Aerosol and Surface Lab

전남대학교 CHONNAM NATIONAL UNIVERSITY

Prof. Ki Joon Heo

Contact

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Email: k.heo@jnu.ac.kr

Academic Education

Ph.D., Department of Mechanical Engineering, Konkuk University 2020
- Control of bioaerosols using active antimicrobial air filter; visible light-activated photosensitizer and conductive fiber

M.S., Department of Mechanical Engineering, Konkuk University 2015
- The concentrations of Culturable bioaerosol and antimicrobial air filters using natural nanoparticles

B.S., Department of Mechanical Engineering, Konkuk University 2013

Professional Experience

Assistant Professor 2022.09 - Present
School of Mechanical Engineering, Chonnam National University, Gwangju, Korea

Post-doc (Fellowship program funded by NRF), 2021.09 - 2022.08
Materials Chemistry Research Centre, University College London (UCL), London, UK

Post-doc (In Lieu of Military Service), 2020.10 - 2021.07
Department of Environmental Machinery, KIMM, Daejeon, Korea

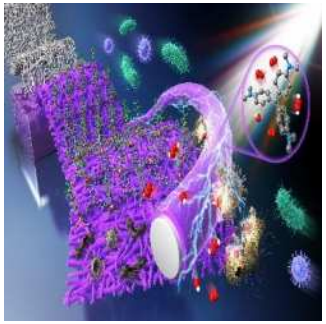
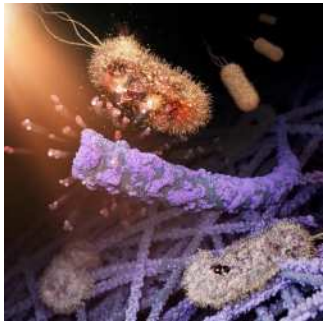
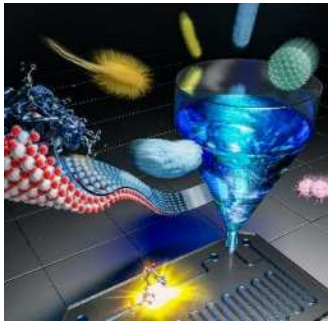
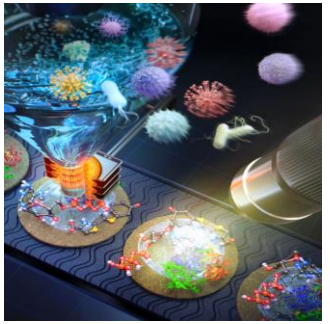
Researcher (In Lieu of Military Service), 2018.07 - 2020.10
Advanced Textile R&D Department, KITECH, Ansan, Korea

Aerosol and Surface Lab

전남대학교 CHONNAM NATIONAL UNIVERSITY

- We work on innovative engineering solutions for environmental problems, especially air pollution issues.
- Our main research interests include control of air pollution, airborne particle measurement, air filtration, and detection and inactivation of airborne microorganisms.
- We are currently focused on the formation of functionalised nanoparticles and development of practical antimicrobial strategies using them to address the threat of infectious microorganisms including bioaerosols.
- We aim to develop a sustainable self-cleaning strategies through robust superhydrophobic surfaces.

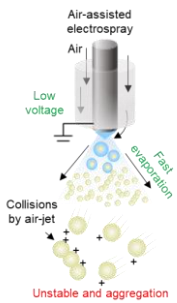
Research highlights

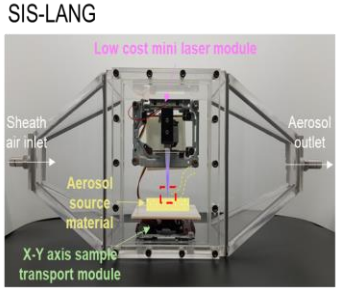






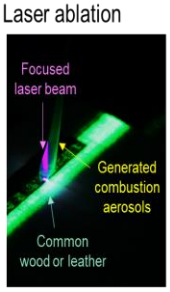

Aerosol technology

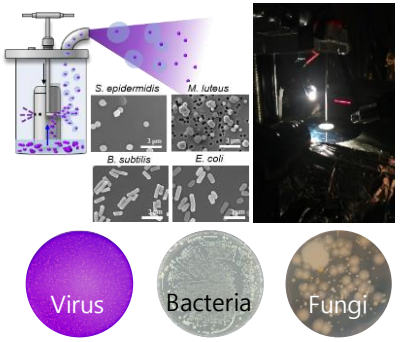
Aerosol generation

- We specialise in aerosol generation using electro spray, laser ablation, pressurized spray technology



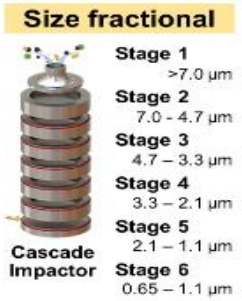


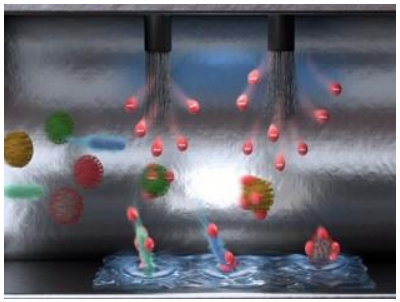


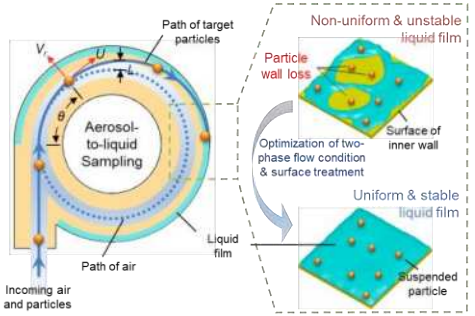


Aerosol collection

- We focuses on the aerosol collection through synergy between functional surfaces and fluid behavior control.

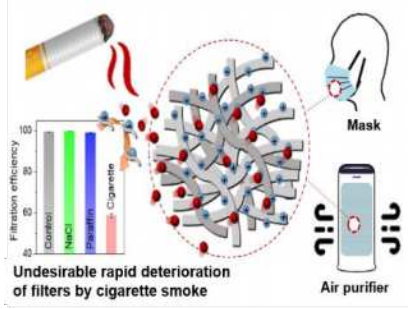


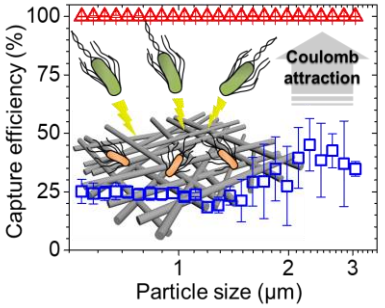


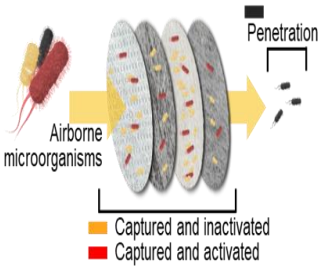


Air filtration

- We are interested in understanding mechanisms of air filtration, and developing innovative functional air filtration technology.



