An, Jaehun *Ph.D.*

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Education

Korea Advanced Institute of Science and Technology (KAIST) — Daejeon, Korea
Ph.D. in Materials Science and Engineering — Mar. 2022 – Aug. 2025
Advisor: Prof. Keon Jae Lee
Dissertation: *"Human-centric Flexible Acoustic Sensor and Cardiac Energy Harvester based on Highly-sensitive Piezoelectric Membrane"*

Korea Advanced Institute of Science and Technology (KAIST) — Daejeon, Korea
M.S. in Materials Science and Engineering — Mar. 2020 – Feb. 2022
Advisor: Prof. Keon Jae Lee
Thesis: *"Wearable Lead-free Piezoelectric Blood Pressure Sensor based on Li-doped KNN for Non-invasive Blood Pressure Monitoring"*

Korea University — Seoul, Korea
B.S. in Materials Science and Engineering — Mar. 2014 – Feb. 2020

Sejong Science High School — Seoul, Korea
Mar. 2012 – Feb. 2014

Experiences

Korea Advanced Institute of Science and Technology (KAIST) — Daejeon, Korea
Postdoctoral Research Fellow, KAIST InnoCORE PRISM-AI Center — Sep. 2025 – Present
(Platform for Real-world Innovation in Smart Manufacturing and AI)

Military service, KATUSA (Korean Augmentation to the US Army) — Camp Jackson, Korea
Sergeant, Eighth Army Wightman NCO Academy, KATUSA Training Academy — Feb. 2016 – Nov. 2017

Research Interests

Advanced Acoustic Sensors and AI-Driven Speech Processing

- Design and fabrication of flexible piezoelectric acoustic sensors (*f-PAS*), utilizing laser-assisted 3D micro-structuring and photolithography patterning for broad frequency coverage and high Signal-to-Noise Ratio (SNR)
- Implementation and optimization of AI-based speech processing algorithms (Speech Recognition & Separation)
- Integration of sensor-AI modules for real-time, on-device voice processing.

Wearable and Implantable Bio-Integrated Electronics

- Development of flexible and wearable piezoelectric sensors designed for continuous, non-invasive blood pressure monitoring (CNBP) via pulse wave analysis.
- Design and fabrication of human-centric 3D optoelectronics featuring flexible microLEDs, tailored for precise phototherapeutic and biomedical implant applications.

Damage-free Thin-Film Transfer Methodologies for Flexible Electronics

- Inorganic laser lift-off (ILLO) process for reliable transfer of high quality ceramic thin films
- Mechanical exfoliation techniques based on nickel stressor layer for large-area, damage-free transfer
- Synthesis and characterization of high-performance piezoelectric/ferroelectric thin films (PZT, KNN, AlN, etc.)

Journal Publications

[†]: Equal Contribution

Publication as Main Author

1) S. Min†, **J. An†**, J. H. Lee†, J. H. Kim, D. J. Joe, S. H. Eom, C. D. Yoo, H. Ahn, J. Hwang, S. Xu, J. A. Rogers, K. J. Lee, "Wearable blood pressure sensors for cardiovascular monitoring and machine learning algorithms for blood pressure estimation", ***Nature Reviews Cardiology***, 1, 2025. [IF: 49.6]
2) K. Y. Nam†, M. S. Kim†, **J. An†**, S. Min, J. H. Lee, J. S. Park, C. Huh, S. H. Yun, K. J. Lee, "Human-Centric, Three Dimensional Micro Light-Emitting Diodes for Cosmetic and Medical Phototherapy", ***Advanced Science***, 12, 2416716, 2025. [IF: 15.1]
3) M. S. Kim†, **J. An†**, J. H. Lee†, S. H. Lee, S. Min, Y. B. Kim, M. Song, S. H. Park, K. Y. Nam, H. J. Park, K. S. Kim, S. H. Oh, D. Hahn, J. Moon, J. W. Park, J. S. Park, T. Kim, B. J. Kim, K. J. Lee, "Clinical Validation of Face-Fit Surface-Lighting Micro Light-Emitting Diode Mask for Skin Anti-Aging Treatment", ***Advanced Materials***, 36, 2411651, 2024. [IF: 29.4]
4) Y. H. Jung†, **J. An†**, D. Y. Hyeon, H. S. Wang, I. Kim, C. K. Jeong, K. Park, P. S. Lee, K. J. Lee, "Theoretical basis of biomimetic flexible piezoelectric acoustic sensors for future customized auditory systems", ***Advanced Functional Materials***, 34, 2309316. 2024. [IF: 19.0]
5) **J. An†**, H. Park†, Y. H. Jung†, S. Min, D. H. Kim, D. J. Joe, S. Lee, D. Y. Hyeon, Y. Je, H. Seo, U. Jeong, S. Hong, G. Hwang, B. Joung, K. J. Lee, "In vivo flexible energy harvesting on porcine heart via highly-piezoelectric PIN–PMN–PT single crystal", ***Nano Energy***, 121,109227, 2024. [IF: 17.6]

