

FinnCERES Flagship

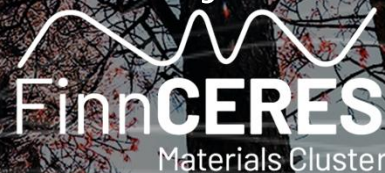
Competence Centre for the
Materials Bioeconomy

Tekla Tammelin

Sunrise Finland Stakeholders WorkShop

9th of December, 2019

Biocity, Turku



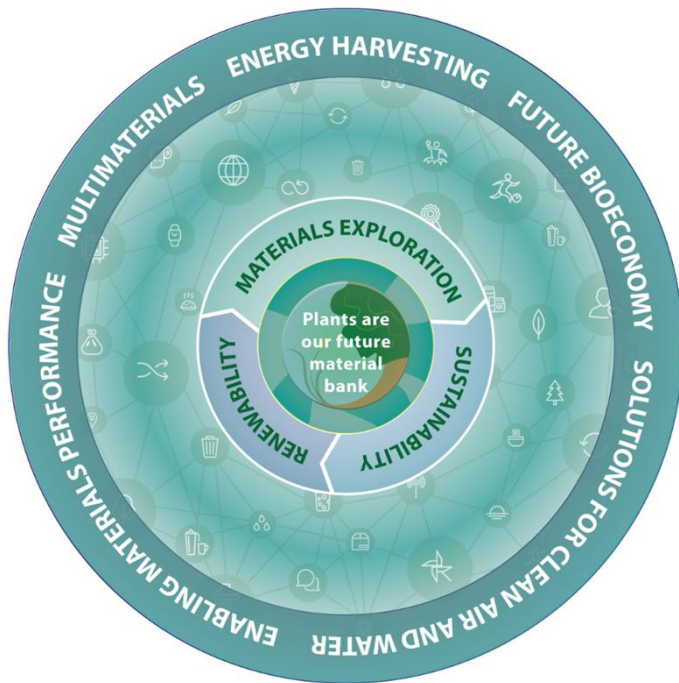
Global challenges

- *Over-reliance on fossil reserves*
- *Resource insufficiency*
- *Climate change*

Urgent need to transform the existing materials paradigm

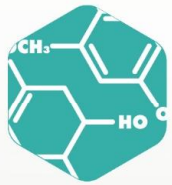


FinnCERES – competence center with ambitious impact target



- Urgent need to transform the existing materials paradigm
- From lignocellulose science to materials bioeconomy
- Joint competence center for the materials bioeconomy between Aalto University and VTT

We will exploit the inherent natural properties of lignocellulose to create new materials



COMPLEX
AND FUNCTIONAL

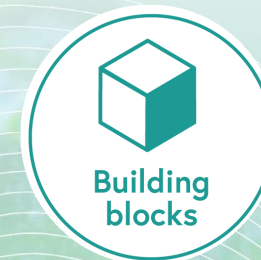
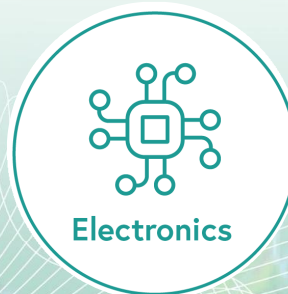


