CURRICULUM VITAE

Jongho Lee, PhD

Yale University
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RESEARCH INTERESTS

Membranes, Water treatment and Desalination, Micro/nanofluidics, Porous media flow, Electrokinetics, Colloids, Surface modification, Nanomaterial synthesis

EDUCATION

PhD in Mechanical Engineering 2014
Massachusetts Institute of Technology, Cambridge, MA, USA

M.S. in Mechanical and Aerospace Engineering 2007
Seoul National University, Seoul, Korea

B.S. in Mechanical and Aerospace Engineering 2003
Seoul National University, Seoul, Korea

RESEARCH EXPERIENCE

Postdoctoral researcher working with Dr. Menachem Elimelech Aug 2014 – Present
Chemical and Environmental Engineering, *Yale University*, New Haven, CT

- Developed a novel reverse osmosis process *via* vapor phase transport
- Developed thermo-osmotic energy conversion process
- Developed omniphobic membranes for oil-water separation
- Identified compaction mechanisms of fouling layers in reverse osmosis
- Developed a dual-functional block copolymer coating for anti-biofouling property using Atom Transfer Radical Polymerization (ATRP)
- Developed a functionalized nanoparticle coating for anti-fouling property

PhD student working with Dr. Rohit Karnik Sep 2008 – Jul 2014
Mechanical Engineering, *MIT*, Cambridge, MA

- Experimentally measured the condensation coefficient of water, an intrinsic probability of conversion from vapor to liquid-phase upon impinging on a liquid-vapor interface
- Developed a plant xylem-based filter for low-cost water treatment
- Investigated damping characteristics of air bubbles inside microfluidic channels and developed high resolution flowmeter (~10 nL/min) based on the principle
- Wrote a review paper on novel nanostructured membranes for water desalination
- Invented and constructed a theoretical model for water desalination via vapor-phase transport through hydrophobic nanopores

Assistant researcher working with Dr. Haecheon Choi Jul 2007 – Jul 2008

Center for Turbulence and Flow Control Research, *Seoul National University*, Seoul, Korea

- Developed a numerical algorithm for solving flow around moving rigid/elastic bodies

M.S. student working with Dr. Haecheon Choi Sep 2005 – Jun 2007

Mechanical and Aerospace Engineering, *Seoul National University*, Seoul, Korea

- Identified sources of spurious force oscillations, a widely known persistent issue of immersed-boundary method in the field of computational fluid dynamics
- Provided consulting to Hyundai Motors for hydrogen fast-filling algorithms of fuel-cell vehicles

TEACHING EXPERIENCE

Teaching Assistant 2007 – 2008

Mechanical and Aerospace Engineering, *Seoul National University*, Seoul, Korea

- *Turbulent flows*
  Graduate level elective course; Provided tutorial sessions; Designed and graded exams and assignments for +30 students
- *Numerical analysis in mechanical engineering*
  Graduate level core course; Provided tutorial sessions; Designed and graded exams and assignments for +90 students

INDUSTRY EXPERIENCE

Machinery designer Feb 2003 – Jun 2005

Dept of Machinery Design, *Hanjin Heavy Industries and Constructions*, Busan, Korea

- Designed engine room systems in container ships: exhaust gas system, CO_2 fire-fighting system, and flexible supporting system
- Conducted performance and reliability tests on the systems during sea trials

HONORS AND AWARDS

- Best Presentation Award, Association of Environmental Engineering and Science Professors (AEESP) Conference 2015
- Best Poster Award (**1st** out of 40+ posters), MIT Water Night 2014
- The Korean Honor Scholarship, The Embassy of the Republic of Korea in the United States of America 2012
- Grand Prize (**1st** out of 162 posters) on Micro/Nano Forum, American Society of Mechanical Engineers (ASME) International Mechanical Engineering Congress and Exposition 2010
- Pappalardo Fellowship, Massachusetts Institute of Technology 2008 – 2009
- Undergraduate Fellowship for Outstanding Achievements, Seoul National University 2000 – 2002
- Nationwide Mathematics Contest sponsored by Yonsei University (Ranked **2nd** in nation) 1998

