Title : **Electronic processes in nitride semiconductor quantum structures and devices**

First Name : Jacques	**Name** : PERETTI	**Laboratory** : PMC

Email : jacques.peretti@polytechnique.edu

Webpage : https://pmc.polytechnique.fr/spip.php?article549

Research Area : 1.Condensed Matter
2.Quantum Science and Technology

Methods : Photoluminescence spectroscopy and microscopy
Scanning probe microscopy

PhD track subject :

In the last decades, the nitride semiconductor technology has emerged and competitive devices are produced for lighting and power electronics applications [1]. These devices are expected to allow huge energy savings (about 15% of the total electricity consumption) but nowadays their performances are still not at the required level [2]. Identifying the limiting mechanisms is a critical issue. In the framework of an international collaboration, we are studying the quantum electronic processes in nitride compounds and devices [3,4]by state-of-the-art spectroscopy and microscopy techniques (Fig.1). The PhD track candidate will participate to this research project.

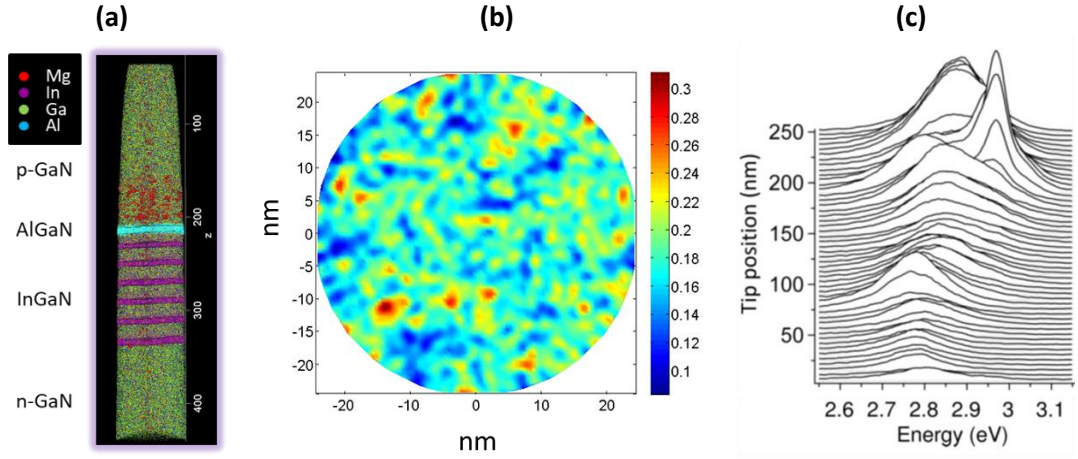

Fig.1 : (a) Structure of a nitride light emitting diode measured by atomic probe tomography (APT). Each point is an atom. The purple layers are 3 nm-thick InGaN quantum wells (QWs). (b) Indium concentration map measured by APT on the middle plane of a QW showing the intrinsic compositional disorder of the InGaN ternary alloy due to the random placement of the atoms on the crystal lattice during growth. (c) Local light emission spectra recorded by scanning tunneling electroluminescence microscopy on an InGaN QW showing photon emission from single localized states induced by the intrinsic compositional disorder of the InGaN ternary alloy.

References :

[1] C. Weisbuch et al., Phys. Status Solidi A 212, 899 (2015)
[2] https://www.energy.gov/sites/default/files/2020/09/f78/ssl-led-adoption-aug2020.pdf
[3] J. Iveland et al., Phys. Rev. Lett. 110, 177406 (2013)
[4] W. Hahn et al., Phys. Rev. B 98, 045305 (2018)