INTERACTIVE

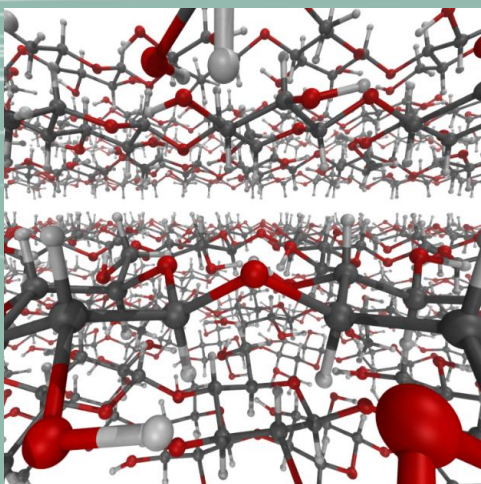


MULTISCALE
AND HIERARCHICAL

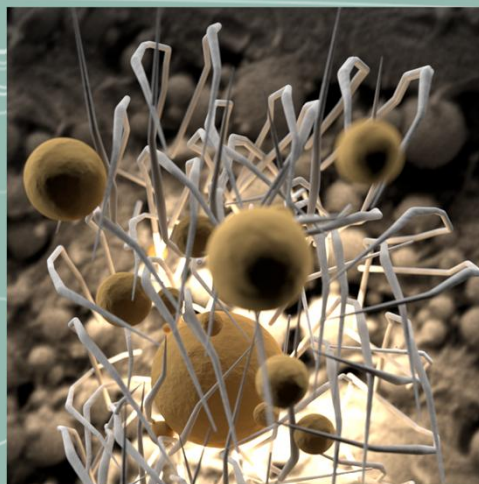
Super strong
Responsive
Chemical/thermal resistant
Modular and tunable
Biodegradable
Sustainable



