Preliminary study on the optical characteristics of SWCNT hybrids dispersed using cellulose extracted from corn husk and coconut coir

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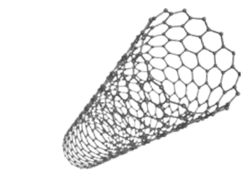
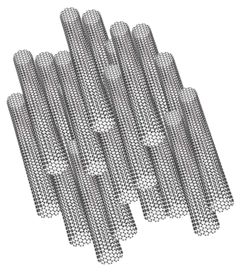
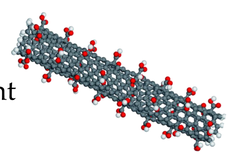
INTRODUCTION

- ✓ Tunable band gap
- ✓ Near-infrared (NIR) absorbance spectra features used in optical communication
- ✓ Optical spectra fall into the biological transparent NIR region of 800-1300nm. [1]



Single-walled carbon nanotube (SWCNT)



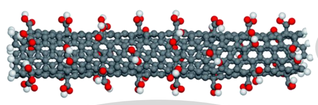


Drawbacks
- Heavily bundled
- Insoluble in aqueous media

To overcome the drawbacks
- Surface Modification (Non covalent functionalization) [2]

CURRENT STATE OF RESEARCH

Functionalized SWCNT



- **Nucleic Acids** (ssDNA, dsDNA) [2-3]
- **Surfactants** (gemini and SDBS surfactants) [4]
- **Proteins** (RecA, amino acids) [5]

IN THIS STUDY….

Cellulose from Philippine endemic plants were used.

Coconut coir

Cellulose

Corn husk

METHODOLOGY

Extraction of cellulose from corn husk and coco coir [6-7]

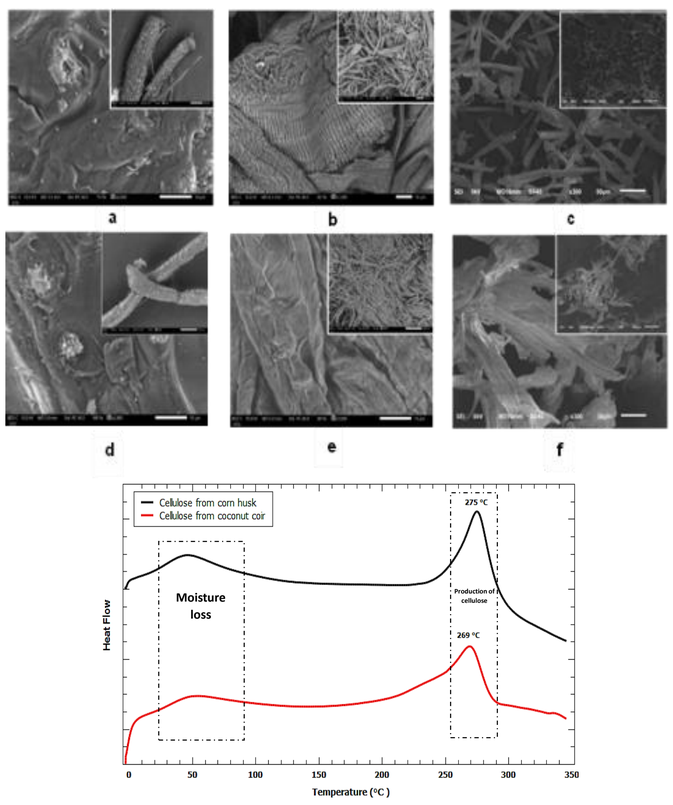
- **Alkali treatment** 2% (w/v) sodium hydroxide
- **Bleach treatment** 1.7 wt% NaClO
- **Acid hydrolysis** 58% (w/w) H_2SO_4 solution
- **Microcrystalline Cellulose solution**

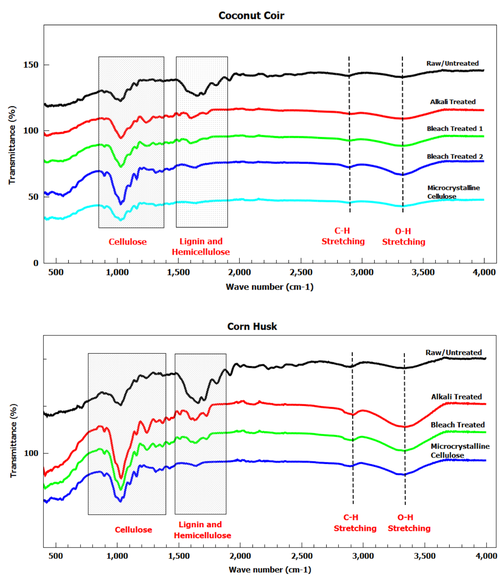
Dispersion of SWCNT [8]

