JINYOUNG KO

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EDUCATION

Hanyang University Seoul, South Korea
M.S. in Architectural Engineering - Architectural Environment System *Sept. 2019 - Aug. 2021*

- Thesis: Power generation performance of novel photovoltaic system integrated with thermoelectric generator and phase change material for building application *Best Graduate Thesis Award*
- *Advisor: Professor Jae-Weon Jeong; GPA: 4.40/4.5*

Hanyang University Seoul, South Korea
B.S. in Architectural Engineering *Mar. 2014 - Feb. 2017*

- ***Summa cum laude,*** *Class rank: 1/44, GPA: 4.20/4.5* *Early Graduation in 6 semesters* & *Best Thesis Award*

ACADEMIC EXPERIENCE

Hanyang University Seoul, South Korea

- *Researcher,* at Building Mechanical and Environmental Systems (BMES) Laboratory *Oct. 2021 - Present*
- *Teaching Assistant,* in Building Energy, ARE4031 & Introduction to Building Equipment, ARE2007 *Mar. 2020 - Aug. 2021*
- *Research Assistant,* at Building Mechanical and Environmental Systems (BMES) Laboratory *Sept. 2019 - Aug. 2021*
- *Undergraduate Research Assistant,* at Architectural Acoustics Laboratory (AAL) *Apr. 2016 - Jun. 2016*

PUBLICATIONS

Journal Papers

1. **J. Ko**, S.-Y. Cheon, Y.-K. Kang, J.-W. Jeong. "Melting temperature design of phase change material in thermoelectric generator-assisted energy harvesting block." *Under Review at Energy Conversion and Management.*
2. **J. Ko**, J.-W. Jeong (2021). "Annual performance evaluation of thermoelectric generator-assisted building-integrated photovoltaic system with phase change material." *Renewable and Sustainable Energy Reviews*, Vol. 145, 111085. https://doi.org/10.1016/j.rser.2021.111085
3. **J. Ko**, J. Park, J.-W. Jeong (2021). "Energy saving potential of a model-predicted frost prevention method for energy recovery ventilators." *Applied Thermal Engineering*, Vol. 185, 116450. https://doi.org/10.1016/j.applthermaleng.2020.116450
4. J.-H. Lee, **J.-Y. Ko**, J.-W. Jeong (2021). "Design of heat pump-driven liquid desiccant air conditioning systems for residential building." *Applied Thermal Engineering*, Vol. 183, 116207. https://doi.org/10.1016/j.applthermaleng.2020.116207

Conference Proceedings in English

1. S.-J. Lee, **J. Ko**, M. Kim, J.-W. Jeong (2021). "Performance enhancement of the liquid desiccant dehumidifier with an ultrasonic atomization." *ISHVAC 2021.*
2. J.-H. Lee, K.-B. Lee, **J. Ko**, J.-W. Jeong (2021). "Bioaerosol inactivation effect of a heat pump-driven liquid desiccant air-conditioning system." *ISHVAC 2021.*
3. **J. Ko**, S.-Y. Cheon, J.-W. Jeong (2021). "Phase-change material design for thermoelectric generator assisted building integrated photovoltaic." *2021 ASHRAE annual conference.*
4. S.-Y. Cheon, H.-J. Cho, **J. Ko**, J.-W. Jeong (2021). "Empirical analysis of dehumidification performance of a hollow fiber membrane dehumidifier." *Heat Pump Conference 2020.*
5. S.-Y. Cheon, H. Lim, H.-W. Dong, **J. Ko**, J.-W. Jeong (2021). "Applicability of vacuum-based membrane dehumidifier in dedicated outdoor air system." *ROOMVENT 2020.*
6. **J. Ko**, H. Lim, J.-H. Lee, J.-W. Jeong (2020). "Development of frost threshold temperature model in energy recovery ventilator regarding indoor and outdoor air conditions." *INDOOR AIR 2020.*

