

원상민 (Sang Min Won)

전자전기공학부 (Department of Electrical and Computer Engineering)

Tel: +82 10 4300 6290

성균관 대학교 (Sungkyunkwan University)

sangminwon@gmail.com / sangminwon@skku.edu

주소: 서울시 강동구 고덕로 80 길 99, 고덕센트럴 아이파크 517 동 1401 호

QUALIFICATION & PROFILE

Dedicated, detailed-oriented Ph.D. electrical engineer with aptitude for research on complex engineering projects, as evidenced by successful development of new classes of flexible, stretchable, and implantable biomedical devices using advanced biocompatible materials and engineered structures. Current researches continue to advance the field in sensors/stimulator with unique applications in advanced biomedical and/or health monitoring system.

EDUCATION & EXPERIENCE

SUNGKYUNKWAN UNIVERSITY, SUWON, REPUBLIC OF KOREA

Assistant Professor in Department of Electrical and Computer Engineering,

2020 – present

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN, Champaign, IL, USA

Bachelor of Science in Electrical Engineering,

2005 - 2009

Master of Science in Electrical Engineering, (Advisor: John A. Rogers)

2009 - 2011

Doctor of Philosophy in Electrical Engineering, (Advisor: John A. Rogers)

2015 – 2019

Postdoctoral Researcher, (Advisor: John A. Rogers)

2019 – 2020

SK-HYNIX, Icheon, South Korea

Research & Development Division

Device & Process Integration Team

2011 – 2014

PUBLICATION

- [37] X. Yuan, et al., “Mechanics of encapsulated three-dimensional structures for simultaneous sensing of pressure and shear stress,” *Journal of the Mechanics and Physics of Solids*, 151, 104400 (2021).
- [36] [S. M. Won*](#), L. Cai*, P. Gutruf, J. A. Rogers, “Wireless, Battery-free Neurotechnologies for Neuroscience Research,” *Nature Biomedical Engineering*, DOI: 10.1038/s41551-021-00683-3 (2021).
- [35] Y. Park et al., “Three-dimensional, multifunctional neural interfaces for cortical spheroids and engineered assembloids,” *Science Advances*, 7, eabf9153 (2021).
- [34] W Bai et al., “Bioresorbable Multilayer Photonic Cavities as Temporary Implants for Tether-Free Measurements of Reginal Tissue Temperatures,” *BME Frontiers*, 8653218 (2021).
- [33] Y. Park et al., “Wireless, skin-interfaced sensors for compression therapy,” *Science Advances*, 6, eab1655 (2020).

