

Jinsung Kim, Ph.D.

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PROFESSIONAL SUMMARY

Predictive Nanostructure Formation and Function in Electronic Materials for Sustainable Energy and Electronics.

Materials scientist and engineer conducting interdisciplinary research at the intersection of nanostructure control of organic/inorganic semiconductor materials, autonomous materials discovery, and device engineering for sustainable renewable energy and next-generation integrated photonic technologies.

EDUCATION

Massachusetts Institute of Technology (MIT)	Cambridge, MA, USA
<i>Postdoctoral Associate, Mechanical Engineering</i>	2024 – Present
University of California, Los Angeles (UCLA)	Los Angeles, CA, USA
<i>Ph.D., Materials Science and Engineering</i>	2024
Pohang University of Science and Technology (POSTECH)	Korea
<i>M.S., Materials Science and Engineering</i>	2018
Dankook University	Korea
<i>B.S., Polymer Science and Engineering, Summa Cum Laude</i>	2015

PROFESSIONAL EXPERIENCE

Postdoctoral Associate	Dec. 2024 – Present
<i>Massachusetts Institute of Technology</i>	Cambridge, MA, USA

Lead research on solution-based nanostructure control of 2D materials using nanoparticle-assisted methodology

- Devised vacuum-free, solution-processable, low-energy method to create few-nanometer pores in graphene
- Demonstrated pore diameter control from 1 nm to 100 nm via catalytic nanoparticle size, with automated imaging analysis
- Developed functional graphene templates for III-V semiconductor (GaAs, GaN) heteroepitaxial growth

Graduate Researcher	Sep. 2019 – Dec. 2024
<i>University of California, Los Angeles – Organic and Hybrid Electronic Materials & Device Lab</i>	Los Angeles, CA, USA

Identified photoactive network formation mechanism of donor and acceptor materials in organic photovoltaics (*Publication 2*)

- Controlled network formation via selective evaporation of solution with solid additives; characterized optoelectronic properties using PL, EQE, and surface properties with AFM, XPS, and XRD
- Visualized donor and acceptor molecular networks in bulk layer and surface via nanomechanical analysis

Led California Energy Commission-funded project (\$600,000) on transparent solar cells for agricultures ([Project link](#))

- Designed a large-area fabrication procedure including layer patterning and conducted experiment
- Achieved PCE 13.5% and transmittance 22% using ternary blended system

Investigated multi-exciton generation of organic semiconductors and its application in photovoltaics (*Publication 3*)

- Analyzed singlet exciton fission of polymer donor into triplet excitons with EQE, PL, and TA analysis
- Examined interface engineering to block the exciton diffusion from the photoactive layer to electrodes

Developed Braille device with a bistable polymer and stretchable and transparent electrodes (*Publication 8*)

- Developed an automated spray coating platform for CNT, and design and prototype the Braille display
- Developed highly conductive, transparent, and thermally stable AgNW/CNT electrodes under high strains
- Executed COMSOL simulation to characterize mechanical and electrical properties under various strains

Engineer Intern, Manufacturing Design/Simulation Team	June 2022 – Sep. 2022
<i>Apple</i>	Cupertino, CA, USA

- Conducted FEA-based optical property simulations of vacuum sputtering deposition processes
- Designed experiments and analyzed data for surface wear resistance and adhesion stability of materials on products

Research Scientist	Aug. 2018 – Aug. 2019
<i>Polymer Research Institute & Center for Advanced Soft Electronics</i>	Korea

Correlation effect between molecular structure and solid-state packing (*Publication 10,11*)

- Investigated the effect of polymer regiochemistry on backbone alignment and solid-state packing
- Designed a molecular orientation method leveraging nanogroove surface structures and capillary force effects
- Characterized polymer chain orientation using AFM, SEM, and TEM; analyzed crystalline structure with GIWAXS

Graduate Researcher

Mar. 2015 – Feb. 2018

Pohang University of Science and Technology – Polymer Surface and Organic Electronics Lab

Korea

Interface engineering using surface chemistry in organic field effect transistors (OFETs) (*Publication 11*)

- Researched low-voltage organic field effect transistors with surface modifications on soft polymer dielectrics
- Investigated the self-assembly mechanism of small molecules in different growth environments
- Developed a new surface chemistry tailoring method with photooxidation for flexible OFET applications

Research Collaborator, Foldable Smartphone Project

Feb. 2016 – Sep. 2016

POSTECH – Samsung Collaboration Research

Korea

- Researched high-conductivity and bending stability requirements for flexible electrode development
- Investigated interface and morphology transitions of electrodes under bending strains using AFM and SEM

PUBLICATIONS

- [1] **Kim, J.**, et al. Nanoporous graphene control via nanoparticle-assisted carbothermal oxidation. (In Preparation)
- [2] **Kim, J.**, Zhao, Y., et al. Photoactive network formation mechanism in organic photovoltaics. (Under revision in Nature Photonics)
- [3] Zheng, R., **Kim, J.**, et al. Orthogonally arranged pentacene polymers for singlet fission organic photovoltaics. (In Preparation)
- [4] Park, H., **Kim, J.**, Kim, M., et al. Human skin-inspired flexible pressure sensor with multi-modulus porous structure. Adv. Electron. Mater. 12, e00629 (2026).
- [5] Lee, D., **Kim, J.**, et al. Structure-Transport-Ion retention coupling for enhanced nonvolatile artificial synapses. Adv. Funct. Mater. 36, e21650 (2026).
- [6] Joung, J., **Kim, J.**, et al. Towards out-of-studio motion capture through wearable sensors. J. Ind. Eng. Chem. 8, 32 (2025).
- [7] Lee, S., **Kim, J.**, Kim, D., et al. Wearable volatile organic compound sensors for plant health monitoring. Adv. Sustain. Syst. 2300634 (2024).
- [8] **Kim, J.**, Xie, Z., Peng, Z., et al. Deformable Joule heating electrode based on hybrid layers of silver nanowires and carbon nanotubes and its application in a refreshable multi-cell Braille display. Adv. Funct. Mater. 2400023 (2024).
- [9] Bae, G. Y., **Kim, J.**, Kim, J., et al. MoTe₂ field effect transistors with low contact resistance through phase tuning by laser irradiation. Nanomaterials, 11, 2805 (2021).
- [10] Chung, S., Cho, Y., **Kim, J.**, et al. Unidirectional macroscopic alignment of chlorobenzo thiadiazole-based semiconducting copolymers with controlled regiochemistry. Adv. Electron. Mater. 7, 2100551 (2021).
- [11] **Kim, J.**, Kang, B., & Cho, K. Heat-assisted photoacidic oxidation method for tailoring the surface chemistry of polymer dielectrics for low-power organic soft electronics. Adv. Funct. Mater. 29, 1806030 (2019).

