

# (PhD/MSc) New Metallurgies for Low-Temperature Hybrid Bonding in Fan-Out Wafer Level Packaging

Record number : OPR-1343

## Overview

### RESEARCH DIRECTION

Dominique Drouin, Professeur -  
Department of Electrical and Computer  
Engineering

### INFORMATION

[dominique.drouin@usherbrooke.ca](mailto:dominique.drouin@usherbrooke.ca)

### 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

### Context:

Advanced packaging technologies are at the core of the microelectronics revolution and play a key role in areas such as artificial intelligence, aerospace, and high performance computing. Among these technologies, Fan Out Wafer Level Packaging (FOWLP) stands out for its high interconnection density and efficient use of space, enabling more compact and powerful systems.

Hybrid bonding, combining polymer dielectrics with metallic interconnections, is a crucial enabling step. However, copper based approaches face challenges related to oxidation and high processing temperatures. This PhD project proposes to explore alternative metallurgies for low temperature hybrid bonding, contributing to the development of future microelectronic technologies.

You will work in a collaborative and stimulating environment within 3IT and C2MI, two centers of excellence where researchers, students, and industry partners innovate together, offering unique opportunities for professional development and global impact.

### Topic:

This thesis aims to explore alternatives to copper for metallic bonding in polymer based hybrid bonding processes, in order to enable low temperature bonding for advanced packaging applications such as Fan Out Wafer Level Packaging (FOWLP).

The main tasks include:

1. Conducting a focused literature review on copper oxidation challenges and alternative metals suitable for low temperature bonding.
2. Developing and characterizing alternative metallurgies for interconnections, ensuring compatibility with the adhesive dielectric material and low electrical resistance.
3. Optimizing protection strategies for copper interconnections, such as barrier layers or coatings, to prevent oxidation and improve wettability.
4. Defining and optimizing die to wafer (D2W) bonding process conditions to achieve a reliable and high performance bonding interface.

5. Performing morphological, electrical, and mechanical characterizations to evaluate adhesion quality and interface robustness.

By the end of this thesis, the candidate will have established an innovative low temperature hybrid bonding process based on alternative metallurgies, contributing to advances in high density interconnection technologies for next generation microelectronic systems.

**Work Supervision:**

This PhD thesis will be supervised by Prof. Dominique Drouin as part of the IBM/NSERC Research Chair in Heterogeneous Multi Chip Integration for High Performance Computing. The doctoral research will be conducted at the 3IT (Université de Sherbrooke) and the C2MI (Bromont), two centers of excellence offering state of the art facilities and a unique collaborative environment. This setting fosters innovation, hands on cleanroom training, and active participation in industrial research projects, while promoting diversity and inclusion. The candidate will have the opportunity to work with multidisciplinary teams and to develop skills that are highly valued in both industry and advanced research.

**Desired Profile:**

- Required qualifications: Master’s degree in mechanical engineering, Nanotechnology, Materials Science, Chemistry or related field.
- Key skills: Microfabrication, surface characterization, and knowledge of metallurgy and polymers.
- Personal qualities: Autonomy, adaptability, strong teamwork skills, and a keen interest in experimental research and innovation.
- Assets: Knowledge of integration processes and advanced microelectronic packaging.
- Languages: Ability to communicate effectively in French or English, both orally and in writing.

Contact: [inpaqt@usherbrooke.ca](mailto:inpaqt@usherbrooke.ca)

Documents to provide: Cover letter, curriculum vitae, transcripts for the past two years, and contact information for 2 references.

<b>Discipline(s) by sector</b>	<b>Funding offered</b>	<b>Partner(s)</b>
<b>Sciences naturelles et génie</b> Génie chimique, Génie électrique et génie électronique, Génie mécanique	Yes Annual 30 000\$	IBM Canada Ltée.

The last update was on 15 January 2026. The University reserves the right to modify its projects without notice.