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Utilizing an LPMO from *Fusarium oxysporum* for the functionalization of lignocellulose-derived and bacterial nanocellulose

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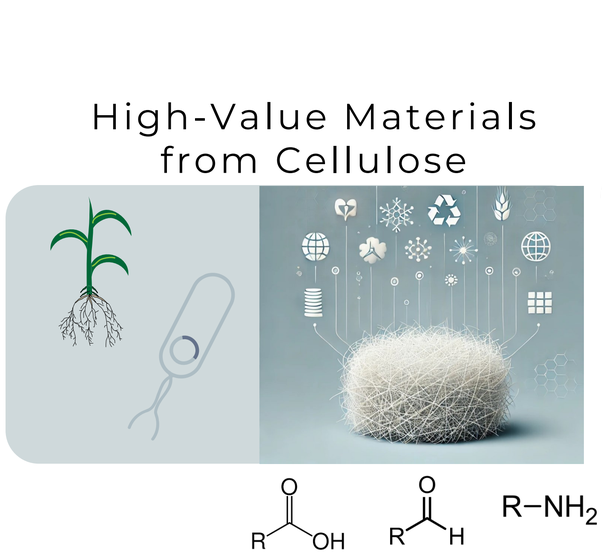
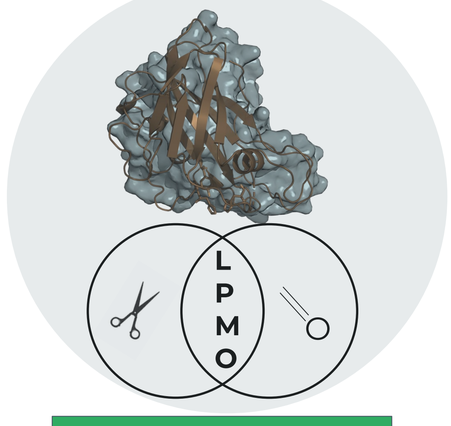
Introduction