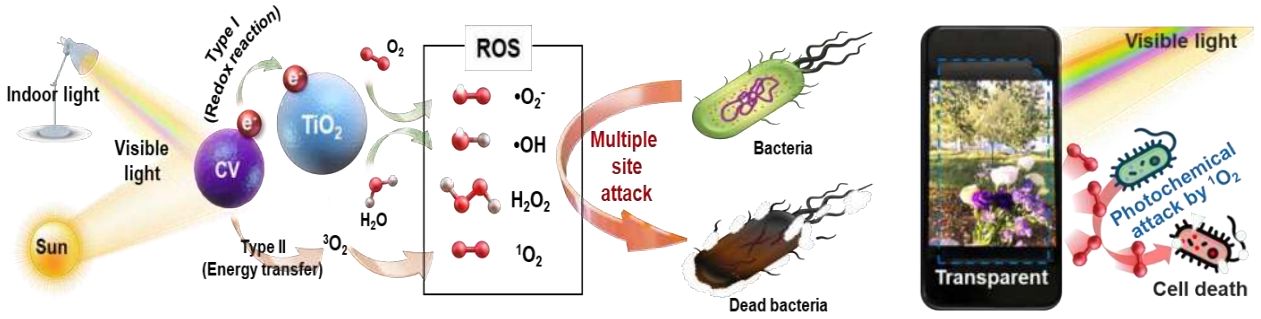




Functional Surfaces

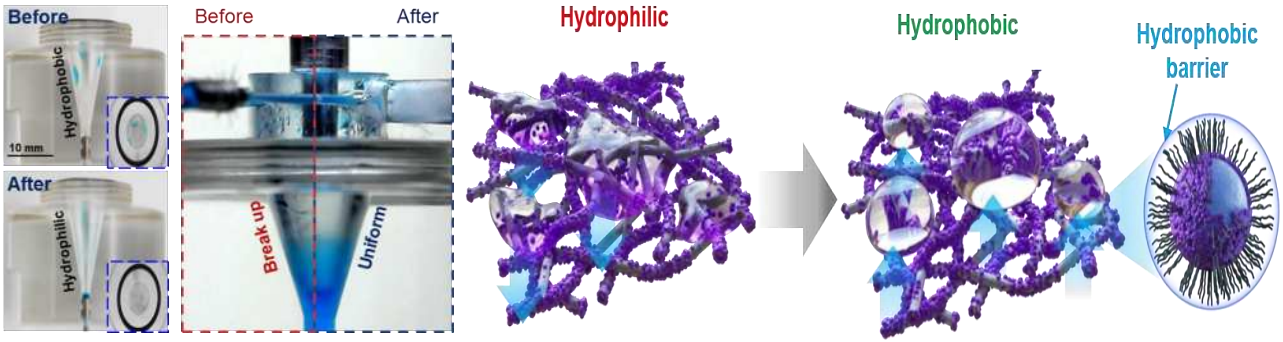
Antimicrobial

- We aim to introduce eco-friendly and harmless antimicrobial strategies.



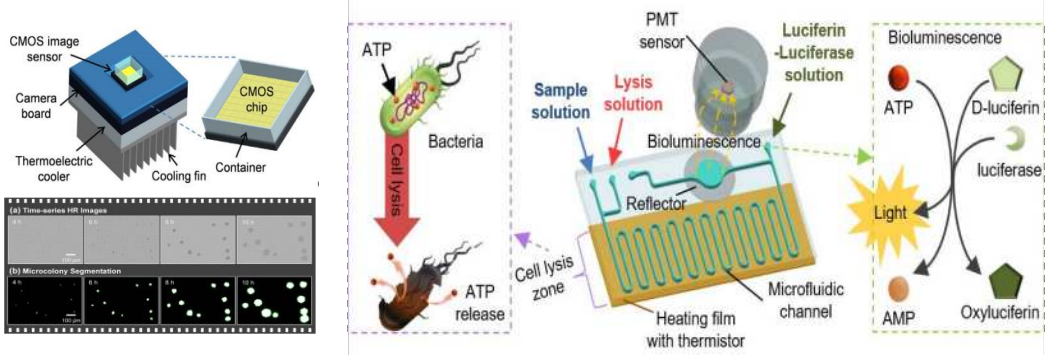
Superhydrophobic

- We have conducted research on applying hydrophobic surfaces to various industrial fields.



Detection

- We are interested in developing a real-time detection system for airborne microorganisms using various microbial detection technologies



Renewable Energy Prototyping Lab

• Principal Investigator

Prof. Soonwook Hong

Professional Experience
- **Assistant Professor, Chonnam Nation University (Mar. 2021 - present)**
- **Postdoctoral Scholar, Stanford University (Sep. 2017 - Feb. 2021)**
- **Ph.D., Hanyang University (Sep. 2012 - Aug. 2017)**
- **B.S., Hanyang University (Mar. 2004 - Aug. 2012)**

Research Fields
Fuel Cells, Water Electrolysis, Thermal Engineering, Thin Film Fabrication

Contact
- **Office : Eng Bdg 1A-421 (+82-62-530-1686) / Email : shong@jnu.ac.kr**

