

Chang-Hwan CHOI, Ph.D.

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1. Education and Training

- **Ph.D.** in Mechanical Engineering (Specialization: Micro-Electro-Mechanical Systems (MEMS) & Nanotechnology, Minor: Fluid Mechanics and Bioengineering), University of California at Los Angeles (UCLA), USA, 2006
 - *Advisor: Prof. Chang-Jin "CJ" Kim*
 - *Dissertation Title: "Nanoengineered Surfaces: Design, Fabrication, and Applications to Microfluidics and Tissue Engineering"*
- **M.S.** in Engineering (Concentration: Fluid, Thermal and Chemical Processes), Brown University, USA, 2002
 - *Advisor: Prof. Kenneth S. Breuer*
 - *Thesis Title: "Flow Rates and Slip Velocities of Liquids in Hydrophilic and Hydrophobic Microchannels"*
- **M.S.** in Aerospace Engineering (Concentration: Aerodynamics), Seoul National University, Korea, 1997
 - *Advisor: Prof. Ohyun Rho*
 - *Thesis Title: "Thermal Analysis and Design of 3-Axis-Stabilized Satellite in Sun-synchronous Orbit"*
- **B.S.** in Aerospace Engineering, Seoul National University, Korea, 1995

2. Professional Appointments

- *Graduate Research Assistant*, Seoul National University, Mar. 1995 – Feb. 1997
- *Lecturer*, Chandrakasem Rajabhat University (Thailand), Mar. 1997 - Nov. 1999
- *Researcher*, Korea Aerospace Research Institute, Dec. 1999 – Jun. 2000
- *Graduate Research Assistant*, Brown University, Aug. 2000 – May. 2002
- *Graduate Research Assistant*, UCLA, Aug. 2002 - Dec. 2006
- *Assistant Professor*, Department of Mechanical Engineering, Stevens Institute of Technology (Stevens), Jan. 2007 – Aug. 2013
- *International Scholar*, Department of Mechanical Engineering, Kyung Hee University (Korea), Mar. 2012 – Feb. 2013
- *Visiting Research Professor*, Institute of Advanced Machinery Design Technology, Korea University, Aug. 2015 – Jan. 2016
- *Visiting Researcher*, Materials and Life Science Division, Korea Institute of Science and Technology (KIST), Aug. 2015 – Jan. 2016
- *Visiting Professor*, Institute of Microengineering, EPFL, Lausanne, Switzerland, May 2016 – Jun. 2016
- *Visiting Professor*, Center of Smart Interfaces, TU Darmstadt, Germany, Feb. 2016 – Apr. 2016
- *Associate Professor*, Department of Mechanical Engineering, Stevens, Sep. 2013 - Aug. 2018

3. Honors and Awards

- *Honors Fellowship*, Seoul National University, 1993 and 1994 (Twice)
- *'Magna cum laude' Honors*, Seoul National University, 1995
- *National Fellowship*, Korean Government, 2000
- *Engineering Research Fellowship*, Brown University, 2000
- *Graduate Fellowship*, California NanoSystems Institute, 2002
- *KUSCO/KSEA Scholarship*, Korea-U.S. Science Cooperation Center (KUSCO) & Korean-American Scientists and Engineers Association (KSEA), 2006
- *NSF Fellowship*, National Science Foundation (NSF) Summer Institute on Nanomechanics, Nanomaterials, and Micro/Nanomanufacturing, 2007, 2010, and 2011 (Three times)
- *Young Investigator Program (YIP) Award*, Office of Naval Research (ONR), 2010
- *Research Recognition Award*, Stevens Institute of Technology, 2010
- *New Jersey Inventors Hall of Fame (NJHoF) Award*, 2012

- *Best Paper Award*, The 9th IEEE International Conference on Nano/Micro Engineered and Molecular Systems (IEEE-NEMS), 2014
- *Brain Pool Fellowship*, Korean Federation of Science and Technology Societies, 2015
- *Humboldt Research Fellowship for Experienced Researchers*, Alexander von Humboldt Foundation, 2015

