

# Sungkyu Kim, Ph. D.

Assistant Professor

Department of Nanotechnology & Advanced Materials Engineering

Sejong University

(05006) 209, Neungdong-ro, Gwangjin-gu, Seoul

E-mail: sungkyu@sejong.ac.kr; gamjadori84@gmail.com

## Education

---

**Ph.D., Department of Materials Science and Engineering (Semiconductor Technology Educational Program), Korea Advanced Institute of Science and Technology (KAIST), Korea (Sep. 2012 – Aug. 2016)**

- Dissertation title: Electron microscopy observation of resistive switching mechanism in graphene oxide memory
- Thesis advisor: Prof. Jeong Yong Lee

**M.S., Department of Materials Science and Engineering (Semiconductor Technology Educational Program), Korea Advanced Institute of Science and Technology (KAIST), Korea (Sep. 2010 – Aug. 2012)**

- Dissertation title: Effects of metal electrodes on graphene oxide thin film based resistive switching memory
- Thesis advisor: Prof. Jeong Yong Lee

**B.S., School of Advanced Materials Science and Engineering, Sungkyunkwan University, Korea (Mar. 2003 – Feb. 2010)**

## Professional Experience

---

**Postdoctoral associate., Department of Mechanical Engineering, Massachusetts Institute of Technology, United States (Oct. 2018 – Dec. 2019)**

- Advisor: Prof. Jeehwan Kim

**Postdoctoral researcher., Center for Functional Nanomaterials, Brookhaven National Laboratory, United States (Jun. 2018 – Sep. 2018)**

- Advisor: Prof. Dong Su

**Postdoctoral researcher., Department of Materials Science and Engineering, Clemson University, United States (May 2018 – Sep. 2018)**

- Advisor: Prof. Kai He

**Postdoctoral researcher., Department of Materials Science and Engineering and NUANCE Center, Northwestern University, United States (Sep. 2016 – Apr. 2018)**

