

Zinc octacarboxyphthalocyanine / Multi-walled Carbon Nanotubes Hybrid for the Development of Dye Solar Cells

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Materials Science & Manufacturing: Energy & Processes (EaP)

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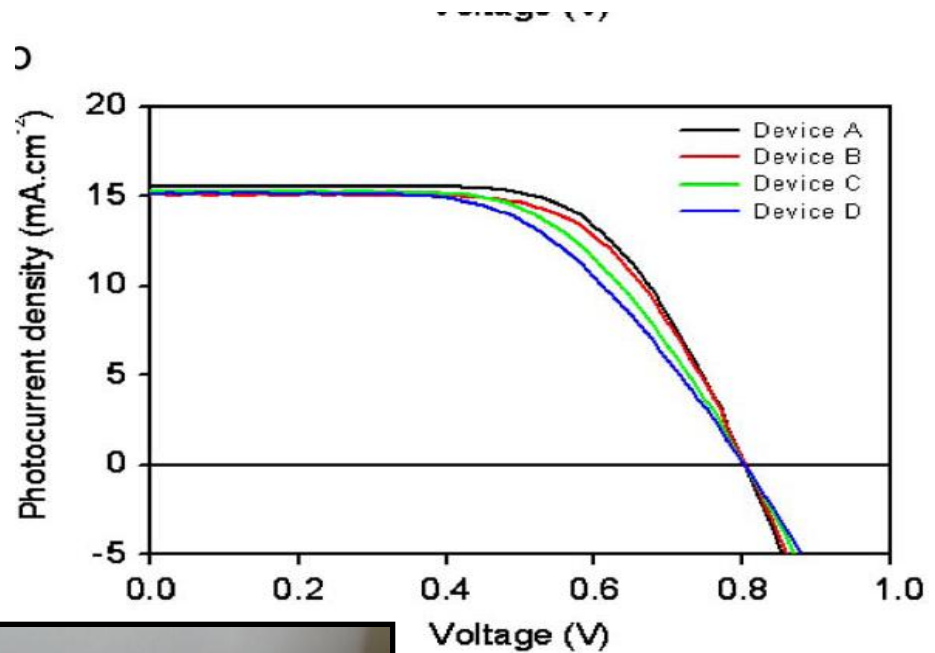
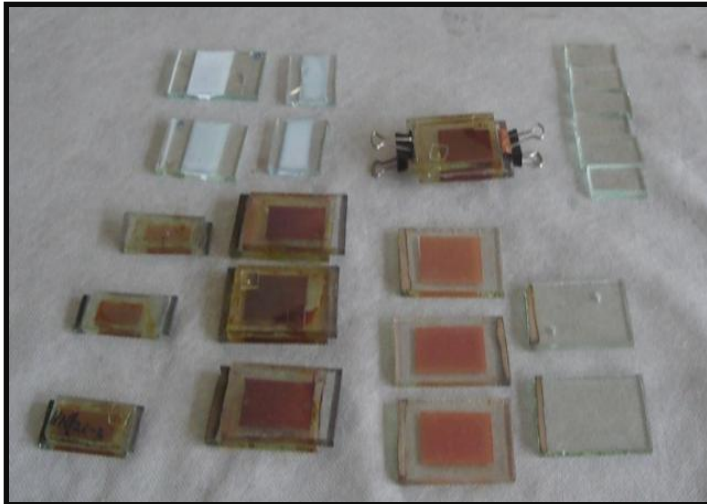
OUTLINE OF PRESENTATION