Publication as Co-Author

6) D. Y. Hyeon, G. -J. Lee, H. J. Park, D. W. Jeon, H. U. Lee, S. B. Cho, **J. An**, A. Nagamalleswara, Y. H. Jung, C. Baek, K. J. Lee, M. -K. Lee, K. -I. Park, "ɣ-ray induced microstructure modulation for enhanced output performance of piezoelectric composites, (Accepted), (***Chemical Engineering Journal***) [IF: 13.3]
7) J. H. Lee, M. S. Kim, S. H. Lee, S. H. Park, K. Y. Nam, **J. An**, M. Song, K. S. Kim, S. H. Oh, T. Kim, K. J. Lee, "Flexible, Surface-lighting MicroLED Skin Patch for Multiple Human Skincare", ***Biomaterials***, 123139, 2025. [IF: 12.8]
8) S. Min, D. Kim, D.J. Joe, B. Kim, Y. Jung, J. Lee, B. Lee, I. Doh, **J. An,** Y. Youn, B. Joung, C. Yoo, H. Ahn, K. Lee "Clinical Validation of a Wearable Piezoelectric Blood-Pressure Sensor for Continuous Health Monitoring", ***Advanced Materials***, 35, 2301627, 2023. [IF 27.4]
9) D. Kim, B. Lee, S. Min, D.J. Jo, **J. An**, B. Kim, Y. Park, S. Kang, G. Hwang, K. J. Lee, "Pulsed direct current magnetic energy harvesting by robotic spot-welding in smart automotive factory" ***Nano Energy***, 104, 107933, 2022. [IF 16.8]

Under review or Revision

10) Y. J. Jeong, K. H. Kim, Y. B. Kim, H. Shin, J. W. Oh, S. H. Sung, **J. An**, K. J. Lee, "Laser-Guided Ion Dynamics in a Dual-Mode Memristor for Bioinspired Neuronal and Synaptic Integration", (***Advanced Materials***) [IF 27.4]

In preparation

11) **J. An†**, S. H. Eon†, Y. J. Jung†, D. Y. Hyeon, D. Kim, M. Chung, J. H. Han, S. Park, T. Zhang, D. J. Joe, G. -T. Hwang, S.-H. Choi, C. D. Yoo, K. J. Lee "Speech Recognition via Human Cochlear-mimicked Gradually-thick PMN-PNN-PZT Acoustic Sensors", to be submitted
12) **J. An†**, D. Y. Hyeon†, Y. J. Jung†, S. Park, M. Song, W. Choi, S. H. Eom, G. -T. Hwang, T. -S. Kim, S.-H. Choi, C. D. Yoo, K. J. Lee, "Speech Separation Using Tectorial Membrane-inspired Perforated Flexible Acoustic Sensor", to be submitted

