



Silesian  
University  
of Technology



RESEARCH  
UNIVERSITY  
EXCELLENCE INITIATIVE  
Ministry of Science  
and Higher Education

# *Nanomaterials*

NanoCarbon Group

[www.nano-c-group.org](http://www.nano-c-group.org)

Prof. Sławomir Boncel  
slawomir.boncel@polsl.pl

Functional Nanomaterials Group

[www.fnano.eu](http://www.fnano.eu)

Prof. Dawid Janas  
dawid.janas@polsl.pl

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**NanoCarbon Group**

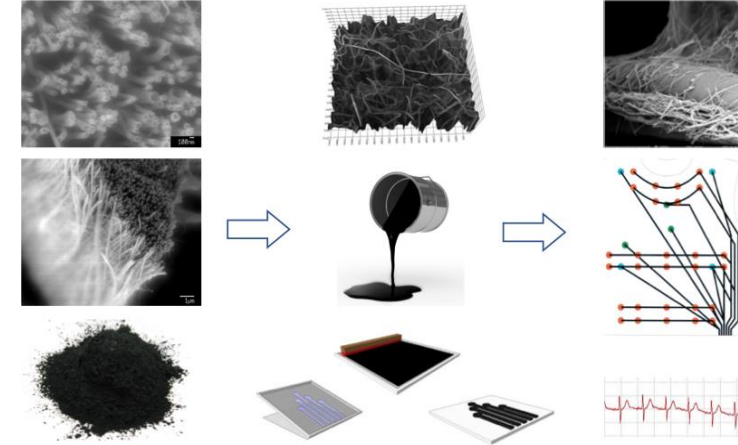
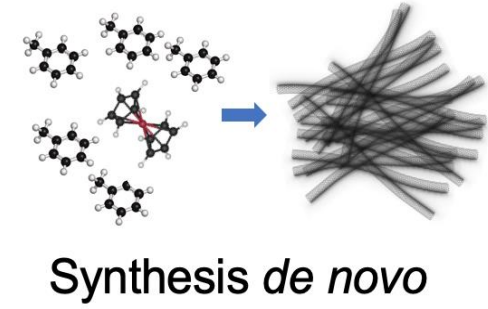


**Silesian University  
of Technology**

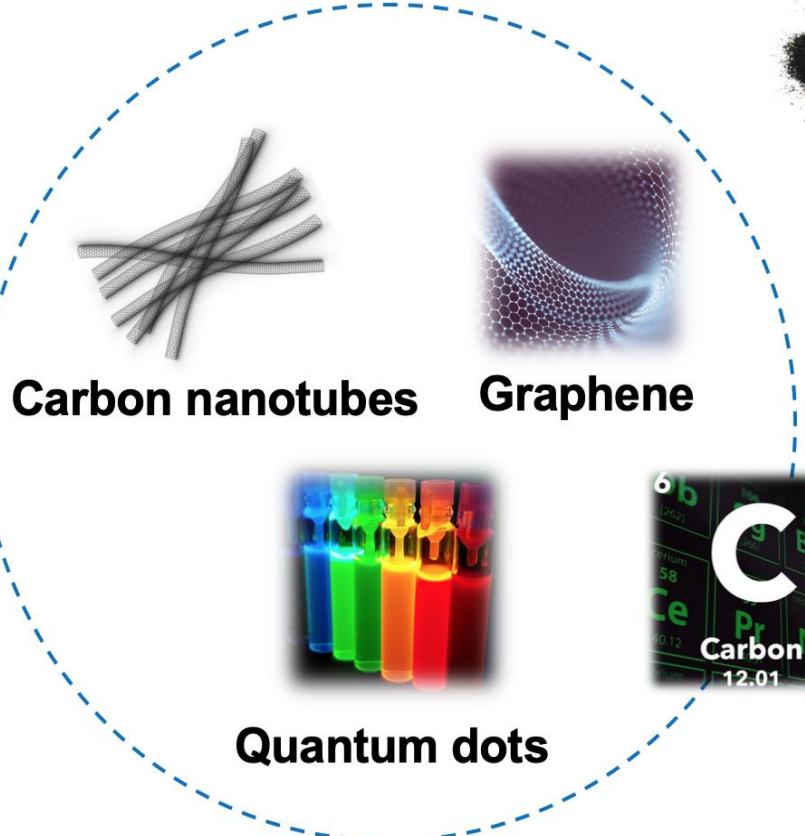
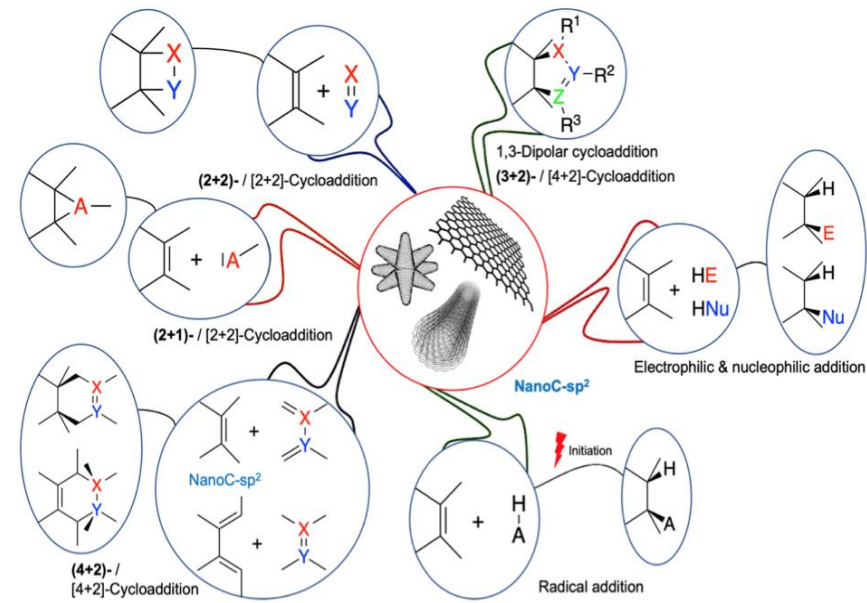




Multi-functional nanocomposites

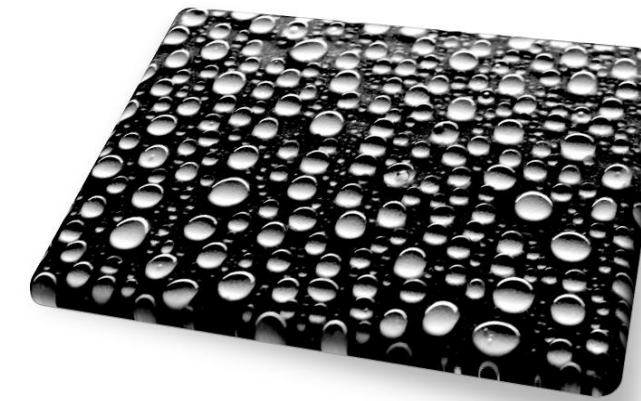


Textronics

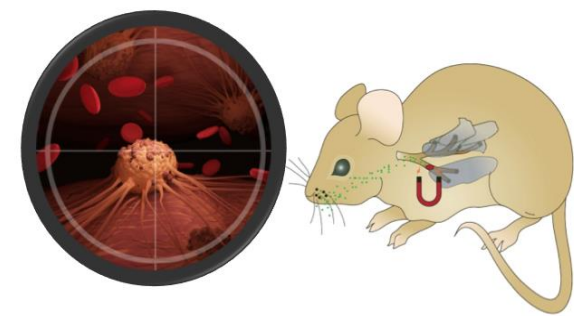


Carbon nanotubes Graphene

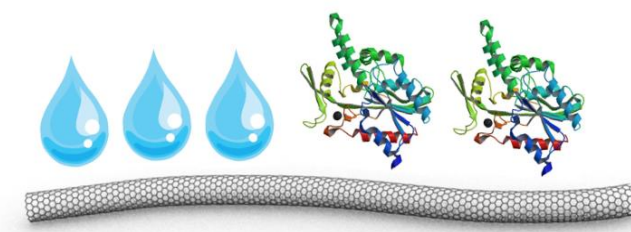
Quantum dots



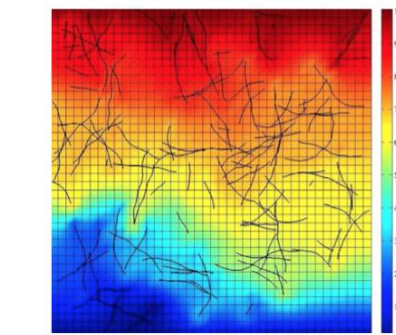
Superomniphobicity



Theranostics



Nano(bio)catalysis



Heat transfer nanofluids

Within *CNT functionalization*

INDIVIDUALIZATION

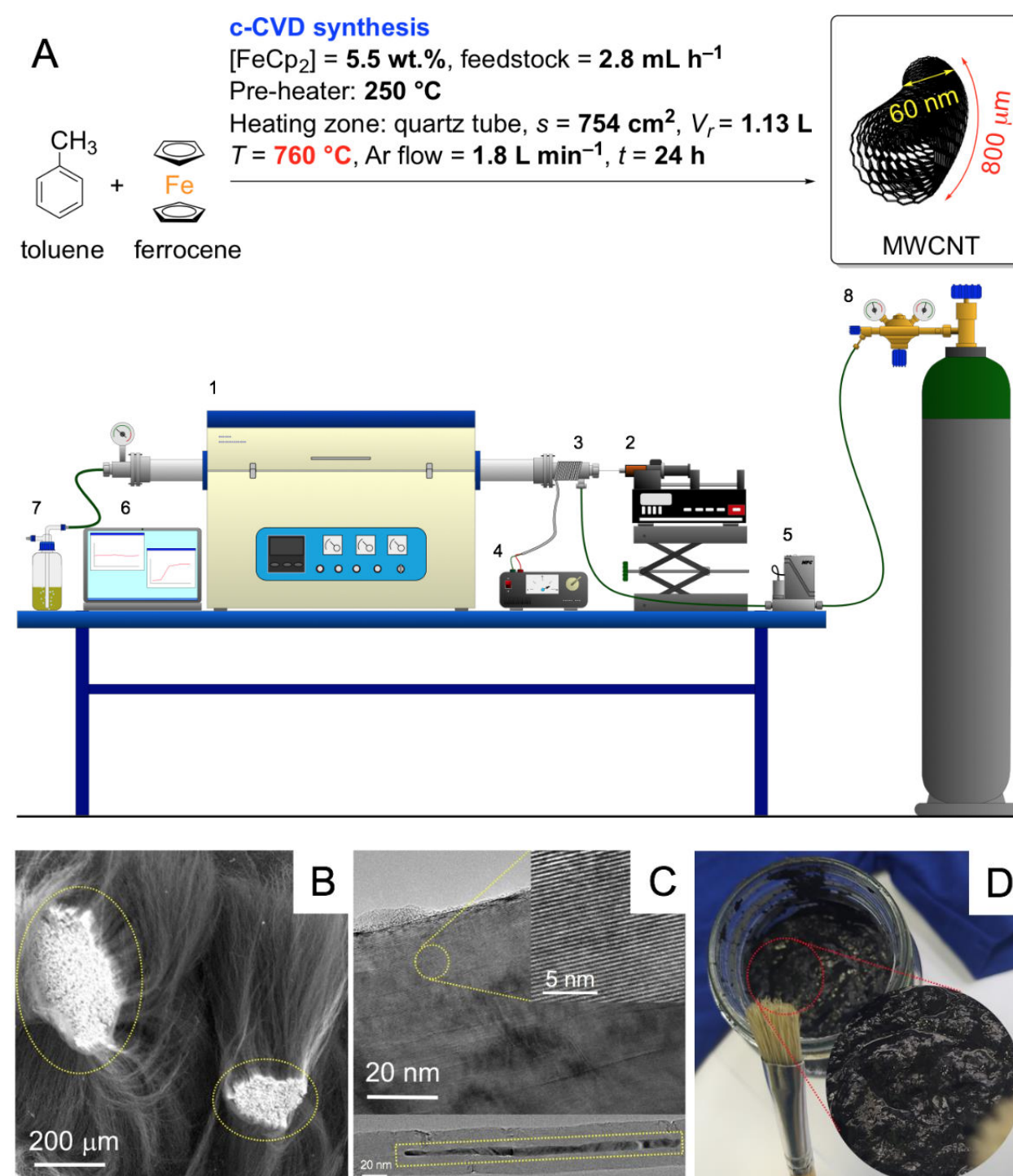
- Dispersibility
- Chemical reactivity
- Catalytic activity
- Fluidity
- Miniaturization

Upon

CROSS-LINKING

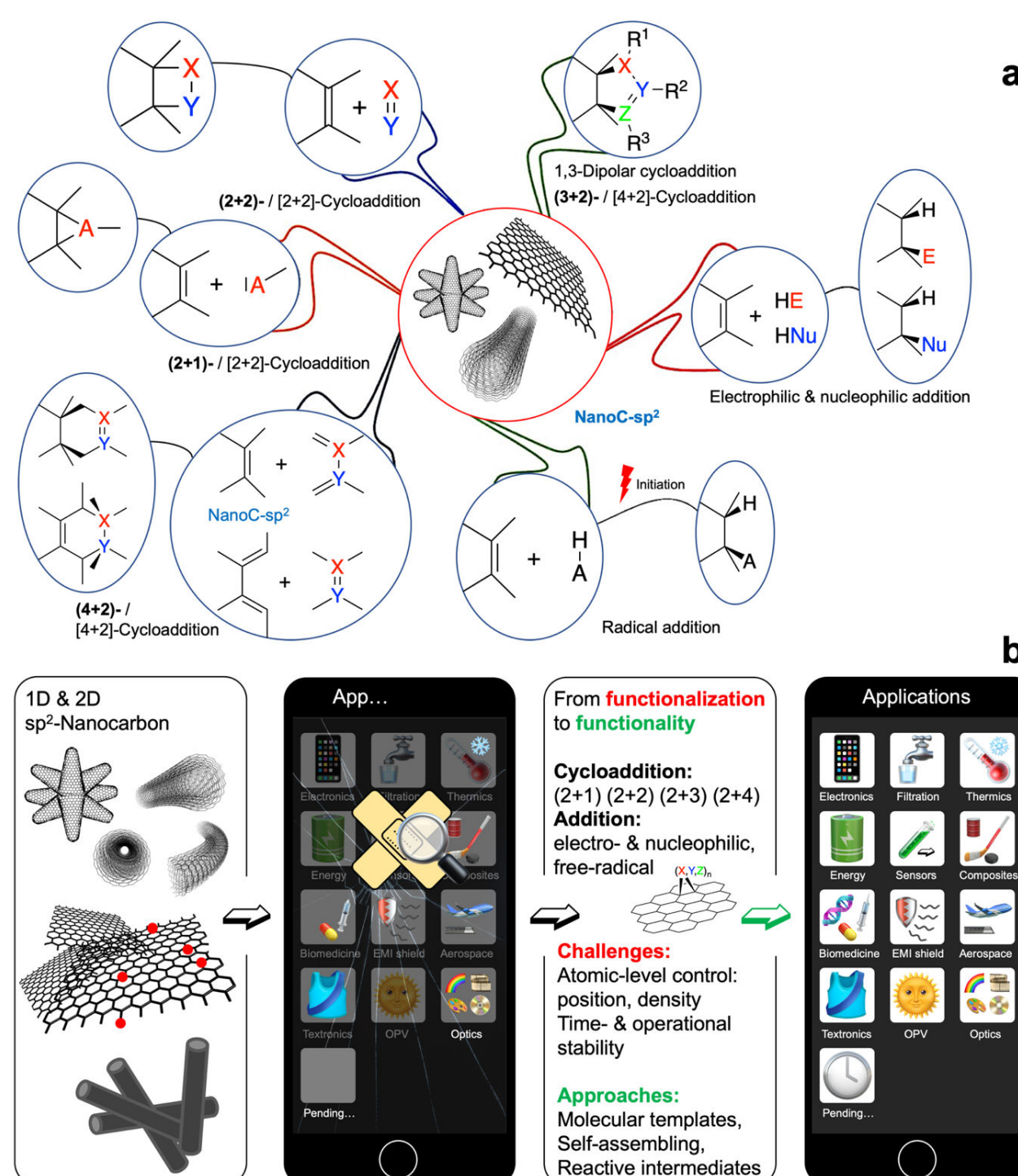
Enhancement of:

- 3D-Assembling
- Electroconductivity
- Thermoconductivity
- Gelation
- Mechanical properties



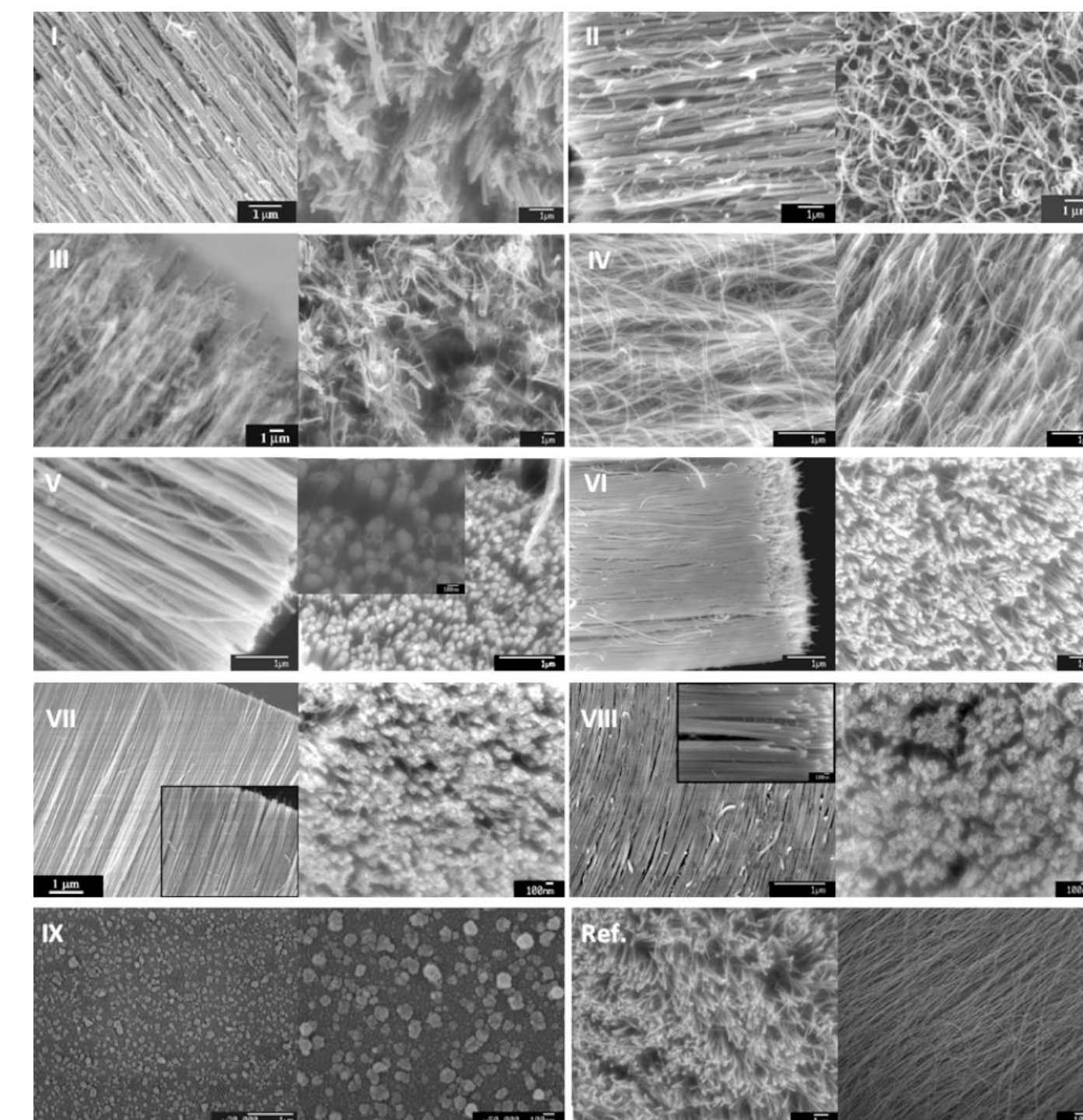
## CVD synthesis of CNTs

*J. Energy Storage 2021*



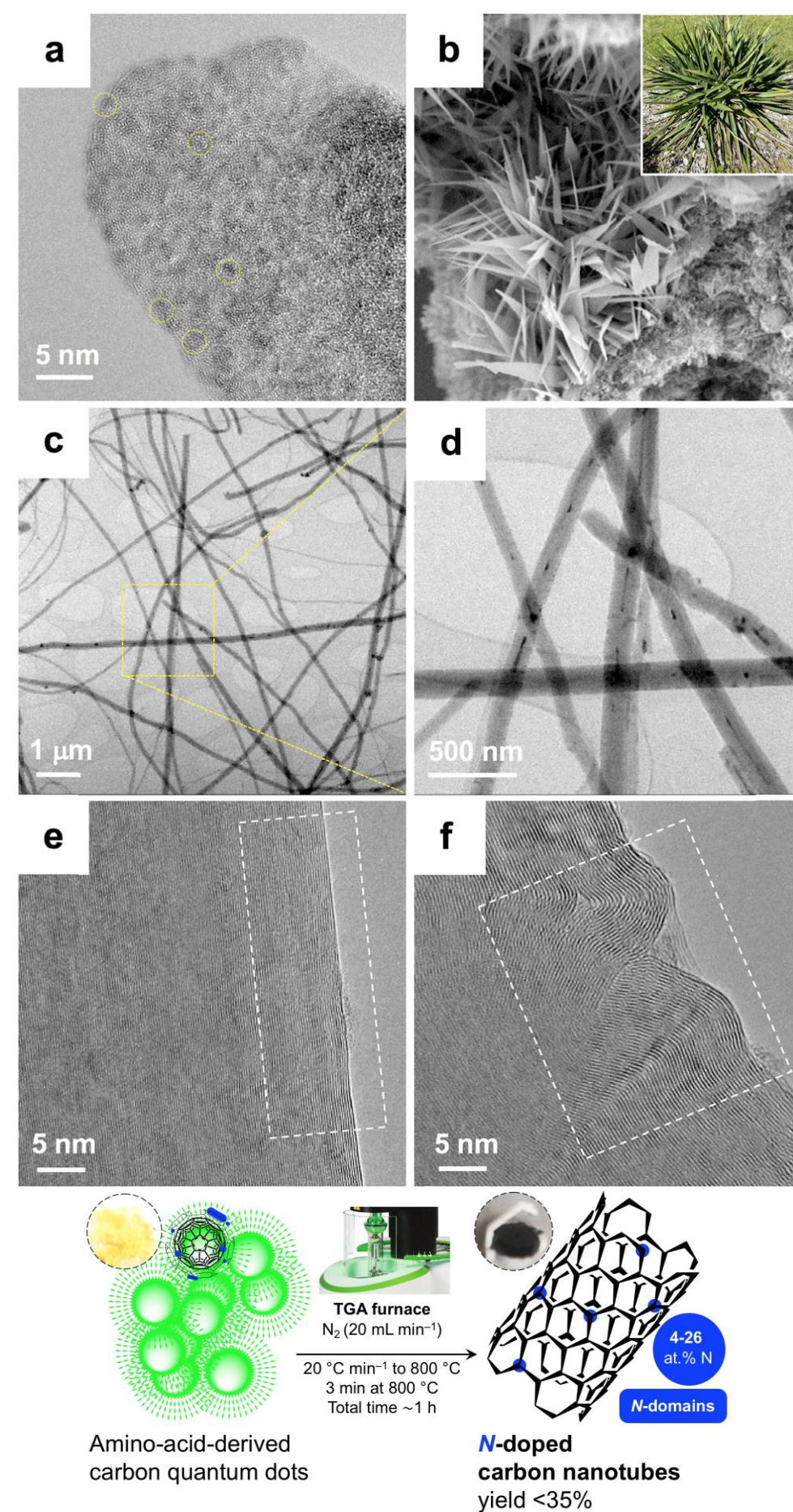
## Functionalization of nanoC-sp<sup>2</sup>

