

Han-Yup Yum, Ph.D.

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Degree & Education

Ph.D. in Physics

University of Wollongong, New South Wales 2500, Australia

July 2022 – December 2026 (Conferral pending)

(Note: Joint Ph.D. Program with Sungkyunkwan University)

Research topic: Flexible Energy Storage Devices for Biomedical Applications

Ph.D. in Materials Science and Engineering

Sungkyunkwan University, Suwon 16419, Republic of Korea

March 2020 – February 2026

(Note: Joint Ph.D. Program with University of Wollongong)

Dissertation: Metal-Organic Framework-Derived Laser Induced Extended Graphene for Flexible Energy and Bioelectronic Devices

B.S. in Chemical Engineering

Inha University, Incheon 22212, Republic of Korea

March 2013 - February 2020

*(Note: **KATUSA** [Korean Augmentation to the United States Army] Military Service during March 2015 – December 2016)*

Professional Positions & Experience

Post-doctoral Researcher

Yonsei University, Seoul 03722, Republic of Korea

March 2026 – present

Co-founder

MAIK, Medical Artificial Intelligence of Korea, Inc. Startup Company

September 2017 – December 2019

Technical Skills

- **Materials synthesis & laser processing:** Laser-induced graphene and laser-induced extended graphene (LIG/LIEG); precursor–template laser synthesis; MOF/COF synthesis; MOF-derived porous carbons; ionically conductive hydrogels; electrode micro/nanostructuring by wet etching, AAO masking, and fs-laser surface texturing.
- **Device fabrication & integration:** Flexible micro-supercapacitors; triboelectric nanogenerators (TENGs); water-activated Mg–Au galvanic cells; galvanic–supercapacitor hybrid patches; flexible and wearable bioelectronic/electroceutical devices.

- **Characterization:** Cyclic voltammetry, galvanostatic charge–discharge, electrochemical impedance spectroscopy; SEM, TEM/HRTEM; Raman spectroscopy, XRD, XPS; sheet-resistance mapping and bending-cycle stability testing.
- **Biointerface evaluation:** Ionically conductive hydrogel interfaces; tissue-load-matched electric-field delivery; in vitro scratch assays; fibroblast migration and orientation analysis.
- **Modeling & computation:** COMSOL Multiphysics for electric-field simulation and tissue-relevant stimulation mapping; Python image analysis including structure-tensor orientation analysis, LIC visualization, and custom flux/orientation metrics.

Publications

First Authored Papers

1. M. Kang#, **H.-Y. Yum**#, H. T. Kim#, B.-J. Park, D. S. Cho, Y. Choi, H. J. Kim, Y. Cho, Y.-J. Kim, D.-M. Lee, D.-G. Lee, H.-C. Song, S. H. Nam, J. H. Lee, B.-O. Choi, and S.-W. Kim, Self-Powered Electrical Bandage Based on Body-Coupled Energy Harvesting, *Advanced Materials*, **36**, 2402491 (2024)
2. **H.-Y. Yum**, S. A Han, K. Konstantinov, S.-W. Kim, and J. H. Kim, Smart triboelectric nanogenerators toward human-oriented technologies: Health monitoring, wound healing, drug delivery, *Advanced Materials Technologies*, **8**, 2201500 (2023)

Contributing Authored Papers

1. J. Kim, D.-M. Lee, Y. Chung, B.-J. Park, H. Mo, J. W. Seon, **H.-Y. Yum**, B. Kim, B.-O. Choi, and S.-W. Kim, *Advanced Materials*, Accepted (2026)
2. M. Kang, Y. Chung, D. Lee, **H.-Y. Yum**, D. Kang, D.-M. Lee, I.-Y. Suh, S.-W. Kim, *Nano Energy*, **151**, 111866 (2026)
3. H. Qutaish, H. Chang, J. Suh, S. Han, **H.-Y. Yum**, M.-S. Park, J. Moon, and J. Kim, *ACS Materials Letters*, **5**, 1593-1600 (2023)
4. C. W. Jang, Y. A. Salawu, J. H. Kim, V. Q. Nguyen, M. S. Kim, S.-E. Lee, H. Son, H.-J. Kim, J.-S. Rhyee, V. T. Hoa, S. Cho, J. S. Lee, M.-H. Jung, W. Shon, T. J. Jeong, S. Kim, **H.-Y. Yum**, J. H. Kim, X. Wang, R. G. Elliman, S. J. Park, J. Kim, H. Jin, and S.-H. Choi, *Advanced Functional Materials*, **33**, 2305179 (2023)
5. S. A Han, J. Moon, **H.-Y. Yum**, M.-S. Park, S.-W. Kim, J. H. Kim, *Composites Part B: Engineering*, **246**, 110205 (2022)

Manuscripts Submitted and in Preparation (First/Lead Author)

1. **H.-Y. Yum** et al., “Decoupling chemistry from architecture in laser-written graphitic carbon” Introduces laser-induced extended graphene (LIEG) synthesized via a ZTIF MOF precursor on a graphene-nanoplatelet template, extending laser-induced graphene synthesis beyond polymer precursors. (Submitted to *Nature Communications*.)
2. **H.-Y. Yum**, S.-W. Kim, “From laser carbonization toward laser crystallization of graphene through nucleation and growth” Proposes that laser-induced graphene formation can be read as a competition between spontaneous nucleation and seeded growth, and identifies three process levers (crystalline

seeds, engineered precursors including MOFs, and laser parameters) that could make its porosity–order trade-off tunable. (Perspective; submitted to *National Materials*.)

3. **H.-Y. Yum**#, Hyeon Mo# et al., “A Rewettable Galvanic–Supercapacitor Bandage for Spatiotemporally Engineered Wound Electrotherapy” A water-activated Mg-galvanic cell integrated with a flexible supercapacitor and an ionically conductive hydrogel, forming a fully flexible bandage that delivers periodic, on-demand electrical stimulation. (Manuscript in preparation.)

Patents

1. S.-W. Kim, B. Ok, H. T. Kim, M. Ki, Y. Jun, **H.-Y. Yum**, W. Seok, Wound treatment patch using static electricity and method for fabricating the patch, U.S. Application No. 17/110,673

Selected Awards & Honors

- **Best Oral Award**, NGPT 2026 Organizing Committee (2026)
- **Honorable Mention (AMSE Award for Outstanding Graduate Students)**, BK21 FOUR Research Center (2025)
- **Outstanding Presentation Award**, The Korean Sensors Society (2022)
- **Best Poster Award**, The Korean Institute of Metals and Materials (2020)

Licenses & Certifications

- **Licensed Chemical Engineer**, Human Resources Development Service of Korea (2020) [No. 19202070156S]
- **Certified Industrial Engineer (Hazardous Materials)**, Human Resources Development Service of Korea (2018) [No. 18204101476T]

Grants & Fellowships

- **Global Research Fellowship for Outstanding Graduate Students**, National Research Foundation (NRF) of Korea (Aug 2024 – Aug 2025)
- **Global Next-Generation Core Talent Fellowship**, Institute for International Cooperative Convergence Bio-Research (Dec 2021 – July 2022)

References

Prof. Sang-Woo Kim (Primary Advisor)

Department of Materials Science and Engineering, Yonsei University, Seoul 03722, Republic of Korea

Email: kimsw1@yonsei.ac.kr

Relationship: Ph.D. Advisor

Prof. Jung Ho Kim (Co-Advisor)

Institute for Superconducting and Electronic Materials, University of Wollongong, New South Wales 2500, Australia

Email: jhk@uow.edu.au

Relationship: Ph.D. Co-Advisor

Prof. Sunkook Kim (Co-Advisor)

School of Advanced Materials Science and Engineering, Sungkyunkwan University, Suwon 16419, Republic of Korea

Email: seonkuk@skku.edu

Relationship: Ph.D. Co-Advisor