- INTRODUCTION
- OBJECTIVES
- EXPERIMENTAL
- PRELIMINARY RESULTS
- CONCLUSIONS
- FUTURE WORK

INTRODUCTION

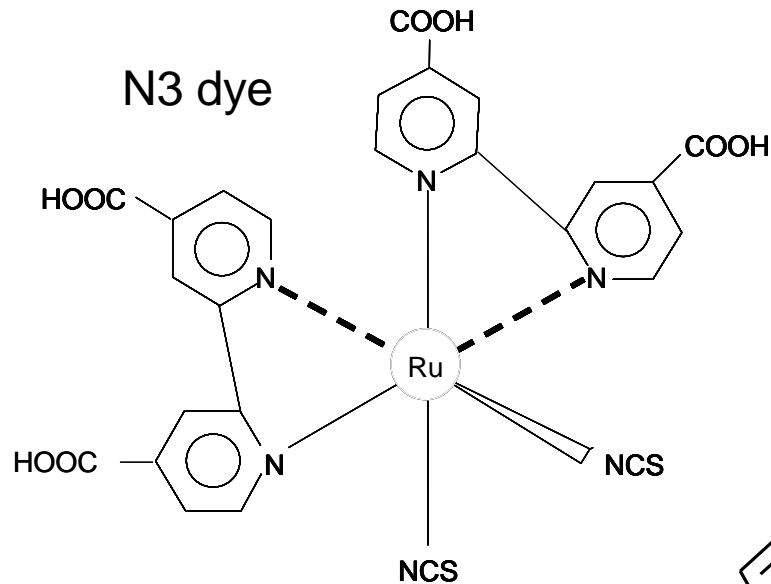
Dye solar cells prepared from our group



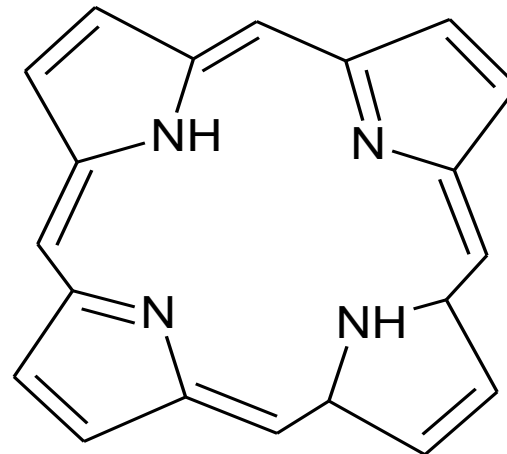
Solar simulator