Patents

1) K. J. Lee, S. M. Kim, J. K. Park, D. Y. Park, D. H. Kim, S. Min, **J. An**, Korean Domestic Patent, "Pulse sensing module, blood pressure calculation module, blood pressure measuring device and method for manufacturing pulse sensing module", (Registration No. 10-2182598)
2) K. J. Lee, S. M. Kim, J. K. Park, D. Y. Park, D. H. Kim, S. Min, **J. An**, Korean Domestic Patent, "Pulse sensing module, blood pressure calculation module, blood pressure measuring device and method for manufacturing pulse sensing module", (Registration No. 10-2182599)
3) K. J. Lee, S. M. Kim, J. K. Park, D. Y. Park, D. H. Kim, S. Min, **J. An**, Korean Domestic Patent, "Pulse sensing module, blood pressure calculation module, blood pressure measuring device and method for manufacturing pulse sensing module", (Registration No. 10-2182600)
4) K. J. Lee, D. H. Kim, S. Min, **J. An**, I.S. Kang, Korean Domestic Patent, "Pulse sensing module and system for calculating blood pressure using same", (Registration No. 10-2495522)
5) K. J. Lee, S. M. Kim, J. K. Park, D. Y. Park, D. H. Kim, S. Min**, J. An**, USA Patent, "Pulse sensing module, blood pressure calculation module, blood pressure measuring device and method for manufacturing pulse sensing module ", (Application N**o**. 16202965)

Technology Transfer

1~4 to RP, Inc. (50 million of KRW)

Honors and Awards

- 2023 Top 100 National Research and Development Achievements

(Development of Biometric Authentication Technology Based on a Voice Sensor Mimicking the Human Cochlea)

Presentations

- *2025 Materials Research Society (MRS) Fall Meeting & Exhibit*, Boston, MA, USA, "Biomimetic Self-Powered Acoustic Sensor for Speech Processing in Noisy Environments", **Oral Presentation**
- *2025 Asia Pacific Metrology Programme (APMP),* Incheon, Korea, "Flexible Electronics for Human-Centric Interaction", **Oral Presentation**
- *2024 Global Conference on Innovation Materials (GCIM),* Jeju, Korea, "Highly-Sensitive, Biomimetic Flexible Piezoelectric PNZT Acoustic Sensors for Deep Learning-based Speech Processing under Noise Condition", **Oral presentation**

- *2023 Korea-China International Symposium on Flexible Electronic Materials and Devices*, Harbin, China, "Validation of Wearable Piezoelectric Blood Pressure Sensor for Continuous Health Monitoring", **Oral Presentation**
- *2022 Materials Research Society (MRS) Spring Meeting & Exhibit*, Honolulu, HI, USA, "In Vivo Self-Powered Wireless Transmission Using Biocompatible Flexible Energy Harvester", **Oral presentation**
- *2021 Summer Annual Conference of The Institute of Electronic and Information Engineers (IEIE),* Jeju, Korea, "A Solid-State Crystal Grown PMN–PZT Energy Harvester with Reconfigurable Rectified Circuit System", **Oral presentation**
- *2020 The Materials Research Society of Korea (MRS K) Spring & Fall Session*, Jeju, Korea, "A Reconfigurable Rectified Flexible Energy Harvester via Solid-State Single Crystal Grown PMN–PZT", **Oral presentation**

Experienced Skills

- **Device Fabrication**: Sputter, PECVD, RTA, Mask/Mask-less Aligner, Spin-coater, Blade cutter, etc.
- **Laser Equipment**: Excimer Laser, Laser Cutting System (Protolaser U4), etc.
- **Materials Characterization**: SEM, XRD, XPS, AFM, Ferroelectric measurement system, Surface profiler, UV-Vis spectroscopy, etc.
- **Electrical Characterization**: NI sound/vibration module, Electrometer (Keithley 6514), Parameter Analyzer (Keithley 4200-SCS), etc.
- **Software**: COMSOL Multiphysics, TCAD, MATLAB, AutoCAD, Fortran, Origin, etc.

References

- **Prof. Keon Jae Lee** (Doctoral course advisor)
  KAIST endowed Chair Professor, Department of Materials Science and Engineering, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Republic of Korea
  Director, Global Bio-integrated Materials Center (ERC)
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- **Prof. Steve Park** (Doctoral course co-advisor)
  Associate Professor, Department of Materials Science and Engineering, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Republic of Korea
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- **Prof. Taek-Soo Kim** (Co-worker)
  Professor, Department of Mechanical Engineering, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Republic of Korea
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