Acetic acid from lignocellulosic biomass pretreatment

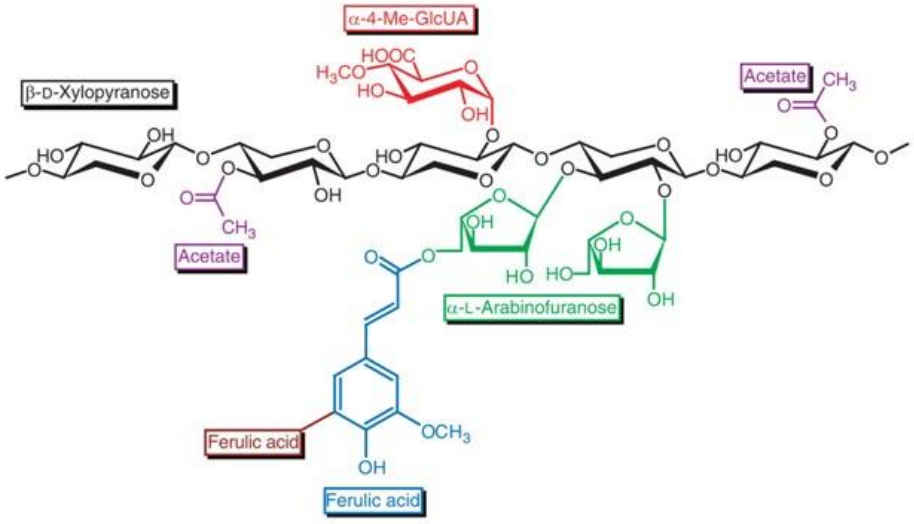
PhD candidate	Chema Jimenez Gutierrez
Supervisors/ Promotors	Dr. ir Adrie J.J. Straathof Prof. Luuk van der Wielen
Institute	Delft University of Technology, Department of Biotechnology, Bioprocess Engineering Section
Project Term	July 2016 – January 2021
Financed by	BE-Basic

Project Description

To recover fermentable sugars (mostly glucose) from lignocellulose biomass, the feedstock needs to be submitted to a pretreatment step. During pretreatment, a selective and effective separation of the main fractions present in lignocellulose biomass is of great interest, especially when fermentation processes will be subsequently performed, because the by-products formed during pretreatment may inhibit the microorganism performance during fermentation, affecting the sugars conversion to product. The great importance of the pretreatment step consists also in the fact that it makes the cellulose polymer more accessible for further conversion to fermentable sugars, which is usually done by using cellulase enzyme cocktails.

Lignocellulosic biomass can contain up to 5% acetate ester groups. Acetic acid is liberated during pretreatment. Conventionally, acetic acid is seen as nuisance and waste in later process steps. This project develops a pretreatment process such that pure acetic acid can be recovered. Such acetic acid might replace petrochemically produced acetic acid, which is an important base chemical.

Besides lab scale tests, pilot tests of biomass pretreatment have also been performed at the Bioprocess Pilot Facility.



PhD Thesis

J.M. Jimenez-Gutierrez, Pretreatment of lignocellulosic biomass for acetic acid co-valorization, PhD thesis, Delft University of Technology, 2023.
http://resolver.tudelft.nl/uuid:3c490160-41c0-404e-8df3-88bf417eb9eb

Publications

J.M. Jimenez-Gutierrez, L.A.M. van der Wielen, A.J.J. Straathof, Subcritical CO_2 shows no effect on liquid hot water pretreatment of poplar wood. Bioresour. Technol. Rep., 11, 2020, 100442. https://doi.org/10.1016/j.biteb.2020.100442

J.M. Jimenez-Gutierrez, R.A.J. Verlinden, P.C. van der Meer, L.A.M. van der Wielen, A.J.J. Straathof (2021) Liquid hot water pretreatment of lignocellulosic biomass at lab and pilot scale. Processes 9, 1518. https://doi.org/10.3390/pr9091518