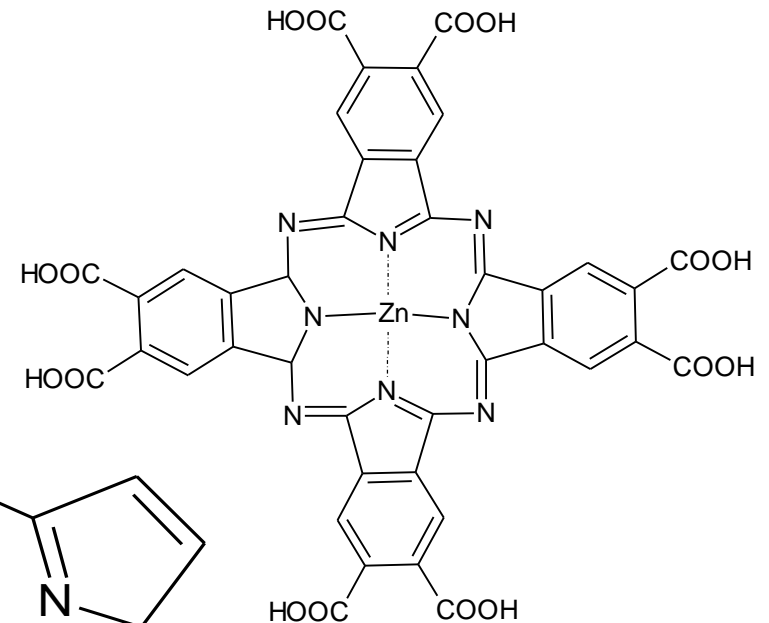
➤ The choice of the sensitisers



Porphyrins



Zinc octacarboxyphthalocyanine



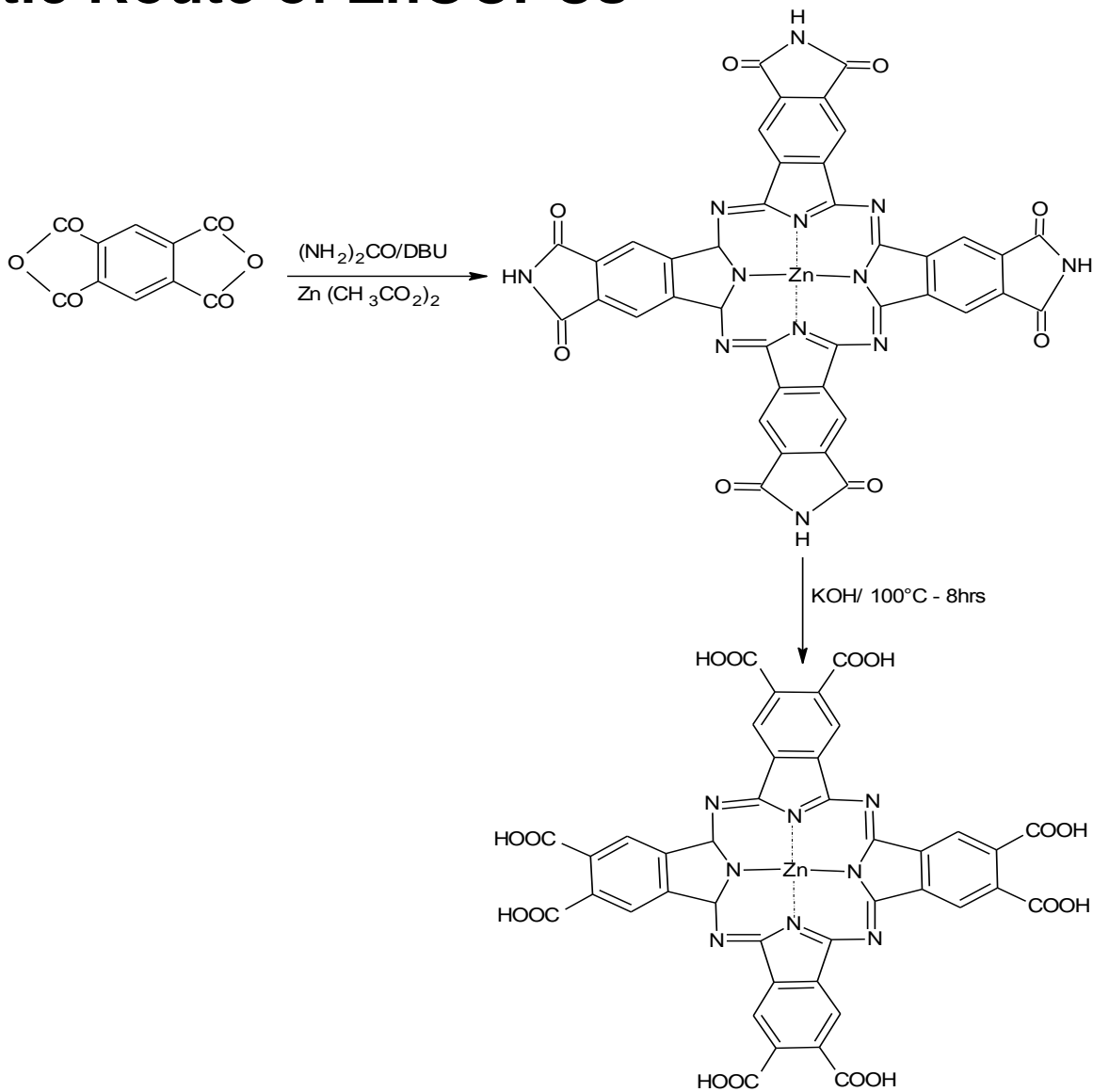
Introduction cont'd

- WHY CNTs?
 - * High thermal stability
 - * High surface area
 - * Excellent electrical conductivity

