

From fundamentals to valorization: Enzymatic oxidation of cellulosic fibres and underlying mechanisms

ForestValue programme final conference, 28.9.2022, Madrid, Spain

Project website: <https://www.nmbu.no/en/projects/node/38547>)

Project acronym: FunEnzFibres

Kaisa Marjamaa, VTT Technical Research Centre of Finland Ltd



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773324

Project partners

Consortium:

- VTT Technical Research Centre of Finland Ltd (coordinator)
 - PI Dean (Aalto University) Kristiina Kruus, Dr Kaisa Marjamaa, Dr Jenni Rahikainen, Dr Nina Aro, MSc Natalia Maiorova, Dr Matthieu Molinier, Dr Anu Koivula
- Norwegian University of Life Sciences (NMBU)
 - PI Prof Vincent Eijsink, Dr Aniko Varnai, MSc Fredrik Støpamo
- University of Natural Resources and Life Sciences (BOKU, Austria)
 - PI Prof Antje Potthast, Dr Irina Sulaeva, MSc David Budischowsky



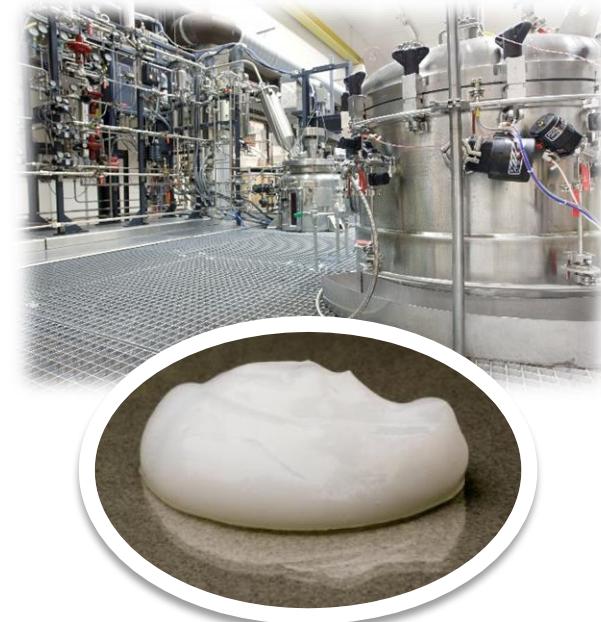
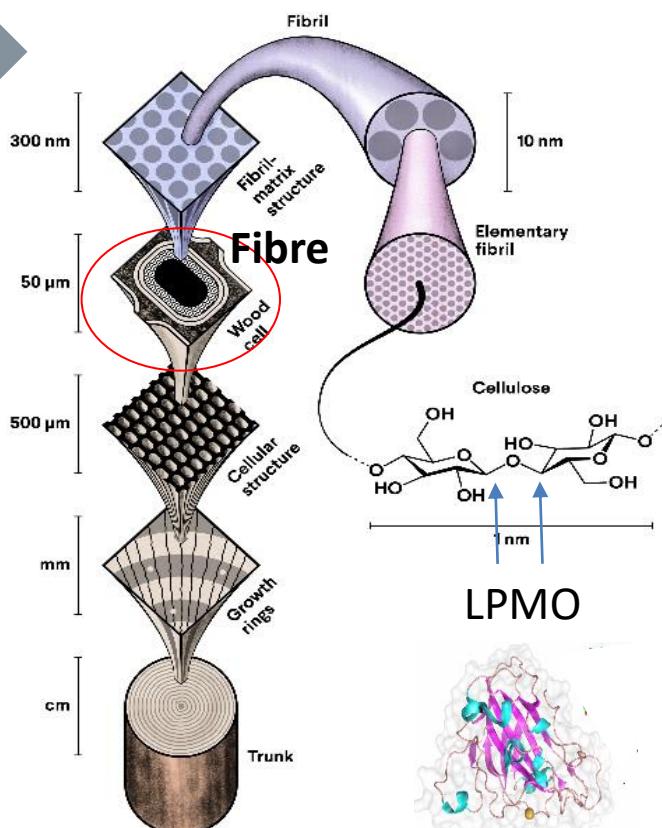
Industrial advisory board:

