# Sangwoo Shin


**Contact Information**

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**Current Position**

**University at Buffalo, The State University of New York**, Buffalo, NY

**Assistant Professor**, Department of Mechanical and Aerospace Engineering

**Education**

**Yonsei University**, Seoul, Korea

Ph.D., Mechanical Engineering, 2012

- Heat/mass transfer, Energy management, Nanomaterials, Nanofluidics
- Thesis: *Thermal Management of Energy Devices using Nanostructured Materials*
- Advisor: Hyung Hee Cho

B.S., Mechanical Engineering, 2005

**Professional Experience**

**Assistant Professor** 2021–current
Department of Mechanical and Aerospace Engineering,
University at Buffalo, The State University of New York

**Assistant Professor** 2017–2021
Department of Mechanical Engineering,
University of Hawaii at Manoa

**Postdoctoral Research Associate** 2013–2016
Department of Mechanical and Aerospace Engineering,
Princeton University (Supervisor: Howard A. Stone)

**Postdoctoral Research Associate** 2012–2013
Low Observable Research Center,
Yonsei University (Supervisor: Hyung Hee Cho)

**Refereed Journal Publications**

**Google Scholar profile:** https://scholar.google.com/citations?user=ZNZtyqcAAAAJ
(* denotes equal contribution; underline denotes advisees)

1. V. S. Doan & **S. Shin**, Formation of a colloidal band via pH-dependent electrokinetics, *Electrophoresis*, **42** 2356–2364 (2021).
2. V. S. Doan, S. G. Chun, J. Feng, & **S. Shin**, Confinement-dependent diffusiophoretic transport of nanoparticles in collagen hydrogels, *Nano Lett.*, **21** 7625–7630 (2021).
3. S. Yasmeen, J. Yoon, C. H. Moon, R. Khan, H. Gaiji, **S. Shin**, I.-K. Oh & H.-B.-R. Lee, Self-formation of superhydrophobic surfaces through interfacial energy engineering between liquid and particles, *Langmuir*, **37** 5356–5363 (2021).
4. S. w. Park, H. Yoon, J. Lee & **S. Shin**, Microfluidic investigation of salinity-induced oil transport in porous media during chemical flooding, *Energy Fuels*, **35** 4885–4892 (2021).
5. T.-H. Kim, M. Cho & **S. Shin**, Constrained mixed-variable design optimization based on particle swarm optimizer with a diversity classifier for cyclically neighboring subpopulations, *Mathematics*, **8** 2016 (2020).

6. V. S. Doan, P. Saingam, T. Yan & **S. Shin**, A trace amount of surfactants enables diffusiophoretic swimming of bacteria, *ACS Nano*, **14** 14219–14227 (2020).

7. **S. Shin**, Diffusiophoretic separation of colloids in microfluidic flows, *Phys. Fluids*, **32** 101302 (2020). *(Invited)*

8. V. Kumar, **S. Shin** & J. Feng, Light-induced explosion of lipid vesicles, *Soft Matter*, **16** 8904–8911 (2020).

9. T. J. Shimokusu, V, G. Maybruck, J. T. Ault & **S. Shin**, Colloid separation by $CO_2$-induced diffusiophoresis, *Langmuir*, **36** 7032–7038 (2020). *(Invited)*

10. **S. Shin**, J. T. Ault, K. Toda-Peters & A. Q. Shen, Particle trapping in merging flow junctions by fluid–solute–colloid–boundary interactions, *Phys. Rev. Fluids*, **5** 024304 (2020).

11. **S. Shin**, V. S. Doan & J. Feng, Osmotic delivery and release of lipid-encapsulated molecules via sequential solution exchange, *Phys. Rev. Appl.*, **12** 024014 (2019).

12. S. Battat, J. T. Ault, **S. Shin**, S. Khodaparast & H. A. Stone, Particle entrainment in dead-end pores by diffusiophoresis, *Soft Matter*, **15** 3879–3885 (2019).