- [32] E. Song*, J. Li*, [S. M. Won*](#), W. Bai*, J. A. Rogers, "Materials for Flexible Bioelectronic Systems as Chronic Neural Interfaces" *Nature Materials*, 19, 590-603 (2020). (***equally contributed**)
- [31] C.-H Chiang*, [S. M. Won*](#), A. L. Orsborn*, K. J. Yu*, M. Trumpis, B. Bent, Y. Xue, C. Wang, S. Min, V. Woods, C. Yu, B. H. Kim, S. B. Kim, R. Huq, J. Li, K. J. Seo, H. Fang, Y. Huang, K. Shepard, B. Pesaran, J. A. Rogers, J. Viventi, "Actively-Powered, Flexible, Kiloscale Devices for Long-Term, High Resolution Brain Recording," *Science Translational Medicine*, 12, eaay4682 (2020). (***equally contributed**)
- [30] [S. M. Won*](#), E. Song*, J. T. Reeder, J. A. Rogers, "Emerging Modalities and Implantable Technologies for Neuromodulation" *Cell*, 181, 115-135 (2020).
- [29] [S. M. Won*](#), H. Wang*, B. H. Kim*, K. Lee*, H. Jang, K. Kwon, K. E. Crawford, H. Li, Y. Lee, X. Yuan, S. B. Kim, Y. S. Oh, W. J. Jang, J. Y. Lee, J. Kim, S. Han, J. Kim, X. Wang, Z. Xie, Y. Zhang, Y. Huang, J. A. Rogers, "Multimodal Sensing with a Three-Dimensional Piezoresistive Structure," *ACS Nano*, 13, 10972-10979 (2019). (DOI: [10.1021/acsnano.9b02030](https://doi.org/10.1021/acsnano.9b02030))
- [28] E. Song, C.-H Chiang, R. Li, X. Jin, J. Zhao, M. Hill, Y. Xia, L. Li, Y. Huang, [S. M. Won](#), K. J. Yu, X. Sheng, H. Fang, M. A. Alam, Y. Huang, J. Viventi, J.-K. Chang, J. A. Rogers, "Flexible Electronic/Optoelectronic Microsystems with Scalable Designs for Chronic Bio-Integration," *Proceedings of the National Academy of Sciences USA*, 116, 15398 (2019).
- [27] J. Li, R. Li, H. Du, Y. Zhong, Y. Chen, K. Nan, [S. M. Won](#), J. Zhang, Y. Huang, J. A. Rogers, "Ultrathin, Transferred Layers of Metal Silicide as Faradaic Electrical Interfaces and Biofluid Barriers for Flexible Bioelectronic Implants," *ACS Nano*, 13, 660 (2019).
- [26] A. D. Mickle*, [S. M. Won*](#), K. N. Noh*, J. Yoon*, K. M. Meacham, Y. Xue, L. A. McIlvried, B. A. Copits, V. K. Samineni, K. E. Crawford, D. H. Kim, P. Srivastava, B. H. Kim, S. Min, Y. Shiuan, Y. Yoon, M. A. Payne, J. Zhang, H. Jang, Y. Li, H. H. Lai, Y. Huang, S. I. Park, R. W. Gereau, J. A. Rogers, "A Wireless Closed Loop System for Optogenetic Peripheral Neuromodulation," *Nature*, 565, 361 (2019). (***equally contributed**)
- [25] J. Shin, Y. Yan, W. Bai, Y. Xue, P. Gamble, L. Tian, I. Kandela, C. R. Haney, W. Spees, Y. Lee, M. Choi, J. Ko, H. Ryu, M. Pezhouh, S. K. Kang, [S. M. Won](#), K. J. Yu, J. Zhao, Y. K. Lee, M. R. MacEwan, S. K. Song, Y. Huang, W. Z. Ray, J. A. Rogers, "Bioresorbable Pressure Sensors with Thermally Grown Silicon Dioxide Biofluid Barriers for Monitoring of Chronic Diseases and Healing Processes," *Nature Biomedical Engineering*, 3, 37 (2019).
- [24] S. B. Kim, K. Lee, M. S. Raj, B. Lee, J. T. Reeder, J. Koo, A. Hourlier-Fargette, A. J. Bandonkar, [S. M. Won](#), Y. Sekine, J. Choi, Y. Zhang, J. Yoon, B. H. Kim, Y. Yun, S. Lee, J. Shin, J. Kim, R. Chaffari, J. A. Rogers, "Soft, Skin-Interfaced Microfluidic Systems with Wireless, Battery-Free Electronics for Digital, Real-Time Tracking of Sweat Loss and Electrolyte Composition," *Small*, 1802876 (2018).
- [23] B. H. Kim, F. Liu, Y. Liu, Y. Yu, H. Jang, Z. Xie, K. Li, J. Lee, J. Y. Jeong, A. Ryu, Y. Lee, D. H. Kim, X. Wang, K. Lee, J. Y. Lee, [S. M. Won](#), N. Oh, J. Kim, J. Y. Kim, S.-J. Jeong, K.-I. Jang, S. Lee, Y. Huang,