- MetsäFibre, Essity, UPM, Novozymes, Acticell

Budget & duration: 1 215 437 Eur, 1.2.2019-31.5.2022

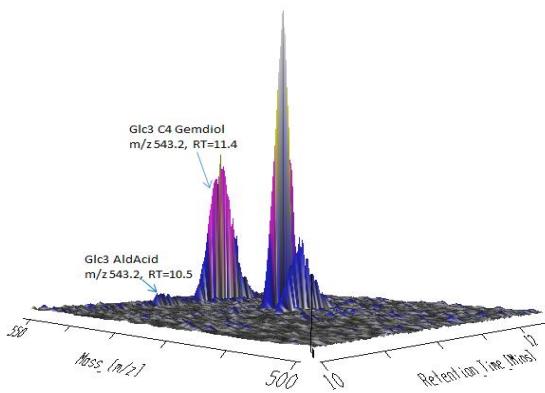


Introduction



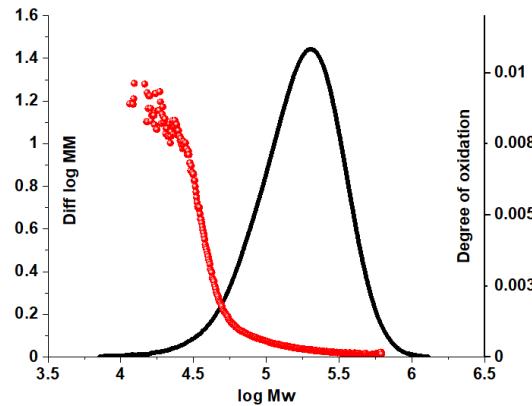
Development/adaptation of analytical tools