13. J. T. Ault, **S. Shin** & H. A. Stone, Characterization of surface-solute interactions by diffusioosmosis, *Soft Matter*, **15** 1582–1596 (2019).

14. P. B. Warren, **S. Shin** & H. A. Stone, Diffusiophoresis in ionic surfactants: effect of micellization, *Soft Matter*, **15** 278–288 (2019).

15. J. T. Ault, **S. Shin** & H. A. Stone, Diffusiophoresis of colloidal particles in narrow channel flows, *J. Fluid Mech.*, **854**, 420–448 (2018).

16. **S. Shin***, G. Choi*, B. Rallabandi, D. Lee, D. I. Shim, B. S. Kim, K. M. Kim & H. H. Cho, Enhanced boiling heat transfer using self-actuated nano-bimorphs, *Nano Lett.*, **18**, 6392–6396 (2018). *(Featured in* ***Phys.org****.)*

17. F. Yang, **S. Shin** & H. A. Stone, Diffusiophoresis of a charged drop, *J. Fluid Mech.* **852**, 37–59 (2018).

18. Z. Zheng*, M. A. Fontelos*, **S. Shin** & H. A. Stone, Universality in the nonlinear leveling of capillary films, *Phys. Rev. Fluids (Rapid Commun.)* **9** 032001(R) (2018).

19. **S. Shin**, P. B. Warren & H. A. Stone, Cleaning by surfactant gradients: Particulate removal from porous materials and the significance of rinsing in fabric cleaning, *Phys. Rev. Appl.* **9** 034012 (2018). *(Featured in* ***Physics****,* ***Cosmos****,* ***Physics World****,* ***New Scientist****.)*

20. N. A. Hynson, K. L. Frank, R. A. Alegado, A. S. Amend, M. Arif, G. M. Bennett, A. J. Jani, M. C. I. Medeiros, Y. Mileyko, C. E. Nelson, N. H. Nguyen, O. D. Nigro, S. Prisic, **S. Shin**, D. Takagi, S. T. Wilson & J. Y. Yew, Synergy among microbiota and their hosts: Leveraging the Hawaiian archipelago and local collaborative networks to address pressing questions in microbiome research, *mSystems* **3**, e00159-17 (2018).

21. Z. Zheng*, M. A. Fontelos*, **S. Shin**, M. C. Dallaston, D. Tseluiko, S. Kalliadasis & H. A. Stone, Healing capillary films, *J. Fluid Mech.* **838**, 404–434 (2018).

22. D. Lee, B. S. Kim, H. Moon, N. Lee, **S. Shin** & H. H. Cho, Enhanced boiling heat transfer on nanowire-forested surfaces under subcooling conditions, *Int. J. Heat Mass Transf.* **120** 1020–1030 (2018).

23. J. T. Ault, **S. Shin**, P. B. Warren & H. A. Stone, Diffusiophoresis in one-dimensional solute gradients, *Soft Matter* **13** 9015–9023 (2017).

24. **S. Shin**, J. T. Ault, P. B. Warren & H. A. Stone, Accumulation of colloidal particles in flow junctions induced by fluid flow and diffusiophoresis, *Phys. Rev. X* **7** 041038 (2017). *(Featured in **Phys.org**.)*

25. F. Boulogne, **S. Shin**, J. Dervaux, L. Limat & H. A. Stone, Diffusiophoretic manipulation of particles in a drop deposited on a hydrogel, *Soft Matter* **13** 5122–5129 (2017).

26. **S. Shin**, J. T. Ault, J. Feng, P. B. Warren & H. A. Stone, Low-cost zeta potentiometry using diffusiophoresis, *Adv. Mater.* **29** 1701516 (2017).

