Jungsoo Lee, Ph.D.

Department of Mechanical Engineering, Ulsan National Institute of Science and Technology (UNIST), Republic of Korea

Email: Ljs0505@unist.ac.kr, Tel: +82 10-5450-1849
LinkedIn: www.linkedin.com/in/jungsoo-lee94
Personal webpage: https://jungsoolee.com/

Education

03/2019 – 02/2024
Ulsan, South Korea

Department of Materials Science and Engineering
Ulsan National Institute of Science and Technology (UNIST)
M.S. & Ph.D. (Joint degree)
Dissertation Title: Geometric optimization and 3D printing of thermoelectric materials for enhancing power generating performance
(Recipient of Scholarships from 2019~2024)

03/2013 – 02/2019
Ulsan, South Korea

Department of Materials Science and Engineering
Ulsan National Institute of Science and Technology (UNIST)
B.S.
(Recipient of Scholarships from 2013~2019)

Research Experience

10/2025 – present
Ulsan, South Korea

Post-doctoral Research
Ulsan National Institute of Science and Technology (UNIST)
Advisor: Prof. Hayoung Chung

- Platform for Real-world Innovation in Smart Manufacturing and AI

03/2024 – 10/2025
Pohang, South Korea

Post-doctoral Research
Pohang University of Science and Technology (POSTECH)
Advisor: Prof. Jae Sung Son

- Topology optimization of thermoelectric materials (submitted)
- Geometric optimization of thermoelectric materials (published in ***Nature energy***).
- Geometric designs for thermoelectric materials under passive cooling condition. (published in ***Advanced Science***)

03/2019 – 02/2024
Ulsan, South Korea

Graduate Research Assistant
Ulsan National Institute of Science and Technology (UNIST)
Advisor: Prof. Jae Sung Son

- Development of 3D printable thermoelectric ink based on $Pb_{1-x}Na_xTe$ and $Pb_{1-x}Sb_xTe$ materials (published in ***Advanced Energy Materials***).

12/2018 – 02/2019 **Undergraduate Research Assistant**
Ulsan, South Korea **Ulsan National Institute of Science and Technology (UNIST)**
Advisor: Prof. Jae Sung Son

- Development of colloidal suprastructures by charged all-inorganic nanoparticles.

Publications

First author

[4] **Jungsoo Lee**†, Seong Eun Yang†, Seungjun Choo†, Haiyang Li, Hyunjin Han, Keonkuk Kim, Yae Eun Park, Hayoung Chung*, and Jae Sung Son* "Topology optimization of thermoelectric generator for maximum power efficiency" *Submitted*

[3] Seungjun Choo†, **Jungsoo Lee**†, Bengisu Şişik, Sung-Jin Jung, Keonkuk Kim, Seong Eun Yang, Seungki Jo, Changhyeon Nam, Sangjoon Ahn, Ho Seong Lee, Han Gi Chae, Seong Keun Kim, Saniya LeBlanc*, and Jae Sung Son* "*Geometric design of Cu_2Se-based thermoelectric device for enhancing power generation*" *Nat. Energy*, **2024**, 9, 1105-1106.

[2] Keonkuk Kim†, Seungjun Choo†, **Jungsoo Lee**†, Hyejin Ju, Soo-ho Jung, Seungki Jo, So-Hyeon Lee, Seongheon Baek, Ju-Young Kim, Kyung Tae Kim, Han Gi Chae, Jae Sung Son* "*Heat-Dissipation Design and 3D Printing of Ternary Silver Chalcogenide-Based Thermoelectric Legs for Enhancing Power Generation Performance*" *Adv. Sci.* **2024**, 11, 2402934

[1] **Jungsoo Lee**, Seungjun Choo, Hyejin Ju, Jaehyung Hong, Seong Eun Yang, Fredrick Kim, Da Hwi Gu, Jeongin Jang, Gyeonghun Kim, Sangjoon Ahn, Ji Eun Lee, Sung Youb Kim*, Han Gi Chae*, and Jae Sung Son* "*Doping-Induced Viscoelasticity in PbTe Thermoelectric Inks for 3D Printing of Power-Generating Tubes*" *Adv. Energy Mater.* **2021**, 11, 2100190.