Conference Proceedings in Korean

1. Y.-K. Kang, M. Kim, **J. Ko**, J.-W. Joung, J.-W. Jeong (2021). "Experimental performance of a phase change material and thermoelectric generator-assisted building-integrated photovoltaic system."Winter Conference of the *Society of Air-Conditioning and Refrigerating Engineers of Korea*.
2. Y.-K. Kang, M. Kim, **J. Ko**, J.-W. Jeong (2021). "Design of a phase change material and thermoelectric generator-assisted building-integrated photovoltaic system."Summer Conference of the *Society of Air-Conditioning and Refrigerating Engineers of Korea*.
3. **J. Ko**, J.-W. Jeong (2021). "Applicability of a thermoelectric heat-pump for pre-heating in winter operation of an energy exchange ventilator." Spring Conference of the *Korea Institute of Ecological Architecture and Environment*.
4. **J. Ko**, S.-Y. Cheon, Y.-K. Kang, J.-W. Jeong (2020). "Generation performance of thermoelectric generator and phase change material assisted building integrated photovoltaic module." Fall Conference of *Korean Institute of Architectural Sustainable Environment and Building Systems*.
5. H.-J. Cho, S.-Y. Cheon, J.-H. Lee, **J. Ko**, L.-H. Lin, J.-W. Jeong (2020). "Experimental study for dehumidification operation of hollow fiber membrane dehumidifier in summer." Winter Conference of the *Society of Air-Conditioning and Refrigerating Engineers of Korea*.
6. Y.-K. Kang, B.-J. Kim, Y.-J. Hwang, **J. Ko**, J.-W. Jeong (2020). "Experiment analysis and system design of PCM assisted thermoelectric radiant cooling panel." Fall Conference of the *Korea Institute of Ecological Architecture and Environment*.
7. **J. Ko**, S.-Y. Cheon, J.-H. Lee, J.-W. Jeong (2020). "Energy savings of a liquid desiccant-assisted dedicated outdoor air system." Summer Conference of the *Society of Air-Conditioning and Refrigerating Engineers of Korea*.
8. J.-H. Lee, H.-Y. Dong, **J. Ko**, S.-J. Lee, J.-W. Jeong (2020). "Energy performance of a heat pump-driven liquid desiccant System in an Apartment Building." Summer Conference of the *Society of Air-Conditioning and Refrigerating Engineers of Korea*.
9. **J. Ko**, J.-W. Jeong (2019). "Development of pre-heat temperature prediction model for condensation prevention regarding effectiveness of energy recovery ventilator." Fall Conference of the *Korea Institute of Ecological Architecture and Environment*.
10. Y.-K. Kang, S. Liu, **J. Ko**, J.-W. Jeong (2019). "Experimental performance analysis of PCM radiant system based on thermoelectric module." Fall Conference of *Korean Institute of Architectural Sustainable Environment and Building Systems*.

RESEARCH PROJECTS

Development of Thermoelectric Radiant Cooling/Heating Panels and Envelop Power Generator for High Performance Zero Energy Buildings (KAIA, No.21CTAP-C163749-01) Seoul, South Korea
Researcher; Principal Investigator: Professor Jae-Weon Jeong *Apr. 2021 - Present*

· Developed energy harvesting blocks to produce electricity from waste heat for building envelopes.
- Modeled 3D-printed energy harvesting blocks based on Fusion 360.
- Accessed generation performance through experiments based on sol-air temperature profiles.
- Submitted journal paper on *Energy Conversion and Management*.

Design of Smart Hybrid Envelope Systems for Zero Energy Buildings through Holistic Performance Test and Evaluation Methods and Fields Verifications (KETEP, No.20202020800030) Seoul, South Korea
Research Assistant; Advisor: Professor Jae-Weon Jeong *Mar. 2020 - Present*

· Established novel concept of building-integrated photovoltaic - thermoelectric generator - phase change material (BIPV-TEG-PCM) system to generate additional electricity from longwave radiation (thermal energy) and shortwave radiation.
- Designed energy simulation with numerical analysis on transient heat transfer through MATLAB.
- Investigated power generation performance and seasonal characteristics of the proposed system.
- Published journal paper on *Renewable and Sustainable Energy Reviews*.

Development of Compact Air Conditioning System based on Energy Efficient Liquid Dehumidification to Improve Air Quality in Apartment Houses (MSS, No.S2782284) Seoul, South Korea
Research Assistant; Advisor: Professor Jae-Weon Jeong *Oct. 2019 - Aug. 2021*

· Performed building energy simulations on heat pump-driven liquid desiccant (HPLD) HVAC systems.
- Assisted in thermodynamic analysis of HPLD air-conditioning systems to evaluate energy consumption.
- Analyzed energy saving potential of HPLD-assisted dedicated outdoor air systems via building energy simulations.
- Published journal paper on *Applied Thermal Engineering*.

Miscellaneous Research Projects in BMES Laboratory Seoul, South Korea
Research Assistant; Advisor: Professor Jae-Weon Jeong *Sept. 2019 - Aug. 2021*

· Presented energy saving approach for outdoor air preheating in energy recovery ventilators.
  - Developed variable target temperature model for preheating and frost prevention via psychrometric equations.
  - Validated the proposed model based on design and analysis of computer experiments (DACE).
  - Published journal paper on *Applied Thermal Engineering*.

· Invented innovative HVAC systems based on thermoelectric cooling and heating technologies.
  - Created concept of thermoelectric heat pump-assisted outdoor air preheater in *Patent Application*.
  - Invented CCHP-assisted dedicated outdoor air system in *Patent Application*.
  - Reported invention of cooling tower-integrated thermoelectric cooling system in *Patent Application*.

Miscellaneous Research Projects in AAL Seoul, South Korea
Undergraduate Research Assistant; Advisor: Professor Jin Yong Jeon *Apr. 2016 - Jun. 2016*

· Implemented acoustic visualization of floor impact noise in apartments.
  - Conducted on-site experiments and measurements on floor impact noise based on receiving positions.
  - Preprocessed measured signal data for acoustic visualization via Adobe Audition.

