

Ph.D. in Materials Engineering

I conducted foundational research on energy harvesting materials and mechanism based on quantum analysis. Building on this research, I proposed design protocol for material development and conducted various bio-application studies using the developed materials.

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**Dr. Donghyeon Kang**

**Grants**

**NRF Postdoctoral Domestic Fellowship** (2025.09–2026.08): 60,000,000 KRW ≈ 44,000 USD

Fully funded for personnel expenses, available for 6-month overseas stay from Mar. 2026

**Postdoctoral fellow, Yonsei University**

Department of Advanced Materials Science & Engineering,
Energy harvesting Lab (Prof. Sang-Woo Kim)

Mar. 2024 - Current

Seoul, Republic of Korea

English

Korea

1. Self-powered wearable and implantable device fabrication

3. Density functional theory (DFT) calculation

4. Polymer and hydrogel synthesis

5. Preclinical study (mouse and rat)

6. FE-SEM, XRD, E-beam evaporator, XPS, FT-IR, and Computer skills

**Skills**

**Professional experience**

**Languages**

**Education**

2019-2024 Ph.D.

Suwon, Republic of Korea

**Sungkyunkwan University (SKKU)**

Department of Advanced Materials Science & Engineering
Supervisor: Prof. Sang-Woo Kim

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1. **Donghyeon Kang**, Byung-Joon Park, Joon-Ha Hwang, Young-Jun Kim, So-Hee Kim, Hyeon Yeong Lee, Bosung Kim, Wanchul Seung, Jihye Kim, Youngwook Chung, Soo Hyun Nam, Byung-Ok Choi, Sang-Woo Kim, In-body current path manipulation with minimal attenuation. *Sci. Adv.* In-press (2025).

2. **Donghyeon Kang**, So-Hee Kim, Sang-Woo Kim, Advancing biomedical implants through triboelectricity. *Device* In-press (2025).

3. Jinyoung Jeon, **Donghyeon Kang**, Sang-Woo Kim, Advances in Triboelectric Nanogenerators for Microbial Disinfection. *Micromachines* **16**, 281 (2025).

4. **Donghyeon Kang**, Joon-Ha Hwang, Young-Jun Kim, Pin Zhao, Hyeon Yeong Lee, Jihye Kim, Min Seok Shin, Sera Jeon, SeongMin Kim, Sang-Woo Kim, Contact electrification controlled by material deformation-induced electronic structure changes. *Mat. Today* **72**, 109-116 (2024).

5. Dong In Jeong, **Donghyeon Kang**, Bong Kyun Kang, Ui Young Lee, In-Yong Suh, Yeseul Kim, Byung Mook Weon, Sang-Woo Kim, Dae Ho Yoon, Self-powered Water Splitting of Ni3FeN@Fe24N10 Bifunctional Catalyst Improved Catalytic Activity and Durability by Forming Fe24N10 on Catalyst Surface via the Kirkendall Effect. *Small* **20**, 2400374 (2024).

6. Chunqing Ma, Yeon-Woo Choi, **Donghyeon Kang**, Bosung Kim, Seung-Gu Choi, Jin-Wook Lee, Sang-Woo Kim, Nam-Gyu Park, Moisturized 2-dimensional halide perovskite generates a power density of 30 mW cm−3. *Energy Environ. Sci.* **16**, 5982-5991 (2023).

7. Jihye Kim, **Donghyeon Kang**, Hoo‐Kyung Lee, Joon‐Ha Hwang, Hyeon Yeong Lee, Sera Jeon, Dabin Kim, SeongMin Kim, Sang‐Woo Kim, Design Principles to Maximize Non‐Bonding States for Highly Tribopositive Behavior. *Adv. Funct. Mater.* **33**, 2209648 (2023).

8. **Donghyeon Kang**, Hyeon Yeong Lee, Joon-Ha Hwang, Sera Jeon, Dabin Kim, SeongMin Kim, Sang-Woo Kim, Deformation-contributed negative triboelectric property of polytetrafluoroethylene: A density functional theory calculation. *Nano Energy* **100**, 107531 (2022).

**🡪 First author**

**Published Paper**

**🡪 Co-author**

1. Young-Jun Kim, So-Hee Kim, Byung-Joon Park, Jinyoung Jeon, **Donghyeon Kang**, Youngwook Chung, Joon-Ha Hwang, Hong-Joon Yoon, Kyu Hyoung Lee, Byung-Ok Choi, Sang-Woo Kim, Wireless monolithic bioresorbable pain blocker with acoustically switchable triboelectric field. *Nat. Biomed. Eng.* In press (2025)

2. Jinyoung Jeon, **Donghyeon Kang**, Sang-Woo Kim, Electrotherapy and Health Monitoring with Piezoelectric and Triboelectric Technologies. *Biomaterials* **323**, 123425(2025).

3. Kwon-Hyung Lee, Min-Gyu Kim, Woosuck Kang, Hyun-moon Park, Youngmin Cho, Jeongsoo Hong, Tae-Hee Kim, Seung-Hyeok Kim, Seok-Kyu Cho, **Donghyeon Kang**, Sang-Woo Kim, Changsin Jo, Sang-Young Lee, Pulse-charging energy storage for triboelectric nanogenerator based on frequency modulation. *Nano-Micro Lett.* **17**, 210 (2025).

4. In-Yong Suh, Zheng-Yang Huo, Jae-Hwan Jung, **Donghyeon Kang**, Dong-Min Lee, Young-Jun Kim, Bosung Kim, Jinyoung Jeon, Pin Zhao, Jeonghune Shin, SeongMin Kim, Sang-Woo Kim, Highly efficient microbial inactivation enabled by tunneling charges injected through two-dimensional electronics. *Sci. Adv.* **10**, eadl 5067 (2024).

5. Taehee Kim, Hwapyung Jung, Haryeong Choi, **Donghyeon Kang**, Wonjun Lee, Vinayak G. Parale, Umakant M. Patil, Younghun Kim, Jiseung Kim, Sang-Hyun Kim, Sang-Woo Kim, Kazuyoshi Kanamori, Hyung-Ho Park, An NiFeSn Oxyhydroxide Electrocatalyst Wet Gel for Highly Efficient Water Electrolysis in Alkaline Media. *Nano Energy* **124**, 109428 (2024).

6. Jihye Kim, Hanjun Ryu, SeongMin Kim, Hyeon Yeong Lee, Armine Karami, Dimitri Galayko, **Donghyeon Kang**, Sung Soo Kwak, Hong‐Joon Yoon, Philippe Basset, Sang‐Woo Kim, Self‐Boosting Energy Generation via Triboelectric Nanogenerator–Capacitor Coupling. *Adv. Mater. Technol.* **9**, 231309 (2024).

7. Dong In Jeong, Hyung Wook Choi, Seongwon Woo, Jung Hyeon Yoo, **Donghyeon Kang**, SeongMin Kim, Byungkwon Lim, Jung Ho Kim, Sang-Woo Kim, Bong Kyun Kang, Dae Ho Yoon, Electronic structure modification and N-doped carbon shell nanoarchitectonics of Ni3FeN@NC for overall water splitting performance evaluation. *J. Mater. Chem. A* **10**, 16704-16713 (2022).

**🡪 Co-author**

1. So-Hee Kim, Haryeong Choi, **Donghyeon Kang**, Taehee Kim, Young-Jun Kim, Jiseung Kim, Jyung Hyun Park, Hyung-Ho Park, and Sang-Woo Kim, A floatable ionovoltaic generator for sustainable hydrogen production. (Submitted, *Nature*)

2. **Donghyeon Kang**, Joon-Ha Hwang, Young-Jun Kim, Byung-Joon Park, Jinyoung Jeon, Youngwook Chung, Soo Hyun Nam, Byung-Ok Choi, Sang-Woo Kim, Ferroelectric peptide hydrogel for tissue engineering. *In preparation*

3. **Donghyeon Kang**, Jinyoung Jeon, Joon-Ha Hwang, Young-Jun Kim, Hyeon Yeong Lee, Byung-Joon Park, Youngwook Chung, Soo Hyun Nam, Byung-Ok Choi, Sang-Woo Kim, Electrical matrix metalloproteinase inhibitor with minimal invasive approach. *In preparation*

