Organic Thin Films Laboratory (OTFL), Hanyang University

Prof. Haiwon Lee (haiwon@hanyang.ac.kr)

Department of Chemistry

- Hanyang University Distinguished Professor
- Director of Asian Research Network Program
- President of Asian Research Network Korea
- Candidate member of the National Academy of Engineering
- Editor-in-Chief, Nano Convergence
- Chairman, International Cooperation Promotion Committee, Ministry of Science, ICT and Future Planning (MSIP)

Projects

- ❑ Development of Nanostructured Sensor Matrix Based on Signal Amplification for Highly Sensitive Diagnosis of Disease Biomarkers, The Ministry of Science, ICT and Future Planning
- ❑ Template Effect on Guiding Biomolecular Growth by 3-D Carbon Nanotube Networks on Silicon and Quartz Plates, AOARD
- ❑ Development of Energy Storage Functional Nano-Micro One-Dimensional Fiber/Textile Device, Ministry of Science, ICT and Future Planning & Information Technology Research Center
- ❑ University-Centered Labs: Biomimetic Nanosensor Systems, Ministry of Education

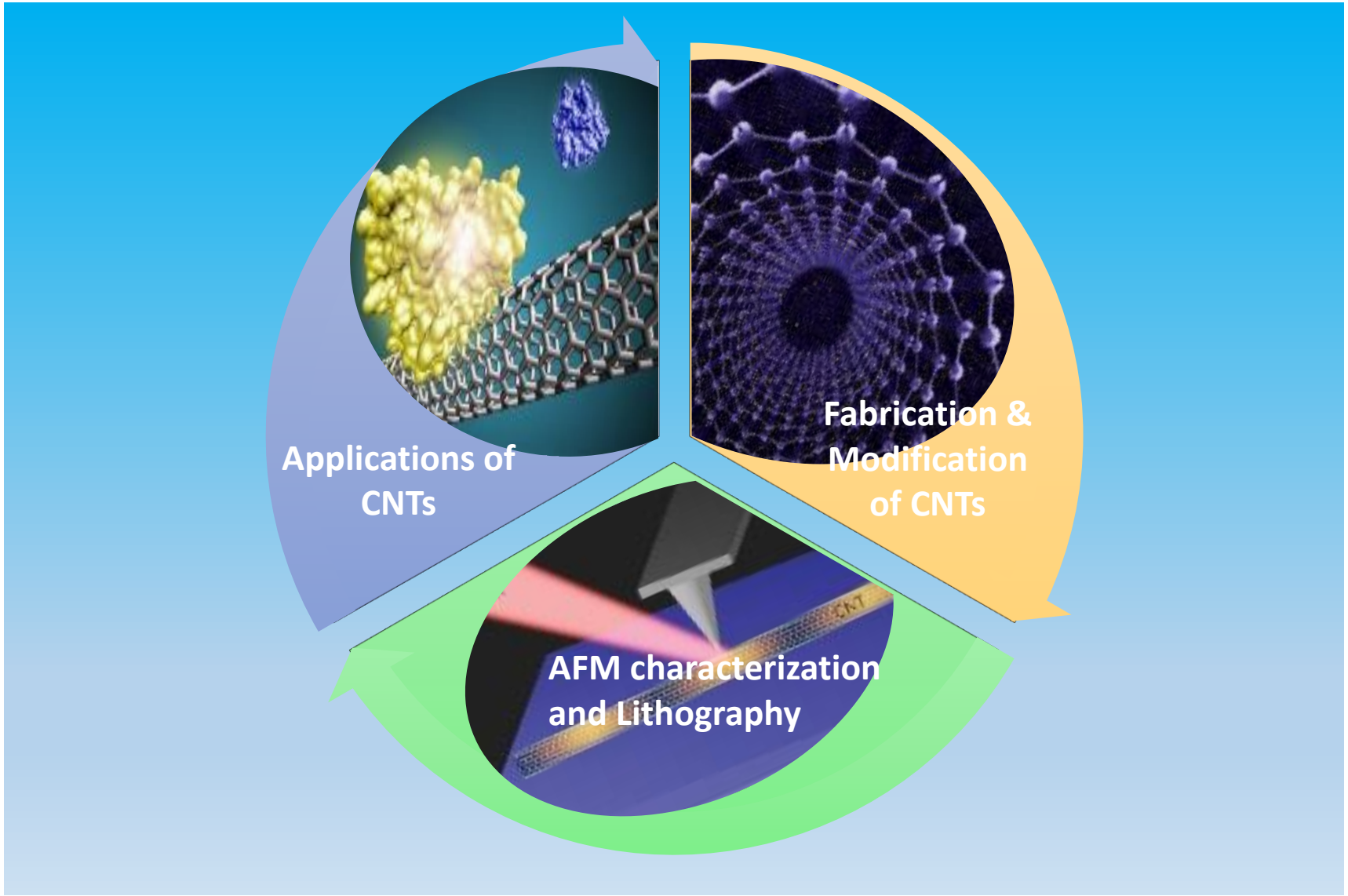
Collaborations

Gwangju Institute of Science and Technology(GIST), Korea Advanced Institute of Science and Technology (KAIST), Korea Institute of Science and Technology(KIST), Sungkyunkwan University(SKKU), Park Systems, National Nanofab Center(NNFC), Tokyo Institute of Technology(TIT), Nanyang Technological University(NTU), Indian Institute of Technology Madras(IITM), University of Pennsylvania(UPENN).

