

DOCTORATE RECRUITMENT

Development of bio-based adhesives without formaldehyde emissions based on proteins: study of peptides

The wood-based composite panel industry is continually evolving and must constantly adapt to consumer needs and volatile organic compound (VOC) emissions regulations. Currently, the adhesives used in the manufacturing of these panels consist of synthetic resins and fossil-based materials, some of which, such as formaldehyde, are classified by the World Health Organization as carcinogenic to humans and animals.

In this project, we prioritize using renewable resources, particularly proteins derived from industrial by-products. Proteins, as natural polymers rich in diverse functional groups, can interact with wood through multiple physicochemical interactions. They prove to be promising raw materials for environmentally friendly adhesives, free from formaldehyde. However, their low moisture resistance is a major challenge in using protein-based adhesives for wood products. This project's envisioned strategy aims to enhance the entanglement of polypeptide chains. To achieve this, exposing reactive functional groups such as carboxyl, amino, hydroxyl, and sulfonamide groups is essential. Thus, treatment with soluble alkalis or enzymatic, etc., will be necessary to expose and disperse more amide functional groups, thereby maximizing adhesion to the wood surface. Several parameters will be investigated, including hydrophobic chain length, hydrophobicity, amino acid sequence, and chemical composition, which are important factors influencing adhesion. This project represents a significant step toward sustainable and innovative solutions in the wood-based composite panel industry.

The consortium Corepan-Bois is a joint initiative of a research team from Université Laval, Université de Québec en Abitibi Témiscamingue, SEREX and with industrial and government partners: FPInnovations, Produits forestiers Arbec, Sacopan, Tafisa, Uniboard, Conseil de l'industrie forestière du Québec, ministère des Ressources naturelles et des Forêts du Québec. The mission of the wood-based composite panel consortium is to contribute to the research and training of highly qualified personnel in three research areas: (1) raw materials, (2) innovative processes and adhesives and (3) products and markets.

This project is part of the "Innovative processes and adhesives" theme of the consortium. The candidate will collaborate with the research consortium partners and be part of the Center for Research on Renewable Materials (CRMR). The members of the CRMR form a multidisciplinary and dynamic team, working for the development of new solid wood products, wood-based composites, wood fiber or lignocellulosic fiber and value-added co-products.

Graduate program

Ph.D. in Wood and Bio-based Materials Engineering, Département des sciences du bois et de la forêt, Université Laval.

Research director

Véronic Landry, Université Laval.

Candidate profile

Master's degree (or equivalent) in chemistry, chemical, wood or material engineering, or other related fields.

Requirements

Eligibility for the Ph.D. program in Wood and Bio-based Materials Engineering at Université Laval.

Conditions

25 000\$ per year, paid as a scholarship. Duration of 3 years.

Starting date

September 2024 or according to the candidate's availability

To apply

Send your resume, cover letter, and transcript to: veronic.landry@sbf.ulaval.ca and ingrid.calvez@sbf.ulaval.ca

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