• Members

Yongchan Park
M.S. course

Hyeontaek Kim
Undergraduate

Davin Jeong
Undergraduate

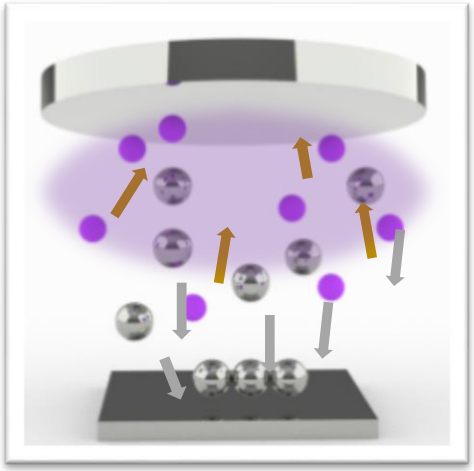
Hyeongmin Kim
Undergraduate

Heechan Kwon
Undergraduate

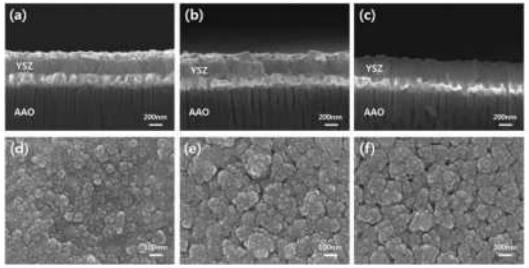
Renewable Energy Prototyping Lab

• Thin Film Fabrication

❖ Sputtering

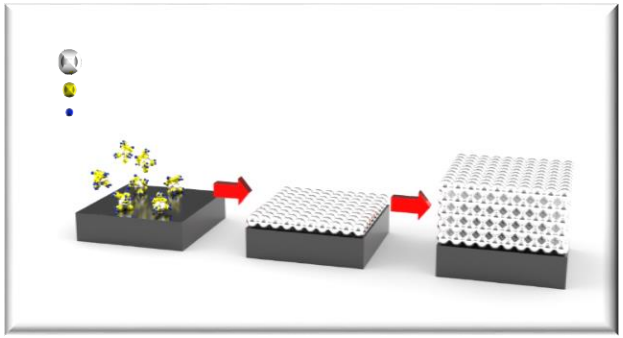


➢ 연료전지 박막전극 제작

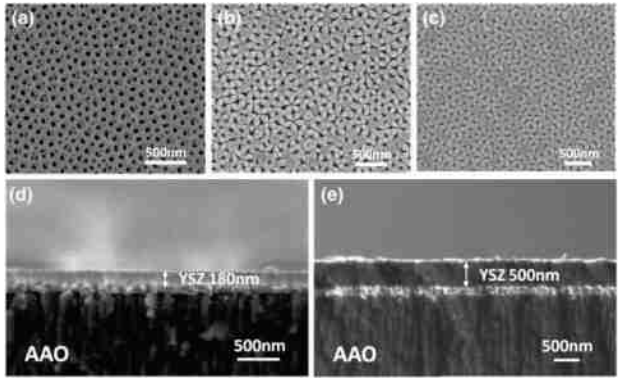


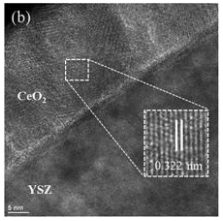
✓ 촉매 열화 방지
✓ 산소환원반응 촉진
✓ 작동온도 감소

❖ Atomic Layer Deposition



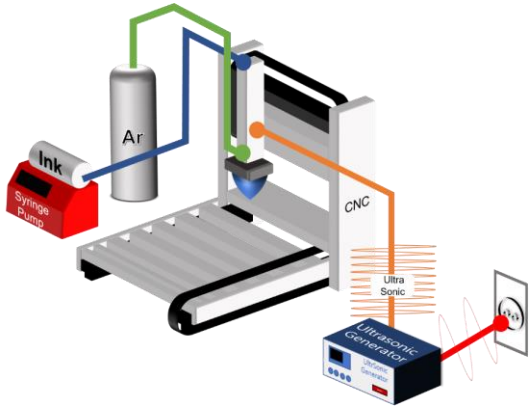
➢ 연료전지 박막 전해질 제작



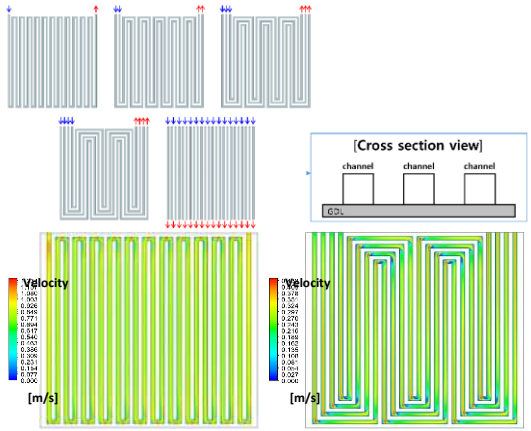


✓ 두께저항 감소
✓ 이온전도도 증가
✓ 내구성 확보

❖ Ultrasonic spray



➢ 수전해 특성부여층 제작

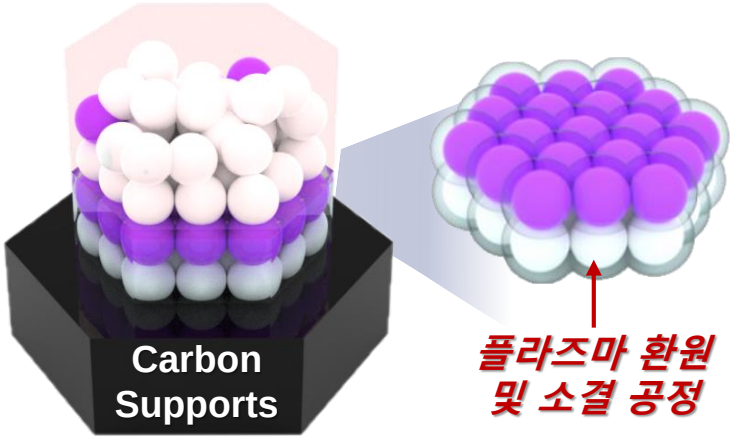


✓ 내부식성 증가
✓ 전기전도도 확보

Renewable Energy Prototyping Lab

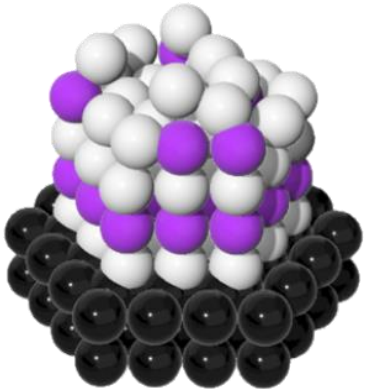
Renewable Energy
Prototyping Laboratory

• Catalyst Fabrication

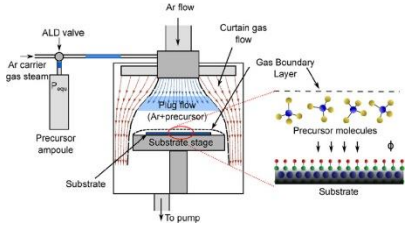


플라즈마 환원
및 소결 공정

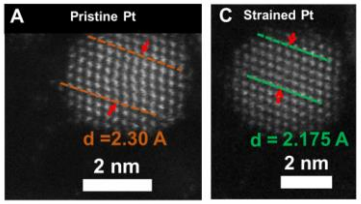
백금-란타늄 촉매



원자층 증착기 설계

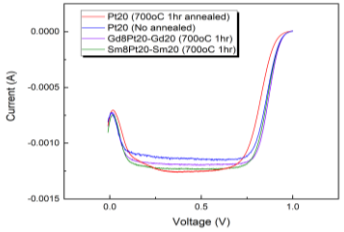


촉매 기계적 스트레인 측정

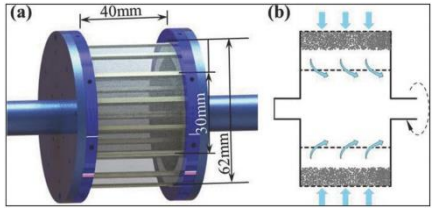


수소 플라즈마 및 소결

촉매 전기화학 특성 평가



카본 파우더 기반 파일럿 스케일 제작

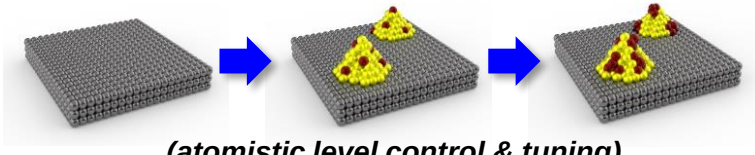


수전해 & 연료전지 MEA 제작 및 열공학 특성 평가