*Nanoscale 2024*



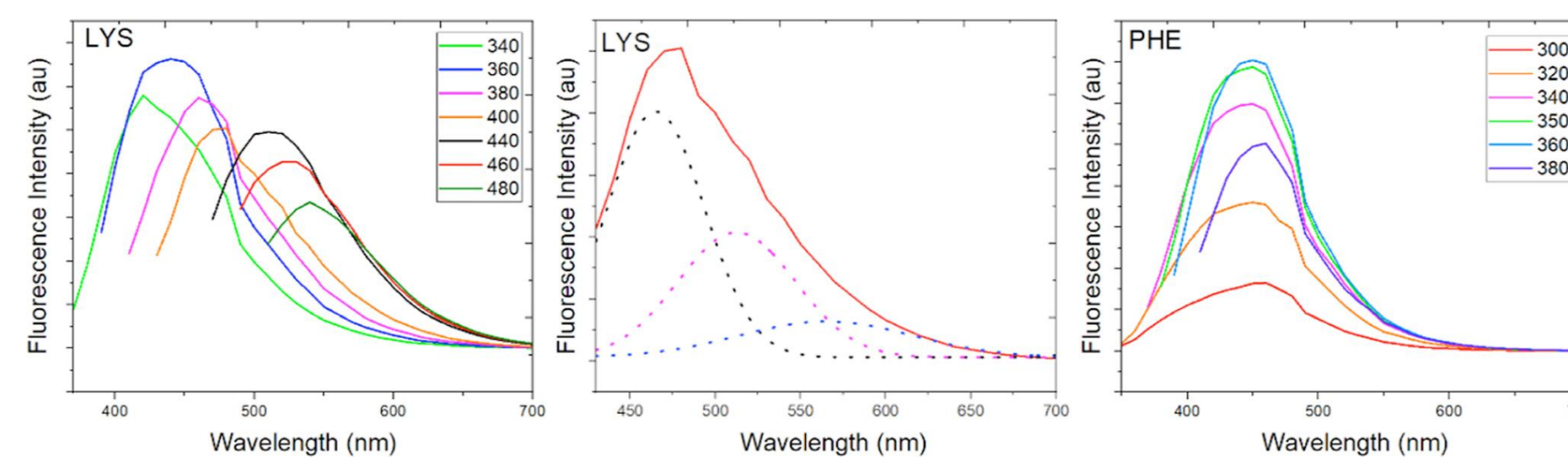
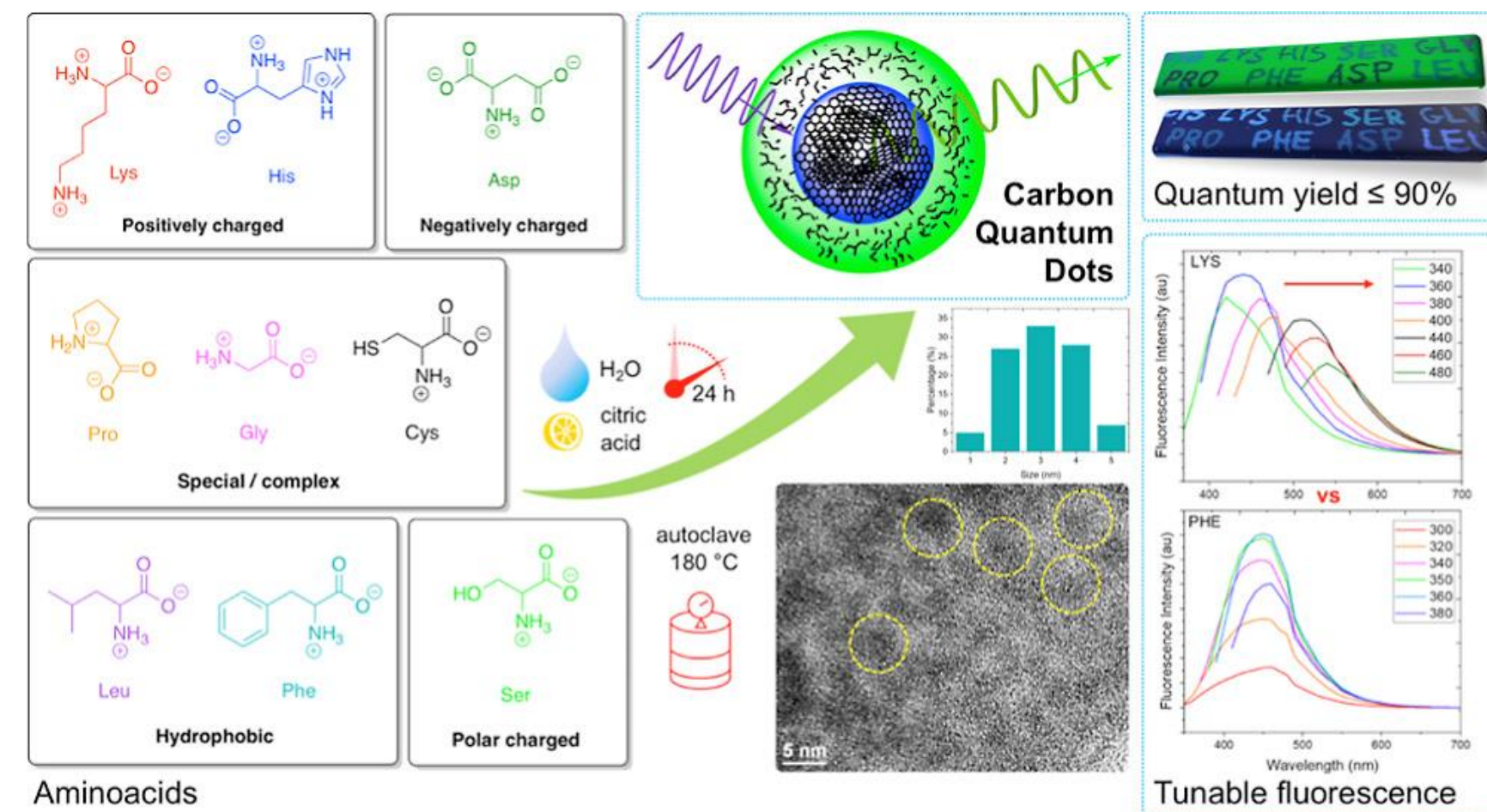
## Synthesis of N-doped CNTs

*Beilstein J. Nanotech. 2014*



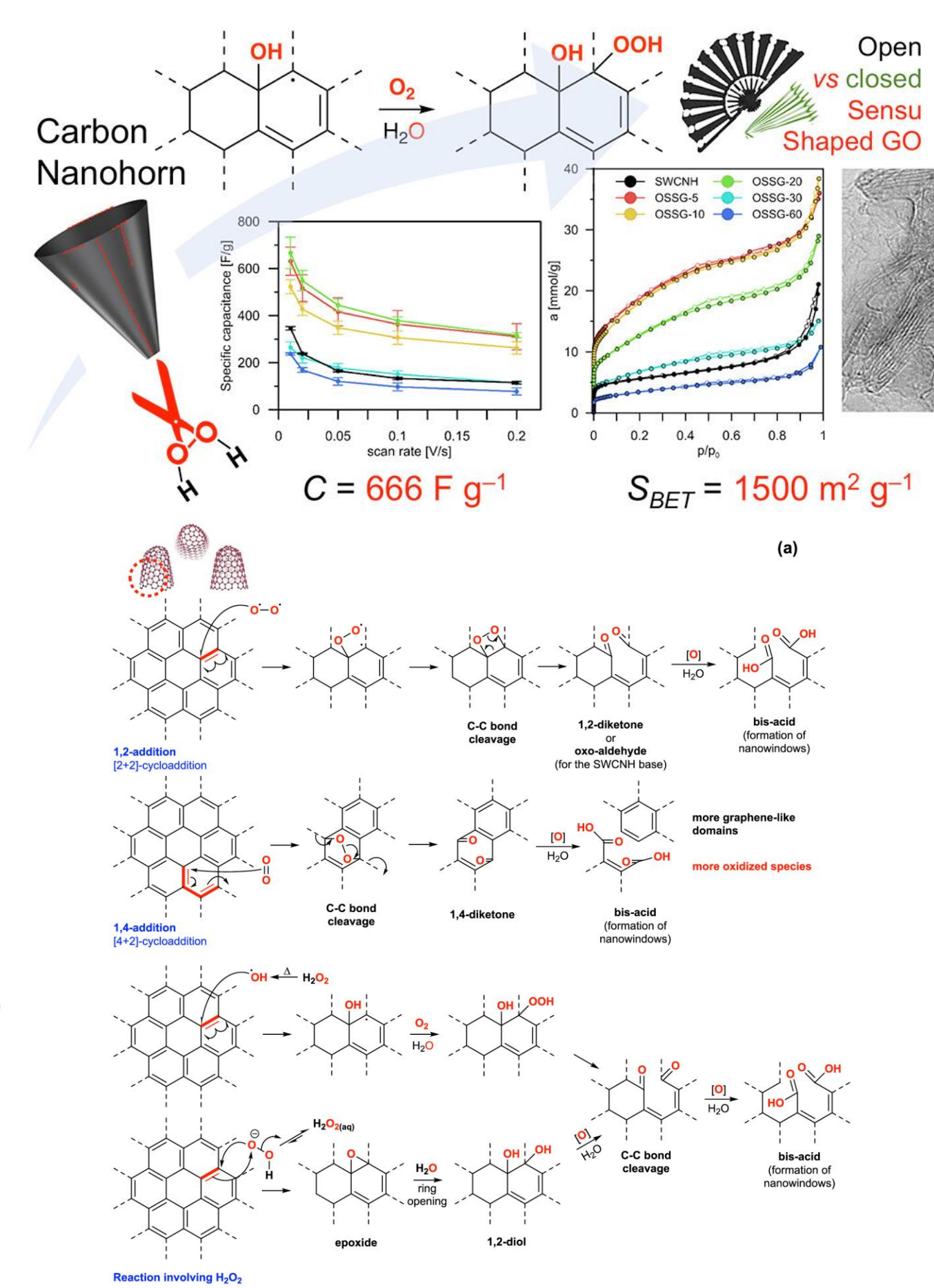
## From dots to tubes

ChemComm 2023



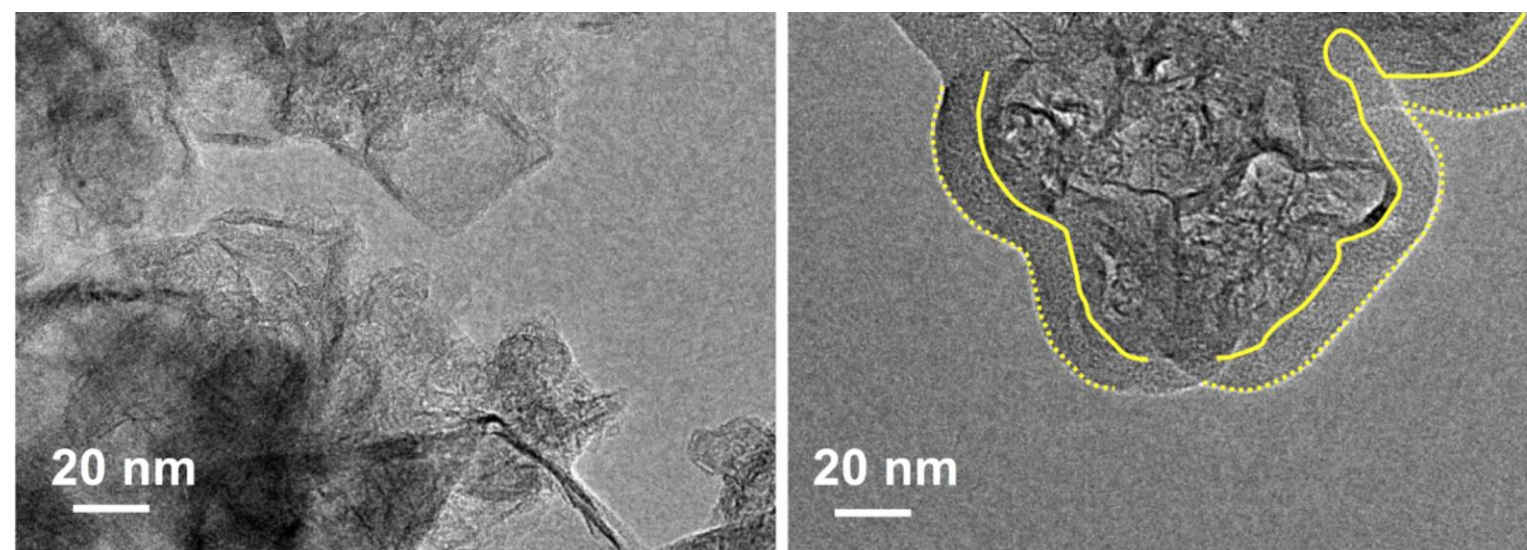
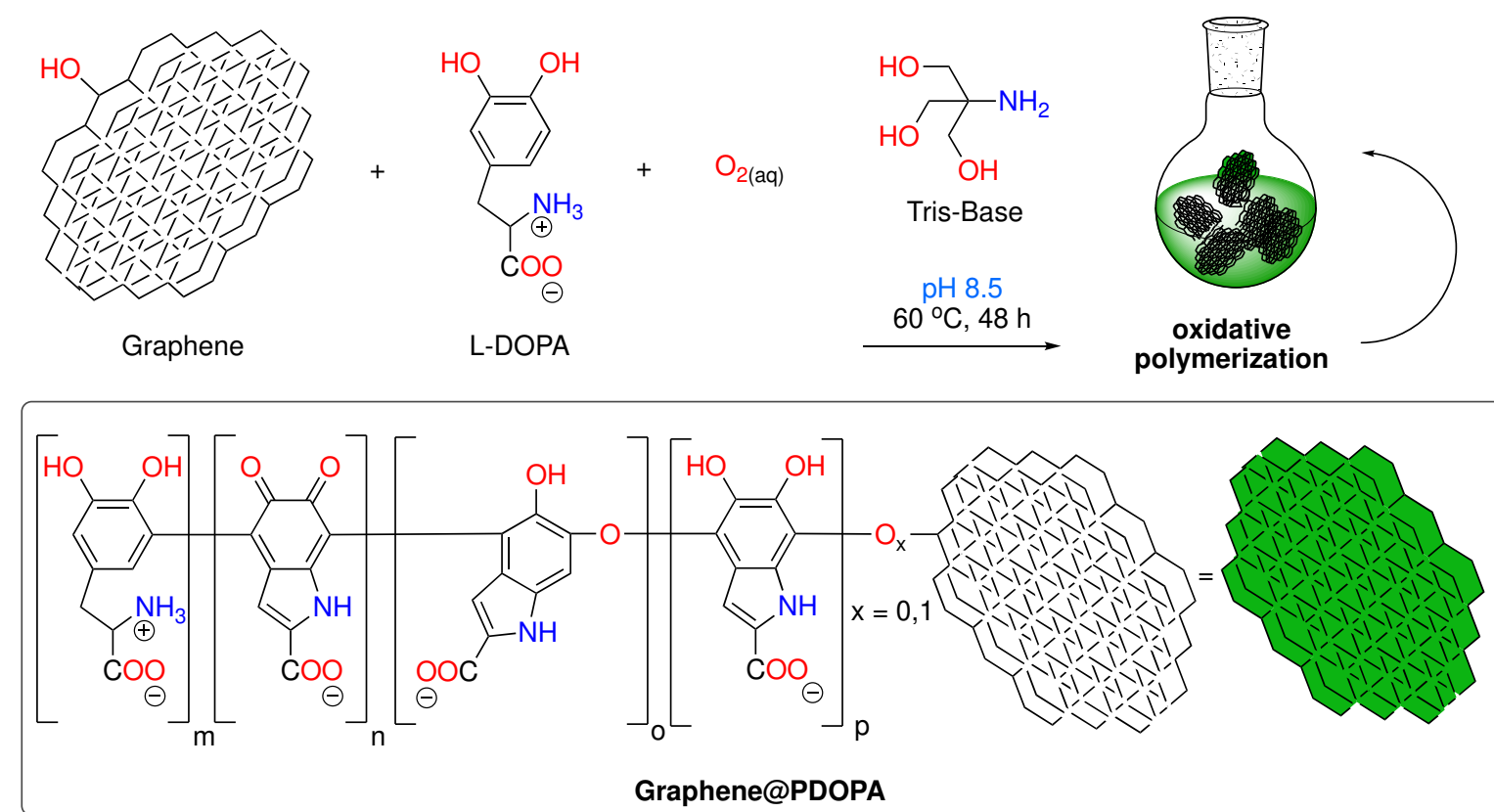
## Carbon quantum dots from amino acids

ACS Omega 2022



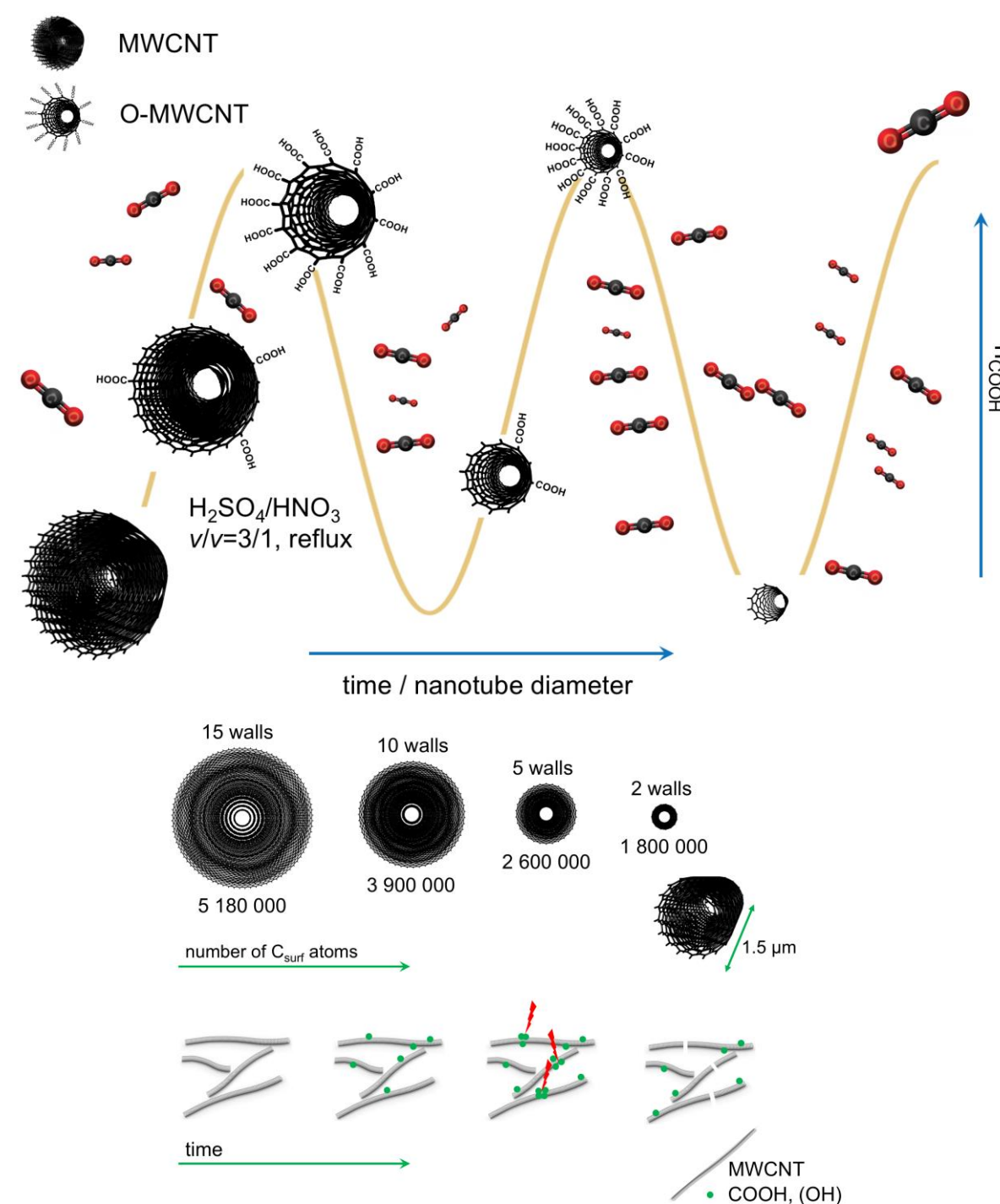
## High-Surface-Area GO

ACS Appl. Nano Mater. 2022



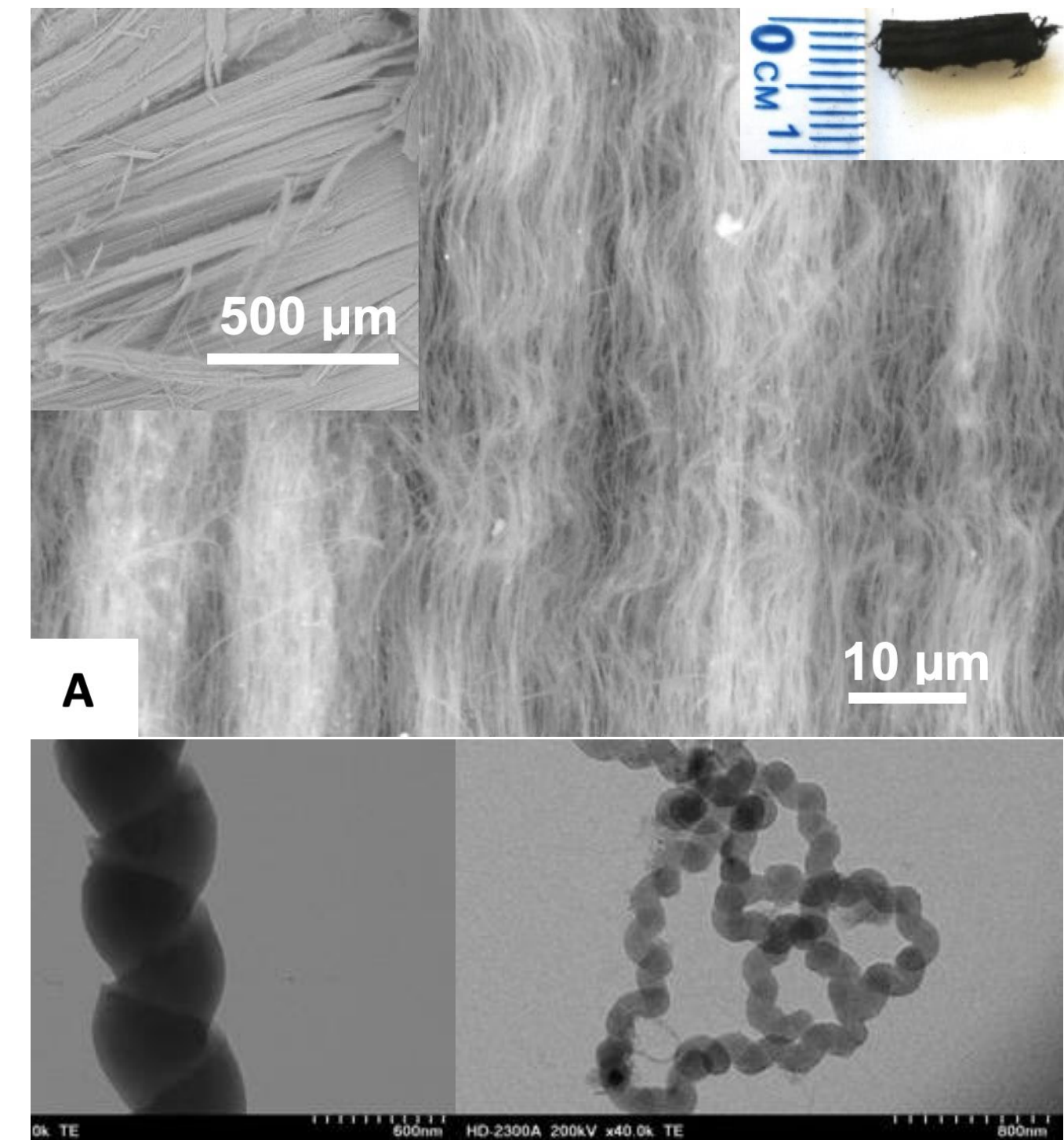
### Biomimetic hydrophilization of graphene