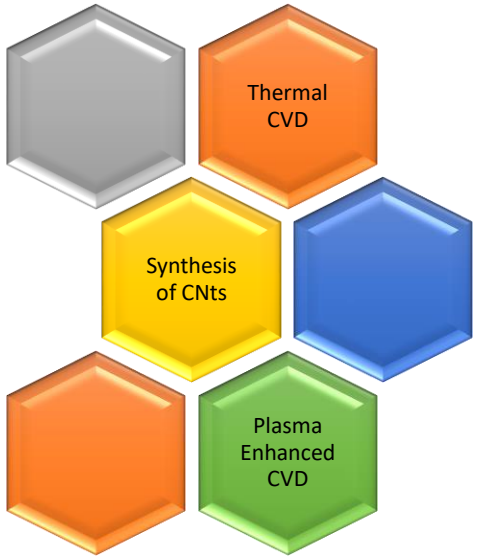
Contact & Web Sites

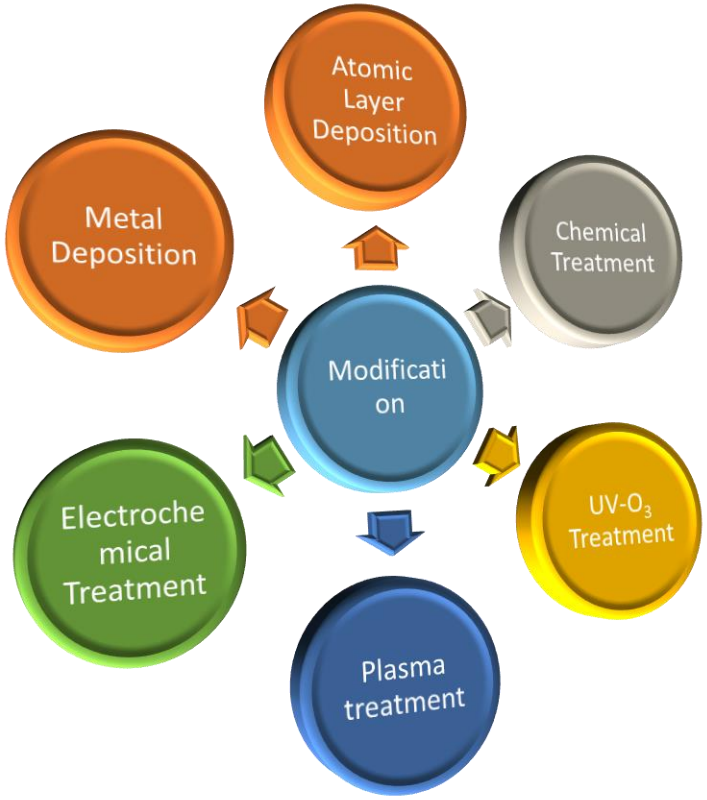
Prof. Haiwon Lee: http://otfl.hanyang.ac.kr.(Lab), http://www.asiarn.org/ (Asian Research Network)

Research Overview at Prof. Haiwon Lee's Lab

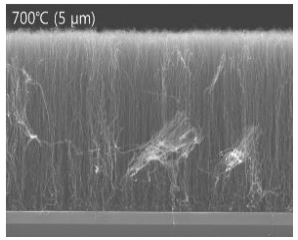


Research: Synthesis of Carbon Nanotubes (Fabrication & Modification)

