



Centre de Nanosciences et de Nanotechnologie

Soutenance de thèse

Mardi 18 septembre

10 h – C2N Site Orsay, Salle 44

Martina MORASSI

“Growth of InGaN nanowires for photovoltaic and piezoelectric energy harvesting “

Composition du jury :

Lutz Geelhaar PDI, Berlin

Eva Monroy, CEA Grenoble

Mathieu Kociak, LPS Orsay

Silvia Rubini, IOM-CNR Trieste

Maria Tchernycheva, C2N (supervisor)

Noelle Gogneau, C2N (co-supervisor)

Abstract:

III-nitride materials are direct bandgap semiconductors presenting several interesting properties for photovoltaic and piezoelectric applications. At the same time, the epitaxial growth of these materials in the form of nanowires (NW) is even more interesting, because binary and heterostructured III-N NWs have a better crystalline quality compared to their 2D and bulk counterparts. In this context, my work focuses on the plasma-assisted MBE (PA-MBE) growth of InGaN / GaN NWs and their characterization. Three main topics are addressed: the growth of axial InGaN heterostructures by PA-MBE, their optical characterization, and the study of the selective area growth (SAG) of GaN NWs on transferred graphene. These studies allowed me to obtain a good control over the growth mode of InGaN heterostructures in a wide range of In contents (up to ~ 40%) and morphologies, to study their axial band edge profile, useful for the optimal design of the photovoltaic structure, and to demonstrate for the first time, that the SAG of GaN NWs on patterned mono-layer graphene is a possible and very promising strategy to improve their homogeneity. Also, preliminary tests have shown that the piezoelectric conversion capacity of GaN NWs can be improved by about 35% when integrating an In-rich InGaN insertion into their volume.

All these results constitute a decisive step in the control and understanding of the properties of these nanostructures, and establish very encouraging perspectives for their integration in novel and efficient photovoltaic and piezoelectric nano-generators.



UMR9001 CNRS-UPSUD
Avenue de la Vauve
91120 Palaiseau

