

H. Jeremy Cho, PhD

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EDUCATION

Massachusetts Institute of Technology

2011–2017

PhD in Mechanical Engineering with a Minor in Chinese

Thesis: Physicochemical Mechanics of Surfactant-Enhanced Boiling Heat Transfer

Core areas of interest: nanotechnology, heat and mass transfer, thermodynamics, interfacial science, physical chemistry, molecular mechanics

Massachusetts Institute of Technology

2009–2011

SM in Mechanical Engineering

Thesis: Surface tension and electroporation of lipid bilayers

University of Michigan

2005–2009

BSE in Mechanical Engineering with a Minor in Music

Experiences: Strain analysis of polymers, shape memory alloys

EXPERIENCE

Assistant Professor at the University of Nevada, Las Vegas, Las Vegas, NV

2019–Present

Mechanical Engineering

- Building an experimental and computational research group in the area of heat/mass transfer and soft matter physics

Postdoctoral Research Associate at Princeton University, Princeton, NJ

2017–2019

Chemical and Biological Engineering

Advisor: Professor Sujit S. Datta

Cracking and Healing Behavior of Shrinkable Granular Systems

- Built a universal understanding of how cracks occur in shrinkable granular materials by bridging the fields of soft matter physics, solid mechanics, and mass transfer using a combination of experiments and simulations
- Discovered a new mode of crack healing controlled by drying rate
- Developed a new particle-based simulation method for shrinkable granular systems

Surfactant Effects on Multiphase Porous Media Flow

- Identifying a new mode of oil scavenging in porous media flow using surfactants
- Utilizing a novel method of 3D flow visualization using confocal microscopy and refractive index-matched transparent porous media systems

Research Assistant and Postdoctoral Associate at MIT, Cambridge, MA

2009–2017

Mechanical Engineering

Advisor: Professor Evelyn N. Wang

Physicochemical Mechanics of Surfactant-Enhanced Boiling Heat Transfer

- Identified molecular mechanism of how surfactants (detergents) can improve boiling performance, which is an energy intensive process used in domestic and industrial settings around the world
- Designed and built numerous experimental setups as well as refined existing experimental techniques and methodologies
- Developed theory to predict performance enhancement based on underlying surfactant chemistry
- Invented a novel way to actively control (turn on and off) boiling spatially and temporally using electric fields and charged surfactants

Surface Tension and Electroporation of Lipid Bilayers

- Investigated the use of artificial cell membranes to engineer new biomaterials for filtration technologies and lab-on-a-chip devices
- Formed lipid layers with Langmuir-Blodgett deposition and studied surface characteristics with atomic force microscope and goniometry

Research Intern at Samsung Electronics, Suwon, South Korea

Summer 2012

- Researched heat transfer within human tissue for development of noninvasive cancer treatment devices
- Optimized heat-transfer simulation methods to increase performance by one hundredfold

Undergraduate Researcher at The University of Michigan, Ann Arbor, MI

2008–2009

Mechanical Engineering

Advisor: Professor Samantha Daly

- Designed and built a mini tensile-testing experimental rig
- Tested mechanical stress of polymers used for medical implants in order to understand how they fail *in vivo*

JOURNAL PUBLICATIONS

Y. Gao, R.A. Phung, **H. J. Cho**, “Fast, continuous atmospheric harvesting through hydrogels in extremely dry environments,” *in preparation*.

B. Ortiz, S. Ricoy, **H. J. Cho** “Separating the effects of diffusion and dilation during surfactant adsorption,” *in preparation*.

M. Mata, B. Ortiz, D. Luhr, V. Evereux, **H.J. Cho**, “How dynamic adsorption controls surfactant-enhanced boiling,” *accepted for publication in Scientific Reports*, 2022.

Y. Gao, **H. J. Cho**, “A Simple Scaling Law: Stiffness vs. Hydraulic Permeability of Hydrogels,” *Soft Matter*, 2022. doi: <https://doi.org/10.1039/D2SM01215D>

Y. Gao, N. K. K. Chai, N. Garkani, S. S. Datta, **H. J. Cho**, “Scaling laws to predict humidity-induced swelling and stiffness in hydrogels,” *Soft Matter*, 2021. doi: <http://dx.doi.org/10.1039/D1SM01186C>