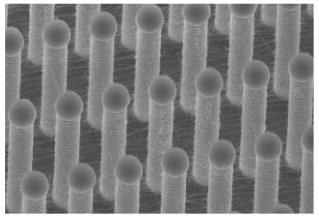




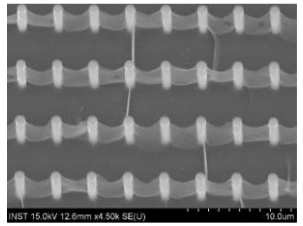
Various Structures of Grown CNTs



Vertical Alignment

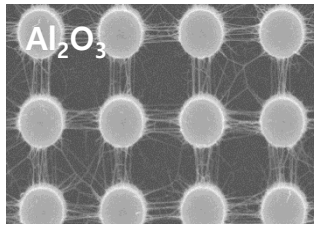


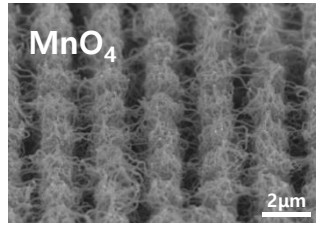
3D Network

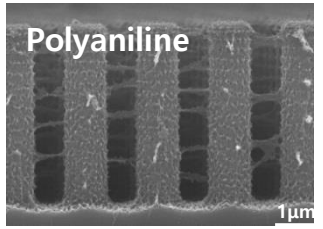


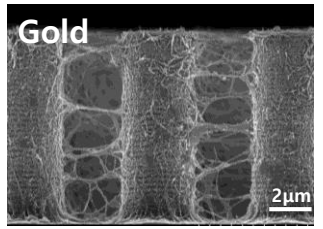
CNTs curtain

CNTs Coated on Various Substrates

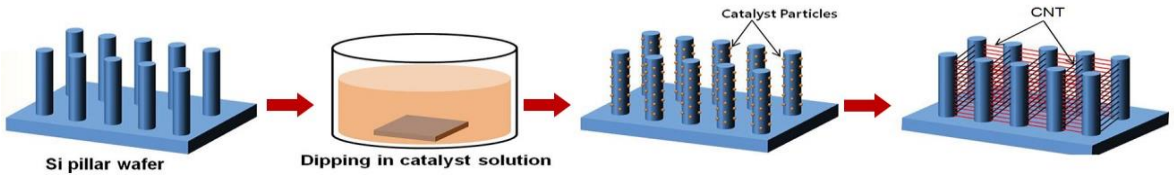








Synthesis of 3D CNTs



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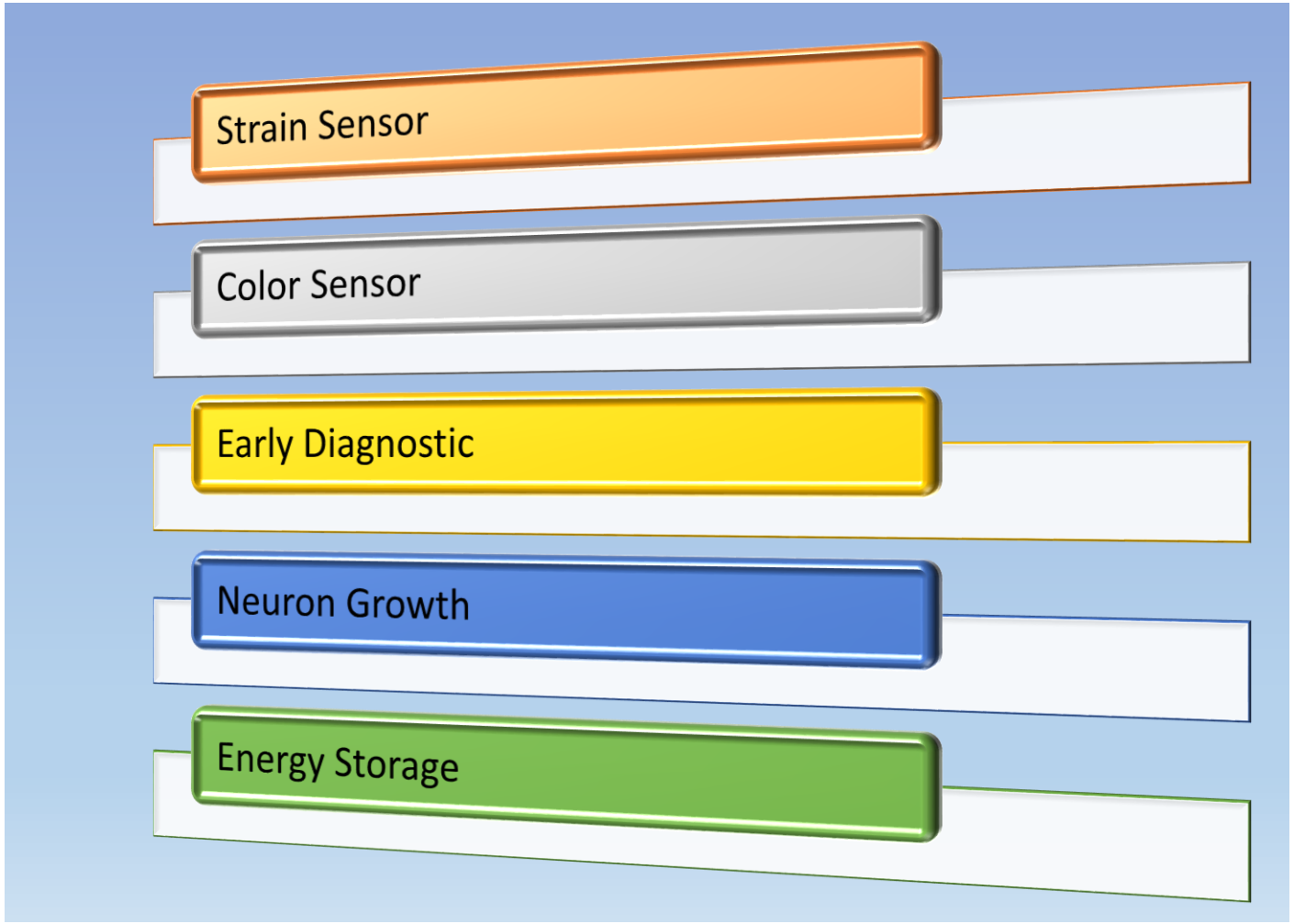
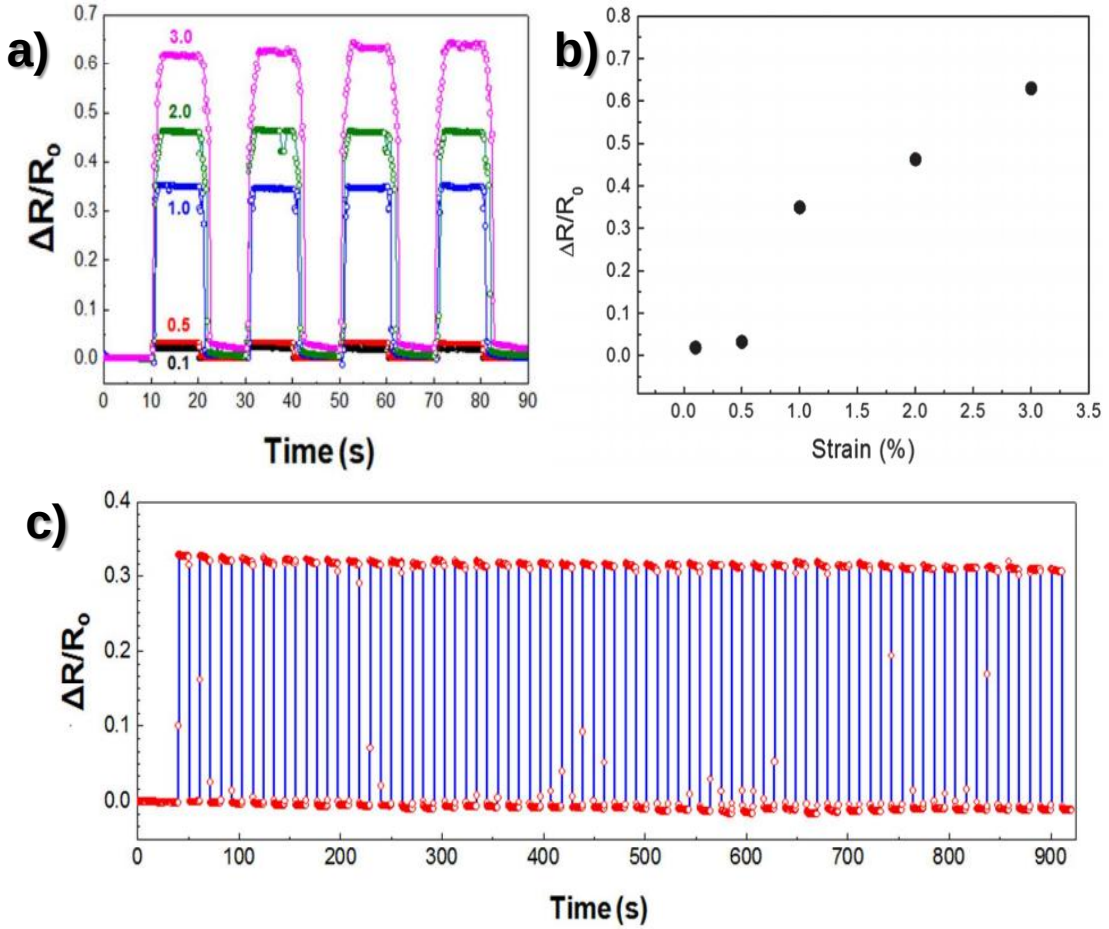
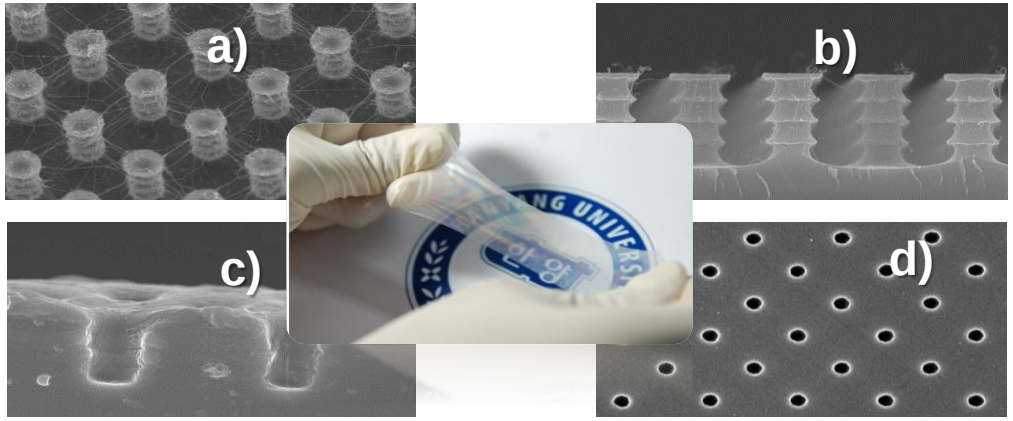
Research: Applications of CNTs