4. Selected Peer-Reviewed Publications

- A full list can be found at <http://personal.stevens.edu/~cchoi/Publication.htm>
- Google Scholar: <https://scholar.google.com/citations?user=7qJ3-glAAAAJ&hl=en>
- ResearchGate: https://www.researchgate.net/profile/Chang_Hwan_Choi

• Nanopatterning/Nanofabrication/Nanomanufacturing

- [1] **Choi CH**, Kim CJ. Design, Fabrication, and Applications of Large-Area Well-Ordered Dense-Array Three-Dimensional Nanostructures. *Nanostructures in Electronics and Photonics*, Ed. Faiz Rahman, Pan Stanford Publishing (2008).
- [2] El Mel AA, Gautron E, **Choi CH**, Angleraud B, Granier A, Tessier PY. Titanium carbide/carbon composite nanofibers prepared by plasma process. *Nanotechnol.* 2010;21:435603.
- [3] Tsai YT, Xu W, Yang EH, **Choi CH**. Self-assembly of nanowires at three-phase contact lines on superhydrophobic surfaces. *Nanosci Nanotechnol Lett.* 2010;2:150.
- [4] Wathuthanthri I, Mao W, **Choi CH**. Two degrees-of-freedom Lloyd-mirror interferometer for superior pattern coverage area. *Opt Lett.* 2011;36:1593.
- [5] Xu W, Leeladhar R, Tsai YT, Yang EH, **Choi CH**. Evaporative self-assembly of nanowires on superhydrophobic surfaces of nano-tip latching structures. *Appl Phys Lett.* 2011;98:073101. ([Selected for a cover page](#))
- [6] Du K, Wathuthanthri I, Mao W, Xu W, **Choi CH**. Large-area pattern transfer of metallic nanostructures on glass substrates via interference lithography. *Nanotechnol.* 2011;22:285306.
- [7] Mao W, Wathuthanthri I, **Choi CH**. Tunable two-mirror interference lithography system for wafer-scale nanopatterning. *Opt Lett.* 2011;36:3176.
- [8] El Mel AA, Achour A, Xu W, **Choi CH**, Gautron E, Angleraud B, Granier A, Le Brizoual L, Djouadi MA, Tessier PY. Hierarchical carbon nanostructures design: Ultra-long carbon nanofibers decorated with carbon nanotubes. *Nanotechnol.* 2011;22:435302.
- [9] Jeong C, **Choi CH**. Single-step direct fabrication of pillar-on-pore hybrid nanostructures in anodizing aluminum for superior superhydrophobic efficiency. *ACS Appl Mater Interfaces.* 2012;4:842.
- [10] El Mel AA, Duvail JL, Gautron E, Xu W, **Choi CH**, Angleraud B, Granier A, Tessier PY. Highly ordered ultralong magnetic nanowires wrapped in stacked graphene layers. *Beilstein J Nanotechnol.* 2012;3:846.
- [11] El Mel AA, Gautron E, Angleraud B, Granier A, Xu W, **Choi CH**, Briston KJ, Inkson BJ, Tessier PY. Fabrication of a nickel nanowire mesh electrode suspended on polymer substrate. *Nanotechnol.* 2012;23:275603.
- [12] Du K, Wathuthanthri I, Liu Y, Xu W, **Choi CH**. Wafer-scale pattern transfer of metal nanostructures on polydimethylsiloxane (PDMS) substrates via holographic nanopatterns. *ACS Appl Mater Interfaces.* 2012;4:5505.
- [13] Du K, Liu Y, Wathuthanthri I, **Choi CH**. Dual application of free-standing holographic nanopatterns for lift-off and stencil lithography. *J Vac Sci Technol B.* 2012;30:06FF04.
- [14] Liu Y, Du K, Wathuthanthri I, **Choi CH**. From nanocone to nanodisc: Structural transformation of gold nanoarrays via simple mechanical stresses. *J Vac Sci Technol B.* 2012;30:06FF10.
- [15] Wathuthanthri I, Liu Y, Du K, Xu W, **Choi CH**. Simple holographic patterning for high-aspect-ratio three-dimensional nanostructures with large coverage area. *Adv Funct Mater.* 2013;23: 608.
- [16] El Mel AA, Buffière M, Tessier PY, Konstantinidis S, Xu W, Du K, Wathuthanthri I, **Choi CH**, Bittencourt C, Snyders R. Highly ordered hollow oxide nanostructures: The Kirkendall effect at the nanoscale. *Small.* 2013;9:2838. ([Selected for a cover page](#))
- [17] Du K, Liu Y, Wathuthanthri I, **Choi CH**. Fabrication of hierarchical nanostructures using free-standing tri-layer membrane", *J Vac Sci Technol B.* 2013;31:06FF04.