4. Jinyoung Jeon, **Donghyeon Kang**, Byung-Joon Park, Joon-Ha Hwang, Youngwook Chung, Soo Hyun Nam, Byung-Ok Choi, Sang-Woo Kim, On-demand bioresorbable nerve conduit for wireless triboelectric neuromodulation. *In preparation*

**Summitted Paper & Manuscript in preparation**

**🡪 First author**

2. Young-Jun Kim, Pin Zhao, Jeonghune Shin, **Donghyeon Kang**, Jae Hwan Jung, Tae Hyeong Kim, Joong Won Shur, JaeMyung Chang, Cheng Gang Zhuang, So-Hee Kim, Hyeon Yeong Lee, Sera Jeon, Unconventional piezoelectricity in twisted multilayer molybdenum disulfide. (In revision, *Advanced Materials*)

3. Young-Jun Kim, Youngwook Chung, Joon-Ha Hwang, Jang-Mook Jeong, **Donghyeon Kang**, Byung-Ok Choi, Hong-Joon Yoon, Sang-Woo Kim, Acoustic impedance mismatch for high-efficiency ultrasound energy harvesting using triboelectric nanogenerators. (Submitted, *Matter* )

4. Younghun Kim, Ik Seon Kwon, Sang-Hyun Kim, **Donghyeon Kang**, Vinayak G. Parale, Haryeong Choi, Wonjun Lee, Jiseung Kim, Hyun Jee Heo, Kug-Seung Lee, Sang-Woo Kim, Hyung-Ho Park, Multi-Metal and Dual-Ligand Engineering in Transition Metal Aerogels: A Pathway to Efficient OER Catalysts. (Submitted, *Small*)

**Patents**

**Technology transfer**

1. TRIBOELECTRIC GENERATOR BASED ON TIME―LIMITED NANO COMPOSITE WITH SELECTIVE ULTRASOUND INFLUENCING PROPERTIES, AND NEUROSTIMULATION THERAPY APPARATUS, Energy mining (KRW 300,000,000 ≒ US 210,000)

1. METHOD OF INHIBITING PROLIFERATION OF TUMOR CELL USING TRIBOELECTRIC ENERGY GENERATOR USING ULTRASONIC WAVE, **US 11,844,942 B2**

2. TRIBOELECTRIC GENERATOR BASED ON TIME―LIMITED NANO COMPOSITE WITH SELECTIVE ULTRASOUND INFLUENCING PROPERTIES, AND NEUROSTIMULATION THERAPY APPARATUS, **KR 10-2348997, US 17/515,675**

3. PROCTETIVE SUITS, MASK AND GLOVES UTILIZING TRIBOELECTRIC GENERATION DEVICES BASED ON HUMAN BODY POWER TRANSMISSION, **KR 10-2024-0052059**

4. NUREAL CONDUIT FOR NEVER STIMULATION USING HUMAN-BASED TRIBOELECTRIC POWER TRANSFER, **KR 10-2024-0072479**

5. AEROGEL BASED BUOYANT SELF-POWERED WATER ELECTROLYSIS HYDRGOEN GENERATION SYSTEM, **KR 10-2024-016978**

6. POLYMER FILM BASED MICROPHONE USING A TWO DIMENSIONAL PIEZOELECTRIC MATERIAL LAYER AND METHOD FOR MANUFACTURING THE SAME, **KR 10-2024-0154352**

7. HUMAN BASED TRIBOELECTRIC GENERATOR WIRELESS POWER TRANSMISSION, **KR 10-2023-0134407, PCT/KR2024/015012**

8. NON SLIP TIRE WITH HIGH BRAKING FORCE ON SNOWY ROAD, **KR 10-2324370**

9. SYSTEM FOR PREVENTING LOSS OF PETS, **KR 10-2392909**

10. TOUCH PANEL CAPABLE OF COMMUNICATION AND COMMUNICATOR, **KR 10-2227195**

1. Brain Korea (BK) 21 AWARD in Sungkyunkwan University

2. Best Paper Award for SPIE Smart Structures + NDE 2024

3. The Korean Sensors Society 2024 Spring Conference Best Poster Award

4. The Korean Sensors Society 2025 Spring Conference Best Oral Award

**Awards**