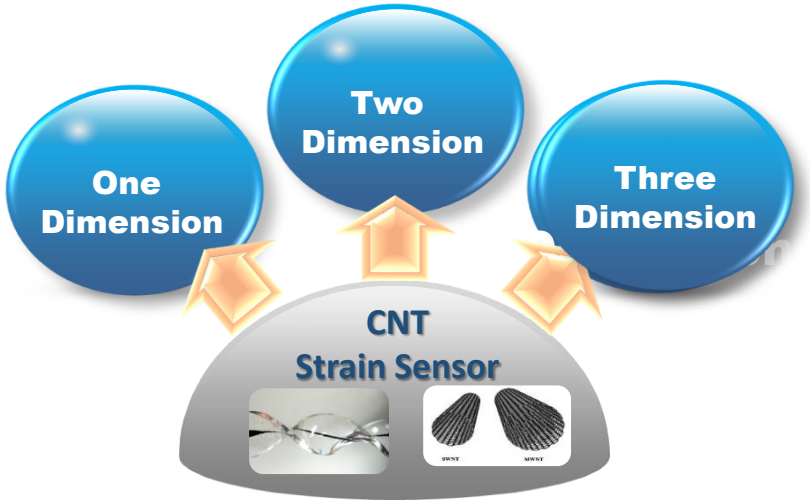
CARBON NANOTUBE STRAIN SENSORS



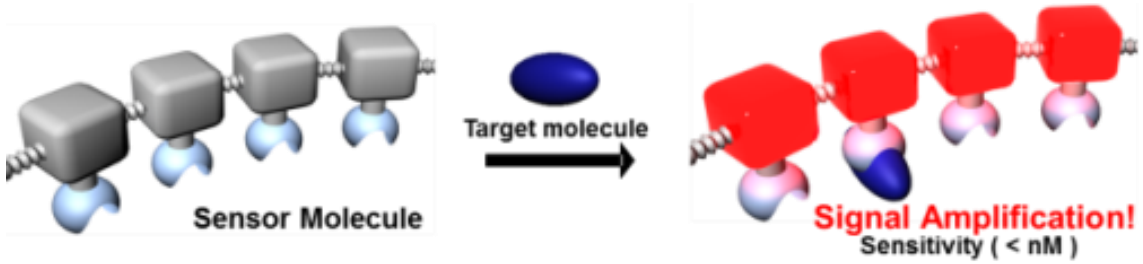
Resistance characteristics of the 3D network of SWNTs in PDMS. a) Resistance under an applied tensile strain of 0.5% to 3.0%. b) The relative change in electrical resistance versus mechanical strain. c) Reliability of the resistance under an applied tensile strain of 1.0%.



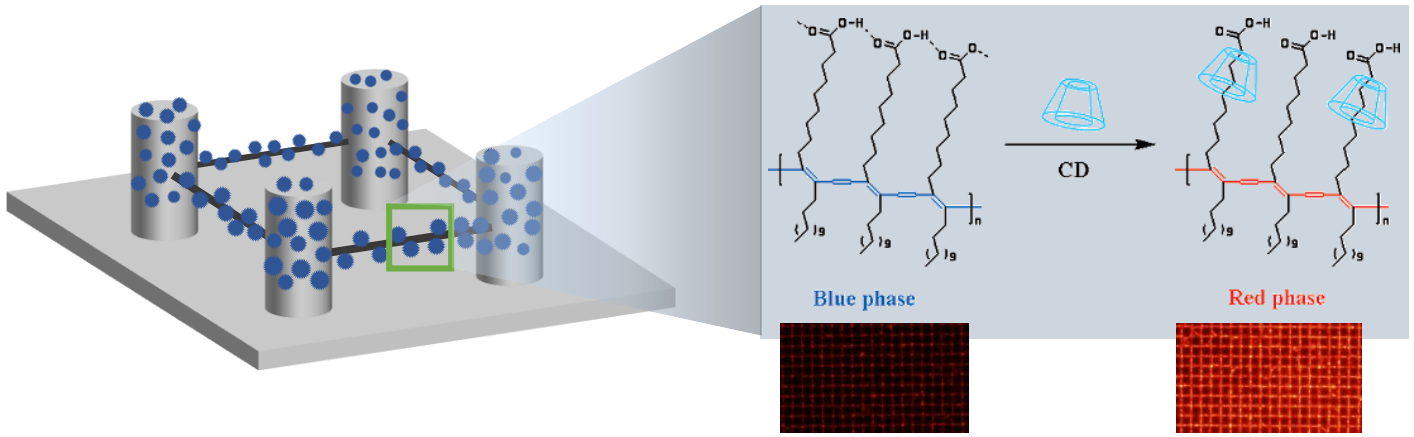
SEM images of a) 3D network of SWCNTs b) Si pillar arrays after removing the 3D network of SWCNTs by a lifting-up process c) The SWCNTs-PDMS film d) Top view SEM image of the 3D network of SWCNTs in PDMS



