2023-2026

PhD Thesis at LMGP and PHELIQS

Ga_2O_3-Based Heterostructures for Next Generation Power Electronics

Detailed Topic

As power consumption continues to rise, there is an increasing demand for power devices that can support energy savings both at the consumer level and in the power distribution process. In response to this demand, SiC and GaN semiconductors are currently mature technologies that are replacing silicon in many applications (e.g. automotive). However, for applications that require a voltage beyond 1000 V (power distribution, photovoltaics, wind energy, railway), ultra-wide-bandgap semiconductors such as diamond, AlN, and gallium oxide (Ga_2O_3) have emerged as viable competitors. Among these, Ga_2O_3 stands out due to its exceptionally high breakdown electric field, and thus has the potential to outperform Si, SiC, and GaN in high-voltage and/or high-power applications.

This PhD position will focus on the growth of Ga_2O_3 and $(Al,Ga)_2O_3/Ga_2O_3$ heterostructures using MBE and ALD. We will exploit the advantages of these techniques in terms of precise thickness control, high purity and low temperature deposition. The success of the project relies on four partial targets: (i) control of the nucleation/growth conditions for thin films of Ga_2O_3, (ii) control of the electrical properties of Ga_2O_3 layers to allow the fabrication of low resistivity contacts and to avoid parasitic conduction channels, (iii) development of a growth protocol to obtain ternary alloys with controlled composition and good surface/interface morphology, and (iv) validation of material structural/electrical quality through device fabrication and characterization.

Location

This project is a collaborative effort between PHELIQS and LMGP laboratories in Grenoble. The successful candidate will work closely with a team of experienced researchers and receive training in both MBE and ALD deposition techniques. To validate the structural/electrical quality of the materials produced, the student will receive additional training in device fabrication technologies in a cleanroom environment, and in a variety of characterization setups, including atomic force microscopy, scanning electron microscopy, x-ray diffraction, Raman spectroscopy, UV spectrophotometry, and Hall effect to name a few.

Web sites: http://www.lmgp.grenoble-inp.fr/ and https://www.pheliqs.fr/

Profile & Required Skills

The applicant should have a Master's or Engineering degree with a strong background in materials science, electronics, solid-state physics, or nanophysics, and a penchant for experimental work. The working language is English, and knowledge of French is not required, but would be appreciated.

Contacts

Please, send your CV, motivation letter, and transcripts by e-mail to:

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