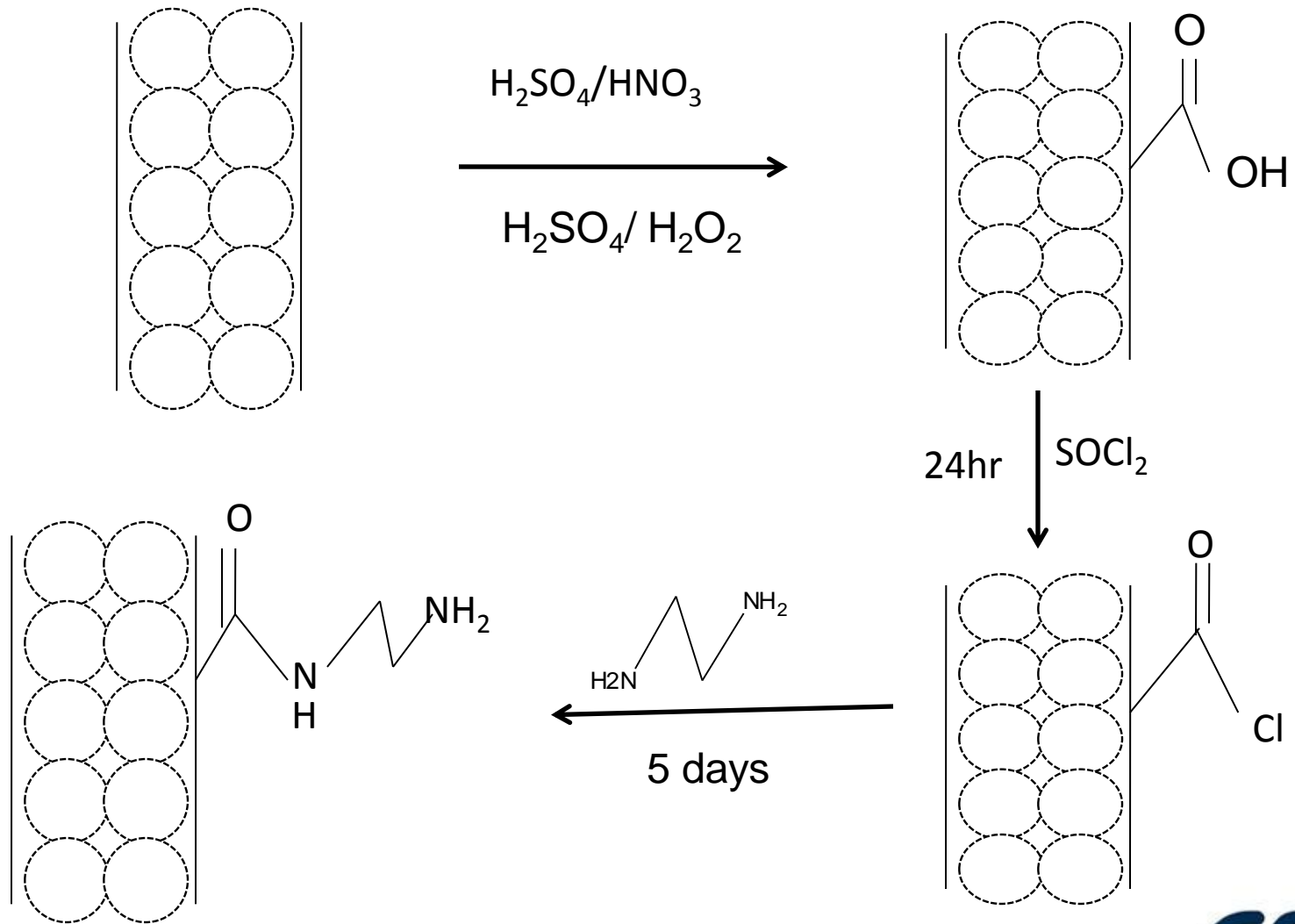
OBJECTIVES

- The main aim is to improve the cell performance and the long term stability of DSCs by utilizing dye (metallophthalocyanines) that absorb light at Visible region, integrated with carbon nanotubes to increase the stability and conductivity.