GRANT PROPOSAL WRITING EXPERIENCE

- **Microfluidic Platform for Continuous, On-line Sensing.** *Submitted*
  PI: Dr. Menachem Elimelech
  Sponsor: National Institute of Environmental Health Sciences
- **Scaling-Resistant Thin-Film Composite RO Membranes to Increase Recovery of Inland Desalination.** *Under Review*
  PI: Dr. Menachem Elimelech
  Sponsor: US Bureau of Reclamation
- **Towards safer drinking water supply: A chemical-free, compact process for sustainable drinking water treatment**
  PI: Dr. Menachem Elimelech
  Sponsor: US National Science Foundation

MENTORING EXPERIENCE

- PhD students for PhD thesis
  (3 students from Yale; 1 visiting student from Harbin Institute of Technology at Yale)
- Master student for master thesis
  (1 student from Seoul National University)
- Undergrad students for senior thesis
  (1 student from Yale; 1 student from MIT; 1 student from Seoul National University)

ACADEMIC SERVICE

- Referee of Journals:
  Environmental Science and Technology, Journal of Material Chemistry, Physics today, RSC Advances, Journal of Membrane Science, Desalination, Environmental Science and Technology Letters, Materials

PROFESSIONAL SOCIETIES

- Association of Environmental Engineering and Science Professors (AEESP)
- American Society of Mechanical Engineers (ASME)
- American Physical Society (APS)
- American Chemical Society (ACS)
- North American Membrane Society (NAMS)

PATENTS

1. R. Karnik and **J. Lee**. "Liquid Filtration Using Pressure Difference Across a Hydrophobic Membrane," PCT/US10/020625, January 2010.

ORAL PRESENTATIONS

1. **J. Lee**, C. Boo and M. Elimelech, "Nanostructure Architecture for Omniphobic Desalination Membranes," Yale Institute for Nanoscience and Quantum Engineering Seminar, Scheduled on Sep. 16, 2016, New Haven, CT, USA

