

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

Project contract No. 1.1.1.2/16/I/001

Project number: 1.1.1.2/VIAA/3/19/388

Operational Programme “Growth and Employment”

Activity 1.1.1.2 “Post-doctoral Research Aid”

Project progress over-view from January 1st 2022 to March 31st 2022

Implementation of WP1 “Comprehensive analysis of pyrolysis condensates obtained from lignocellulose”, WP2 “Fractionation of pyrolysis condensates”, and WP3 “Analysis of the pyrolysis product fractions and purification of specific chemicals” continues.

In the 7th quarter a scientific article “Discrimination of levoglucosan and its structural isomer in biomass pyrolysis products by iodometry, liquid chromatography, mass spectrometry”, which was prepared in cooperation with the partners at KTU, has been finished and submitted for publication. Abstracts for participation in two international conferences have been submitted to International Conference for Young Scientists on Biorefinery Technologies and Products 2022 and the 26th International Congress of Chemical and Process Engineering CHISA 2022.

During the mobility to InnoRenew Centre of Excellence in Izola, Slovenia normal phase FlashPrep chromatography was tried out to separate the anhydrosugar fraction obtained from a pyrolysis condensate. There was some separation of the sample into fractions with different polarity, but further analysis at LSIWC showed that levoglucosan and 1,6-anhydro- β -D-glucofuranose were not separated. Furthermore, during the mobility new contacts were established with the InnoRenew scientists. A co-authored manuscript was discussed, involving UHPLC-MS analysis carried out at the Liquid Chromatography Centre of LSIWC. In the fractions of pyrolysis products obtained at InnoRenew, furans and phenols were determined.

A sufficient amount of anhydrosugars (60% of condensate dry matter) have been separated for further valorisation: 1) crystallisation of high purity levoglucosan from ethanol; 2) determining different technical properties of levoglucosan; 3) testing the residual mixture of anhydrosugars by hydrolysis and fermentation in co-operation with KTU. Compared to anhydrosugars, the yield of the phenol fraction from solid phase extraction is quite low – only 10% of condensate dry matter, even with the optimal desorption solvent consisting of water, methanol and acetic acid. Therefore, other desorption parameters will be evaluated – the ratio of sample and solvent, temperature, intensity and time of stirring, etc.

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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Project beginning: 01.05.2020.

Report prepared: 31.03.2022.