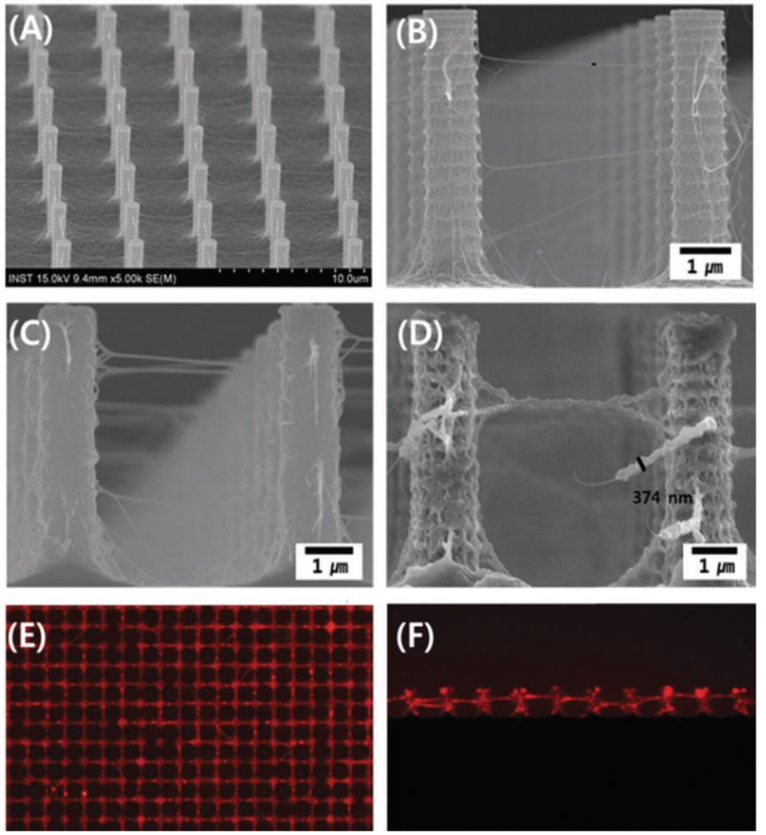
3D NETWORKED POLYDIACETYLENE BASED COLOR SENSOR



Signal Amplification Effect of PDA Vesicles



3D Network of CNTs for PDA Sensor Platform



(A–D) SEM images of networked CNT (A and B), after Al_2O_3 deposition (C), and after immobilization of PDA vesicles (D). Fluorescence Microscopic images of the PDA immobilized networked structures from top (E) and side (F) views.

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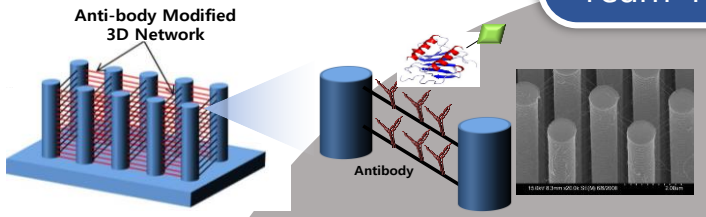
SIGNAL ENHANCEMENT FOR EARLY DIAGNOSIS

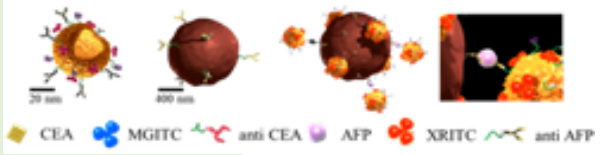
Team 1

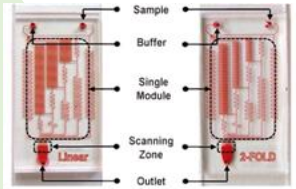


3D CNT Network Structure

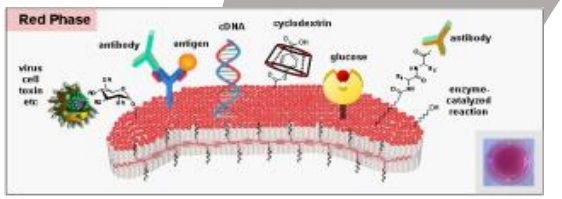
Team 2

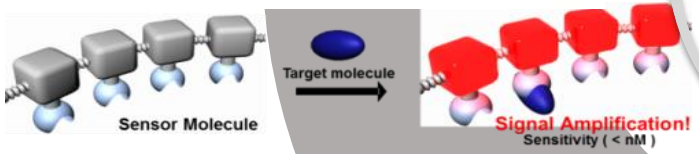
SERS
Lap-on-a Chip





Signal Amplification Based on Polymers



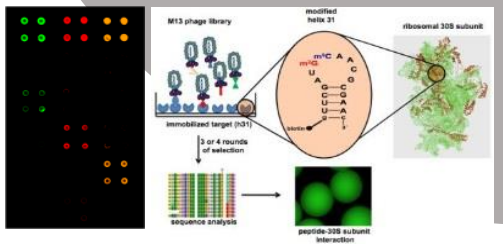


Core Technology

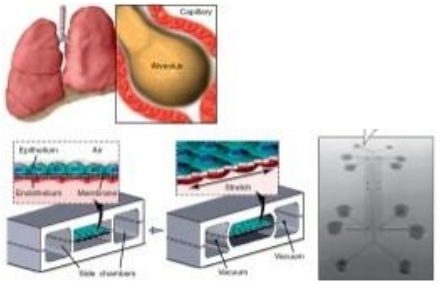
Diagnosis, Point-of-Care

Micro Biomimetic/Microfluidics

Phage Display & Aptamer
Nano **FRET/BRET**



Team 3



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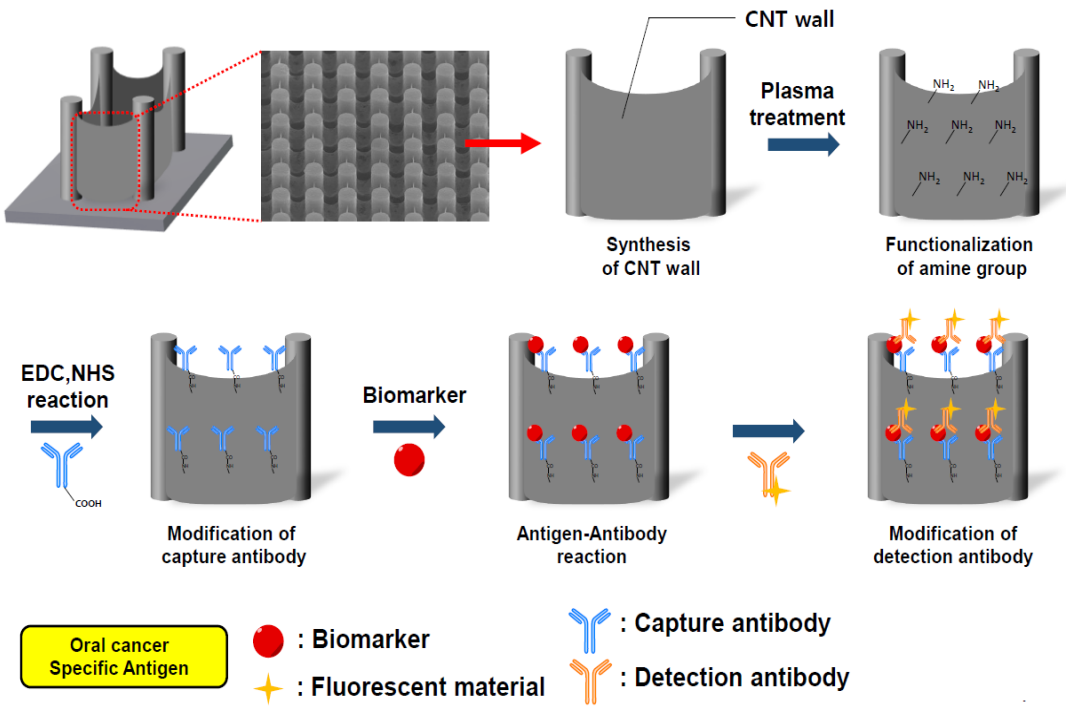
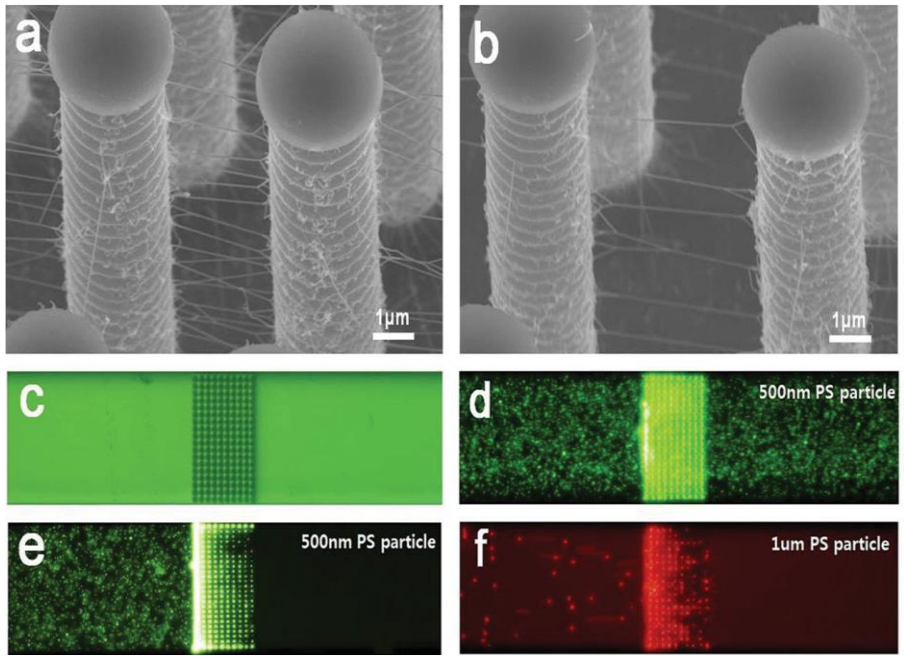
3D NETWORK OF CNT-BASED BIOSENSOR FOR CANCER ANTIGEN DETECTION

