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Title:
High Strength Nanostructured Chitin Membrane

Presentation Outline

- Introduction
- Preparation – mechanical disintegration

- Results and Discussion
  - Colloidal properties – Dynamic light scattering (DLS)
  - Stress-strain behaviour
  - Scanning Electron Microscope (SEM) - microstructure
  - Fractured properties – SEM and XRD results

- Conclusion –Summary

Introduction - Chitin sources

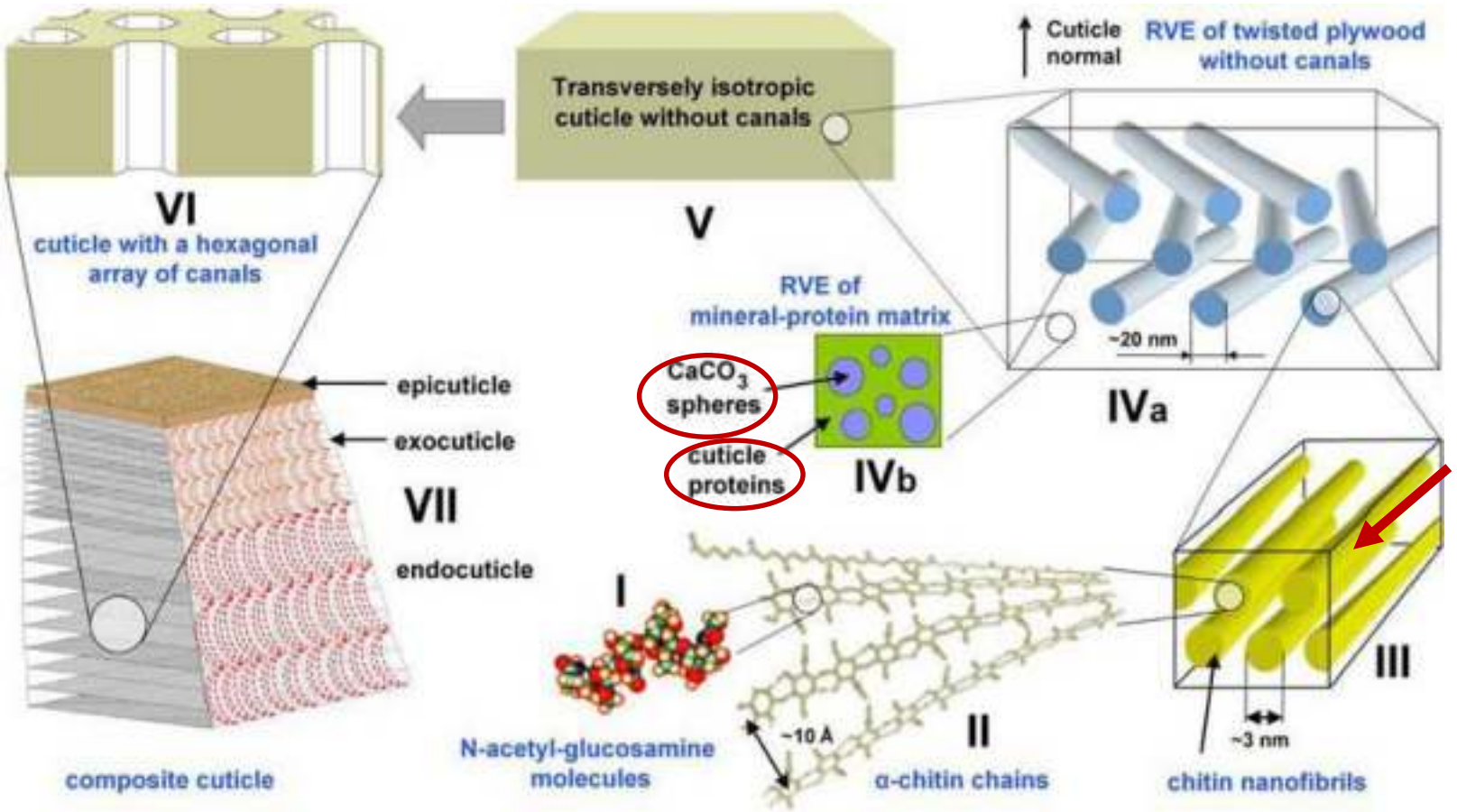
Shrimp

Crab

Lobster

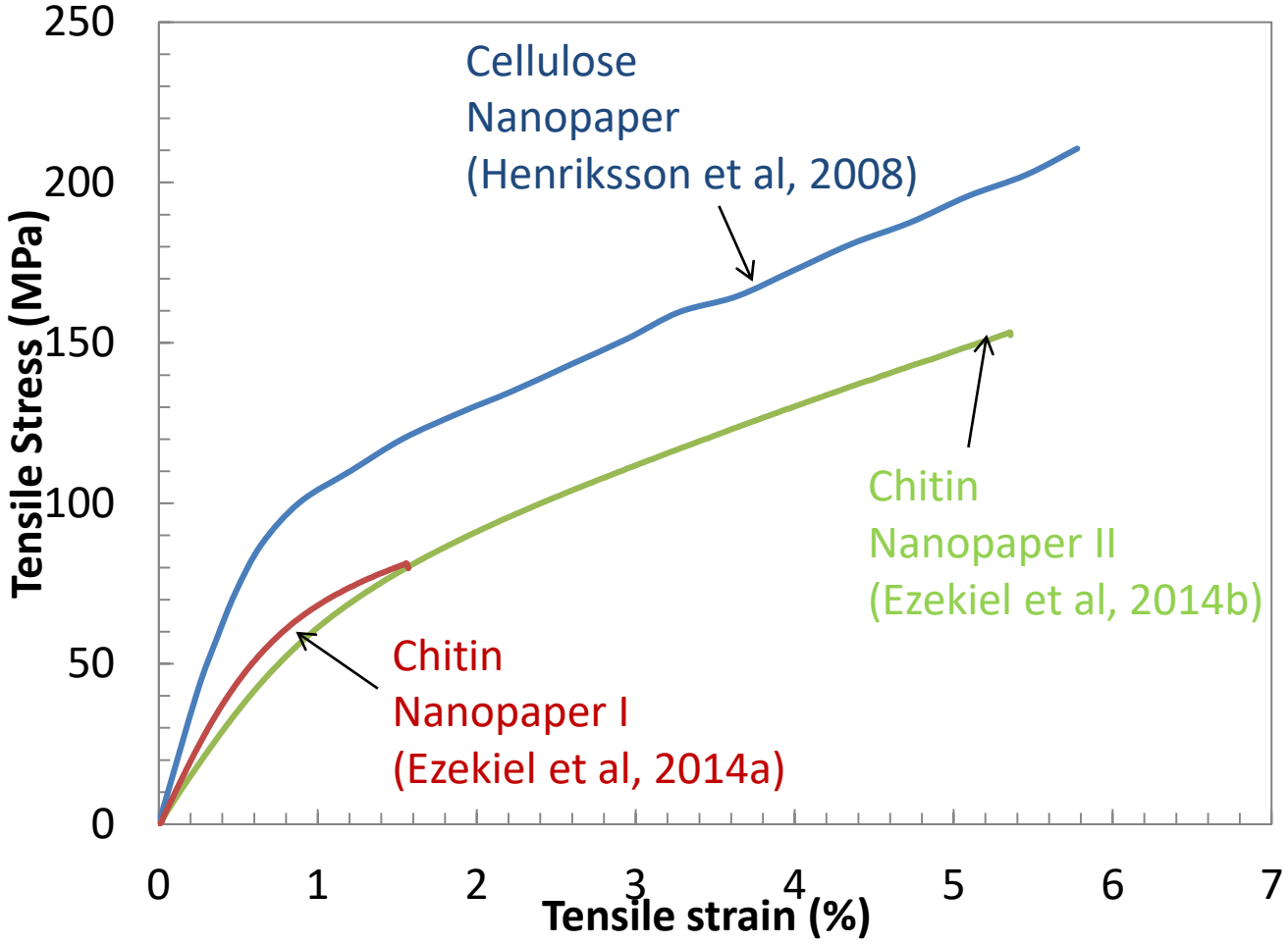
Other sources: Insects, fungi