27. **S. Shin***, O. Shardt*, P. B. Warren & H. A. Stone, Membraneless water filtration using $CO_2$, *Nature Commun.* **8** 15181 (2017). *(Highlighted in **Nature, Nature Reviews Chemistry**. Featured in **The Economist.**)*

28. J. Lee, **S. Shin**, Y. Jiang, C. Jeong, H. A. Stone & C.-H. Choi, Oil-Impregnated nanoporous oxide layer for corrosion protection with self-healing, *Adv. Funct. Mater.* **27** 1606040 (2017). *(Selected as the front cover)*

29. **S. Shin**, E. Um, B. Sabass, J. T. Ault, M. Rahimi, P. B. Warren & H. A. Stone, Size-dependent control of colloid transport in dead-end channels via solute gradients, *Proc. Natl. Acad. Sci. U.S.A.* **113**, 257–261 (2016).

30. J. T. Ault, A. Fani, K. K. Chen, **S. Shin**, F. Gallaire & H. A. Stone, Vortex-breakdown induced particle capture in branching junctions, *Phys. Rev. Lett.* **117**, 084501 (2016).

31. J. Feng, J. K. Nunes, **S. Shin**, J. Yan, S. D. Stoyanov, L. N. Arnaudov, Y. L. Kong & H. A. Stone, A scalable platform for functional nanoemulsions via bubble bursting, *Adv. Mater.* **28**, 4047 (2016).

32. **S. Shin**, I. Jacobi & H. A. Stone, Bénard-Marangoni instability driven by moisture absorption, *EPL* **113**, 24002 (2016).

33. B. S. Kim, G. Choi, **S. Shin**, T. Gemming & H. H. Cho, Nano-inspired fluidic interactivity for boiling heat transfer: impact and criteria, *Sci. Rep.* **6**, 34348 (2016).

34. Z. Zheng, **S. Shin** & H. A. Stone, Converging gravity currents over a permeable substrate, *J. Fluid Mech.* **778**, 669–690 (2015).

35. **S. Shin***, J. T. Ault* & H. A. Stone, Flow-driven rapid vesicle fusion via vortex trapping, *Langmuir* **31**, 7178–7182 (2015).

36. B. S. Kim, K. M. Yang, **S. Shin**, G. Choi & H. H. Cho, Local nucleation propagation on heat transfer uniformity during subcooled convective boiling, *Heat Mass Transf.* **51**, 1–9 (2015).

37. C.-S. Park, M.-H. Hong, **S. Shin**, H. H. Cho & H.-H. Park, Synthesis of mesoporous $La_{0.7}Sr_{0.3}MnO_3$ thin films for thermoelectric materials, *J. Alloy Compd.* **632**, 246–250 (2015).

38. H. Moon, K. M. Kim, Y. H. Jeon, **S. Shin**, J. S. Park & H. H. Cho, Effect of thermal stress on creep lifetime for a gas turbine combustion liner, *Eng. Fail. Anal.* **47**, 34–40 (2015).

39. **S. Shin***, T. T. Al-Housseiny*, B. S. Kim, H. H. Cho & H. A. Stone, The race of nanowires: morphological instabilities and a control strategy, *Nano Lett.* **14**, 4395–4399 (2014). *(Highlighted in **Science – Editors' Choice**)*

40. G. Choi, B. S. Kim, H. Lee, **S. Shin** & H. H. Cho, Jet impingement in a crossflow configuration: Convective boiling and local heat transfer characteristics, *Int. J. Heat Fluid Flow* **50**, 378–385 (2014).

41. B. S. Kim, H. Lee, **S. Shin**, G. Choi & H. H. Cho, Interfacial wicking dynamics and its impact on critical heat flux of boiling heat transfer, *Appl. Phys. Lett.* **105**, 191601 (2014).

42. **S. Shin***, G. Choi*, B. S. Kim & H. H. Cho, Flow boiling heat transfer on nanowire-coated surfaces with highly wetting liquid, *Energy* **76**, 428–435 (2014).

