INSTITUT DE PHYSIQUE ET CHIMIE DES MATERIAUX DE STRASBOURG

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Séminaire AXE 1 - Sciences et Matériaux Quantiques

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Atomically precise graphene nanoribbons: the road towards device integration

Graphene nanoribbons (GNRs) are emerging as a key platform for nanoelectronics due to their tunable band gaps, quantum confinement effects, and atomically precise structures [1]. Their electronic and magnetic properties can be tailored at the single-atom level, enabling applications from field-effect transistors (FETs) to spintronic devices. In this talk, I will outline the pathway from bottom-up synthesis under ultra-high vacuum conditions to device integration. I will focus on the synthesis of atomically precise GNRs, their transfer to technologically relevant substrates [2] using wet and dry methods, and their structural and electronic characterization via Raman spectroscopy [3] and scanning probe techniques [4]. Special emphasis will be placed on the integration of 9-atom-wide armchair GNRs (9-AGNRs) into multi-gated FET architectures using graphene and carbon nanotube electrodes [5,6]. These devices display quantum dot behavior with well-defined Coulomb diamonds, highlighting the potential of GNRs for quantum transport studies and scalable device applications.

[1] J. Cai *et al.*, Nature, **466** (2010)

[2] G. Borin Barin *et al.*, ACS Applied Nanomaterials, **2** (2019)

[3] R. Darawish *et al.*, Carbon, **218** (2024)

[4] A. Kinikar *et al.*, ACS Applied Nanomaterials, **8** (2025)

[5] J. Zhang *et al.,* Nature Electronics, **6** (2023)

[6] J. Zhang *et al.*, Nature Reviews Materials, 1-19 (2026)

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