Introduction - Chitin nanofiber from crustacean



Fabritius et al, 2011, *Chitin,* pp. 35-60.

Nanostructured membrane– Motivation



- **Chitin nanofiber - Lightweight, higher surface area and low thermal conductivity**

Chitin nanofiber - Preparation

Ambient condition - room temperature

2M HCl

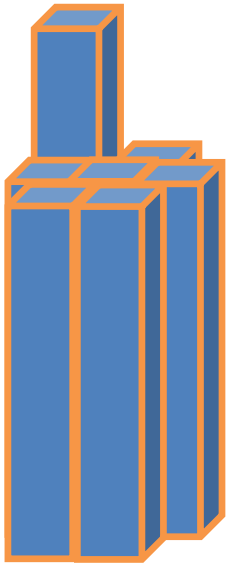
EtOH

ChNf bundle (≥20 nm)

'Native'

20%NaOH

Treatment



ChNf bundle (10-20 nm)

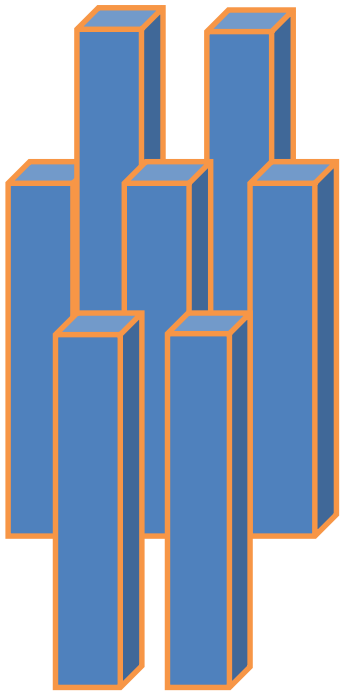
'Bound'

Acetic acid

pH3

Chitosan was added here

Mechanical treatment



Individual ChNf (3-6 nm)

