

Synthesis of Poly(vinyl) Alcohol-Cellulose

Nanocrystal Hybrid Aerogel

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Outline

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INTRODUCTION

02

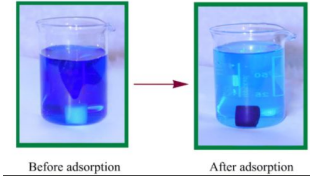
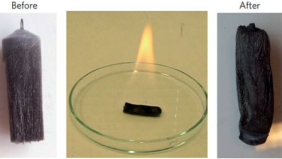
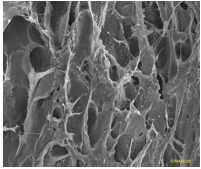
EXPERIMENTAL

03

RESULTS

04

CONCLUSION



MOTIVATION & AIM OF PROJECT

Polyvinyl alcohol (PVA) Aerogel

- low density
- biodegradable polymer
- various applications

-Disadvantages

- ✓ unstable in aqueous medium
- ✓ poor mechanical property (compressive strength)

Cellulose Nanocrystal (CNC)

- crystalline rigid material
- has rod-like shapes / spherical
- D= 5–20 nm; L= 100–300 nm
- sources : biomass waste



Cross linker (Glutaraldehyde) **GA**
Reinforcement (i.e. CNC)



Oil palm tree



Empty Fruit bunch (EFB)



EFB Fiber



EFB CNC

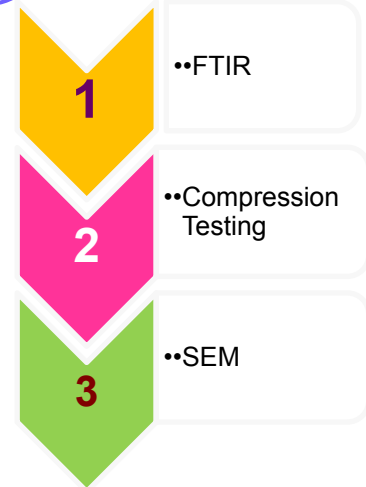
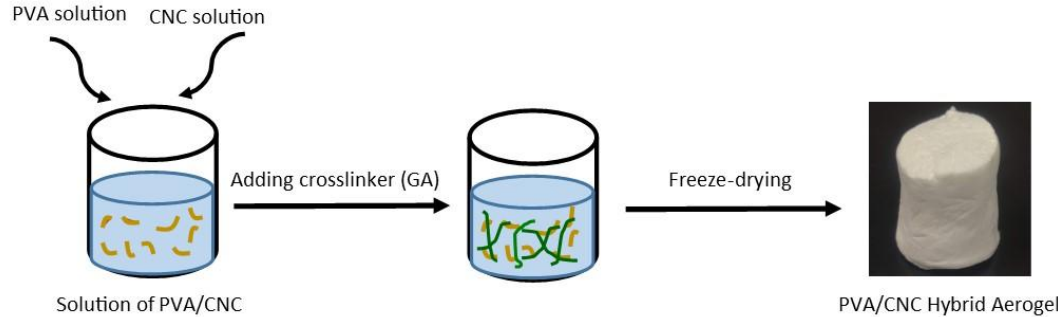
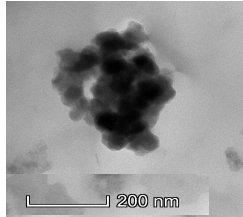
AIM: To evaluate the content of CNC and crosslinking agent on the mechanical property of PVA hybrid CNC aerogel



PROCESSING & COMPOSITIONS



Ammonium
Persulfate
(APS)



CNC (%)/ crosslinker (GA) (uL)	80	120	160
0.25	0.25/80	0.25/120	0.25/160
0.5	0.5/80	0.5/120	0.5/160
0.7	0.7/80	0.7/120	0.7/160