- [18] El Mel AA, Molina-Luna L, Buffiere M, Tessier PY, Du K, **Choi CH**. Electron beam nanosculpting of Kirkendall oxide nanochannels. *ACS Nano*. 2014;8:1854.
- [19] Ding J, Du K, Wathuthanthri I, **Choi CH**, Fisher F, Yang EH. Transfer patterning of large-area graphene nanomesh via holographic lithography and plasma etching. *J Vac Sci Technol B*. 2014;32:06FF01.
- [20] Du K, Wathuthanthri I, Liu Y, Kang YT, **Choi CH**. Fabrication of polymer nanowires via maskless O₂ plasma etching. *Nanotechnol*. 2014;25:165301 ([Selected for a cover page](#)).
- [21] Thiry D, Molina-Luna L, Gautron E, Stephan N, Chauvin A, Du K, Ding J, **Choi CH**, Tessier PY, El-Mel AA. The Kirkendall effect in binary alloys: Trapping gold in copper oxide nanoshells. *Chem Mater*. 2015;27:6374.
- [22] El Mel AA, Tessier PY, Buffiere M, Gautron E, Ding J, Du K, **Choi CH**, Konstantinidis S, Snyders R, Bittencourt C, Molina-Luna L. Controlling the formation of nanocavities in Kirkendall nanoobjects through sequential thermal ex situ oxidation and in situ reduction reactions. *Small* 2016;12:2885.
- [23] Chauvin A, Delacote C, Molina-Luna L, Duerrschnabel M, Boujtita M, Thiry D, Du K, Ding J, **Choi CH**, Tessier PY, El Mel AA. Planar arrays of nanoporous gold nanowires: When electrochemical dealloying meets nanopatterning. *ACS Appl Mater Interfaces* 2016;8:6611.
- [24] El Mel AA, Chettab M, Gautron E, Chauvin A, Humbert B, Mevellec JY, Delacote C, Thiry D, Stephan N, Ding J, Du K, **Choi CH**, Tessier PY. Galvanic replacement reaction: A route to highly ordered bimetallic nanotubes. *J Phys Chem*. 2016;120:17652.
- [25] Chauvin A, Delacote C, Boujtita M, Angeraud B, Ding J, **Choi CH**, Tessier PY, El Mel AA, Dealloying of gold-copper alloy nanowires: From hillocks to periodic ring-shaped nanopore. *Beilstein J Nanotechnol*. 2016;7:1361.

