

SOOYON CHANG

Department of Mechanical Engineering, Purdue University, West Lafayette, IN-47907, chan1047@purdue.edu,
imdasiun@gmail.com

EDUCATION

Undergraduate: SUNY Korea, Stonybrook University, Mechanical engineering 2018.02-2021.12
GPA: 3.87/4.0

Master's Degree: Cornell University, Mechanical engineering, ZT Group 2022.08-2024.05

Doctoral Degree in progress: Purdue University, Mechanical engineering, Energy and Transport Sciences Laboratory (ETSL) 2024.08-current

RESEARCH EXPERIENCE

Undergraduate research

2020.07.01~2021.03.01

"130 Commodity ecology project (grant by NRF)" Research assistant for Prof. Mark Whitaker.

Making published book and mobile platform in categorizing material and technology for each ecoregion. Researched Categories: Energy and Energy Storage (Graphene batteries, solid state batteries, hydrogen fuel cell, redox flow battery, molten silicon storage etc.)

2021.03-2021.12

"GPS-Free Path planning for autonomous delivery vehicle" Research Assistant for Prof. Brad Jongseong Choi.

Hands on experience creating autonomous delivery vehicle using LiDAR, SLAM, Velodyne, and ROS navigation. Established the ROS operation by obtaining a costmap from 3D point clouds. Took responsibility in fixing frames and transforms to optimize the current position of the vehicle. Mapped entire campus using SLAM. Completed mechanical drawings(CAD) of the aluminum delivery box.

2021.09-2022.02

"Improving the reliability of the airbreather (Hyundai motors)" Research Assistant for Prof. Changwoon Han.

Researched about the reliability of the air-breather and its expected failure reasons, based on deactivation of defoamants. Suggested additional examinations of the bulk modulus inside transmission systems. Using Stress-Strength model, anticipated failure percentages of the newly designed air breather.

2022.01-2022.06

"Improving the reliability of Multilayered ceramic capacitors during production (company Amotech)" Research Assistant for Prof. Changwoon Han.

Applied the homogenization method of material properties along with ANSYS simulation. Organized possible reasons for the changing properties of elastic modulus based on perovskite cell structure. Derived equations for the homogenization of periodic materials displacement (elastic modulus, coefficient of thermal expansion). Created a Matlab code that automates the calculation for homogenization of material properties.

Graduate research

2022.08-2024.05

“Improving thermoelectric generators using flexible thin films derived from waste heat (The Department of Energy)” Research assistance for Prof. Zhiting Tian.

Took lead role of researching the behaviors of n-type thin films and enhancing ZT value. Started from literature review in selecting film materials to synthesizing n-type films using carbon nanotubes, surfactants, and polymer doping. Devised hypothesis and checked how polymer aggregation affects the electrical conductivity of films. Optimized parameters for CNT dispersion and synthesized CNT composite films. Conducted various thin film characterization methods (Electrical conductivity measurements, surface profilometry, Seebeck coefficient measurements, SEM, Raman spectroscopy, TGA, XPS, Hall measurements).

Thesis: Enhancement of electrical conductivity in CNT networks for highly stable n-type thermoelectrics

2024.08-Current

“The study of thermal stability of solid state batteries” Research assistance for Prof. Partha Mukherjee.

Currently working on experimental lab in fabricating and testing anode free cells.

PUBLICATIONS

1. S. Chang, P. Biswas, Z. Qin, Z. Tian, Unusual Electrical Conductivity Enhancement in Stable n-Type Carbon Nanotube Networks. *Small Methods* 2024, 2400585. <https://doi.org/10.1002/smt.202400585>
2. L. Shi, S. Chang, Z. Tian, Freestanding and Flexible Micrometer-Thick PEDOT:PSS Film with High Power Factor, *ACS Appl. Energy Mater.* <https://doi.org/10.1021/acsaem.4c02568>

CONFERENCES

2022.03.23-2022.03.25

KSME Spring Conference: Field of Reliability. Attended and presented a poster on, “Design and Validation for Enhancing the Reliability of Air Breather of Vehicle Transmission.”

2023.11.26-2023.12.01

Materials Research Society conference, Electronics Optics and Photonics. Attended and presented a poster on carrier-doping behavior of n-type CNT films.

TEACHING EXPERIENCE

Undergraduate TA

AMS 161, applied calculus 2

2018.08.27-2018.12.21

AMS 161, applied calculus 3

2020. 08.24-2020.12

SCHOLARSHIPS AND AWARDS

Undergraduate

Encouragement award (4 semesters), Academic excellence full tuition scholarship (2 semesters), Merit scholarship (1 semester)

2018- 2021

SUNY Korea Project Expo Poster, MEC Departmental Winner for autonomous delivery vehicle, "Baero."

2021.06

Graduated with honor academic honor of Summa Cum Laude

2021.12

Selected as the valedictorian for 2021 Fall Graduation of SUNY Korea

2021.12

TECHNICAL SKILLS

Software abilities

Microsoft office(Excel, Word, Presentation), Python, CAD (Fusion 360, Autocad, NX), MATLAB, LabVIEW, ANSYS (Mechanical, Fluent)

DFT and MD simulation (GAMESS, LAMMPS, Quantum Espresso)

Film Synthesis/Characterization Abilities

Spin coating (Laurell), Drop casting and gas furnace annealing, Sonication (bath sonication, pen sonication)

Centrifuge (Fisher Scientific), Profilometry analysis (Tencor Alpha Step, Keyence laser scanning microscope)

Four point probe measurement (Cascade CPS 06), Seebeck coefficient measurements, SEM (Zeiss Gemini 500) and EDS, Raman microscope (WITec), Thermogravimetric analyzer (TGA), Xray Photoelectron Spectroscopy (XPS), Hall measurements, XRD