A biorefinery approach to the separation and application of the products of lignocellulose pyrolysis

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Operational Programme "Growth and Employment"
Activity 1.1.1.2 "Post-doctoral Research Aid"

Project progress over-view from January 1st 2021 to March 31th 2021

Implementation of WP1 continues: Comprehensive analysis of pyrolysis condensates obtained from lignocellulose.
Implementation of WP2 continues: Fractionation of pyrolysis condensates.

In accordance with the project plan, in the 3rd quarter at the Latvian State Institute of Wood Chemistry the 1st project work package is being continued. Validation protocols have been written for the following analytical methods: Quantitative determination of levoglucosan and cellobiosan with UHPLC-ELSD; Quantitative determination of selected furans and phenols with UHPLC-UV. The linearity, precision, recovery, LOQ and system suitability – capacity factor k', resolution R, repeatability of retention times and tailing T have been evaluated of the said methods in accordance with the general guidelines ("A guide to analytical method validation" *Waters*). All of the results fit the method criteria.

Within the 2nd work package of the project, a scientific article about the separation of catalytic lignocellulose pyrolysis by-products (aromatic compounds) from levoglucosenone distillation residues has been finished and submitted for publication. Work at the separation of the condensable products of pyrolysis is being continued, by investigating preparative liquid chromatography to separate various anhydrosugars obtained via fast pyrolysis. Separation of levoglucosan was the most effective by ligand exchange chromatography, giving a levoglucosan rich fraction with about 90 % purity. To increase the purity of levoglucosan, it is crystallised from ethanol. Other anhydrosugars are found at much lower concentrations in the pyrolysis condensates, so their separation is more complicated. These are – cellobiosan and 1,6-anhydro-β-D-glucofuranose, which are only partly separated in column chromatography. However, by sacrificing product yield (<50%), it is possible to obtain 1,6-anhydro-β-D-glucofuranose with >80% purity. The purification of anhydrodisaccharides is more influenced by compounds belonging to other chemical classes, so other methods will be used, such as polishing with activated carbon.

Leading partner – Latvian State Institute of Wood Chemistry
Cooperation partner – Kaunas University of Technology, the Department of Food Science and Technology

Project duration: 36 months.

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