ACS Sus. Chem. Eng. 2022



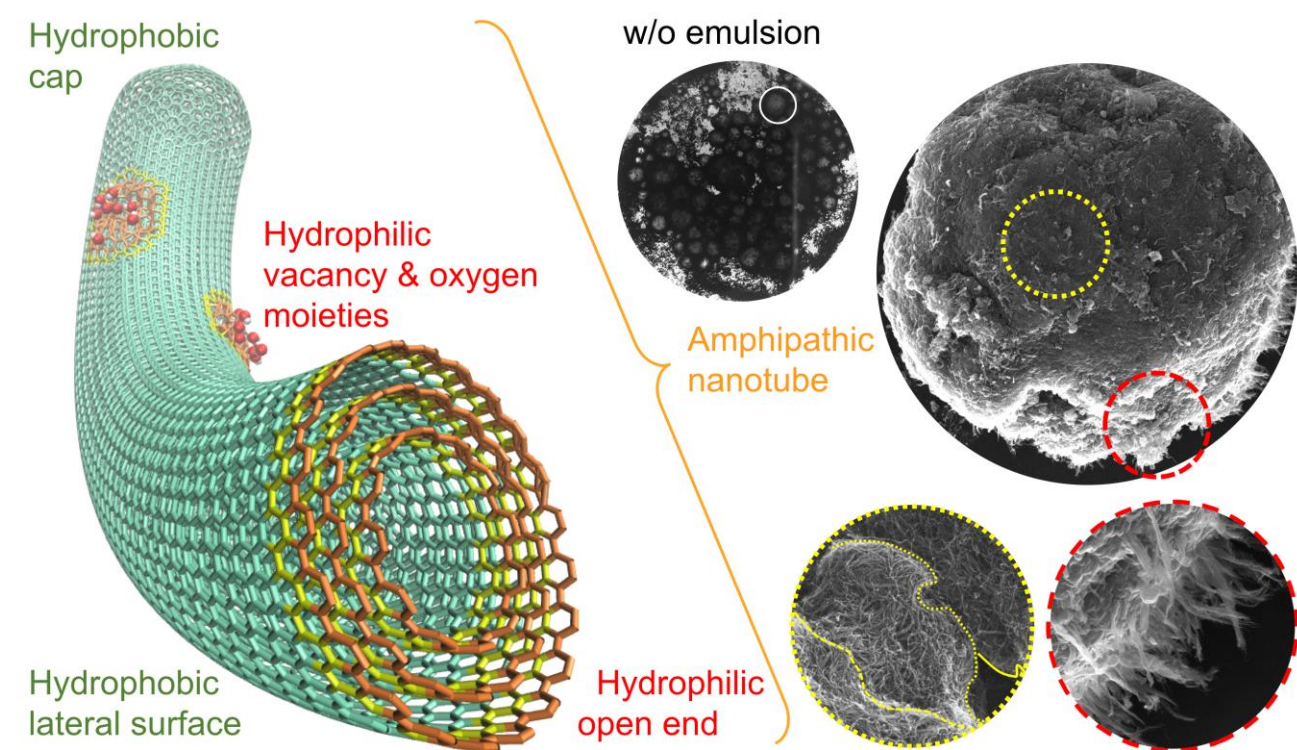
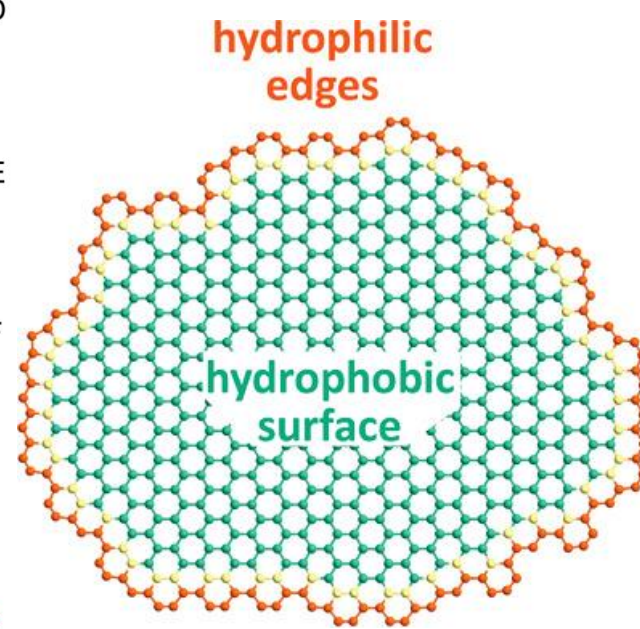
### Periodic functionalization of CNTs

RSC Adv. 2019



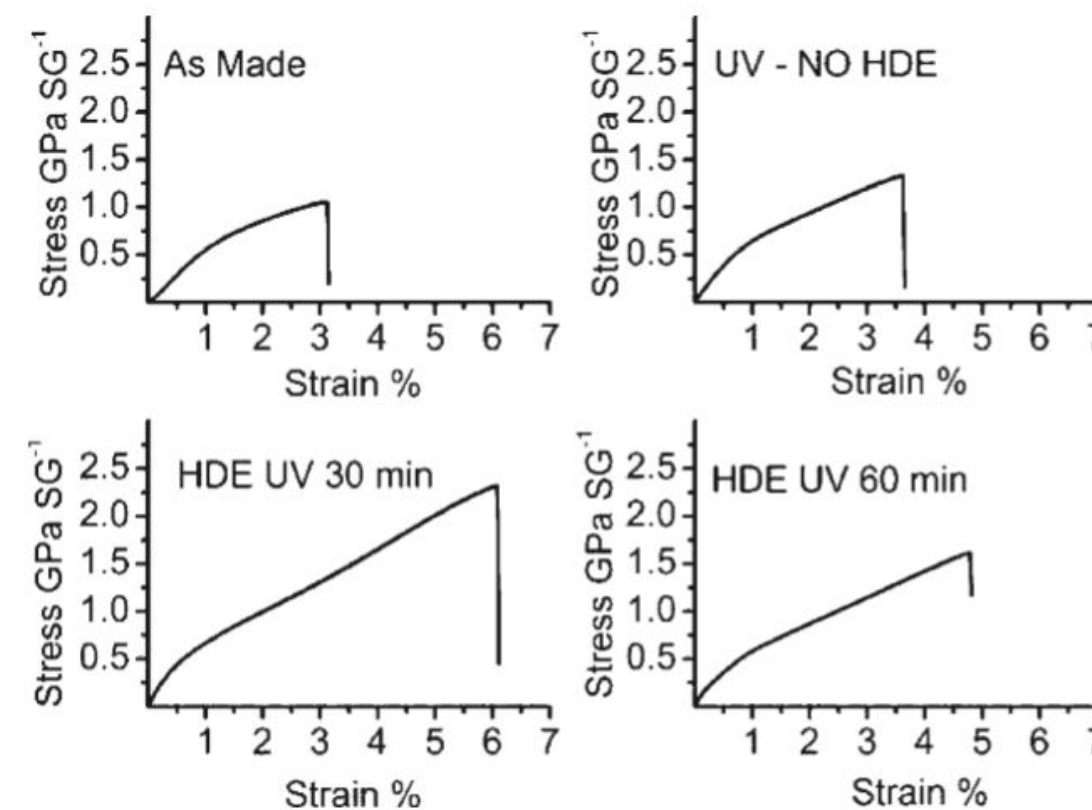
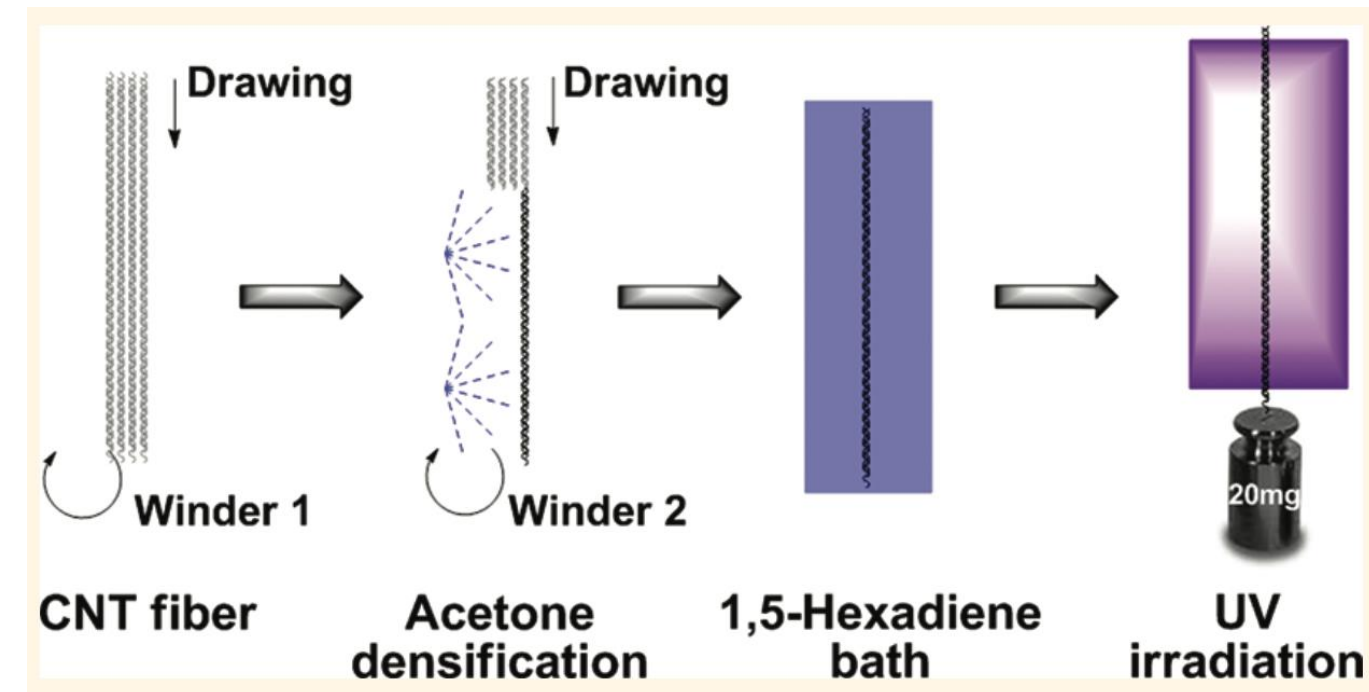
### Synthesis of helical CNTs

Heat and Mass Transfer 2018



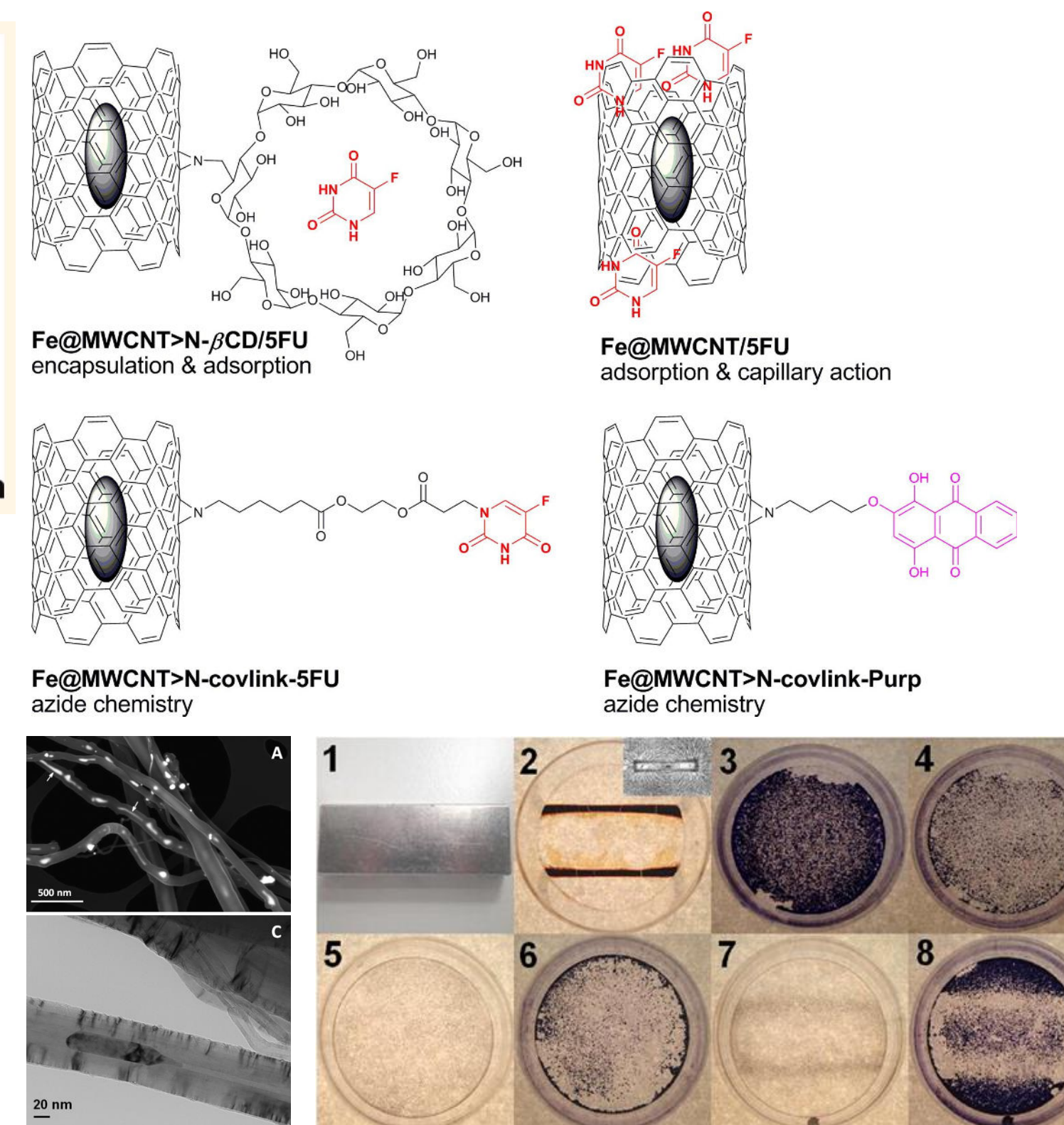
### Emulsifying amphiphilic nanoC-sp<sup>2</sup>

