

Seung Sae Hong

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Education

Stanford University, Stanford, CA
PhD in Applied Physics (2014)
Dissertation: *Electronic transport in topological insulator nanostructures*

Seoul National University, Seoul, Korea
BS in Physics (minor in Electrical Engineering), *summa cum laude* (2007)
Thesis: *Demonstration and calibration of NEMS torsional resonators combined with carbon nanotubes*

Research Interests

Materials physics: Complex oxide heterostructures and interfaces; Low-dimensional quantum materials; Correlated electronic systems in the reduced dimension; Nanomaterials and devices for energy applications

Research Positions

UC Davis	Assistant Professor, Materials Science and Engineering	(2020 – present)
Stanford University	Postdoctoral Research Scholar (Advisor: Harold Hwang)	(2014 – 2019)
Stanford University	Graduate Research Assistant (Advisor: Yi Cui)	(2007 – 2013)
Seoul National University	Undergraduate Research Assistant	(2006 – 2007)

Professional Activities

Member of American Physical Society (APS), Materials Research Society (MRS)
Journal reviewer for Nano Letters, Nature Communications, Nature Nanotechnology, Science Advances, Scientific Reports, Physics Review Materials, APL journals, ACS journals.

Awards

National Science Foundation CAREER award (2021)
Advancing Scientific Careers in Nuclear Technology Faculty award (2021)
Graduate Student Award Gold medal, Materials Research Society (2012)

Teaching/Outreach

UC Davis	Instructor, EMS 172 Smart Materials (2020)
UC Davis	Instructor/course design, EMS 170L Sustainable Energy Technology Lab (2020-2022)
UC Davis	Instructor, EMS 162 Structure and Characterization of Engineering Materials (2020, 2022)
UC Davis	Mentor, AvenueE program for transfer students
UC Davis	Advising seven graduate/undergraduate students

Stanford University Advised/trained six graduate students during PhD/Postdoctoral periods
Stanford University Teaching assistant, Physics 42 Classical Mechanics Lab (2013)
Stanford University Tutoring staff, Physics tutoring center (2013)

Publications

33. *Stabilization of $Sr_3Al_2O_6$ growth templates for ex situ synthesis of freestanding crystalline oxide membranes*
D. Li, C. Adamo, B. Y. Wang, H. Yoon, Z. Chen, S. S. Hong, D. Lu, Y. Cui, Y. Hikita, & H. Y. Hwang
Nano Letters, 21, 4454 (2021).

32. *Strain gradient elasticity in $SrTiO_3$ membranes: bending versus stretching*
V. Harbola, S. Crossley, S. S. Hong, D. Lu, Y. A. Birkhölzer, Y. Hikita, & H. Y. Hwang
Nano Letters, 21, 2470 (2021).

31. *Strain-induced room-temperature ferroelectricity in $SrTiO_3$ membranes*
R. Xu, J. Huang, E. Barnard, S. S. Hong, P. Singh, E. Wong, T. Jansen, V. Harbola, J. Xiao, B. Y. Wang, S. Crossley, D. Lu, S. Liu, & H. Y. Hwang
Nature Communications, 11, 3141 (2020).

30. *Extreme tensile strain states in $La_{0.7}Ca_{0.3}MnO_3$ membranes*
S. S. Hong, M. Gu, M. Verma, V. Harbola, B. Y. Wang, D. Lu, A. Vailionis, Y. Hikita, R. Pentcheva, J. M. Rondinelli, & H. Y. Hwang
Science, 368, 71 (2020).

29. *Freestanding crystalline $YBa_2Cu_3O_{7-x}$ heterostructure membranes*
Z. Chen, B. Y. Wang, B. H. Goodge, D. Lu, S. S. Hong, D. Li, Y. Hikita, L. F. Kourkoutis, & H. Y. Hwang
Physical Review Materials, 3, 060801 (2019).

28. *Large-area crystalline $BaSnO_3$ membranes with high electron mobilities*
P. Singh, A. Swartz, D. Lu, S. S. Hong, K. Lee, A. F. Marshall, K. Nishio, Y. Hikita, & H. Y. Hwang
ACS Applied Electronic Materials, 1, 1269 (2019).

27. *Delta-doped $SrTiO_3$ top-gated field effect transistor*
H. Inoue, H. Yoon, T. A. Merz, A. G. Swartz, S. S. Hong, Y. Hikita, & H. Y. Hwang
Applied Physics Letters, 114, 231605 (2019).

26. *Two-dimensional limit of crystalline order in perovskite membrane films*
S. S. Hong, J. H. Yu, D. Lu, A. F. Marshall, Y. Hikita, Y. Cui, & H. Y. Hwang
Science Advances, 3, eaao5173 (2017).