Key research areas



Interactions and
modelling



Biomass fractionation
and modification



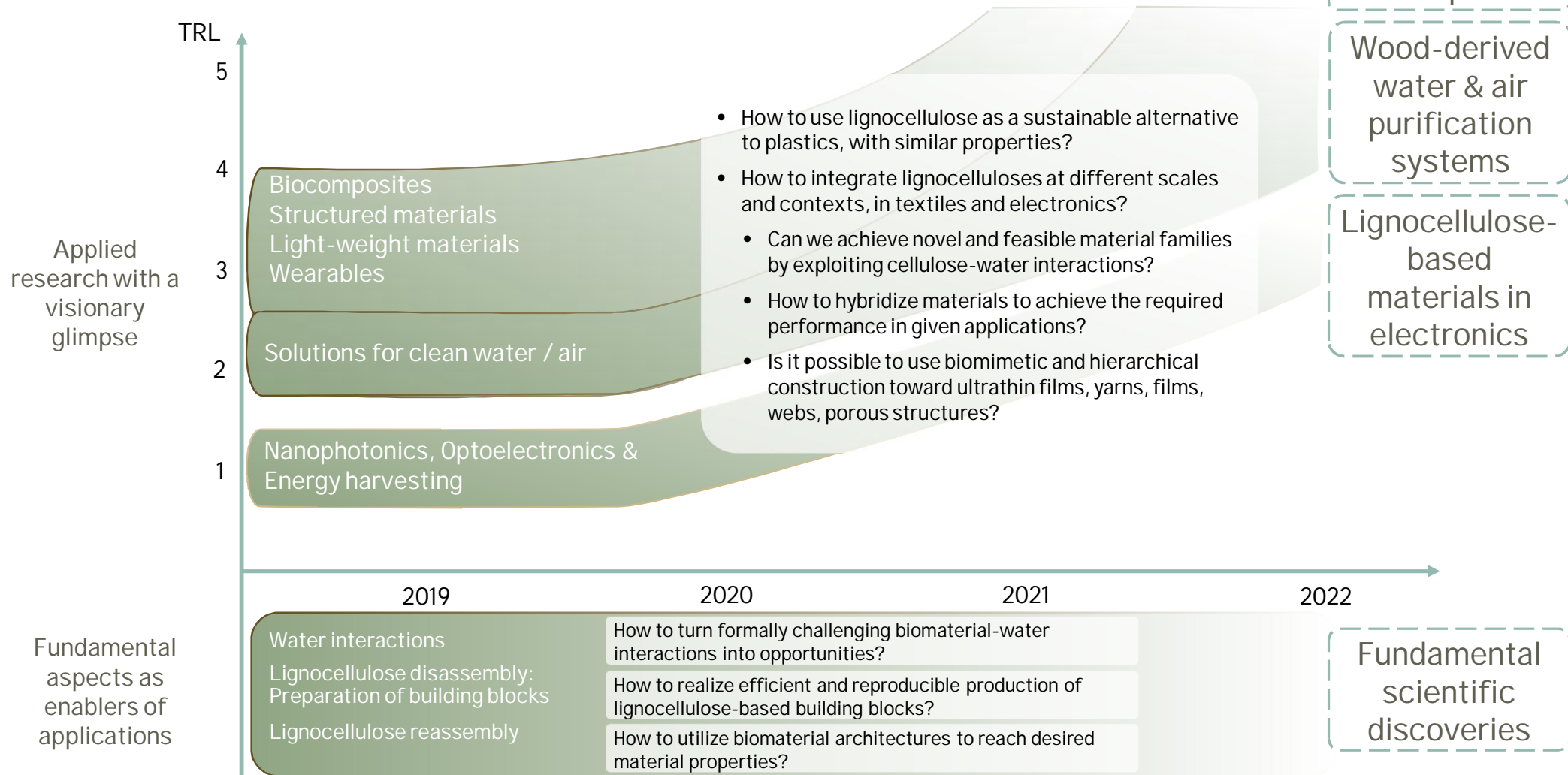
Structured materials



Advanced materials
and products

FinnCERES Scientific Roadmap

The scientific questions



FinnCERES Ecosystem

- Collaboration platform - one access gate to world-class knowledge and talents
- Company specific solutions and co-operation with FinnCERES experts
- Early announcement of research progress for its members
 - Networking with FinnCERES community and other ecosystem members
 - Influencing FinnCERES Flagship
 - Talent creation and knowhow

Project

Project

Project

Project

Project

Project

Project



FinnCERES Flagship

Joint competence center for the materials bioeconomy
between Aalto University and VTT

Funding by the Academy of Finland

Aim to develop new lignocellulose based materials and
applications with a solid scientific foundation

FinnCERES Collaborators



More information?

Scientific aspects



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Industry collaboration



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Practical matters



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NANOCELLULOSE
ARCHITECTURES AS
CHEMICAL CONVERSION
PLATFORMS

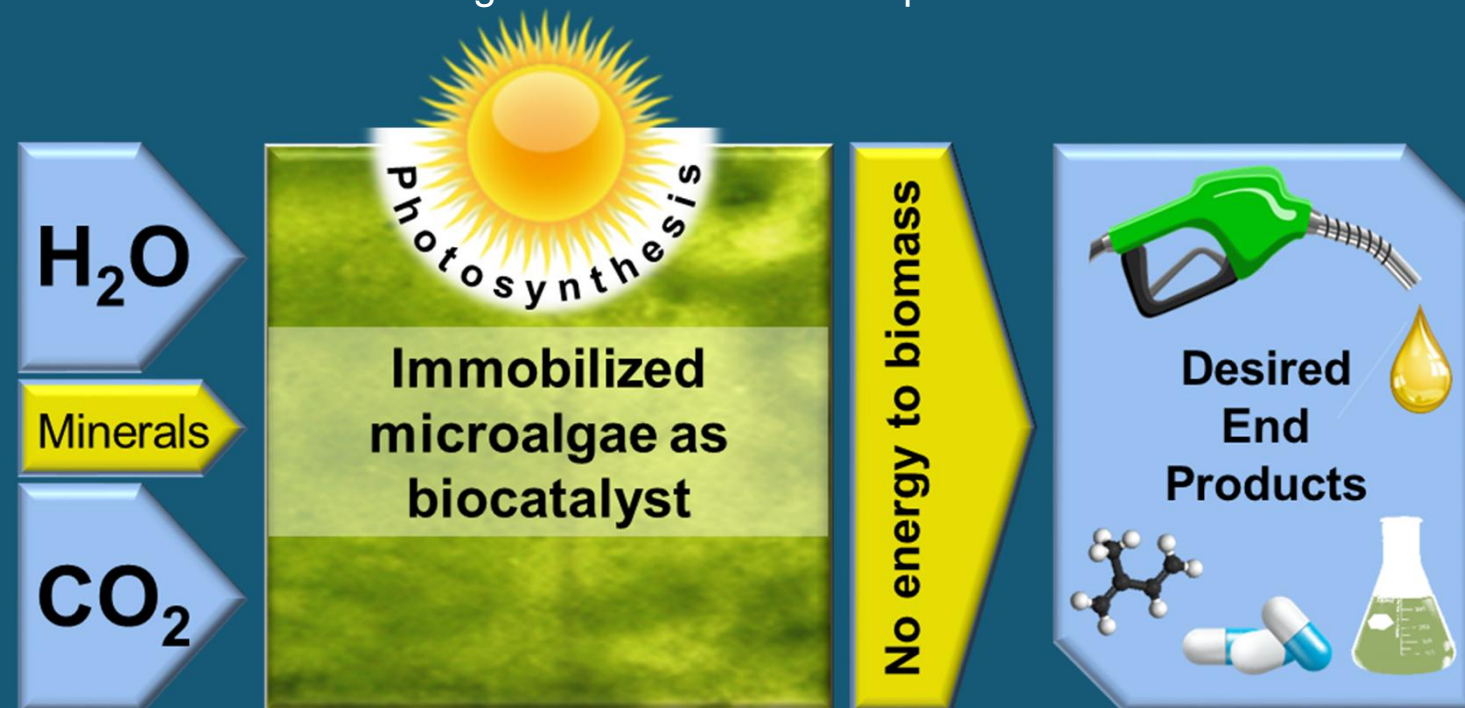
Chemicals production with immobilized microalgae



