

# SOONWOOK KIM

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## EDUCATION

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### University of Illinois at Urbana-Champaign

Ph.D. in Mechanical Science & Engineering

August 2017-December 2024

Overall GPA: 3.92/4.0

Graduate Advisor: Prof. William P. King & Prof. Nenad Miljkovic

August 2020-December 2024

Graduate Advisor: Prof. Gaurav Bahl

August 2017-July 2020

### Korea University

B.S. in Mechanical Engineering

March 2010- February 2016

Overall GPA: 4.36/4.5

Undergraduate Advisor: Prof. Jae Bok Song

## EMPLOYMENT

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### Kyung Hee University

Assistant Professor

March 2026-Present

Yongin-si, Gyeonggi-do, South Korea

### Texas A&M University

Postdoctoral Researcher

January 2025-February 2026

College Station, TX, USA

- Department of Material Science & Engineering, Supervisor: Prof. Patrick J. Shamberger
- Developed cost-effective, salt hydrate eutectic-graphite foam composite based high-energy-density PCMs for near-room-temperature applications as part of the DOE BENEFIT project, "Multi-functional HVAC Platform with Modular Thermal Storage"
- Developed testbed for barocaloric plastic crystal cooling system as part of ONR project, "Dynamic Rates of Pressure-tunable Thermal Energy Storage Materials and Components"
- Developed reduced-order model for PCM-based thermal impedance analysis.
- Collaborated with external institutions including Purdue University and Army Research Laboratory (ARL)

### University of Illinois at Urbana-Champaign

Graduate Research Assistant, Center for Power Optimization of Electro-Thermal Systems (POETS)

August 2020-December 2024

Champaign, IL, USA

- Co-advised by Prof. William P. King and Prof. Nenad Miljkovic.
- Worked on phase change material(PCM)-integrated electronics transient thermal management.
- Designed and fabricated PCM-integrated heat sink for gallium nitride (GaN) device cooling.
- Developed reduced-order model for expedited estimation of the PCM temperature behavior (MATLAB).
- Developed a Gaussian Process-based geometry optimization method for PCM-integrated heat sink using ROM.
- Designed and fabricated dynamic PCM (DynPCM) for GaN-based multichip thermal management and liquid cooling system and explored the impact of pressure-controlled close-contact melting on electronics cooling.
- Gained in-depth experience in thermal analysis in both experimental and computational aspects (COMSOL).
- Collaborated with external institutions including Army Research Laboratory (ARL) and Ben-Gurion University of the Negev.

### University of Illinois at Urbana-Champaign

Graduate Research Assistant

August 2017-July 2020

Champaign, IL, USA

- Worked with Prof. Bahl and developed design and fabrication process for on-chip optical non-reciprocal devices.
- Designed and fabricated integrated optical isolator. This work focused on designing integrated optical isolator using acousto-optic spatiotemporal modulation.
- Acquired skills regarding nano-scale structure design and gained in-depth cleanroom experience in Micro/nanofabrication.

### Korea Institute of Science and Technology (KIST)

Full-Time Research Intern

August 2016 - April 2017

Seoul, South Korea

- Analyzed drying dynamics of picoliter-scale protein solution droplet(Fourier-Transform Infrared Spectromicroscopy).
- Investigated ways to improve the efficiency of the adsorption cooling system (computational simulation).

## PUBLICATIONS

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Lucas Oelkers, **Soonwook Kim**, Rachel McAfee, Adam Wilson, Michael Fish, and Patrick Shamberger *Heat Transfer Coefficient Effect on Thermal Impedance of Phase Change Composites*, International Journal of Heat and Mass Transfer, in review

Samuel Tsai, Liuyang Cheng, Ali Albazroun, Qiong Wang, Jeongmin Kim, Arman Tekinalp, **Soonwook Kim**, Charlie Simcox, Ryne Downing, Vagish Sivaramkrishnan, Grace Carsello, Miles Bimrose, Wonsik Eom, William P. King, Mattia Gazzola, and Sameh Tawfick *Hierarchical Artificial Muscle with Nonlinear Elasticity for Antagonistic and Cyclic Robotics*, Science Advances, in review

Vivek S. Garimella, Wuchen Fu, Robert A. Stavins, **Soonwook Kim**, Tomer Shockner, Elad Koronio, Doron Sahray, Inon Salman, Venus Fu, Gennady Ziskind, William P. King, and Nenad Miljkovic *Analysis of dynamic phase change materials*, International Journal of Heat and Mass Transfer, in review

**Soonwook Kim**, Robert A. Stavins, Elad Shoham, Gennady Ziskind, Nenad Miljkovic, and William P. King *High power transient thermal management with dynamic phase change material and liquid cooling*, International Journal of Heat and Mass Transfer, 246, 126998 (2025) <https://doi.org/10.1016/j.ijheatmasstransfer.2025.126998>

Inon Salman, Tomer Shockner, Robert A. Stavins, Tomer Shockner, **Soonwook Kim**, Elad Koronio, Oren Gal, William P. King, Nenad Miljkovic, and Gennady Ziskind *A “bourglass” system for transient thermal management based on dynamic close-contact melting of a phase-change material*, International Journal of Heat and Mass Transfer, 239, 126542 (2025) <https://doi.org/10.1016/j.ijheatmasstransfer.2024.126542>