25. *Synthesis of freestanding single-crystal perovskite films and heterostructures by etching of sacrificial water-soluble layers*
D. Lu, D. J. Baek, S. S. Hong, L. F. Kourkoutis, Y. Hikita, & H. Y. Hwang
Nature Materials, 15, 1255 (2016).

24. *Lateral and vertical two-dimensional layered topological insulator heterostructures*
Y. Li, J. Zhang, G. Zheng, Y. Sun, S. S. Hong, F. Xiong, S. Wang, H. R. Lee, & Y. Cui
ACS Nano, 9, 10916 (2015).

23. *Topological insulator nanostructures*
S. S. Hong & Y. Cui

Book chapter in *Topological Insulators*, John Wiley & Sons (2015).

22. *Vertical heterostructure of two-dimensional MoS₂ and WSe₂ with vertically aligned layers*
J. H. Yu, H. R. Lee, S. S. Hong, D. Kong, H.-W. Lee, H. Wang, F. Xiong, S. Wang, & Y. Cui
Nano Letters, 15, 1031 (2015).

21. *Physical and chemical tuning of two-dimensional transition metal dichalcogenides*
H. Wang, H. Yuan, S. S. Hong, Y. Li, & Y. Cui
Chemical Society Reviews, 44, 2664 (2015).

20. *Topological insulator nanostructures*
S. S. Hong, D. Kong, & Y. Cui
MRS Bulletin, 39, 873 (2014).

19. *One-dimensional helical transport in topological insulator nanowire interferometers*
S. S. Hong, Y. Zhang, J. J. Cha, X.-L. Qi, & Y. Cui
Nano Letters, 14, 2815 (2014).

18. *Ambipolar field effect in Sb-doped Bi₂Se₃ nanoplates by solvothermal synthesis*
D. Kong, K. J. Koski, J. J. Cha, S. S. Hong, & Y. Cui
Nano Letters, 13, 632 (2013).

17. *Progress, challenges, and opportunities in two-dimensional materials beyond graphene*
S. Z. Butler, S. M. Hollen, L. Cao, Y. Cui, J. A. Gupta, H. R. Gutiérrez, T. F. Heinz, S. S. Hong, J. Huang, A. F. Ismach, E. Johnston-Halperin, M. Kuno, V. V. Plashnitsa, R. D. Robinson, R. S. Ruoff, S. Salahuddin, J. Shan, L. Shi, M. G. Spencer, M. Terrones, W. Windl, & J. E. Goldberger
ACS Nano, 7, 2898 (2013).

16. *Silicon nanowires and related nanostructures as lithium-ion battery anodes*
L. Hu, L. Cui, S. S. Hong, J. McDonough, & Y. Cui
Book chapter in *Silicon and Silicide Nanowires*, Pan Stanford Publishing (2013).

15. *Unconventional Josephson effect in hybrid superconductor-topological insulator devices*
J. R. Williams, A. J. Bestwick, P. Gallagher, S. S. Hong, Y. Cui, A. S. Bleich, J. G. Analytis, I. R. Fisher, & D. Goldhaber-Gordon
Physical Review Letters, 109, 056803 (2012).

14. *Ultra-low carrier concentration and surface dominant transport in antimony-doped Bi₂Se₃ topological insulator nanoribbons*
S. S. Hong, J. J. Cha, D. Kong, & Y. Cui
Nature Communications, 3, 757 (2012).

13. *Effects of magnetic doping on weak antilocalization in narrow Bi₂Se₃ nanoribbons*
J. J. Cha, M. Claassen, D. Kong, S. S. Hong, K. J. Koski, X.-L. Qi, & Y. Cui
Nano Letters, 12, 4355 (2012).

12. *Weak antilocalization in Bi₂(Se_xTe_{1-x})₃ nanoribbons and nanoplates*
J. J. Cha, D. Kong, S. S. Hong, J. G. Analytis, K. Lai, & Y. Cui
Nano Letters, 12, 1107 (2012).

11. *In situ X-ray diffraction studies of (De)lithiation mechanism in silicon nanowire anodes*

S. Misra, N. Liu, J. Nelson, S. S. Hong, Y. Cui, & M. F. Toney
ACS Nano, 6, 5465 (2012).

10. *Ambipolar field effect in the ternary topological insulator $(\text{Bi}_x\text{Sb}_{1-x})_2\text{Te}_3$ by composition tuning*
D. Kong, Y. Chen, J. J. Cha, Q. Zhang, J. G. Analytis, K. Lai, Z. Liu, S. S. Hong, K. J. Koski, S. K. Mo, Z. Hussain, I. R. Fisher, Z. X. Shen, & Y. Cui
Nature Nanotechnology, 6, 705 (2011).

