

INSPIRATION FROM NATURE: TAILORMADE CELLULOSE NANOFIBERS FOR SPECIFIC APPLICATIONS

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**Utilizing the natural
composition of industrial
bio-based residues for
efficient separation of
functional nanofibers**

**Targeted Means from
Strategic Funds B4E3-
TM-1-03**

Ended: Dec 31, 2021

Research interest

Can we utilize the natural composition of bio-residues to achieve nanofibers with functional properties?

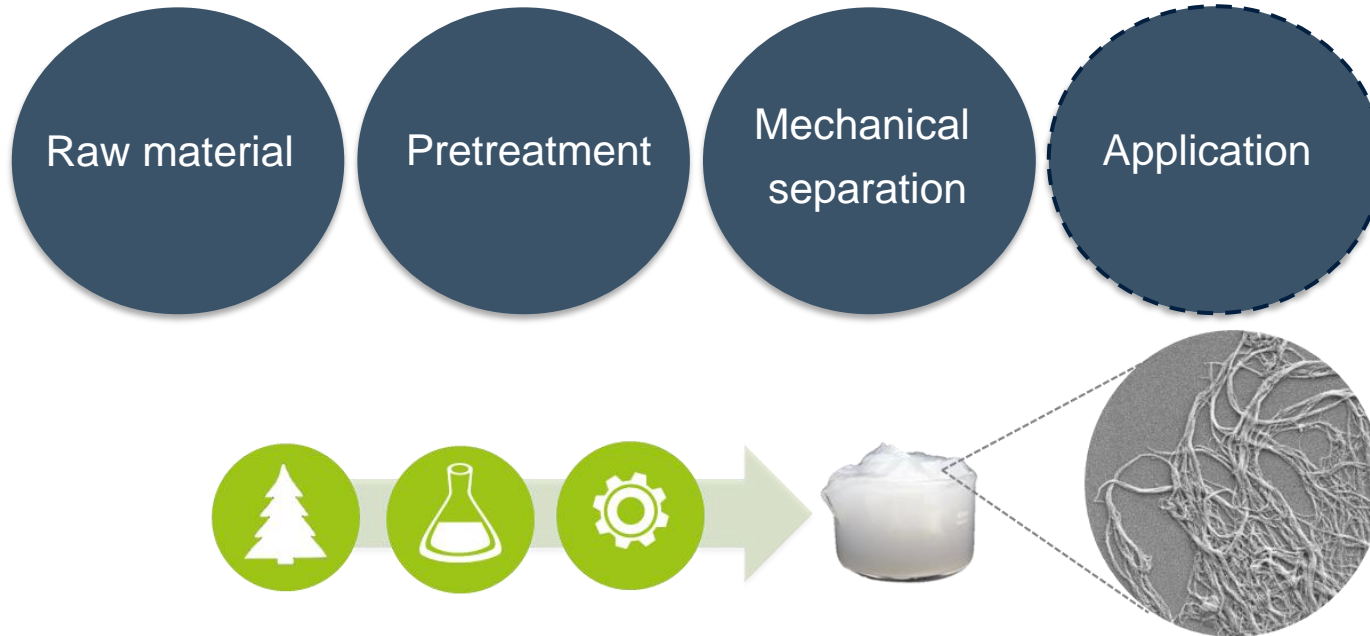


Resource efficiency

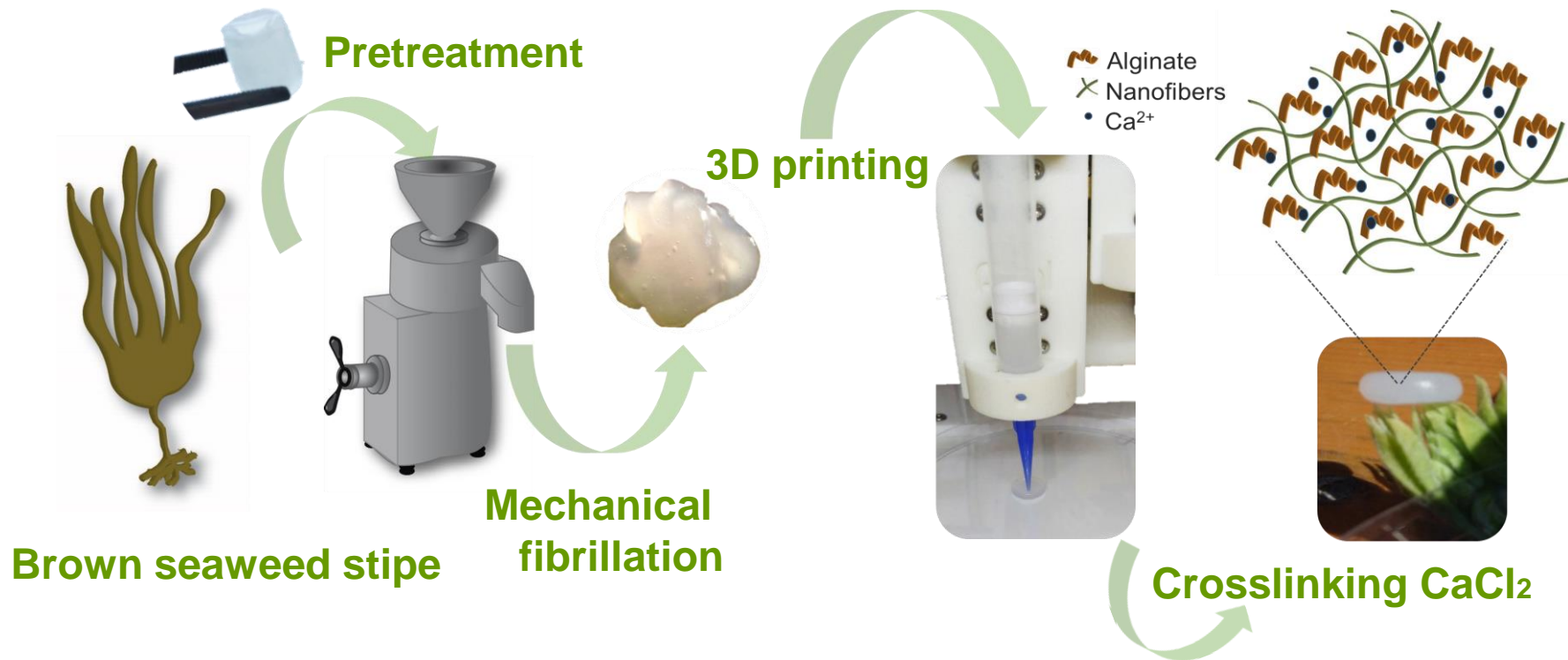


Biomimetic design for added
functionality

Main steps in production of nanofibers

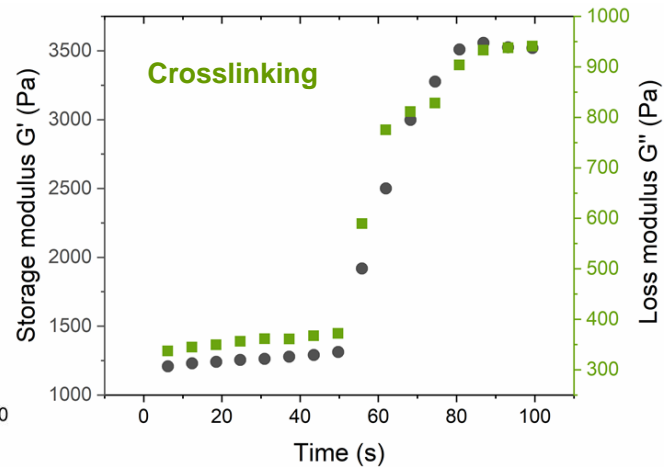
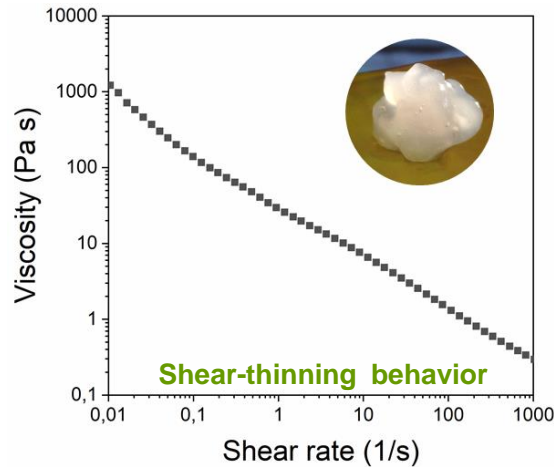
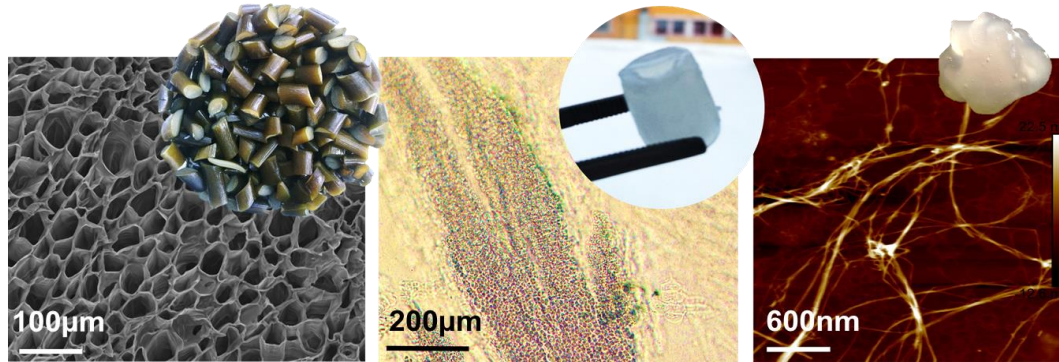


From seaweed to nanofiber hydrogel for biomedical applications



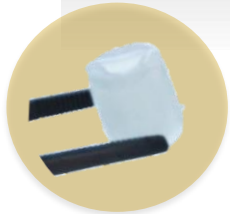
Berglund et al., ACS Appl. Bio Mater. 2020, 3

