Centre de Nanosciences et de Nanotechnologies

Soutenance de thèse

Vendredi 18 février
15h00
Centre de Nanosciences et de Nanotechnologies
10 boulevard Thomas Gobert
91120 Palaiseau
Amphithéâtre

« Nanostructured III-nitride light emitting diodes »

Nuño Amador-Mendez

Link : soon

Jury members :

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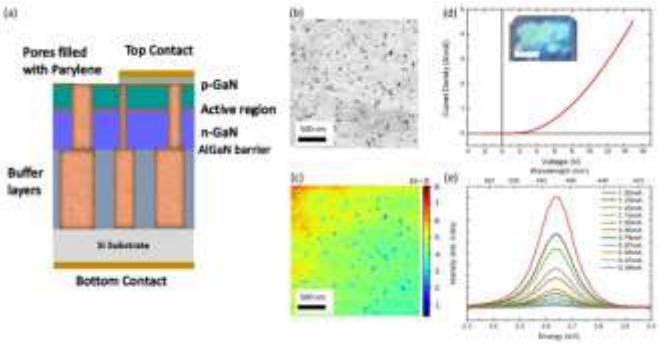
Abstract :
Flexible light emitting diodes (LEDs) are today a topic of intense research driven by applications such as bendable displays, conformable light sources, bio-medical devices, etc. The conventional inorganic semiconductor devices are mechanically rigid; the fabrication of flexible devices from thin film structures is quite challenging and requires micro-structuring and lift-off of the active layer. Instead of two-dimensional films, in this thesis two types of III-nitride nanostructures are studied: (i) a bottom-up strategy using core shell nanowires, and (ii) a top-down strategy using a porous structure.

Polymer-embedded nanowire membranes combine the high efficiency and the long lifetime of inorganic semiconductor materials with the high flexibility and transparency of polymers. I used MOCVD cores shell NWs for the fabrication of flexible blue and green NW LEDs, I also combined them with nanophosphors of different emission colors to produce a second generation of white LEDs with an improved color quality. For the fabrication of red flexible NW LEDs, I tested different strategies, namely an all-InGaN route based on In rich InGaN/GaN MQW NWs with a down-conversion of the blue light by a red phosphor and a red emission from GaAsP NWs.



Selective area sublimation was demonstrated to be a promising approach to improve the luminous efficacy of defective GaN layers on Si. In my work, I analyzed the impact of porosification on InGaN/GaN single quantum wells and on p-i-n light emitting diode structures. The optical analyses were performed by cathodoluminescence demonstrating that the high temperature sublimation process does not degrade the QW emission while electron beam induced current microscopy showed that the p-i-n junction profile is also preserved after sublimation. I also describe the optimization of the technology for porous LED fabrication following several strategies. As a result, I demonstrated the first porous InGaN/GaN blue LED using parylene pore filling for electrical insulation.