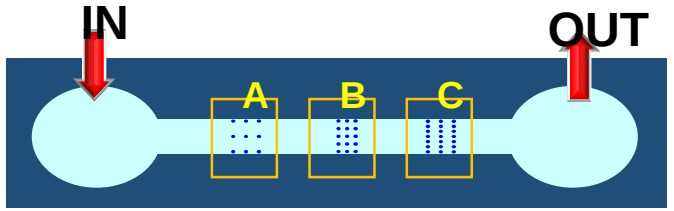


3D Curtain of CNTs for Biosensor Platform

MICROFLUIDIC SYSTEM BASED ON 3D-NETWORKED CNTS



SEM images and optical images of Al_2O_3 coated 3D network of SWNTs on (a, c, e) 2.5 μm spacing and (b, d, f) 5 μm spacing Si pillar templates in microfluidic channel. (c) Microscopic image of Si micro pillar in microfluidic channel. And fluorescent microscopic images of (d) passing 500 nm green-PS particles through 3D networks on 5 μm spacing Si pillar template, (e) Filtered 500 nm green-PS particles by 3D networks on 2.5 μm spacing template, and (f) filtered 1 μm red-PS particles by 3D networks on 5 μm spacing template.



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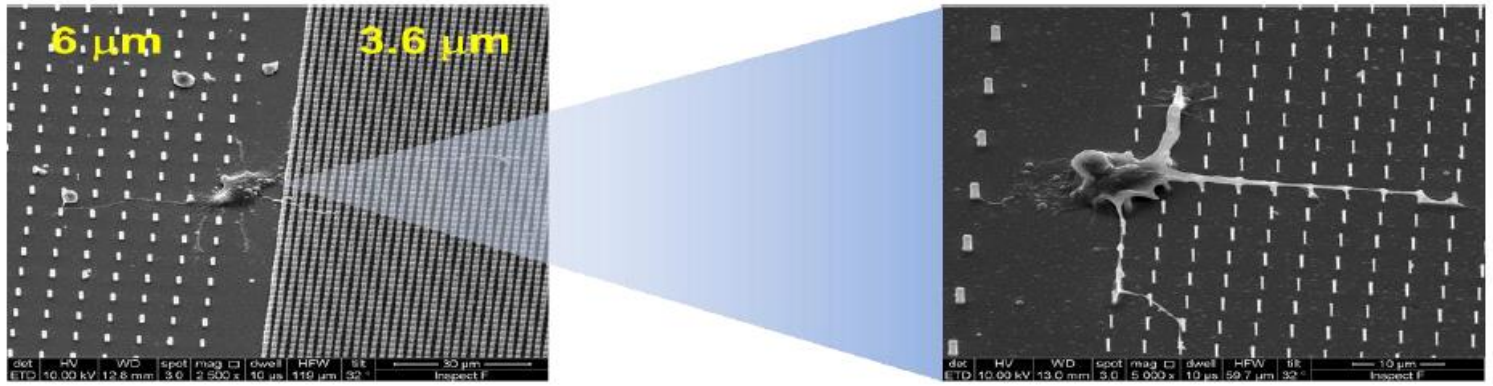
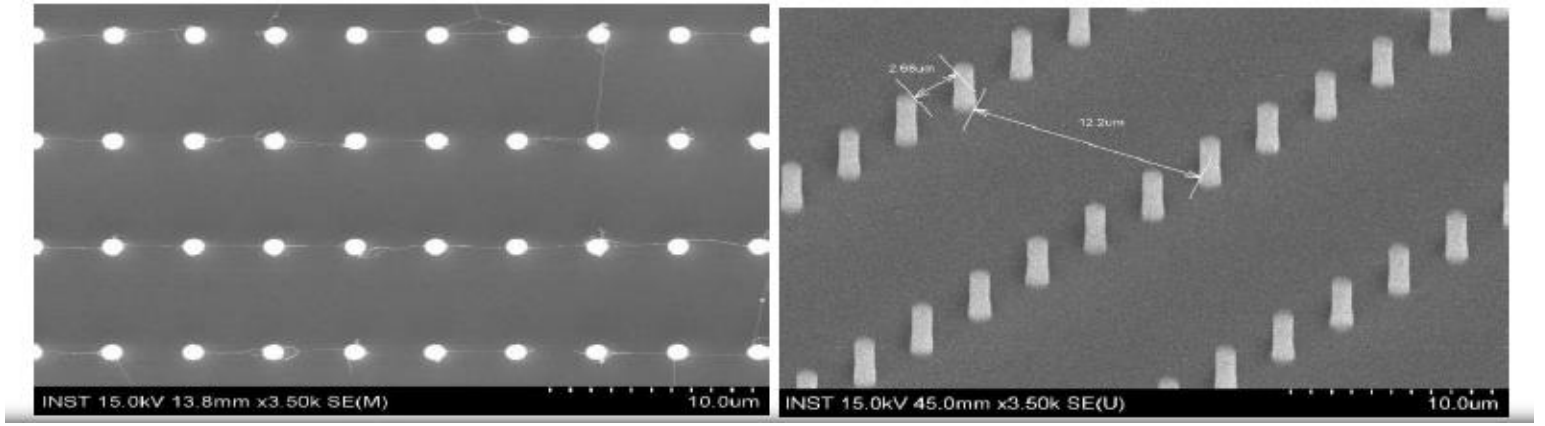
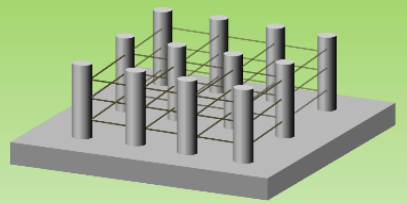
GROWTH OF NEURON ON 3D NETWORK OF CNT-BASED TEMPLATES