Seaweed nanofiber hydrogel behavior



Structure of seaweed stipe structure and nanofiber hydrogel

3D reconstruction after freeze-drying

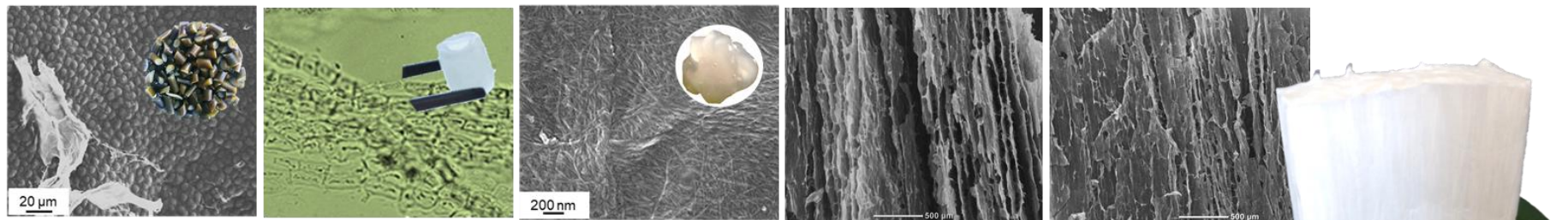


Natural seaweed-stipe
after purification



3D printed seaweed-
stipe nanostructure

Seaweed nanofiber aerogels for insulation applications



Raw material



Chemical
pretreatment



Mechanical
separation

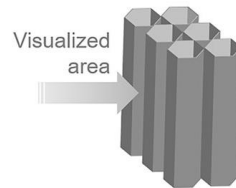
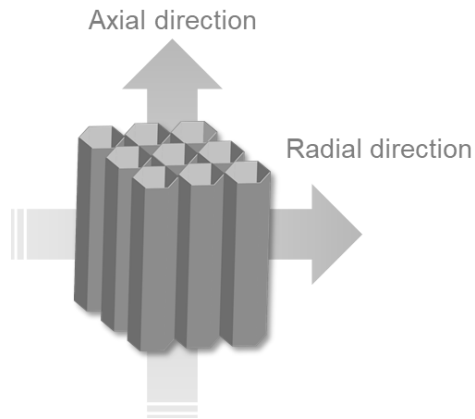


