

8th International Conference and Exhibition on

LASERS, OPTICS & PHOTONICS

November 15-17, 2017 | Las Vegas, USA

Hydride vapor phase epitaxy growth of III-V nanostructures for high performance devices

Geoffrey Avit

Université Clermont Auvergne, France

III-V semiconductors have a direct bandgap that can be tuned through alloy engineering and therefore appear as very interesting for solar-cells, solid-state lighting and high power applications. The performances of current devices may be increased through the use of nanostructures and nanowires which look promising for the integration of high efficiency devices. Nanowires exhibit great properties such as efficient strain relieving capability and large specific area. Growth on silicon substrates and core-shell structures can be considered as well. Still, the production of nanowire-based devices faces material challenges related to morphological, structural, optical and electrical properties which are very much linked to the synthesis process. This presentation will focus on hydride vapor phase epitaxy, which is a growth process implemented in a hot wall reactor using chloride precursors and showing unique features regarding the growth of III-V and III-nitride nanowires. For example, self-catalyzed GaAs nanowires were grown on silicon at a faster growth rate ($60 \mu\text{m}\cdot\text{h}^{-1}$) exhibiting a constant zinc-blende crystalline phase, for the potential fabrication of GaAs-based photonic devices on Si. For III-nitride materials, InGaN nanowires demonstrating the entire composition range were grown by using a method compatible with the standard GaCl-based GaN growth process. Photoluminescence coupled with transmission electron microscopy measurements showed that these nanowires could overcome the so-called green gap and stretch the limits of solar cells efficiency. By taking advantage of the large growth rates anisotropy resulting from the use of chloride precursors, we could freely tune the shape of GaN wires on masked substrates with (sub)-micrometric apertures.

Biography

Geoffrey Avit has completed his PhD in the year 2014 from Blaise Pascal University. He is currently a Post-doctoral Researcher at Institut Pascal (France), a leading laboratory in the field of HVPE growth of III-V nanostructures.

Geoffrey.AVIT@uca.fr

Notes: