



Shibo Wang, Ph.D., EIT

Curriculum Vitae

(as of October 2016)

Biography

Shibo Wang is a hydrogeologist and reservoir engineer, currently in his fourth-year appointment as the NCGC Postdoctoral Fellow in the US DOE's Energy Frontier Research Center (EFRC) for the Nanoscale Control of Geologic CO₂ (NCGC) at the Energy Geosciences Division of Lawrence Berkeley National Laboratory. He studies the key mechanisms and physicochemical basis of multiphase flow through porous media and reservoir processes pertaining to production of subsurface energy resources, carbon storage, and remediation of groundwater contamination. He performs experimental, theoretical and numerical studies and particularly specializes in designing, constructing, and conducting state-of-the-art high pressure high temperature experiments that simulate geologic reservoir in situ conditions and processes. He also works in the interdisciplinary areas including computational and experimental fluid dynamics, microfluidic flow control, lubrication, tribology, rheology, and carbon neutral engineering to address global grand challenges.

Before joining LBNL, he received both his M.E. (2009) and Ph.D. (2013) in Civil and Environmental Engineering at University of Virginia. His Ph.D. dissertation is on "the role of interfacial phenomena in leakage from geologic carbon sequestration sites" and his M.E. work is on "gas-expanded lubricants for increased energy efficiency" and "analytical model of metalworking fluid penetration into the flank contact zone in orthogonal cutting". At LBNL, his research efforts are unified on molecular-, nano-, pore-, core-, and continuum-scale interfacial phenomena that govern fluid-fluid and fluid-fluid-rock interactions and thus the fate and transport of geofluids and geosolids. Specifically, he investigates capillary pressure-saturation-permeability, wettability, interfacial tension, adhesion, viscosity and rheology, rock and fluid properties, natural organic matters, nano-particles, and geochemical, geomechanical and petrophysical properties and their effects on multiphase flow, transport, reaction, and equilibrium to improve basic understanding and develop industrial solutions. Extra efforts have been made to integrate advanced computational and data mining tools to translate research findings to larger-scale systems.

Professionally trained in a series of top-tier multidisciplinary engineering programs for over 13 years, he has developed in-depth research expertise in the core areas of energy resources and sustainable engineering. To date, his research has contributed 9 journal articles (another 6 in progress), 5 conference proceedings, 1 patent, and over 50 conference presentations to the aforementioned research fields. These research findings are well recognized among peers. Some recent measures of esteem include ACS Editors' Choice Award, Annual Award for Excellence in Research, Chinese National Award for Outstanding Ph.D. Scholars, be an expert reviewer/judge for 22 international journals, funding agency and awards, and serving as the primary convener and chair of several technical sessions at AGU Fall Meetings.

Career Goals

Global leader in sustainable development of energy resources and environmental protection

Research Interests

1. multiphase flow through porous media 2. reservoir engineering 3. colloids and interfaces
4. computational and experimental fluid dynamics 5. lubrication and tribology
6. nano-engineering 7. microfluidics 8. supercritical fluids 9. carbon neutral manufacturing
10. renewable energy 11. energy efficiency 12. sustainability

Current Appointment

2013–present **NCGC Postdoctoral Fellow**, Energy Frontier Research Center, Energy Geosciences
Division, U.S. Department of Energy's Lawrence Berkeley National Laboratory

Education

2009–2013 **Ph.D. in Civil and Environmental Engineering** GPA: 4.0/4.0, Top 1
University of Virginia, Charlottesville, USA

2007–2009 **M.E. in Civil and Environmental Engineering** GPA: 4.03/4.0 (A+ = 4.33), Top 1
University of Virginia, Charlottesville, USA

2003–2007 **B.E. in Chemical/Environmental Engineering** GPA: 3.86/4.0, Top 5%
Minor. in English GPA: 3.88/4.0
Dalian University of Technology, China

Professional Certificates

2016 **MOOC Oil & Gas** IFP School

2014 **Reservoir Geomechanics** Stanford University

2012 **Engineer in Training** NCEES

Software Skills

MATLAB, ABAQUS, C, LabVIEW, COMSOL, Crystal Ball, PHREEQC II, Visual
MINTEQ, AspenPlus, Simapro, Microsoft Office Suite, Adobe Acrobat Suite, ImageJ

Computational Skills

Proficient in commonly used numerical methods, e.g., finite element analysis, finite
difference analysis

Work Permit

U.S. Permanent Resident, alien of extraordinary ability (EB-1A) category

Research and Teaching Experiences

Research

- 2013–Present **NCGC Postdoctoral Fellow**, Energy Frontier Research Center, Energy Geosciences Division, Lawrence Berkeley National Laboratory
(Supervisor: Dr. Tetsu K. Tokunaga)
- Design and perform experimental, computational, and theoretical studies to investigate the physicochemical processes pertaining to CO₂ sequestration, enhanced oil recovery, shale gas and oil, and hydrogeology
 - Devised and developed a state-of-the-art automated high pressure high temperature experimental system with record-breaking precision at only 10% cost of the commercially available system
 - 3 first-authored peer-reviewed journal articles (another 6 in progress), 2 awards
- 2009–2013 **Ph.D. Researcher**, Virginia Environmentally Sustainable Technologies Laboratory, Department of Civil and Environmental Engineering, University of Virginia
(Supervisor: Dr. Andres F. Clarens)
- Conducted unified research on multiphase flow and interfacial phenomena ranging from molecular-, nano-, pore-, core-, to continuum-scales and successfully developed effective solutions for energy resources engineering and greenhouse gas control using the state-of-the-art experimental, computational, and data mining tools
 - 11 peer-reviewed journal articles and conference papers, 6 awards
- 2007–2009 **Graduate Researcher**, Virginia Environmentally Sustainable Technologies Laboratory, Department of Civil and Environmental Engineering, University of Virginia
(Supervisor: Dr. Andres F. Clarens and Dr. Wu-seng Lung)
- Resolved key problems in the areas of computational and experimental fluid dynamics, microfluidics, green engineering and sustainability, lubrication and tribology, and water resources modeling
 - Invented and patented (in the U.S., Europe, and internationally) a sustainable technology of supercritical CO₂ gas-expanded lubricants with a 20% increase in energy efficiency
 - 1 patent, 1 award
- 2005–2007 **Undergraduate Researcher**, Key Laboratory of Industrial Ecology and Environmental Engineering, Chinese Ministry of Education, Dalian University of Technology
(Supervisor: Dr. Xie Quan and Dr. Jingwen Chen)
- Applied the design-for-environment principles and developed novel environmental and chemical engineering technologies with broad applications in wastewater treatment and air pollution control
 - 1 peer-reviewed journal article, 7 awards

