

JONGYOUN KIM, Ph.D.

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EDUCATION

MS/Ph.D. Department of Energy Science & Engineering
Mar 2017 – Feb 2023 Organic and Printed Electronic Laboratory (OPEL)
Daegu Gyeongbuk Institute of Science & Technology (DGIST)
Thesis: Synthesis, Assembly and Device Engineering of Copper and Silver Nanowires for Advanced Electronic Applications.

Advisor: Prof. Youngu Lee

BS Department of Chemistry
Mar 2012 – Feb 2017 **Korea Advanced Institute of Science & Technology (KAIST)**
Research experiences: Epitaxial synthesis of Au nanowire, Facet control of Au nanoparticle, Surface-enhanced Raman scattering (SERS) biosensor.

PROFESSIONAL EXPERIENCE

Visiting Scholar Sep 2024 –
Department of Materials Science & Engineering; A.J. Drexel Nanomaterials Institute
Drexel University, Philadelphia, PA, United States

Advisor: Prof. Yury Gogotsi

Postdoctoral Researcher 2023 – 2024
Department of Energy Science & Engineering; Organic and Printed Electronic Laboratory (OPEL)
Daegu Gyeongbuk Institute of Science & Technology (DGIST), South Korea

Advisor: Prof. Youngu Lee

Research & Education Assistant 2020
Department of Energy Science & Engineering; Organic and Printed Electronic Laboratory (OPEL)
Daegu Gyeongbuk Institute of Science & Technology (DGIST), South Korea

Teaching Assistant 2018
Department of Energy Science & Engineering, DGIST, South Korea
General Chemistry Laboratory (2019)

Undergraduate Research Assistant 2015
Center for Nanotectonics (Advisor: Prof. Sang Woo Han)
Department of Chemistry, KAIST, South Korea

RESEARCH SKILLS

Material Engineering of Metal Nanostructures

- ✓ Synthesis of **multi-dimensional metal nanomaterials** for efficient conductors or electrocatalysts; quantum dot (0D), nanowire (1D), and nanoparticle/dendrites (3D)
- ✓ Device engineering based on functionalized nanomaterials; Piezoresistive sensors, thermistors, and supercapacitors
- ✓ Chemical modification of metal surfaces for highly productive **CO₂ reduction electrocatalysts**

Chemistry of 2D Materials

- ✓ Handling and characterization of various 2D materials; graphene, hexagonal boron nitride (h-BN), molybdenum disulfide (MoS₂), and tungsten diselenide (WSe₂)
- ✓ **Assembly of 2D materials** with controlled crystal structure to improve their physical and electrochemical properties
- ✓ Development of **metal-2D material hybrid nanostructure** for advanced electronics and electrocatalysts

High-Resolution Printing Technology for Advanced Electronic Devices

- ✓ Extensive experience in the development, optimization, and application of **high-resolution offset-based printing** technologies
- ✓ **Formulation of conductive inks** based on metal nanostructures; Controlling rheology, dispersibility, drying properties.
- ✓ **Device engineering** for transparent/flexible conductors based on **micropatterned electrodes**; High-frequency antenna, flexible integrated circuits, organic light-emitting diodes (OLEDs), and transparent heaters

Characterization Techniques

- ✓ Scanning/Transmission Electron Microscopy (SEM/TEM, ultrahigh-resolution crystal identification **using Titan ETEM**), Energy Dispersive X-ray Spectroscopy (EDS), Electron Energy Loss Spectroscopy (EELS), X-ray Diffraction (XRD), X-ray Photoelectron Spectroscopy (XPS), UV-Vis Spectroscopy, Thermal Gravimetric Analysis (TGA), Differential Scanning Calorimetry (DSC), X-ray absorption fine structure (XAFS, at the **national synchrotron accelerator**), Wide-Angle X-ray Scattering (WAXS, at the **national synchrotron accelerator**), Cyclic Voltammetry (CV) and High-Performance Liquid Chromatography (HPLC)

