Master / PhD Thesis Project

AlN:Ga dilute alloy : a new type of single UV-C photon emitter

Due to the quantum dot-like behaviour of sub-nanometric Ga-rich local composition fluctuations acting as carrier localization centres, AlN:Ga dilute alloy (Ga content in the 0.1-1% range) appears as a new system, unexplored to date, for the realization of both UV-C LEDs and single UV photon emitters, depending on the Ga content. The main applications of such UV-C (200-280 nm) emitters include water, air and surface disinfection as well as short distance encrypted communication. To optimize the emission properties of such devices we propose to develop a new strategy by using AlN nanowires (NWs). As a matter of fact, the absence of extended defects in NWs, the higher limit solubility of both Si and Mg 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 UV emitters. The active region will consist of an AlN:Ga dilute alloy, taking advantage of the emission stability inherent to quantum dot-like sub-nanometric Ga-rich local composition fluctuations. In the general context of a marked interest in single UV-C photon emitters for encrypted short distance communication, the goal of the internship will be to grow and optically characterize AlN:Ga with a Ga content below 0.1% with the purpose of assessing their potential for single photon emission properties in the UV range.

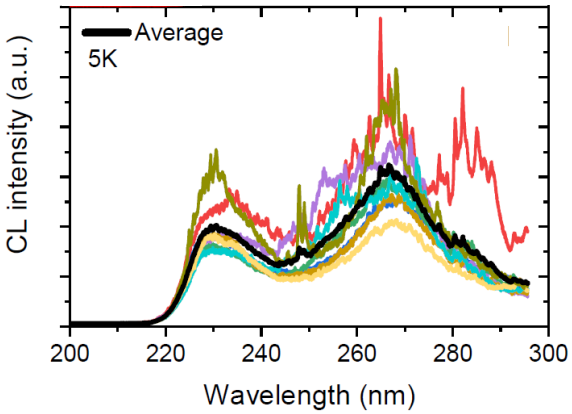

Figure: CL spectra of AlN:Ga nanowires. Sharp lines correspond to single photon emission

The growth of the structures will be performed by plasma-assisted molecular beam epitaxy in CEA-Grenoble IRIG/PHELIQS-NPSC, the optical characterization being made in collaboration between CEA and Institut Néel.

APPLY

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

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