Teaching

- 2009–2010 **Ph.D. Instructor**, Department of Civil and Environmental Engineering, University of Virginia
- Class of “CEE 4100–6220: Water Chemistry for Engineers”
 - Only winner of the Annual Graduate Teaching Award in the Department
- 2007–2008 **Graduate Teaching Assistant**, Department of Civil and Environmental Engineering, University of Virginia
- Class of “CEE 6720: Continuum Mechanics”

Publications

Ph.D. Dissertation

Shibo Wang. “The role of interfacial phenomena in leakage from geologic carbon sequestration sites”. University of Virginia

- Ph.D. Committee: Andres F. Clarens (Advisor), Catherine A. Peters (Princeton University), James A. Smith (Chair), Roseanne M. Ford, Teresa B. Culver

Peer-Reviewed Journal Articles

9. **Shibo Wang**, Tetsu K. Tokunaga, Jiamin Wan, Wenming Dong, and Yongman Kim (2016). “Capillary pressure–saturation relations in quartz and carbonate sands: Limitations for correlating capillary and wettability influences on air, oil, and supercritical CO₂ trapping”. *Water Resources Research*, 52 (8), 6671–6690.
8. **Shibo Wang**, and Tetsu K. Tokunaga (2015). “Capillary pressure–saturation relations for supercritical CO₂ and brine in limestone/dolomite sands: Implications for geologic carbon sequestration in carbonate reservoirs”. *Environmental Science and Technology*, 49 (12), 7208–7217.
 - ACS Editors’ Choice award
7. **Shibo Wang**, Zhiyuan Tao, Sara M. Persily, and Andres F. Clarens (2013). “CO₂ adhesion on hydrated mineral surfaces”. *Environmental Science and Technology*, 47 (20), 11858–11865.
6. **Shibo Wang**, and Andres F. Clarens (2013). “Analytical model of metalworking fluid penetration into the flank contact zone in orthogonal cutting”. *Journal of Manufacturing Processes*, 15 (1), 41–50.
5. Yiwen Ouyang, **Shibo Wang**, Jingyi Li, Paul S. Riehl, Matthew R. Begley, and James P. Landers (2013). “Rapid patterning of ‘tunable’ hydrophobic valves on disposable microchips by laser printer lithography”. *Lab on a Chip*, 13 (9), 1762–1771.
4. **Shibo Wang**, Ian M. Edwards, and Andres F. Clarens (2012). “Wettability phenomena at the CO₂–brine–mineral interface: implications for geologic carbon sequestration”. *Environmental Science and Technology*, 47 (1), 234–241.
3. **Shibo Wang**, and Andres F. Clarens (2012). “The effects of CO₂–brine rheology on leakage processes in geologic carbon sequestration”. *Water Resources Research*, 48 (8), W08518.
2. Andres F. Clarens, Amir Younan, **Shibo Wang**, and Paul E. Allaire (2010). “Feasibility of gas-expanded lubricants for increased energy efficiency in tilting-pad journal bearings”. *Journal of Tribology*, 132 (3), 031802.
1. Yanhe Han, Xie Quan, Shuo Chen, **Shibo Wang**, and Yaobin Zhang (2007). “Electrochemical enhancement of adsorption capacity of activated carbon fibers and their surface physicochemical characterizations”. *Electrochimica Acta*, 52 (9), 3075–3081.

Journal Articles in Progress

6. **Shibo Wang**, and Tetsu K. Tokunaga. “Capillary pressure–saturation relations for supercritical CO₂ and brine in Idaho Gray sandstone”, to be submitted to *Environmental Science and Technology*.
5. **Shibo Wang**, and Tetsu K. Tokunaga. “Effects of ionic and nonionic surfactants on capillarity and wettability in enhanced oil recovery processes”, to be submitted to *Journal of Petroleum Science and Engineering*.
4. Jiamin Wan, Yongman Kim, Tetsu K. Tokunaga, **Shibo Wang**, Maria V.P. Altoe, Paul D. Ashby, and Donald J. DePaolo. “Reactivity of supercritical CO₂ with muscovite”, to be submitted to *Nature Geoscience*.
3. Tetsu K. Tokunaga, **Shibo Wang**, Jiamin Wan, and Yongman Kim. “Changes in interfacial properties caused by natural organic substances and extended supercritical CO₂ exposure”, to be submitted to *Environmental Science and Technology*.
2. Abdullah Cihan, **Shibo Wang**, Tetsu K. Tokunaga, and Jens Birkholzer. “An integrated experimental and modeling study on two-dimensional immiscible gravity exchange flow”, to be submitted to *Water Resources Research*.
1. **Shibo Wang**, Ian C. Bourg, Yangyang Liu, Tetsu K. Tokunaga, and Andres F. Clarens. “Hydrophilicity of quartz surfaces in geologic CO₂ sequestration: An integrated experimental and molecular dynamics simulation study”, to be submitted to *Proceedings of the National Academy of Sciences*.