Analysis of soluble oxidation products



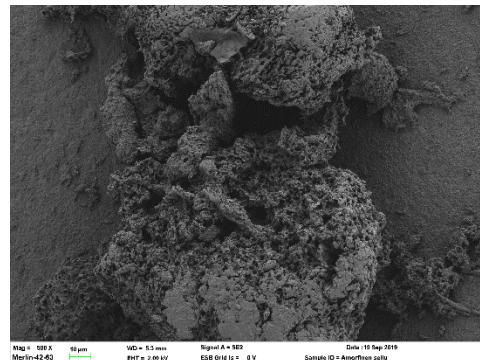
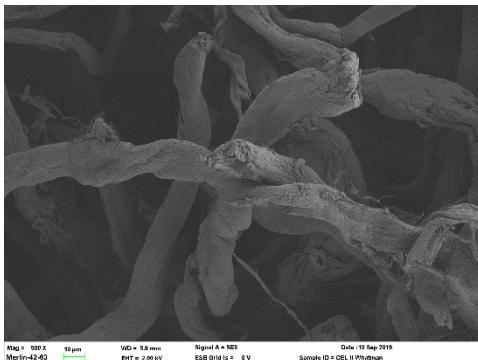
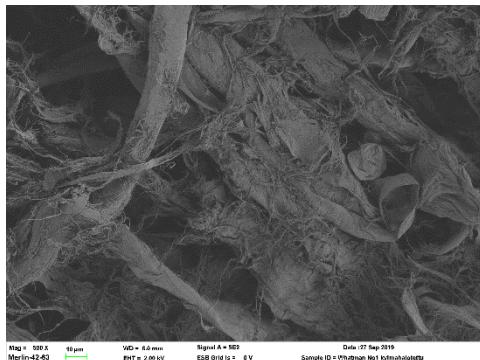
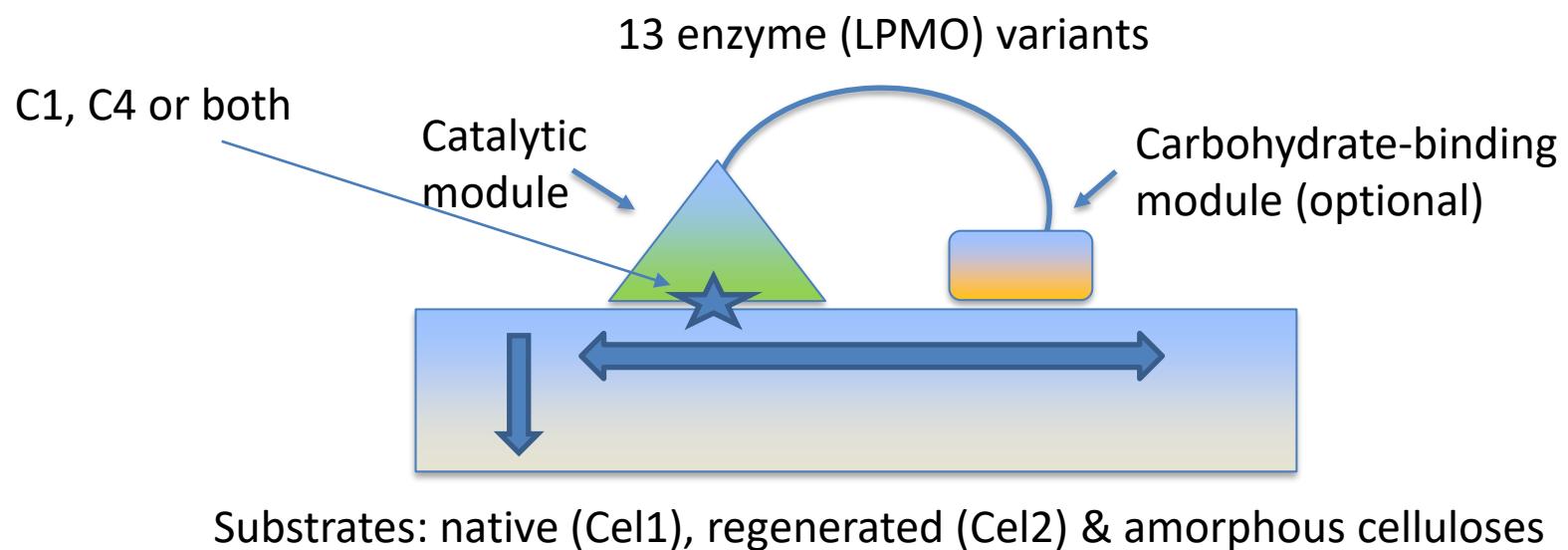
Marjamaa et al. (2022) Cellulose 29, 6021–6038.
<https://doi.org/10.1007/s10570-022-04648-w>

Analysis of oxidation products in fibres



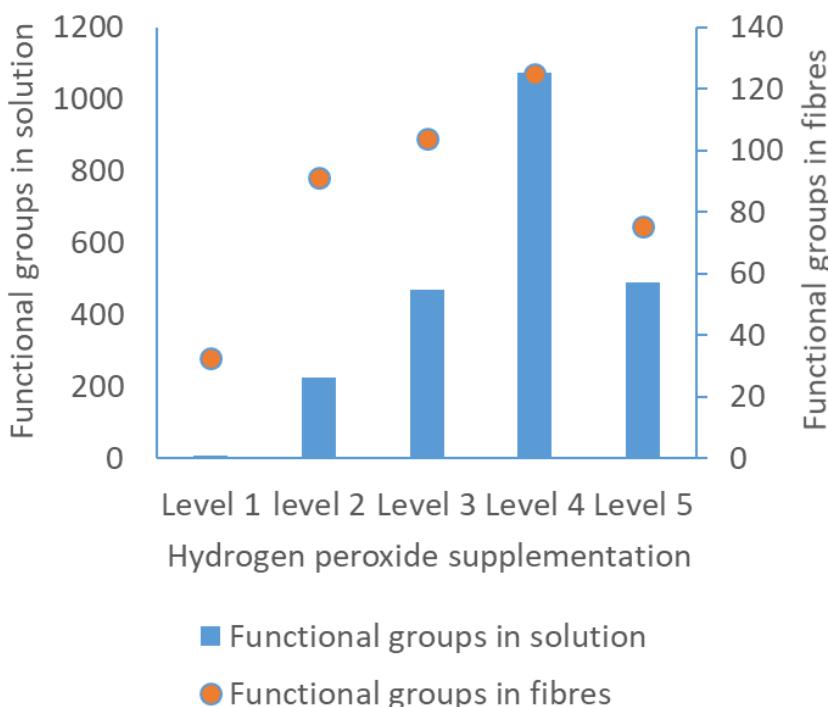
Sulaeva et al. (2021) <https://forestvalue.org/wp-content/uploads/2021/03/FunEnzFibres-stake-holder-oriented-article-2.pdf>
Sulaeva et al. (2022a) & (2022b) submitted/in preparation
Budischowsky et al. (2022) 295: 119860.
<https://doi.org/10.1016/j.carbpol.2022.119860>