- Y. Zhang, J. A. Rogers, "Mechanically Guided Post-Assembly of 3D Electronic Systems," *Advanced Functional Material*, 1803149 (2018).
- [22] J. Koo, M.R. MacEwan, S.-K. Kang, [S. M. Won](#), M. Stephen, P. Gamble, Z. Xie, Y. Yan, Y.-Y. Chen, J. Shin, N. Birenbaum, S. Chung, J. Khalifeh, D.V. Harburg, K. Bean, S.B. Kim, M. Paskett, J. Kim, Z.S. Zohny, S.M. Lee, R. Zhang, K. Luo, B. Ji, A. Banks, H.M. Lee, Y. Huang, W.Z. Ray, J.A. Rogers "Wireless Bioresorbable Electronic System Enables Sustained Non-Pharmacologic Neuroregenerative Therapy," *Nature Medicine*, 24, 1830 (2018).
- [21] [S. M. Won*](#), J. Koo*, K. E. Crawford*, A. D. Mickle, Y. Xue, S. Min, L. A. McIlvried, Y. Yan, S. B. Kim, S. M. Lee, M. R. MacEwan, Y. Huang, R. W. Gereau, J. A. Rogers, "Natural Wax for Transient Electronics," *Advanced Functional Materials*, 28, 1801819 (2018).
- [20] [S. M. Won*](#), E. Song*, J. Zhao, J. Li, J. Rivnay, J. A. Rogers, "Recent Advances in Materials, Devices, and Systems for Neural Interfaces," *Advanced Materials*, 30, 1800534 (2018).
- [19] K. E. Crawford, Y. Ma, S. Krishnan, C. Wei, D. Carpuia, Y. Xue, S. Xu, Z. Xie, [S. M. Won](#), L. Tian, C. Webb, Y. Li, X. Feng, Y. Huang, J. A. Rogers, "Advanced approaches for quantitative characterization of thermal transport properties in soft materials using thin, conformable resistive sensors," *Extreme Mechanics Letters*, 22, 27 (2018).
- [18] B. H. Kim*, J. Lee*, [S. M. Won*](#), Z. Xie, J. K. Chang, Y. Yu, Y. K. Cho, H. Jang, J. Y. Jeong, Y. Lee, A. Ryu, D. H. Kim, K. H. Lee, J. Y. Lee, F. Liu, X. Wang, Q. Huo, S. Min, D. Wu, B. Ji, A. Banks, J. Kim, N. Oh, H. M. Jin, S. Han, D. Kang, C. H. Lee, Y. M. Song, Y. Zhang, Y. Huang, K. I. Jang and J. A. Rogers, "Three-Dimensional Silicon Electronic Systems Fabricated by Compressive Buckling Process," *ACS Nano*, 12, 4164 (2018). (***equally contributed**)
- [17] S. Han*, J. Kim*, [S. M. Won*](#), Y. Ma*, D. Kang, Z. Xie, K. T. Lee, H. U. Chung, A. Banks, S. Min, S. Y. Heo, C. R. Davies, J. W. Lee, C. H. Lee, B. H. Kim, K. Li, Y. Zhou, C. Wei, X. Feng, Y. Huang, J. A. Rogers, "Battery-free, Wireless Sensors for Full-Body Pressure and Temperature Mapping," *Science Translational Medicine*, 10, eaan4950 (2018). (***equally contributed**)
- [16] S. B. Kim, Y. Zhang, [S. M. Won](#), A. J. Bandodkar, Y. Sekine, Y. Xue, J. Koo, S. W. Harshman, J. A. Martin, J. M. Park, T. R. Ray, K. E. Crawford, K.T. Lee, J. Choi, R. L. Pitsch, C. C. Grigsby, A. J. Strang, Y. Y. Chen, S. Xu, J. Kim, A. Koh, J. S. Ha, Y. Huang, S. W. Kim, J. A. Rogers, "Super-Absorbent Polymer Valves and Colorimetric Chemistries for Time-Sequenced Discrete Sampling and Chloride Analysis of Sweat via Skin-Mounted Soft Microfluidics," *Small* 14, 1703334 (2018).
- [15] Y. R. Jeong, J. Kim, Z. Xie, Y. Xue, [S. M. Won](#), G. Lee, S. W. Jin, S. Y. Hong, X. Feng, Y. Huang, J. A. Rogers, J. S. Ha, "A Skin-Attachable, Stretchable Integrated System Based on Liquid GaInSn for Wireless Human Motion Monitoring with Multi-Site Sensing Capabilities," *NPG Asia Materials*, 9, e443 (2017).
- [14] G. Lee, S. K. Kang, [S. M. Won](#), P. Gutruf, Y. R. Jeong, J. Koo, S. S. Lee, J. A. Rogers and J. S. Ha, "Fully Biodegradable Microsupercapacitor for Power Storage in Transient Electronics," *Advanced Energy Materials*, 7, 1700157 (2017).