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Microalgae as a catalyst for directed biosynthesis of solar biofuels (H_2) and high-value chemical compounds



§ Immobilization of microalgae on transparent nanocellulose matrix

- Re-routes photosynthetic electron flow to biofuel production
- Restricts excessive biomass growth
- Increases light utilization efficiency

§ Advantages of nanocellulose:

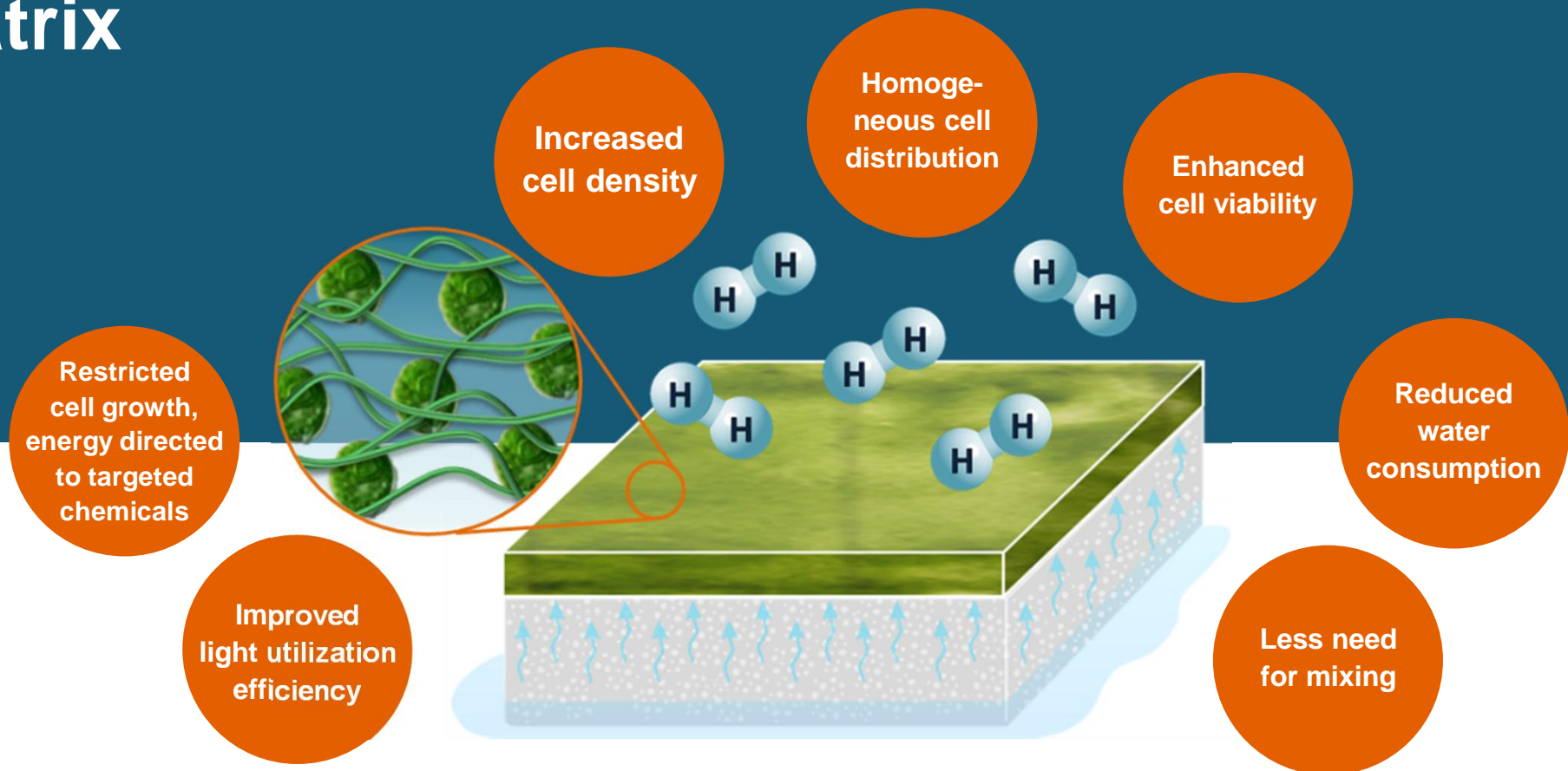
- Biocompatibility
- Transparency
- Mechanical stability
- Porosity for gas and vapour diffusion
- Water holding ability