Co-author

[8] Seong Eun Yang†, Youngtaek Oh†, **Jungsoo Lee**, Seungheon Shin, So-Hyeon Lee, Keonkuk Kim, Changhyeon Nam, Sangjoon Ahn, Ju-young Kim*, Hayoung Chung*, and Jae Sung Son* "*Ductile $(Ag,Cu)_2(S,Se,Te)$-based auxetic metamaterials for sustainable thermoelectric power generation*" *Nano Energy* **2024**, 132, 110392.

[7] Hyunjin Han†, Seong Eun Yang†, **Jungsoo Lee**, Keonkuk Kim, Changhyeon Nam, Seungki Jo, Sangjoon Ahn, and Jae Sung Son* "*3D-printed functionally graded thermoelectric materials for enhanced power generation*" *Chem. Engineer. J.* **2024**, 497, 154547.

[6] Seungjun Choo†, Faizan Ejaz†, Hyejin Ju, Fredrick Kim, **Jungsoo Lee**, Seong Eun Yang, Gyeonghun Kim, Hangeul Kim, Seungki Jo, Seongheon Baek, Soyoung Cho, Keonkuk Kim, Ju-Young Kim, Sangjoon Ahn, Han Gi Chae*, Beomjin Kwon*, and Jae Sung Son* "*Cu2Se-based Thermoelectric Cellular Architectures for Efficient and Durable Power Generation*" *Nat. Commun.* **2021**, 12, 3550.

[5] Fredrick Kim†, Seong Eun Yang†, Hyejin Ju†, Seungjun Choo, **Jungsoo Lee**, Gyeonghun Kim, Soo-ho Jung, Suntae Kim, Chaenyung Cha, Kyung Tae Kim, Sangjoon Ahn, Han Gi Chae*, and Jae Sung Son* "*Direct ink writing of three-dimensional thermoelectric microarchitectures*" *Nat. Electronics* **2021**, 4, 579-587.

[4] Shi-Hyun Seok, Seungjun Choo, Jinsung Kwak, Hye-Jin Ju, Ju-Hyung Han, Woo-Seok Kang, Joonsik Lee, Se-Yang Kim, Do Hee Lee, **Jungsoo Lee**, Jaewon Wang, Seunguk Song, Wook Jo, Byung Mun Jung, Han Gi Chae*, Jae Sung Son*, and Soon-Yong Kwon* "*Synthesis of Solution-Processed 2D Carbide MXene Flakes Using Highly Purified Precursors for Ink Applications*" *Nanoscale Advances* **2021**, 3, 517-527.

[3] Seong Eun Yang, Fredrick Kim, Faizan Ejaz, Gi Seung Lee, Hyejin Ju, Seungjun Choo, **Jungsoo Lee**, Gyeonghun Kim, Soo-ho Jung, Sangjoon Ahn, Han Gi Chae*, Kyung Tae Kim*, Beomjin Kwon*, Jae Sung

Son* "*Composition-segmented BiSbTe thermoelectric generator fabricated by multimaterial 3D printing*" *Nano Energy* **2021**, 81, 105638.

[2] Du San Baek, Kyung Ah lee, Jaehyuk Park, Jae Hyung Kim, **Jungsoo Lee**, June Sung Lim, So Young Lee, Tae Joo Shin, Hu Young Jeong, Jae Sung Son, Seok Ju Kang*, Jin Young Kim*, and Sang Hoon Joo* "*Ordered Mesoporous Carbons with Graphitic Tubular Frameworks by Dual Templating for Efficient Electrocatalysis and Energy Storage*" *Angew. Chem. Int. Ed*. **2020**, 60, 1441-1449.

[1] Da Hwi Gu, **Jungsoo Lee**, Hyeong Woo Ban, Gibok Lee, Minju Song, Wooyong Choi, Seongheon Baek, Hyewon Jeong, Song Yeul Lee, Yong Il Park*, and Jae Sung Son* "*Colloidal Suprastructures Self-Organized from Oppositely Charged All-Inorganic Nanoparticles*" *Chem. Mater*. **2020**, 32, 8662-8671.