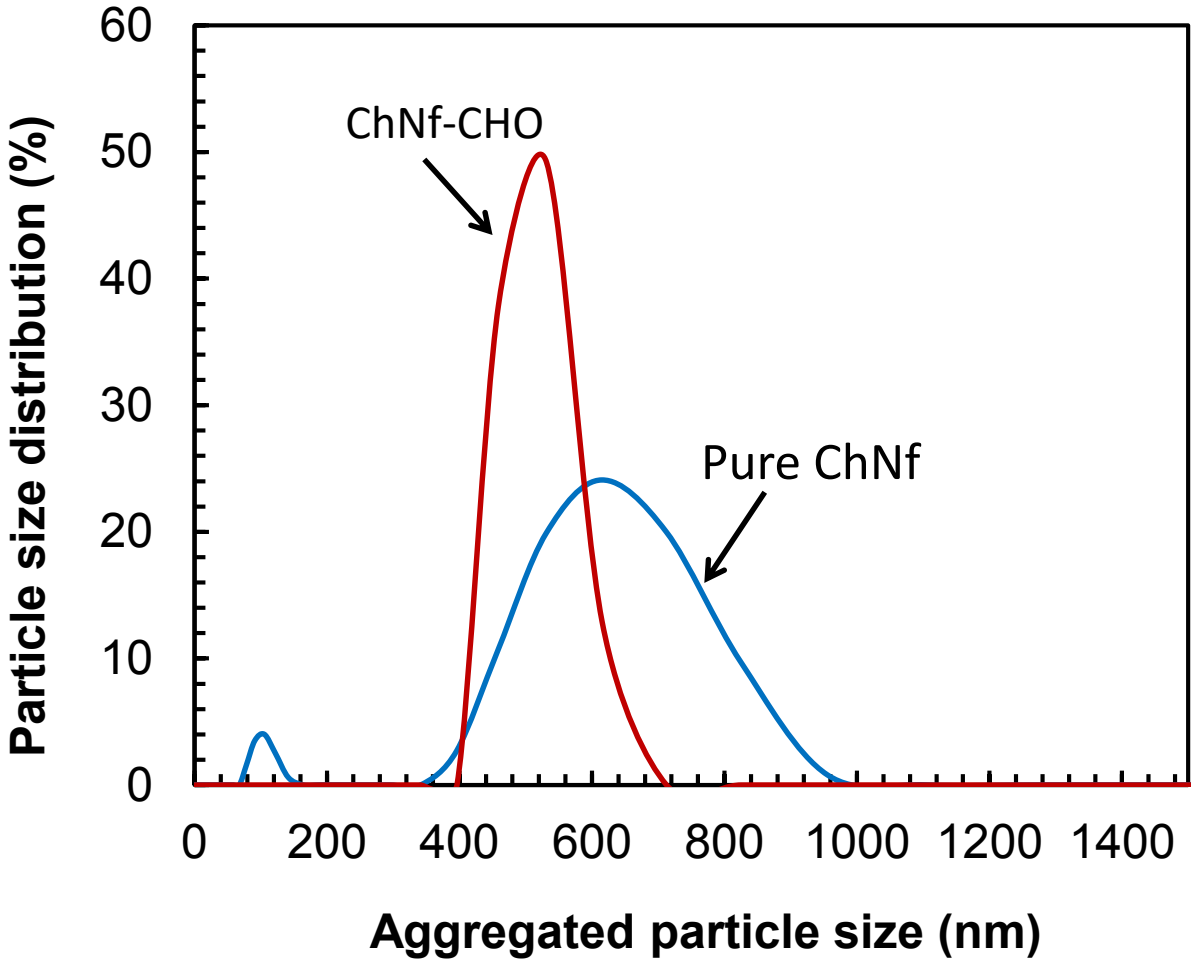
'Fine'

Chitin nanofiber - Preparation

1 wt% colloidal suspension of chitin nanofibers

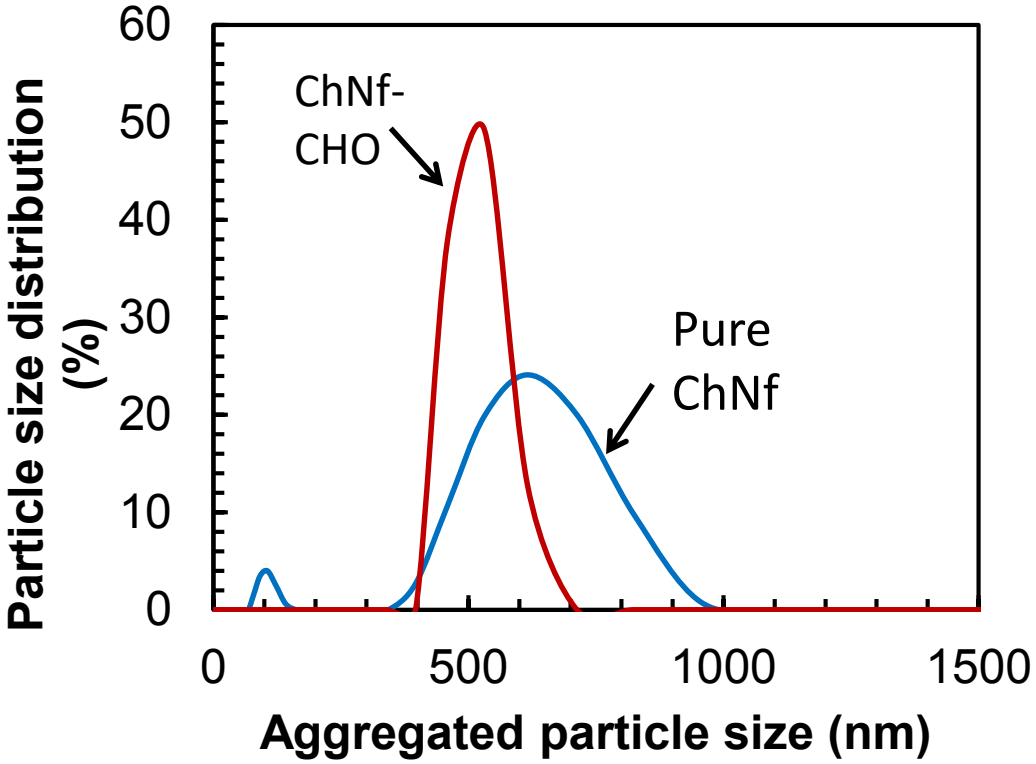
”NEW METHOD → TYPE OF CHITIN NANOFIBERS”

