(PhD/MSc) Bonding and transfer processes for membranes (W2W) and Ge dies (D2W) onto Si wafers for large-scale integration of SWIR devices

Record number : OPR-1336

Overview

RESEARCH DIRECTION

Serge Ecoffey, Professeur sous octroi de recherche - Department of Electrical and Computer Engineering

INFORMATION

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RESEARCH CO-DIRECTION

Amrid Amnache, Responsable de recherche - Department of Mechanical Engineering

INFORMATION

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ADMINISTRATIVE UNIT(S)

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

LEVEL(S)

2e cycle
3e cycle

LOCATION(S)

3IT - Institut interdisciplinaire d'innovation technologique

Project Description

Join 3IT – An Exceptional Innovation Environment
Are you eager to contribute to the future of groundbreaking technologies in materials and semiconductor engineering? Become part of the Umicore Research Chair team at the Interdisciplinary Institute for Technological Innovation (3IT). In collaboration with Umicore and Teledyne Dalsa, this research aims to advance knowledge in materials science and semiconductor engineering.
The chair's goal is to demonstrate the feasibility of manufacturing a high-performance short-wave infrared (SWIR) device on a large-diameter substrate and to enable the transfer of fabrication methods to industrial environments. The anticipated results could revolutionize the SWIR device industry, with potential applications in telecommunications, healthcare, and environmental monitoring.

Research Topic (PhD / MSc)
As part of this research chair, we are seeking exceptional and creative candidates at the PhD and MSc levels interested in wafer bonding technology.
The main objective of the project is to integrate a functional SWIR (short-wave infrared) device onto a 200 mm silicon (Si) substrate. Selected candidates will work closely to develop efficient and reliable methods for detaching and transferring germanium (Ge)-based device membranes, fabricated using the innovative PEELER process [1], onto a silicon wafer.
The research scope includes both die-to-wafer (D2W) and wafer-to-wafer (W2W) bonding approaches. Several strategies will be thoroughly investigated to ensure durability for subsequent processing steps while achieving optimal electrical isolation and thermal transfer properties—critical for the final device performance.

Candidate Profile

• Education: Bachelor’s degree for MSc applicants; Master’s degree for PhD applicants in relevant fields (materials engineering, electrical engineering, mechanical engineering, or related disciplines).
• Research Experience: Prior experience in semiconductor engineering is required for PhD candidates.
• General Skills: Proven ability to work effectively in a team while conducting independent research projects.
• Additional Asset: Experience in wafer bonding technology is an advantage.

Work Environment
Under the supervision of Professors Serge Ecoffey and Amrid Amnache, the research will primarily take place at 3IT, an exceptional setting combining scientific excellence, entrepreneurship, and innovation.

Application Process
Interested candidates are invited to submit their CV, a cover letter, academic transcripts, and contact information for two academic references. recrutement.3it.genie@usherbrooke.ca

More Information
https://www.usherbrooke.ca/3it/fr/actualites/nouvelles/details/51594

Reference
[1] N. Paupy et al., “Wafer-scale detachable monocrystalline germanium nanomembranes for the growth of III–V materials and substrate reuse,” Nanoscale Adv., vol. 5, no. 18, pp. 4696–4702, Sep. 2023, doi: 10.1039/D3NA00053B.

Discipline(s) by sector

Sciences naturelles et génie

Génie chimique, Génie électrique et génie électronique, Génie mécanique

Funding offered

Yes

Partner(s)

Teledyne DALSA, Umicore