location: Unité Mixte Internationale Georgia Tech-CNRS Metz, France, with extended visits to GT-Atlanta, USA.

More information and application:
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