43. B. S. Kim, **S. Shin**, D. Lee, G. Choi, K. M. Kim & H. H. Cho, Stable and uniform heat dissipation by nucleate-catalytic nanowires for boiling heat transfer, *Int. J. Heat Mass Transf.* **70**, 23–32 (2014).

44. **S. Shin** & H. H. Cho, Self-formed platform for in situ measurement of electrical resistance of individual Cu nanowires, *Electrochim. Acta* **117**, 120–126 (2014).

45. H. Choi, J. H. Baeck, T. H. Kim, J. Y. Song, **S. Shin**, H. H. Cho, D.-H. Ko, J. Kim, K. H. Jeong & M.-H. Cho, Effect of phonon scattering by atomically aligned Te layers in self-ordered $Sb_2Te_2$ films, *J. Mater. Chem. C* **1**, 7043–7053 (2013).

46. S. Cho, J. H. Kim, H. K. Cho, **S. Shin** & H. H. Cho, All-solution-processed $InGaO_3(ZnO)_m$ thin films with layered structure, *J. Nanomater.* **2013**, 909786 (2013).

47. T.-J. Ha, **S. Shin**, H. K. Kim, M.-H. Hong, C.-S. Park, H. H. Cho, D. J. Choi & H.-H. Park, Use of ordered mesoporous $SiO_2$ as protection against thermal disturbance in phase-change memory, *Appl. Phys. Lett.* **102**, 144102 (2013).

48. M.-H. Hong, C.-S. Park, **S. Shin**, H. H. Cho, W.-S. Seo, Y. S. Lim, J.-K. Lee & H.-H. Park, Effect of surfactant concentration on the thermoelectric properties of mesoporous ZnO thin films, *J. Nanomater.* **2013**, 172504 (2013).

49. M.-H. Hong, S.-Y. Jung, T.-J. Ha, W.-S. Seo, Y. S. Lim, **S. Shin**, H. H. Cho & H.-H. Park, Thermoelectric properties of mesoporous $TiO_2$ thin films through annealing temperature and ratio of surfactant, *Surf. Coat. Technol.* **231**, 370–373 (2013).

50. J. Song, J. W. Lee, M. S. Yu, **S. Shin**, B. S. Kim & H. H. Cho, Thermal characteristics of inclined plate impinged by underexpanded sonic jet, *Int. J. Heat Mass Transf.* **62**, 223–229 (2013).

51. S.-Y. Jung, T.-J. Ha, C.-S. Park, W.-S. Seo, Y. S. Lim, **S. Shin**, H. H. Cho & H.-H. Park, Improvement in the conductivity ratio of ordered mesoporous Ag-$TiO_2$ thin films for thermoelectric materials, *Thin Solid Films* **529**, 94–97 (2013).

52. **S. Shin**, B. S. Kim, G. Choi, H. Lee & H. H. Cho, Double-templated electrodeposition: simple fabrication of micro-nano hybrid structure by electrodeposition for efficient boiling heat transfer, *Appl. Phys. Lett.* **101**, 251905 (2012).

53. T.-J. Ha, H. K. Kim, D. J. Choi, **S. Shin**, H. H. Cho, H. W. Jang, S.-J. Yoon & H. H. Park, Application of ordered mesoporous $SiO_2$ film for low power consumption in phase-change memory, *Microporous Mesoporous Mater.* **163**, 321–325 (2012).

54. J. H. Kim, D. K. Seo, C. H. Ahn, **S. Shin**, H. H. Cho & H. K. Cho, Hybrid solution processed $InGaO_3(ZnO)_m$ thin films with periodic layered structures and thermoelectric properties, *J. Mater. Chem.* **22**, 16312–16317 (2012).

55. **S. Shin**, B. S. Kim, J. Song, H. Lee & H. H. Cho, A facile route to the fabrication of large-scale gate-all-around nanofluidic field-effect transistor with low leakage current, *Lab Chip* **12**, 2568–2574 (2012).