Microalgae immobilized in transparent nanocellulose matrix



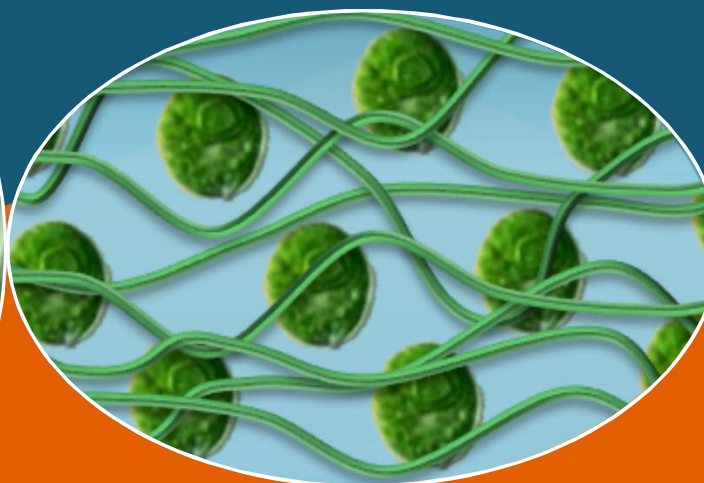
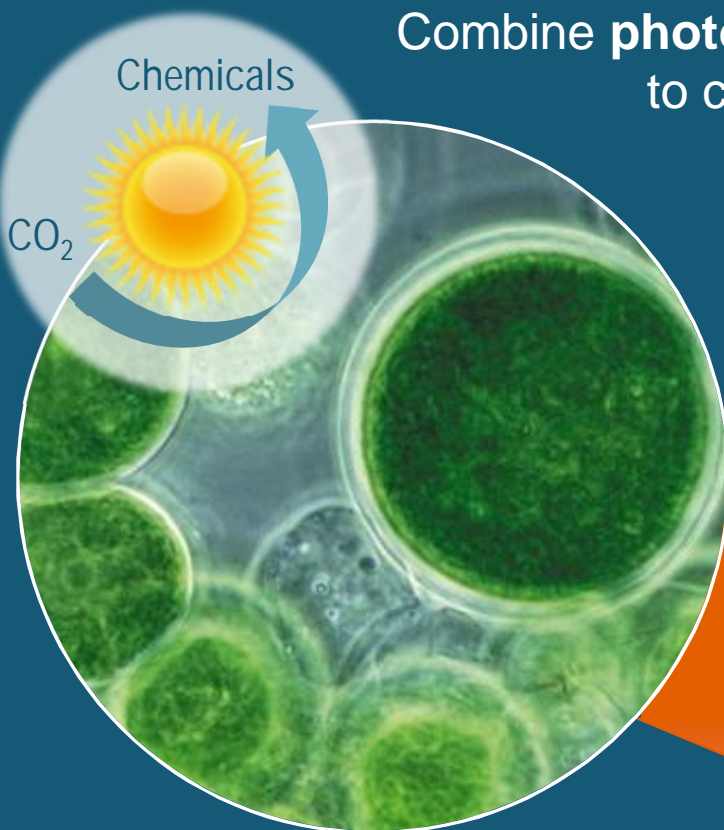
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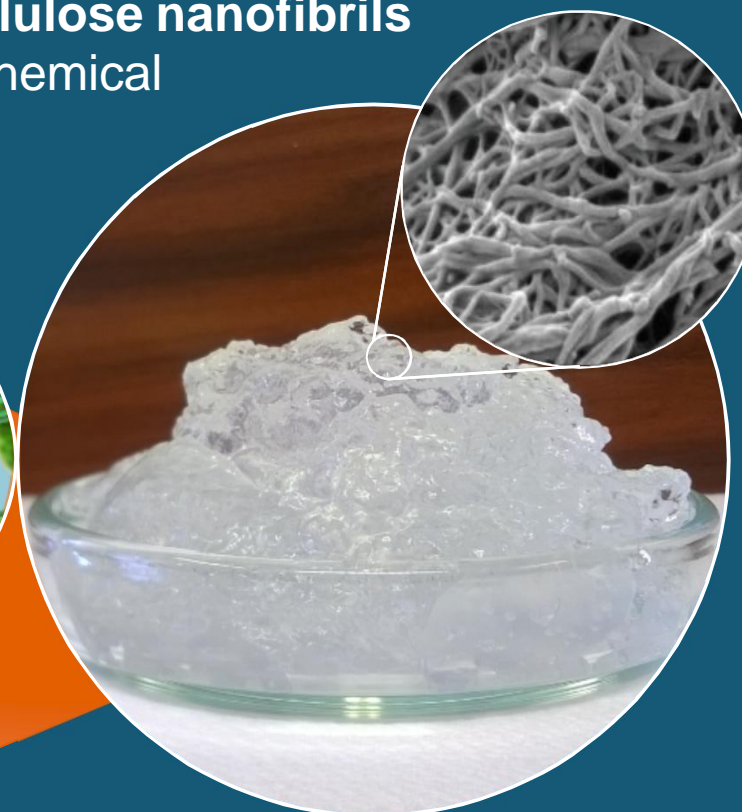




