Master / PhD Thesis Project

Al-polar AlN nanowires grown by molecular beam epitaxy for efficient UV-C LEDs realization

The Minamata Convention entered into force on 16 August 2017, with the purpose of progressively banning mercury use and mercury-using devices. This directly concerns mercury lamps, which are the current source of UV light for a wide range of applications including -but not limited to- water processing, disinfection, air sanitization, psoriasis bleaching, wireless short range communication, banknote counterfeiting detection, agriculture, etc…. This political framework is boosting the rapidly growing market of UV light emitting diodes (LEDs) and stimulates even more the active research and development activities in the field.

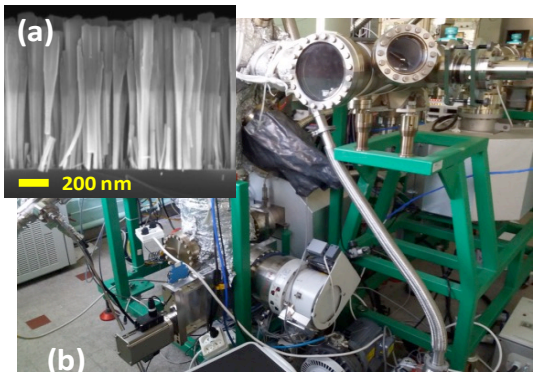

Figure: (a) SEM cross section view of AlN nanowires (b) partial view of a molecular beam epitaxy machine

In this context, IRIG and CNRS-Néel are collaborating for long on a joined research program targeting at the realization of disruptive UV-C LEDs using AlN nanowires (NWs), grown by molecular beam epitaxy (MBE) on Si. Due to the lack of symmetry center in wurtzite AlN, this material may be either N- or Al-terminated, depending on substrate and growth technique: indeed using Si substrate leads to Al-terminated NWs –in other words Al-polar NWs-. As this orientation tends to favour the incorporation of point defects detrimental to LED performances, it is desirable to revert it from N- to Al-termination: accordingly, the purpose of the internship is to develop Al-polar, AlN NW-based UVC LEDs, by polarity inversion using transitory O exposure in the growth chamber[1]. The material growth and structural characterization will be performed in CEA while the electrical characterizations will be carried out in Institut Néel in strong interaction with a PhD student. This internship requires a marked interest for material growth and the physics of semiconductors. Continuation in PhD will be possible.

[1] *A. Concordel et al,* **Appl. Phys. Lett. 114, 172101 (2019); doi: 10.1063/1.5094627**

APPLY

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

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