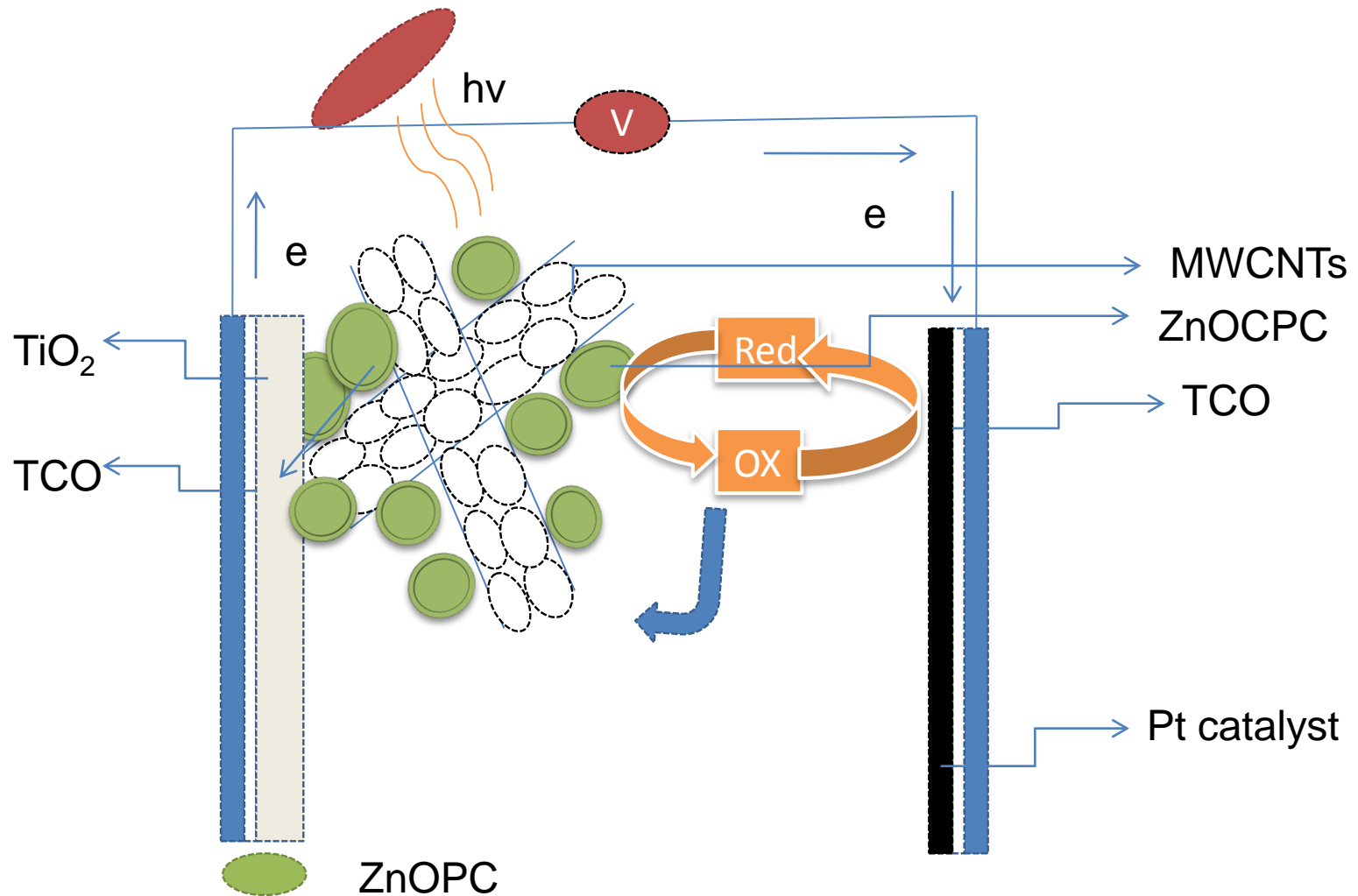
Synthetic Route of ZnOCPCs



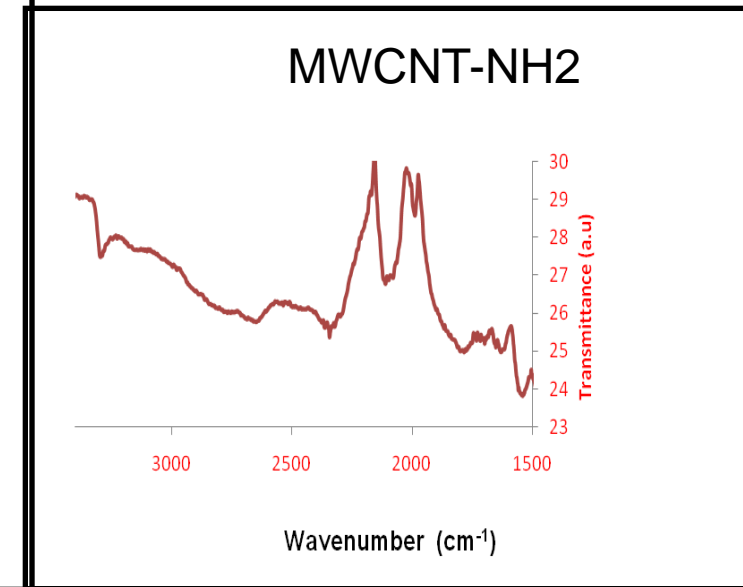
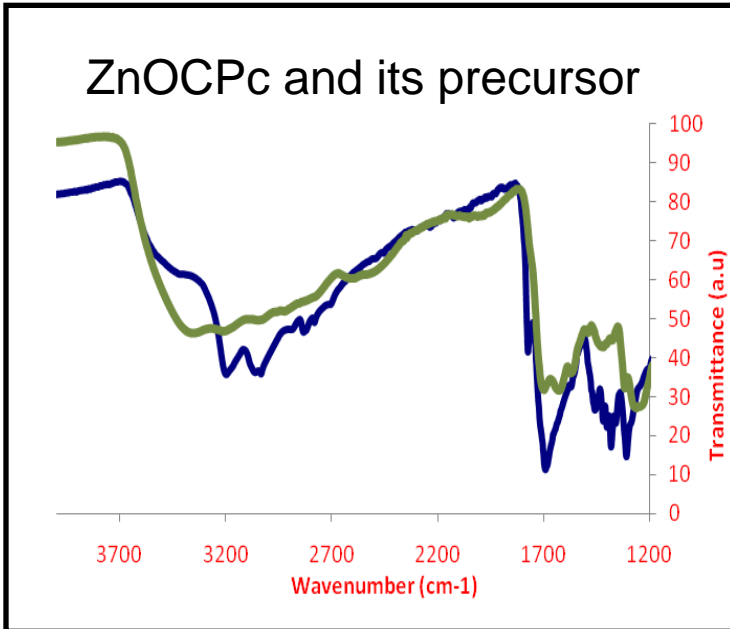