*Adv. Mater.* 2020  
*Adv. Mater. Interfaces* 2023



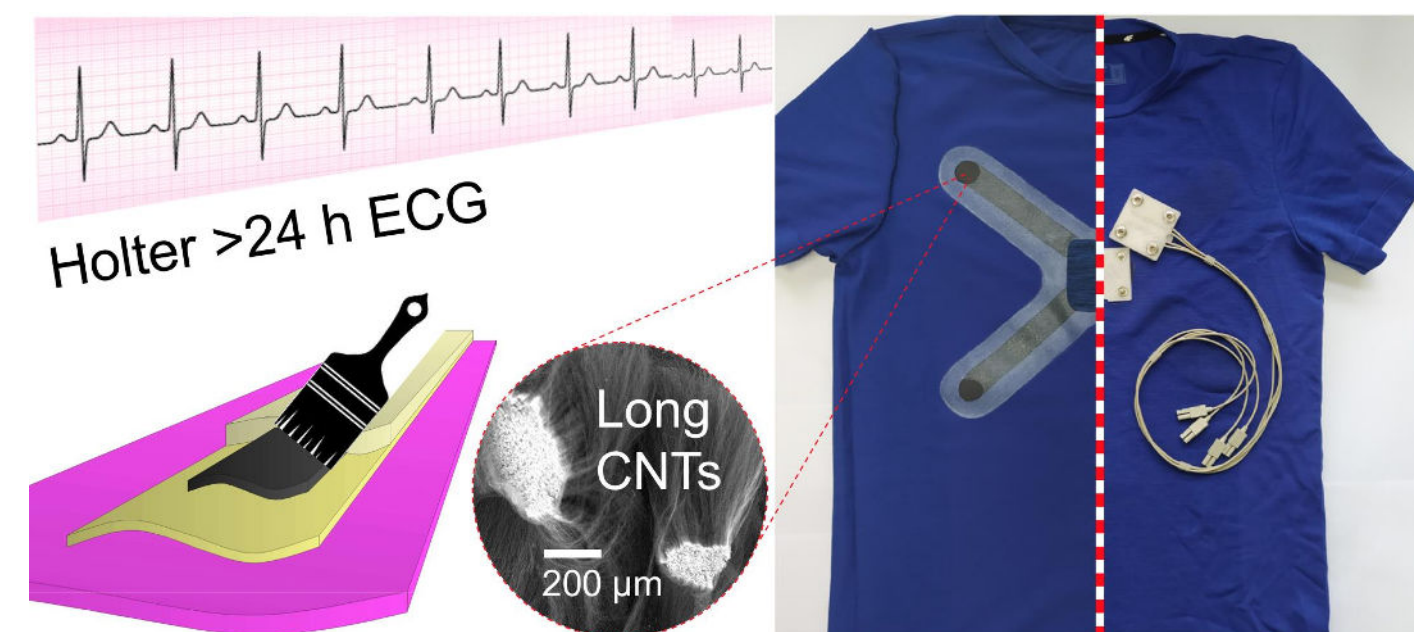
### High-performance CNT fibers

*ACS Nano* 2011



### Magnetic anticancer CNT-drug hybrids

*ACS Biomater. Sci. Eng.* 2016



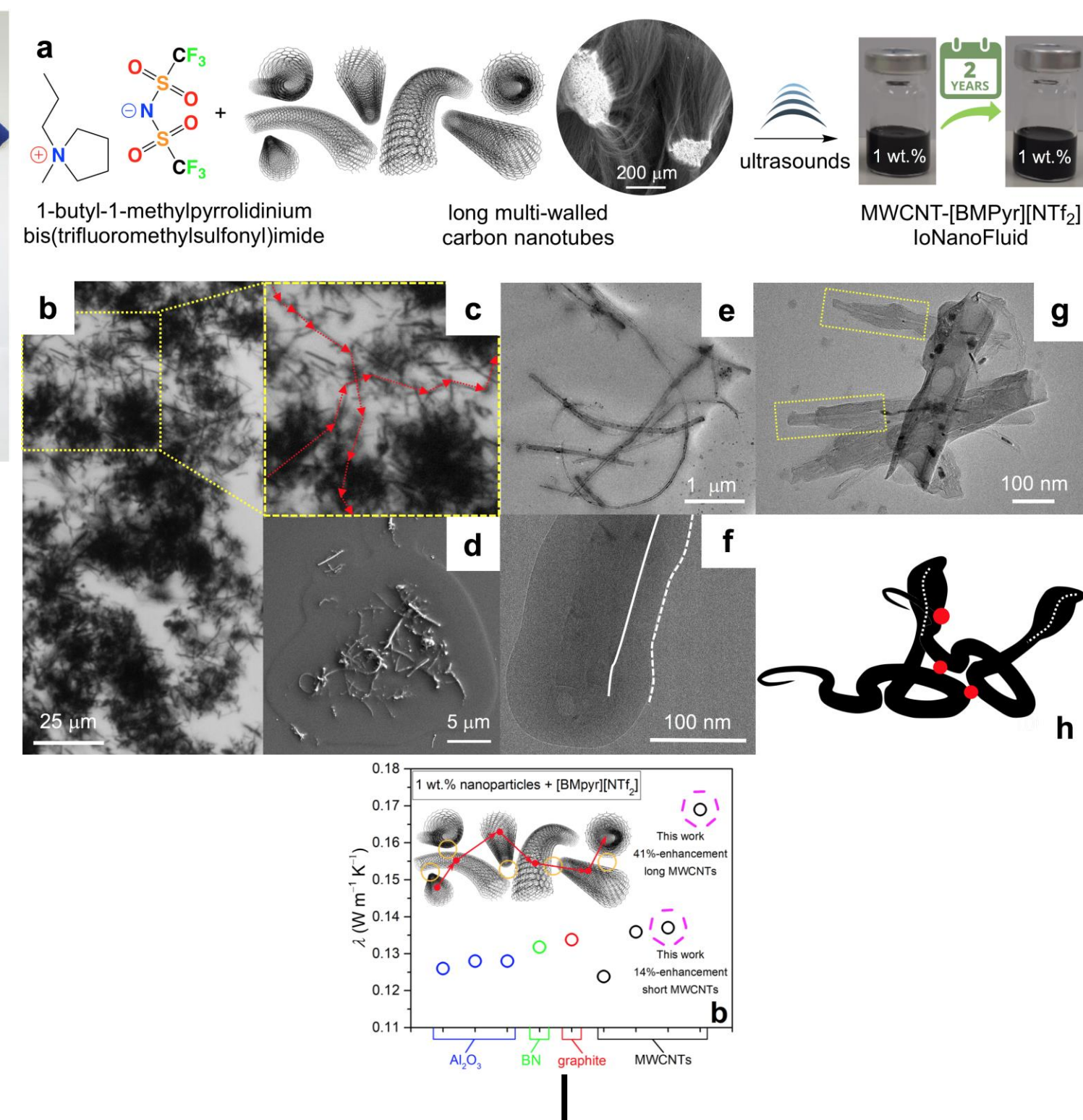
Painted textronics

ECG T-shirt



ECG textronic T-shirt

ACS Appl. Nano Mater. 2022

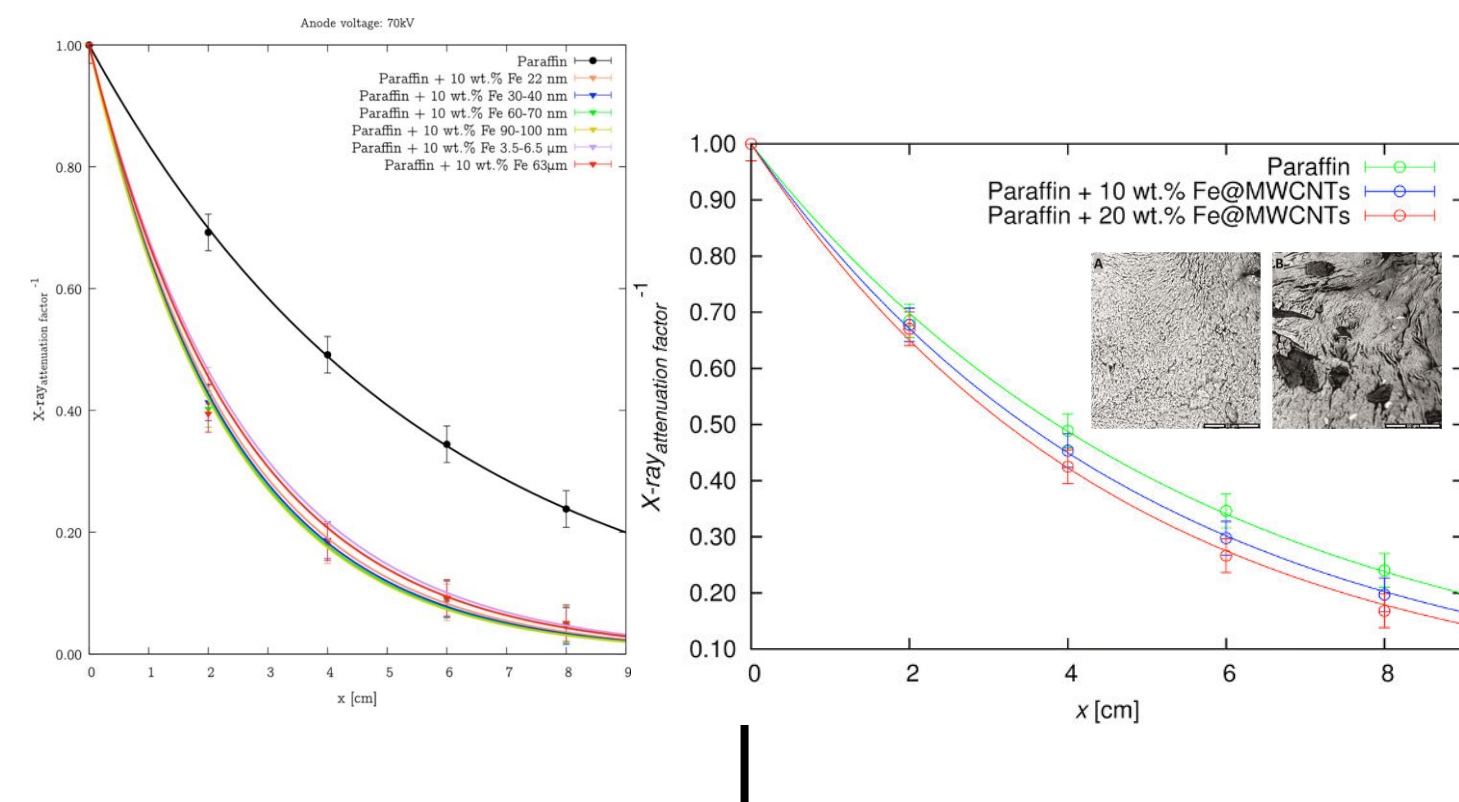


Cobra-CNT heat transfer nanofluid

ACS Appl. Mater. Interfaces 2022



New paraffin-iron X-ray shielding composites with controllable shape

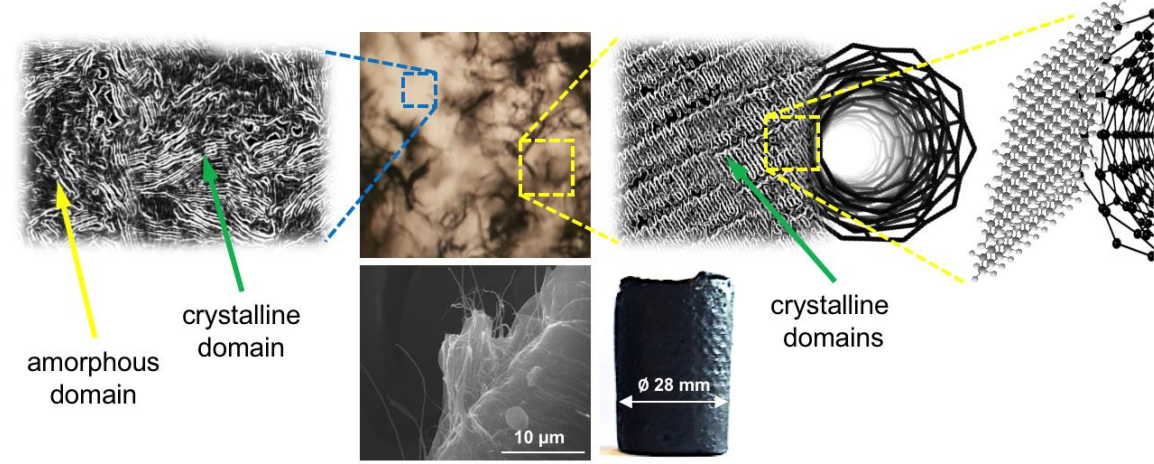


X- and gamma-ray attenuation

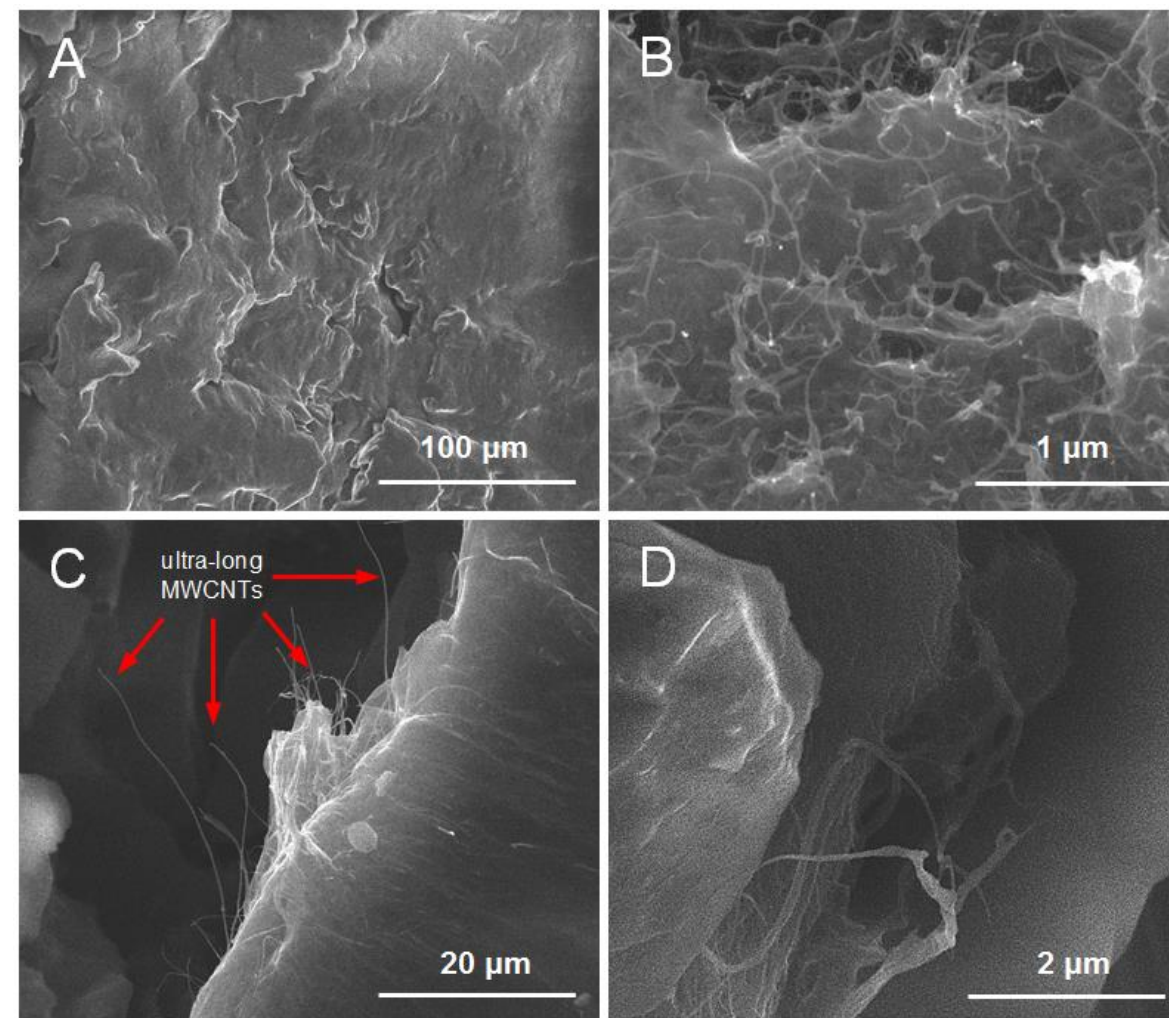
ACS Appl. Eng. Mater. 2023



### Ultra-long MWCNT-paraffin composites

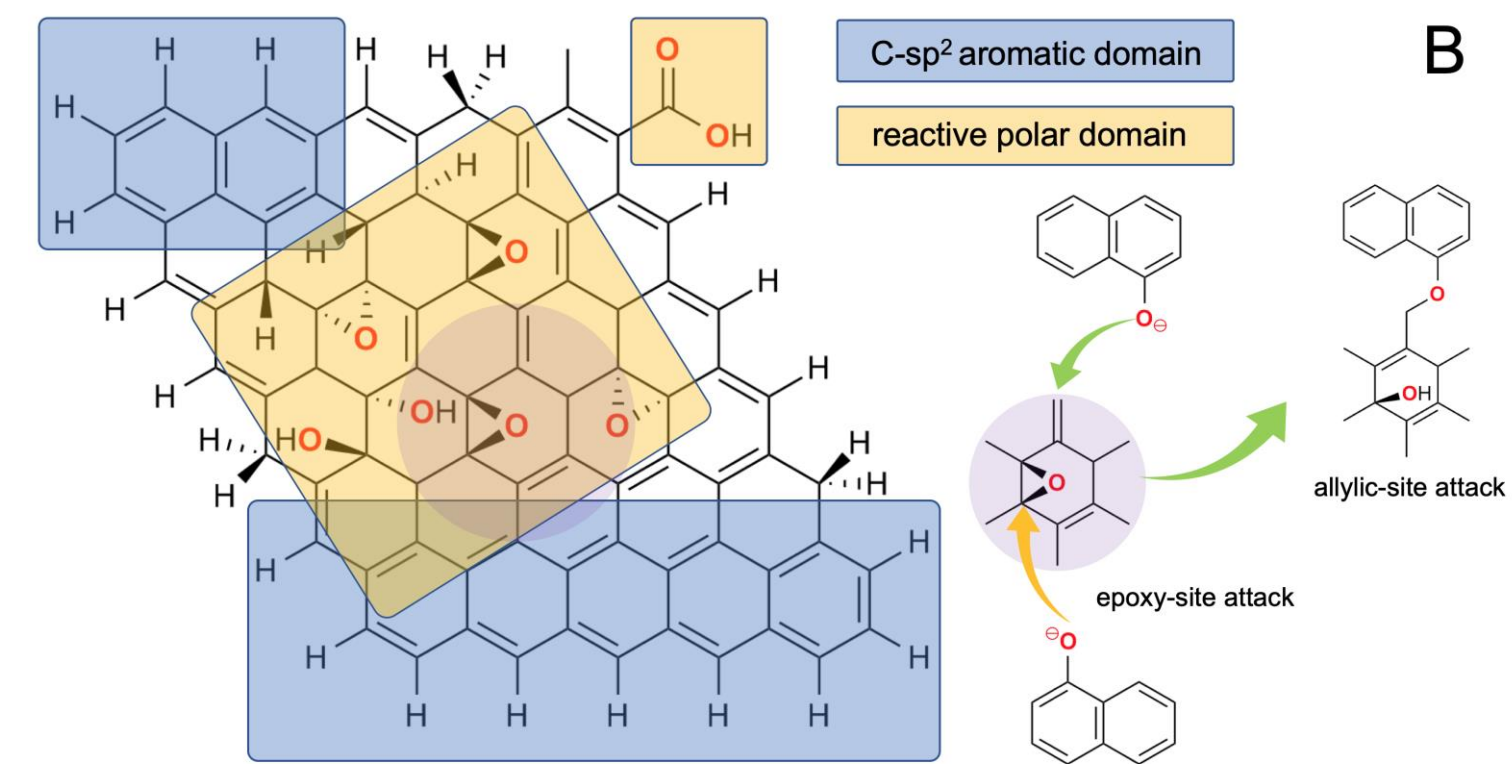
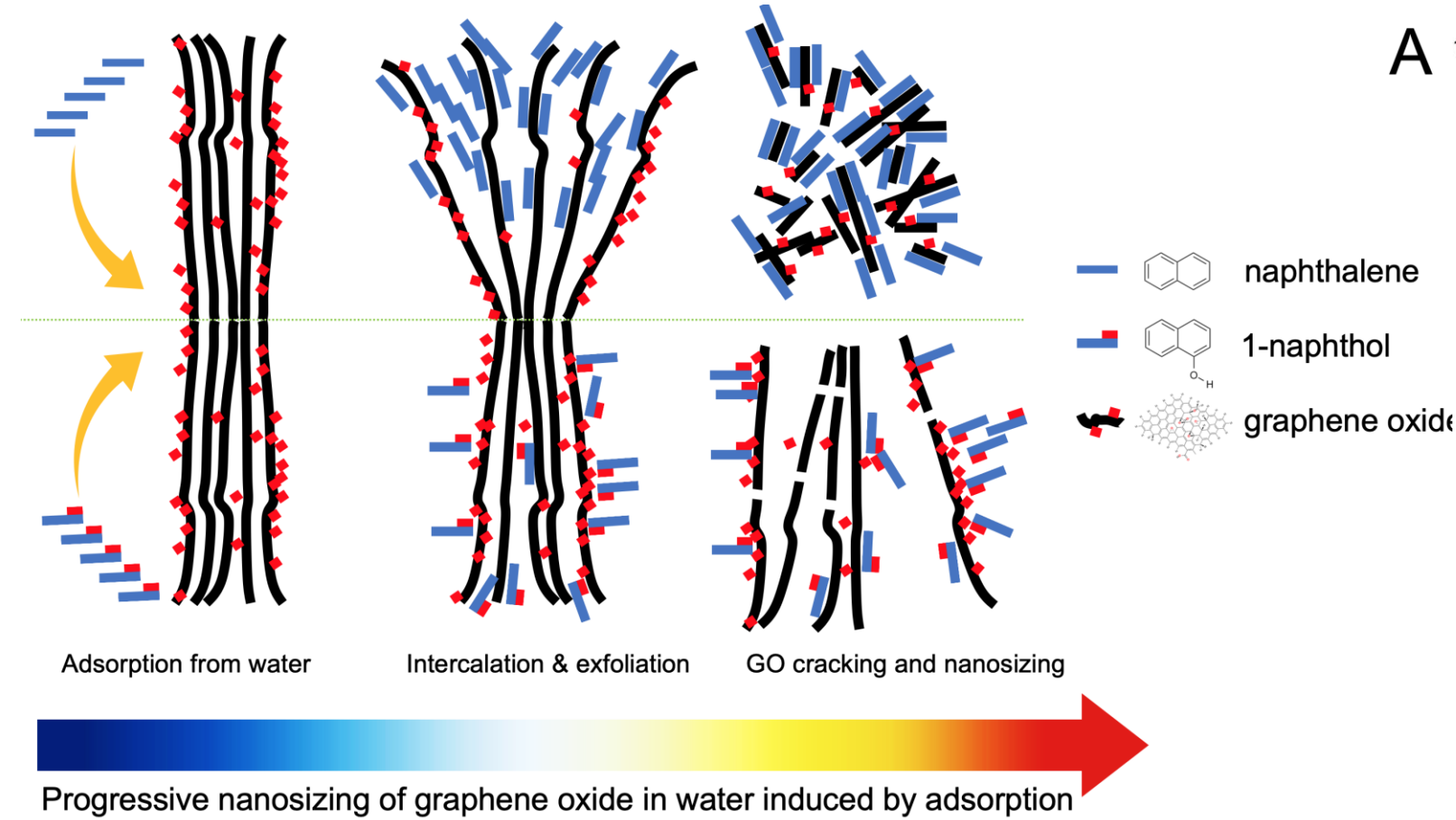


- ✓ 97% enhanced thermal conductivity ( $\lambda$ )
- ✓ 6.3% higher enthalpy of phase change ( $\Delta H_m$ )
- ✓ Low supercooling temperature of 2.4 °C



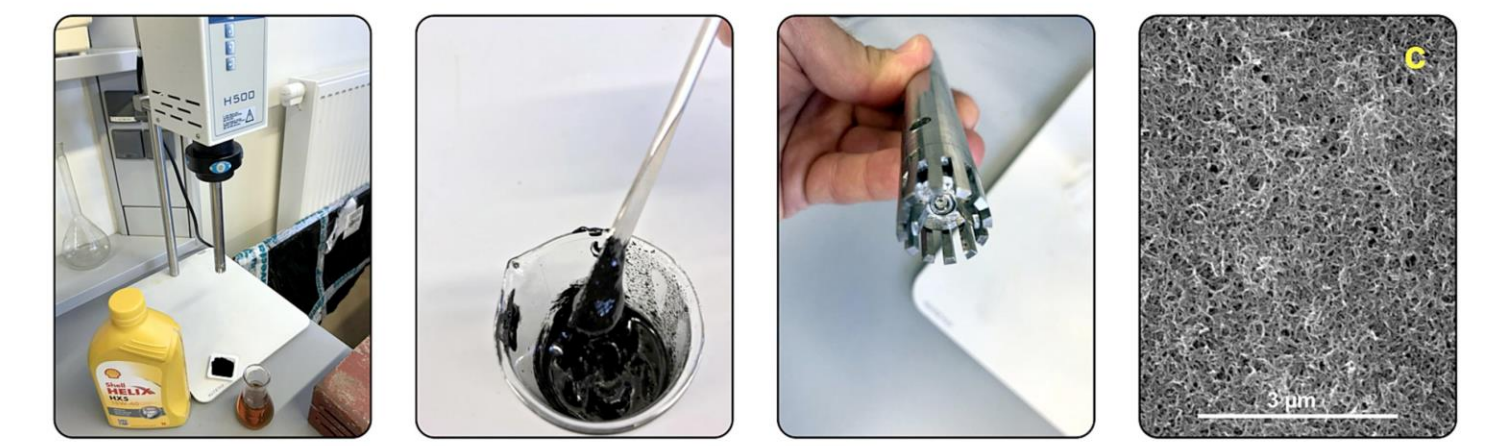
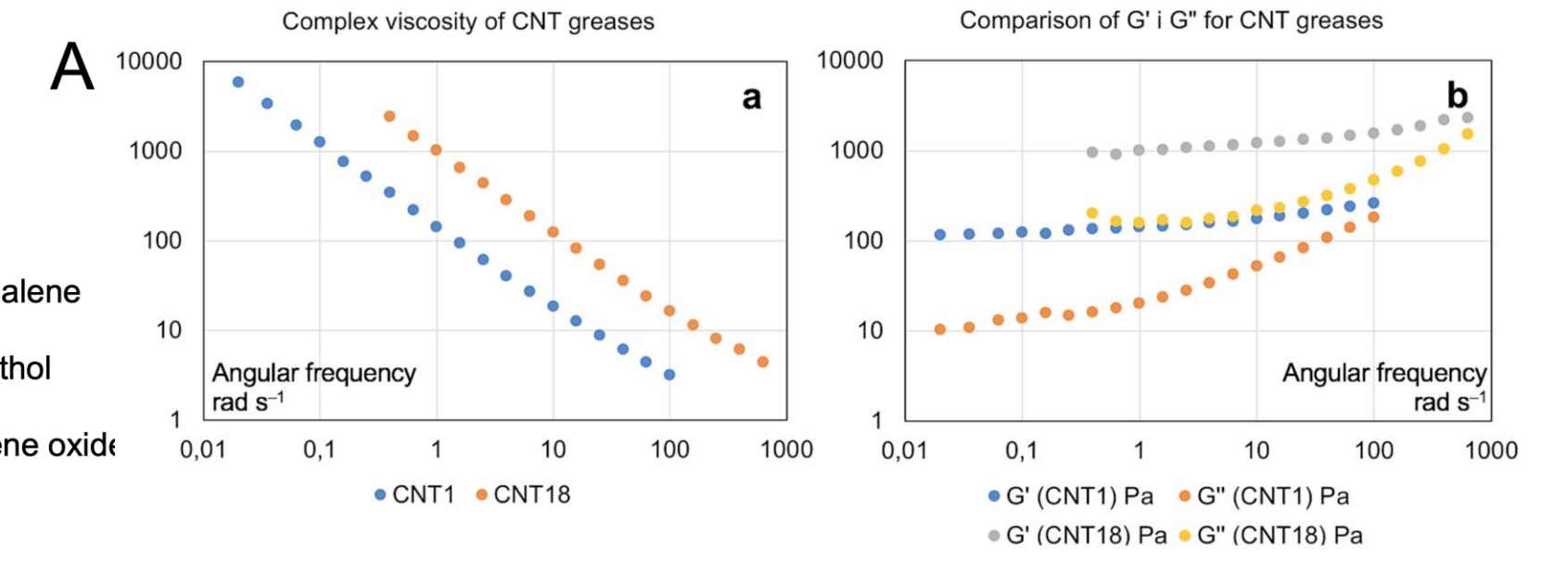
### Heat storage nanomaterials