Combine **photosynthetic microalgae** and **cellulose nanofibrils**
to create bio-sourced energy and chemical
conversion platforms



Solid state cell factory via cell
immobilization

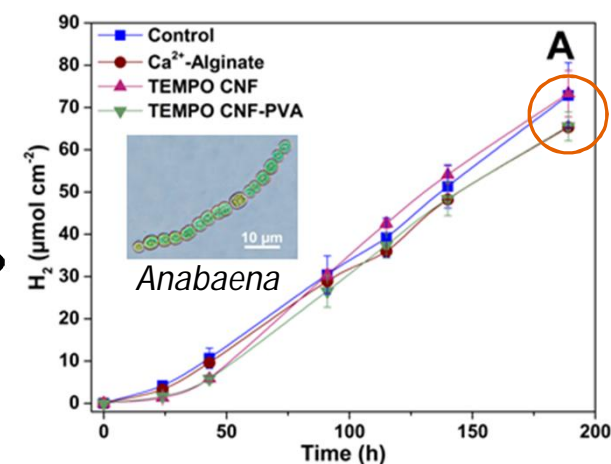
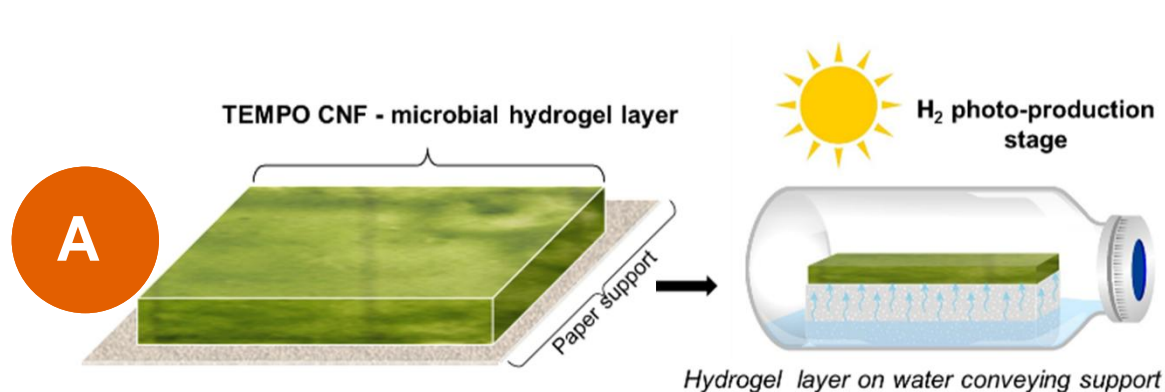


