Development of epitaxial Ga_2O_3 thin films for next generation power electronics

Detailed Topic

The demand for power electronic devices keeps increasing due to the rapid development of industries related to electricity, automotive and consumer electronics. In order to meet this demand, the use of wide bandgap semiconductors such as diamond, aluminum nitride or gallium oxide (Ga_2O_3) has emerged as a potential avenue for development. Among these materials, β-phase Ga_2O_3 has many advantages, such as an ultra-wide bandgap energy (4.6-4.9 eV), a particularly high breakdown voltage (≈ 8 MV/cm) as well as a high electron mobility (≈ 250 cm^2/Vs). In addition, the availability of large and reasonable-cost Ga_2O_3 substrates makes it possible to consider this semiconductor as building block for next-generation power devices.

The target of this internship is to develop the epitaxial growth of Ga_2O_3 thin films by pulsed liquid injection metalorganic chemical vapor deposition using a semi-industrial reactor, in which different chemicals as precursors will be explored. A wide range of morphological and structural characterization techniques will be used, including scanning and transmission electron microscopy, X-ray diffraction, and Raman spectroscopy, to finely assess and optimize the thin film growth mechanisms involved as well as the interface properties with the substrate. The optical and electrical properties of Ga_2O_3 thin films will be further characterized by optical absorption, Fourier Transform infrared spectroscopy, I-V, and photoconductivity measurements.

Location and duration

The candidate will work in the Materials and Physical Engineering Laboratory (LMGP), in the Nanomaterials and Advanced Heterostructures team (NanoMAT), as well as in Institut Néel, in the Wide Band Gap Semiconductor team (SC2G).

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

Internship duration: 6 months.

Internship allowance: ~550 €/month.

Profile & required skills

The applicant should be an Engineering School or Master 2 student in the fields of materials science and engineering and/or semiconductor physics. Specific skills for teamwork and oral and written English expression will be appreciated. We are looking for dynamic, highly motivated candidates, who are interested to pursue a PhD thesis.

Topic to be continued with a PhD thesis: Yes (funding already available).

Contacts

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