*J. Energy Storage* 2021

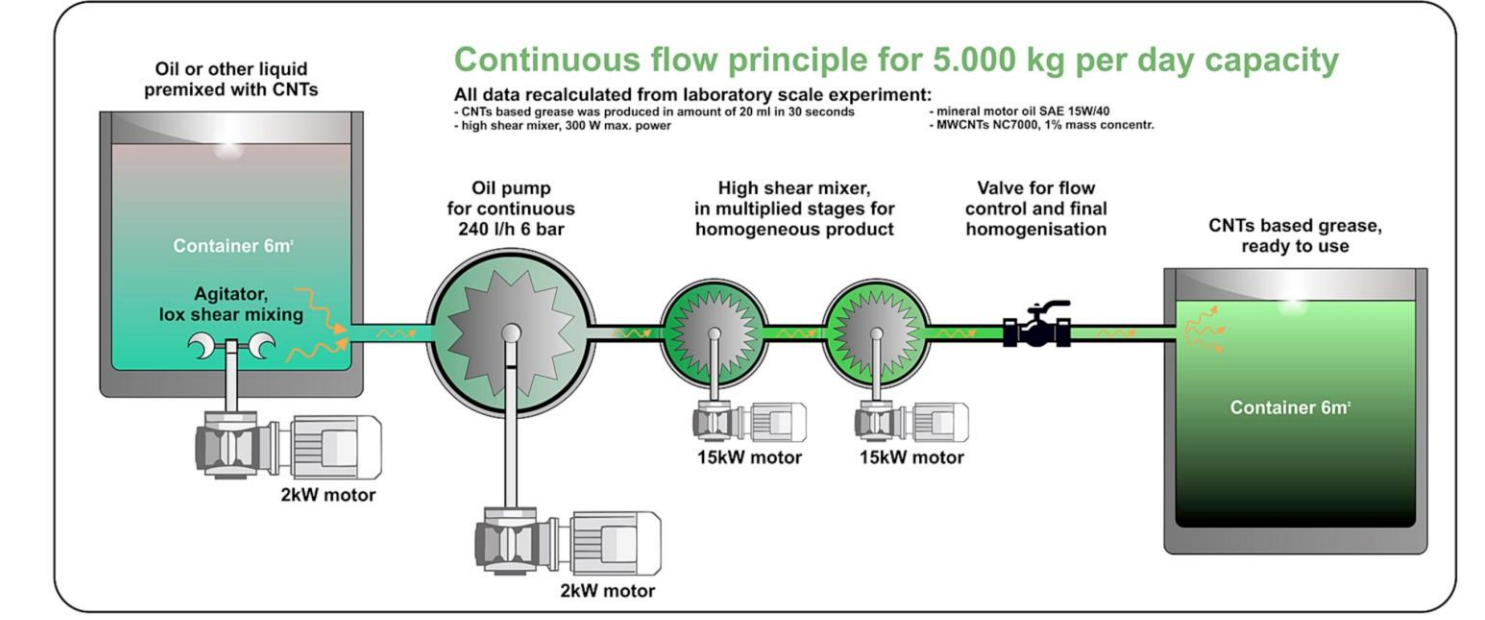


### Nanosizing of graphene oxide

*Carbon* 2021



### CNTs BASED GREASE - industrial scale manufacturing



### CNT superlubricant, $COF < 0.01$

*Tribology Int.* 2024  
*J. Mol. Liq.* 2022

# Head & Post-docs

10



**Prof. Sławomir Boncel**  
Head of *NanoCarbon Group*



**Dr Rafał Jędrysiak**  
Chief Scientific Officer



**Dr Adam Marek**



**Dr Magdalena Małecka**



**Dr Paweł Gancarz**



# PhD Students



**Anna Blacha**



**Zunaira Amjad**



**Szymon Ruczka**



**Monika Tarnowska**



**Rupinder Kaur**



**Anna Tracz**



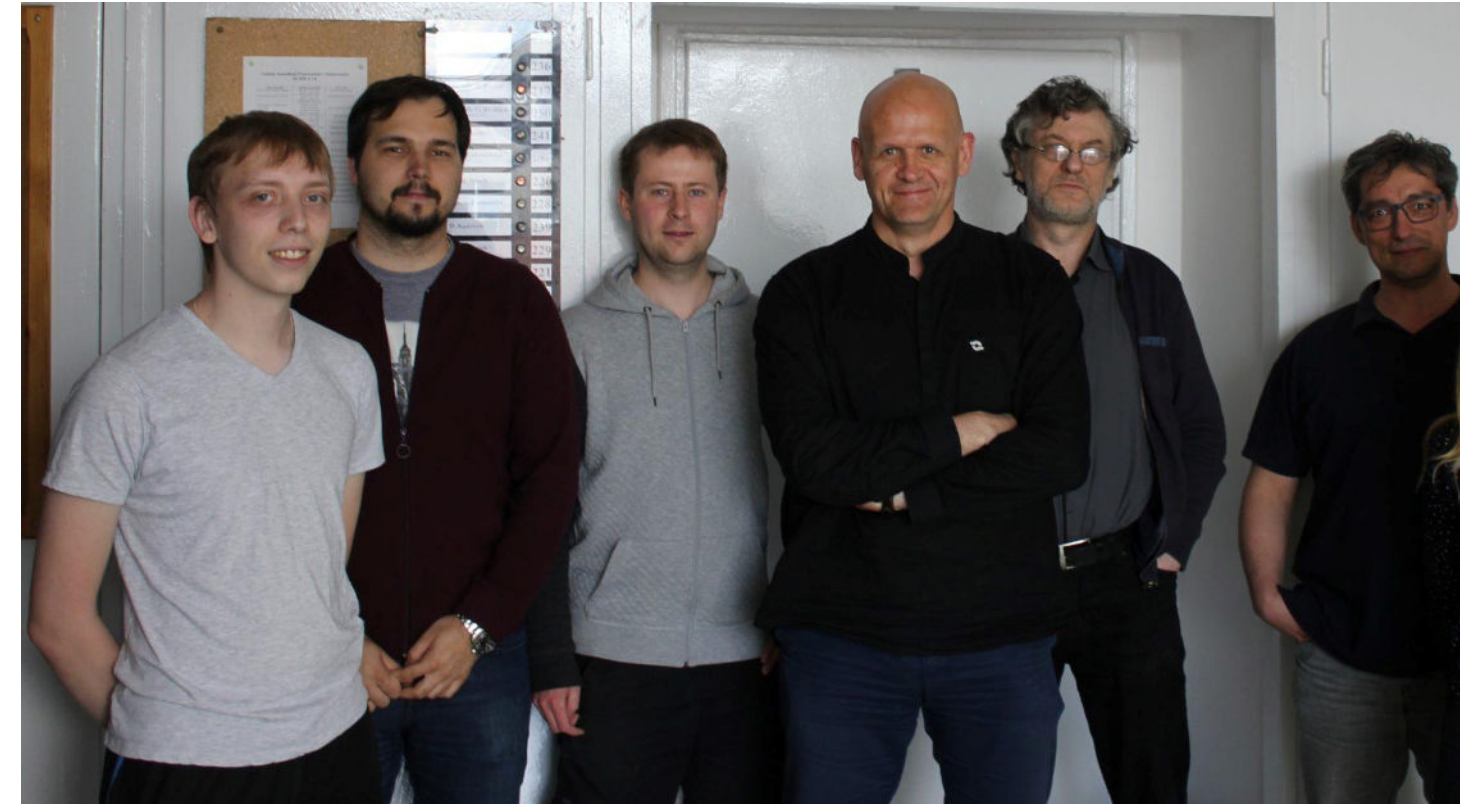
**Ilona Scudło**



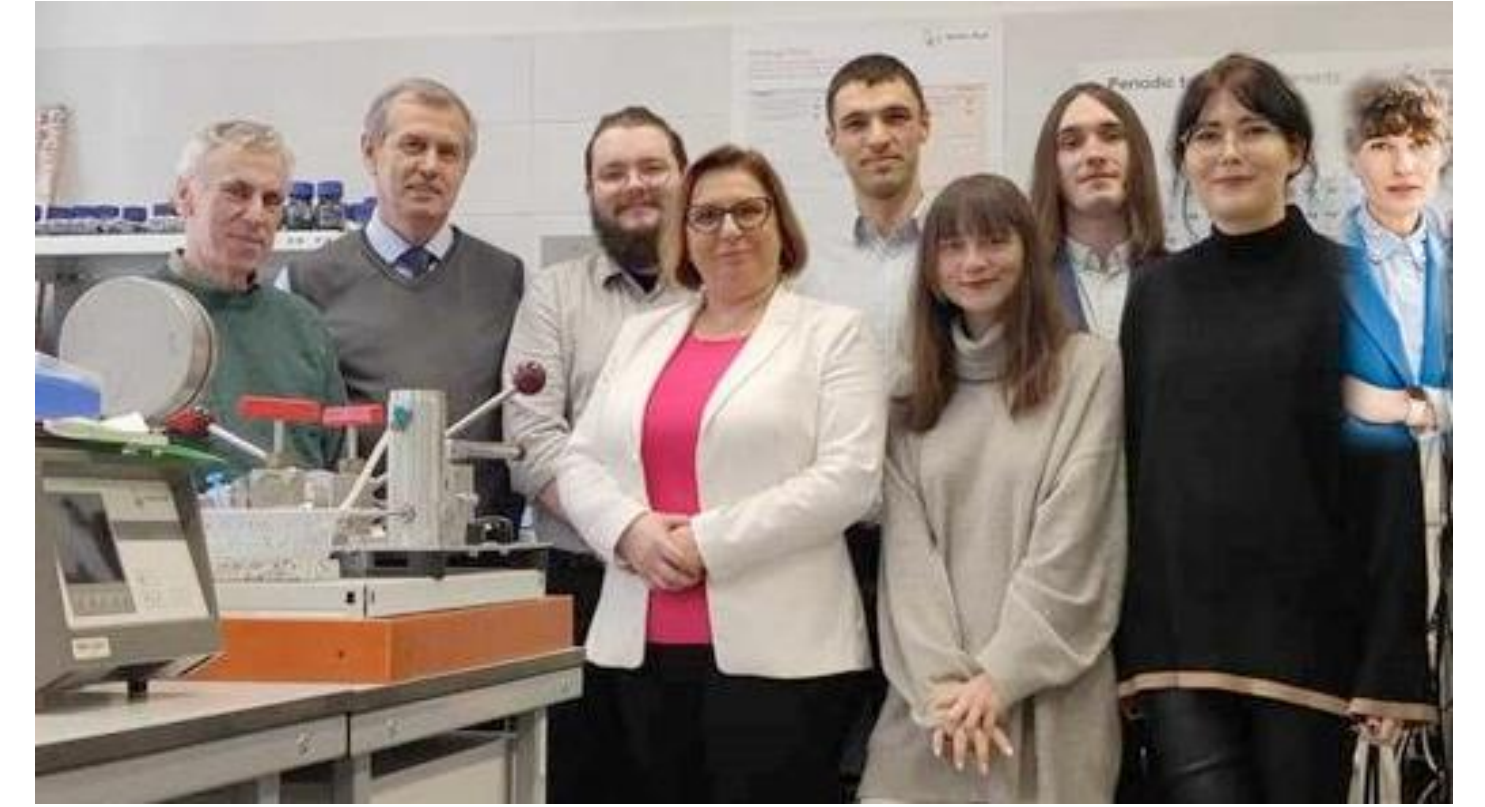
# Collaboration



12 Prof. Alan Windle's  
Macromolecular Materials Laboratory



Prof. Artur Terzyk's Research Group  
Physicochemistry of Carbon Materials



Prof. Marzena Dzida's  
Physical Chemistry Research Group



POZNAŃ UNIVERSITY OF TECHNOLOGY