Conference Papers

5. **Shibo Wang**, and Andres F. Clarens. “Improved force balance for predicting vertical migration of CO₂ from geologic sequestration sites”. In *American Institute of Chemical Engineers Carbon Management Technology Conference*, Orlando, Florida, February 7–9, 2012.
4. Yiwen Ouyang, Jingyi Li, Christopher Phaneuf, **Shibo Wang**, Paul S. Riehl, and James P. Landers. “Design and fabrication of a CD-like disposable microfluidic platform for serial dilution”. In *The 16th International Conference on Miniaturized System for Chemistry and Life Science*, Okinawa, Japan, October 28–November 1, 2012.
3. Andres F. Clarens, **Shibo Wang**, Amir Younan, and Paul E. Allaire. “Feasibility of gas-expanded lubricants for increased energy efficiency in rotating machinery”. In *Society of Tribologists and Lubrication Engineers/American Society of Mechanical Engineers International Joint Tribology Conference*, San Francisco, California, October 2010.
2. **Shibo Wang**, and Andres F. Clarens. “Analytical model of metalworking fluid penetration into the flank contact zone in orthogonal cutting”. In *Society of Tribologists and Lubrication Engineers/American Society of Mechanical Engineers International Joint Tribology Conference*, San Francisco, California, October 2010.
1. **Shibo Wang**, and Andres F. Clarens. “Feasibility of gas-expanded lubricants for increased energy efficiency in power turbines”. In *239th American Chemical Society National Meeting and Exposition*, San Francisco, California, March 21–25, 2010.

Session Proposals

3. **Shibo Wang**, Lauren E. Beckingham, Megan M. Smith, and Charles J. Werth. “New perspectives on CO₂ flow, transport, and long-term storage in subsurface reservoirs”. In *American Geophysical Union Fall Meeting*, San Francisco, California, December 2015.
2. **Shibo Wang**, and Lauren E. Beckingham. “New perspectives on hydrological and geochemical processes pertaining to geologic CO₂ storage”. In *American Geophysical Union Fall Meeting*, San Francisco, California, December 2015.
1. Stuart D. Walsh, Susan A. Carroll, Megan M. Smith, and **Shibo Wang**. “Coupled hydraulic, geochemical, and geomechanical processes in carbon storage”. In *American Geophysical Union Fall Meeting*, San Francisco, California, December 2014.

Patent

2011/2012 **Gas-Expanded Lubricants for Increased Energy Efficiency and Related Method and System**. 2009 priority

- Inventors: Andres F. Clarens, Paul E. Allaire, Amir Younan, **Shibo Wang**
- License number: WO2011047285 A1 (International); US20120199421 A1 (U.S.)
EP2488614 A1 (European)

Abstracts and Presentations

Invited Talks

3. **Shibo Wang**. “Capillary pressure–saturation relations for supercritical CO₂ and brine in limestone/dolomite sands: Implications for geologic carbon sequestration in carbonate reservoirs”. In *Geologic Carbon Sequestration Program Meeting*, Lawrence Berkeley National Laboratory, Berkeley, California, August 2015.
2. **Shibo Wang**. “Investigation of interfacial phenomena: Capillary pressure–saturation relations, rheology, wettability and CO₂ adhesion for geologic carbon sequestration”. In *Energy Frontier Research Center Junior Scientist Meeting*, Lawrence Berkeley National Laboratory, Berkeley, California, April 2014.
1. **Shibo Wang**, Xuehua Li, Xiaojia Mu, Tingting Zhang, Sihan Sun and Yiwen Liu. “Life cycle impact analysis of disposable lunchbox and its alternatives”. In *International Specialized Environmental Issues Conference*, Kitakyushu, Japan, July 2006.

Conference Talks

34. **Shibo Wang**, and Tetsu Tokunaga. “Brine capillary pressure-saturation relations and residual saturation of scCO₂, decane, and air in unconsolidated and consolidated porous media”. In *Center for Nanoscale Control of Geologic CO₂ All-Hands Meeting*, Lawrence Berkeley National Laboratory, Berkeley, California, October 2016.
33. Abdullah Cihan, Jens Birkholzer, **Shibo Wang**, Tetsu Tokunaga, Luca Trevisan, and Tissa

- Illangasekare. “Development and testing of a hysteresis modeling approach for the two-phase flow capillary pressure–saturation–relative permeability relationship: Laboratory-scale analyses”. In *The XXI International Conference Computational Methods in Water Resources*, Toronto, Canada, June 2016.
32. Jiamin Wan, Yongman Kim, Tetsu K. Tokunaga, **Shibo Wang**, Maria V.P. Altoe, Paul D. Ashby, and Donald J. DePaolo. “Reactivity of dissolved- vs. supercritical-CO₂ phase toward muscovite basal surfaces”. In *American Geophysical Union Fall Meeting*, San Francisco, California, December 2015.
 31. Tetsu K. Tokunaga, and **Shibo Wang**. “What causes deviations in predictions of scCO₂–brine saturation relations?”. In *Center for Nanoscale Control of Geologic CO₂ All-Hands Meeting*, Lawrence Berkeley National Laboratory, Berkeley, California, November 2015.
 30. Jiamin Wan, Yongman Kim, Tetsu K. Tokunaga, **Shibo Wang**, Maria V.P. Altoe, Paul D. Ashby, and Donald J. DePaolo. “Reactivity of dissolved- vs. supercritical-CO₂ phase toward muscovite basal surfaces”. In *Center for Nanoscale Control of Geologic CO₂ All-Hands Meeting*, Lawrence Berkeley National Laboratory, Berkeley, California, November 2015.
 29. **Shibo Wang**, Tetsu K. Tokunaga, and Jiamin Wan. “Capillary pressure–saturation relations and residual saturation of CO₂, oil, and air in quartz and limestone sandpacks”. In *12th International Symposium on Reservoir Wettability and its Effects on Oil Recovery*, Lawrence, Kansas, October 2015.
 28. **Shibo Wang**, Tetsu K. Tokunaga, and Jiamin Wan. “Capillary pressure–saturation relations for supercritical CO₂ and brine in limestone/dolomite sands: Implications for geologic carbon sequestration in carbonate reservoirs”. In *250th American Chemical Society National Meeting and Exposition*, Boston, Massachusetts, August 2015.
 27. Tetsu K. Tokunaga, **Shibo Wang**, Jiamin Wan, and Yongman Kim. “Why do some scCO₂–brine saturation relations deviate from capillary scaling predictions?”. In *Center for Nanoscale Control of Geologic CO₂ Pore-scale Multiphase Workshop*, Stanford University, Stanford, California, August 2015.
 26. Tetsu K. Tokunaga, and **Shibo Wang**. “Thrust 2, residual/capillary trapping updates”. In *Center for Nanoscale Control of Geologic CO₂ PI Telecon*, Lawrence Berkeley National Laboratory, Berkeley, California, July 2015.
 25. **Shibo Wang**, Tetsu K. Tokunaga, and Jiamin Wan. “Capillary pressure–saturation relations for supercritical CO₂ and brine in limestone/dolomite sands: Implications for geologic carbon sequestration in carbonate reservoirs”. Pop-Up Presentation in *Gordon Research Conference on Carbon Capture, Utilization and Storage*, Easton, Massachusetts, June 2015.
 24. Tetsu K. Tokunaga, and **Shibo Wang**. “Capillary pressure–saturation relations for supercritical CO₂ in carbonate reservoirs”. In *Center for Nanoscale Control of Geologic CO₂ PI Telecon*, Lawrence Berkeley National Laboratory, Berkeley, California, May 2015.
 23. Tetsu K. Tokunaga, **Shibo Wang**, and Jiamin Wan. “Capillary controls on CO₂–brine distributions in porous media”. In *Center for Nanoscale Control of Geologic CO₂ Dynamic*

