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Education

2015/05 Ph.D., Mechanical Engineering and Materials Science Dept., Duke University
2013/08 M.S., Mechanical Engineering and Materials Science Dept., Duke University
2010/06 B.S., Theoretical and Applied Mechanics, Fudan University

Research and Professional Experience

2015- Postdoc Research Associate, Center for Nanophase Materials, Oak Ridge National Laboratory
Advisor: C. Patrick Collier

2010-2015 Research Assistant, Microscale Physicochemical Hydrodynamics Laboratory, Duke University
Advisor: Chuan-Hua Chen

- Identified fundamental mechanism for surface energy powered motion with integrated experimental and numerical studies.
- Applied the mechanistic understanding to dropwise condensers, drop coalescers, self-cleaning materials, and ballistospore launching.
- Experimentally mapped out the operating diagram of electrohydrodynamic cone-jet bridges in terms of bridge morphology and breakup modes.

2011-2012 Teaching Assistant, Duke University
ME431 (Heat and Mass Transfer)

2009-2010 Research Assistant, Mechanics Department, Fudan University

- Numerically modelled vascular tumor growth under anti-angiogenesis therapy.

Member American Physical Society (APS)
American Society of Mechanical Engineers (ASME),
Society of Women Engineers (SWE)

Reviewer Applied Physic Letters, Applied Thermal Engineering
Physical Review E, Physical Review Letters,
Proceedings of the National Academy of Sciences

Honors and Awards

2013 Invited Oral Presentation, 6th Annual MEMS Graduate Retreat, Duke University
2006-2010 Cyrus Tang Scholarship, China
2007-2009 First Prize Scholarship, Fudan University
2006-2007 SUNTORY Scholarship, Fudan University

Journal Publications

1. K. Zhang, F. Liu, A. J. Williams, X. Qu, J. J. Feng, C.H. Chen, “Self-propelled droplet removal from fiber-based coalescers,” *Physical Review Letters*, vol. 115, no. 074502 2015. *Chosen as Physics Focus story and covered by MRS Materials360 Online and EurekAlert.*
2. X. Qu, J. B. Boreyko, F. Liu, R. L. Agapov, N. V. Lavrik, S. T. Retterer, J. J. Feng, C. P. Collier, and C.H. Chen, “Self-propelled sweeping removal of dropwise condensate ,” *Applied Physics Letters*, vol. 106, no. 221601 , 2015.
3. F. Liu*, G. Ghigliotti*, J.J. Feng, C.H. Chen, “Numerical simulations of self-propelled jumping upon drop coalescence on non-wetting surfaces,” *Journal of Fluid Mechanics*, vol. 752, pp. 39-65, 2014. (*equal contributions)
4. F. Liu, G. Ghigliotti, J.J. Feng, C.H. Chen, “Self-propelled jumping upon drop coalescence on Leidenfrost surfaces,” *Journal of Fluid Mechanics*, vol. 752, pp. 22-38, 2014.
5. F. Liu, C.H. Chen, “Electrohydrodynamic cone-jet bridges: stability diagram and operating modes,” *Journal of Electrostatics*, vol. 72, pp. 330-335, 2014.
6. K.M. Wisdom*, J.A. Watson*, X. Qu*, F. Liu, G.S. Watson, C.H. Chen, “Self-cleaning of superhydrophobic surfaces by self-propelled jumping condensate,” *Proceedings of the National Academy of Sciences*, vol. 110, pp. 7992-7997, 2013. (*equal contributions) *Highlighted in PNAS Early Edition and reported in Scientific American, NBC News, and many other media outlets.*
7. Y. Zhao, F. Liu, C.H. Chen, “Thermocapillary actuation of binary drops on solid surfaces,” *Applied Physics Letters*, vol. 99, no. 104101, 2011.
8. F. Liu, Y. Cai, S.X. Xu, Q. Long, H.Y. Zhang, J. F. Cao, Y. Zhou, “Numerical simulation of tumor blood perfusion in vascular normalization window period by anti-angiogenesis therapy,” *Biomedical Engineering and Clinical Medicine*, vol. 14, pp. 105-109, 2010.