- Advisor: Prof. Kai He and Prof. Vinayak P. Dravid

## Publications (\* equally contributed)

---

1. H. Kum\*, H. Lee\*, **S. Kim\***, S. Lindemann\*, R. Bliem, W. Kong, K. Qiao, P. Chen, S. Subramanian, L. Ranno, S. Seo, J. Irwin, S.-H. Bae, H. Le, K. Lee, M. S. Rzechowski, J. A. Robinson, B. Yildiz, C.-B. Eom, J. Kim, “Heterogeneous integration of freestanding epitaxial complex-oxide membranes”, *Nature* 578, 75-81 (2020) (\* equally contributed)
2. S.-H. Bae\*, K. Lu\*, Y. Han\*, **S. Kim\***, K. Qiao, C. Choi, Y. Nie, H. Kim, H. Kum, P. Chen, W. Kong, B.-S. Kang, J. Song, Y. Baek, M. Joo, J. Park, D. Muller, K. Lee, J. Kim, “Graphene allows spontaneous for a new pathway of releasing strain energy in heteroepitaxy”, *Nature Nanotechnology* (2020) (\* equally contributed)
3. **S. Kim**, J. Cui, V. P. Dravid, K. He, “Orientation-dependent intercalation channels for lithium and sodium in black phosphorus”, *Advanced Materials* 31(46), 1904623 (2019)
4. J. Gao, Y. Meng, T. Hong, **S. Kim**, S. Lee, K. He, K. S. Brinkman, “Rational anode design for protonic ceramic fuel cells by a one-step phase inversion method”, *Journal of Power Sources* 418, 162-166 (2019)
5. **S. Kim**, G. Evmenenko, Y. Xu, D. B. Buchholz, M. Bedzyk, K. He, J. Wu, V. P. Dravid, “Thin film RuO<sub>2</sub> lithiation: fast lithium-ion diffusion along the interface”, *Advanced Functional Materials* 28(52), 1805723 (2018)
6. **S. Kim**, Z. Yao, J.-M. Lim, M. C. Hersam, C. Wolverton, V. P. Dravid, K. He, “Atomic-scale observation of electrochemically reversible phase transformations in SnSe<sub>2</sub> single crystals”, *Advanced Materials - frontispiece article* 30(51), 1804925 (2018)
7. **S. Kim**, H. J. Jung, J. C. Kim, K.-S. Lee, S. S. Park, V. P. Dravid, K. He, H. Y. Jeong, “In situ observation of resistive switching in an asymmetric graphene oxide bilayer structure”, *ACS Nano* 12(7), 7335-7342 (2018)
8. H. J. Jung, D. Kim, **S. Kim**, J. Park, V. P. Dravid, B. Shin, “Stability of halide perovskite solar cell devices: In situ observation of oxygen diffusion under biasing”, *Advanced Materials* 30(39), 1802769 (2018)
9. B. C. Jang\*, **S. Kim\***, S. Y. Yang\*, J. Park, J. Choi, S. G. Im, V. P. Dravid, S.-Y. Choi, “Polymer analogue memristive synapse with atomic-scale conductive filament for flexible neuromorphic computing system”, *Nano Letters* 19(2), 839-849 (2018) (contributed equally to this work)
10. C. villa\*, **S. Kim\***, Y. Lu, J. Wu, V. P. Dravid, “Cu-substituted NiF<sub>2</sub> as cathode material for Li-ion Batteries”, *ACS Applied Materials & Interfaces* 11(1), 647-654 (2019) (contributed equally to this work)
11. H. Kang\*, **S. Kim\***, D. S. H. Wong, H. J. Jung, S. Lim, K. Zou, R. Li, G. Li, V. P. Dravid, L. Bian, “Remote Manipulation of Ligand Nano-Oscillations Regulates Adhesion and Polarization of Macrophages In Vivo” *Nano Letters* 17(10), 6415-6427 (2017) (contributed equally to this work)
12. **S. Kim**, J. Y. Kim, B. C. Jang, M. S. Cho, S.-Y. Choi, J. Y. Lee, and H. Y. Jeong, “Conductive graphitic channel in graphene oxide-based memristive devices,” *Advanced Functional Materials - back cover article* 26(41), 7406-7414 (2016)
13. **S. Kim**, J.Y. Kim, S.-Y. Choi, J.Y. Lee, and H.Y. Jeong, “Direct observation of conducting nanofilaments in graphene-oxide-resistive switching memory,” *Advanced Functional Materials -inside cover article* 25(43), 6710-6715 (2015)