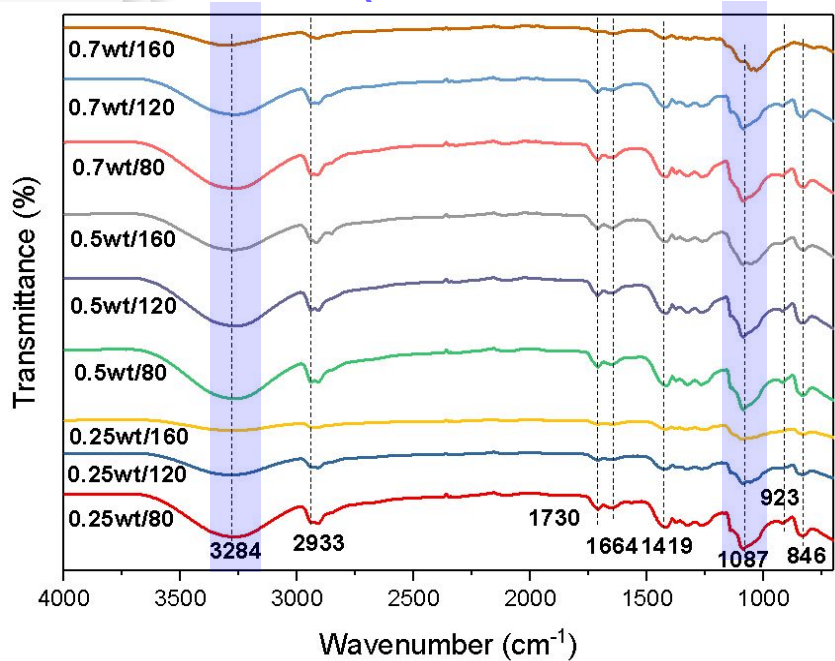


RESULT & DISCUSSION

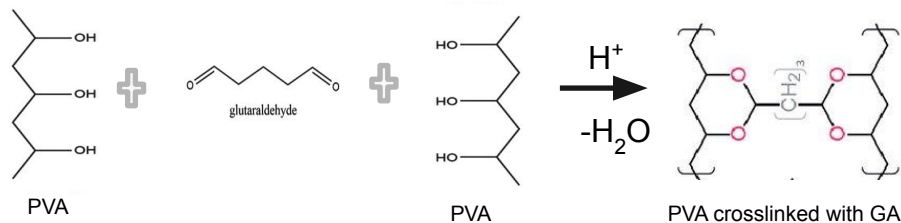




FTIR RESULT

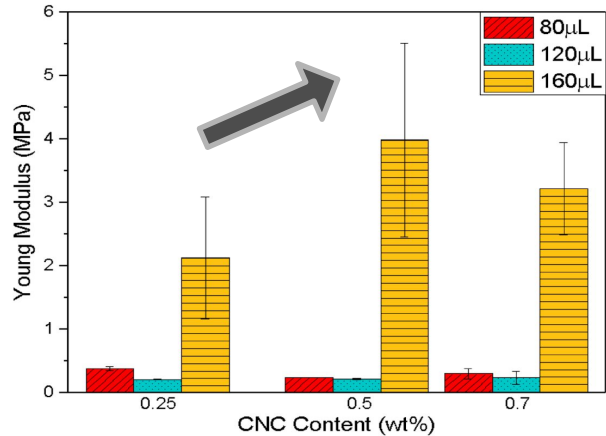
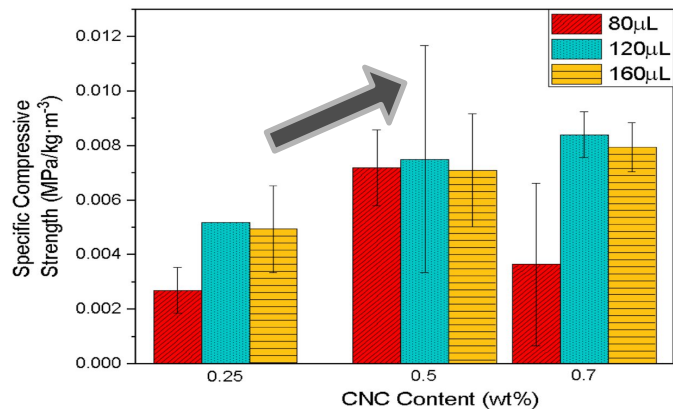
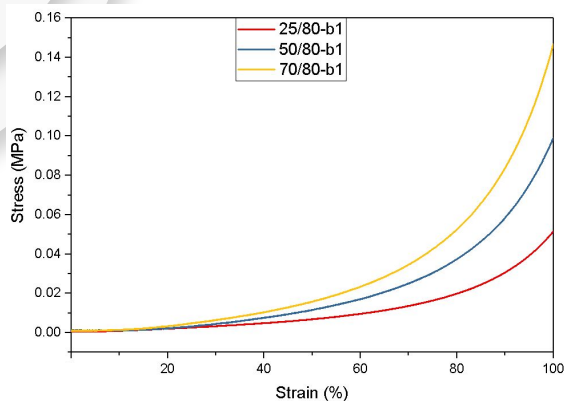