2. **J. Lee**, G. Ye, F. Perreault and M. Elimelech, "Block Copolymer Functionalized Thin-Film Composite Membranes for Anti-fouling and Anti-microbial Properties Using Atom-Transfer Radical Polymerization," New England Graduate Student Water Symposium, Sep. 11 – 13, 2015, Amherst, MA, USA
3. **J. Lee**, G. Ye, F. Perreault and M. Elimelech, "Block Copolymer Functionalized Thin-Film Composite Membranes for Anti-fouling and Anti-microbial Properties Using Atom-Transfer Radical Polymerization," American Chemical Society meeting, Aug. 16 – 20, 2015, Boston, MA, USA
4. **J. Lee**, G. Ye, F. Perreault and M. Elimelech, "Block Copolymer Functionalized Thin-Film Composite Membranes for Anti-fouling and Anti-microbial Properties," Association of Environmental Engineering and Science Professors conference, Jun. 13 – 16, 2015, New Haven, CT, USA. **Awarded a Best Presentation Prize.**
5. **J. Lee**, G. Ye, F. Perreault and M. Elimelech, "Block Copolymer Functionalized Thin-Film Composite Membranes for Anti-fouling and Anti-microbial Properties Using Atom-Transfer Radical Polymerization," North American Membrane Society, May 30 – Jun. 3, 2015, Boston, MA, USA
6. **J. Lee**, M. S. H. Boutilier, B. Potash, V. Chambers, V. Venkatesh and R. Karnik, "Water Filtration Using Plant Xylem," International Conference on Micro and Nanofluidics, May 18-21, 2014, Enschede, The Netherlands
7. **J. Lee**, T. Laoui and R. Karnik, "Desalination of Water by Fast Vapor Transport through Osmosis Membranes with Nanoscale Vapor Traps," Proceedings of the IMECE 2013 International Mechanical Engineering Congress & Exposition, Nov. 15-21, 2013, San Diego, CA, USA
8. **J. Lee**, S. C. O'Hern, F. Rahman, T. Laoui, and R. Karnik, "Osmosis Membranes Employing Vapor-Phase Transport through Short Hydrophobic Nanopores," ICREA Symposium 2012: Nanofluidics, Colloids, and Membranes, July 16-18, 2012, Barcelona, Spain
9. **J. Lee**, S. C. O'Hern, T. Laoui, F. Rahman, and R. Karnik, "Vapor-trapping Membrane for Water Desalination," EDS Desalination for the Environment Conference & Exhibition, Apr. 22-26, 2012, Barcelona, Spain
10. **J. Lee**, S. O'Hern, T. Laoui, F. Rahman, and R. Karnik, "Vapor Transport through Short Hydrophobic Nanopores for Desalination," 64th Annual Meeting of the APS Division of Fluid Dynamics, Nov. 20-22, 2011, Baltimore, MD, USA
11. **J. Lee**, S. O'Hern, T. Laoui, F.Rahman, and R. Karnik, "Vapor-trapping Membrane for Reverse Osmosis," Proceedings of the IMECE 2013 International Mechanical Engineering Congress & Exposition, Nov. 12-18, 2010, Vancouver, BC Canada,
12. **J. Lee** and R. Karnik, "Vapor-Trapping Membrane for Reverse Osmosis," Thirteenth International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTas), Nov. 1-5, 2009, Jeju, Korea
13. **J. Lee**, J. Kim, H. Choi, and K. Yang, "Sources of force oscillations from an immersed boundary method for moving-body problems," 60th Annual Meeting of the APS Division of Fluid Dynamics, Nov. 18-20, 2007, Salt Lake City, UT, USA

POSTER PRESENTATIONS

1. **J. Lee**, T. Laoui and R. Karnik, "Nanofluidic Transport Governed by the Liquid-Vapour Interface," International Conference on Micro & Nanofluidics, May 18-21, 2014, Enschede, The Netherlands
2. **J. Lee**, M. S. H. Boutilier, B. Potash, V. Chambers, V. Venkatesh and R. Karnik, "Water Filtration Using Plant Xylem," MIT Water Night, Mar 20, 2014, Boston, MA, USA. **Awarded 1st Prize in the Best Poster Competition**
3. **J. Lee,** S. C. O'Hern, T. Laoui, F. Rahman, and R. Karnik, "Bubble-stabilized Microfluidic Comparator for Measurement of Small Flow Rates Through Nanoporous Membranes," Gordon Research Conference: Microfluidics, Physics & Chemistry of, Jun. 26 – Jul. 1, 2011, Water Valley, NH, USA
4. **J. Lee**, S. O'Hern, T. Laoui, F.Rahman, and R. Karnik, "Vapor-trapping Membrane for Reverse Osmosis," International Mechanical Engineering Congress & Exposition, Nov. 12-18, 2010, Vancouver, BC Canada, **Awarded Grand Prize in the Best Poster Competition at the 2010 ASME society-wide Micro/Nano Technology Forum**.