- [13] B. H. Kim, J. H. Kim, L. Persano, S. W. Hwang, S. Lee, J. Lee, Y. Yu, Y. Kang, [S. M. Won](#), J. Koo, Y. K. Cho, G. Hur, A. Banks, J. K. Song, P. Won, Y. M. Song, K. I. Jang, D. Kang, C.H. Lee, D. Pisignano and J. A. Rogers, "Dry Transient Electronic Systems by Use of Materials that Sublime," *Advanced Functional Materials*, 27, 1606008 (2017).
- [12] H. Fang, K. J. Yu, C. Gloschat, Z. Yang, E. Song, C. H. Chiang, J. Zhao, [S. M. Won](#), S. Xu, M. Trumpis, Y. Zhong, S. W. Han, Y. Xue, D. Xu, S. W. Choi, G. Cauwenberghs, M. Kay, Y. Huang, J. Viventi, I. R. Efimov and J.A. Rogers, "Capacitively Coupled Arrays of Multiplexed Flexible Silicon Transistors for Long-Term Cardiac Electrophysiology," *Nature Biomedical Engineering*, 1, 0038 (2017).
- [11] H. Fang, J. Zhao, K. J. Yu, E. Song, A. B. Farimanic, C. H. Chiang, X. Jin, Y. Xue, D. Xu, W. Dui, K. J. Seo, Y. Zhong, Z. Yang, [S. M. Won](#), G. Fang, S. W. Choi, S. Chaudhuri, Y. Huang, M. A. Alam, J. Viventi, N. R. Aluru and J. A. Rogers, "Ultra-thin, Transferred Layers of Thermally Grown Silicon Dioxide as Biofluid Barriers for Bio-Integrated Flexible Electronic Systems," *Proceedings of the National Academy of Sciences USA*, 113, 11682 (2016).
- [10] B. H. Kim, S. Nam, N. Oh, S. Y. Cho, K. J. Yu, C. H. Lee, J. Zhang, K. Deshpande, P. Trefonas, J. H. Kim, J. Lee, J. H. Shin, Y. Yu, J. B. Lim, [S. M. Won](#), Y. K. Cho, N. H. Kim, K. J. Seo, H. Lee, T. I. Kim, M. Shim and J. A. Rogers, "Multilayer Transfer Printing for Pixelated, Multicolor Quantum Dot Light-Emitting Diodes," *ACS Nano*, 10, 4920 (2016).
- [9] K. J. Yu, D. Kuzum, S. W. Hwang, B. H. Kim, H. Juul, N. H. Kim, [S. M. Won](#), K. Chiang, M. Trumpis, A. G. Richardson, H. Cheng, H. Fang, M. Thompson, H. Bink, D. Talos, K. J. Seo, H. N. Lee, S. K. Kang, J. H. Kim, J. Y. Lee, Y. Huang, F. E. Jensen, M. A. Dichter, T. H. Lucas, J. Viventi, B. Litt and J. A. Rogers, "Bioresorbable Silicon Electronics for Transient Spatiotemporal Mapping of Electrical Activity from the Cerebral Cortex," *Nature Materials*, 15, 782 (2016).
- [8] H. Jang, W. Lee, [S. M. Won](#), S.Y. Ryu, D. Lee, J.B. Koo, S.-D. Ahn, C.-W. Yang, M.-H. Jo, J.H. Cho, J.A. Rogers and J.-H. Ahn, "Quantum Confinement Effects in Transferrable Silicon Nanomembranes and Their Applications on Unusual Substrates," *Nano Letters*, 13, 5600 (2013).
- [7] S.-W. Hwang, H. Tao, D.-H. Kim, H. Cheng, J.-K. Song, E. Rill, M.A. Brenckle, B. Panilaitis, [S. M. Won](#), Y.-S. Kim, Y.M. Song, K.J. Yu, A. Ameen, R. Li, Y. Su, M. Yang, D.L. Kaplan, M.R. Zakin, M.J. Slepian, Y. Huang, F.G. Omenetto and J.A. Rogers, "A Physically Transient Form of Silicon Electronics," *Science*, 337, 1640 (2012).
- [6] [S. M. Won](#), H.-S. Kim, N. Lu, D.-G. Kim, C.D. Solar, T. Duenas, A. Ameen and J.A. Rogers, "Piezoresistive Strain Sensors and Multiplexed Arrays Using Assemblies of Single-Crystalline Silicon Nanoribbons on Plastic Substrates," *IEEE Transactions on Electron Devices*, 58, 4074 (2011).
- [5] D.-H. Kim, N. Lu, R. Ma, Y.-S. Kim, R.-H. Kim, S. Wang, J. Wu, [S. M. Won](#), H. Tao, A. Islam, K.J. Yu, T.-I. Kim, R. Chowdhury, M. Ying, L. Xu, M. Li, H.-J. Chung, H. Keum, M. McCormick, P. Liu, Y.-W. Zhang, F.G. Omenetto, Y. Huang, T. Coleman and J.A. Rogers, "Epidermal Electronics," *Science*, 333, 838 (2011).