• Interfacial Phenomena

- [1] Lee C, **Choi CH**, Kim CJ. Structured surfaces for a giant liquid slip. *Phys Rev Lett*. 2008; 101:064501. ([Featured in Nature Research Highlights](#): "Fluid dynamics: Slip and slide", *Nature*. 2008;454:920)
- [2] **Choi CH**, Kim CJ. Droplet evaporation of pure water and protein solution on nanostructured superhydrophobic surfaces of varying heights. *Langmuir*. 2009;25:7561.
- [3] **Choi CH**, Kim CJ. Advanced nanostructured surfaces for the control of biofouling: Cell adhesions to three-dimensional nanostructures. *Green Tribology: Biomimetics, Energy Conservation, and Sustainability*. Ed. B. Bhushan. Springer. 2011.
- [4] Xu W, **Choi CH**. Experimental studies on evaporation kinetics and wetting dynamics of nanofluid droplets on superhydrophobic surfaces of micro-post patterns. *J Adhes Sci Technol*. 2011;25:1305.
- [5] Tsai YT, **Choi CH**, Gao N, Yang EH. Tunable wetting mechanism of polypyrrole surfaces and low-voltage droplet manipulation via redox. *Langmuir*. 2011;27:4249.
- [6] Liu Y, Xin J, **Choi CH**. Cotton fabric with single-faced superhydrophobicity. *Langmuir*. 2012;28:17426.
- [7] Xu W, **Choi CH**. Effects of surface topography and colloid particles on the evaporation kinetics of sessile droplets on superhydrophobic surfaces. *J Heat Transfer*. 2012;134:051022.
- [8] Xu W, **Choi CH**. From sticky to slippery droplets: Dynamics of contact line depinning on superhydrophobic surfaces. *Phys Rev Lett*. 2012;109:024504.
- [9] Tsai YT, **Choi CH**, Yang EH. Low-voltage manipulation of an aqueous droplet in a microchannel via tunable wetting on PPy(DBS). *Lab Chip*. 2013;13:302.
- [10] Aljallis E, Sarshar M, Datla R, Sikka V, Jones A, **Choi CH**. Experimental study of skin friction drag reduction on superhydrophobic flat plates in high Reynolds number boundary layer flow. *Phys Fluids*. 2013;25:025103.
- [11] Xu W, Leeladhar R, Kang YT, **Choi CH**. Evaporation kinetics of sessile water droplets on micropillared superhydrophobic surfaces. *Langmuir*. 2013;29:6032.
- [12] Nam SR, Jung CW, **Choi CH**, Kang YT. Cooling performance enhancement of LED packages with carbon nanogrease. *Energy*. 2013;60:195.

- [13] Sarshar MA, Xu W, **Choi CH**. Correlation between contact line pinning and contact angle hysteresis on heterogeneous surfaces: A review and discussion. **Advances in Contact Angle, Wettability and Adhesion**. Ed. Kash Mittar. Wiley. 2013.
- [14] Liu Y, **Choi CH**. Condensation induced wetting state and contact angle hysteresis on superhydrophobic lotus leaves. **Coll Polym Sci**. 2013;291:437.
- [15] Sarshar MA, Swartz C, Hunter S, Simpson J, **Choi CH**. Effects of contact angle hysteresis on ice adhesion and growth over superhydrophobic surfaces under dynamic flow conditions. **Coll Polym Sci**. 2013;291:427.
- [16] Lu Y, Sarshar MA, Du K, Chou T, **Choi CH**, Sukhishvili SA. Large-amplitude, reversible, pH-triggered wetting transitions enabled by layer-by-layer films. **ACS Appl Mater Interfaces** 2013;5:12617.
- [17] Ozbay R, Kibar A, **Choi CH**. Bubble adhesion on superhydrophilic surfaces”, in **Advances in Contact Angle, Wettability and Adhesion**, Vol. 2, Ed. Kash Mittar, Scrivener Publishing / Wiley (2015) (**invited**).
- [18] Hizal F, Zhuk I, Sukhishvil S, Busscher HJ, van der Mei HC, **Choi CH**. Impact of 3D herarchical nanostructures on the antibacterial efficacy of a bacteria-triggered self-defensive antibiotic voating. **ACS Appl Mater Interfaces** 2015;7:20304.
- [19] Jeong C, Xu W, Du K, **Choi CH**. Air-impregnated nanoporous anodic aluminum oxide layers for enhancing corrosion resistance of aluminum. **Langmuir** 2015;31:11040.
- [20] Xu W, Xu J, **Choi CH**, Yang EH. *In situ* control of underwater-pinning of organic droplets on a surfactant-doped conjugated polymer surface. **ACS Appl Mater Interfaces** 2015;7:25608.
- [21] Kim D, Lee J, Kim J, **Choi CH**, Chung W. Enhancement of heat dissipation of LED module with cupric-oxide composite coating on aluminum-alloy heat sink. **Energy Convers Manage** 2015;106:958.
- [22] Xu W, Xu J, Li X, Tian Y, **Choi CH**, Yang EH. Lateral actuation of an organic droplet on conjugated polymer electrodes *via* imbalanced interfacial tensions. **Soft Matter** 2016;12:6902 (**Selected for a cover page**).
- [23] Jiang Y, Xu W, **Choi CH**. Effects of particulates on contact angles and adhesion of a droplet: A critical review. **Rev Adhesion Adhesives** 2016;4:192.
- [24] Hizal F, **Choi CH**, Busscher HJ, van der Mei HC. Staphylococcal adhesion, detachment and transmission on nanopillared Si surfaces. **ACS Appl Mater Interfaces** 2016;8:30430.
- [25] Lee C, **Choi CH**, Kim CJ. Superhydrophobic drag reduction in laminar flows: A critical review. **Exp Fluids** 2016;57:176.