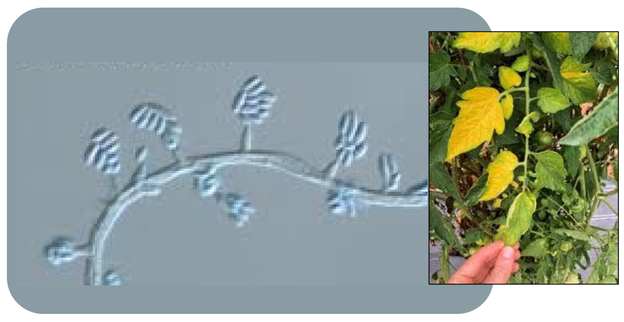
High-Value Materials from Cellulose



LPMOs in Lignocellulose Biomass Processing

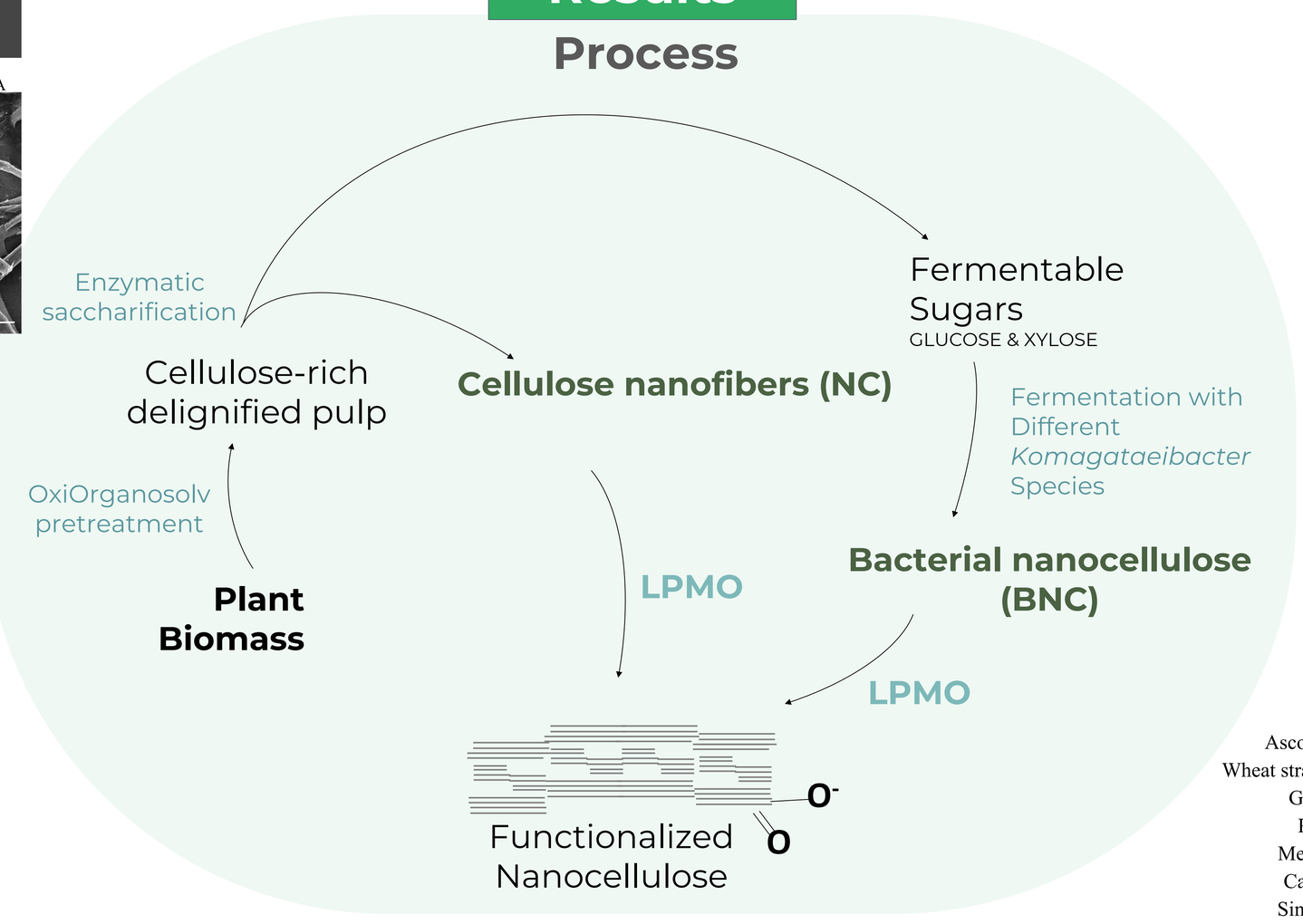


Fusarium oxysporum: A plant pathogen

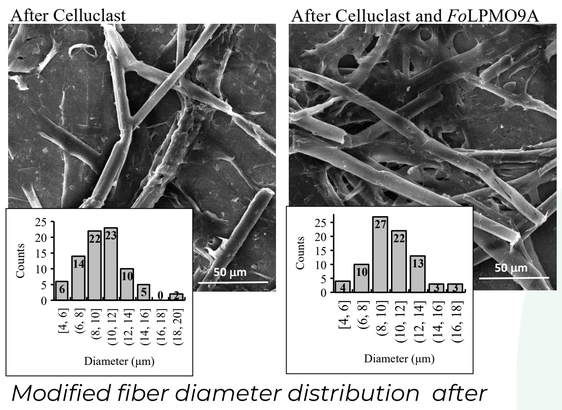


Results

Process

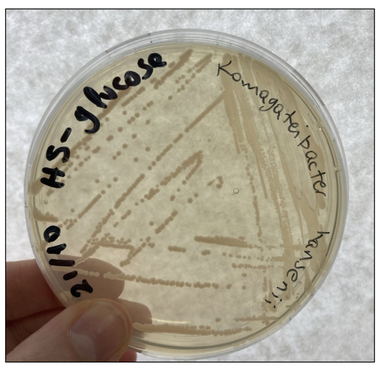


Wheat straw derived fibers



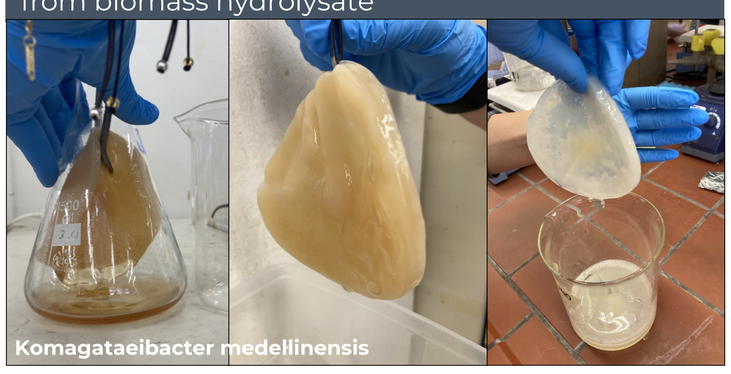
Modified fiber diameter distribution after LPMO treatment.

Bacteria used for the process



Komagataeibacter xylinus
Komagataeibacter hansenii
Komagataeibacter medellinensis

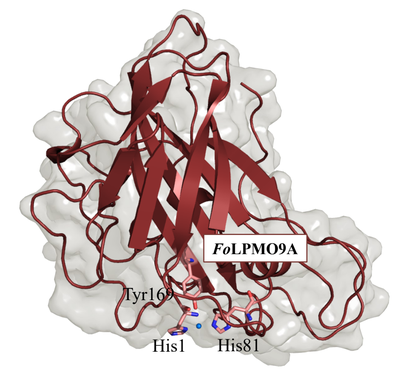
Bacterial nanocellulose from biomass hydrolysate



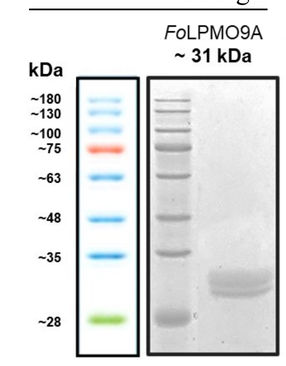
One month culture → **Retrieve Bacterial Nanocellulose** → **Wash biofilms**