- [4] H.-J. Chung, T.-I. Kim, H.-S. Kim, S.A. Wells, S. Jo, N. Ahmed, Y.H. Jung, [S. M. Won](#), C.A. Bower and J.A. Rogers, "Fabrication of Releasable Single-Crystal Silicon-Metal Oxide Field-Effect Devices and Their Deterministic Assembly on Foreign Substrates," *Advanced Functional Materials*, 21, 3029 (2011).
- [3] D.-H. Kim, N. Lu, R. Ghaffari, Y.-S. Kim, S. P. Lee, L. Xu, J. Wu, R.-H. Kim, J. Song, Z. Liu, J. Viventi, B. D. Graff, B. Elolampi, M. C. Mansour, M. J. Slepian, S. Hwang, J. D. Moss, [S. M. Won](#), Y. Huang, B. Litt, and J. A. Rogers, "Materials for Multifunctional Balloon Catheters With Capabilities in Cardiac Electrophysiological Mapping and Ablation Therapy," *Nature Materials*, 10, 316 (2011).
- [2] H.-S. Kim, [S. M. Won](#), Y.-G. Ha, J.-H. Ahn, A. Facchetti, T. J. Marks, J. A. Rogers., "Self-assembled Nanodielectrics and Silicon Nanomembranes for Low Voltage, Flexible Transistors, and Logic Gates on Plastic Substrates," *Applied Physics Letters*, 95, 183404 (2009).
- [1] T.-H. Kim, A. Carlson, J.-H. Ahn, [S. M. Won](#), S. Wang, Y. Huang and J. A. Rogers, "Kinetically Controlled, Adhesiveless Transfer Printing Using Microstructured Stamps," *Applied Physics Letters*, 94, 113502 (2009).

PATENT

- [3] J. A. Rogers, S. Han, [S. M. Won](#), J. Kim, "Wireless surface mountable sensors and actuators," **US20210127975A1** (US Patent) (2021)
- [2] [S. M. Won](#), "Semiconductor device and method for forming the same," **US9397044B2** (US Patent) (2016)
- [1] [S. M. Won](#), "Semiconductor device and method for manufacturing," **US8809960B2** (US Patent) (2014)