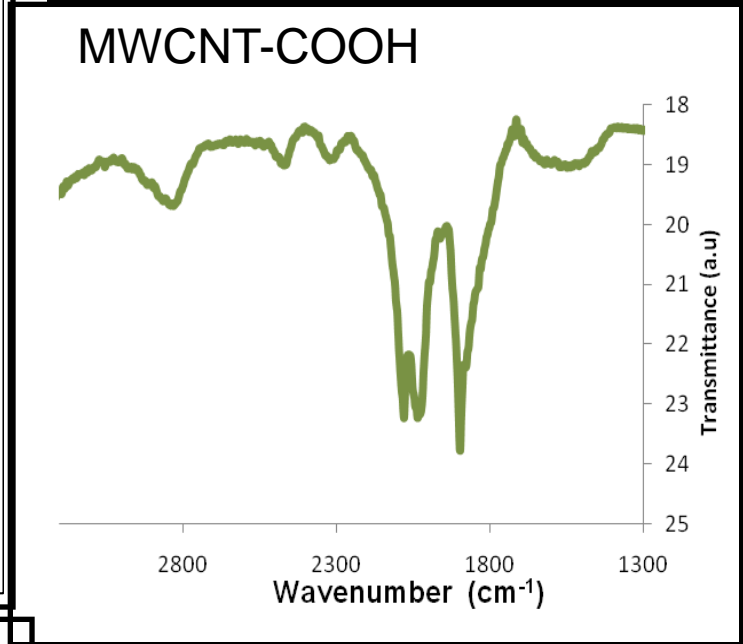
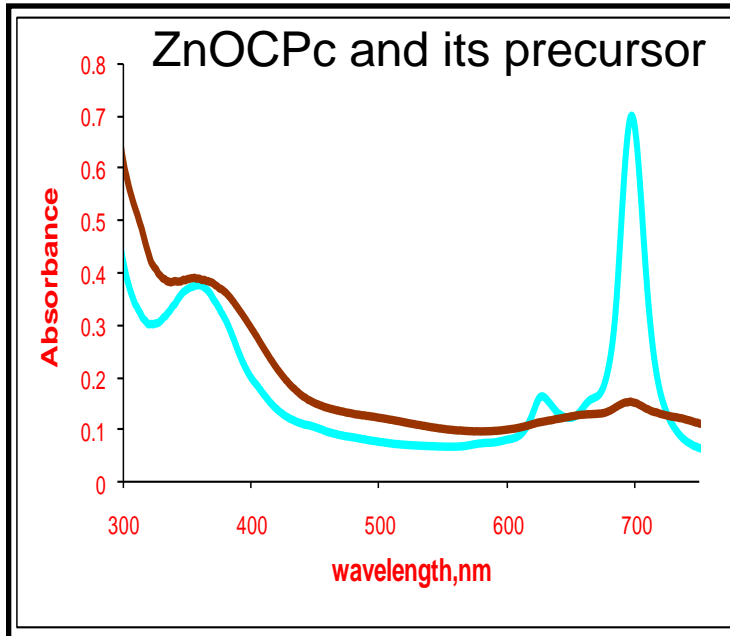
Amine-functionalised MWCNTs