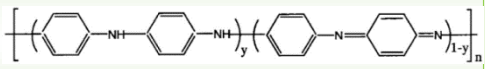
SUPERCAPACITOR BASED ON 3D NETWORK CNT TEMPLATES

3D Network of CNTs

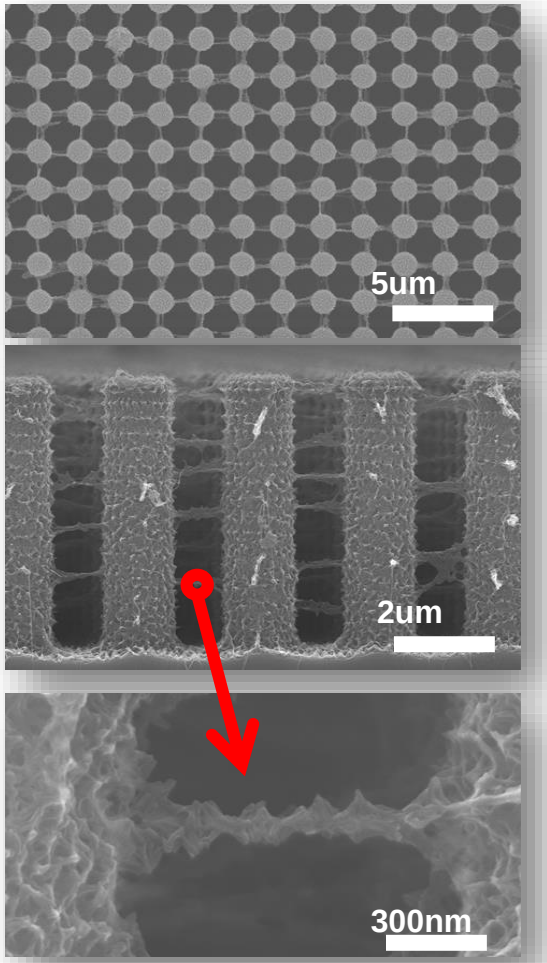


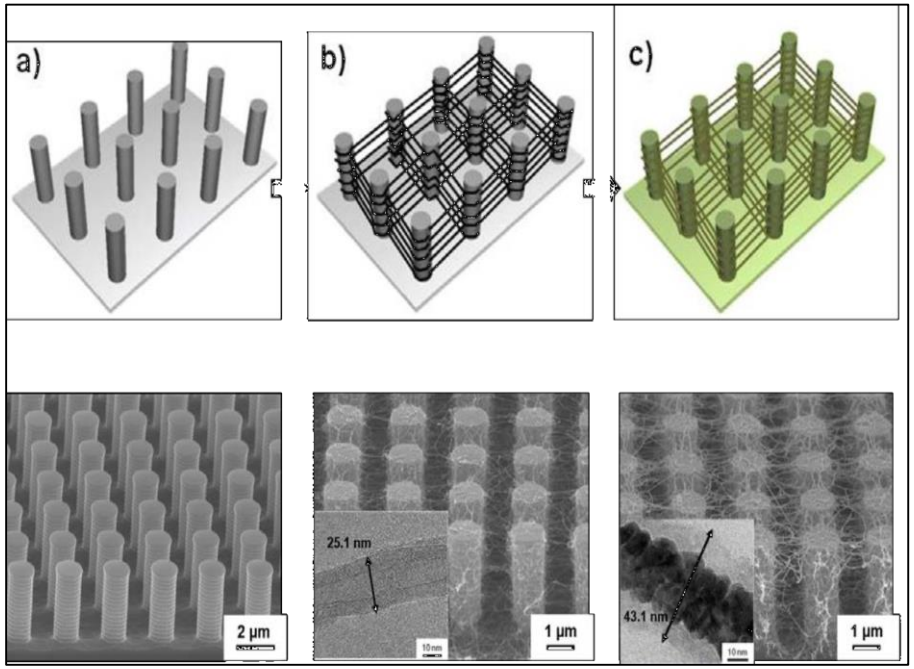
+

Polyaniline



- *Good electroactivity*
- *Ease of synthesis at low cost*
- *Good processability*
- *Environmental Stability*
- *Doping/de-doping chemistry*





Schematic illustration of 3DNC/MnOx fabrication process and SEM images of (a) pristine Si pillar substrate, (b) as synthesized 3DNC and (c) 3DNC/MnOx.