Renewable Energy Prototyping Lab

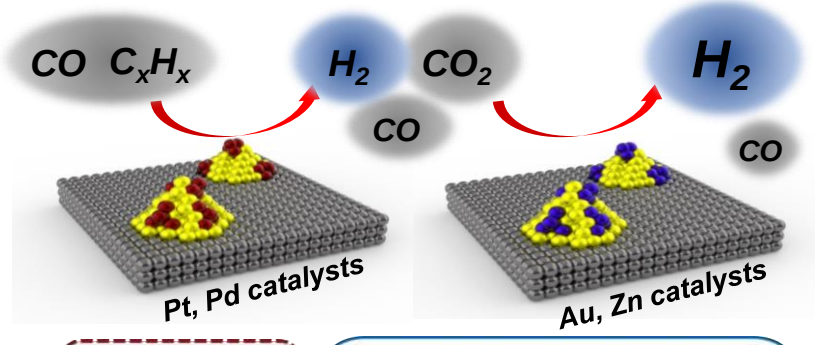
• Plastic Waste Conversion

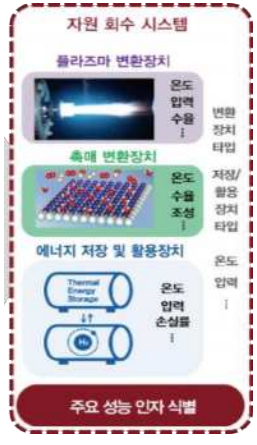
❖ ALD를 이용한 원자 단위의 촉매 설계

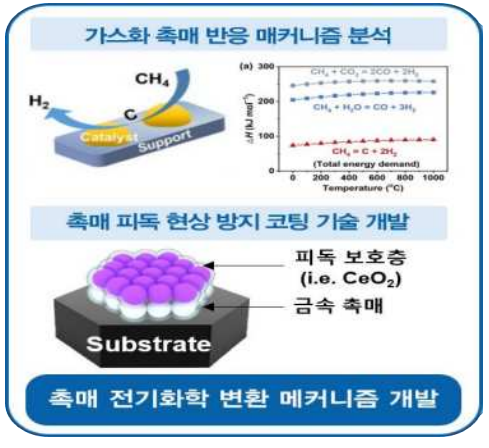


(atomistic level control & tuning)

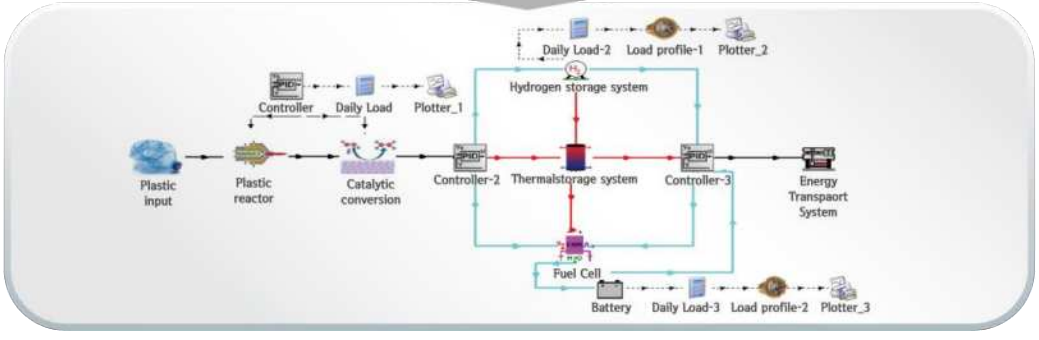
❖ 선택적 촉매 반응을 위한 원자 단위 촉매 제작

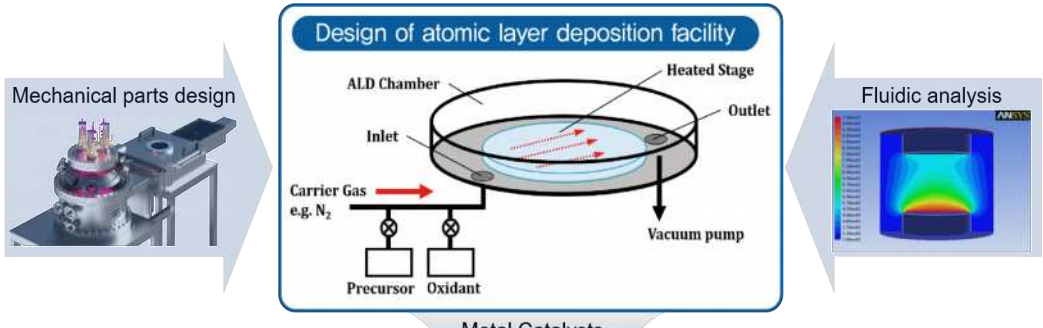




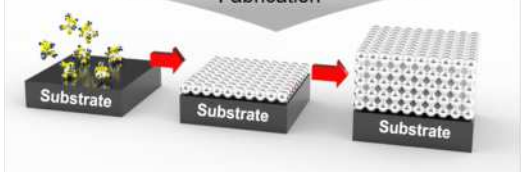


자원회수 시스템 모델링 기초설계





Metal Catalysts Fabrication



Autonomous and Intelligent Robotics Lab

School of Mechanical Engineering
Chonnam National University

Principal Investigator - Prof. Ayoung Hong

Contact
Office: Eng Bldg 1A-202
Lab: Eng Bldg 1B-202
Tel: +82-62-530-4211
email: ahong@jnu.ac.kr

Assistant Professor, 2019 – current

- School of Mechanical Engineering
- Robotics Engineering Convergence

Education

- Ph.D. in Mechanical and Process Engineering, ETH Zurich — 2019
- M.S. in Mechanical Engineering, KAIST — 2012
- B.S. in Mechanical Engineering, KAIST — 2009

Professional Experience

- ETH Zurich, postdoctoral researcher — Feb 2019 – Jun 2019
- ETH Zurich, graduate research assistant — Jul 2013 – Dec 2018
- KIMM, research assistant — Dec 2012 – Jun 2013
- Max Planck Institute — Jan 2012 – Oct 2012