Wetting Workshop, Lawrence Berkeley National Laboratory, Berkeley, California, April 2015.

22. **Shibo Wang**, Tetsu K. Tokunaga, Jiamin Wan, Wenming Dong, and Yongman Kim. “Capillary pressure–saturation relations for supercritical CO₂ and brine: Implications for capillary/residual trapping in carbonate reservoirs during geologic carbon sequestration”. In *American Geophysical Union Fall Meeting*, San Francisco, California, December 2014.
21. **Shibo Wang**, Tetsu K. Tokunaga, Jiamin Wan, Wenming Dong, and Yongman Kim. “Capillary pressure–saturation relations and residual saturation of CO₂, oil, and air in quartz and limestone sandpicks”. Pop-Up Presentation In *Center for Nanoscale Control of Geologic CO₂ Fall Symposium*, Lawrence Berkeley National Laboratory, Berkeley, California, November 2014.
20. Tetsu K. Tokunaga, **Shibo Wang**, Jiamin Wan, Wenming Dong, and Yongman Kim. “Capillary trapping of scCO₂ in reservoirs: Laboratory experiments on quartz and limestone sands”. In *Center for Nanoscale Control of Geologic CO₂ Fall Symposium*, Lawrence Berkeley National Laboratory, Berkeley, California, November 2014.
19. Jiamin Wan, Tetsu K. Tokunaga, Yongman Kim, and **Shibo Wang**. “Contact angle measurement ambiguity in supercritical CO₂–water–mineral systems”. In *Center for Nanoscale Control of Geologic CO₂ Fall Symposium*, Lawrence Berkeley National Laboratory, Berkeley, California, November 2014.
18. Tetsu K. Tokunaga, and **Shibo Wang**. “Proposed plans for P_c(S) relations in reservoir materials”. In *Thrust 2: Secondary Trapping Meet-Up*. Stanford University, Palo Alto, California, October 2014.
17. **Shibo Wang**, Andres F. Clarens, Zhiyuan Tao, and Sara M. Persily. “Adhesion of CO₂ on hydrated mineral surfaces and its implications to geologic carbon sequestration”. In *American Geophysical Union Fall Meeting*, San Francisco, California, December 2013.
16. Tetsu K. Tokunaga, and **Shibo Wang**. “Capillary pressure and mineral wettability influences on reservoir CO₂ capacity”. In *Mineralogical Society of America and Geochemical Society Short Course on Geochemistry of Geologic CO₂ Sequestration*. Lawrence Berkeley National Laboratory, Berkeley, California, December 2013.
15. **Shibo Wang**, Tetsu K. Tokunaga, Jiamin Wan, Jong-Won Jung, Tae-Wook Kim, Yongman Kim, Wenming Dong, Andres F. Clarens, Zhiyuan Tao, and Sara M. Persily. “Investigation of interfacial phenomena: Capillary pressure–saturation relations, CO₂ adhesion and wettability hysteresis for geologic carbon sequestration”. In *Center for Nanoscale Control of Geologic CO₂ Fall Symposium*, Lawrence Berkeley National Laboratory, Berkeley, California, November 2013.
14. Jiamin Wan, Yongman Kim, Prem Bikkina, Tetsu K. Tokunaga, and **Shibo Wang**. “Wetting behavior of supercritical CO₂ and brine on mica surfaces and in silica pore networks”. In *Center for Nanoscale Control of Geologic CO₂ Fall Symposium*, Lawrence Berkeley National Laboratory, Berkeley, California, November 2013.
13. Andres F. Clarens, and **Shibo Wang**. “CO₂ adhesion at the hydrated mineral interface could greatly reduce the risk of leakage from geologic carbon sequestration sites”. In

American Institute of Chemical Engineers Carbon Management Technology Conference,
Alexandria, Virginia, October 2013.