- J-F Louf, N. B. Lu, M. G. O'Connell, **H. J. Cho**, S. S. Datta, "Under pressure: Hydrogel swelling in a granular medium," *Science Advances*, vol. 7, no. 7, pp. 3840–3847, 2021.
- H. J. Cho**, S. S. Datta, "Scaling law of cracking in shrinkable, granular packings," *Physical Review Letters*, vol. 123, no. 15, pp. 158004, 2019.
- H. J. Cho**, E. N. Wang, "Bubble nucleation, growth, and departure: A new, dynamic understanding," *International Journal of Heat and Mass Transfer*, vol. 145, pp. 118803, 2019.
- H. J. Cho**, N. B. Lu, M. P. Howard, R. A. Adams, S. S. Datta, "Cracking and self-closing in shrinkable, granular packings," *Soft Matter*, vol. 15, no. 23, pp. 4689–4702, 2019.
- C. Tian, J. Feng, **H. J. Cho**, S. S. Datta, R. K. Prud'homme, "Adsorption and denaturation of structured polymeric nanoparticles at an interface," *Nano Letters*, vol. 18, no. 8, pp. 4854–4860, 2018.
- H. K. Mutha, **H. J. Cho**, M. Hashempour, B. L. Wardle, C. V. Thompson, E. N. Wang, "Salt rejection in flow-between capacitive deionization devices," *Desalination*, vol. 437, pp. 154–163, 2018.
- H. J. Cho**, V. Sresht, E. N. Wang, "Predicting surface tensions of surfactant solutions from statistical mechanics," *Langmuir*, vol. 34, no. 6, pp. 2386–2395, 2018.
- H. K. Mutha, Y. Lu, I. Y. Stein, **H. J. Cho**, M.E. Suss, T. Laoui, B. L. Wardle, C. V. Thompson, E. N. Wang, "Porosimetry and packing morphology of vertically-aligned carbon nanotube arrays via impedance spectroscopy," *Nanotechnology*, vol. 28, no. 5, pp. 1–6, 2016.
- H. J. Cho**, D. J. Preston, Y. Zhu, E. N. Wang "Nanoengineered materials for liquid-vapour phase-change heat transfer", *Nature Reviews Materials*, vol. 2, p. 16092, 2016.
- H. Kim, **H. J. Cho**, S. Narayanan, S. Yang, H. Furukawa, S. Schiffres, X. Li, Y. Zhang, J. Jiang, O.M. Yaghi, E.N. Wang, "Characterization of Adsorption Enthalpy of Novel Water-Stable Zeolites and Metal-Organic Frameworks," *Scientific Reports*, vol. 6, pp. 1–8, January 2016.
- H. J. Cho**, J. P. Mizerak, E. N. Wang, "Turning bubbles on and off during boiling using charged surfactants," *Nature Communications*, vol. 6, pp. 1–7, October 2015.
- N. Miljkovic, R. Enright, S. C. Maroo, **H.J. Cho**, E.N. Wang, "Liquid Evaporation on Superhydrophobic and Superhydrophilic Nanostructured Surfaces," *Journal of Heat Transfer*, vol. 133, no. 8, p. 080903, 2011.

PEER-REVIEWED CONFERENCE PUBLICATIONS

- H. J. Cho**, E. N. Wang, "A New Analytical Model of Bubble Growth during Boiling," *Pacific Rim Thermal Engineering Conference*, December 13–17, 2019.
- H. J. Cho**, V. Sresht, D. Blankschtein, E. N. Wang, "Understanding Enhanced Boiling with Triton X Surfactants," *Proceedings of the ASME 2013 Summer Heat Transfer Conference*, Minneapolis, MN, July 14–19, 2013.
- H. J. Cho**, S. C. Maroo, E. N. Wang, "Characterization of Lipid Membrane Properties for Tunable Electroporation," *Proceedings of the ASME 2012 3rd Micro/Nanoscale Heat & Mass Transfer International Conference*, Atlanta, Georgia, March 3–6, 2012.

S. C. Maroo, **H. J. Cho**, E. N. Wang, "Wetting Characteristics of a Phospholipid Membrane using Molecular Dynamics Simulation," *Proceedings of the ASME International Mechanical Engineering Congress & Exposition*, Vancouver, Canada, November 12–18, 2010.

CONFERENCE PRESENTATIONS, SEMINARS, POSTERS

H. J. Cho, S. S. Datta, "Cracking and self-healing of shrinkable, granular materials," ACS Fall 2019 National Meeting, San Diego, CA, August 25–29, 2019.