5. Selected Patents

- [1] Mao W, Wathuthanthri I, **Choi CH**. Tunable two-mirror interference lithography system. 2014. US 8,681,315.

6. Selected Sponsored Research Projects (Role, Funding Source, Project Title, Period): **Total number of sponsored projects>20, Total funding amount>\$6M** as a Principal Investigator (PI)

- [1] PI, Air Tech, Inc., Design, Simulation, and Testing of Regenerative Blowers for Optimized Efficiency, 9/08-8/09.
- [2] Co-PI, NSF, MRI: Acquisition of an Inductively Coupled Plasma Etching System for Nano/Micro Device Fabrication, 9/08-8/11.
- [3] PI, Department of Energy (DOE), Nanostructured Superhydrophobic Coatings for Breakthrough Energy Savings, 2/09-9/11.
- [4] PI, Ross Technology Corporation, Characterization of Superhydrophobic Coatings for Hydrodynamic Drag Reduction, 3/09-12/09.
- [5] PI, Office of Naval Research (ONR), Nano-Engineered Superhydrophobic Aluminum Surfaces for Marine Anti-Corrosion, 6/09-5/10.
- [6] Co-PI, Defense Advanced Research Projects Agency (DARPA), Infused Teflon Films for Multi-Functional Appliqué, 7/09-6/10.
- [7] Co-PI, American Chemical Society (ACS), Bubble Detachment on Micro/Nano Structured Solid Surfaces in Energy Applications, 9/09-8/11.
- [8] Co-PI, US Army Picatinny (ARDEC), Energy Harvesting from Energetic Materials, 9/09-9/11.