H₂ production capacity of entrapped cells

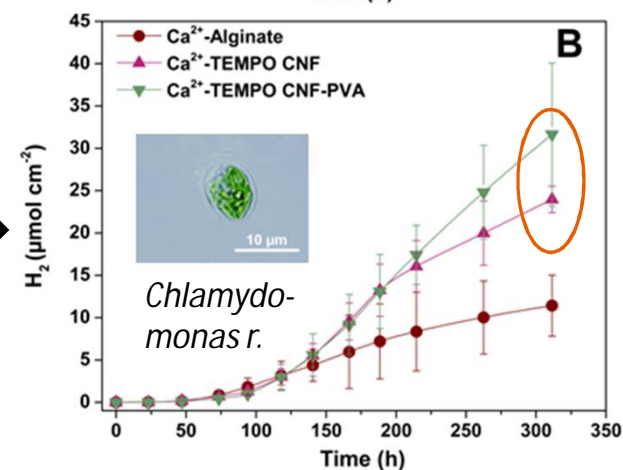
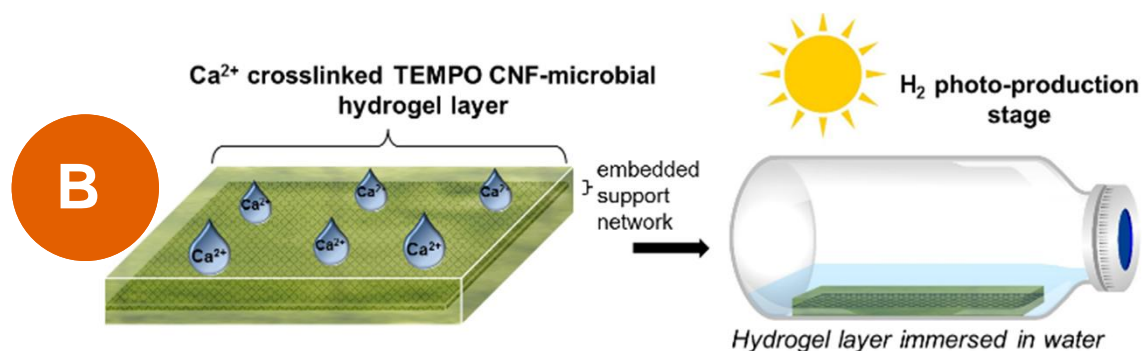


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Equal H₂
production
capacity



Improved
H₂
production
capacity

Acknowledgments



novo nordisk fonden

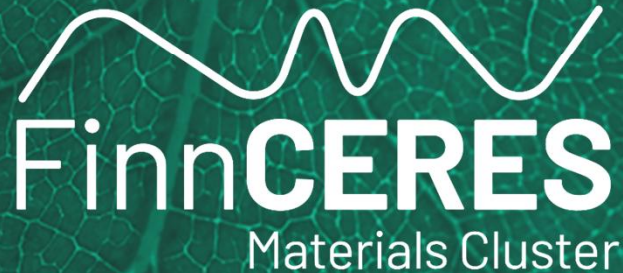


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Thank You for listening



We are part of the FinnCERES Flagship that develops novel lignocellulose-based materials to address the main challenges of our century including resource sufficiency and climate change.

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FLAGSHIP PROGRAMME