12. Tetsu K. Tokunaga, Jiamin Wan, Jong-won Jung, Tae-Wook Kim, Yongman Kim, Wenming Dong, and **Shibo Wang**. “Capillary pressure relations with brine saturations under geologic carbon sequestration conditions”. In *Clay Minerals Society Annual Meeting*, University of Illinois, Urbana-Champaign, Illinois, October 2013.
11. Andres F. Clarens, **Shibo Wang**, Bo Liang, Catherine A. Peters, Jeffrey P. Fitts, Brian R. Ellis, and Hang Deng. “An integrated experimental program to understand leakage from geologic carbon sequestration sites across scales”. In *Association of Environmental Engineering and Science Professors Biannual Meeting*, Golden, Colorado, July 2013.
10. Tetsu K. Tokunaga, Jiamin Wan, Jongwon Jung, TaeWook Kim, Yongman Kim, Wenming Dong, and **Shibo Wang**. “Testing predictability of capillary pressure–saturation relations for geological CO₂ sequestration”. In *Center for Nanoscale Control of Geologic CO₂ Seminar*, Lawrence Berkeley National Laboratory, Berkeley, California, July 2013.
9. Andres F. Clarens, **Shibo Wang**, Bo Liang, Catherine A. Peters, Jeffrey P. Fitts, Hang Deng, and Brian R. Ellis. “An integrated experimental program to understanding leakage from geologic carbon sequestration sites across scales”. In *American Geophysical Union Fall Meeting*, San Francisco, California, December 2012.
8. **Shibo Wang**, and Ian M. Edwards. “CO₂ wetting on representative minerals and its implications for geologic carbon sequestration”. In *Robert J. Huskey Research Exhibition*, Graduate School of Arts and Sciences, University of Virginia, Charlottesville, Virginia, March 2012.
7. **Shibo Wang**, and Andres F. Clarens. “CO₂–brine rheology could suppress leakage from geologic carbon sequestration sites”. In *American Geophysical Union Fall Meeting*, San Francisco, California, December 2011.
6. Catherine A. Peters, Andres F. Clarens, Jeffrey P. Fitts, Brian R. Ellis, **Shibo Wang**, Curtis M. Oldenburg, Patrick F. Dobson, Joseph S.Y. Wang, and Yves Guglielmi. “Safe and effective geologic sequestration of CO₂: Multi-scale experimental studies of formation integrity and leakage”. In *Association of Environmental Engineering and Science Professors Biannual Meeting*, Tampa, Florida, July 2011.
5. Andres F. Clarens, **Shibo Wang**, Amir Younan, and Paul E. Allaire. “Feasibility of gas-expanded lubricants for increased energy efficiency in rotating machinery”. In *Society of Tribologists and Lubrication Engineers/American Society of Mechanical Engineers International Joint Tribology Conference*, San Francisco, California, October 2010.
4. Andres F. Clarens, and **Shibo Wang**. “Modeling metalworking fluid penetration into the cutting zone to describe the behavior of environmentally adapted lubricants”. In *Society of Tribologists and Lubrication Engineers/American Society of Mechanical Engineers International Joint Tribology Conference*, San Francisco, California, October 2010.
3. **Shibo Wang**, and Andres F. Clarens. “Rheology of CO₂-saturated brine solutions: Implications for fluid flow under geologic storage relevant conditions”. In *National Energy*

Technology Laboratory Carbon Capture and Sequestration Meeting, Pittsburgh, Pennsylvania, May 2010.

2. **Shibo Wang**, and Andres F. Clarens. “Feasibility of gas-expanded lubricants for increased energy efficiency in power turbines”. In *239th American Chemical Society National Meeting and Exposition*, San Francisco, California, March 2010.
1. **Shibo Wang**, and Andres F. Clarens. “Rheology of CO₂–H₂O mixtures: Implications for understanding leakage in geologic sequestration”. In *239th American Chemical Society National Meeting and Exposition*, San Francisco, California, March 2010.

Poster Presentations

19. **Shibo Wang**, Tetsu K. Tokunaga, Jiamin Wan, Wenming Dong, and Yongman Kim. “Capillary pressure–saturation relations in quartz and carbonate sands: Limitations for correlating capillary and wettability influences on air, oil, and supercritical CO₂ trapping”. In *American Geophysical Union Fall Meeting*, San Francisco, California, December 2016.
18. **Shibo Wang**, Tetsu K. Tokunaga, Jiamin Wan, Yongman Kim, and Timothy J. Kneafsey. “Capillary and wettability controls on CO₂–brine distributions in geologic carbon sequestration”. In *Center for Nanoscale Control of Geologic CO₂ All-Hands Meeting*, Lawrence Berkeley National Laboratory, Berkeley, California, November 2015.
17. **Shibo Wang**, Tetsu K. Tokunaga, Jiamin Wan, Yongman Kim, and Timothy J. Kneafsey. “Capillary and wettability controls on CO₂–brine distributions in geologic carbon sequestration”. In *U.S. Department of Energy EFRC Principal Investigators’ Meeting*, Washington D.C., October 2015.
16. Timothy J. Kneafsey, **Shibo Wang**, Tetsu K. Tokunaga, Jiamin Wan, Jonathan B. Ajo-Franklin, Marco Voltolini, and David Trebotich. “Effects of wettability on CO₂ behavior in mineral media”. In *U.S. Department of Energy Carbon Storage R&D Project Review Meeting: Transforming Technology through Integration and Collaboration*, National Energy Technology Laboratory, Pittsburgh, Pennsylvania, August 2015.
15. **Shibo Wang**, Tetsu K. Tokunaga, Jiamin Wan. “Capillary pressure–saturation relations for supercritical CO₂ and brine in limestone/dolomite sands: Implications for geologic carbon sequestration in carbonate reservoirs”. In *Gordon Research Conference on Carbon Capture, Utilization and Storage*, Easton, Massachusetts, June 2015.
14. **Shibo Wang**, Tetsu K. Tokunaga, Jiamin Wan, Wenming Dong, and Yongman Kim. “Capillary pressure–saturation relations and residual saturation of CO₂, oil, and air in quartz and limestone sandpacks”. In *Center for Nanoscale Control of Geologic CO₂ Fall Symposium*, Lawrence Berkeley National Laboratory, Berkeley, California, November 2014.
13. Tetsu K. Tokunaga, Jiamin Wan, Yongman Kim, Tae-Wook Kim, **Shibo Wang**, Antonio G. Lanzirotti, Matthew G. Newville, Stephen R. Sutton, W. Rao, and Sue Wirick. “Controlling and measuring water potentials and water film thickness on mineral surfaces”. In *“Geosciences Models – Where are the Rocks?” the Annual Symposium for the Geosciences Research Program within the Department of Energy’s Office of Basic Energy Sciences*,

Gaithersburg, Maryland, May 2014.

