Minicolloque MMPS20 X **Oral** ☐ **Poster**

Superconductor-semiconductor nanowires; in situ fabrication schemes and new materials for quantum devices

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Recent years superconductor-semiconductor hybrid materials have been established as an essential platform for quantum devices, notably used in the search for Majorana zero modes and other bound states that may serve as qubits [1].

In this talk we will look beneath the surface of these nanowire devices and discuss recent advances in materials science and nanofabrication. In particular we will see how in-situ fabrication [2,3] and new superconductors [4] have been implemented, expanding the available parameter space for hybrid quantum devices.

This work is mainly based on Molecular Beam Epitaxy growth of III-V nanowires, high resolution electron microscopy and low temperature electron transport experiments.

[1] E. Prada et al., From Andreev to Majorana bound states in hybrid superconductor-semiconductor nanowires, Nature Reviews Physics (2020)
[2] T. Kanne et al., Double nanowires for hybrid quantum devices, arXiv:2103.13938
[3] D. Carrad et al., Shadow Epitaxy for In Situ Growth of Generic Semiconductor/Superconductor Hybrids, Advanced Materials (2020)
[4] T. Kanne et al., Epitaxial Pb on InAs nanowires for quantum devices, Nature Nanotechnology (2021)

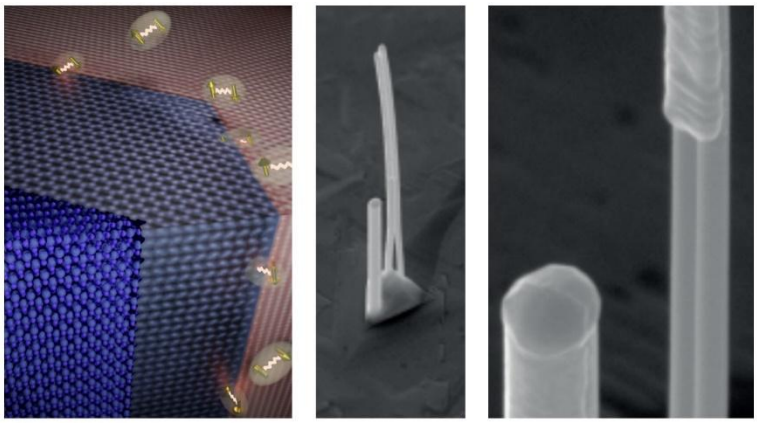

Figure 1 : In situ manufacture of superconductor-semiconductor hybrids. InAs nanowire core (blue) with an epitaxially matched Pb shell (red), illustrated by a composite of transmission electron microscopy imaging and modelling (left). Controlled growth of a double nanowire with a shadowed Al coating (right), allowing experiments on parallel hybrid nanowires.