Minicolloque n° CPR24 ☑ **Oral** ☐ **Poster**

Well-ordered (In,Ga)N nanowires grown by SAG Hydride Vapor-Phase Epitaxy

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Due to its wide direct bandgap which cover the entire spectral range from far ultraviolet to near infrared, (In,Ga)N is paramount for optoelectronic applications, particularly RGB LEDs and solar cells. Planar growth of high-quality (In,Ga)N layers for the full range of indium composition remains challenging due to its large lattice mismatch with common substrates. Therefore, nanowires or nanorods have recently emerged for improving the crystal quality of (In,Ga)N in quasi one-dimensional form. Today, the most reliable option to control the growth of well-ordered III-V nitrides nanowires with a high degree of reproducibility is to proceed by Selective Area Growth (SAG). Hydride vapor phase epitaxy (HVPE) is a growth process implemented in a hot wall reactor using chloride precursors for the III elements. This process shows unique features regarding the selective growth of nitrides nanowires [1,2]. This presentation will focus on a comprehensive study of (In,Ga)N nanowires grown by SAG-HVPE, combining the growth mechanisms, complementary chemical and structural analyses with also photoluminescence characterization. The selective growth of well-ordered and vertically aligned (In,Ga)N nanowires with high aspect ratio is demonstrated as shown in figure1(a). We show that In content can be varied from 0 to 100% with a high degree of homogeneity along the nanowire length (figure1(b)) keeping a good crystal quality. This is achieved by understanding thermodynamic of the vapor phase and surface kinetics which are coupled with controlled composition of solid nanowires. The results provide a convenient method to grow homogenous (In,Ga)N nanowires and could pave the way to develop high-performance (In,Ga)N nanorods-based devices.

[1] Zeghouane M, Avit G, Cornelius T W, André Y, Bougerol, C, Taliercio T, Ferret P, Gil E, Tournié E, Thomas O, Trassoudaine A. CrystEngComm, **21** 2702-2708. 2019
[2] Zeghouane M, Avit G, André Y, Taliercio T, Ferret P, Gil E, Castelluci D, Disseix P, Leymarie J, Tournié E, Trassoudaine A. Cryst. Growth Des. 2020, 20, 2232−2239

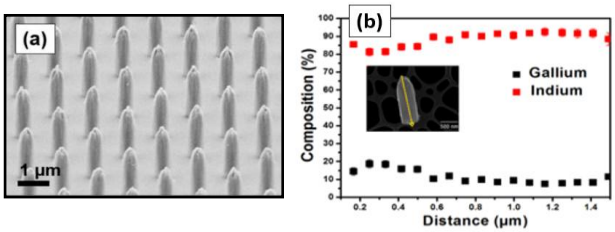

Figure 1: Tilted-view SEM image of InGaN nanorods grown on Ga-polar GaN template masked with SiN with 200 nm holes, b) Energy Dispersive X-ray Spectroscopy (EDS) image showing homogeneous indium composition along the nanorods length.