- [9] PI, ONR, Configurable and Multi-Modal Thin Film Deposition System for Multi-Functional Nanostructured Surfaces, 4/10-4/11.
- [10] PI, ONR ([Young Investigator Program Award](#)), Nano-Engineering of Superhydrophobic Surfaces for Light Metal Anti-Corrosion, 5/10-11/13.
- [11] Co-PI, NSF, MRI: Acquisition of a Nanoimprint Lithography System for Nanoscience Research and Education based on Low-Dimensional Materials, 1/11-12/13.
- [12] PI, ONR, Environmental Scanning Electron Microscope for In-Situ Wetting dynamics Study of Nanostructured Surfaces, 6/11-6/12.
- [13] PI, ONR, Small Angle X-Ray Scattering (SAXS) Instrument for Nondestructive Characterization of Nanobubble Kinetics and Dynamics on Nanostructured Surfaces, 6/12-12/13.
- [14] Co-PI, NSF, Tunable Wetting on Smart Polymers for Ultra-Low Voltage Digital Microfluidics, 9/12-8/14.
- [15] PI, ONR, Molecular Vapor Deposition Systems for Vapor-Phase Self-Assembled Monolayer Superhydrophobic Coatings, 6/13-6/14.
- [16] PI, ONR, Oil-Impregnated Oxide Nanostructures for Aluminum Corrosion Prevention, 6/14-5/16.
- [17] Co-PI, U. S. Department of Agriculture (USDA), Prevention of Microbial Adhesion in Food Processing Environment using Multifunctional Nanopillared Surfaces, 1/15-12/17.
- [18] PI, NSF, Hydropower Plant on a Chip: Frictionless Nanochannel Systems, 6/15-5/17.
- [19] PI, NSF, Structured Surfaces for Prevention of Ice Adhesion and Growth, 9/15-8/17.

7. Other Career Highlights

- Training and Thesis Advising: **5 Post-Docs, 10 PhD students, and 8 MS students**
- Interviewed by and Featured in [Nature](#) Careers Q&A, “From aerospace to Navy ships: Design for anti-corrosive vessel surfaces earns award for nanoengineer”, *Nature*. 2010 May 19;465:385. <http://www.nature.com/naturejobs/2010/100520/pdf/nj7296-385a.pdf>.
- Selected as one of AZoNano **Nanotechnology Thought Leaders** and an invited article published at **AZoNano Series** in 2010: <http://www.azonano.com/article.aspx?ArticleId=2714>.
- Selected as one of eight **US delegates** for the CRDF Global Workshop, “A Shift in Power: Developments in Energy Research and Collaboration between the U.S. and Uzbekistan”, Tashkent, Uzbekistan, 2013.
- Invited talks/seminars/lectures more than **70 times** (since 2007), including:
 - The Northeast Complex Fluids and Soft Matter Workshop (Newark, NJ, Jan. 2015), “Hydrodynamic Friction on Superhydrophobic Surfaces” ([Plenary talk](#)).
 - Microfluidics & Lab on a Chip India (Mumbai, India, Jan. 2015), “Superhydrophobic Surfaces for Microfluidics and Lab on a Chip Applications” ([Keynote talk](#)).
 - CRDF Global Workshop: A Shift in Power: Developments in Energy Research and Collaboration between the U.S. and Uzbekistan (Tashkent, Uzbekistan, Feb. 2013), “Nanoengineered Surfaces for Energy Applications” ([selected one of eight US delegates](#)).
 - International Symposium on Nature-Inspired Technology (Yongpyeong, Korea, Jan. 2013), “Nanoengineered Surfaces for Energy Saving Applications”.
 - US-Korea Conference on Science, Technology, and Entrepreneurship (Los Angeles, CA, Aug. 2012), “Anodizing of Pillar-on-Pore Hybrid Nanostructures for Superhydrophobic Surfaces of Aluminum”.
 - The Third Conference on Advances in Microfluidics and Nanofluidics (Dalian, China, May 2012), “Bio-Inspired Nanoengineered Surfaces for Micro/Nano-Fluidics”.
 - NSF Pan-American Advanced Studies Institute (PASI) Program: Scalable, Functional Nanomaterials (Costa Rica, Aug. 2011), “Large-Area 3D Nanopatterning and Nanostructure Fabrication”.
 - The Second Conference on Advances in Microfluidics and Nanofluidics and Asian-Pacific International Symposium on Lab on Chip (Singapore, Jan. 2011), “Large-Area Pattern Transfer of Metal Nanostructures on PDMS via Interference Nanolithography”.
 - The Sixth International Conference on Mathematical Modeling and Computer Simulations of Materials Technologies (Ariel, Israel, Aug. 2010), “Cell Adhesion on Three-Dimensional Nanostructures” ([Plenary talk](#)).