



Position: post-doctoral fellowship at GREMAN (Tours University)

Starting date: As soon as possible

Topic: *Material investigations for GaN power devices*

Wide band-gap semiconductors (SiC, GaN) are the subject of intensive research and development activities. This growing attention is motivated by attractive material properties which make silicon carbide and gallium nitride promising materials for high power and high temperature electronic devices. GaN can be heteroepitaxially grown on silicon substrates even though the lattice mismatch is still high. The capability to grow the material on low cost and large diameter silicon substrates becomes then an extremely attractive solution for manufacturing. On the other hand, GaN bulk material starts to be available offering an alternative to SiC for some higher voltage applications. In this framework, power High Electron Mobility Transistors (HEMT) as well as Schottky barrier diodes (SBD) and p-n junction diodes have nowadays broad developments.

Since many years, GREMAN has developed know-how in GaN processing and characterization (Physical and Electrical) for industrial power applications. It is also to note that HEMTs and SBD generally require AlGaIn/GaN heterostructures when using lateral structures and that AlScN/GaN heterostructure is developing fastly. In the case of vertical GaN SBD other material solutions are possible, often requiring the addition of p-type GaN layer. Such layer can also be used in lateral devices to increase their reliability. In this work, we propose to study the III-N materials that will be developed in the framework of the GaN4AP European project to better understand the presence of defects and their impact on devices. We will also investigate the defects induced by process steps that many also affect the device quality. This work will be in direct continuity with the work done in GREMAN on GaN. Processes to obtain contacts, annealing or etching of III-N material will be investigated.

To ensure device reliability, physical characterizations and defect engineering are essential. The availability of material imaging using electronic microscopy (SEM, TEM), and the associated sample preparation (using FIB), is key to understand device structure and behavior as well as defect evolution in wide band-gap materials (here essentially GaN). These characterizations are hence a key issue for the development of devices in such materials and will be the aims of the work developed here.

Background:

The candidate must have a doctoral degree in SC physics or material science, ready for teamwork. Knowledge in semiconductors is essential, especially wide band-gap materials. Excellent background and practice in physical characterization techniques, in particular, SEM, STEM, TEM and FIB preparation, is important for this position. The candidate must have knowledge in TEM imaging and associated sample preparation. Knowledge in XRD measurements is a plus.

This work will be done in the framework of a national project and the European project ECSEL-H2020 GaN4AP in close cooperation with project partners both academic (CNR-IMM, CRHEA, FhG) and industrial ones (here in particular, STMicroelectronics).

To apply for this position, a CV and a cover letter including date available to start, the names of three references are mandatory.

Contract Duration : 1 year (renewable 1 year)

Contact:

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