9. *Hollow carbon nanofiber-encapsulated sulfur cathodes for high specific capacity rechargeable lithium batteries*
G. Zheng, Y. Yang, J. J. Cha, S. S. Hong, & Y. Cui
Nano Letters, 11, 4462 (2011).

8. *One nanometer resolution electrical probe via atomic metal filament formation*
S. S. Hong, J. J. Cha, & Y. Cui
Nano Letters, 11, 231 (2010).

7. *Ultrathin topological insulator Bi_2Se_3 nanoribbons exfoliated by atomic force microscopy*
S. S. Hong, W. Kundhikanjana, J. J. Cha, K. Lai, D. Kong, S. Meister, M. A. Kelly, Z. Shen, & Y. Cui
Nano Letters, 10, 3118 (2010).

6. *New nanostructured Li_2S /silicon rechargeable battery with high specific energy*
Y. Yang, M. T. McDowell, A. Jackson, J. J. Cha, S. S. Hong, & Y. Cui
Nano Letters, 10, 1486 (2010).

5. *Si nanoparticle-decorated Si nanowire networks for Li-ion battery anodes*
L. Hu, H. Wu, S. S. Hong, L. Cui, J. R. McDonough, S. Bohy, & Y. Cui
Chemical Communications, 47, 367 (2010).

4. *Impedance analysis of silicon nanowire lithium ion battery anodes*
R. Ruffo, S. S. Hong, C. K. Chan, R. A. Huggins, & Y. Cui
Journal of Physical Chemistry C, 113, 11390 (2009).

3. *Surface chemistry and morphology of the solid electrolyte interphase on silicon nanowire lithium-ion battery anodes*
C. K. Chan, R. Ruffo, S. S. Hong, & Y. Cui
Journal of Power Sources, 189, 1132 (2009).

2. *Structural and electrochemical study of the reaction of lithium with silicon nanowires*
C. K. Chan, R. Ruffo, S. S. Hong, R. A. Huggins, & Y. Cui
Journal of Power Sources, 189, 34 (2009).

1. *High-frequency micromechanical resonators from aluminum-carbon nanotube nanolaminates*
J. H. Bak, Y. D. Kim, S. S. Hong, B. Y. Lee, S. R. Lee, J. H. Jang, M. Kim, K. Char, S. Hong, & Y. D. Park
Nature Materials, 7, 459 (2008).

Invited talks

16. *Extreme tensile strain states in complex oxide membranes*
Electronic Materials and Applications (EMA) 2022, Orlando, FL, January 2022

15. *Extreme tensile strain states in complex oxide membranes*
12th International Conference on Advanced Materials and Devices, Jeju, Korea, December 2021
14. *Freestanding crystalline oxide membranes and heterostructures*
Epitaxy on 2D materials for layer release and their applications, online, June 2021
13. *Extreme tensile strain states in magnetic oxide membranes*
American Physical Society March meeting, online, March 2021
12. *Designing Low-dimensional Quantum Materials*
University of Tennessee, Knoxville, TN, February 2021
11. *Freestanding crystalline oxide membranes and heterostructures*
47th Conference on the Physics and Chemistry of Surfaces and Interfaces, Boulder, CO, January 2020
10. *Freestanding crystalline oxide membranes and heterostructures*
19th International Conference on Crystal Growth and Epitaxy, Keystone, CO, July 2019
9. *Complex oxide membranes: More freedom for artificial materials*
University of California, Davis, Davis, CA, May 2019
8. *Complex oxide membranes: More freedom for artificial materials*
University of Nebraska-Lincoln, Lincoln, NE, March 2019
7. *Complex oxide membranes: More freedom for artificial materials*
College of William and Mary, Williamsburg, VA, January 2019
6. *Extreme strain design to control electromagnetism in complex oxide membranes*
ALS User Meeting Workshop, Berkeley, CA, October 2018
5. *Complex oxide membranes: stretching the boundary of quantum materials*
Geballe Laboratory for Advanced Materials student seminar, Stanford, CA, April 2018
4. *Electronic transport in topological insulator nanostructures*
US-Korea Conference 2014, San Francisco, CA, July 2014
3. *Electronic transport in topological insulator nanostructures*
Seoul National University, Seoul, Korea, February 2014
2. *Topological insulator nanostructures: material design toward a new quantum device*
Energy Materials Nanotechnology meeting, Houston, TX, January 2013
1. *Topological insulator nanostructures*
2D Materials Beyond Graphene Workshop, Columbus, OH, August 2012