Elucidation of fibre oxidation by the LPMO variants

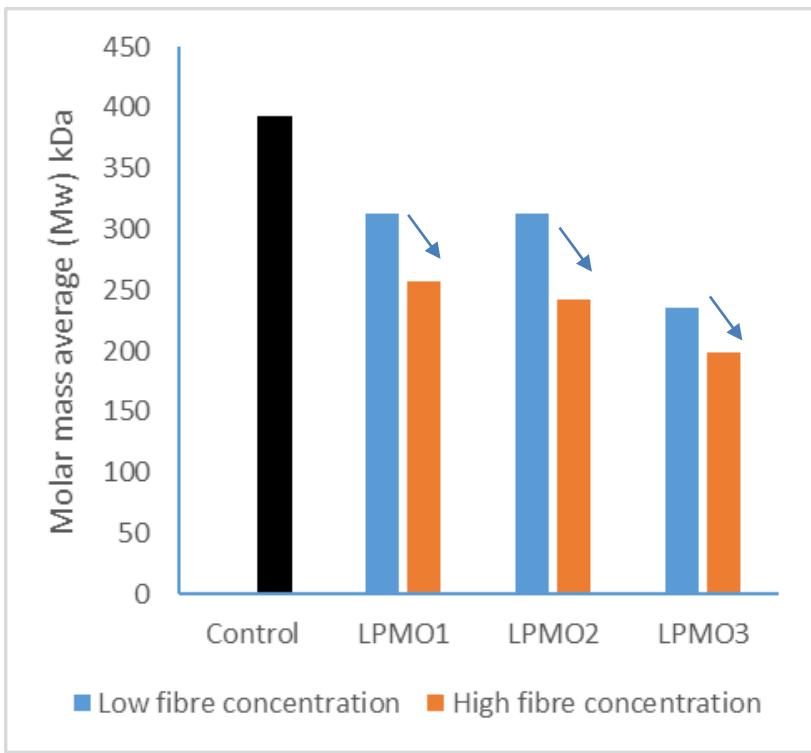


Elucidation of effects of reaction conditions

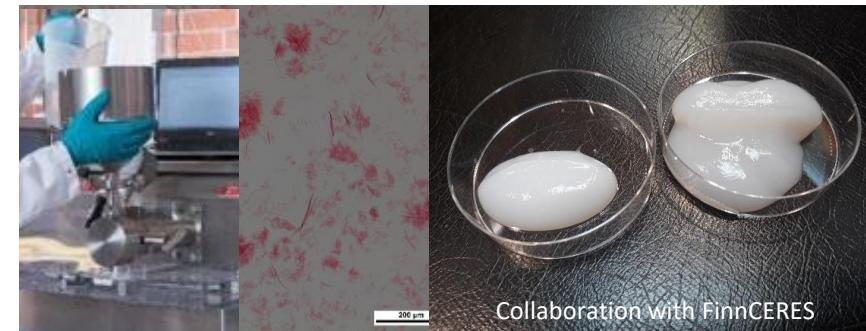
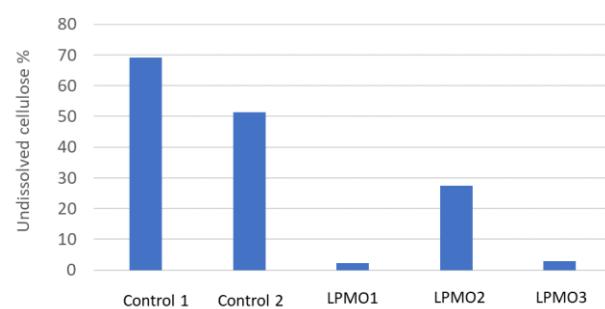
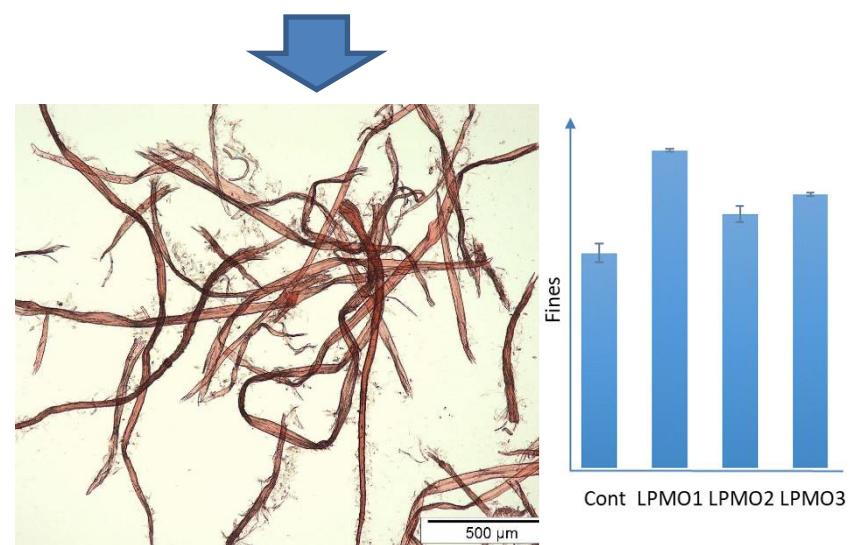
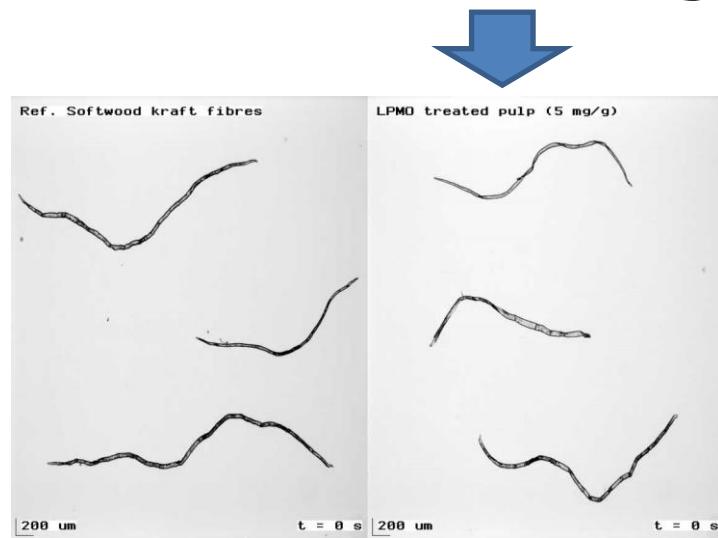
Fibre functionalization



Effect of fibre consistency



Enzymatic oxidation improved fibre solubility and fibrillation



Impacts

Communication (public):

Project websites: <https://www.nmbu.no/en/projects/node/38547> ;

<https://www.researchgate.net/project/From-fundamentals-to-valorization-Enzymatic-oxidation-of-cellulosic-fibres-and-underlying-mechanisms-FunEnzFibres>

Press release: <https://www.vttresearch.com/en/news-and-ideas/top-experts-austria-finland-and-norway-combine-forces-make-more-value-out-forests>

Stakeholder-oriented articles:

Aro et al. (2020) https://forestvalue.org/wp-content/uploads/2020/06/FunEnzFibres-stakeholder-oriented-article-1_FF.pdf

Sulaeva et al. (2021) <https://forestvalue.org/wp-content/uploads/2021/03/FunEnzFibres-stakeholder-oriented-article-2.pdf>