Ice-templating

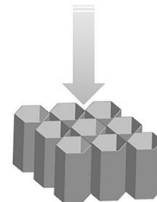


Crosslinking

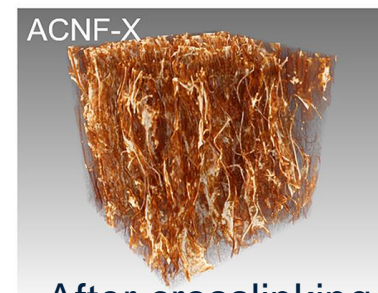
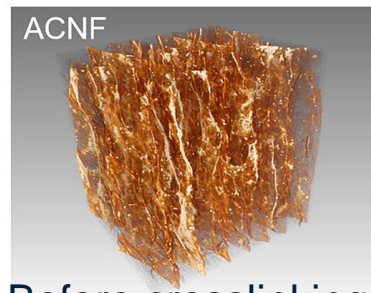
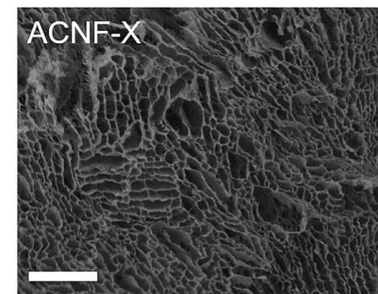
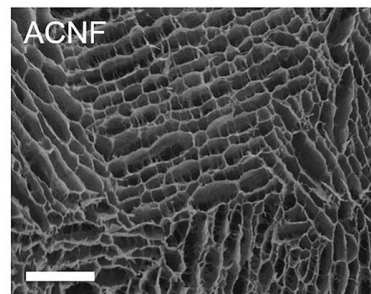
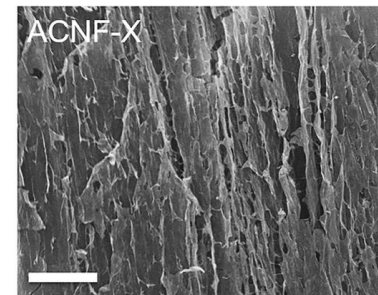
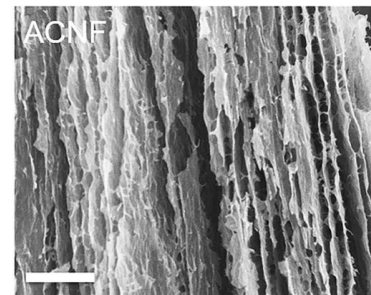
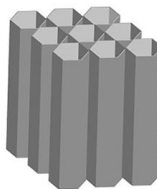




Visualized area



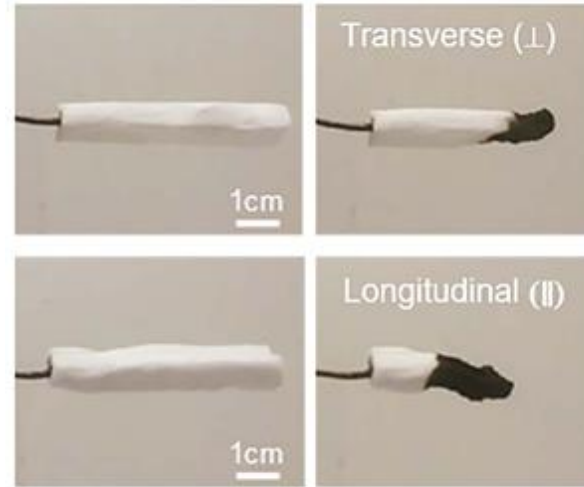
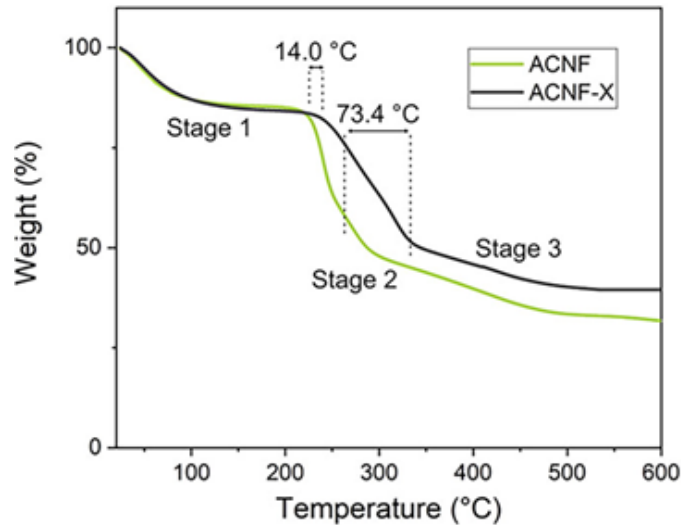
3D-reconstruction