Patents

[1] Lee, J. and Son, J.S. "*Ink FOR THERMOELECTRIC MATERIAL AND THERMOELECTRIC MATERIAL MANUFACTURED USING THE SAME*" KR patent 10-2022-0114219 (2023)

Research Presentations

April 2025 **Jungsoo Lee**, Seungjun Choo, Jae Sung Son, "*Geometric optimization of Cu2Se-based thermoelectric materials for enhanced power generation"* (MRS 2025 spring), **[Poster presentation]**

April 2023 **Jungsoo Lee**, Sung Youb Kim, Han Gi Chae, Jae Sung Son, "*Doped-PbTe Thermoelectric Inks with Viscoelasticity for 3D Printing of Systemically Optimized Power-Generating Tube"* (MRS 2023 spring), **[Oral presentation]**

Nov 2021 **Jungsoo Lee**, Seungjun Choo, Hyejin Ju, Jaehyung Hong Seong Eun Yang, Fredrick Kim, Da Hwi Gu, Jeongin Jang, Gyeonghun Kim, Sangjoon Ahn, Ji Eun Lee, Sung Youb Kim, Han Gi Chae, Jae Sung Son, "*Doping-Induced Viscoelasticity in PbTe Thermoelectric Inks for 3D Printing of Power-Generating Tubes"* (ICAE 2021), **[Oral presentation]**

Jul 2021 **Jungsoo Lee**, and Jae Sung Son, "*Doping-Induced Viscoelasticity in PbTe Thermoelectric Inks for 3D Printing of Power-Generating Tubes*" Virtual Conference on Thermoelectrics (VCT 2021), Online **[Oral presentation]**

Awards

[2] 30th Samsung Humantech Paper Award (2024)
Gold Award

[1] Graduation with honors: MAGNA CUM LAUDE, UNIST, Korea (2019)

Research Skills

Rheological Design	Fabrication of Inorganic Ion Solution with high concentration Solvent exchange and ligand stripping of nanoparticles for improving concentration and rheological properties Fabrication of high concentrated suspension with 2D materials for thin film painting Fabrication of high concentrated suspension with micro-sized particles for 3D printing, including Direct Ink Writing (DIW) and Digital Light Processing (DLP)
Material Synthesis	Alkahest Synthesis for Inorganic ions Solvothermal Synthesis for Nanomaterials Mechanical alloying for synthesis of bulk materials
Analysis	Microstructure: OM, SEM, TEM Optical Characteristic: UV-vis Absorption Material Analysis: XRD Rheological Properties: Rheometer Electrical Properties: Van der Pauw, Hall Measurement Thermoelectric Properties: Seebeck Coefficient Measurement Thermal analysis: LFA
Computational skills	Finite Element Analysis (COMSOL Multiphysics; AC/DC, Fluid Flow, Heat Transfer, Structural Mechanics, Mathematics, Thermoelectrics, LiveLink for MATLAB) Programming (Python, MATLAB) 3D Modeling (Fusion 360, 3Ds Max) Software tools: 3D print design (Ultimaker Cura), Plotting (Origin), Video producing (Premiere Pro), citation managing (Endnote) Optimization & Machine Learning (Topology optimization; Density-base, level-set, Bayesian optimization)
Application	3D Printing: DIW, DLP and Selective Laser Melting (SLM) Fabrication of thermoelectric device

References

Professor Jae Sung Son

Professor in the Department of Chemical Engineering
Pohang University of Science and Technology (POSTECH)
sonjs@postech.ac.kr

Professor Han Gi Chae

Professor in the Department of Materials Science and Engineering
Ulsan National Institute of Science and Technology (UNIST)
hgchae@unist.ac.kr

Professor Hayoung Chung

Associate Professor in the Department of Mechanical Engineering
Ulsan National Institute of Science and Technology (UNIST)
hychung@unist.ac.kr