PUBLICATIONS

1. **J. Kim**, T. Lee, B. Kang, D.-H. Nam, Y. Lee, “High-rate Electrocatalytic Reduction of CO₂ to Ethylene via Enhanced CO₂ Transport by Microporous Polyaminal Network” **In preparation**
2. J. Gu[‡], **J. Kim**[‡], M.-G. Go[‡], H. Jung, Y. Hwang, J. Park, B. Kang, D.-W. Kim, S. Ahn, J. H. Lim, Y. Lee, “Neuron-astrocyte interaction-inspired percolative networks with metal microdendrites and nanostars for ultrasensitive and transparent electronic skins” **Submitted, Chem. Eng. J., 2024**, 498, 155175.
3. **J. Kim**, T. Lee, H. D. Jung, M. Kim, J. Eo, B. Kang, H. Jung, J. Park, D. Bae, Y. Lee, S. Park, W. Kim, S. Back, Y. Lee, D.-H. Nam, “Vitamin C-induced CO₂ capture enables high-rate ethylene production in CO₂ electroreduction” *Nat. Commun.*, **2024**, 15, 192. **Selected as Editor’s Highlights**
4. **J. Kim**, B. Kang, H. Kim, S. H. Choi, H. Jung, Y. Hwang, S. Kwon, K. Woo, Y. Lee, “High-Resolution Printing of Micrometer-Scale Copper Electrode: From Ink Formulation and Process Optimization to Application” *J. Mater. Res. Technol.*, **2024**, 28, 131-138.
5. H. Jung, **J. Kim**, J. Park, M. Jahankhan, Y. Hwang, B. Kang, H. Kim, H.-Y. Park, P. Ahn, D. H. Um, J.-S. Jee, W. S. Shin, B. S. Kim, S.-H. Jin, C. E. Song, Y. Lee, “Achieving an excellent efficiency of 11.57 % in a polymer solar cell submodule with a 55 cm² active area using 1D/2A terpolymers and environmentally friendly nonhalogenated solvents” *EcoMat*, **2024**, 6, E12421.
6. M. Athithan, H. Bae, J. Park, H. Jung, Y. Hwang, **J. Kim**, C. Park, B. Kang, M. Song, Y. Lee, “Low-Temperature Crosslinkable Hole Transport Materials for Solution-Processed Quantum Dot and Organic Light-Emitting Diodes with High Efficiency and Color Purity” *ACS Appl. Mater. Interfaces*, **2023**, 15, 45167-45176.
7. **J. Kim**, M. Kim, H. Jung, J. Park, Y. Lee, “Ultrastable 2D Material-Wrapped Copper Nanowires for High-Performance Flexible and Transparent Energy Devices” *Nano Energy*, **2023**, 106, 108067.
8. **J. Kim**, M. Kim, H. Jung, J. Park, B. O. Jun, B. Kang, J. E. Jang, Y. Lee, “High-Quality Micro-Printable and Stretchable Conductors for High-Performance 5G Wireless Communication” *ACS Appl. Mater. Interfaces*, **2022**, 16, 53250-53260.
9. H. Jung, K. Kim, **J. Kim**, S. Jang, Y. Lee, “Side-chain engineering of regioregular copolymers for high-performance polymer solar cells processed with nonhalogenated solvents” *Bull. Korean Chem. Soc.*, **2022**, 43, 1200-1206.
10. **J. Kim**, I. Hwang, M. Kim, H. Jung, H. Bae, Y. Lee, “Simple, Fast, and Scalable Reverse-Offset Printing of Micropatterned Copper Nanowire Electrodes with Sub-10 μm Resolution” *ACS Appl. Mater. Interfaces*, **2022**, 14, 5807-5814.
11. R. D. G. Gayathri, T. Gokulnath, H.-Y. Park, J. Kim, H. Kim, **J. Kim**, B. Kim, Y. Lee, J. Yoon, S.-H. Jin, “Impact of Aryl End Group Engineering of Donor Polymers on the Morphology and Efficiency of Halogen-Free Solvent-Processed Nonfullerene Organic Solar Cells” *ACS Appl. Mater. Interfaces*, **2022**, 14, 10616-10626.
12. **J. Kim**, H. Jung, M. Kim, H. Bae, Y. Lee, “Conductive Polymer Composites for Soft Tactile Sensors” *Macromol. Res.*, **2021**, 29, 761-775.
13. H. D. Xuan, B. Timothy, H.-Y. Park, T. N. Lam, D. Kim, Y. Go, **J. Kim**, Y. Lee, S. I. Ahn, S.-H. Jin, J. Yoon, “Super Stretchable and Durable Electroluminescent Devices Based on Double-Network Ionogels” *Adv. Mater.*, **2021**, 33, 2008849.
14. H. Jung, G. Yu, **J. Kim**, H. Bae, M. Kim, K. Kim, B. Kim, Y. Lee, “Unprecedented Long-Term Thermal Stability of 1D/2A Terpolymer-Based Polymer Solar Cells Processed with Nonhalogenated Solvent” *Sol. RRL*, **2021**, 5, 2100513.