14. J. Gao, Y. Meng, T. Hong, **S. Kim**, S. Lee, K. He, K. S. Brinkman, "Rational anode design for protonic ceramic fuel cells by a one-step phase inversion method", *Journal of Power Sources* 418, 162-166 (2019)
15. H. J. Jung, D. Kim, **S. Kim**, J. Park, V. P. Dravid, B. Shin, "Stability of halide perovskite solar cell devices: In situ observation of oxygen diffusion under biasing", *Advanced Materials* 30(39), 1802769 (2018)
16. V. Nandvana, R. Zhao, J. Mohapatra, **S. Kim**, P. V. Prasad, V. P. Dravid, "Exchange coupling in soft magnetic nanostructures and its direct effect on their theranostic properties", *ACS Applied Materials & Interfaces* 10(32), 27233-27243 (2018)
17. H. Kang, H. J. Jung, **S. Kim**, D. S. H. Wong, S. Lin, G. Li, V. P. Dravid, L. Bian, "Magnetic Manipulation of Reversible Nanocaging Controls In Vivo Adhesion and Polarization of Macrophages", *ACS Nano* 12(6), 5978-5994 (2018)
18. H. Kang\*, H. J. Jung\*, D. S. H. Wong, **S. Kim**, S. Lin, K. F. Chan, L. Zhang, G. Li, V. P. Dravid, L. Bian, "Remote Control of Heterodimeric Magnetic Nanoswitch Regulates the Adhesion and Differentiation of Stem Cells", *Journal of the American Chemical Society* 140(18), 5909-5913 (2018) (contributed equally to this work)
19. A. A. Murthy, T. K. Stanev, J. D. Cain, S. Hao, T. LaMountain, **S. Kim**, N. Speiser, K. Watanabe, T. Taniguchi, C. Wolverton, N. P. Stern, V. P. Dravid, "Intrinsic transport in 2D heterostructures mediated through h-BN tunneling contacts", *Nano Letters* 18(5), 2990-2998 (2018)
20. H. Kang, E. S. H. Wong, X. Yan, H. J. Jung, **S. Kim**, S. Lin, K. Wei, G. Li, V. P. Dravid, L. Bian, "Remote control of multimodal nanoscale ligand oscillations regulates stem cell adhesion and differentiation", *ACS Nano* 11(10), 9636-9649 (2017)
21. B. C. Jang, S. Y. Yang, H. Seong, **S. Kim**, J. Choi, S. G. Im, S.-Y. Choi, "Zero-static-power nonvolatile logic-in-memory circuits for flexible electronics", *Nano Research* 10(7), 2459-2470 (2017)
22. D.-H. Im, Y. I. Kim, M. Jeong, K. W. Park, **S. Kim**, J. M. Yuk, W. H. Nam, S. Y. Kim, K.-S. Lee, K.-V. Im, H. Lim, J. Y. Lee, "Annihilation behavior of planar defects on phosphorus-doped silicon at low temperatures", *Journal of Nanoscience and Nanotechnology* 17: 3370 (2017)
23. H. Park, K. R. Yoon, **S. Kim**, I.-D. Kim, J. Jin, Y. H. Kim, B.-S. Bae, "Highly conducting In<sub>2</sub>O<sub>3</sub> nanowire network with passivating ZrO<sub>2</sub> thin film for solution-processed field effect transistors", *Advanced Electronic Materials* 2(11), 1600218 (2016)
24. M. Aouassa, I. Jadil, A. Bandyopadhyay, **S. Kim**, I. Karaman, J. Y. Lee, "Mn-doped Ge self-assembled quantum dots via dewetting of thin films", *Applied Surface Science* 397: 40 (2016)
25. J. Jeong, J. E. Choi, Y.-J. Kim, S. Hwang, **S. Kim**, J. K. Kim, H. Y. Jeong, and Y. J. Hong. "Reverse-bias-driven dichromatic electroluminescence of n-ZnO wire arrays/p-GaN film heterojunction light-emitting diodes," *Applied Physics Letters* 109: 101103 (2016)
26. B. C. Jang, H. Seong, **S. Kim**, J. Y. Kim, B. J. Koo, J. Choi, S. Y. Yang, S. G. Im, and S.-Y. Choi, "Flexible nonvolatile polymer memory array on plastic substrate via initiated chemical vapor deposition," *ACS Applied Materials & Interfaces* 8: 12951 (2016)
27. C.-M. Choi, Y.-T. Oh, K.-J. Kim, J.-S. Park, H. Sukegawa, S. Mitani, **S. Kim**, J. Y. Lee, and Y.-H. Song, "Temperature dependence of reliability characteristics for magnetic tunnel junctions with a thin MgO dielectric film," *Semiconductor Science and Technology* 31: 075004 (2016)