Prof. Łukasz Wojciechowski  
Institute of Machines & Motor Vehicles



Prof. Gaweł Żyła  
Department of Physics  
& Medical Engineering

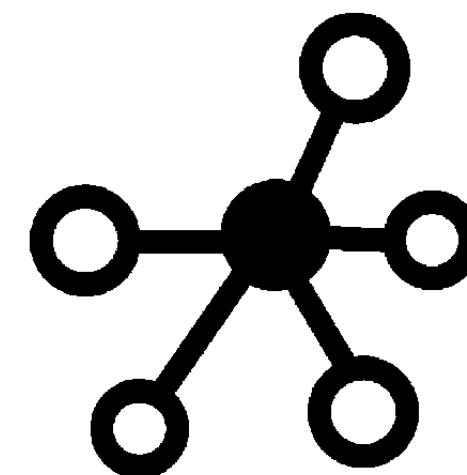


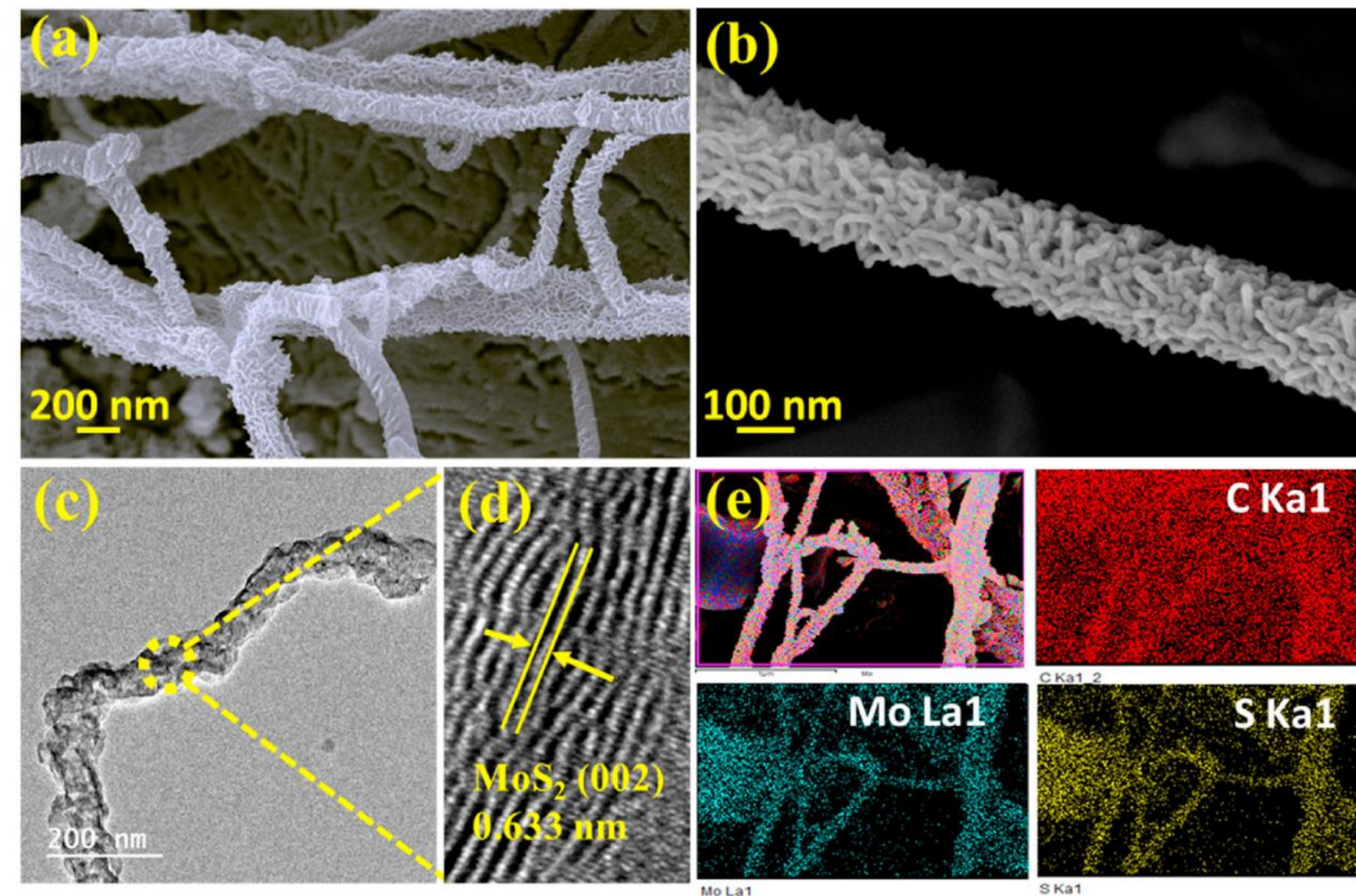
Prof. Anna Chrobok's Research Group



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of Technology

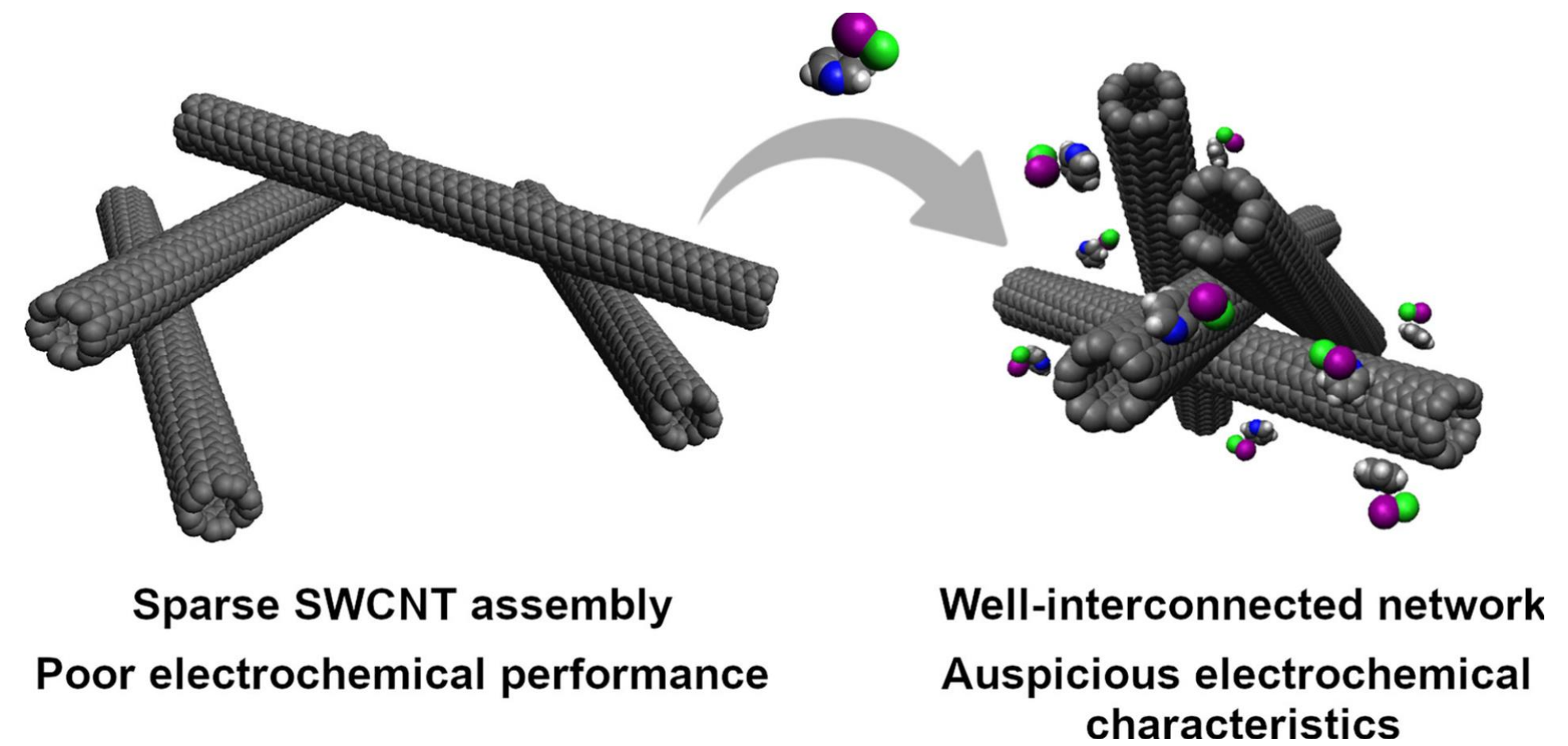
**Functional**  
Nanomaterials  
Group





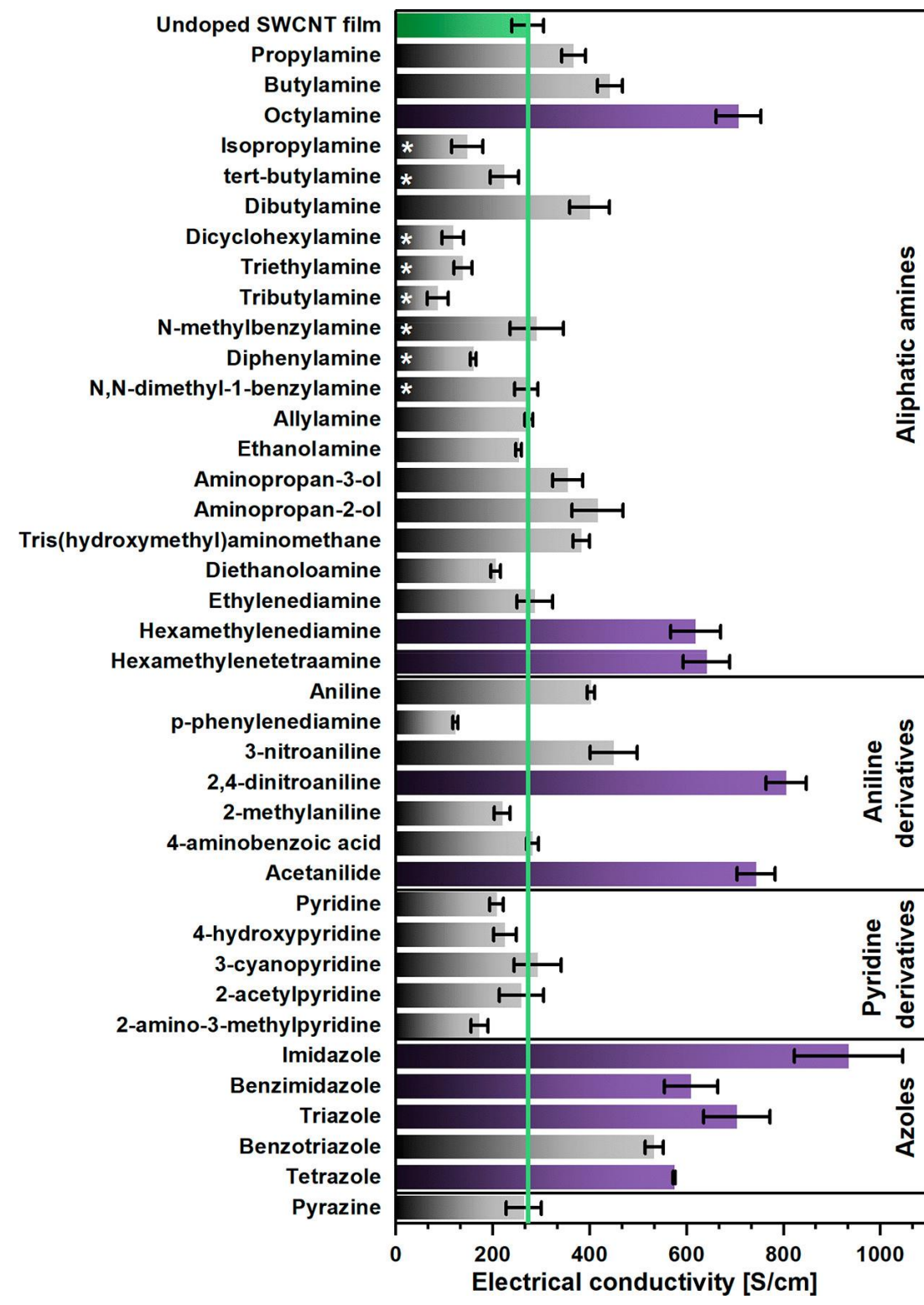
**SWCNT-based supercapacitors**

*Carbon 2021*



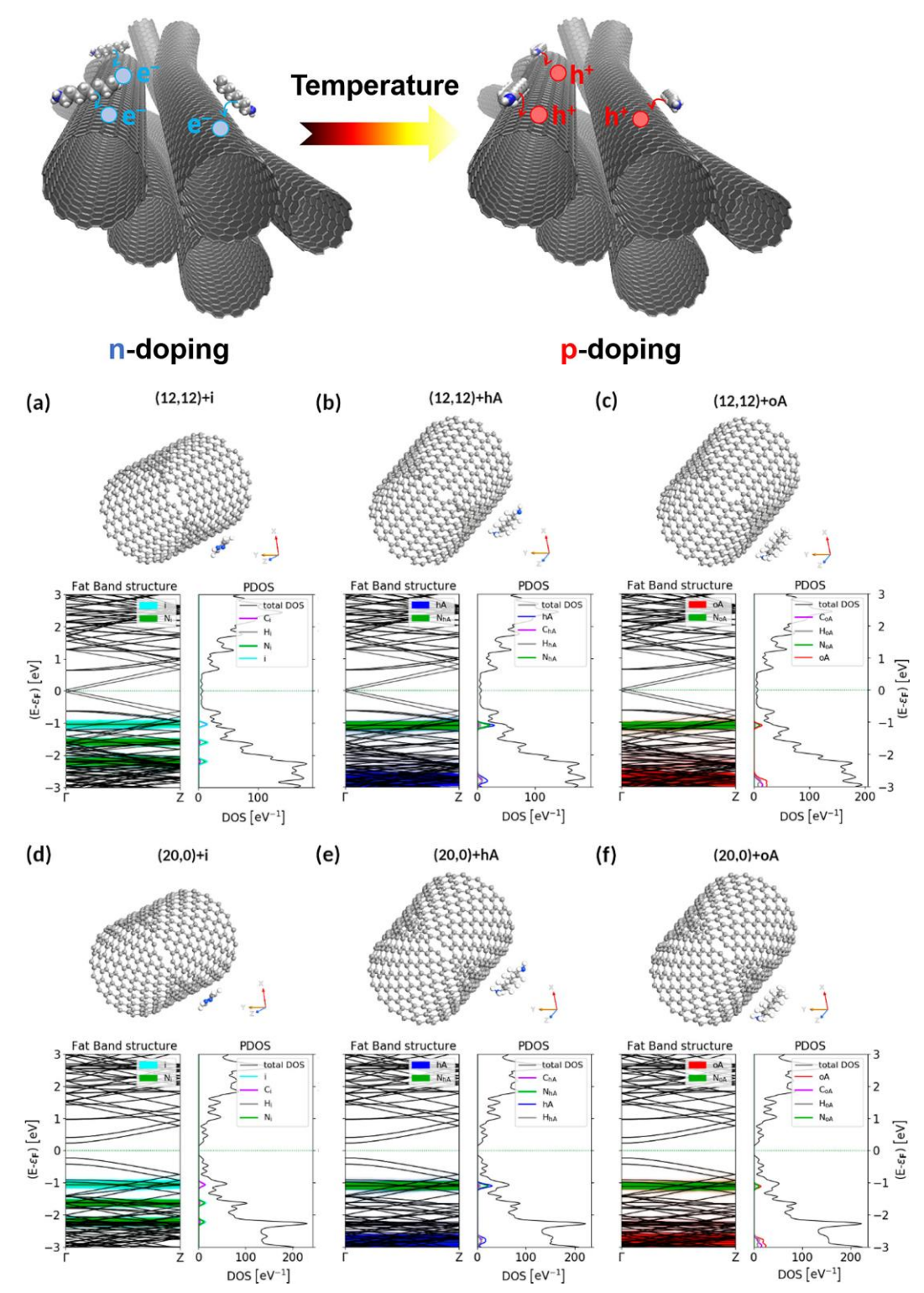
**SWCNTs for resilient charge storage**

*Electrochimica Acta 2024*

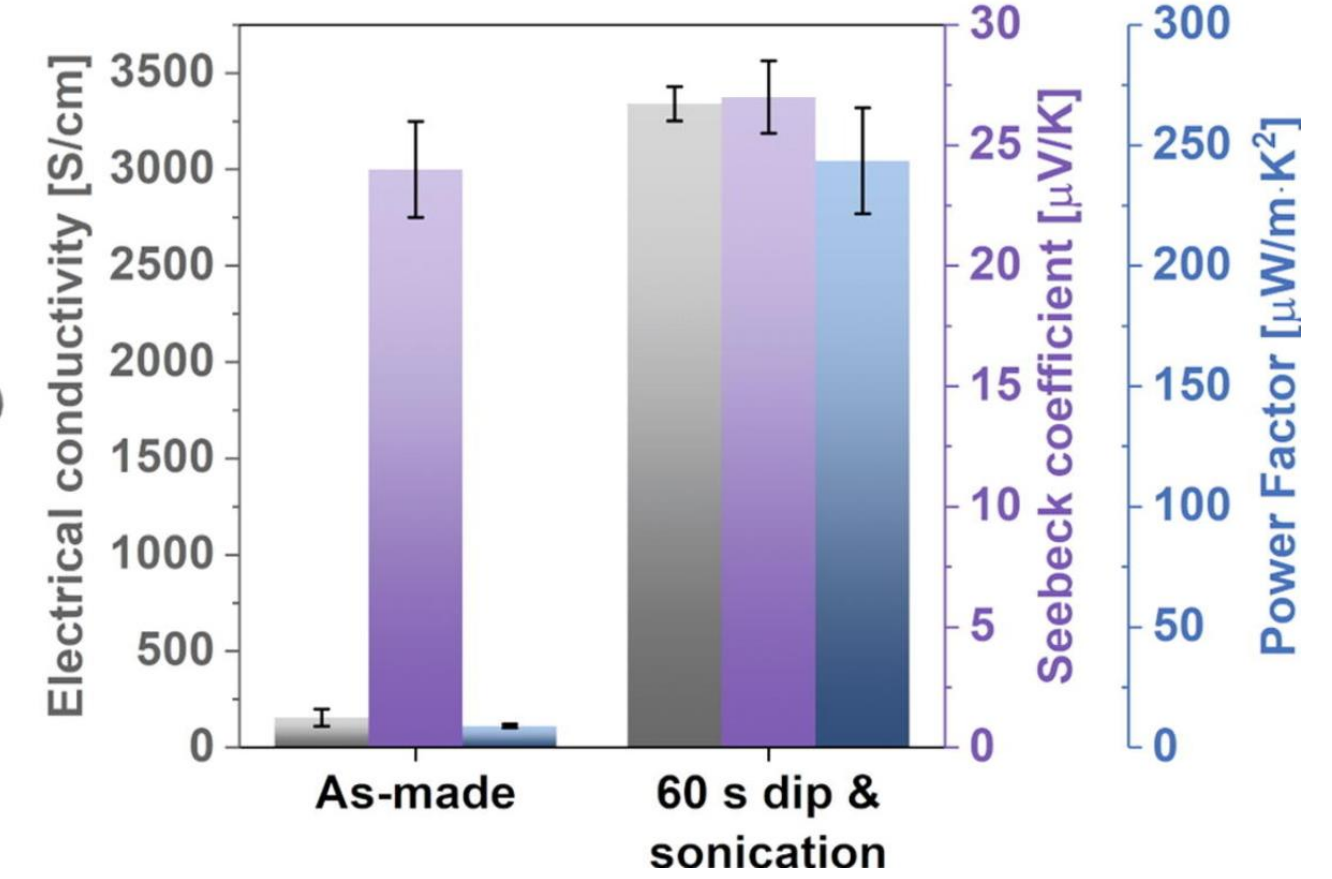
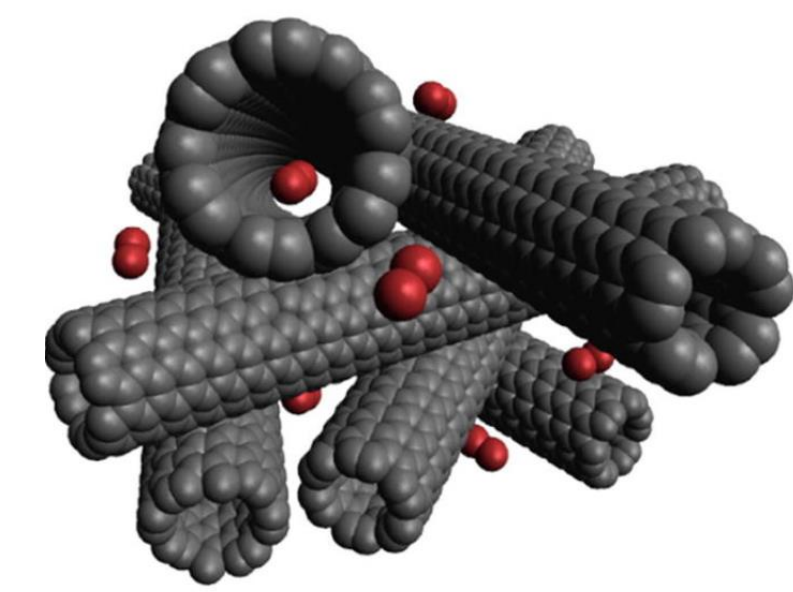


Tailoring electrical properties by doping

Carbon 2021

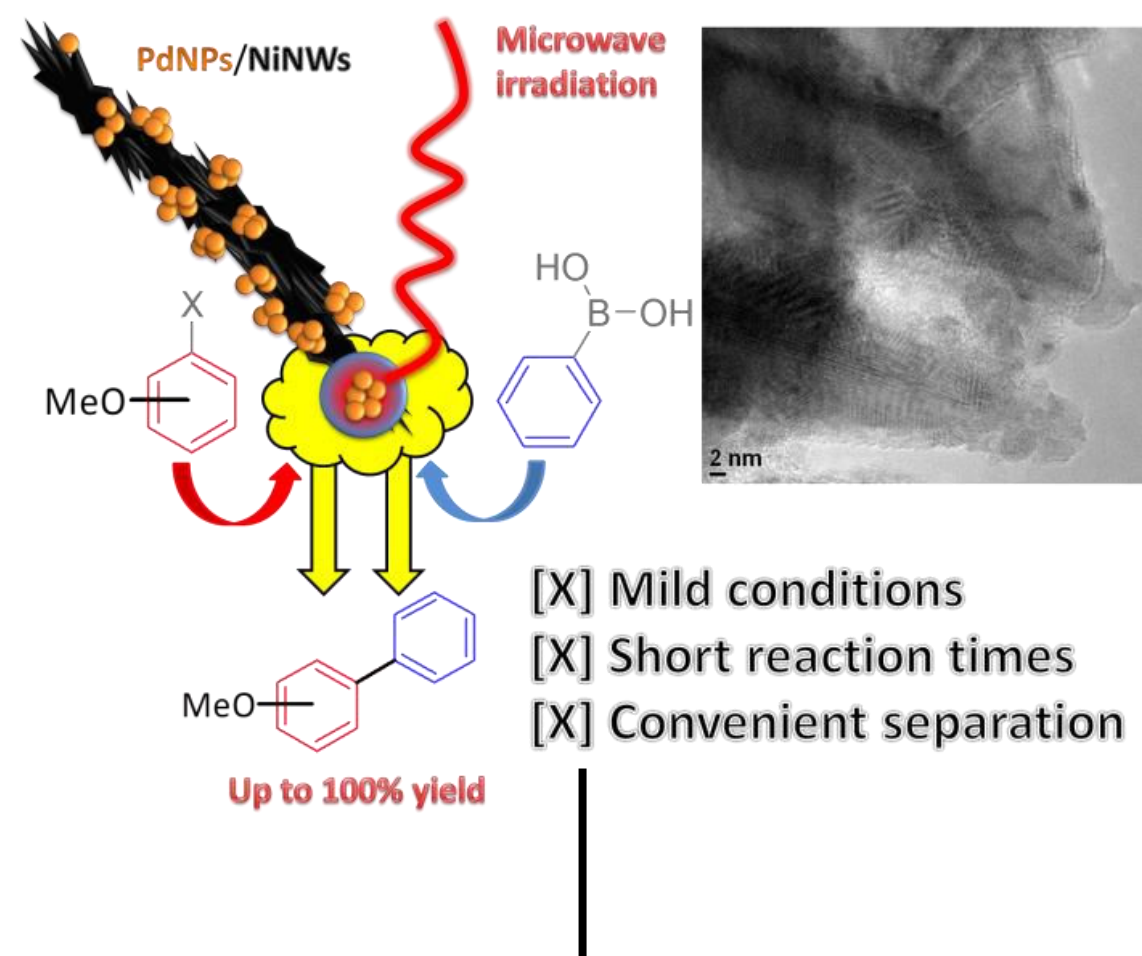
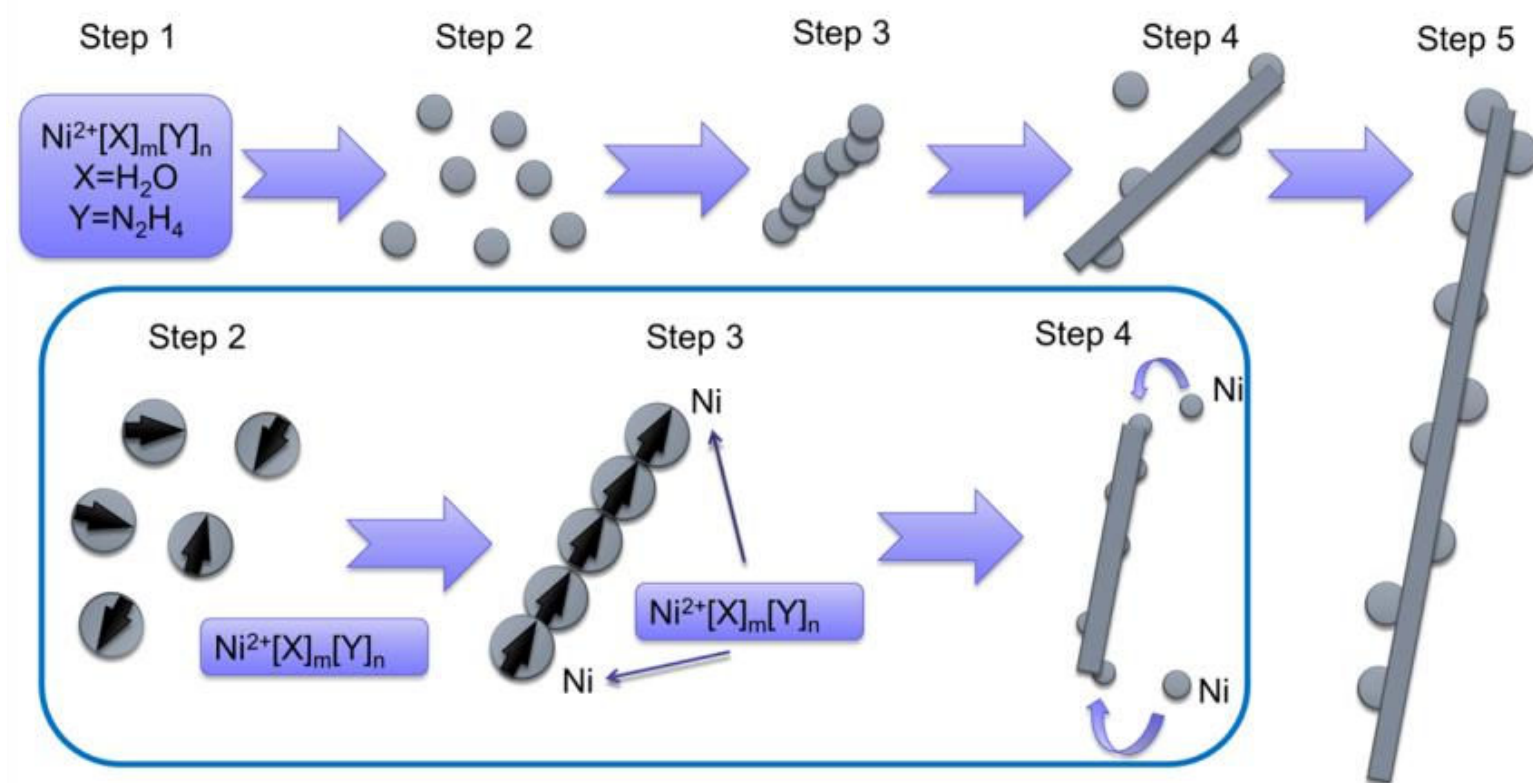


## Br<sub>2</sub>-doped SWCNT films



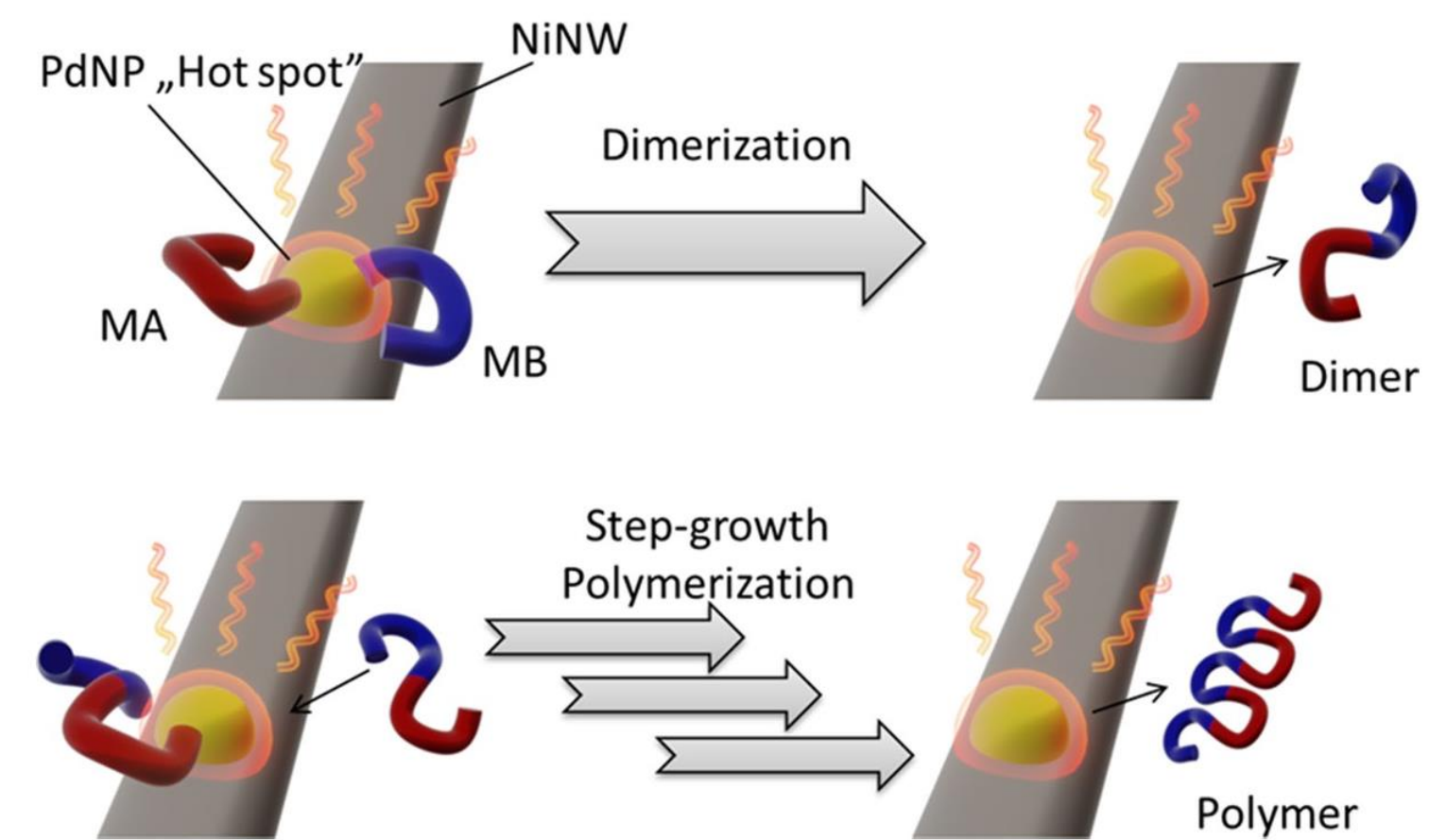
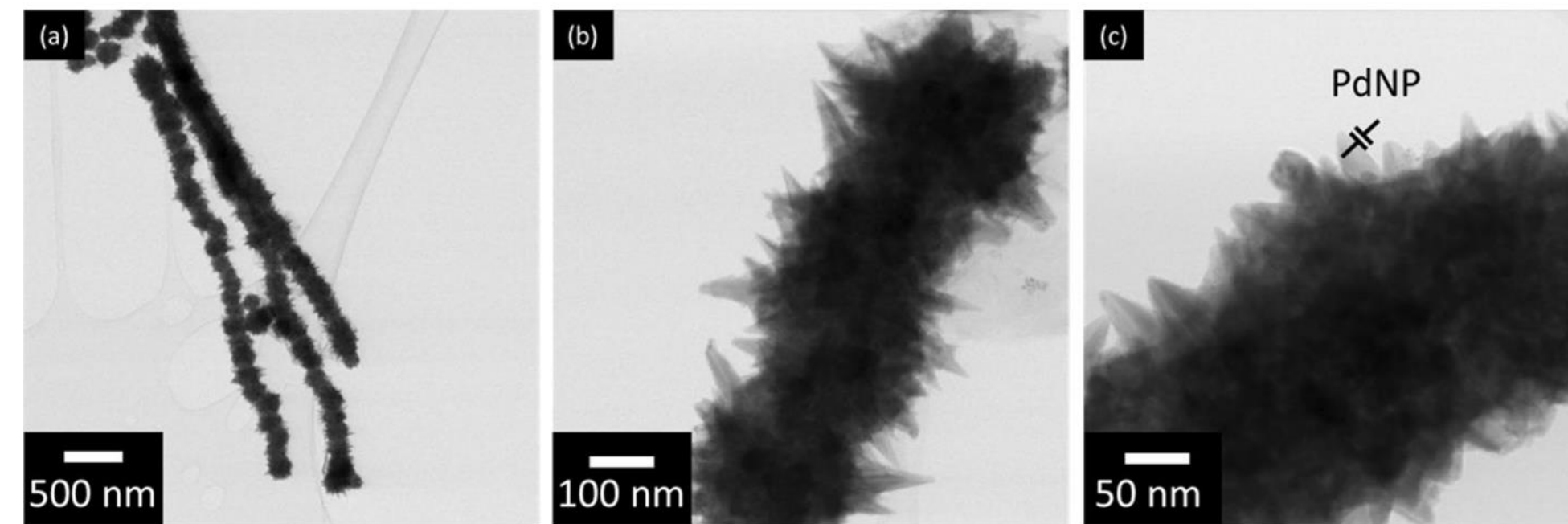
Highly conductive doped SWCNTs