PATENTS

- [1] **Jinsung Kim**, Boseok Kang, and Kilwon Cho. Method of manufacturing surface-modified polymer film and fabricating organic electronic device comprising the same. Patent registered US 11,050,024 B2, June 29, 2021; Patent filed Europe EP18203481 and China 201811516078.3, 2019.
- [2] Qibing Pei, **Jinsung Kim**, and Hyeonji Hong. A bistable deformable tactile responsive material and device. Patent filed US 63,568,839, March 2024.

TEACHING EXPERIENCE

- TA, Science of Materials (MSE 104), Materials Science and Engineering Dept., UCLA Spring 2021, Winter 2024
- TA, Organic Chemistry (Chem 14C), Chemistry Dept., UCLA Spring 2023, Fall 2023
- TA, Solid Structure and Properties of Polymer (CHEB801), Chemical Engineering Dept., POSTECH Fall 2017
- TA, Advanced Thermodynamics (CHEB621), Chemical Engineering Dept., POSTECH Fall 2016

MENTORING EXPERIENCE

- MIT UROP: guiding three undergraduates in experiment design, presentation, and nanoporous graphene fabrication 2026
- MIT Women's Technology Program in Mechanical Engineering: mentored students in hydrogel device design for metal ion collection 2026
- UCLA UROP and graduate students: taught how to read and review research papers, fabricate solar cells, measure optical properties, and make figures for research papers 2022–2024
- Science High School Mentoring, online: mentored a project on dye-sensitized solar cell fabrication using spinach 2024

CONFERENCE PRESENTATIONS

- [1] Jinsung Kim, Kuangye Lu, Ne Myo Han, DoA Kwon, Jeehwan Kim, and Rohit Karnik. Nanostructure-engineered graphene via nanoparticle-assisted carbon oxidation for semiconductor applications. MRS 2026 Spring Meeting, Hawaii, US, 2026.
- [2] Jinsung Kim. Solution-processed electronics across scales: engineering interfaces, networks, and nanostructures. MRS 2026 Spring Meeting, Hawaii, US, 2026.
- [3] Jinsung Kim, Kuangye Lu, Ne Myo Han, DoA Kwon, Jeehwan Kim, and Rohit Karnik. Nanoporous graphene via nanoparticle-assisted carbon oxidation. MIT MERE 2026 (Mechanical Engineering Research Exhibition), Cambridge, 2026.
- [4] Jinsung Kim, Kuangye Lu, Ne Myo Han, DoA Kwon, Jeehwan Kim, and Rohit Karnik. Nanoporous graphene via nanoparticle-assisted carbon oxidation. MARC 2026 (Microsystems Annual Research Conference), New Hampshire, 2026.
- [5] Jinsung Kim and Yang Yang. Mechanism study of the photoactive morphology formation in bulk-heterojunction organic photovoltaics. MRS 2024 Fall Meeting, Boston, US, 2024.
- [6] Jinsung Kim, Yepin Zhao, and Yang Yang. Study on the photoactive network formation of donor and acceptors in organic photovoltaics. MRS 2024 Spring Meeting, Seattle, US, 2024.
- [7] Jinsung Kim and Yang Yang. Morphology transition mechanism in bulk-heterojunction of organic solar cells. UKC 2024 Meeting, San Francisco, US, 2024.
- [8] Jinsung Kim and Kilwon Cho. Surface modification of polymer gate dielectrics for low power organic soft electronics. Polymer Society of Korea 2018 Fall Meeting, Gyeongju, Korea, 2018.
- [9] Jinsung Kim, Boseok Kang, and Kilwon Cho. Analysis of growth mechanism of self-assembled monolayer in organic field effect transistors. IUPAC-FAPS 2017 International Polymer Congress, Jeju, Korea, 2017.

PROFESSIONAL ACTIVITIES AND DEVELOPMENT

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| • Generative Multiscale Materials Design Program: Physics, AI, and Manufacturing, MIT, | 2026 |
| • Session Co-Chair, Materials Research Society (MRS) Fall Meeting, Boston, Sessions EN02.03, EN02.04, EN02.08 | 2025 |
| • Kaufman Teaching Certificate Program, MIT | 2025 |

AWARDS & HONORS

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| • MRS Research Career Poster Pitch Award, MRS Spring Conference | 2026 |
| • AMP Distinguished Student Award, UCLA | 2023 |
| • Graduate Scholarship, KSEA (Korean-American Scientists and Engineers Association) & KUSCO | 2022 |
| • Blackstone LaunchPad Entrepreneurship Award, Future Founders, Techstars, and Blackstone | 2021 |
| • Graduate Research Presentation – Pitch Competition Award, UCLA | 2021 |
| • Graduate Dean's Scholarship, UCLA | 2020 |