**Soonwook Kim**, Hyeongkeun Kim, William P. King, and Nenad Miljkovic *Optimal phase change material integration strategies for maximizing electronic device reliability*, Applied Thermal Engineering, 267, 125736 (2025) <https://doi.org/10.1016/j.applthermaleng.2025.125736>

**Soonwook Kim**, Robert A. Stavins, Vivek S. Garimella, Elad Koronio, Tomer Shockner, Gennady Ziskind, Nenad Miljkovic, and William P. King *Cooling High Power Electronics using Dynamic Phase Change Material*, International Journal of Heat and Mass Transfer, 237, 126433 (2025) <https://doi.org/10.1016/j.ijheatmasstransfer.2024.126433>

Robert A. Stavins, **Soonwook Kim**, Amari Meddling, Vivek S. Garimella, Elad Koronio, Tomer Shockner, Gennady Ziskind, Nenad Miljkovic, and William P. King *Dynamic phase change materials with extended surfaces*, Applied Physics Letters, 125(6) (2024) \*Editor’s pick, <https://doi.org/10.1063/5.0217531>

Vivek Garimella, Wuchen Fu, Robert Stavins, **Soonwook Kim**, Tomer Shockner, Elad Koronio, Gennady Ziskind, William P. King, and Nenad Miljkovic, *Fundamental limits of dynamic phase change materials*, Applied Physics Letters, 124(12) (2024) <https://doi.org/10.1063/5.0190273>

Rachel McAfee, Michael Fish, Adam Wilson, Harvey Tsang, Jonathan Boltersdorf, **Soonwook Kim**, William P. King, and Nenad Miljkovic, *Fabrication and thermal properties of a gallium and porous foam composite phase change material*, ACS Applied Engineering Materials, 1(11), 2847–2857 (2023) <https://doi.org/10.1021/acsanm.3c00366>

**Soonwook Kim**, Hyeongkeun Kim, William P. King, and Nenad Miljkovic *Gaussian Process Optimization of Phase Change Material Heat Sink Design*, Numerical Heat Transfer, Part B: Fundamentals, 85(12), 1767–1785 (2023) <https://doi.org/10.1080/10407790.2023.2273513>

**Soonwook Kim**, Tianyu Yang, Nenad Miljkovic, and William P. King, *Phase change material integrated cooling for transient thermal management of electronic devices*, International Journal of Heat and Mass Transfer, 213, 124263 (2023) <https://doi.org/10.1016/j.ijheatmasstransfer.2023.124263>

**Soonwook Kim**, Donggyu B. Sohn, Christopher W. Peterson, and Gaurav Bahl, *On-chip optical non-reciprocity through a synthetic Hall effect for photons*, APL Photonics, 6(1) (2021) \*Editor’s pick, <https://doi.org/10.1063/5.0034291>

## CONFERENCES

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**International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems (InterPACK)** October 2024  
Oral presentation San Jose, CA, USA

- Oral Presentation for “Dynamic Phase Change Material for High Power Electronics Cooling.”

**AI for Thermal Energy Science Workshop** April 2023  
Poster presentation Irvine, CA, USA

- Poster Presentation for “Design of phase change material heat sinks using a Gaussian Process optimizer.”

**International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems (InterPACK)** October 2022  
Oral presentation Garden Grove, CA, USA

- Oral Presentation for “Measurements and parametric study of phase change material integrated transient cooling.”

**Conference on Lasers and Electro-Optics (CLEO)***Oral presentation*

May 2020

*Virtual Conference*

- Oral Presentation for "Demonstration of a Synthetic Hall Effect for Photons"

**3rd Workshop on Optomechanics and Brillouin Scattering: Fundamentals, Applications and Technologies (WOMBAT)***Oral presentation*

March 2019

*Tel Aviv, Israel*

- Oral presentation for "Optomechanical Non-reciprocity in a Nanophotonic Resonator Chain."

**TECHNICAL SKILLS**

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**Experiment Skills**

Gallium nitride (GaN) junction temperature measurement,  
Phase change material (PCM) integrated transient thermal measurement  
Single-phase liquid flow loop design and development  
Differential Scanning Calorimetry (DSC)  
Thermogravimetric Analysis (TGA)  
Scanning Electron Microscopy (SEM)

**Simulation Tools**

COMSOL Multiphysics, ANSYS FLUENT, ANSYS ICEPAK

**CAD Tools**

KiCAD, Solidworks, Klayout

**Computer Programs**

MATLAB, LabVIEW, ORIGINLAB, MS Office, Adobe Illustrator

**Language**

Korean (native), English (strong fluency and literacy)

**Micro/Nano Fabrication Skills**

- Lithography: Photolithography (EVG Mask Aligner, Karl Suss MJB3), E-beam lithography (Raith EBL)
- Dry Etching: ICP Reactive Ion Etching (Oxford ICP RIE, PlasmaTherm SLR-770 ICP RIE), XeF<sub>2</sub> etching (Xactix XeF<sub>2</sub>)
- Metal deposition: Thermal evaporation, E-beam evaporation