Title : **Spin-dependent charge dynamics in dilute nitride and defect-engineered semiconductor quantum structures and devices**

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

Methods : Photoluminescence spectroscopy and microscopy
Scanning probe microscopy

PhD track subject :

Alloying is widely used in the semiconductor industry to tune bandgaps and create quantum confined hetero-structures with extraordinary opto-electronic properties [1]. Growth of alloys from liquid or gas phase precursors is however a fundamentally statistical process in which isochemical elements randomly occupy lattice sites. In the framework of an international collaboration, we are studying spectacular spin-dependent charge dynamics in dilute nitride alloys and defect-engineered III-V alloys that arise directly from this alloy disorder [2]. The PhD track candidate will participate to this research project.

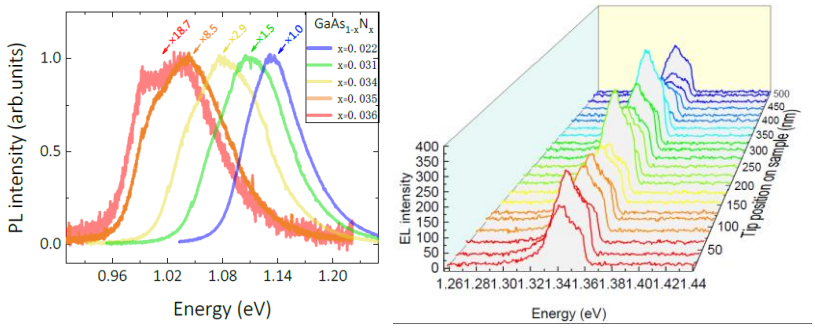

Fig.1 : (left) Spatially averaged effect of changes in alloy content on the photoluminescence spectrum of a series of dilute nitride alloys. The link between alloy content and emission spectrum enables the using scanning tunneling luminescence microscopy (STLM) [3] to directly image alloy disorder by recording electroluminescence spectra from nanoscale sample volumes. (right) STLM line scan showing variation in electroluminescence spectra over nanometer distances in a defect-engineered InGaAs quantum well.

References :

[1] https://en.wikipedia.org/wiki/Band-gap_engineering
[2] C. T. Nguyen et al. Applied Physics Letters 103, 052403 (2013)
[3] W. Hahn et al., Phys. Rev. B 98, 045305 (2018)