Scientific peer reviewed publications:

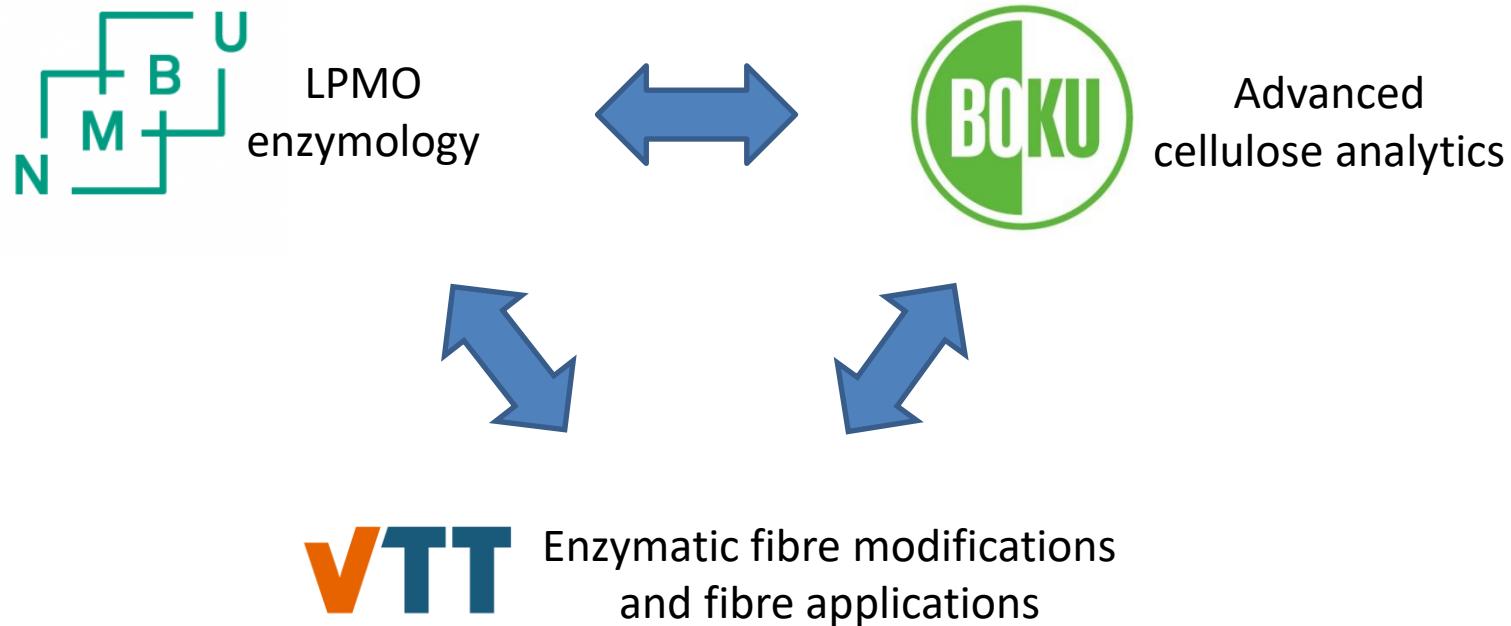
Published	Submitted	In preparation
4	1	6

Thesis: supported 2 PhD projects

Industry: 3 advisory board meetings & final advisory board seminar

Patent application: WO2019243673—'Improved fibre dissolution with enzymatic treatment'

The value of scientific cooperation



Eye-opening discussions (at least 4 times/year) & Smooth collaboration

In figures:

2 research visits, >100 samples exchanged, 6 joint publications in preparation

Thank you!

Dean Kristiina Kruus
kristiina.kruus@aalto.fi

Prof Vincent Eijsink
vincent.eijsink@nmbu.n

Prof Antje Potthast
antje.potthast@boku.ac.at

Dr Kaisa Marjamaa
kaisa.marjamaa@vtt.fi

ForestValue

Website: <https://forestvalue.org/>

Twitter: <https://twitter.com/ForestValue2017>

LinkedIn: <https://www.linkedin.com/groups/12110816/>