Wafer-scale integration of 2D materials for optoelectronic applications - PhD

Record number : OPR-1106

Overview

RESEARCH DIRECTION

Mathieu Massicotte, Professeur - Department of Electrical and Computer Engineering

INFORMATION

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ADMINISTRATIVE UNIT(S)

Faculté de génie
Département de génie électrique et de génie informatique
Département de génie mécanique
Institut interdisciplinaire d'innovation technologique (3IT)
Institut quantique

LEVEL(S)

3e cycle

LOCATION(S)

3IT - Institut interdisciplinaire d'innovation technologique
Institut Quantique Sherbrooke

Project Description

Two-dimensional (2D) materials, such as graphene, are a new class of one-atom-thick crystals with spectacular optical and electrical properties. The vast number of studies on these materials and the high performance of device demonstrators clearly demonstrate their potential for several applications, in particular in the field of photonics and electronics. One of the main hurdles to the development of technologies based on 2D materials is the lack of device manufacturing processes at large scale. The development of reliable production processes would unleash the potential of 2D materials for a whole range of technologies.

Research project:
We are looking for a well-qualified and highly motivated student to develop new fabrication processes to integrate 2D materials into high-performance devices at the wafer-scale. Building on the expertise and facilities available at Université de Sherbrooke, one of the main goals of the PhD project is to develop a scalable and industry-compatible process to perform the damage-free transfer of 2D materials onto various substrates. The project also aims to improve the micro/nanofabrication steps (lithography, etching, encapsulating, etc.) required to integrate the transferred 2D material into high-performance optoelectronic devices. In collaboration with academic and industrial partners (Teledyne-DALSA), the resulting devices will be characterized and put to use in various proof-of-concept technologies, including quantum simulators and photonic integrated circuits.

Research environment:
The PhD student will be supervised by Prof. Mathieu Massicotte from the Department of Electrical and Computer Engineering of Université de Sherbrooke, and principal investigator of the Nano-Opto-Electro group (www.optonanoelectro.com). The work will be done mainly at the Interdisciplinary Institute for Technological Innovation (3IT) and the Institut Quantique (IQ) at the Université de Sherbrooke. 3IT is a unique institute in Canada, specializing in the research and development of innovative technologies for energy, electronics, robotics and health. It holds a state-of-the art cleanroom with a complete micro-nanofabrication infrastructure. IQ is a new research institute equipped with

cutting-edge research tools, that brings together world-renowned experts in quantum science and engineering. The PhD student will thus benefit from a highly interdisciplinary research environment that combines students, technicians and professors working together to develop the technologies of the future.

Candidate profile:
• Bachelor’s and/or Master’s degree in engineering, physics or material science
• Experience and skills in laboratory work.
• Background knowledge in material science and characterization, micro/nanofabrication and/or semiconductor physics.
• Excellent adaptability, autonomy, teamwork and problem solving skills.
• Assets: knowledge or experience in cleanroom environment, 2D materials, electrical and optoelectronic measurements.

To apply please send the following documents to one@usherbrooke.ca
• Curriculum Vitae.
• Transcript (Bachelor's and/or Master's degree).
• Cover letter emphasizing the relevance of your experience with the proposed subject.
• Letters of recommendation and/or contact details of 2 references.

Discipline(s) by sector

Sciences naturelles et génie

Génie électrique et génie électronique,
Génie mécanique

Funding offered

Yes

$ 25 000

Partner(s)

Teledyne DALSA

The last update was on 24 October 2025. The University reserves the right to modify its projects without notice.