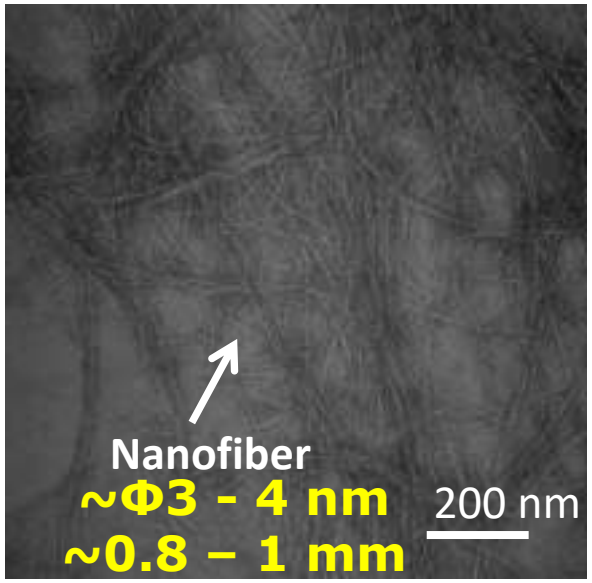
Colloidal properties: Dynamic light Scattering



- **ChNf-CHO shows narrower distribution and smaller particle aggregate sizes.**

Colloidal properties

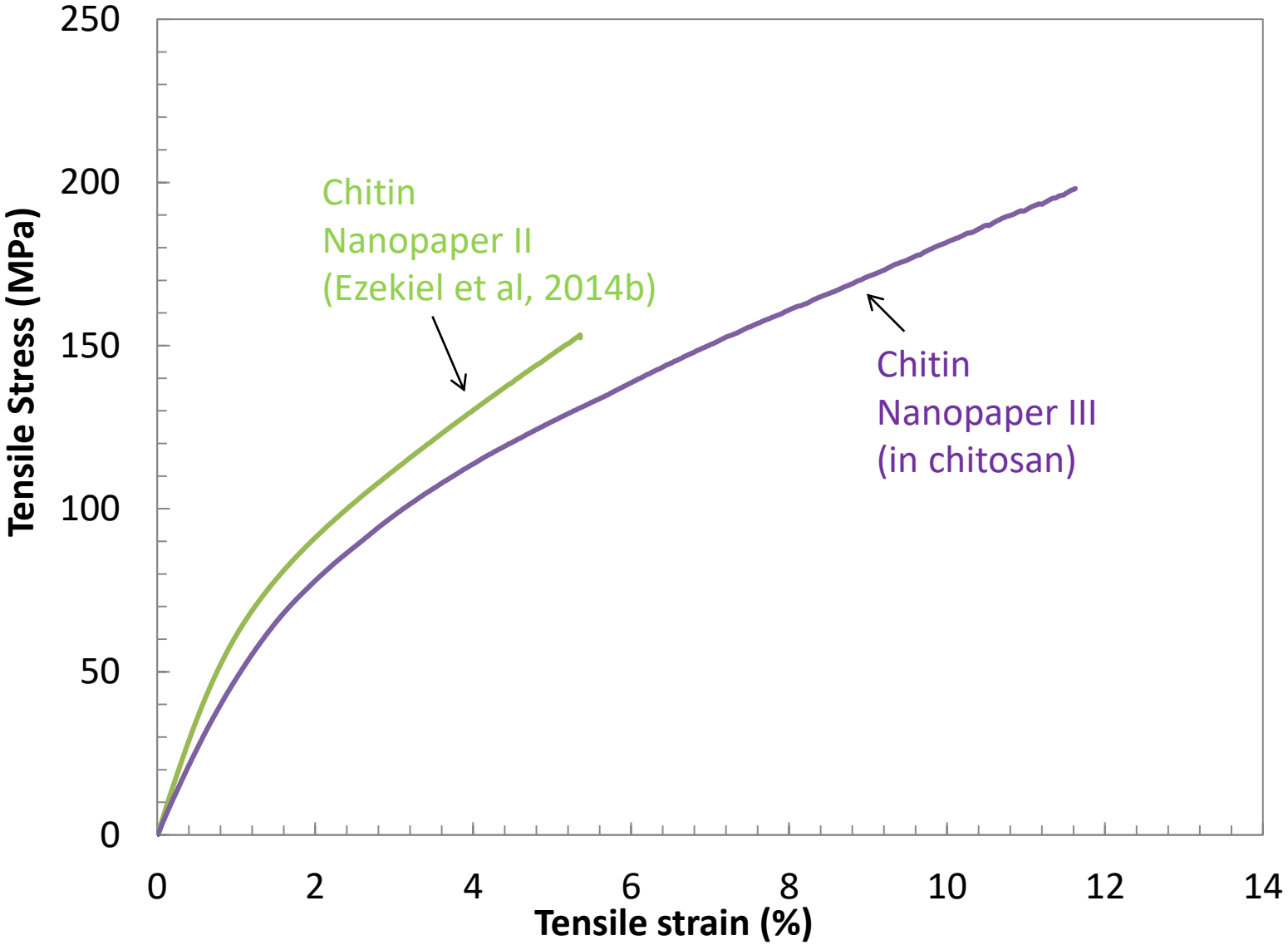




TEM Image of ChNfCHO

Photograph image of ChNf "Membrane"

