

# Novel green methods for the pretreatment and characterization of lignocellulosic biomass and products

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## Summary

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*This PhD study contributes to the development of novel green fractionation technologies for the extraction of lignin and cellulose from different kinds of biomass. The project focuses on the development of reliable analytical methods for the qualitative and quantitative assessment of feedstock, fractionation products and new materials.*

Research field:	Chemistry and Biotechnology
Supervisors:	Tiit Lukk Maria Kulp
Availability:	This position is available.
Offered by:	School of Science Department of Chemistry and Biotechnology
Application deadline:	Applications are accepted between May 03, 2021 00:00 and May 31, 2021 23:59 (Europe/Zurich)

## Description

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Lignocellulosic biomass is a ubiquitous feedstock with considerable potential for the production of biofuels and chemicals. Efficient pretreatment methods destroy the supramolecular structures within lignocellulose matrix and disrupt the linkage between carbohydrates and lignin. Traditional methods, which influence the processing equipment and environment negatively (corrosion/toxicity) are some of the motivating factors behind the search for greener and more sustainable lignocellulose pretreatment technologies. Contemporary analytical chemistry acting at the interplay between composition and structure on one side and properties and functionality of complex materials on the other are able to provide detailed descriptions of the chemical constitution of complex and often highly heterogeneous objects, which are crucial for the evaluation of fractionation processes' efficiency and quality of obtained products.

The aims of the project are (1) to develop and apply green methods for separation of cellulose and lignin from bleached chemi-thermomechanical aspen pulp (BCTMP) and wood-processing industry waste products, and (2) to develop and apply different analytical methods (HPLC/MS, GC/MS, SEC, capillary electrophoresis, FTIR, NMR), statistical design of experiments and chemometric approaches for processes and products characterization.

### **Responsibilities and tasks of the PhD student:**

- Devise strategies for biomass fractionation using deep eutectic solvents and organosolv/catalyst systems
- Develop analytical procedures for qualitative and quantitative characterization of biomass and products and process efficiency (classic and instrumental methods of analysis; FTIR, NMR, UV spectroscopy)
- Apply chemometric methods for analysis of multidimensional data (principal component analysis, hierarchical cluster analysis and/or partial least square)
- Carry out planning and optimization of experiments using different experimental design approaches (e.g. response surface modelling)

### **Applicants should fulfil the following requirements:**

- MSc degree in applied or analytical chemistry
- Previous experience in development and validation of analytical procedures
- Previous experience in quality assurance in chemical/instrumental analysis
- Experience in chemometrics is a plus
- Experience in chemistry of biopolymers is a plus

- Excellent communication skills in English (spoken and written) and a team working attitude



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