56. **S. Shin**, B. S. Kim, K. M. Kim & H. H. Cho, Multi-variable thermal design of T-structured phase-change memory cell using advanced response surface method, *Microelectron. Eng.* **91**, 1–8 (2012).

57. T.-J. Ha, H.-H. Park, H. W. Jang, S.-J. Yoon, **S. Shin** & H. H. Cho, Study on the thermal stability of ordered mesoporous $SiO_2$ film for thermal insulating film, *Microporous Mesoporous Mater.* **158**, 123–128 (2012).

58. **S. Shin**, B. S. Kim, K. M. Kim, B. H. Kong, H. K. Cho & H. H. Cho, Tuning the morphology of copper nanowires by controlling the growth processes in electrodeposition, *J. Mater. Chem.* **21**, 17967–17971 (2011).

59. K. M. Kim, **S. Shin**, D. H. Lee & H. H. Cho, Influence of material properties on temperature and thermal stress of thermal barrier coating near a normal cooling hole, *Int. J. Heat Mass Transf.* **54**, 5192–5199 (2011).

60. J. Lee, H. G. Kwon, **S. Shin**, S. Han, J. Ha, H. Yoo & H. H. Cho, Thermal design of hot plate for 300-mm wafer heating in post-exposure bake, *Microelectron. Eng.* **88**, 3195–3198 (2011).

61. D. K. Seo, **S. Shin**, H. H. Cho, B. H. Kong, D. M. Whang & H. K. Cho, Drastic improvement of oxide thermoelectric performance using thermal and plasma treatments of the InGaZnO thin films grown by sputtering, *Acta Mater.* **59**, 6743–6750 (2011).

62. T.-J. Ha, S.-Y. Jung, J.-H. Bae, H.-L. Lee, H. W. Jang, S.-J. Yoon, **S. Shin**, H. H. Cho & H.-H. Park, Analysis of heat transfer in ordered and disordered mesoporous $TiO_2$ films by finite element analysis, *Microporous Mesoporous Mater.* **144**, 191–194 (2011).

63. B. S. Kim, **S. Shin**, S. J. Shin, K. M. Kim & H. H. Cho, Control of superhydrophilicity/superhydrophobicity using silicon nanowires via electroless etching method and fluorine carbon coatings, *Langmuir* **27**, 10148-10156 (2011). *(Most Read Article)*

64. **S. Shin**, B. H. Kong, B. S. Kim, K. M. Kim, H. K. Cho & H. H. Cho, Over 95% of large-scale length uniformity in template-assisted electrodeposited nanowires by subzero-temperature electrodeposition, *Nanoscale Res. Lett.* **6**, 467 (2011). *(Highly Accessed Article)*

65. T.-J. Ha, Y.-J. Choi, S.-Y. Jung, W.-S. Seo, Y. S. Lim, **S. Shin**, H. H. Cho & H.-H. Park, Study on the electrical and thermal conductivity of ordered mesoporous $TiO_2$ thin film incorporated with Pt nanoparticles, *Jpn. J. Appl. Phys.* **50**, 075001 (2011).

66. S.-Y. Jung, T.-J. Ha, W.-S. Seo, Y. S. Lim, **S. Shin**, H. H. Cho & H.-H. Park, Thermoelectric properties of Nb-doped ordered mesoporous $TiO_2$, *J. Electron. Mater.* **40**, 652–656 (2011).

67. B. S. Kim, **S. Shin**, S. J. Shin, K. M. Kim & H. H. Cho, Micro-nano hybrid structures with manipulated wettability using a two-step silicon etching on a large area, *Nanoscale Res. Lett.* **6**, 333 (2011).

68. **S. Shin**, K. M. Kim, J. Song, H. K. Kim, D. J. Choi & H. H. Cho, Thermal stress analysis of $Ge_1Sb_4Te_7$-based phase-change memory devices, *IEEE Trans. Electron Dev.* **58**, 782–791 (2011).