Member of

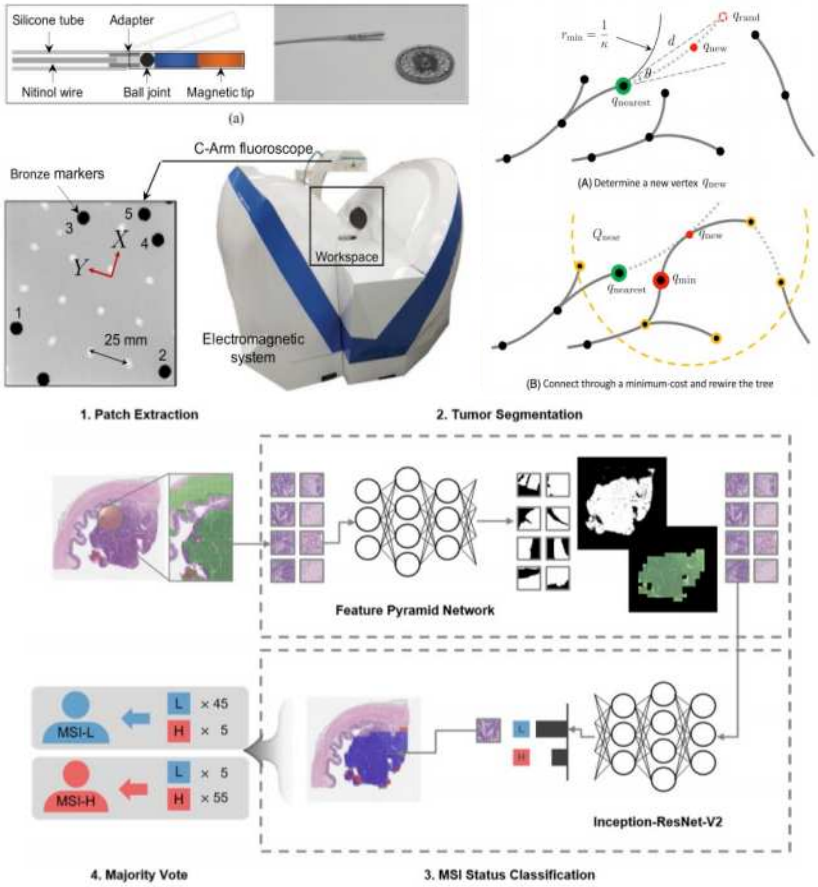
- IEEE Robotics and Automation Society
- Institute of Control, Robotics and Systems

Autonomous and Intelligent Robotics Lab

Research Interests Robot motion planning, Learning-based control, Deep learning
Applications: Medical/Surgical robotics, Agriculture robotics

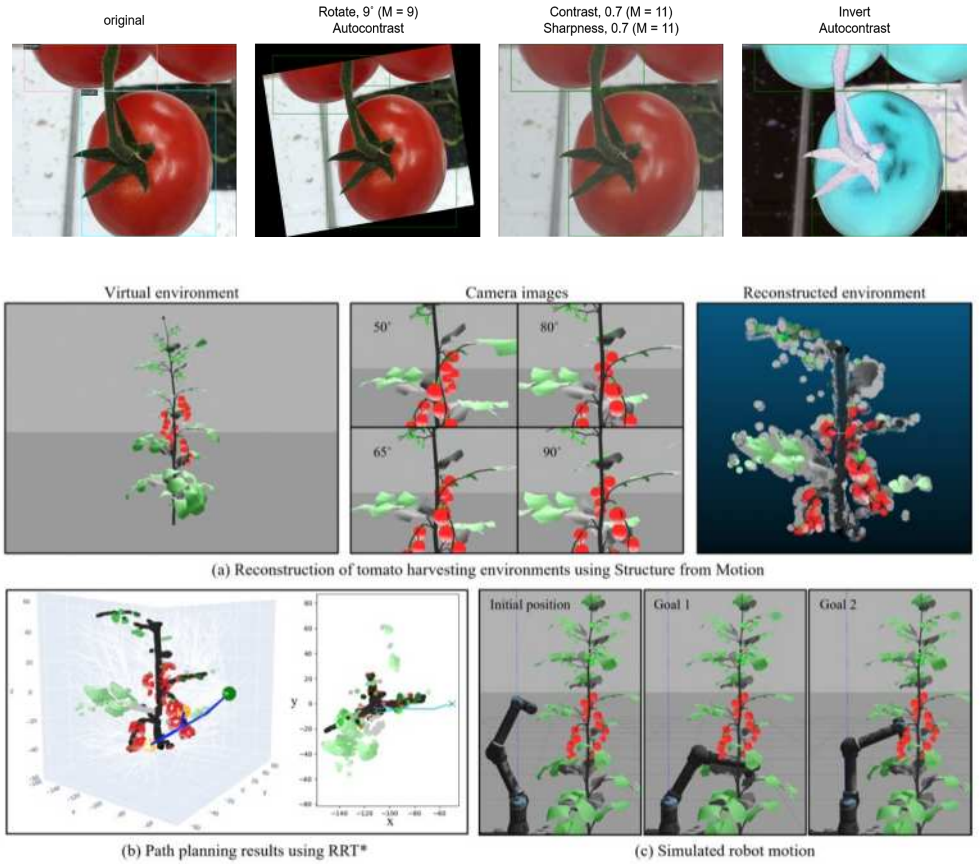
Medical/Surgical robotics

Magnetically guided catheter
Surgical planning, Medical image analysis



Agriculture robotics

Learning-guided motion planning
Deep learning based Crop detection



Projects / Fundings

적과(적화) 및 수확 작업을 위한 작업자 시연 학습 기반 한국형 매니퓰레이터 기술개발
Development of Monitoring, Fruit Thinning, and Harvesting Robot for Hydroponics
- Learning from Demonstration, Robot motion planning
- 스마트팜다부처패키지혁신기술개발사업, 2021 – 2024

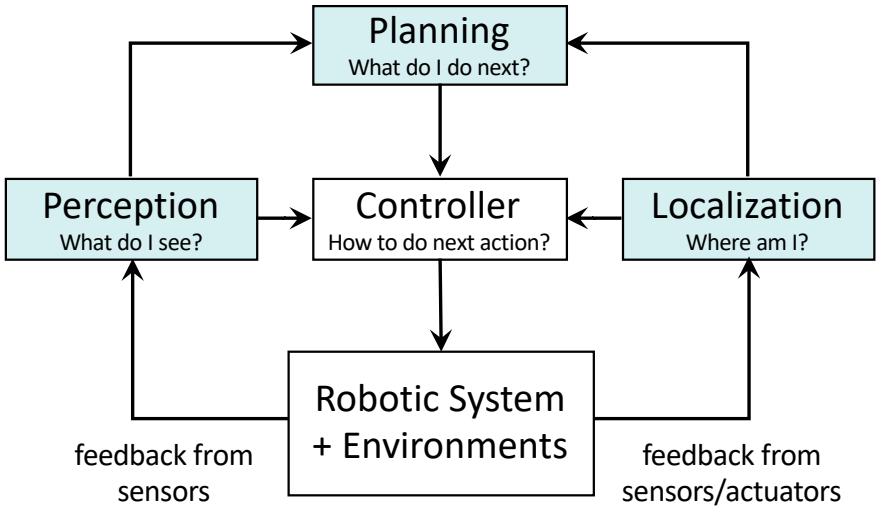
약물교차투입과 시술도구 모듈화 기반의 통증 중재시술 3종 적용이 가능한 협업 플랫폼 기술 개발
Development of clinician-collaborative robot platform technology for 3 types of pain interventional procedures based on cross-drug handler and instrument modules
- 3차원 환부 위치 인식 및 영상 정합 알고리즘 개발
- 산업통상자원부, 2023 - 2027