Materials & Design 2022



### Novel catalysts from metal nanowires

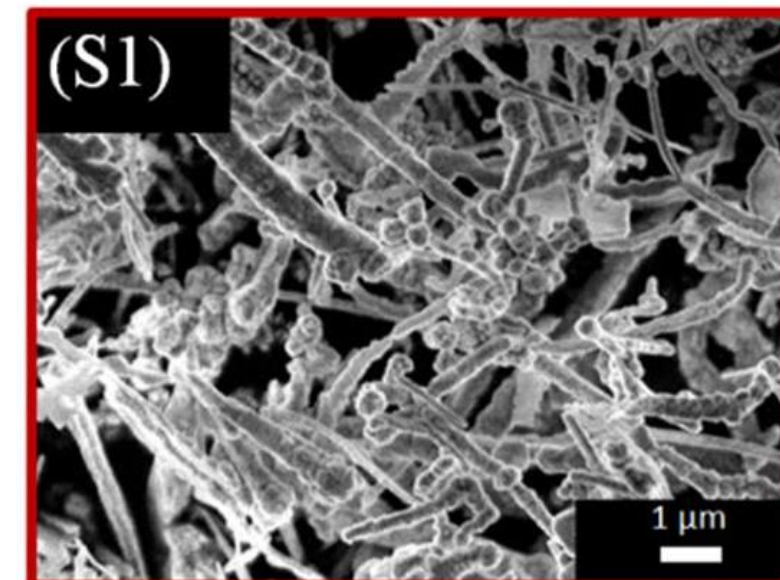
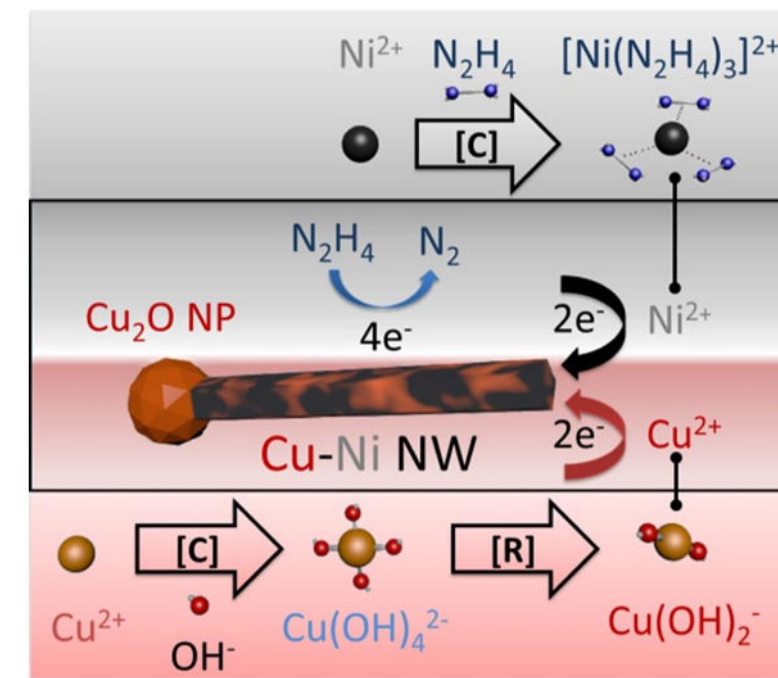
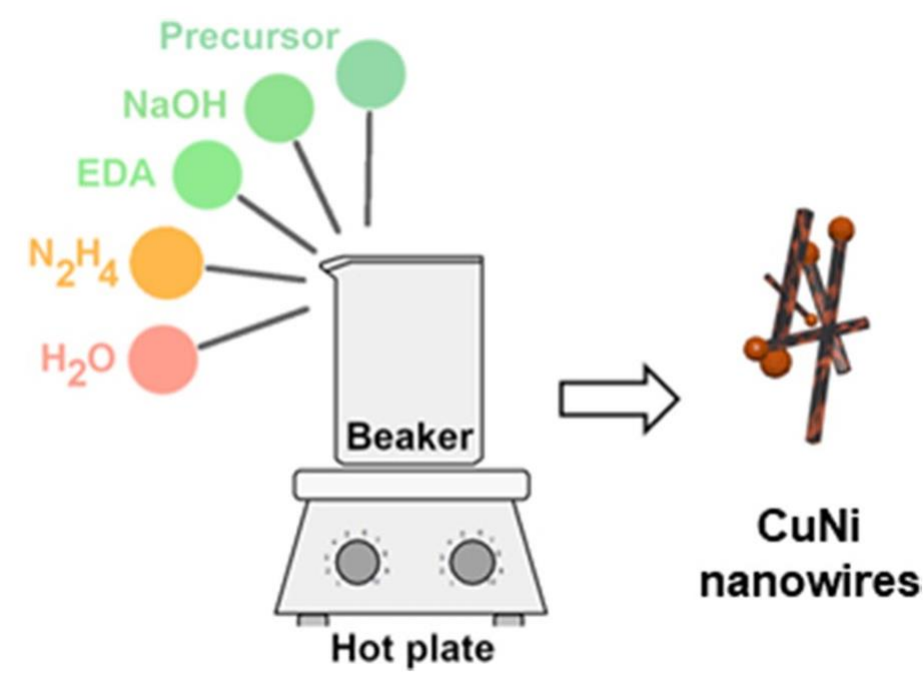
*Nano-Structures & Nano-Objects 2023*



### Nanocatalysts for facile polymerization

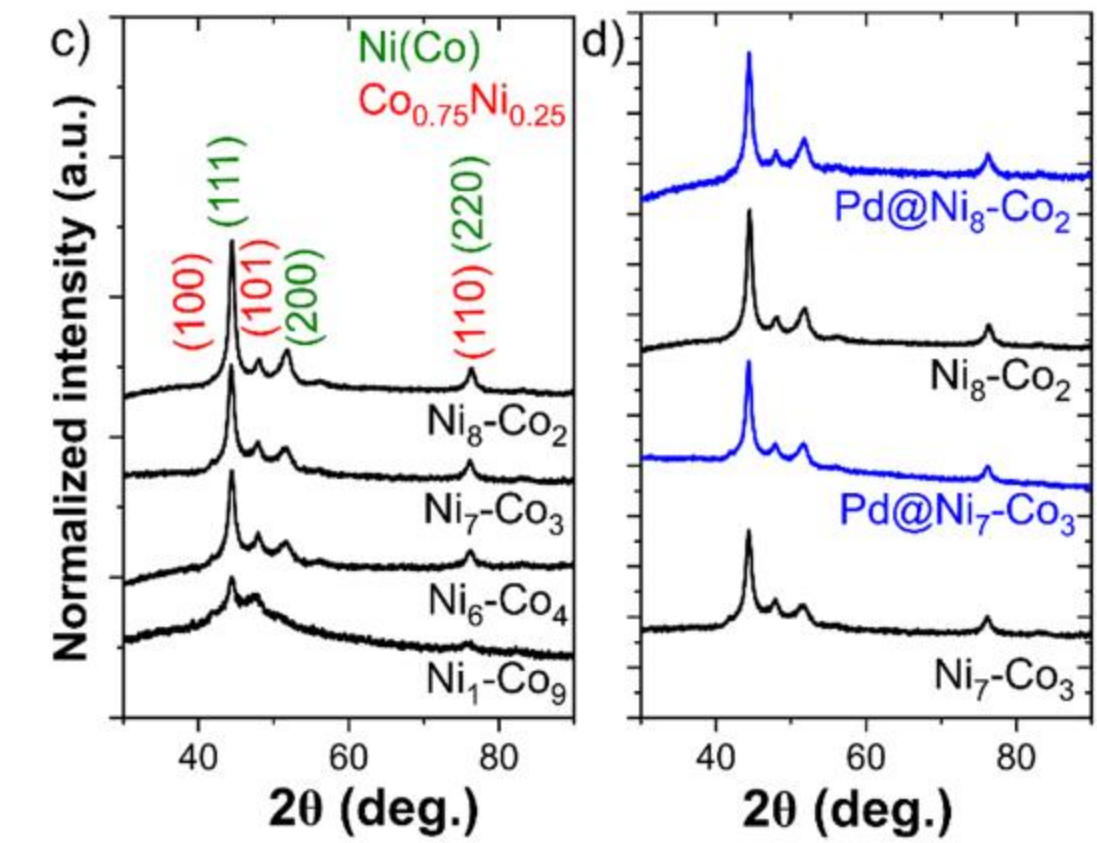
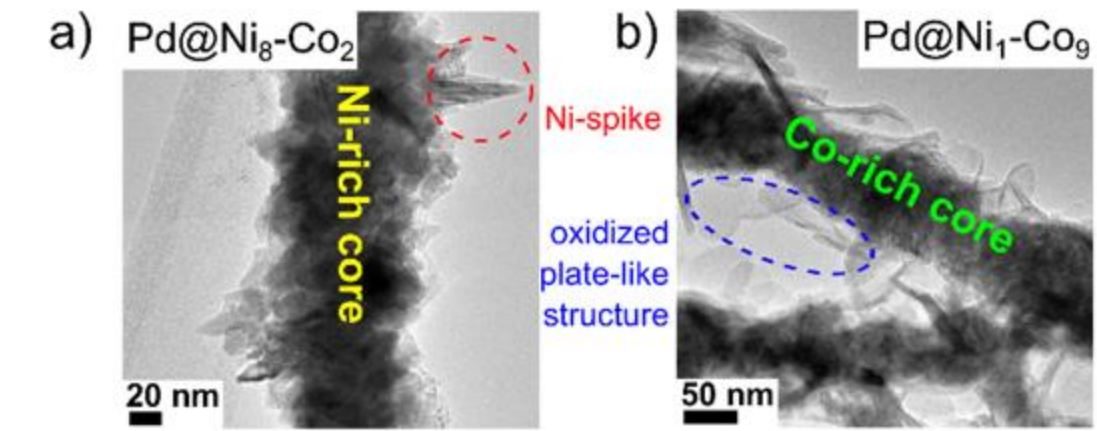
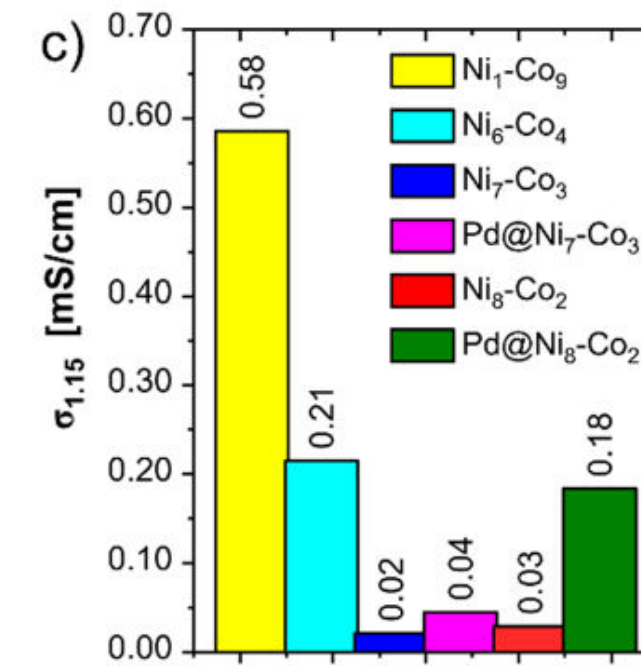
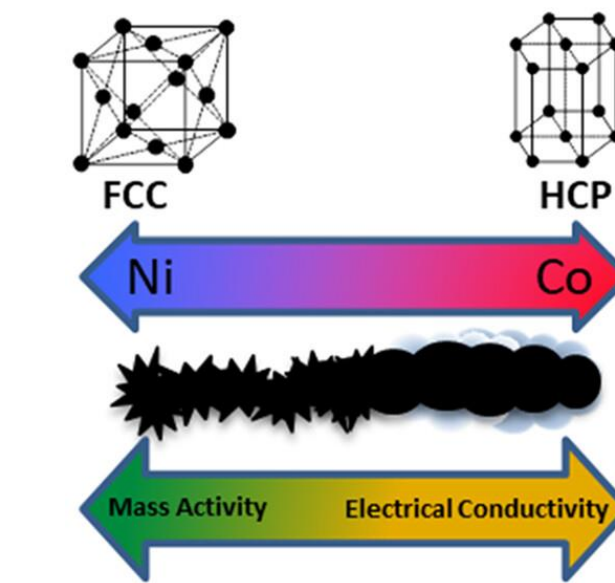
*Scientific Reports 2024*





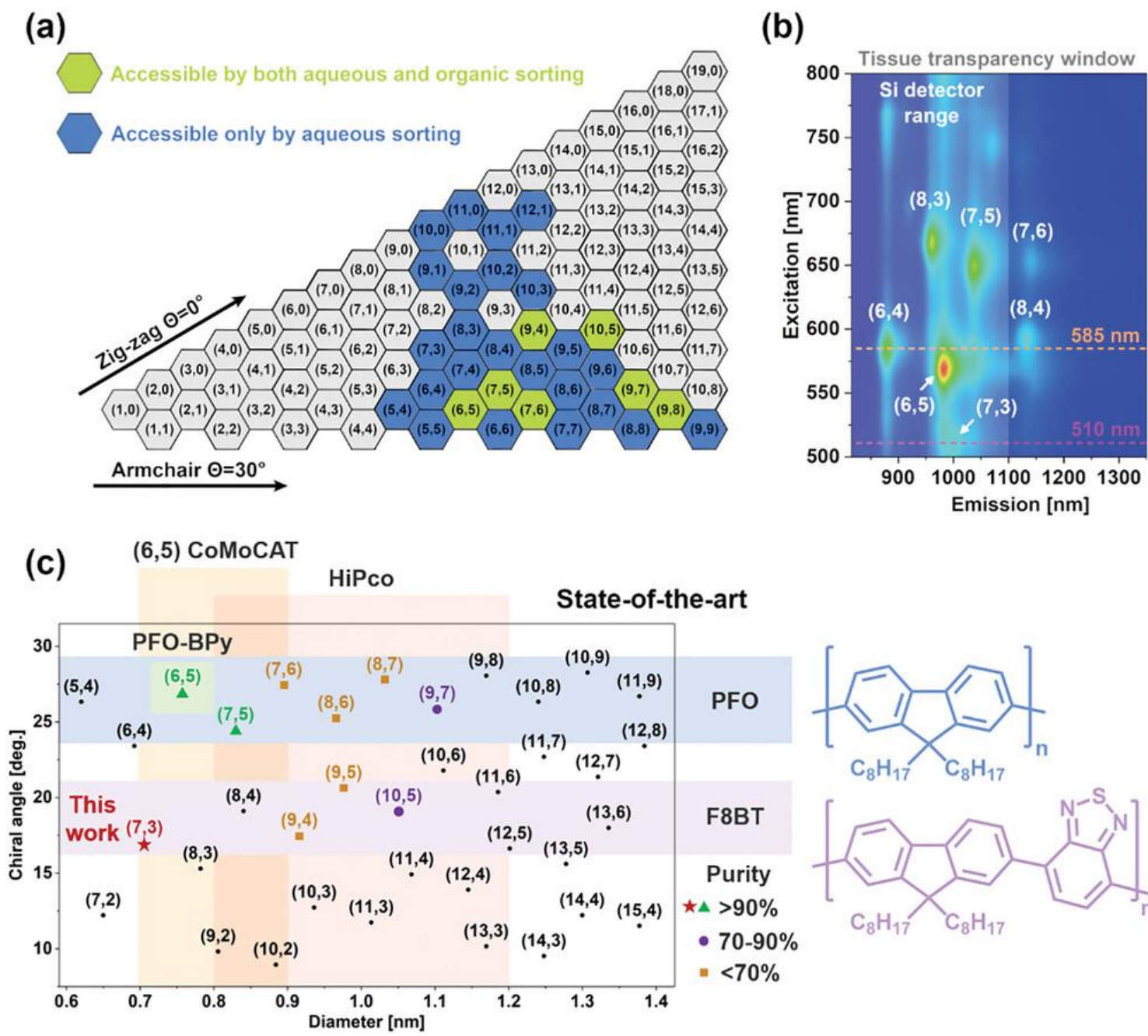
### From metal-containing waste water to nanowires

*Scientific Reports 2020*



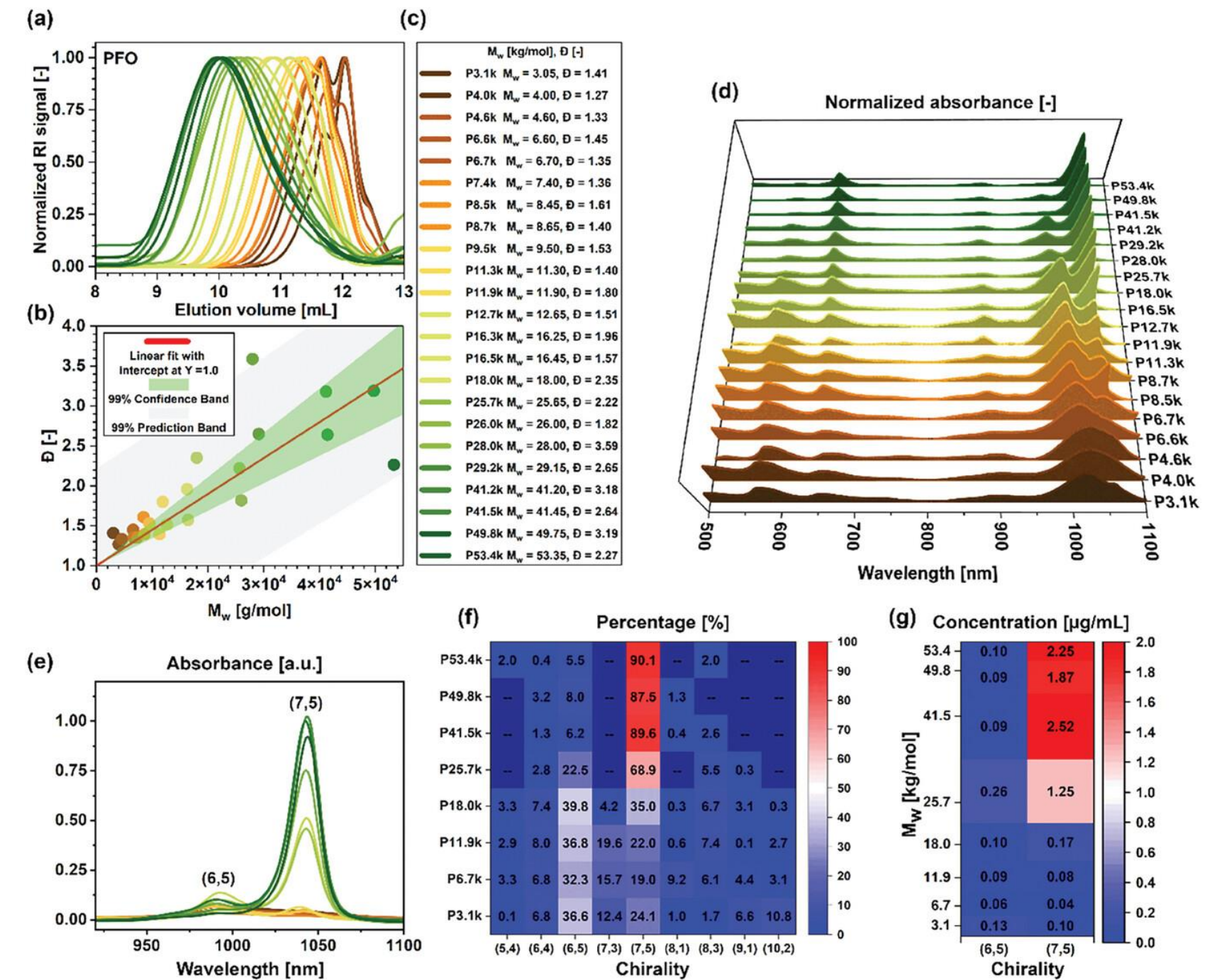
### Crystal engineering for catalysts

*The Journal of Physical Chemistry Letters 2024*



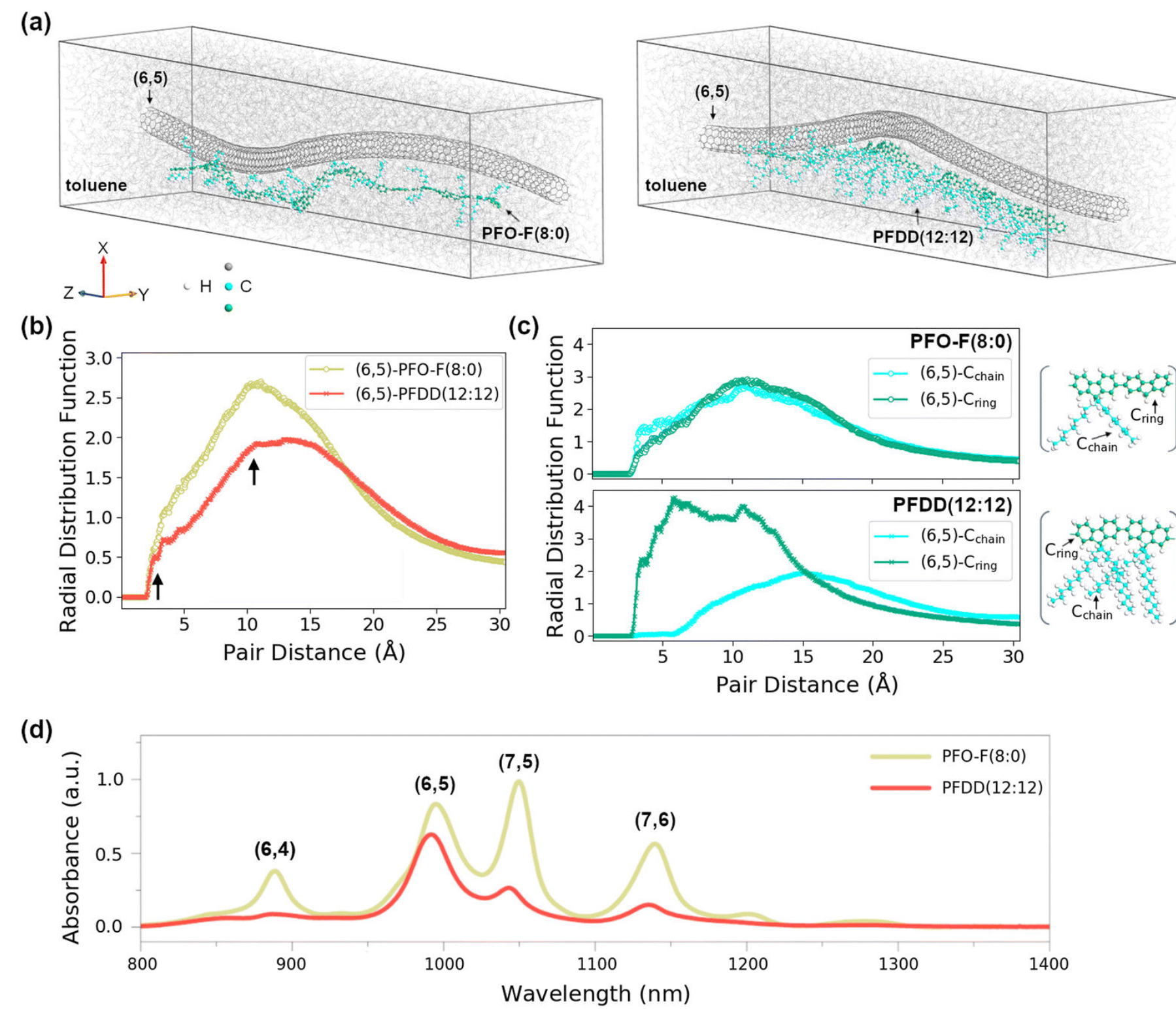
## Solvent engineering to facilitate SWCNT partitioning