H. J. Cho, N. B. Lu, S. S. Datta, "Controlling Crack Evolution in Drying Suspensions," *AIChE Annual Meeting*, Pittsburgh, PA, October 28–November 2, 2018.

H. J. Cho, N. B. Lu, S. S. Datta, "Crack this: These particle networks keep healing!" *9th Northeastern Complex Fluids & Soft Matter Workshop*, Philadelphia, PA, May 25, 2018.

H. J. Cho, N. B. Lu, S. S. Datta, "Using Drying to Heal Cracks in Soft Materials," *Princeton Research Day*, Princeton, NJ, May 9, 2018.

H. J. Cho, N. B. Lu, S. S. Datta, "Crack this: These particle networks keep healing!" *Soft Materials Coffee Hour*, Princeton, NJ, April 30, 2018.

H. J. Cho, N. B. Lu, S. S. Datta, "How surfactants mobilize oil trapped in a 3D porous medium," *APS March Meeting*, Los Angeles, CA, March 5–9, 2018.

H. J. Cho, V. Sresht, D. Blankschtein, E. N. Wang, "Prediction of Pool Boiling Enhancement with Surfactants," *ASME 2017 Summer Heat Transfer Conference*, Seattle, WA, July 9–12, 2018.

H. J. Cho, V. Sresht, D. Blankschtein, E. N. Wang, "Predicting Nucleate Pool Boiling Enhancement with Surfactants" *Gordon Research Conference: Micro & Nanoscale Phase Change Heat Transfer*, Galveston, TX, January 8–13, 2017.

H. J. Cho, J. P. Mizerak, E. N. Wang, "On Demand and Tunable Pool Boiling," *Gordon Research Conference: Micro & Nanoscale Phase Change Heat Transfer*, Galveston, TX, January 11–16, 2015.

H. J. Cho, E. N. Wang, "Dynamically Tuning Pool Boiling with Charged Surfactants," *MTL Annual Research Conference*, Bretton Woods, NH, January 29–30, 2014.

H. J. Cho, E. N. Wang, "Tunable Nucleate Boiling Using Electric Fields and Charged Surfactants," *Proceedings of the ASME 2013 4th Micro/Nanoscale Heat & Mass Transfer International Conference*, Hong Kong, December 11–14, 2013.

H. J. Cho, E. N. Wang, "Wetting and Phase Behavior of Phospholipids," *Materials Day 2012*, Cambridge, MA, October 16, 2012.

H. J. Cho, S. C. Maroo, E. N. Wang, "Wetting Phenomena of Phospholipid Films for Electroporating Membranes," *MRS Fall Meeting*, Boston, MA, November 28–December 2, 2011.

H. J. Cho, S. C. Maroo, E. N. Wang, "Surface Morphology, Interfacial Energy, and Wetting of DPPC Monolayers," *Materials Day 2011*, Cambridge, MA, October 18, 2011.

H. J. Cho, S. C. Maroo, E. N. Wang, "Wetting and Electroporation Behavior of Phospholipid Layers for Desalination Membranes," *ASME International Mechanical Engineering Congress & Exposition*, Vancouver,

Canada, November 12–18, 2010.

H. J. Cho, S. C. Maroo, E. N. Wang, “Wetting and Electroporation of Phospholipid Layers,” *Micro Nano Seminar*, Cambridge, MA, November 11, 2010.

PATENTS

H. J. Cho, E. N. Wang, Massachusetts Institute of Technology, “Tunable nucleate boiling using electric fields and ionic surfactants,” Patent No. 9841186. Dec 12, 2017.

AWARDS & HONORS

Faculty advisor award for senior design (1 st place and interdisciplinary)	2022
UNLV CSUN Faculty Achievement Award	2022
UNLV Office of Economic Development Technology Commercialization Award	2022
Faculty Opportunity Award, UNLV	2021
Best Poster Award in the Transport in Disordered Environments workshop, Princeton Center for Theoretical Science	2019
ReMatch+ mentorship program fellow, Princeton	2018
First place in the de Florez Competition for Graduate Science, MIT	2015
Summer Undergraduate Research Award, University of Michigan	2008
Pi Tau Sigma Mechanical Engineering Honor Society	2007

OTHER ACTIVITIES

2017 Northeast Asia Economic Forum Young Leaders Program Fellowship at the University of Hong Kong	2017
2011 Northeast Asia Economic Forum Young Leaders Program Fellowship at the University of Hawai‘i	2011
Senior Photo Editor and Photojournalist at The Michigan Daily	2005–2009