Stress-strain behaviour- Nanostructured membrane

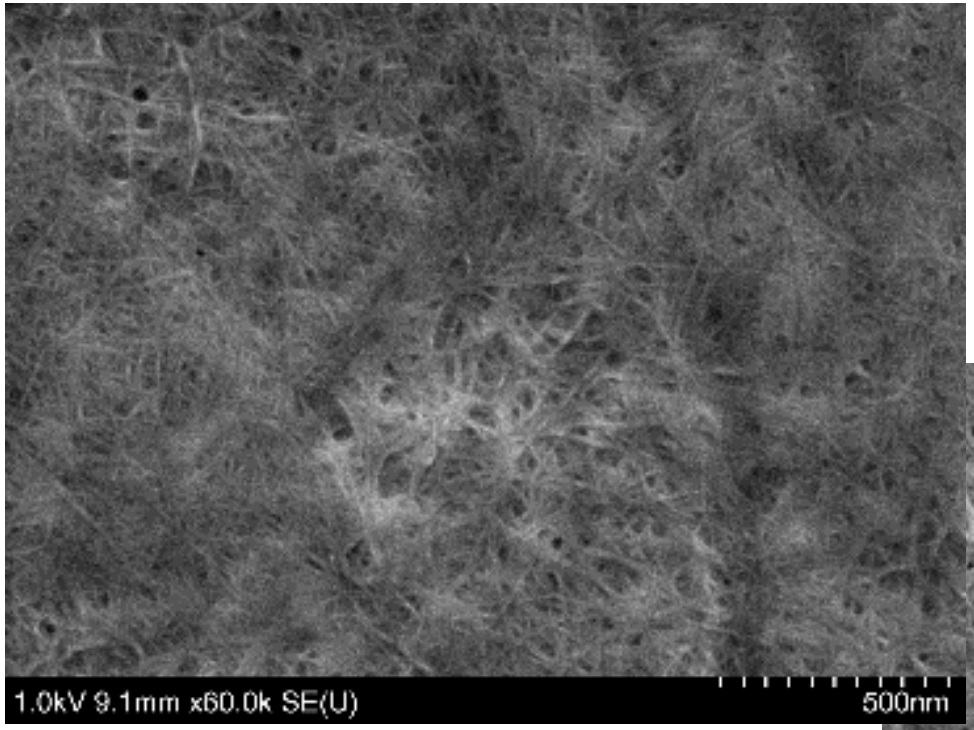


Tensile properties: high mechanical strength

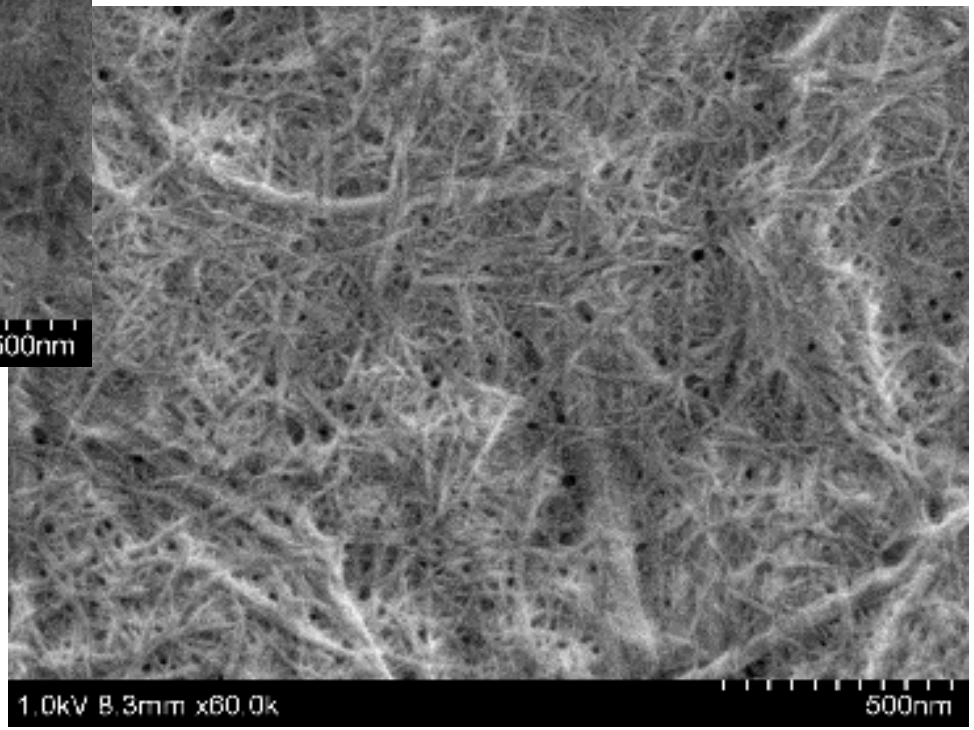
Parameters	ChNf Membrane	ChNf-CHO Membrane
Tensile Modulus (GPa)	7,3 (0,1)	6,3 (0,4)
Tensile Strength (MPa)	155,7 (10,5)	**186 (1,5)**
Tensile Strain (%)	8,0 (1,0)	9,6 (0,6)