12. Andres F. Clarens, **Shibo Wang**, and Zhiyuan Tao. “Adhesion at the CO₂/mineral interface”. In *Association of Environmental Engineering and Science Professors Biannual Meeting*, Golden, Colorado, July 2013.
11. **Shibo Wang**, and Andres F. Clarens. “Adhesion and its role in geologic carbon sequestration”. In *12th Carbon Capture, Utilization and Sequestration Conference*, Pittsburgh, Pennsylvania, May 2013.
10. Yiwen Ouyang, Jingyi Li, Christopher Phaneuf, **Shibo Wang**, Paul S. Riehl, and James P. Landers. “Design and fabrication of a CD-like disposable microfluidic platform for serial dilution”. In *16th International Conference on Miniaturized System for Chemistry and Life Science*, Okinawa, Japan, October–November 2012.
9. **Shibo Wang**, and Andres F. Clarens. “Wettability phenomena of representative minerals in geologic carbon sequestration formations”. In *11th Carbon Capture, Utilization and Sequestration Conference*, Pittsburgh, Pennsylvania, May 2012.
8. **Shibo Wang**. “The role of interfacial phenomena in leakage from geologic carbon sequestration sites”. In *2nd Presidential Poster Competition*, University of Virginia, Charlottesville, Virginia, April 2012.
7. **Shibo Wang**, and Andres F. Clarens. “Improved force balance for predicting vertical migration of CO₂ from geologic sequestration sites”. In *American Institute of Chemical Engineers Carbon Management Technology Conference*, Orlando, Florida, February 2012.
6. **Shibo Wang**, Ian M. Edwards, and Andres F. Clarens. “The wettability of CO₂ on minerals under relevant geologic carbon sequestration conditions and its implications on leakage processes”. In *American Geophysical Union Fall Meeting*, San Francisco, California, December 2011.
5. Ian M. Edwards, **Shibo Wang**, and Andres F. Clarens. “Contact angle measurements for assessing the wettability of CO₂ in a saline–rock/clay system: Implications for geologic carbon sequestration”. In *University of Virginia REU Research Symposium*, Charlottesville, Virginia, July 2011.
4. Brandon C. Lee, **Shibo Wang**, Brian K. Weaver and Andres F. Clarens. “Evaluating CO₂ leakage from sequestration sites using column studies”. In *University of Virginia RET Research Symposium*, Charlottesville, Virginia, July 2011.
3. Karla H. Sharrer, **Shibo Wang**, Brian K. Weaver, and Andres F. Clarens. “Research experience for teachers: Evaluating CO₂ leakage from sequestration sites using column studies”. In *University of Virginia RET Research Symposium*, Charlottesville, Virginia, July 2010.
2. **Shibo Wang**, and Andres F. Clarens. “Rheology of CO₂-saturated brine solutions: Implications for fluid flow under geologic-storage relevant conditions”. In *9th Annual Carbon Capture & Sequestration Conference*, Pittsburgh, Pennsylvania, May 2010.
1. Chenxi Li and, **Shibo Wang**. “Effects of pH, extraction time, and soil types on heavy metal extractability”. In *Environmental Microbiology Class Poster Competition*, University of Virginia, Charlottesville, Virginia, April 2009.

Honors and Awards (after 2008)

- 2015 **ACS Editors' Choice Award** American Chemical Society
- Selected from ACS's 44 peer-reviewed journals based on recommendations from 400+ editors, <0.37% winning rate
- 2013 **Annual Award for Excellence in Research** Dept. of CEE, UVa
- Only winner, <1% winning rate
- 2013 **Chinese Government Scholarship for Outstanding Self-Financed Student Abroad** China Scholarship Council
- Global selection among all Chinese Ph.D. scholars overseas, <0.16% winning rate
- 2012 **Huskey Award for Outstanding Research – “Two-Hoos” Team Research** UVa (Shared with Ian Edwards)
- 2012 **Travel Grant Award** Dept. of CEE, UVa
- 2011 **Travel Grant Award** American Geophysical Union
- 2011 **Annual Graduate Teaching Award** Dept. of CEE, UVa
- Only winner
- 2010 **ACS Graduate Student Award** American Chemical Society
- #1 ranking among 25 awardees selected from all American universities
- 2009 **ConocoPhillips–Penn State Energy Prize** ConocoPhillips (Shared with Andres Clarens and Brian Tison)
- Won, as part of a 3-member team, 2nd place among ~180 candidates, <0.57% selection rate, \$75000 funding

Research Projects

- 2013–Present **Lawrence Berkeley National Laboratory, Berkeley, California** (Funded by U.S. DOE)
- Reservoir Processes and Engineering**
- Physicochemical basis of multiphase flow in porous media
 - CO₂-EOR mobility and conformance control technologies
 - Effects of natural organic matters on reservoir capillarity and wettability
 - Roles of nano-particles on interfacial phenomena
 - Mechanisms of immiscible gravity exchange flow: experiments and modeling
 - Investigation of capillary pressure–saturation relations of supercritical CO₂–brine, oil–brine, and air–brine in consolidated or unconsolidated sandstone and carbonate reservoirs
 - Surfactant and CO₂ flooding in quartz and limestone sandpacks

- Improved EOR mobility control and sweep efficiency with CO₂/CO₂-foam
- Oil/CO₂/brine displacement, pore flow dynamics (e.g., snap-off, haines jumps, interface evolution)
- Multiphase flow of CO₂/CO₂-foam in microfluidic porous model
- Reactivity of supercritical CO₂ with mica minerals
- Investigation of proppant transport efficiency and fluid leak-off in hydraulic fracturing
- In-depth exploration of reservoir wettability mechanisms and their impacts on pore and Darcy flow
- Utilization of capillary scaling to predict wettability alteration
- Improvement of pore to reservoir/basin upscaling

2007–2013 **University of Virginia**, Charlottesville, Virginia (funded by U.S. NSF)