딥러닝 기술을 이용한 시계열 데이터 시뮬레이션
- 플랜트 배관의 이상 탐지 성능 개선을 위한 딥러닝 기반 생성 모델에 대한 연구
- 한국원자력연구원, 2023

마이크로의료로봇 구동모듈 개발
- 보건복지부 공동연구, 2021 – 2024

로봇기반 혁신선도 전문인력양성 사업
- 대학원 인재 육성 사업 공동연구
- 산업통산자원부&한국산업기술진흥원, 2021 – 2024

SW중심대학
- 소프트웨어 기반 융합인재 양성 사업
- 정보통신창의인재양성, 2021 – 2028



Autonomous and Intelligent Robotics Lab

AIRLab Members

Giwan Lee Ph.D. student
Research interests: Robot vision, Data augmentation

Phayuth Yonrith Master student
Research interests: Robot motion planning

Sharmee Sharmin Sultatn Master student
Research interests: Deep learning

Jiyoung Choi Master student
Research interests:Robot manipulation, Deep learning

Jeong Il Choi Master student
Research interests: Robot perception

More information from: https://sites.google.com/view/airlab-jnu

ConFluX Lab (Convergent Fluid-X Lab)

Laboratory for Fluidic Systems across Scales and Disciplines
(다양한 스케일과 분야를 잇는 유체기반 시스템)

Juyeol Bae, Ph.D.

Assistant Professor

bjy4969@jnu.ac.kr

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Education

Mar. 2016 - Feb. 2022	**Ph.D.** Mechanical Engineering, Ulsan National Institute of Science and Technology (UNIST), Korea (PI: *Prof. Taesung Kim*)
Mar. 2012 - Feb. 2016	**B.S.** Mechanical Engineering, Ulsan National Institute of Science and Technology (UNIST), Korea (PI: *Prof. Heungjoo Shin*)

Research Experience

Sep. 2024 - Present	**Assistant Professor**, Department of Mechanical Engineering, Chonnam National University, Korea
Sep. 2022 - Aug. 2024	**Postdoctoral Fellow**, Querrey Simpson Institute for Bioelectronics, Northwestern University, US (PI: *Prof. John A. Rogers*)
Mar. 2022 - Aug. 2022	**Postdoctoral Fellow**, Ulsan National Institute of Science and Technology, Korea
Mar. 2015 - Aug. 2015	**Researcher**, Korea Institute of Science and Technology-Europe (KIST-Europe), Germany (PI: *Prof. Andreas Manz*)

Professional Activities

Board Member,	The Korean Society of Mechanical Engineers (대한기계학회, 유체공학부문 이사)
Board Member,	The Society of Micro and Nano Systems (마이크로나노시스템 학회, 바이오부문 이사)
Board Member,	The Korean Society of Visualization (한국가시화학회, 이사)

Honors & Awards

2023 Honor	Postdoctoral Overseas Research Program, National Research Foundation (박사후국외연수 사업, NRF), Korea
2022 Honor	Outstanding PhD Award, UNIST, Korea
2022 Award	삼성전자 휴먼테크 논문상, Samsung Electronics, Korea
2020 Award	Best poster award, 2020 The Korea Society of Mechanical Engineers Conference on Micro-/Nano- Engineering, Korea
2020 Award	Outstanding paper award, 2019 Fall Materials Research Society (MRS) International Conference, United States
2019 Award	삼성전자 휴먼테크 논문상, Samsung Electronics, Korea
2017~22 Honor	Global Ph.D. Fellowship, National Research Foundation, Korea (글로벌박사펠로우십, NRF)
2016 Honor	Magma Cum Laude (B.S.), UNIST, Korea
2015 Honor	Fellowship in KIST-Europe, 2015.

❖ Motivation

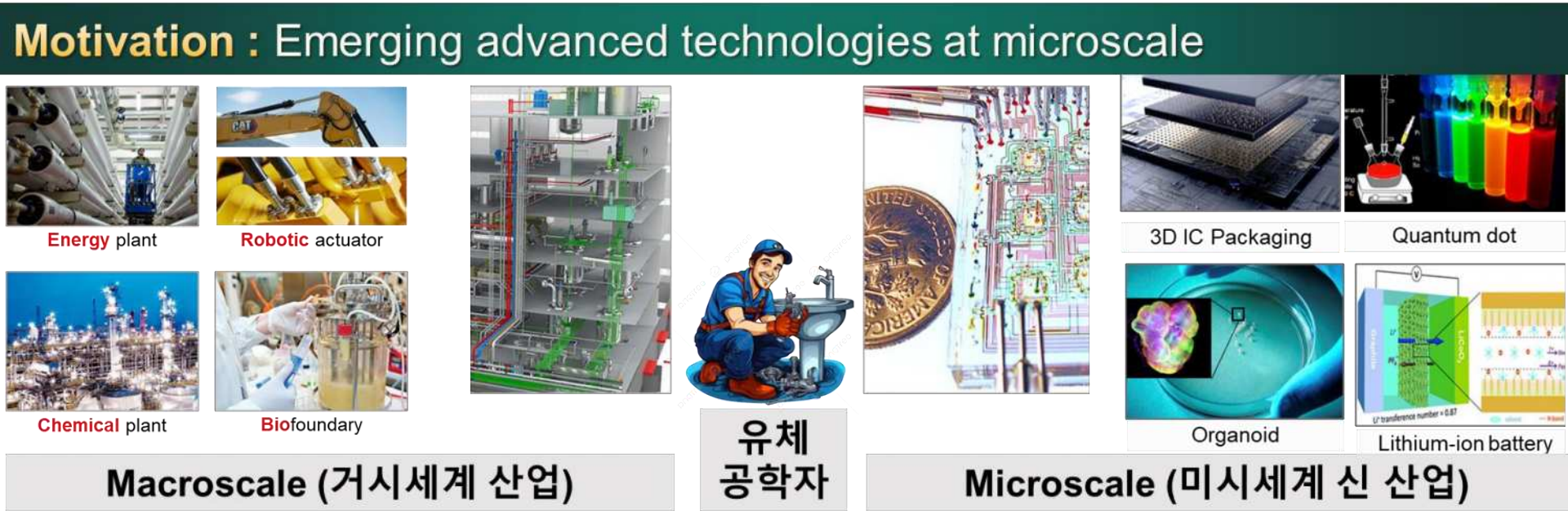
미래 신 생명공학, 화학, 재료 기술이 마이크로/나노 스케일에서 등장하고 있습니다. 이에 마이크로 머신 설계 및 제조 분야의 엔지니어 수요가 꾸준히 증가하고 있습니다.

❖ Vision

우리는 인류 삶의 질의 향상과 지속가능 미래를 실현하기 위해 첨단 마이크로 머신을 만듭니다.

❖ Mission

미세·나노 스케일 역학을 기반으로, 우리는 최첨단 미세유체 플랫폼을 활용해 생물학·화학·재료공학이 교차하는 지점에서 혁신적인 솔루션을 제공합니다.
이를 통해 더욱 건강하고 편리하며, 인간과 기계가 유기적으로 통합된 더 지속 가능한 세상을 만들어 나갑니다.