- **Mixed Cellulose & SWCNT** ratio of 2:1; SWCNT and cellulose
- **Sonication** (to disperse SWCNT powder to cellulose solution)
- **Centrifugation** (to remove aggregates)
- **SWCNT & Cellulose Suspension**

RESULTS and DISCUSSIONS

1. Extraction of cellulose

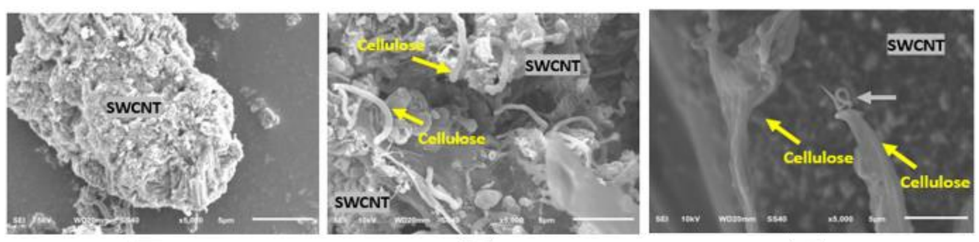




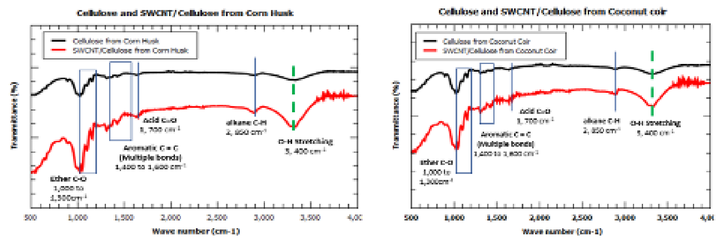
SEM, FTIR and DSC results implied the removal of hemicellulose, lignin and other impurities present in fibers both in corn husk and coconut coir, and microcrystalline cellulose was obtained

2. Dispersion of SWCNT

Photographs of the hybridization of SWCNTs and cellulose from corn husk (a-c), and coconut coir (d-f).

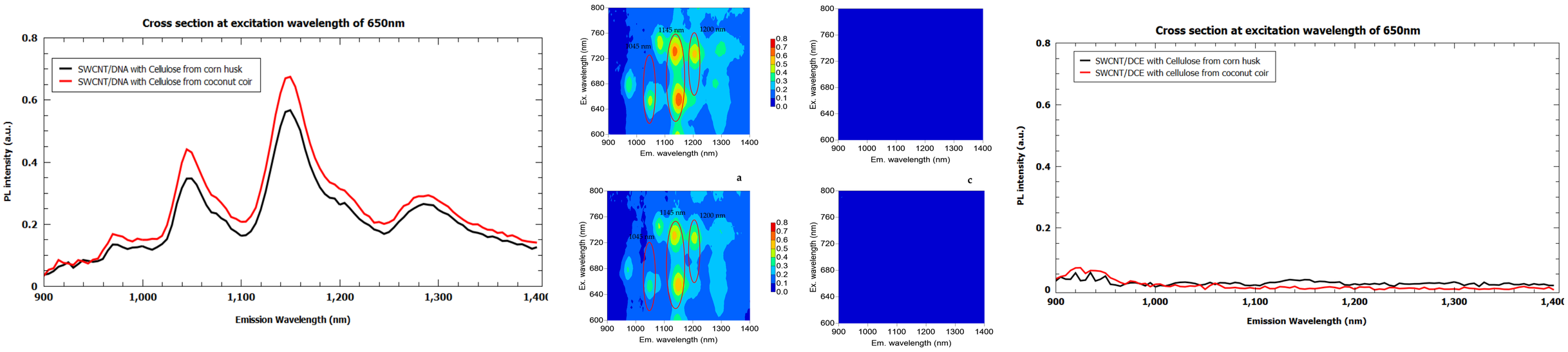


SEM images of a.) SWCNT, b.) SWCNT/cellulose from corn husk, and c.) SWCNT/cellulose from coconut coir with their FTIR results



Photographs, SEM and FTIR results revealed that nanotubes can be dispersed in a solution with the use of cellulose extracted from corn husk and coconut coir.

3. Photoluminescence response of SWCNT hybrids mixed with cellulose



PL maps of (a.) SWCNT/DNA mixed with cellulose from corn husk, (b.) SWCNT/DNA hybrid mixed with cellulose from coconut coir, (c.) SWCNT/DCE mixed with cellulose from corn husk and (d.) SWCNT/DCE mixed with cellulose from coconut coir.

PL-NIR findings implied the poor interaction of cellulose when SWCNT is dispersed with hydrophobic solvent like dichloroethane (DCE).

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