Schematic of ZnOCPC/MWCNT Hybrids in DSC



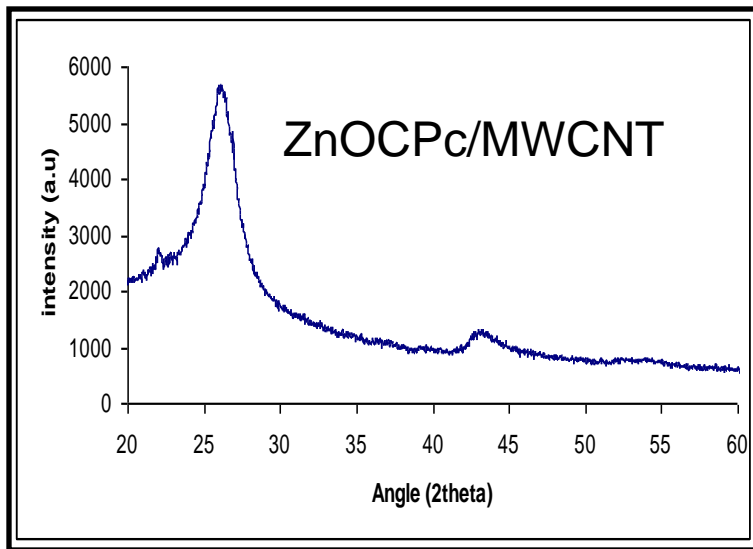
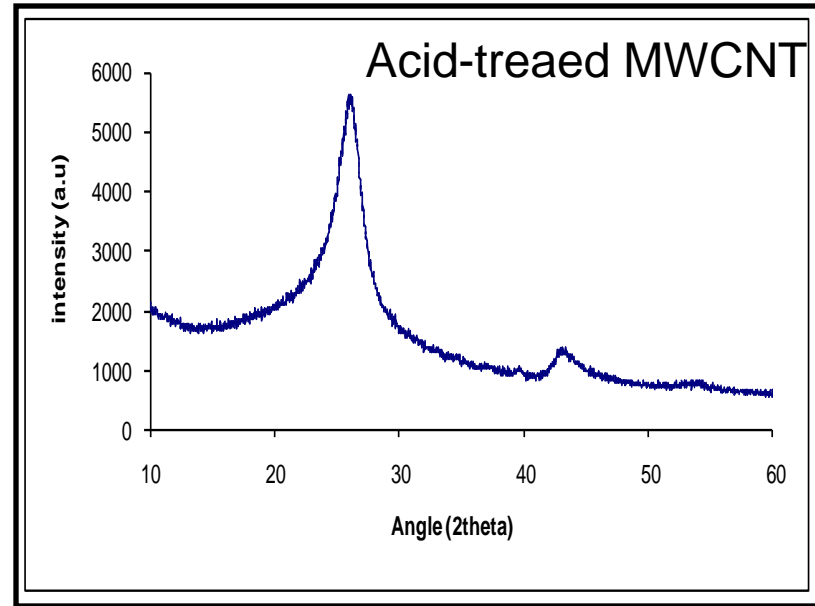
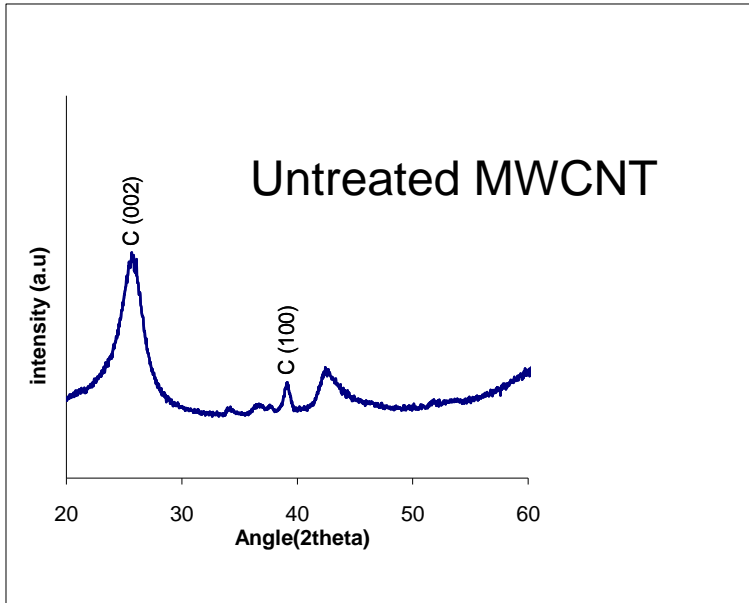
Preliminary Results cont'd