PATENTS

1. J.-W. Jeong, **J. Ko** (2021). "Preheater for ventilator: thermoelectric heat pump-assisted outdoor air preheater." Application No.10-2021-0127272, South Korea.
2. J.-W. Jeong, H. Lim, **J. Ko** (2021). "Dedicated outdoor air system: liquid desiccant-assisted dedicated outdoor air system integrated with thermoelectric modules and CCHP." Application No.10-2021-0081446, South Korea.
3. J.-W. Jeong, S.-Y. Cheon, **J. Ko** (2021). "Apparatus for controlling cooling water temperature of cooling tower: design of cooling tower-integrated thermoelectric cooling system." Application No.10-2021-0041683, South Korea.

TEACHING EXPERIENCE

Building Energy, ARE4031 & Introduction to Building Equipment, ARE2007 Seoul, South Korea
Teaching Assistant *Mar. 2020 - Jun. 2021*

· Supported professors in implementing curriculum for classes with 28-73 undergraduates.
· Provided one-on-one support to undergraduates for understanding class materials and examples.

Private Tutoring Seoul, South Korea
Mathematics Tutor *Jan. 2017 - Aug. 2017*

· Educated high school freshmen about advanced calculus, conducting a weekly tutoring schedule.
· Designed math curriculum for self-directed learning which helps students continue studying after tutoring.

Jeonnong Cram School Seoul, South Korea
Mathematics Teacher *Oct. 2016 - Dec. 2016*

· Taught middle school students within a small group (3-5 students) about basic algebra and geometry.
· Prepared class structures from fundamentals to advanced contents according to level of students.

VOLUNTEER EXPERIENCE

Vision Training Center Seoul, South Korea
Social Service Agent *Oct. 2017 - Aug. 2019*

· Served at a homeless shelter as an alternative to compulsory military service of South Korea.

Seongdong Public Health Center, Geumho Branch Seoul, South Korea
Volunteer *Mar. 2014 - Dec. 2015*

· Designed and conducted weekly music therapy programs the elderly and people with learning difficulties.

RAON Community Child Care Center Seoul, South Korea
Volunteer *Mar. 2014 - Jun. 2014*

· Provided one-to-one mentoring for children using elementary school teaching materials.
· Assisted in preparing field trips and chaperoning children home.

LEADERSHIP EXPERIENCE

HX-Corps program — Seoul, South Korea
Team leader — *Apr. 2020 - Nov. 2020*

· Instructed two undergraduate students to develop numerical modeling of PVT systems with heat-driven generators.
· Designed experimental setup to evaluate generation performance of the proposed system.

SOKNA, School Band at Hanyang University — Seoul, South Korea
President — *Jan. 2015 - Dec. 2015*

· Managed band club of more than 30 people and performed four times a year.
· Led weekly meetings and hosted forums for band members to discuss plans for performance preparation.

AWARDS AND HONORS

Academic awards

Best Graduate Thesis Award, *Hanyang University*	Aug. 2021
Graduation Excellence Award - Summa cum laude, *Hanyang University*	Feb. 2017
Excellence Award in the 2nd semester of 2016, *Hanyang University*	Dec. 2016
Best Undergraduate Thesis Award, *Hanyang University*	Nov. 2016
Excellence Award in the 1st semester of 2016, *Hanyang University*	Jun. 2016
Academic Achievement Excellence Award, *Hanyang University*	Apr. 2016
Excellence Award in the 2nd semester of 2015, *Hanyang University*	Dec. 2015
Excellence Award in the 1st semester of 2015, *Hanyang University*	Jun. 2015
Academic Achievement Excellence Award, *Hanyang University*	Apr. 2015
Excellence Award in the 2nd semester of 2014, *Hanyang University*	Dec. 2014
Excellence Award in the 1st semester of 2014, *Hanyang University*	Jun. 2014

Conference awards

Best Presentation Award, *Korea Institute of Ecological Architecture and Environment*	May 2021
Best Presentation Award, *Korean Institute of Architectural Sustainable Environment and Building Systems*	Nov. 2020
Outstanding Paper Award, *The Society of Air-Conditioning and Refrigerating Engineers of Korea*	Jun. 2020
Best Presentation Award, *Korea Institute of Ecological Architecture and Environment*	Nov. 2019

Miscellaneous awards

Excellence Prize (with $400 reward), *Student Startup Idea Contest for Smart Life*	Dec. 2020
Excellence Award (with $850 reward), *HX-Corps Program, Hanyang University*	Nov. 2020
Student Achievement Award of 77th Foundation Day, *Hanyang University*	May 2016
Grand Prize, *Digital Virtual Village Modeling Competition*	Nov. 2015

Scholarships

Merit-based National Scholarship for Science and Engineering, *Korean Government*	Mar. 2016 - Feb. 2017
Merit-based Scholarship, *Hanyang University*	Sept. 2014 - Feb. 2016

SKILLS

Programming Languages	Python, Matlab, HTML
Building / CFD Simulation Tools	TRNSYS, EnergyPlus/Euclid, ANSYS Fluent
Engineering Software	Design-Expert, Engineering Equation Solver (EES)
Architecture / Product Design Tools	Autodesk Fusion 360, Autodesk AutoCAD, Ultimaker Cura, SketchUp, Rhinoceros/Grasshopper
Documentation Software	LaTeX, Mendeley, Microsoft Office