28. J. S. Heo, J.-W. Jo, J. Kang, C.-Y. Jeong, H. Y. Jeong, **S. Kim**, K. Kim, H.-I. Kwon, J. Kim, Y.-H. Kim, M.-G. Kim, and S. K. Park, "Water-mediated photochemical treatment for the low-temperature passivation of metal-oxide thin-film transistors," *ACS Applied Materials & Interfaces* 8: 10403 (2016)
29. B.C. Jang, H. Seong, J.Y. Kim, B.J. Koo, **S. Kim**, S.Y. Yang, S.G. Im, and S.-Y. Choi, "Ultra-low power, highly uniform polymer memory by inserted multilayer graphene electrode," *2D Materials* 2: 044013 (2015)
30. W.I. Park, J.M. Yoon, M. Park, J. Lee, **S. Kim**, J.W. Jeong, K. Kim, H.Y. Jeong, S. Jeon, K.S. No, J.Y. Lee, and Y.S. Jung, "Self-assembly-induced formation of high-density silicon oxide memristor nanostructures on graphene and metal electrodes," *Nano Letters* 12: 1235 (2012)
31. S. Kim, H.Y. Jeong, **S. Kim**, S.-Y. Choi, and K.J. Lee, "Flexible memristive memory array on plastic substrates," *Nano Letters* 11: 5438 (2011)
32. H.Y. Jeong, **S. Kim**, J.Y. Lee, and S.-Y. Choi, "Role of interface reaction on resistive switching of metal/amorphous TiO<sub>2</sub>/Al RRAM devices," *Journal of The Electrochemical Society* 158: H979 (2011)
33. H.Y. Jeong, **S. Kim**, J.Y. Lee, and S.-Y. Choi, "Impact of amorphous titanium oxide film on the device stability of Al/TiO<sub>2</sub>/Al resistive memory," *Applied Physics A: Materials Science & Processing* 102: 967 (2011)

### Selected Presentations

---

1. **S. Kim**, V. P. Dravid, K. He, "In situ atomic-scale TEM observation of phase transformation in two-dimensional SnSe<sub>2</sub> single crystals", Microscopy and Microanalysis (2018)
2. K. He, **S. Kim**, S. Hwang, D. Su, "Panoramic visualization of lithiation of copper sulfide by in situ STEM", Microscopy and Microanalysis (2018)
3. **S. Kim**, J. C. Kim, and H. Y. Jeong, "Direct observation of oxygen movement in graphene oxide-based resistive switching memory", Microscopy and Microanalysis (2017)
4. **S. Kim**, V. P. Dravid, K. He, "In situ observation of structural change in single-crystalline LiFePO<sub>4</sub> nanoflakes during electrochemical cycling", Microscopy and Microanalysis (2017)
5. H. J. Jung, D. Kim, **S. Kim**, B. shin, V. P. Dravid, "Operando injection of oxygen ions to organometal halide perovskite (CH<sub>3</sub>NH<sub>3</sub>PM<sub>3</sub>) under in-situ electrical biasing STEM-EELS", Microscopy and Microanalysis (2017)
6. **S. Kim**, J.Y. Lee, and H.Y. Jeong, "Direct observation of conducting path with highly reduced graphene oxide in Au/GO/Al resistive switching memory," Microscopy and Microanalysis 2016 Meeting, Columbus, Ohio (Jul. 2016)
7. **S. Kim**, J.Y. Lee, and H.Y. Jeong, "Conducting nano-filaments in Au/graphene oxide/Al RRAM," 2015 MRS Fall Meeting, Boston, MA (Nov. 2015)
8. **S. Kim**, J.Y. Lee, and H.Y. Jeong, "Resistive switching characteristics in asymmetric reduced graphene oxide/graphene oxide bilayers," IUMRS-ICAM 2015, Jeju, Korea (Oct. 2015)
9. B.C. Jang, H. Seong, J.Y. Kim, B.J. Koo, **S. Kim**, S.Y. Yang, S.G. Im, and S.-Y. Choi, "Highly uniform and reliable polymer memory vis iCVD using multilayer graphene barrier electrode," Graphene 2015, Bilbao, Spain (Mar. 2015)
10. **S. Kim**, J.Y. Kim, S.-Y. Choi, J.Y. Lee, and H.Y. Jeong, "Direct observation of microscopic origin of bipolar resistive switching in graphene oxide thin films using transmission electron microscopy" NVMTS 2014, Jeju, Korea (Oct. 2014)
11. **S. Kim**, J.Y. Kim, H.Y. Jeong, S.-Y. Choi, and J.Y. Lee, "Effects of metal electrodes on graphene oxide thin film based resistive switching memory" 2014 MRS Spring Meeting, San Francisco, CA (Apr. 2014)