69. B. S. Kim, B. S. Kwak, **S. Shin**, S. Lee, K. M. Kim, H.-I. Jung & H. H. Cho, Optimization of microscale vortex generators in a microchannel using advanced response surface method, *Int. J. Heat Mass Transf.* **54**, 118–125 (2011).

70. T.-J. Ha, H.-H. Park, E. S. Kang, **S. Shin** & H. H. Cho, Variations in mechanical and thermal properties of mesoporous alumina thin films due to porosity and ordered pore structure, *J. Colloid Interface Sci.* **345**, 120–124 (2010).

71. **S. Shin**, H. K. Kim, J. Song, D. J. Choi & H. H. Cho, Phase-dependent thermal conductivity of $Ge_1Sb_4Te_7$ and N:$Ge_1Sb_4Te_7$ for phase change memory applications, *J. Appl. Phys.* **107**, 033518 (2010).

72. H. K. Kim, S. Y. Lee, D. J. Choi, **S. Shin**, H. H. Cho & J. S. Roh, Effects of nitrogen doping and working pressure on the crystallization of $Ge_1Sb_4Te_7$ thin films for PRAM applications, *J. Kor. Phys. Soc.* **55**, 1896–1900 (2009).

73. D. H. Lee, K. M. Kim, **S. Shin** & H. H. Cho, Thermal analysis in a film cooling hole with thermal barrier coating, *J. Thermophys. Heat Transf.* **23**, 843–846 (2009).

74. K. M. Kim, H. Lee, B. S. Kim, **S. Shin**, D. H. Lee & H. H. Cho, Optimal design of angled rib turbulators in a cooling channel, *Heat Mass Transf.* **45**, 1617–1625 (2009).

75. **S. Shin**, T.-J. Ha, H.-H. Park & H. H. Cho, Thermal conductivity of BCC-ordered mesoporous silica films, *J. Phys. D: Appl. Phys.* **42**, 125404 (2009).

76. S. G. Choi, T.-J. Ha, H.-H. Park, **S. Shin** & H. H. Cho, Effective heat conservation in a sandwich-structured microbolometer using mesoporous $TiO_2$ layers, *Sens. Actuators A* **155**, 131–135 (2009).

77. **S. Shin**, H. N. Cho, B. S. Kim & H. H. Cho, Influence of upper layer on measuring thermal conductivity of multilayer thin films using differential 3-$\omega$ method, *Thin Solid Films* **517**, 933–936 (2008).

78. S. G. Choi, T.-J. Ha, B.-G. Yu, **S. Shin**, H. H. Cho & H.-H. Park, Application of mesoporous $TiO_2$ as a thermal isolation layer for infrared sensors, *Thin Solid Films* **516**, 212–215 (2007).

## Books and Book Chapters

1. **S. Shin** & A. S. Kim, (2018), Temperature Effect on Forward Osmosis, in H. Du, A. Thompson & X. Wang (Eds.), *Osmotically Driven Membrane Process – Approach, Development and Current Status*, InTech. (ISBN 978-953-51-5688-8)

## Invention Disclosures and Patents

1. *Gradient induced particle motion in suspensions*, U.S. Patent No. 11,007,500 with H. A. Stone, P. B. Warren, O. Shardt & S. Shim (2021).
2. *Methods of particle manipulation and analysis*, U.S. Patent No. 10,697,931 with J. T. Ault , H. A. Stone, J. Feng & P. B. Warren (2020).
3. *Targeted delivery and release of drugs in tumors using sequential solution exchange*, Invention disclosure at the University of Hawaii at Manoa (2018).
4. *Rapid preconcentrator using flow-driven diffusiophoretic accumulation*, Invention disclosure at Princeton University with H. A. Stone, J. T. Ault & P. B. Warren (2017).

