



DUKHYUN CHOI

Associate Professor

Dept. of Mechanical Engineering, College of Engineering

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Background Summary

MSE (BS): In Postech, Study for fundamental physics, chemistry, material science, and mechanics.

ME (MS and Ph.D): In Postech, Researches for **i)** the investigation of lateral measurement system in atomic force microscopy (AFM), **ii)** the measurement and characterization of mechanical and tribological properties of nanostructured materials by using AFM and nano-indenter, **iii)** the fabrication of nanostructured materials such as anodic aluminum oxide (AAO) structures, and **iv)** the creative engineering design with axiomatic design and TRIZ.

BioE (Postdoc.): In UC Berkeley, Researches for the development of plasmonic nanostructures for in-vivo/in-vitro molecular sensing and imaging. Especially, I focused on SERS (surface-enhanced Raman scattering) system development with a microfluidic CD-based platform and modified AAO structures

EE (R&D staff): In SAIT, Researches for the development of a self-powered nanogenerator with ZnO nanowire, organic/inorganic hybrid solar cell systems, touch sensors, and thin-film encapsulations for organic flexible electronics.

Education

2007. 1 – 2008. 2 Postdoc., UC Berkeley, Bioengineering, Biomolecular Nanotechnology Center (BNC), Berkeley Sensor and Actuator Center (BSAC)
(Advisor: Prof. Luke P. Lee)

2006. 8 – 2006.11 Postdoc., Postech, Center for Systems Biodynamics

2002. 3 – 2006. 7 Ph. D, Postech, Mechanical Engineering
(Advisor: Prof. Woonbong Hwang)
Dissertation: *Mechanical Characterization and Tribophysics of Nanohoneycomb Structures*

2000. 3 – 2002. 2 M. S., Postech, Mechanical Engineering
(Advisor: Prof. Woonbong Hwang)
Thesis: *Suspension System Design using Axiomatic Design Approach*

1996. 3 – 2000. 2 B. S., Postech, Materials and Science Engineering
(Advisor: Prof. Jinchul Jung)



Work experience

- 2016. 9 –present** Associate Professor, Dept. of Mechanical Engineering
College of Engineering, Kyung Hee University
- 2016. 10 –2017.08** Visiting Researcher, Center for Electronic Materials, KIST
- 2016. 7 –2016.12** Visiting Researcher, School of Integrative Technology
College of Engineering, Yonsei University
- 2012. 9 –2016.08** Assistant Professor, Dept. of Mechanical Engineering
College of Engineering, Kyung Hee University
- 2010. 9 –2012.08** Full-time Lecturer (Assistant Prof. B), Dept. of Mechanical Engineering
College of Engineering, Kyung Hee University
- 2008. 4 –2010. 7** R&D Staff Member, Flexible Electronics Group
Samsung Advanced Institute of Technology (SAIT), Korea
1. Piezoelectric energy generator by ZnO nanorods
 2. Organic/inorganic hybrid solar cell
 3. Touch sensors
 4. Thin-film encapsulations for organic flexible electronics
- 2007. 1 – 2008.2** Postdoc., UC Berkeley, Bioengineering, BNC, BSAC, USA
1. Plasmonic nanostructures
 2. SERS-based detection architectures
 3. Optofluidic molecular detection
- 2006. 8 – 2006.11** Postdoc., Postech, Center for Systems Biodynamics, Korea
- 2001. 3 – 2006.8** Graduate Research Assistant and Teaching Assistant, Postech,
Mechanical Engineering, Korea

Research interests

- Triboelectric nanogenerator (TENG) - Nanopiezotronics - Human-powered energy harvesting system
- Photovoltaics - Touch sensors - Flexible transparent electronics - Thin-film encapsulations
- Nanoplasmonics – Subwavelength optics - Surface-enhanced Raman scattering (SERS)
- Tip-enhanced Raman scattering (TERS) - Plasmonic nanostructures
- Multiplex sensing systems for biology and environment - Molecular imaging – Nanofabrications
- Metamaterials - Nano/biomechanics – Nanotribology – Surface engineering - Biomimetics

Other experiences and professional membership

- 2018 – present** The Korean Sensors Society (KSS)
- 2016 – present** International Society for Optics and Photonics (SPIE)
- 2014 – present** The Korean Institute of Electrical and Electronic Material Engineers (KIEEME)
- 2014 – present** The Korean Ceramic Society (KCS)



- 2013 – present** The Korean Society for Power System Engineering (KSPSE)
- 2012 – present** Korean Society of Mechanical Technology (KSMT)
- 2011 – present** Korea Society of Optoelectronic Engineering (KSOE)
- 2009 – present** Materials Research Society (MRS)
- 2006 – present** The Polymer Society of Korea (PSK)
- 2004 – present** The Korea Society of Mechanical Engineers (KSME)
- 2003 – present** The Korea Society of Precision Engineering (KSPE)
- 2003 – present** The Korea Society of Composite Materials (KSCM)

Honors and awards

- 2019. 11. 23** **Best poster Award** The Korean Society for Composite Materials (KSCM 2018 fall), Daejeon, Korea
- 2019. 05. 10** **Invited talk**, Soongsil University, Seoul, Korea
- 2019. 11. 23** **Best poster Award** The Korean Society for Composite Materials (KSCM 2018 fall), Daejeon, Korea
- 2019. 05. 10** **Invited talk**, Soongsil University, Seoul, Korea
- 2019. 11. 23** **Best poster Award** The Korean Society for Composite Materials (KSCM 2018 fall), Daejeon, Korea
- 2019. 11. 23** **Best poster Award** The Korean Society for Composite Materials (KSCM 2018 fall), Daejeon, Korea
- 2019. 05. 10** **Invited talk**, Soongsil University, Seoul, Korea
- 2019. 11. 23** **Best poster Award** The Korean Society for Composite Materials (KSCM 2018 fall), Daejeon, Korea
- 2019. 11. 23** **Best poster Award** The Korean Society for Composite Materials (KSCM 2018 fall), Daejeon, Korea
- 2018. 11. 23** **Best poster Award** The Korean Society for Composite Materials (KSCM 2018 fall), Daejeon, Korea
- 2018. 10. 26** **Young Scientist Award** The 3rd International Workshop on Active Materials and Soft Mechatronics (AISM 2018), Daejeon, Korea
- 2018. 08. 08** **Best poster Award** 54th The Korean Vacuum Society (KVS 2018), Seoul, Korea
- 2018. 05. 11** **Best poster Award** 4th International Conference on Nanogenerators and Piezotronics (NGPT 2018), Seoul, Korea
- 2018. 04. 07** **Best poster Award** The Korean Society for Composite Materials (KSCM 2018 spring), Jeju, Korea
- 2018. 03. 01** **Kyung Hee Fellow** Kyung Hee University, Yongin, Korea
- 2017. 11. 24** **Best poster Award** 4th International Conference on Advanced Electromaterials (ICAE2017), Jeju, Korea



- 2017. 09. 15** **Best paper Award** The 7th Asian International Symposium on Mechatronics (AISM2017), Pohang, Korea
- 2017. 06. 22** **Best paper**, The Korean Institute of Electrical and Electronic Material Engineers, Pyeongchang, Korea
- 2017. 05. 10** **Invited talk**, Soongsil University, Seoul, Korea
- 2017. 03. 22** **Invited talk**, Ewha Womans University, Seoul, Korea
- 2016. 08. 23** **Invited talk**, IWPMA & ECMD 2016, Jeju, Korea
- 2016. 07. 14** **Invited talk**, Nanoenergy and Nanosystem (NENS) 2016, Beijing, China
- 2016. 04. 19** **Invited talk**, The Materials Challenges in Alternative and Renewable Energy 2016 conference, Clearwater, FL, USA
- 2016. 01. 27** **Best poster paper**, 2016 Society of LED and Solid State Lighting – KSOE integrated conference, Gwangju, Korea
- 2015. 10. 09** **Best oral presentation**, The 5th Asian International Symposium on Mechatronics (AISM2015) Guilin, China
- 2015. 06. 26** **Outstanding Presenter Award**, International Symposium on Green Manufacturing and Applications (ISGMA 2015), Qingdao, China.
- 2015. 05. 22** **Best poster presentation**, KSME 2015 fall meeting, BEXCO, Busan, Korea
- 2010. 10. 21** **Best paper**, The Korean Physical Society fall meeting, Pyeong Chang, Gangwon, Korea
- 2009. 07. 01** 2010 Edition of Who's Who in the World
- 2006. 08. 23** Korea Research Foundation (KRF) Postdoctoral Fellowship, Korea
- 2006. 05. 19** The Third Prize, 1st Creative Design Competitive Exhibition, Department of Mechanical Engineering, Postech, Korea
- 2005. 11. 18** **Best paper**, The Korea Society of Composite Materials fall conference, Kyungbuk National University, Korea
- 1999. 08. 18** Magna cum laude award, Postech, Korea
- 1999. 02. 19** Magna cum laude award, Postech, Korea
- 1998. 02. 18** Cum laude awards, Postech, Korea
- 1996-1999** Jigok scholarships, Pohang University of Science and Technology (Postech), Korea



Peer-reviewed Publications

[102] Wook Kim, Takeru Okada, Hyun-Woo Park, Jihye Kim, Kwun-Bum Chung, Sang-Woo Kim, Seiji Samukawa, and Dukhyun Choi, Surface Modification of Triboelectric Materials by Neutral Beams, *Journal of Materials Chemistry A*, Vol. 7, 2019, p.25066, Corresponding author

[101] Do Hyung Chun, Sungsoon Kim, Sung Uk Chai, Wook Kim, Wanjung Kim, Jung Hwan Lee, Ryan Rhee, Dukhyun Choi, Jung Kyu Kim, Hyunjung Shin, and Jong Hyeok Park, Grain Boundary Healing of Organic–Inorganic Halide Perovskites for Moisture Stability, *Nano Lett.* Vol. 19, 2019, p.6498 Co-Author

[100] Wook Kim, Divij Bhatia, Hee Jae Hwang, Kyungwho Choi, and Dukhyun Choi, Double impact triboelectric nanogenerators for harvesting broadband vibrations from vehicles, *Functional Composites and Structures*, Vol.1, 2019, p.035003. Corresponding author

[99] Jihoon Chung, Deokjae Heo, Gunsub Shin, Dukhyun Choi, Kyungwho Choi, Dongseob Kim,* and Sangmin Lee*, Ion-Enhanced Field Emission Triboelectric Nanogenerator, *Advanced Energy Materials*, Vol 9(37), 2019, p.1901731, Co-author

[98] Jeonghoon Han, Changwoo Bae, Songhwa Chae, Dukhyun Choi, Sangmin Lee, Youngsuk Nam, Choongyeop Lee, High-efficiency power generation in hyper-saline environment using conventional nanoporous membrane, *Electrochimica Acta*, Vol. 319, 2019, p.366. Co-author

[97] Yoonsu Bae, Jiseop Yu, Yeonseok Jung, Donghun Lee, and Dukhyun Choi, Cost-Effective and High-Throughput Plasmonic Interference Coupled Nanostructures by Using Quasi-Uniform Anodic Aluminum Oxide, *Coatings*, Vol. 9, 2019, p.420. Corresponding author

[96] Hee Jae Hwang, Yeonseok Jung, Kyungwho Choi, Dongseob Kim, Jinhyoung Park & Dukhyun Choi, Comb-structured triboelectric nanogenerators for multi-directional energy scavenging from human movements, *Science and Technology of Advanced Materials*, Vol. 20, 2019, p.725. Corresponding author

[95] Divij Bhatia, Hee Jae Hwang, Nghia Dinh Huynh, Sangmin Lee, Choongyeop Lee, Youngsuk Nam, Jin-Gyun Kim, and Dukhyun Choi, Continuous scavenging of broadband vibrations via omnipotent tandem triboelectric nanogenerators with cascade impact structure, *Scientific Reports*, Vol. 9, 2019, p.8223, Corresponding author

[94] Hai Bo Xua, Jeong Hun Kim, Sangtae Kim, Hee Jae Hwang, Deepam Maurya, Dukhyun Choi, Chong-Yun Kang, and Hyun-Cheol Song, Double layered dielectric elastomer by vapor encapsulation casting for highly deformable and strongly adhesive triboelectric materials, *Nano Energy*, Vol.62, 2019, p.144. Corresponding author



[93] Yujang Cho, Kyeongsoo Lee, Sangki Park, Seongcheol Ahn, Wook Kim, Junseo Kim, Siyoung Park, Jingzhe Sun, Chanhee Jung, Jikang Chung, Mincheol Chang, Dukhyun Choi, and Jong-Jin Park, Rotational wind power triboelectric nanogenerator using aerodynamic changes of friction area and the adsorption effect of hematoxylin onto feather based on a diversely evolved hyper-branched structure, *Nano Energy*, Vol.61, 2019, p.370. Corresponding author

[92] Hee Jae Hwang, Joo Sung Kim, Wook Kim, Hyunwoo Park, Divij Bhatia, Eunsong Jee, Yoon Sun Chung, Do Hwan Kim, and Dukhyun Choi, An Ultra-Mechanosensitive Visco-Poroelastic Polymer Ion Pump for Continuous Self-Powering Kinematic Triboelectric Nanogenerators, *Advanced Energy Materials*, Vol 9, 2019, p.1803786, Corresponding author

[91] Sangki Park, Seongcheol Ahn, Jingzhe Sun, Divij Bhatia, Dukhyun Choi, Kap Seung Yang, Jihyun Bae, and Jong-Jin Park, Highly Bendable and Rotational Textile Structure with Prestrained Conductive Sewing Pattern for Human Joint Monitoring, *Advanced Functional Materials*, Vol 29, 2019, p.1808369, Co-author

[90] Hyun-Woo Park, Sera Kwon, Aeran Song, Dukhyun Choi, and Kwun-Bum Chung, Dynamics of bias instability in the tungsten- indium-zinc oxide thin film transistor, *Journal of Materials Chemistry C*, Vol 7, 2019, p.1006, Co-author

[89] Jin Pyo Lee, Jae Won Lee, Bo-Kyung Yoon, Hee Jae Hwang, Sungwoo Jung, Katherine A. Kim, Dukhyun Choi, Changduk Yang, Jeong Min Baik, Boosting the energy conversion efficiency of a combined triboelectric T nanogenerator-capacitor, *Nano Energy*, Vol.56, 2019, p.571. Co-author

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[87] Do Hyung Chun, Young Jin Choi, Yongjae In, Jae Keun Nam, Yung Ji Choi, Sangeun Yun, Wook Kim, Dukhyun Choi, Dongho Kim, Hyunjung Shin, Jeong Ho Cho, and Jong Hyeok Park, Halide Perovskite Nanopillar Photodetector, *ACS Nano*, Vol. 12, 2018, p.8564. Co-author

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[85] Sukjin Jang, Eunsong Jee, Daehwan Choi, Wook Kim, Joo Sung Kim, Vipin Amoli, Taehoon Sung, Dukhyun Choi, Do Hwan Kim, and Jang-Yeon Kwon, Ultrasensitive, Low-Power Oxide Transistor-Based Mechanotransducer with Microstructured, Deformable Ionic Dielectrics, *ACS Applied Materials & Interfaces*, Vol.10, 2018, p.31472. Co-author



[84] Hyun-Woo Park, Nghia Dinh Huynh, Wook Kim, Hee Jae Hwang, Hyunmin Hong, KyuHyeon Choi, Aeran Song, Kwun-Bum Chung, and Dukhyun Choi, Effects of Embedded TiO_{2-x} Nanoparticles on Triboelectric Nanogenerator Performance, *Micromachines*, Vol.9, 2018, p.407. Corresponding author

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[81] Hyun-Woo Park, Nghia Dinh Huynh, Wook Kim, Choongyeop Lee, Youngsuk Nam, Sangmin Lee, Kwun-Bum Chung, and Dukhyun Choi, Electron Blocking Layer-based Interfacial Design for Highly-enhanced Triboelectric Nanogenerators, *NANO ENERGY*, Vol 350, 2018, p.225-232, Corresponding author

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[79] Jihoon Chung, Hyungseok Yong, Haksung Moon, Seung Tae Choi, Divij Bhatia, Dukhyun Choi, Dongseob Kim, Sangmin Lee, Capacitor-Integrated Triboelectric Nanogenerator Based on Metal-Metal Contact for Current Amplification, *Advanced Energy Materials*, Vol 8(15), 2018, p.1703024, Co-author

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- [70] RS Hyam, J Jeon, S Chae, YT Park, SJ Kim, B Lee, C Lee, D Choi , Plasmonic-Photonic Interference Coupling in Submicrometer Amorphous TiO₂-Ag Nanoarchitectures, *Langmuir*, Vol.33 (43), 2017, p. 12398-12403, Corresponding author
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- [57] Wook Kim, Dukhyun Choi, Design of Gear Train based Sliding Mode Triboelectric Nanogenerator, *J. Light Emitting Diodes*, Vol. 8, June 2016, p.27 ~ 34, Corresponding author
- [56] Handong Cho, Jonghyeon Jeong, Wook Kim, Dukhyun Choi, Sangmin Lee* and Woonbong Hwang*, Conformable superoleophobic surfaces with multi-scale structures on polymer substrates, *J. Mater. Chem. A*, Vol. 4(21), 2016, p.8272 ~ 8282, Co-author



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- [39] Do Hwan Kim, Hyo Sug Lee, Hyeon-Jin Shin, Yoon-Su Bae, Kang-Hyuck Lee, Sang-Woo Kim, Dukhyun Choi*, and Jae-Young Choi*, Graphene Surface Induced Specific Self-Assembly of Poly (3-hexylthiophene) for Nanohybrid Optoelectronics: From First-principles Calculation to Experimental Characterizations, *Soft Matter*, Vol 9(22),April 17, 2013, p 5355~5360, Co-authors
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