

PhD position in Nanotechnology, Toulouse, France

LAAS-CNRS, Paul Sabatier University

“Bottom Up” Integration of High Mobility III-V Nanowires on Silicon

Nanowires (NWs) are a new material class in the world of semiconductors with potential applications for electronics, photovoltaics, sensors and many other areas. So far, their synthesis using a bottom-up approach has been the most successful these 10 last years since it allowed the combination of materials previously incompatible both axially and laterally. Among the different possibilities, III-V based materials benefit from the most interesting intrinsic properties such as direct bandgaps, high mobilities, and large wavelength coverage. In addition, it has been shown for nanowires based on this semiconductor family that good control can be obtained over their dimension, morphology, position, material combination and crystalline structure. Unfortunately, their integration on silicon and their combination with the CMOS technology suffer two major drawbacks: they are mostly grown using a gold catalyst which create detrimental mid-gap defect states in silicon and their growth direction is $\langle 111 \rangle$, in most of the case, which is incompatible with the CMOS technology. This research proposal aims at solving these two bottlenecks by growing gold-free nanowires on silicon in the $\langle 001 \rangle$ direction using new nanotechnology advances.

The research work will be conducted in the MPN group of the LAAS-CNRS under the supervision of Dr. Sébastien Plissard. The PhD candidate will benefit from the state of the art clean-room environment of the lab, and from the broad knowledge of the group in the fields of nanoelectronics, nanowire growth, nano fabrication and material characterization. The project is funded by the French Ministry of Higher Education and Research and should start around October 2015.

Potential candidates should demonstrate knowledge or experience in nanoelectronics, thin film deposition, materials science, material characterization and nanofabrication.

Recent publications:

S.R. Plissard et al., Nature Nanotechnology 2013, 8, 859-864.

J. Wang et al., Nano Letters 2013, 13(8), 3802-3806.

V. Mourik et al., Science 2012, 336(6084), 1003-1007.

S. Plissard et al., Nanotechnology 2011, 22(27), 275602.

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