

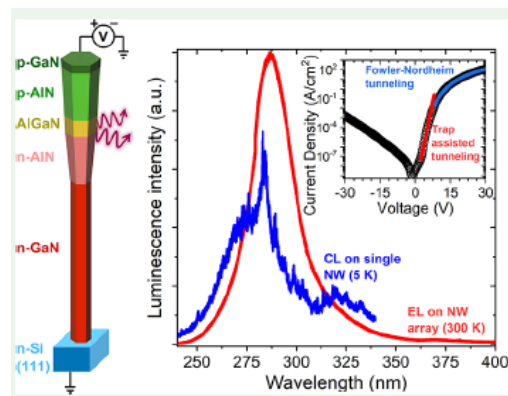
p-type doping of AlN nanowires for UV-C LEDs realization

General Scope :

The realization of efficient UV-C (200-280 nm) light emitting diodes (LEDs) is a current challenge to meet the requirements of numerous applications ranging from water, air and surface disinfection to short distance encrypted communication. However the efficiency of conventional UV-C LEDs is still low due to poor p-type doping and limited light extraction. In this context, the CEA/CNRS consortium involved in the realization of such emitters is developing 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 (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 UV emitters.

Research topic and facilities available

A scheme of such LEDs is shown in the figure. The inset shows the current-voltage characteristics which assesses the rectifying character of the device. Finally, an electroluminescence (EL) spectrum is shown assessing the successful realization of a UV-C LED. However, efficiency improvement now requires optimization of p-type doping, which will be the core of the present project, i.e. the growth, structural, optical and electrical characterization of p-type AlN nanowires.



Possible collaboration and networking :

The growth of the structures will be performed by plasma-assisted molecular beam epitaxy in CEA-Grenoble IRIG/PHELIQS-NPSC. Electrical characterization will be made in Institut Néel following NW processing in clean room environment. The optical characterization will be made in collaboration between CEA and Institut Néel.

Required skills: This project requires a strong interest in experimental science (Nanoscience, Nanophysics academic background) and could be extended into a PhD.

Starting date: Jan/Feb 2023

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