Reservoir Characterization and Engineering

- Pore-scale modeling of CO₂ transport velocity in different reservoirs
- Characterization of reservoir rock, fluid and interfacial properties (e.g., wettability, adhesion, and hysteresis) with supercritical CO₂ and N₂
- Investigation of reservoir fluid properties (e.g., viscosity, rheology) of CO₂-brine mixtures for mobility control
- Modeling of multiphase flow through porous media under CO₂ sequestration/EOR reservoir conditions; evaluation of roles of important geophysical, geochemical and operational parameters
- Porous media column study via electrical resistivity to study pore-scale CO₂-brine transport, distribution and dissolution
- Pore-to-reservoir upscaling methods

Carbon Neutral Manufacturing, Renewable Energy, Lubrication/Tribology

- Invention of CO₂-based property adjustable lubricants with a 20% increase in energy efficiency in wind turbine
- Determination of the viscosity, tribology and thermoelastichydrodynamic properties of the invented lubricants (funded by ConocoPhillips)
- Modeling of fluid dynamics of lubricants (e.g., emulsion, CO₂, N₂, polymer, CO₂-polymer); evaluated tribology and heat transfer in advanced manufacturing processes using finite element/difference (FEA/FDA) methods

Microfluidic Flow Control

- Design and fabrication of disposable microfluidic device by laser printer lithography

Hydrology and Watershed Modeling

- Fate and transport modeling of estrogen pollutants in Chesapeake Bay watershed

2006–2007 **Dalian University of Technology**, Dalian, China (funded by China NSF)

Environmental and Chemical Engineering

- Fabrication of orderly semiconductor nitrogen, potassium doped TiO₂ nanotube and its environmental application in degradation of persistent organic pollutants
- Electrochemical adsorption capacity of activated carbon fibers and their surface physicochemical characterizations
- Construction of an integrated database on waste water treatment plants in china
- Design of environmentally friendly lunchbox using life cycle impact analysis
- Uptake of atmospheric PAHs by leaves

Scholarly Services

Funding Proposal Reviewer

1. American Chemical Society Petroleum Research Fund (ACS PRF)

Journal Reviewer

20. International Journal of Molecular Sciences
19. Sustainability
18. Energy and Fuel
17. Journal of Colloid and Interface Science
16. Royal Society of Chemistry Advances
15. Journal of Earth System Science
14. Geophysical Research Letters
13. Lab on a Chip
12. Advances in Water Resources
11. International Journal of Greenhouse Gas Control
10. Water Resources Research
9. Environmental Earth Sciences
8. Environmental Progress and Sustainable Energy
7. Geophysics
6. Journal of Canadian Petroleum Technology
5. Desalination
4. Journal of Water and Climate Change
3. Energies
2. SPE Reservoir Evaluation & Engineering – Formation Evaluation

1. Environmental Science and Technology

Convener and Chair

- 2015.12 **Primary Convener**, Session H43K: “New perspectives on CO₂ flow, transport, and long-term storage in subsurface reservoirs II” In *American Geophysical Union Fall Meeting*, San Francisco, California, December 2015.
- 2015.12 **Primary Convener**, Session H44D: “New perspectives on CO₂ flow, transport, and long-term storage in subsurface reservoirs III” In *American Geophysical Union Fall Meeting*, San Francisco, California, December 2015.
- 2015.12 **Primary Convener and Co-Chair**, Session H41C: “New perspectives on CO₂ flow, transport, and long-term storage in subsurface reservoirs I posters” In *American Geophysical Union Fall Meeting*, San Francisco, California, December 2015.
- 2014.12 **Convener and Co-Chair**, Session H11K: “Coupled hydraulic, geochemical, and geomechanical processes in carbon storage I” In *American Geophysical Union Fall Meeting*, San Francisco, California, December 2014.
- 2014.12 **Convener and Co-Chair**, Session H12B: “Coupled hydraulic, geochemical, and geomechanical processes in carbon storage II” In *American Geophysical Union Fall Meeting*, San Francisco, California, December 2014.
- 2014.12 **Convener and Co-Chair**, Session H23O: “Coupled hydraulic, geochemical, and geomechanical processes in carbon storage IV” In *American Geophysical Union Fall Meeting*, San Francisco, California, December 2014.
- 2014.12 **Convener and Co-Chair**, Session H24A: “Coupled hydraulic, geochemical, and geomechanical processes in carbon storage V” In *American Geophysical Union Fall Meeting*, San Francisco, California, December 2014.

Seminar Organizer and Host

- 2016.5 Distinguished Scientist Seminar featuring **Dr. Shemin Ge** on “Groundwater dynamics in headwater regions under a changing climate”, Lawrence Berkeley National Laboratory, Berkeley, California.
- 2016.5 Distinguished Scientist Seminar featuring **Dr. Anthony Kavscek** on “Experimental microfluidics to improve mechanistic understanding of two-phase flow”, Lawrence Berkeley National Laboratory, Berkeley, California.
- 2015.12 Darcy Lecture/Distinguished Scientist Seminar featuring **Dr. Rainer Helmig** on “Evaluating the competitive use of the subsurface: the influence of energy storage and production in groundwater”, Lawrence Berkeley National Laboratory, Berkeley, California.
- 2015.4 Distinguished Scientist Seminar featuring **Dr. Michael Celia** on “Leakage along old wells with applications to CO₂ sequestration and methane emissions”, Lawrence Berkeley National Laboratory, Berkeley, California.
- 2014.9 Distinguished Scientist Seminar featuring **Dr. Robert Enick** on “Improving CO₂ enhanced oil recovery with CO₂-soluble additives, with possible application to CO₂

sequestration”, Lawrence Berkeley National Laboratory, Berkeley, California.

Committee

- 2014–Present Distinguished Scientist Seminar Series Committee, Earth and Environmental Research Area, Lawrence Berkeley National Laboratory.
- 2011 Engineering Research Symposium, University of Virginia.
- 2009–2010 CEE Department Advisory Committee, University of Virginia.