- ChNF-CHO has higher strength than pure chitin membrane

Membrane Microstructure - SEM

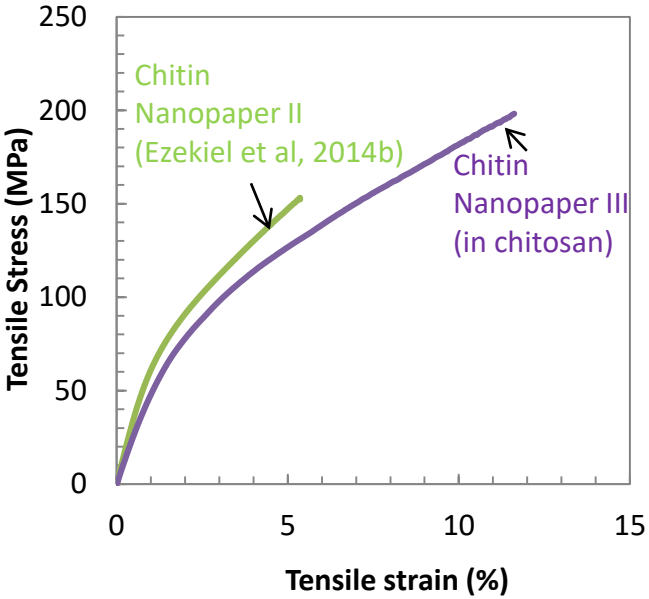


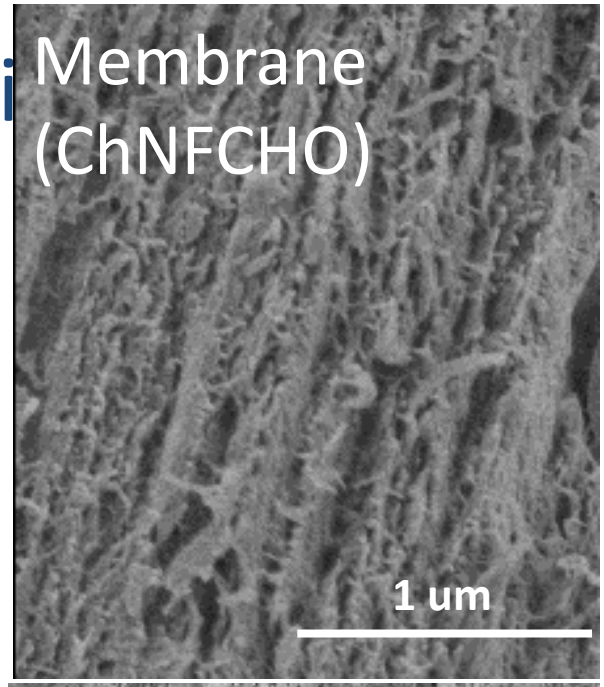
ChNfCHO Membrane

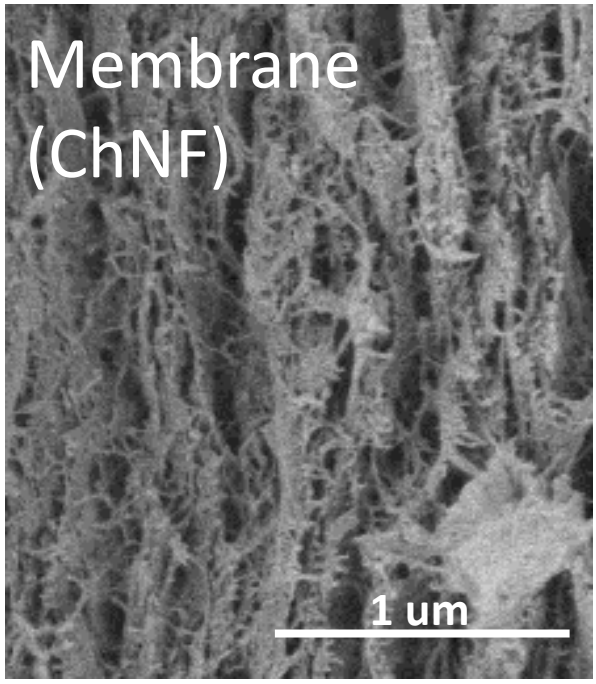


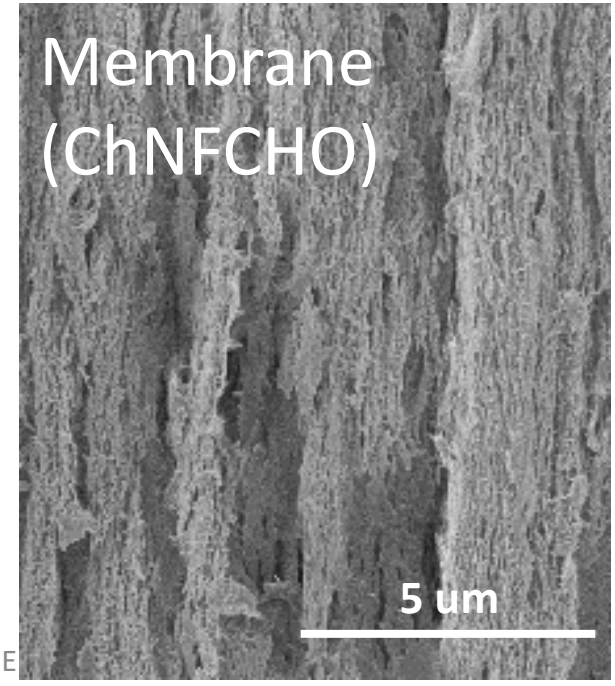
ChNf Membrane

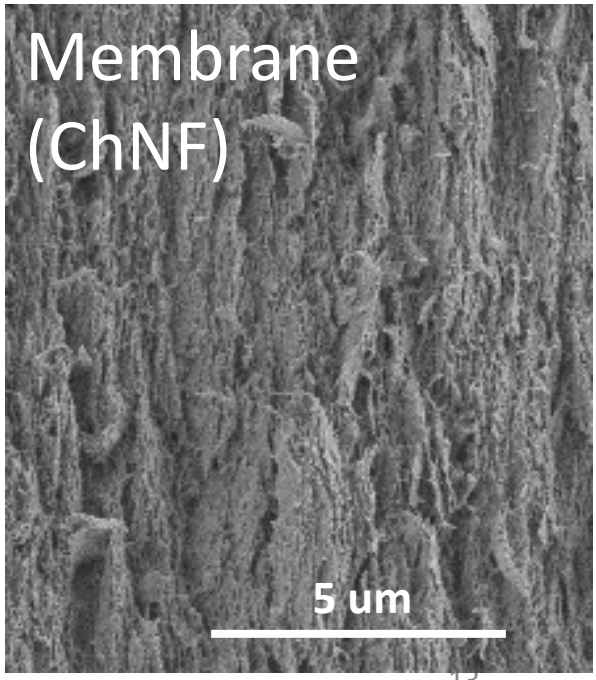