5. *Zeta potentiometer using diffusiophoresis and diffusioosmosis*, Invention disclosure at Princeton University with H. A. Stone, J. T. Ault, J. Feng & P. B. Warren (2017).

6. *Device and methods for continuous flow separation of particles by gas dissolution*, Invention disclosure at Princeton University with H. A. Stone, P. B. Warren & O. Shardt (2016).

7. *Particle motion in suspensions driven by contact with gas*, Invention disclosure at Princeton University with H. A. Stone, P. B. Warren, O. Shardt & S. Shim (2016).

8. *A method for producing large lipid vesicles*, Invention disclosure at Princeton University with H. A. Stone & J. T. Ault (2015).

9. *A method for controlling growth instability in template-assisted electrodeposition of nanowires*, Invention disclosure at Princeton University with H. A. Stone, T. T. Al-Housseiny, H. H. Cho & B. S. Kim (2014).

10. *Highly efficient desalination system and method using multi-stage ionic field-effect transistor*, Korean Patent 10-1592892 with H. H. Cho & B. S. Kim (2016).

11. *Highly efficient nanofluidic energy harvesting system and method using ionic field-effect transistor*, Korean Patent 10-1419742 with H. H. Cho & B. S. Kim (2014).

12. *Light-heat energy conversion module having nanostructured surface and method for fabricating the same*, Korean Patent 10-1374272 with H. H. Cho, B. S. Kim, J. Song & T. H. Kim (2014).

13. *Heat transfer element*, Korean Patent 10-1273365 with H. H. Cho, B. S. Kim, S. H. Lee & J. Song (2013).

14. *Method for Manufacturing Structure and Structure for Removing Bubble*, Korean Patent 10-1163639 with H. H. Cho, K. M. Kim, B. S. Kim, S. H. Lee & J. Song (2012).

15. *Bipolar plate with nano and micro structures*, Korean Patent 10-1075518 with H. H. Cho, J. H. Yoon, H. G. Kwon, B. S. Kim & S. H. Lee (2011).

16. *PCR device which has a real-time monitoring function*, Korean Patent 10-1040489 with H. H. Cho, K. M. Kim, D. H. Lee, B. S. Kim, S. H. Lee & M. O. Lee (2011).

17. *Apparatus of PCR using constant temperature metal block and method thereof*, Korean Patent 10-0790004 with H. H. Cho, M. S. Yu, D. H. Lee, J. J. Yi & B. S. Kim (2007).

## Funded Grants

1. National Science Foundation, CBET #1930691 ($320,238), Role: PI, 2019-2022. *Colloid dynamics in porous media induced by fluid flow and solute transport.*

2. National Science Foundation, CMMI #1919539 ($466,902), Role: Co-PI (PI: Joseph J. Brown, Co-PIs: Tyler Ray, Sangwoo Shin, Woochul Lee, Aaron Ohta), 2019-2022. *MRI: Acquisition of High-Speed Lithography Tool for Research and Education at the University of Hawaii.*

3. National Research Foundation of Korea, #2013R1A6A3A03020179 ($30,000), Role: PI, 2013-2014. *Development of highly-efficient electrokinetic energy harvesting through surface engineering.*

## Awards

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|---|---|
| Finalist, Falling Walls Lab 2017 (Falling Walls Foundation) | 2017 |
| National Postdoctoral Fellowship (National Research Foundation) | 2013 |
| Distinguished Thesis Award (Yonsei University) | 2012 |
| Best Thesis Award (Energy & Power Engineering Division, KSME) | 2012 |
| Outstanding Poster Award (Micro & Nano Engineering Division, KSME) | 2012 |
| Outstanding Paper Award (Dept. of Mech. Eng., Yonsei University) | 2012 |
| Nano Today 2011 Student Travel Award (2nd Nano Today Conference) | 2011 |
| Outstanding Paper Award (Dept. of Mech. Eng., Yonsei University) | 2011 |
| National Science and Technology Fellowship (National Research Foundation) | 2008 |
| Seoul Science Fellowship (Seoul Metropolitan Government) | 2007 |