Referee

- 2015.12 **Outstanding Student Paper Awards.** *American Geophysical Union Fall Meeting* San Francisco, California, December 2015.
- Session H21A: “Complexities of flow and transport in porous media across diverse disciplines I posters”
- Session H23I: “Complexities of flow and transport in porous media across diverse disciplines II”
- Session H24A: “Complexities of flow and transport in porous media across diverse disciplines III”
- Session H41C: “New perspectives on CO₂ flow, transport, and long-term storage in subsurface reservoirs I posters”
- 2014.12 **Outstanding Student Paper Awards.** *American Geophysical Union Fall Meeting* San Francisco, California, December 2014.
- Session H11K: “Coupled hydraulic, geochemical, and geomechanical processes in carbon storage I”
- Session H12B: “Coupled hydraulic, geochemical, and geomechanical processes in carbon storage II”
- Session H13P: “Persistent problems in multiphase flow in porous media: Modern approaches to modelling and visualization of flow from pore to laboratory and field-scales I”
- Session H14C: “Persistent problems in multiphase flow in porous media: Modern approaches to modelling and visualization of flow from pore to laboratory and field-scales II”
- Session H23O: “Coupled hydraulic, geochemical, and geomechanical processes in carbon storage IV”

Professional Affiliations

- 2016–Present US DOE EFRC Early Career Network
- 2015–Present International Society for Porous Media (InterPore)
- 2015–Present Young Professionals in Energy (YPE)

- 2014–Present Stanford Energy Club (SEC)
- 2014–Present Berkeley Energy and Resources Collaborative (BERC)
- 2012–Present Society of Petroleum Engineers (SPE)
- 2011–Present American Geophysical Union (AGU)
 - 2013–2014 Society of Exploration Geophysicists (SEG)
 - 2012–2013 Chinese American Petroleum Association (CAPA)
 - 2007–2013 American Society of Civil Engineering (ASCE)
 - 2008–2011; American Chemical Society (ACS)
- 2015–Present
 - 2007–2009 Virginia Water Environment Association/Water Environment Federation (VWEA/WEA)
 - 2007–2009 American Water Works Association (AWWA)

Mentorship

- 2014–Present **Lawrence Berkeley National Laboratory**, Berkeley, California
 - 1 visiting professor, 2 postdoc, and 3 Ph.D. students
- 2009–2013 **University of Virginia**, Charlottesville, Virginia
 - 3 Ph.D. students, 8 undergraduate students, and 3 high school teachers

Media Coverage

- 2015.11 **“Where are they now? – Dr. Shibo Wang”**, University of Virginia CEE Grad Newsletter
- 2015.6 **“Capillary Pressure Saturation Relations for Supercritical CO₂ and Brine in Limestone/Dolomite Sands: Implications for Geologic Carbon Sequestration in Carbonate Reservoirs”**, U.S. Department of Energy – Energy Frontier Research Centers Community Website
- 2015.6 **“Wang, Tokunaga Win ACS Editors' Choice Award”**, LBNL – Earth Sciences Division News and Events; ESD Twitter Webpage; ESD Facebook Webpage
- 2015.6 **“ACS Publications – Editors' Choice”**, American Chemical Society Website
- 2014.10 **“Introduction of Winner of Chinese Government Scholarship for Outstanding Self-Financed Student”**, China Scholars Abroad Magazine
- 2013.12 **“Lab Earth Scientists Present Talks at American Geophysical Union Meeting”**, Today at Berkeley Lab, LBNL Webpage
- 2013.4 **“2012 Chinese Government Scholarship for Outstanding Self-Financed Student”**, China Scholarship Council Webpage
- 2012.8 **“Underground Bubbles Could Help Keep Unwelcome Carbon Dioxide Out Of The Atmosphere”**, American Geophysical Union Blogosphere
- 2012.5 **“Gas Expanded Lubricants: Smart Fluids For Improving Efficiency of Wind**

- Turbines**", National Science Foundation Website
- 2011.4 **"WIPO Assigns Patent To University of Virginia Patent Foundation For "Gas-Expanded Lubricants For Increased Energy Efficiency And Related Method And System"**, American Inventors, HighBeam Research
- 2010.11 **"Generating a 'Smart' Solution For More-Efficient Energy Production"**, School of Engineering and Applied Science E-News Online, University of Virginia
- 2010.10 **"Generating a 'Smart' Solution For More-Efficient Energy Production"**, Patent Foundation Website, University of Virginia
- 2010.5 **"Gas-Expanded Lubricants"**, Tech Beat, Tribology and Lubrication Technology
- 2009.10 **"ConocoPhillips Energy Prize Winner Announced"**, Bloomberg web news
- 2009.10 **"VESTlab Team Wins 1st Runner Up in 2009 ConocoPhillips – Penn State Energy Prize!"**, University of Virginia web news

Entrepreneurship

- 2013–2015 **Co-Founder**, Running River Investment LLC, California
- 2012–2013 **Co-Founder and Vice President**, US-China Business and Finance Club, University of Virginia
- 2011 **Co-Founder**, Sinora Business and Financial Club, US, China and Europe

Non-Academia and Volunteer Activities (after 2007)

- 2016 **Champion**, UC Berkeley/UCSF Case Competition
- 2016 **Member**, Ph.D. Consulting Club, University of California Berkeley
- 2011 **Referee**, Chinese Student and Scholars Society Singing Contest, University of Virginia
- 2010–2011 **Vice President**, Graduate Engineering Student Council, University of Virginia
- 2010 **Champion**, Chinese Student and Scholars Society Singing Contest, University of Virginia
- 2010 **Organizer and Volunteer**, Charity Concert for Haiti Earthquake, Charlottesville, Virginia (Raised \$30,000)
- 2009 **Volunteer**, Hope Community Center, Charlottesville, Virginia
- 2008 **Organizer and Volunteer**, Charity Concert Series for 2008.5.12 Earthquake in China, Charlottesville, Virginia (Raised \$10,000)

Hobby and Interests

Skiing, speed ice-skating, charter fishing, horseback riding, hiking, basketball, running, golfing, traveling, movie, vocal music, violin