15. **J. Kim**, D. Lee, K. Park, H. Goh, Y. Lee, “Silver fractal dendrites for highly sensitive and transparent polymer thermistors” *Nanoscale*, **2019**, 11, 15464-15471.
16. K. Park, K. Woo, **J. Kim**, D. Lee, Y. Ahn, D. Song, H. Kim, D. Oh, S. Kwon, Y. Lee, “High-Resolution and Large-Area Patterning of Highly Conductive Silver Nanowire Electrodes by Reverse Offset Printing and Intense Pulsed Light Irradiation” *ACS Appl. Mater. Interfaces*, **2019**, 11, 14882-14891.
17. D. Lee, **J. Kim**, H. Lee, H. Heo, K. Park, Y. Lee, “High-performance transparent pressure sensors based on sea-urchin shaped metal nanoparticles and polyurethane microdome arrays for real-time monitoring” *Nanoscale*, **2018**, 10, 18812-18820.

PATENTS

1. “Carbon dioxide electrochemical conversion catalyst with improved productivity for ethylene and a flow cell for carbon dioxide conversion including the same” Application number : 10-2023-0108046.
2. “Method for preparing core-shell nanowire and core-shell nanowire manufactured by the same” Application number : 10-2022-0056781.
3. “Reverse offset printing ink composition and reverse offset printing method using the same” Application number : 10-2021-0101430.
4. “Variable resistance film and sensor device comprising the same”, Application number : 10-2018-0096130, Registration number : 10-2446078.

PRESENTATIONS

1. **Jongyoun Kim**, and Youngu Lee, “Copper Nanowires Covered with Lattice-Rearranged 2D Materials for Flexible Transparent Electronics”, **2022 MRS Spring Meeting**, Hawaii, US, (2022).
2. **Jongyoun Kim**, and Youngu Lee, “Sub-10 μm Resolution of Micropatterned Copper Nanowire Electrodes by Reverse Offset Printing”, **129th General Meeting of Korean Chemical Society (KCS)**, Hoengseong, Korea, (2022).
3. **Jongyoun Kim**, and Youngu Lee, “High-Resolution Silver Nanowire Micropatterns Based on Reverse Offset Printing and Intense Pulsed Light Irradiation”, **3rd Conference of Korea Flexible & Printed Electronics Society**, Hoengseong, Korea, (2021).
4. **Jongyoun Kim**, and Youngu Lee, “Highly Sensitive and Transparent Positive Temperature Coefficient Polymer Thermistors Using Silver Fractal Dendrites and Polyacrylate”, **48th World Polymer Congress (IUPAC-MACRO2020+)**, Jeju, Korea, (2021).
5. **Jongyoun Kim**, and Youngu Lee, “Silver Fractal Dendrites for Highly Sensitive and Transparent Positive Temperature Coefficient Polyacrylate Thermistors”, **Polymer Society of Korea 2020 Fall Meeting**, Pusan, Korea, (2020).
6. **Jongyoun Kim**, and Youngu Lee, “Highly Sensitive and Transparent Polymer Thermistors Composed of Silver Fractal Dendrites and Polyacrylate”, **2019 MRS Fall Meeting**, Boston, US, (2019).
7. **Jongyoun Kim**, and Youngu Lee, “Highly Sensitive, Flexible and Transparent Polymer Thermistors Using Silver Fractal Dendrites and Polyacrylate”, **Polymer Society of Korea 2019 Fall Meeting**, Jeju, Korea, (2019).
8. **Jongyoun Kim**, and Youngu Lee, “Highly Sensitive, Flexible and Transparent Polymer Thermistors Based on Silver Fractal Dendrites and Polyacrylate”, **124th General Meeting of Korean Chemical Society (KCS)**, Changwon, Korea, (2019).
9. **Jongyoun Kim**, and Youngu Lee, “Highly Sensitive, Flexible, and Transparent Thermistors Composed of Silver Fractal Dendrites and Polyacrylate Matrix”, **KJF-International Conference on Organic Materials for**

Electronics and Photonics (KJF-ICOMEF) 2019, Jeju, Korea, (2019).

10. Jongyoun Kim, Donghwa Lee, and Youngu Lee, “Ultrasensitive Transparent Pressure Sensors Using Sea-Urchin Shaped Metal Nanoparticles and Microdome Patterned Elastomer”, **Polymer Society of Korea 2019 Spring Meeting**, Pusan, Korea, (2019).
11. Jongyoun Kim, and Youngu Lee, “Highly Sensitive, Transparent, and Flexible Temperature Sensors Based on Silver Fractal Dendrites”, **ACS National Meeting**, Boston, US, (2018).

AWARDS & HONORS

2022	Excellent research award , (DGIST, South Korea)
2021	Excellent poster award , (DGIST, South Korea)
2021	Best poster award , (Korea Flexible & Printed Electronics Society)
2020	Best paper presentation award , (Polymer Society of Korea)
2019	Best paper presentation award , (Polymer Society of Korea)