## Invited Talks

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|---|---|
| Brown University, Fluids Seminar | Apr. 2022 |
| Jeonbuk National University, Mechanical System Engineering | Jan. 2022 |
| IEEE NANOMED 2020, Virtual Conference | Dec. 2020 |
| Mini-symposium on Fluid-Structure Interactions, OIST | Jan. 2020 |
| Yonsei University, Mechanical Engineering | Jan. 2020 |
| Chungnam National University, Chemical Engineering | Jan. 2020 |
| UNIST Mechanical Engineering | Dec. 2019 |
| TMS 2019, San Antonio, TX | Mar. 2019 |
| IEEE NANOMED 2018, Honolulu, HI | Dec. 2018 |
| Incheon National University, Materials Science and Engineering | Nov. 2018 |
| Korea Institute of Energy Research | Nov. 2018 |
| Chung-Ang University, Mechanical Engineering | Nov. 2018 |
| Okinawa Institute of Science and Technology (OIST) | Nov. 2018 |
| Falling Walls Lab 2017, Berlin, Germany | Nov. 2017 |
| Korea Institute of Science and Technology (KIST) | Jan. 2017 |
| Yonsei University, Mechanical Engineering | Jan. 2017 |
| Sungkyunkwan University, Mechanical Engineering | Jan. 2017 |
| UNIST Physics & IBS CSLM | Feb. 2016 |
| Yonsei University, Mechanical Engineering | Jan. 2016 |
| Stevens Institute of Technology, Mechanical Engineering | Mar. 2015 |
| New Jersey Institute of Technology, Mathematical Sciences | Apr. 2014 |

## Teaching Experience

Course Instructor (University at Buffalo) 2021–current

- Thermodynamics (MAE204; Undergraduate)
- Biotransport and Biofluid Mechanics (MAE618; Graduate)

Course Instructor (University of Hawaii) 2017–2021

- Thermodynamics (ME311; Undergraduate)
- Mechanics of Fluids and Lab (ME322; Undergraduate)
- Introduction to Transport Phenomena (ME491; Undergraduate)
- Introduction to Microfluidics (ME491; Undergraduate)
- Microfluidics and Nanofluidics (ME624; Graduate)
- Biotransport and Biofluid Mechanics (ME696; Graduate)

## Students Advised

Current Members

| | |
|---|---|
| Viet Sang Doan | PhD student, 2021–current |

Thesis Committee Chair

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|---|---|
| Viet Sang Doan | MS, 2021 |
| Sung wan Park | MS, 2020 |
| Kyle Barefoot | MS, 2018 |

Thesis Committee Member

| | |
|---|---|
| Don Krasky | PhD, 2019 |
| Rintaro Hayashi | PhD, 2021 |
| Adam Macalalag | MS, 2021 |
| Matthew Nakamura | MS, 2021 |

Postdocs and Visitors

| | |
|---|---|
| Liangyu Wu | Visiting Postdoc, 2019-2020 |
| Cheng Yu | Visiting Postdoc, 2019-2020 |
| Tanja Riess | Visiting MS student, 2019 |

Undergraduates

| | |
|---|---|
| Jeffrey Zheng | 2018 |
| Trevor Shimokusu | 2019 |
| Kaytlynn Chun Fat-Ardren | 2019 |
| Penny Loo | 2021 |

## Other Professional Activities

Co-founder

Phoresis Inc., Princeton, NJ — 2018–current

Conference Organizing Committee

Technical Program Committee, *12th IEEE International Conference on Nano/Molecular Medicine and Engineering (IEEE-NANOMED 2018)* — Dec. 2018

Technical Program Committee, *15th IEEE International Conference on Nano/Molecular Medicine and Engineering (IEEE-NANOMED 2021)* — Nov. 2021

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