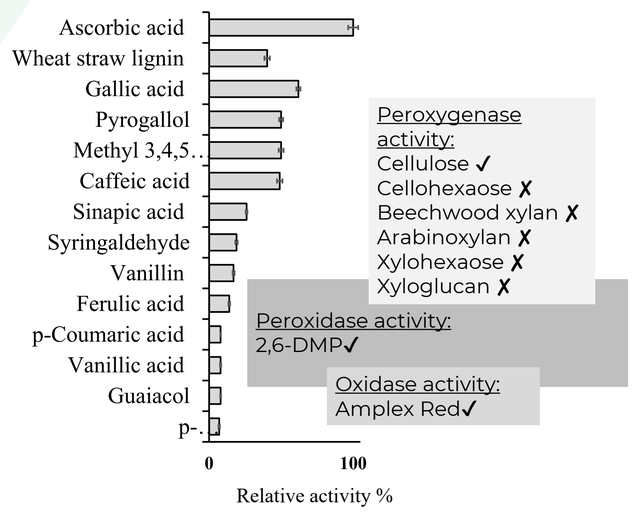
25 C, pH 6 | *Quantify yields* | *5% KOH*

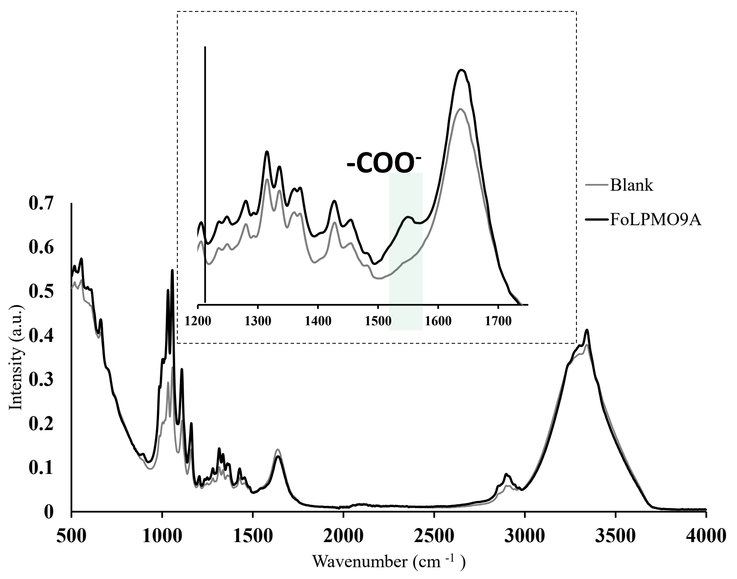
3D model



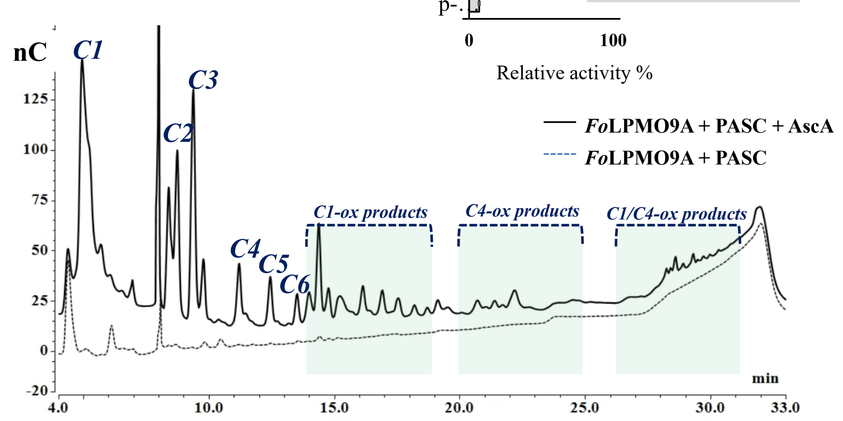
SDS gel







FTIR analysis of FoLPMO9A-oxidized cellulosic materials.



HPAE-PAD analysis of FoLPMO9A-oxidized cellulose.

Conclusions

- *Fo*LPMO9A was expressed and characterized, with low protein productivity observed.
- *Fo*LPMO9A shows C1/C4 regioselectivity on cellulose.
- *Fo*LPMO9A exhibits both peroxidase and oxidase activities.
- *Fo*LPMO9A can be effectively applied in the production of plant-derived functionalized cellulosic materials.
- *Fo*LPMO9A successfully oxidizes bacterial nanocellulose.

Future Directions

- Promote circular economy by optimizing lignin utilization in complex processes including LPMO-mediated nanocellulose functionalization.
- Incorporate hemicellulose liquid fraction-derived carbon sources, such as glucose, xylose, to feed nanocellulose-producing bacteria, leveraging their ability to utilize these substrates.
- Engineer *Fo*LPMO9A for improved stability and broader substrate specificity.

Acknowledgments

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