- The broad band in the **3500–3000** cm^{-1} region - due to the OH-stretching vibration in **cellulose and PVA** - the hydrogen bonds
- Acetal linkage (**-C-O-C-**) stretching vibrations near **1087** cm^{-1} - indicates crosslinked PVA aerogel with GA - this cause decreases in intensity of O-H peaks (3500-3000 cm^{-1})





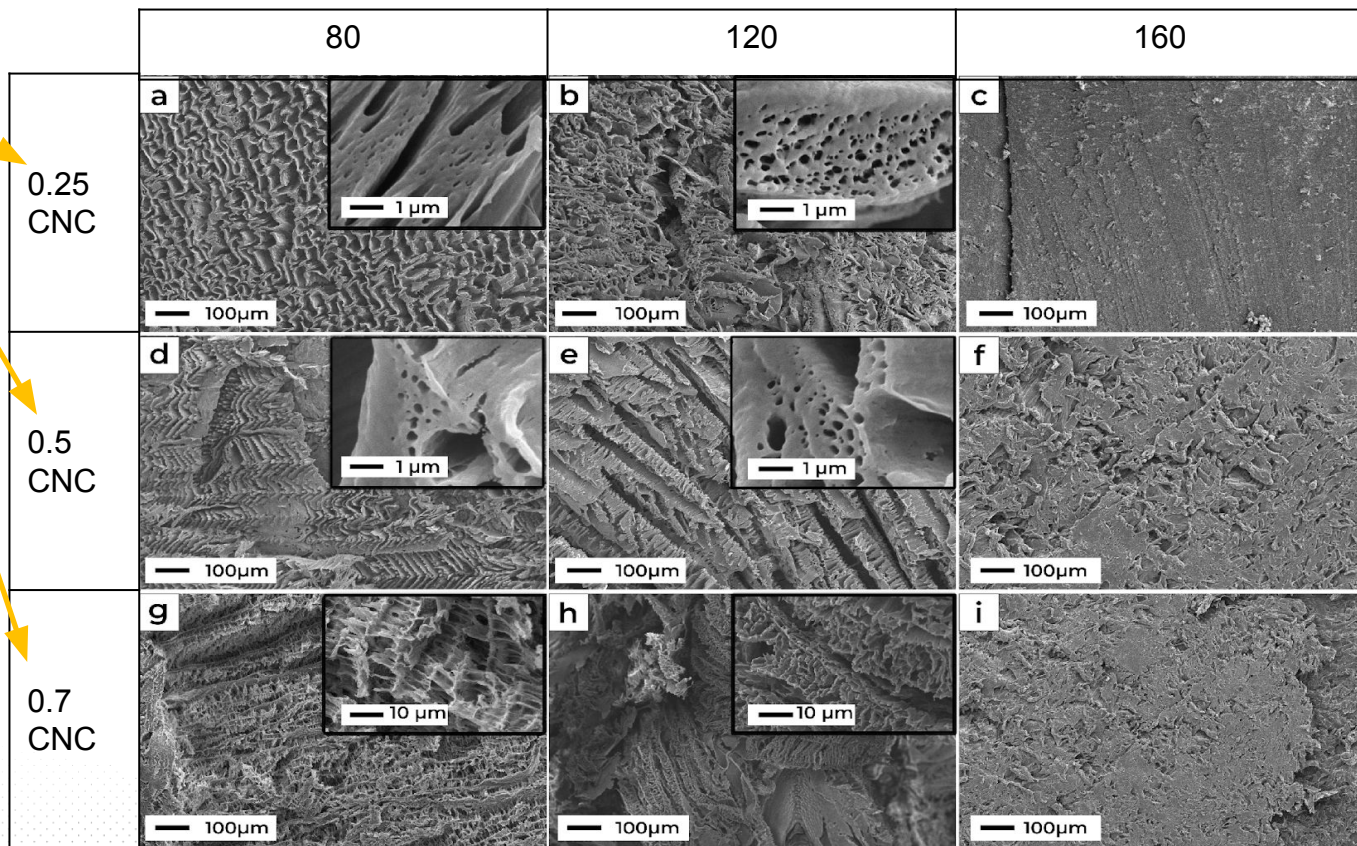
MECHANICAL RESULTS



- CNC - stiffness
- GA - cross-linked - chain mobility decreased
- Excessive degree of crosslink - brittle - a slight drop in YM



SEM RESULT



CONCLUSIONS

1

Mechanical strength of the PVA aerogels has been improved by incorporating the CNCs

2

The variation in content of CNCs and crosslinking agent affects the aerogels porous structures as well as the mechanical property

3

The excessive cross-linked decreased the mechanical property of PVA/CNC hybrid aerogel

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