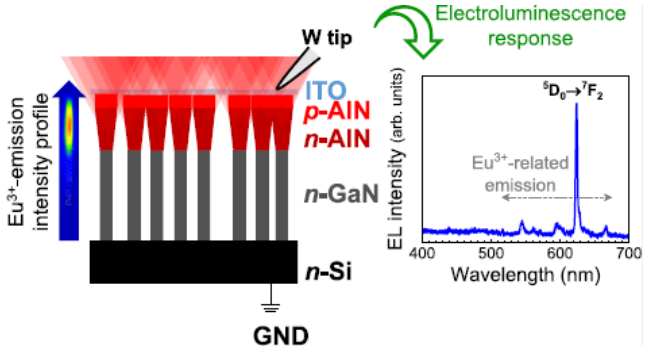
Master thesis Project

Eu- doped InGaN quantum disks in GaN and AlN nanowires for efficient red LEDs realization

The realization of red/green/blue (RGB) micro-LEDs is a current industrial challenge for micro-display applications. While the efficiency of InGaN/GaN-based blue LEDs (and to a large extent green ones) is very high, there is still room for improvement as concerns red LEDs, which are still far from meeting the requirements for integration in devices. The difficulties met, namely a high density of extended defects, an increased quantum confined Stark effect (QCSE) for increasing In content and a limited current injection on p-type side can be potentially overcome by using nanowire (NW) heterostructures. As a matter of fact, the absence of extended defects in NWs, the higher limit solubility of both Si (n-type) and Mg (p-type) electrical dopants, the eased light extraction intrinsically related to the large "roughness" of an ensemble of NWs make them particularly suitable to the realization of efficient red emitters. In this context, the CEA/PHELIQS laboratory has been collaborating for many years with Aledia company in view of realizing innovative, efficient NW-based LEDs grown by molecular beam epitaxy (MBE). Along these lines, the proposed project will consist in the MBE growth, structural and optical characterization of GaN/InGaN or AlnN/InGaN NW heterostructures containing Eu in the InGaN quantum disks. Preliminary results are shown in the schematics, where Eu was implanted in the depletion region of an AlN NW p-n junction. A sharp electro-emission peak is shown at 620 nm, assigned to Eu. The goal of the master internship will be to directly incorporate Eu in NW heterostructures during MBE growth, and subsequently to study the structural and optical properties of the grown nanostructures. This project requires a strong interest in experimental science (Nanoscience, Nanophysics academic background) and could be extended into a PhD.



APPLY

To apply for this position, send your application (including CV) by e-mail to: bruno.daudin@cea.fr, bruno.gayral@cea.fr

French Commission for Atomic Energy and Alternative Energies
Interdisciplinary Research Institute of Grenoble
Quantum Photonics, Electronics and Engineering Laboratory
17 av. des Martyrs – 38054 Grenoble cedex 9 – France