PhD Thesis advertisement (Laboratoire Ampère - Lyon)

Thesis topics: Optimization of technological steps for the fabrication of a Ga_2O_3 field-effect transistor.

Scientific Context:
Gallium oxide (Ga_2O_3) is a wide-bandgap semiconductor offering exceptional physical properties necessary for high-voltage and high-current devices. The Institute of Nanotechnologies of Lyon (INL) has been conducting in-depth research on the physical characterization of this material for several years, and its current quality paves the way for the development of high-performance power components.
A thesis is currently underway between the INL and the AMPERE laboratory, focusing on the design, fabrication, and characterization of Ga_2O_3 diodes. This project benefits from the expertise developed at the INL on the same material, as well as the know-how of the LN2, whose state-of-the-art cleanroom facilities enable advanced manufacturing processes. The LN2 plays a key role in optimizing manufacturing processes and fine characterization of devices. Additionally, the AMPERE laboratory's skills in the design and characterization of power components complement these technological assets.
On an international scale, similar initiatives are increasingly emerging in Europe, the United States, and Japan, aiming to exploit the potential of Ga_2O_3 for the development of next-generation electronic devices.

Goals / Purpose:

The objective of this thesis is to design, fabricate, and characterize a new vertical electronic component based on gallium oxide (Ga_2O_3) whose performance surpasses that achieved by other research groups. This work falls within the framework of optimizing wide-bandgap semiconductor devices, which hold significant potential for power applications, particularly at high temperatures. With its high bandgap, Ga_2O_3 is a very promising semiconductor material for the next generation of field-effect transistors.

Reasearch planning and Scientific approach:

1st Semester: Bibliographic research on materials and technology of Ga_2O_3 components, learning TCAD simulation and electrical characterization methods.
2nd Semester: Optimization of microfabrication technological steps and fabrication of test structures for electrical testing.
3rd Semester: Design of a Ga_2O_3-based component meeting the thesis objectives and optimization of the Ga_2O_3 heterojunction with another semiconductor material to be defined (e.g., NiOx).
4th Semester: Fabrication of a component ready for characterization.

5th Semester: Electrical (DLTS, C-V, I-V) and optical (micro-Raman, FTIR) characterizations, design feedback on the component.
6th semester: Writing the manuscript and defense

Candidates' Background:

Last year of Engineering school or Master 2 in Electronic, Semi-conductor Material, Micro-Nano Technology
Interesting, Stringent and Self-Contained.
Ability to summarize

Required Knowledge:

Physics of Semi-conductor, Device-physics, Electronic, Power Electronic

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Thesis location: Laboratoire Ampère, INSA de Lyon, Villeurbanne, France
L2N laboratory, University of Sherbrook, Sherbrook, Canada
Laboratoire INL, INSA de Lyon, Villeurbanne, France

Start Date: October 1st 2025

Provided documents by the candidate:

- CV
- Motivation Letter
- Academic Transcript

Send your candidature to: pierre.brosselard@insa-lyon.fr