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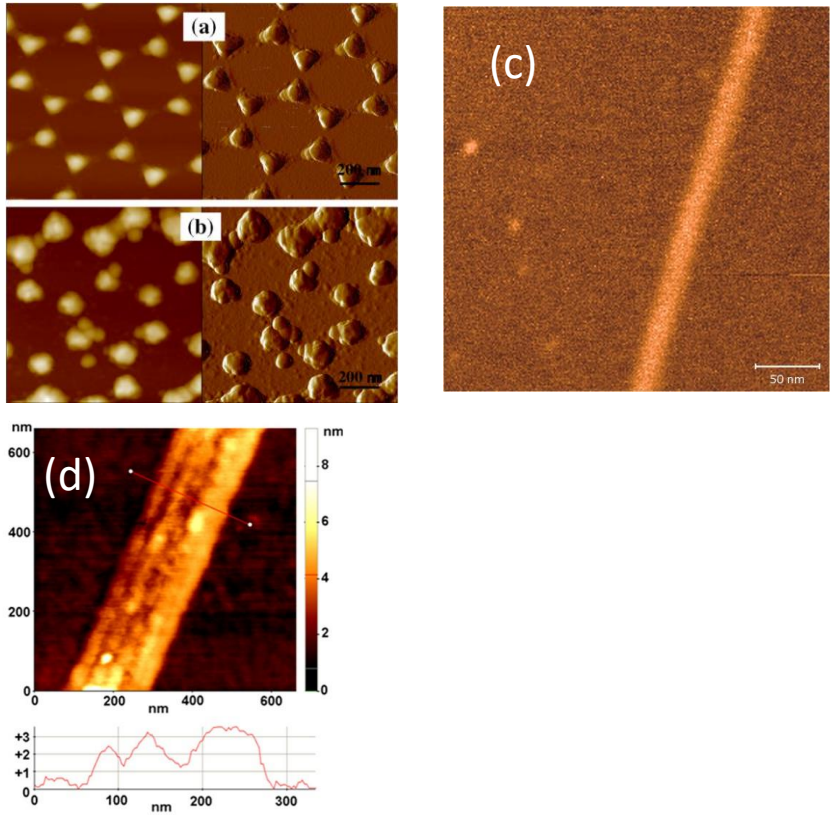
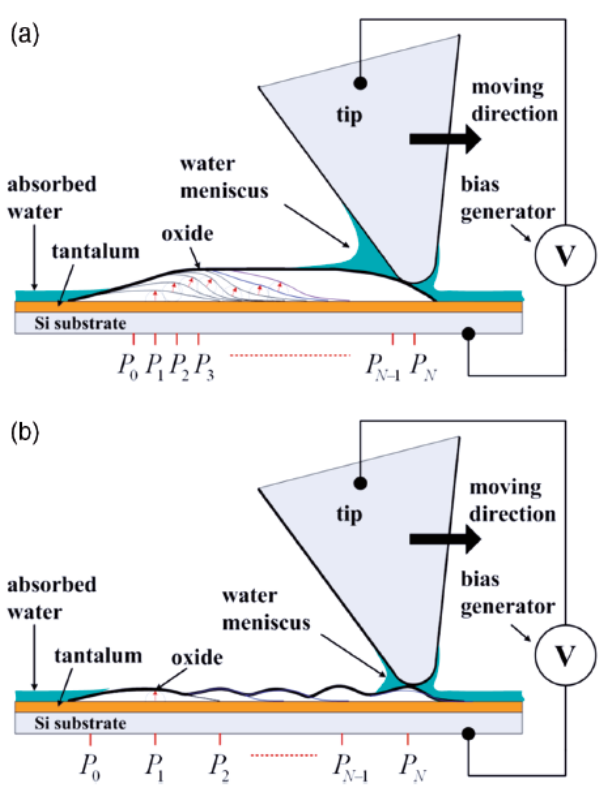
Research: AFM Characterization and Lithography

AFM Measurement & Recognition

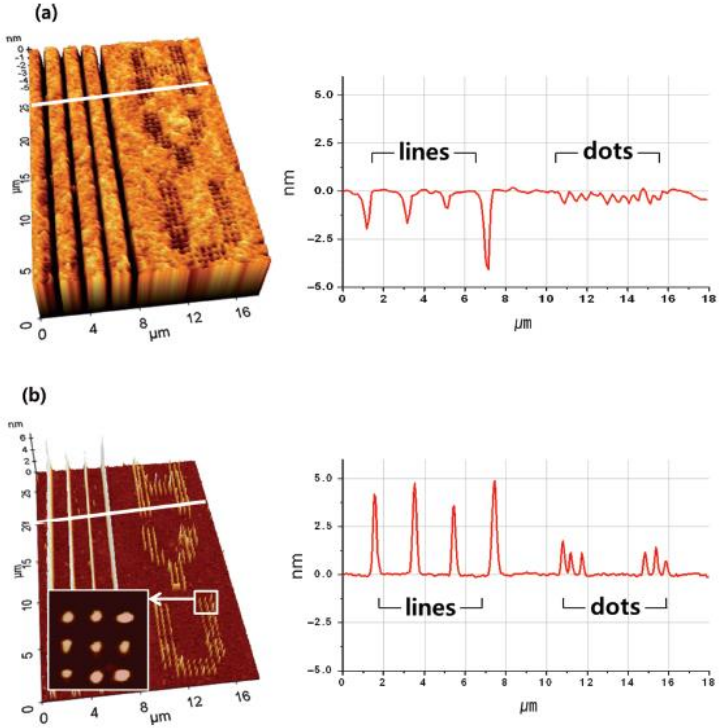


(a), (b): Tapping mode AFM image of the gold dot array (a) before and (b) after protein immobilization. (c): Non-contact mode AFM image of Micro cyclic diacetylene-3 nanotube. (d): An AFM image showing SWCNTs aligned in the WS-PANI/PVA/SWCNTs nanofiber.

Scanning Probe Lithography



Scheme of Line Patterning



AFM topography of (a) decompose cobalt pattern after performing lithography and (b) fabricated uniform and well-connected cobalt nanostructures after the development process

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LABORATORY EVENTS

Homecoming Day

Laboratory Tour

Tokyo Institute of Technology
Japan Students Visit

OTFL Progress Meeting

OTFL Picnic

OTFL Year-End Party

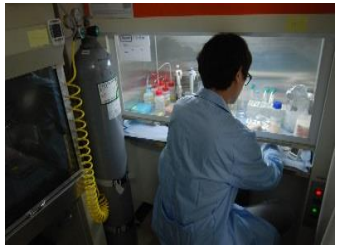
OTFL Organic Thin Films Laboratory

Laboratory Environment

FTC 5th Floor

Laboratory

Sample Preparation Room



Bio Chamber

Measurement Chamber

Laboratory Equipment

AFM (XE-100)

AFM (XE-100)

PE(Plasma-Enhanced) CVD

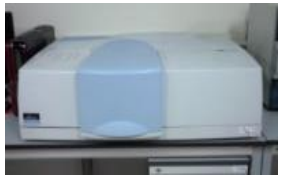
Thermal CVD

Thermal CVD

Thermal Evaporator

Glove box

UV-O_3 Cleaner



UV/VIS/NIR

Ellipsometer

Fluorescens-Microscope

Strain Sensor

OTFL Organic Thin Films Laboratory

Alumni Status (1993-2016)