Fractured properti - SEM



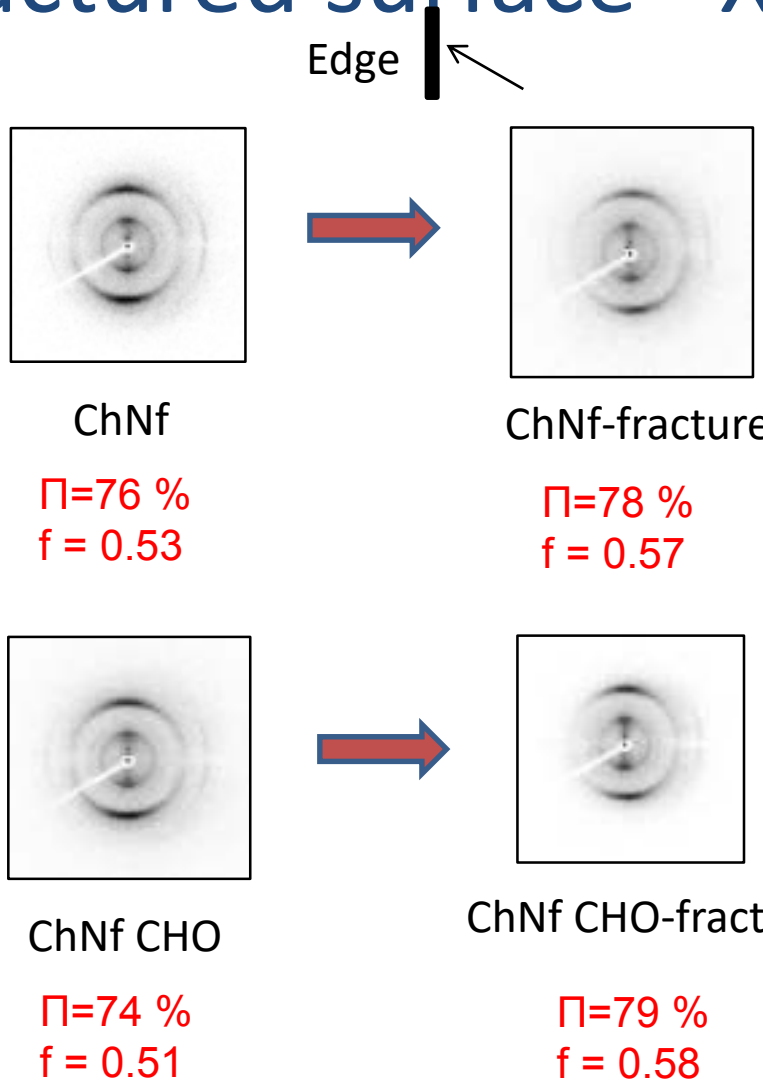






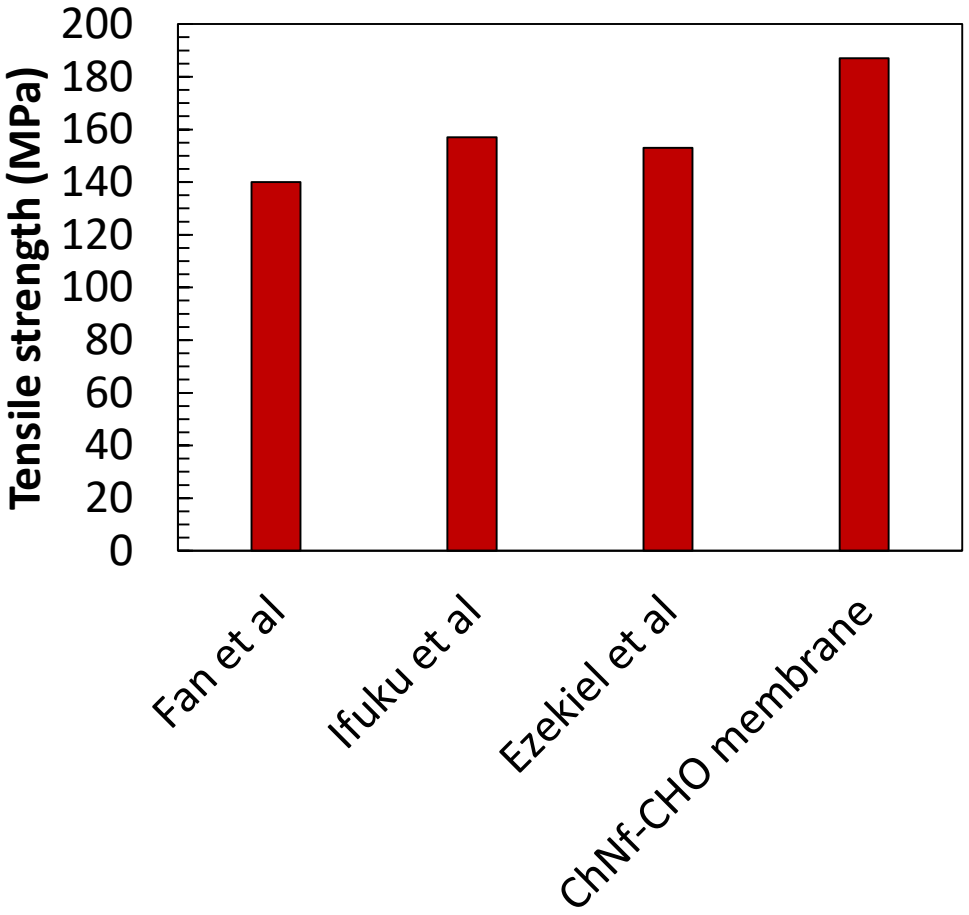


Fractured properties: Orientation at fractured surface - XRD results



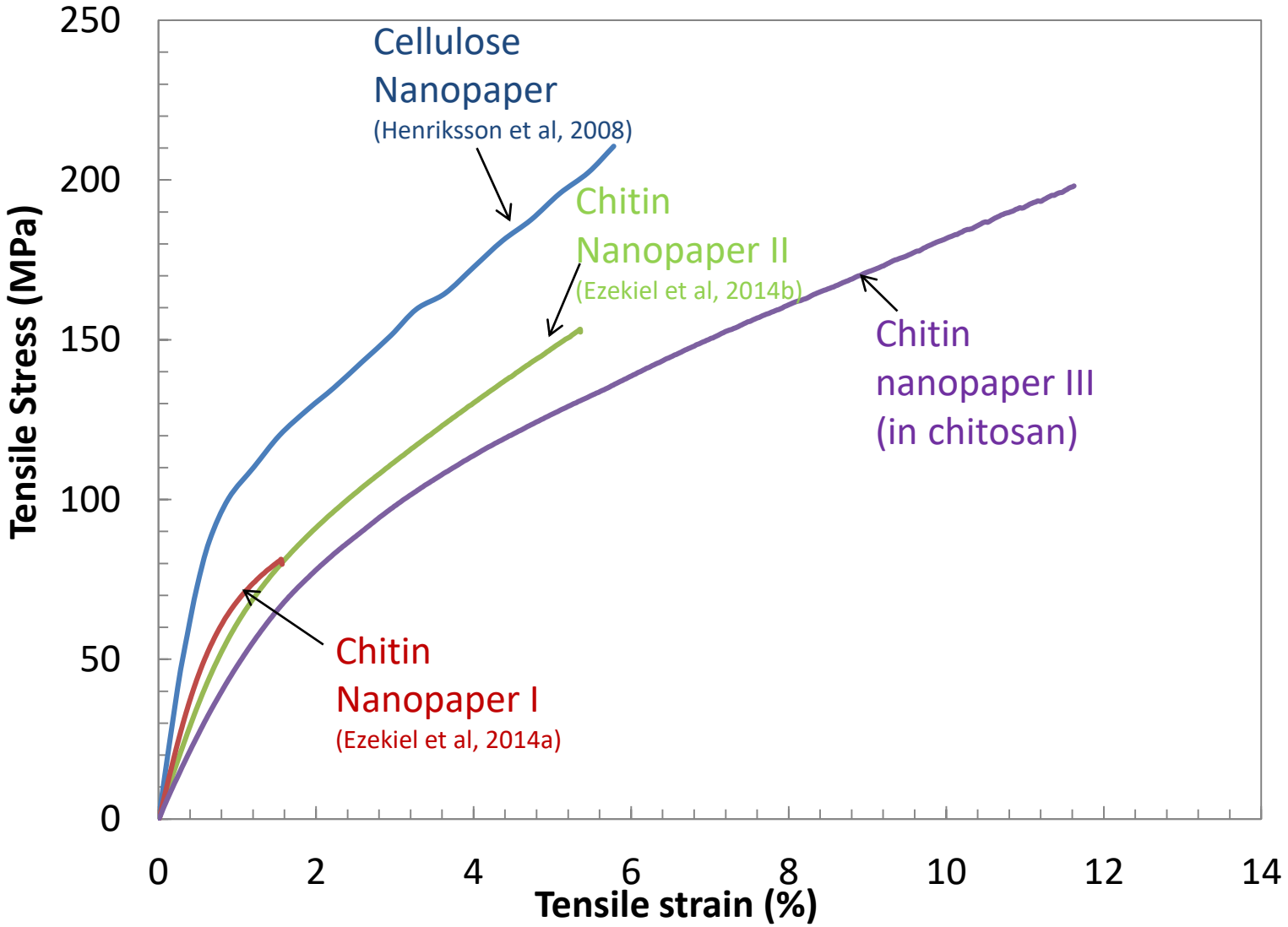
- ***ChNf-CHO shows strong in-plane orientation at fracture surface***
  - ***~twice as much as ChNf membrane***

Summary I: Tensile strength data



- **New chitin membrane have higher mechanical strength – new method, new nanofibers**

Summary II - Tensile behavior



- **We can make different kind of chitin nanofiber and toiler the membrane properties**

Acknowledgements

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Thank you all for Listening