Small 2023



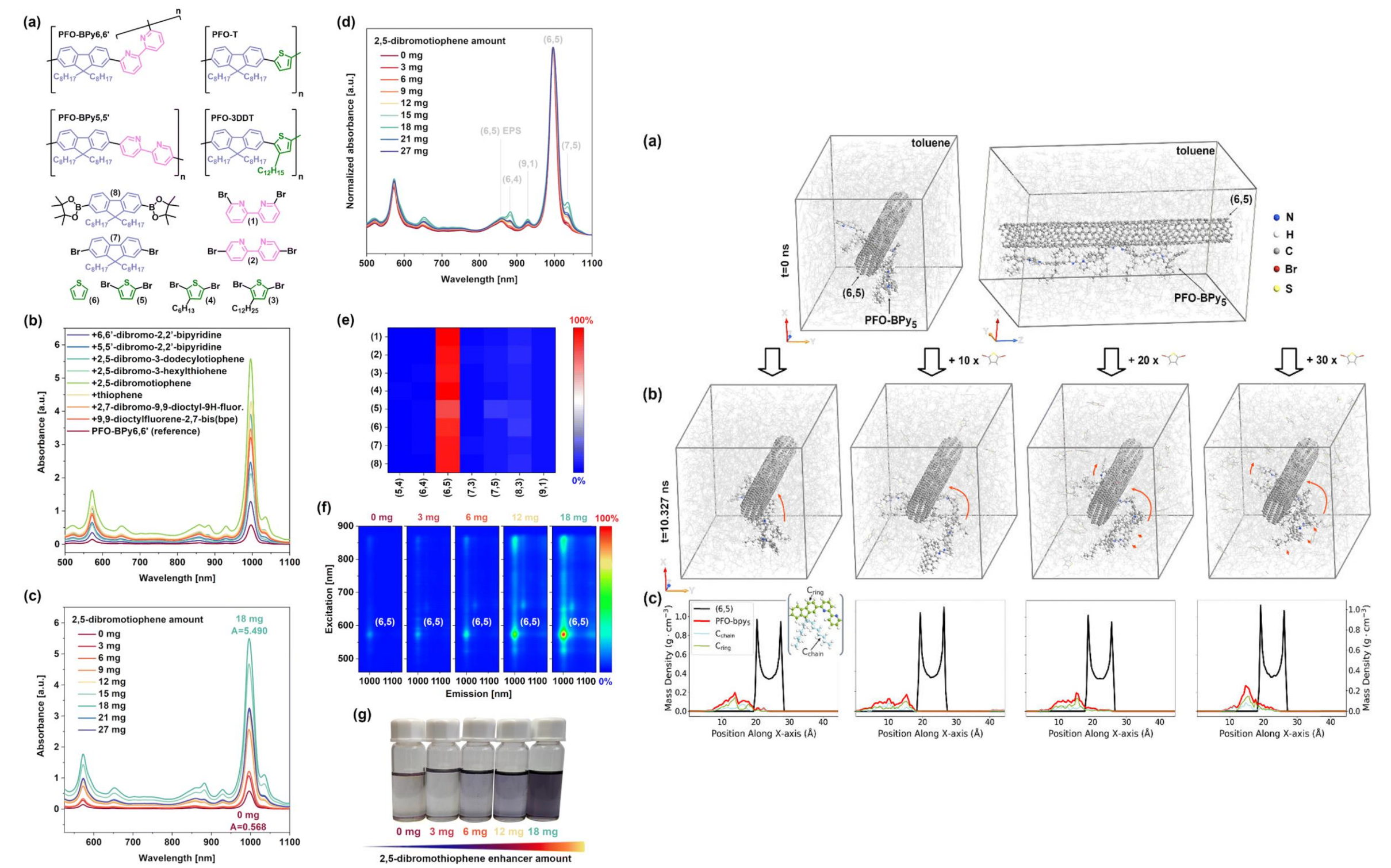
## Polymer chemistry for SWCNT sorting

Advanced Science 2024



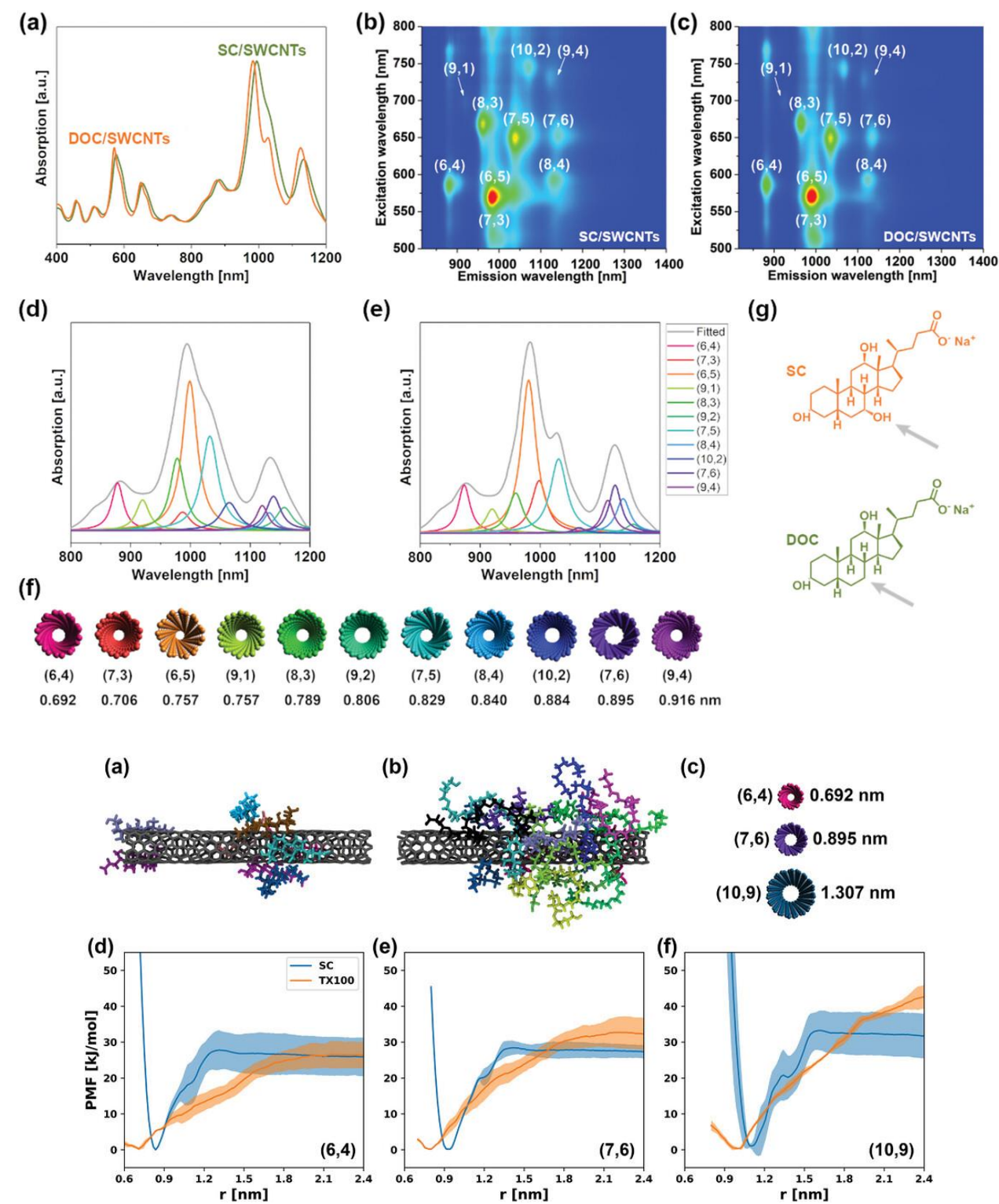
## Modelling of polymer-SWCNT interactions

*Nanoscale Horizons 2024*



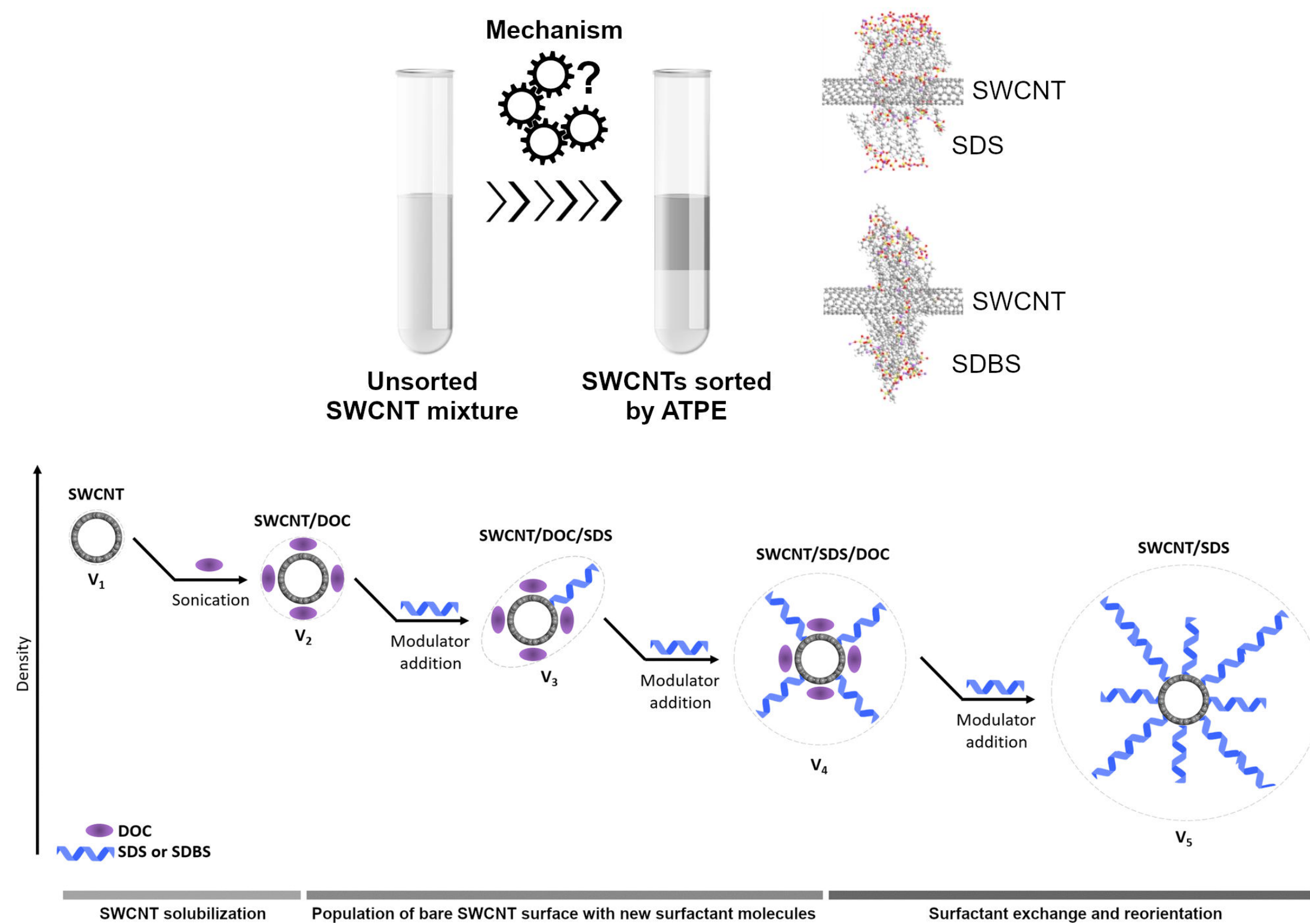
## Highly selective and effective SWCNT partitioning

*Materials Horizons 2024*



## Understanding the nature of surfactants

*Advanced Science 2024*

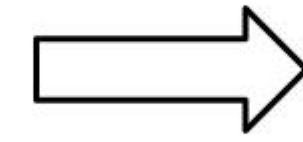


## Elucidation of the mechanism of the aqueous two-phase extraction system

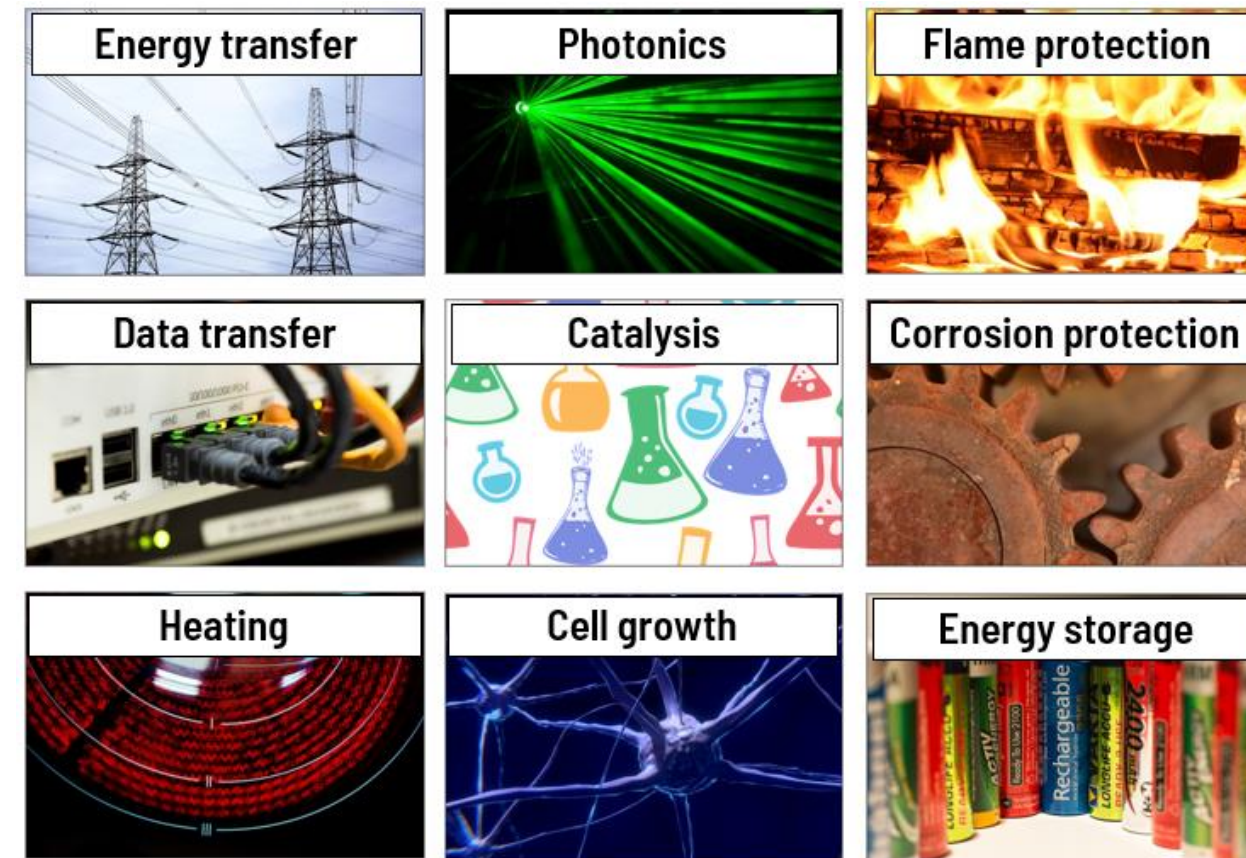
*Nanoscale Horizons 2023*



Nanocarbon powder

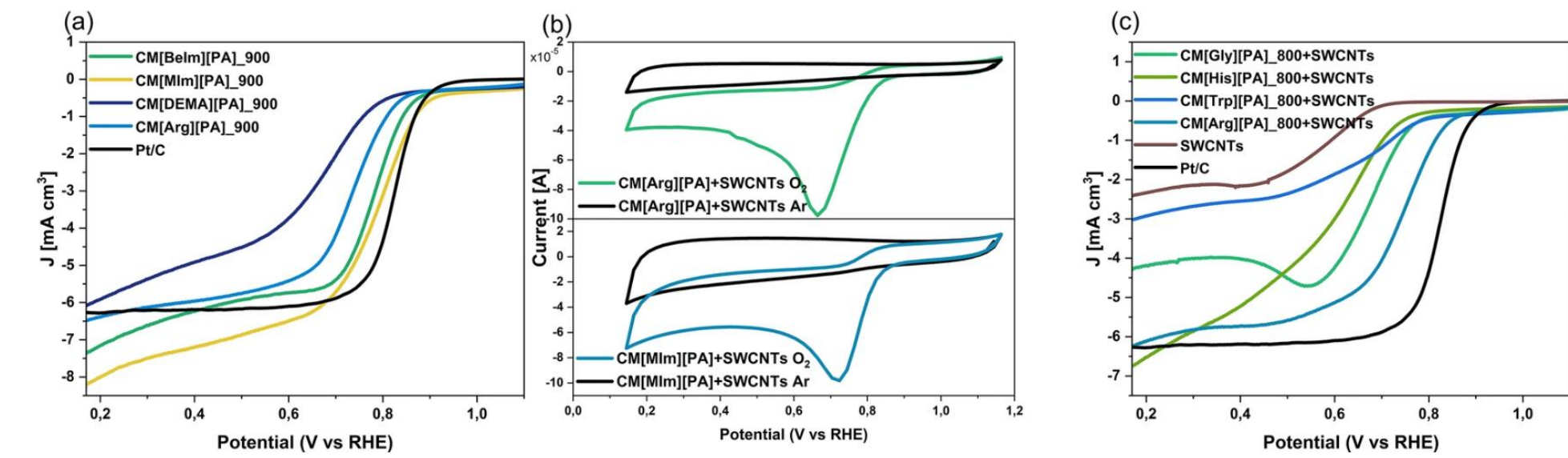
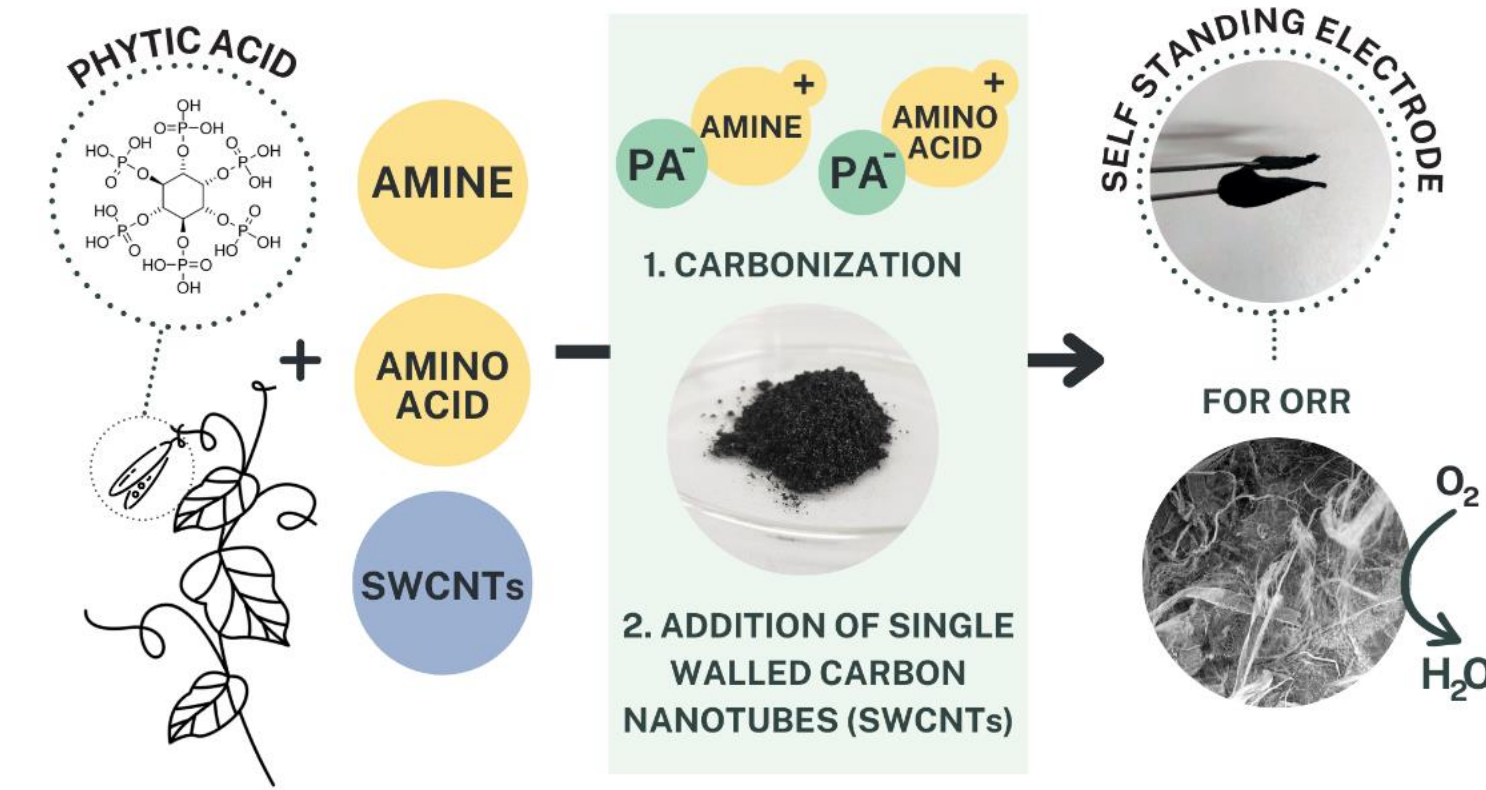


Macroscopic network from nanocarbon



## Self-standing films from nanocarbon for transformative applications

*Materials & Design 2017*



## Sustainable bio-based electrodes

*Scientific Reports 2024*

# The team



**Prof. Dawid Janas**

Head



**Dr. Andrzej Dzienia**

Research Associate



**Dr. Blazej Podlesny**

Research Associate



**Cosmos Uzoma**

PhD student



**Dominik Just**

PhD student



**Patrycja Taborowska**

PhD student



**Julia Borda**

Master student



**Jakub Cwiertnia**

Master student



**Lukasz Czapura**

Master student



**Ryszard Siedlecki**

Master student

# International collaboration