PUBLICATIONS

1. C. Boo, **J. Lee** and M. Elimelech, "Engineering Surface Energy and Nanostructure of Microporous Films for Expanded Membrane Distillation Applications." ***Environmental Science and Technology***, 50(15), 8112 (2016)
2. A.P. Straub, N.Y. Yip, S. Lin, **J. Lee** and M. Elimelech, "Harvesting Low-grade Heat Energy using Thermo-osmotic Vapor Transport through Nanoporous Membranes." ***Nature Energy***, 1, 16090 (2016)
3. **J. Lee,** C. Boo, W. Ryu, A. Taylor and M. Elimelech. "Development of Omniphobic Desalination Membranes Using a Charged Electrospun Nanofiber Scaffold." ***ACS Applied Materials and Interfaces***, 8(17), 11154 (2016)
4. M. Xie, **J. Lee**, L.D. Nghiem, and M. Elimelech. "Role of pressure in organic fouling in forward osmosis and reverse osmosis." ***Journal of Membrance Science***, 493, 748 (2015)
5. G. Ye, **J. Lee,** F. Perrault and M. Elimelech. "Controlled Architecture of Dual-functional Block Copolymer Brushes on Thin-Film Composite Membrane via Surface-initiated ARGET-ATRP for Integrated 'Defending' and 'Attacking' Strategies against Biofouling." ***ACS Applied Materials and Interfaces***, 7(41), 23069 (2015)
6. **J. Lee,** T. Laoui and R. Karnik. "Nanofluidic Transport Governed by the Liquid/Vapour Interface." ***Nature Nanotechnology***, 9, 317 (2014). **(Featured in a number of media)**
7. M. Boutilier*, **J. Lee*,** V. Chambers, V. Venkatesh and R. Karnik. "Water Filtration Using Plant Xylem." ***PLOS One*****,** 9(2), e89934 (2014) *** First authorship shared. This paper was featured in a number of media and ranked among top 25 most viewed articles of all time PLOS One.**
8. **J. Lee,** F. Rahman, T. Laoui and R. Karnik. "Bubble-induced Damping in Displacement-driven Microfluidic Flows." ***Physical Review E***, 86, 026301 (2012)
9. T. Humplik, **J. Lee,** S. C. O'Hern, B. A. Fellman, M. A. Baig, S. F. Hassan, M. A. Atieh, F. Rahman, T. Laoui, R. Karnik and E. N. Wang. "Nanostructured Materials for Water Desalination." ***Nanotechnology***, 22, 292001 (2011)
10. **J. Lee** and R. Karnik. "Desalination of Water by Vapor-phase Transport through

Hydrophobic Nanopores." ***Journal of Applied Physics***, 108, 044315 (2010)

11. **J. Lee,** J. Kim, H. Choi and K. Yang. "Sources of Spurious Force Oscillations from an Immersed Boundary Method for Moving-body Problems." ***Journal of Computational Physics***, 230(7), 2677 (2011)

PUBLICATIONS in preparation

1. **J. Lee,** T. Straub, J. Werber and M. Elimelech. "Vapor Phase Reverse Osmosis Membrane." *In preparation*
2. C. Liu, **J. Lee**, C. Small, J. Ma, and M. Elimelech. "Antifouling Thin-Film Composite Membranes by Controlled Architecture of Zwitterionic Polymer Brush Layer." *In preparation*
3. T. Humplik, **J. Lee**, S.C. O'Hern, T. Laoui, R. Karnik, and E.N. Wang, "Enhanced Water Transport and Salt Rejection through Hydrophobic Zeolite Pores." *In preparation*

FEATURED IN MEDIA

- Nanofluidic Transport Governed by the Liquid/Vapour Interface (*Nature Nanotechnology*, 2014)

Science Daily	http://www.sciencedaily.com/releases/2014/03/140316153324.htm
American Society of Civil Engineering	http://www.asce.org/magazine/20140325-researchers-examine-novel-desalination-method
MIT news	http://newsoffice.mit.edu/2014/novel-membrane-reveals-water-molecules-will-bounce-off-a-liquid-surface

- Water Filtration Using Plant Xylem (*PLOS One*, 2014)

National Public Radio	http://www.npr.org/blogs/health/2014/03/05/286215962/to-clean-drinking-water-all-you-need-is-a-stick
Science Daily	http://www.sciencedaily.com/releases/2014/02/140226174548.htm
Boston Globe	https://www.bostonglobe.com/metro/2014/03/09/mit-engineers-test-low-tech-water-filter-inspired-nature/fpq416KF2TQ3IpRSZk8pML/story.html

REFERENCES

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