Conference Proceedings

1. F. Liu, J.B. Boreyko, X. Qu, C.H. Chen, “Self-propelled jumping condensate: fundamental mechanisms and vapor-chamber applications,” 9th *ECI International Conference on Boiling and Condensation Heat Transfer*, Boulder, CO, 2015, *for Keynote speech.*

Conference Presentations

1. J. B, X. Qu, F. Liu, R.L. Agapov, N. Lavrik, S. Retterer, J.J. Feng, C.P. Collier, C.H. Chen, “Self-Propelled Sweeping Removal of Dropwise Condensate on Two-Tier Superhydrophobic Surfaces”, American Physical Society Division of Fluid Dynamics Annual Meeting, Boston, MA, 2015.

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2. X. Qu, J.B. Boreyko, F. Liu, R.L. Agapov, N.V. Lavrik, S.T. Retterer, J.J. Feng, C.P. Collier, C.H. Chen, "Self-propelled sweeping removal of dropwise condensate on hierarchical superhydrophobic surfaces," *International Conference on Nanochannels, Microchannels and Minichannels*, San Francisco, CA, 2015.
 3. R. L. Chavez, F. Liu, J.J. Feng, C.H. Chen, "Capillary-inertial colloidal catapult upon drop coalescence," *American Physical Society Division of Fluid Dynamics Annual Meeting*, San Francisco, CA, 2014.
 4. F. Liu, G. Ghigliotti, J.J. Feng, C.H. Chen, "Coalescence-induced jumping motion on non-wetting surfaces: The mechanism of low energy conversion efficiency," *American Physical Society Division of Fluid Dynamics Annual Meeting*, San Francisco, CA, 2014.
 5. K.M. Wisdom, J.A. Watson, X. Qu, F. Liu, G.S. Watson, C.H. Chen, "Self-cleaning of superhydrophobic surfaces by self-propelled jumping condensate," *MRS Fall Meeting*, Boston, MA, 2013.
 6. X. Qu, J.B. Boreyko, F. Liu, C.H. Chen, "Hotspot cooling with self-propelled jumping condensate," *American Physical Society Division of Fluid Dynamics Annual Meeting*, San Diego, CA, 2012.
 7. F. Liu, G. Ghigliotti, J.J. Feng, C.H. Chen, "Self-propelled jumping drops on Leidenfrost surfaces: experiments and simulations," *American Physical Society Division of Fluid Dynamics Annual Meeting*, San Diego, CA, 2012.
 8. F. Liu, C.H. Chen, "Electrohydrodynamic cone-jet bridges," *ACS Colloid and Surface Science Symposium*, Baltimore, MD, 2012.
 9. F. Liu, Y. Zhao, C.H. Chen, "Thermocapillary actuation of binary drops on solid surfaces," *ASME Micro/Nanoscale Heat & Mass Transfer International Conference*, Atlanta, GA, 2012.
 10. F. Liu, Y. Zhao, C.H. Chen, "Thermocapillary actuation of binary drops on solid surfaces," *American Physical Society Division of Fluid Dynamics Annual Meeting*, Baltimore, MD, 2011.

Conference Posters

1. X. Qu, J.B. Boreyko, F. Liu, R.L. Agapov, N.V. Lavrik, S.T. Retterer, J.J. Feng, C.P. Collier, C.H. Chen, "Self-propelled sweeping removal of dropwise condensate on hierarchical superhydrophobic surfaces," *Gordon Research Conference on Micro & Nanoscale Phase Change Heat Transfer*, Galveston, TX, 2015.
2. Y. Zhao, F. Liu, C.H. Chen, "Thermocapillary actuation of binary drops," *Triangle Soft Matter Workshop*, Chapel Hill, NC, 2011.

Theses

1. *Surface Energy Powered Process upon Drop Coalescence*
Ph.D. Dissertation, Advisor: Chuan-Hua Chen, Department of Mechanical Engineering and Materials Science, Duke University, 2015 (in preparation).
2. *Self-propelled Jumping upon Coalescence on Leidenfrost Surfaces*
M.S. Thesis, Advisor: Chuan-Hua Chen, Department of Mechanical Engineering and Materials Science, Duke University, 2013.
3. *Numerical Simulation of Tumor Blood Perfusion in Vascular Normalization Window Period by Anti-angiogenesis Therapy*
B.S. thesis, Advisor: Shixiong Xu, Department of Theoretical and Applied Mechanics, Fudan University, China, 2010.