PRE LIMINARY RESULTS

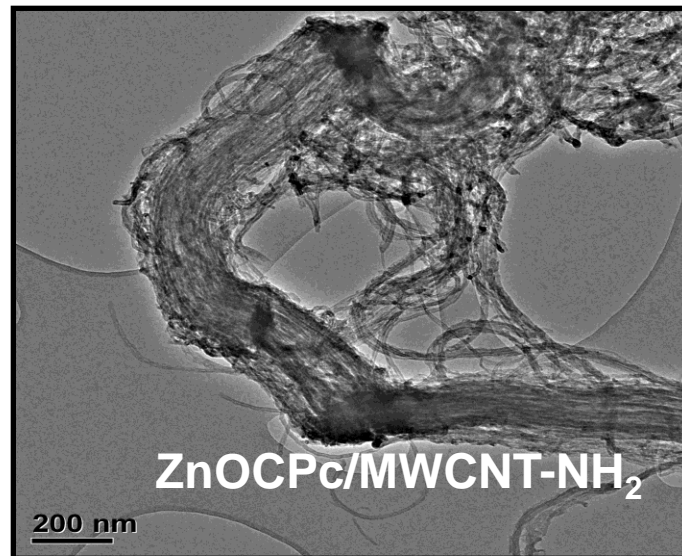
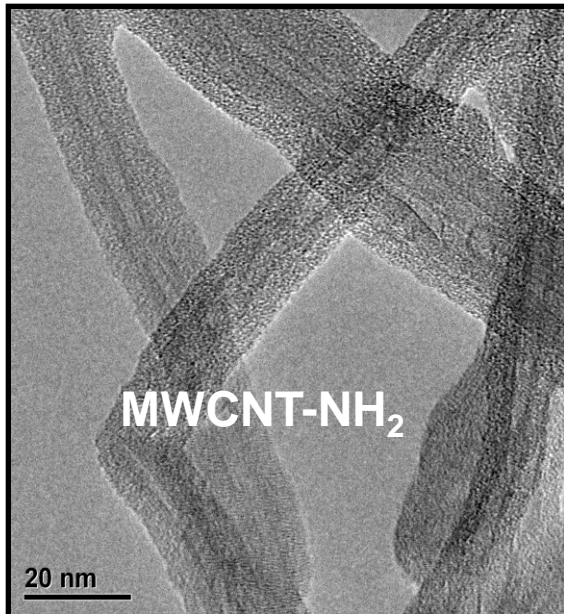
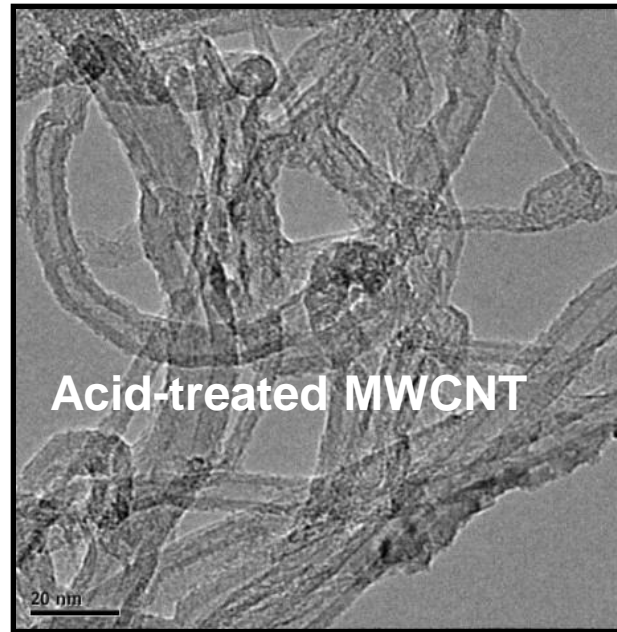
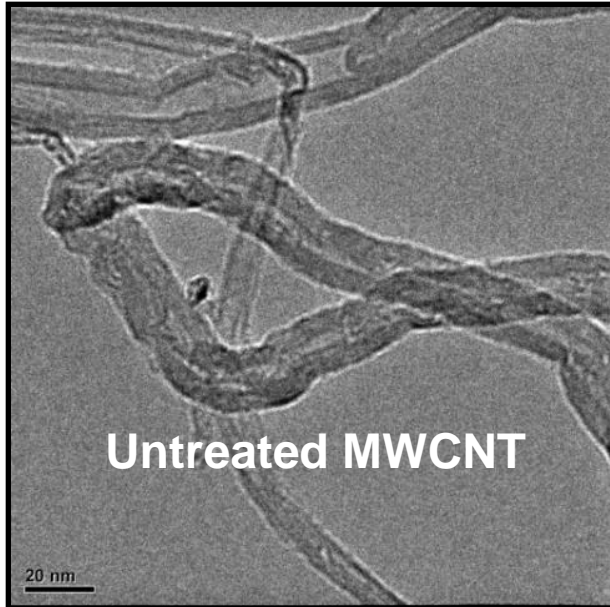
TECHNIQUES	INFORMATION GATHERED	EXAMPLE
UV/Vis	To identify the absorption spectra of ZnOPC	B-band ~350nm Q-band~690nm
FTIR	To determine functional groups present in ZnOPC and MWCNTs	<p>Carboxylic acid - ZnOPCs</p> <p>C=O ~ 1740-1680 cm⁻¹</p> <p>OH ~ 3400-3000cm⁻¹ (broad peak)</p> <p>Amide -MWCNTs</p> <p>N-H ~ 3450-3100 cm⁻¹ (secondary-assigned with one peak)</p> <p>C=O~1690-1630cm⁻¹</p>
TEM	Investigate internal structure of MWCNT-ZnPC	
XRDs	Investigate the crystallinity of a-MWCNT, a-MWCNT-ZnOCP c nanocomposite	

Preliminary Results cont'd



- Figures show MWCNTs after treated with acid and also integrating the ZnOCPc/ MWCNT nanocomposite

Preliminary Results cont'd



- Figures show MWCNTs after each stage of the functionalisation step
- Increase in the metallic content noticed (dark spots)
- Suggests that functionalisation process was successful
- Need to do high-resolution TEM to further investigate the surface/interface between MWCNT and ZnOPc

CONCLUSIONS

- Managed to synthesised ZnOCPC and it was confirmed by UV/Vis. Performed the treatment of MWCNTs
- Integrated the ZnOCPC/MWCNTs and applied in DSC, tested using the solar simulator

FUTURE WORK

- Characterisation of treated MWCNTs – SEM, XRD
- Characterisation of ZnOPC-MWCNTs-XPS, TGA, XRD, EDX
- Full DSC studies
- Visit to Japan to make Ti-based MPc

Acknowledgements

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