

Designing wood-bio-based adhesive interphases for enhancing the materials performance in sustainable veneer-based products

Summary

TalTech Laboratory of Wood Technology is offering PhD position to well-qualified individual to work on a PhD research project to design the wood-bio-based adhesive systems based on well-known and highly reproducible wood surfaces from different wood species with commercially available bio-based adhesive systems. TalTech has excellent facilities and staff for accomplishing this research. TalTech has a laboratory veneer peeling and plywood production line which allows controlling processing parameters to develop reproducible surfaces with a range of characteristics and for testing the surface properties and mechanical properties of the products. The individual assigned to this position will be enrolled to the doctoral study program "Chemical and Materials Technology" and part time employed as early-stage researcher by the Department of Materials and Environmental Technology.

Research field:	Chemical, materials and energy technology
Supervisors:	Prof. Dr. Jaan Kers Dr. Heikko Kallakas
Availability:	This position is available.
Offered by:	School of Engineering Department of Materials and Environmental Technology
Application deadline:	Applications are accepted between November 16, 2020 00:00 and December 16, 2020 23:59 (Europe/Zurich)

Description

Although work has been done on developing adhesives for wood bonding with higher bio-based content, almost no research has been made on understanding their impact on the adhesive-wood boundary. These deficiencies in knowledge and methods are the motivation to conduct this study for better understanding the influence of veneer production process parameters to the surface quality and its effect on bonding. Creation of a well-defined and reproducible surface will enable the study of the veneer surface interaction with adhesives and improvement in surface characterization methods for predicting the performance of wood-adhesive systems quality and enhance the development of sustainable veneer-based products from underutilized wood species. Although much work has been done on developing bio-based adhesives, almost no research has been on understanding their weaknesses, especially at the adhesive-wood boundary.

Objectives and responsibilities:

1. To study the influence of the wood processing parameters (log soaking temperatures, drying temperatures to the veneer surface properties of different hardwood and softwood species.
2. To study how bio-based wood adhesives interact with the same surface of veneer substrate differently and thus the correlation of adhesive substrate interface properties with plywood product physical and mechanical properties.
3. Develop new and to improve existing testing and evaluation methods for veneer surfaces and of bonded products performance.
4. Use well defined and highly reproducible wood surfaces to improve the understanding of adhesive performance and accelerate the implementation of new environmentally friendly bio-based resins.

Tasks:

1. Review the existing knowledge in the field of bio-based adhesive systems
2. Preparation and execution of a research plan
3. Design the process parameters to obtain highly reproducible wood surfaces with known properties
4. Design the of wood-bio-based adhesive interphases and develop testing methods



Qualifications

The applicants should fulfil the following requirements:

- Master's degree in the field of wood technology, wood science, wood chemistry, materials technology or polymer technology
- Excellent communication skills (written and spoken) in English
- Deep knowledge in the field of wood technology and adhesives bonding of wood materials



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