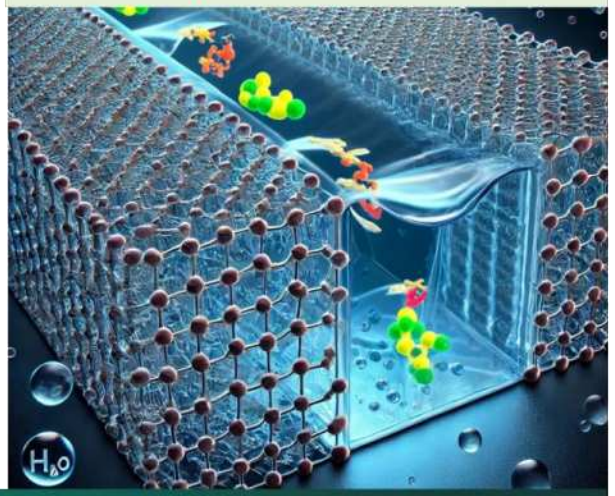


Vision: Human well-being through sustainable hybridization of humans and machines

1) Bio-Integrated Machines

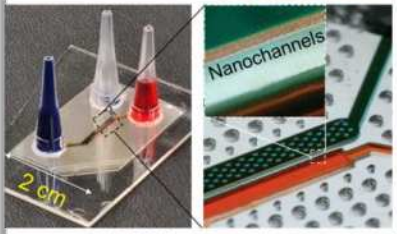
2) Solution Processing

3) Nanofluidics



Mission: Development of novel fluid machinery grounded in micro-/nanomechanics

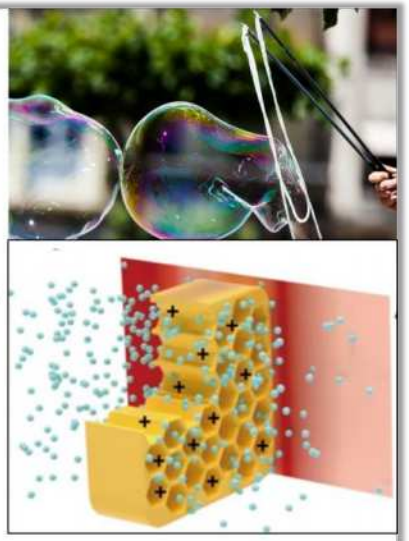
- ✓ Flexible
- ✓ Bio-Materials
- ✓ Mass Production
- ✓ Three-dimension



Advanced Nano-Fabrication

Bio, Mat, Chem
(Convergence)

- ✓ Soft Matter
- ✓ Fluid Mechanics
- ✓ Mass & Heat Transfer



Mechanics at Micro-/Nano Scale

Energy-Autonomous Smart Transformation (ENST) Systems Lab

● Advisor

Yoonsang Ra, Ph.D.

- **Assistant Professor**
- **Affiliation**
  School of Mechanical Engineering
  Chonnam National University
  Republic of Korea
- **Contact**
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  e-mail: yra87@jnu.ac.kr
- **Web page**
  https://sites.google.com/view/enstlab/
- **Google scholar**
  https://scholar.google.com/citations?user=T_3D2XsAAAAJ&hl=ko&oi=ao

Education

Ph.D. in Mechanical Engineering, Kyung Hee University (2024.02)
M.S. in Mechanical Engineering, Kyung Hee University (2021.02)
B.S. in Mechanical Engineering, Kyung Hee University (2019.02)

Work Experience

Assistant Professor. Chonnam National University (2025.09~)
Research Fellow. National University of Singapore (2024.09~2025.06)
Academical Research Professor. Kyung Hee University (2024.09~2025.06)
Postdoctoral Researcher. Kyung Hee University (2024.03~2024.08)

Awards and Honors

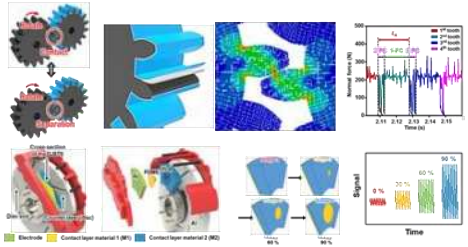
- *Best Paper Award (2024)*
  - The Korea Institute of Electrical and Electronic Material Engineering
- *Gold prize (2024)*
  - NANO KOREA 2024 Symposium
- *Excellence Degree Paper Award (2024)*
  - Kyung Hee University 2023 Academic Year Engineering Department
- *Best Paper Award (2023)*
  - BK21 Program
- *Best Paper Award at The Conference (2022)*
  - Conference of Korea Society for Precision Engineering
- *Deputy Prime Minister and Minister of Education Commendation (2021)*
  - Excellent participants for BK21 Program

Energy-Autonomous Smart Transformation (ENST) Systems Lab

Research vision

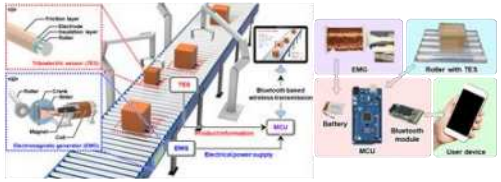
Element development

- **Development of self-powered sensor**
- Grid-independent wireless operation
- Sensing of external stimuli and tracking of environmental conditions
- Design of smart mechanical elements



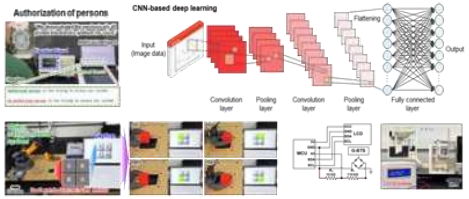
System development

- **Development of grid-independent monitoring system**
- Energy harvesting-based power supply
- Low-power signal processing and power management

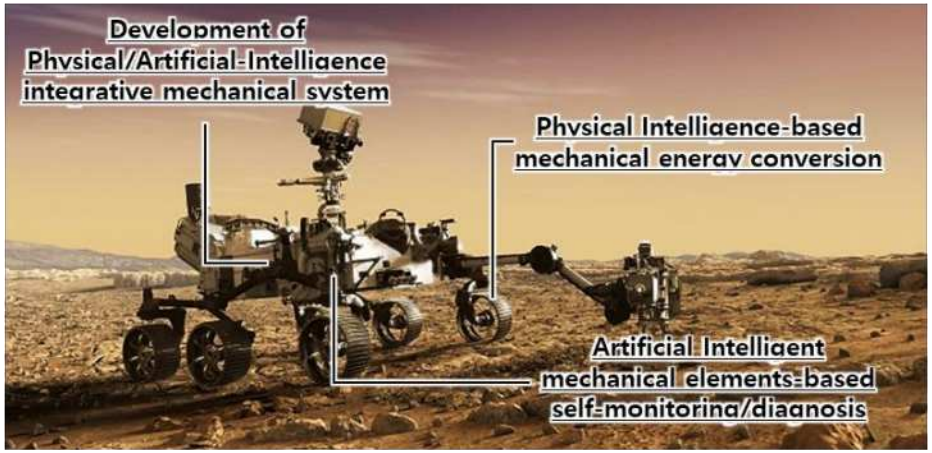


Software development

- **Advancement of grid-independent monitoring system**
- Sensor performance and applicability enhancement
- AI-based data analysis considering characteristics of the self-powered sensors