Before crosslinking

After crosslinking

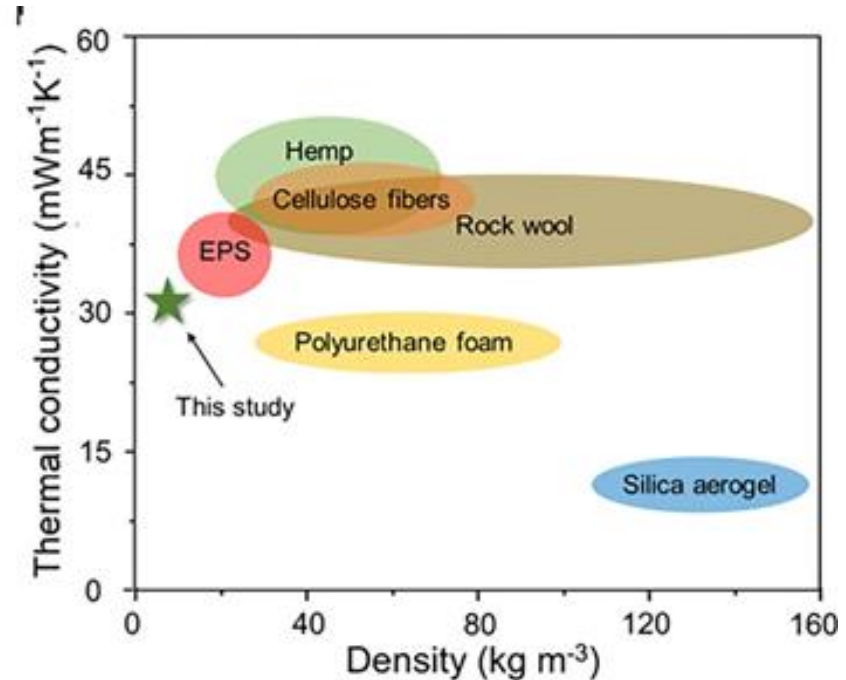
Seaweed nanofiber aerogels for insulation applications



- Thermal stability improved after crosslinking
- **Combustion velocity is affected by the alignment of nanofibers, aerogels are self-extinguished**

Seaweed nanofiber aerogel for insulation applications

- Thermal conductivity is low for both transverse and longitudinal testing directions and their also have very low density



**Targeted Means
from Strategic
Funds**

B4E3-TM-1-03

**Utilizing the natural composition of
industrial bio-based residues for
efficient separation of functional
nanofibers**

Targeted
Means from
Strategic
Funds

B4E collaborations

Industrial bioresidues

SLU, Shaojun Xiong
Department of
Forest Biomaterials
and Technology

1

2

3

LTU, Linn Berglund Wood and
Bionanocomposites

6

Developed bio-based
nanomaterials

5

LTU, Io Antonopoulou
Biochemical Process
Engineering

4

UmU, Ola Sundman and Carlos
Martín, Department of Chemistry





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UNIVERSITY
OF TECHNOLOGY

Tack så mycket.

Thank you for your attention.