Energy-autonomous smart transformation of mechanical system

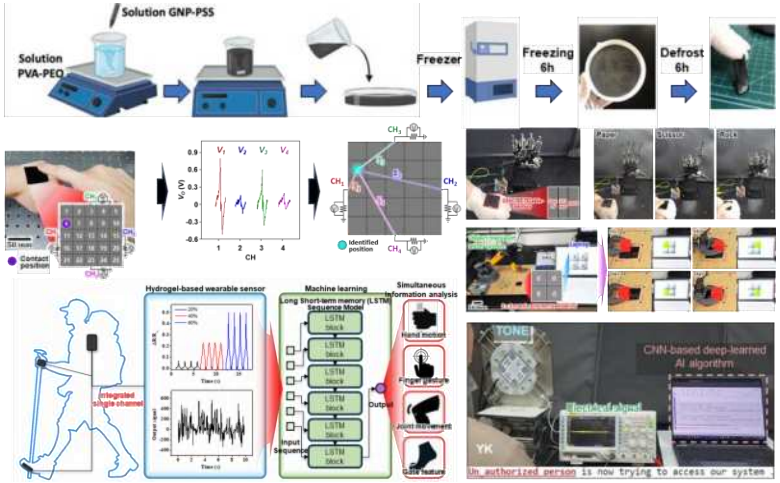


Next-generation intelligent mechanical monitoring system

- **Physical intelligent design of mechanical elements/systems for extremely harsh environments**
- **Real-time and grid-independent self-monitoring/diagnosis with artificial intelligence**
- **Integrative technology-based practical realization of next-generative mechanical system**

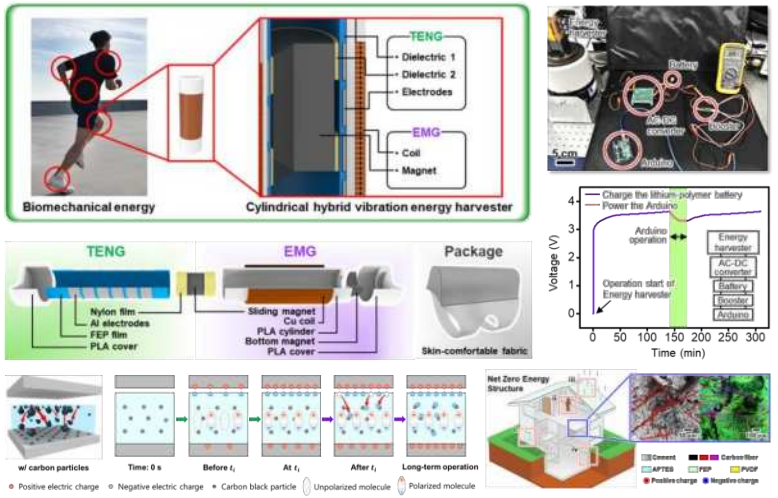
Energy-Autonomous Smart Transformation (ENST) Systems Lab

Research area



Self-powered sensing

- Grid-independent wireless IoT sensors
- Functional materials/surfaces/structures with Triboelectric, Piezoelectric, and Thermoelectric effects
- Mechanical/chemical/physical stimuli sensing
- Machine status monitoring, human motion/voice detection, environmental condition tracking, etc.

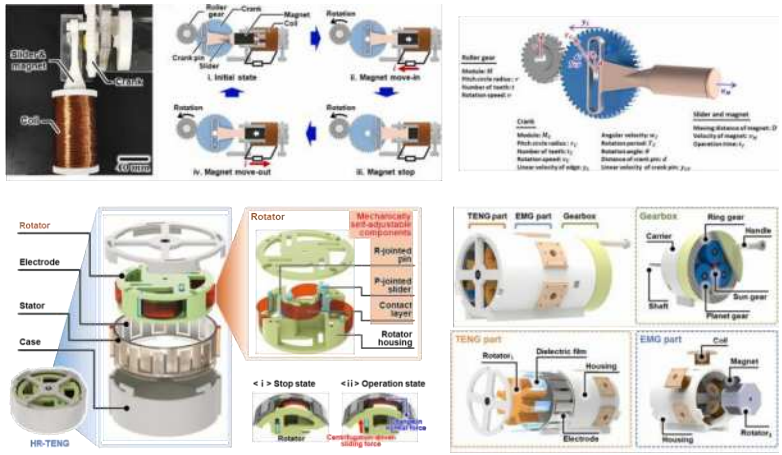


Energy harvesting

- Sustainable/semipermanent distributed generation with Electromagnetic, Triboelectric, and Piezoelectric generators
- Renewable energy harvesting (wind, vibration, human motion, biomechanical energy, etc.)
- Mechanical energy conversion principle investigation
- Micro/nano-materials and composites design
- Rational design-based high performance device

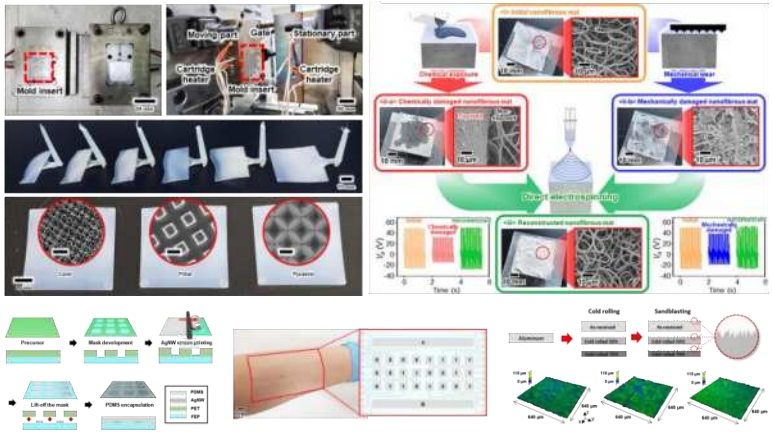
Energy-Autonomous Smart Transformation (ENST) Systems Lab

Research area



Mechanical element design

- Theoretical analysis of mechanical elements
- 3D-modeling & CAD design
- Kinetic/kinematic model-based mechanism investigation
- Advanced design-based additional functionalities including self-monitoring and energy harvesting
- Intelligent mechanical elements-based system development



Multi-scale manufacturing

- Macro/micro/nano-scale process
- Additive manufacturing-based fast prototyping
- Classical manufacturing with molding/subtraction/solution/cold-rolling/R2R/etc.
- Electrospinning/spray-based micro/nano fiber/particle fabrication
- Functional surfaces, structures, and designs demonstration