

# Shiqiang Zou

Ph.D. Candidate of Civil Engineering, Interdisciplinary Graduate Education Program (IGEP) Scholar  
Tau Beta Pi & Phi Kappa Phi Honor Society, Virginia Tech

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## Education

Aug. 2015-May 2019 **Virginia Polytechnic Institute and State University, United States (Ph.D., Civil Engineering)**

- Current GPA: 4.0/4.0. The Raymond and Madelyn Curry Fellowship receiver (1/10).
- Advisor: Prof. Zhen He, Professor, Director of Environmental Biotechnology & Bioenergy Lab

Aug. 2013-Dec. 2014 **National University of Singapore, Singapore (M.Sc., by research, Chemistry)**

- GPA: 4.0/4.0. Singapore-Peking-Oxford Research Enterprise (SPORE) Scholarship recipient.
- Advisor: Prof. Loh Kian Ping, Provost's Chair Professor

Aug. 2011-July 2014 **Peking University, China (M.Sc., Environmental Engineering)**

- Ranking: 1/34. GPA: 4.0/4.0. The highest departmental scholarship recipient.
- Advisor: Prof. Jinren Ni, Professor, Academician of Chinese Academy of Sciences

Sept. 2007-June 2011 **Beijing Institute of Technology, China (B. Eng., Environmental Engineering)**

- Ranking: 3/29. GPA: 3.7/4.0. The Outstanding Undergraduates of Beijing.
- The National Scholarship receiver (1/135). The "Xu Teli" Scholarship receiver (1/400).

## Research (as Graduate Research Assistant)

Jan. 2018-May 2019 **Mitigation of Bidirectional Solute Flux (Reverse Solute Flux and Forward Solute Flux) in Forward Osmosis via Surface Coating of Zwitterion Carbon Nanotubes**

- Investigated bidirectional solute flux reduction via surface coating of **zwitterion carbon nanotubes**.
- Successfully achieved **enhanced fouling resistance** in coated membrane over semi-continuous operation.

Jan. 2017-Dec. 2017 **Electrolysis-Assisted Mitigation of Reverse Solute Flux (RSF) in Forward Osmosis (FO) towards Energy-Efficient Water Recovery and Reuse**

- Successfully achieved **> 50% RSF reduction** through electrolysis-assisted ion capture (*first study*).
- Achieved desirable energy consumption of **0.02 kWh m<sup>-3</sup>** harvested water by reducing recirculation rate.

Aug. 2015-Dec. 2016 **Nutrient-Energy-Water (NEW) Recovery from Sidestream Centrate through Microbial Electrolysis Cell – Forward Osmosis (MEC-FO) Hybrid System**

- Sponsored by National Science Foundation, USA. Grant No. 1358145.
- Achieved resources recovery from sidestream centrate under close-loop operation, including **54%** fresh water (for irrigation), **99%** ammonium, and **80%** phosphorus (as struvite).
- Minimized energy consumption with multiple resource recovery achieved.

Aug. 2011-July 2014 **Enrichment and Characterization of Psychrotolerant Nitrifying and Denitrifying Consortia**

- Sponsored by National Natural Science Foundation of China. Grant No. 21261140336/B070302.
- Successfully obtained psychrotolerant consortia with **>75%** aerobic total nitrogen removal under 4 °C.

## Competition & Awards

1. **ACS Graduate Student Award in Environmental Chemistry** (Merit-based Scholarship, American Chemical Society, 2019)
2. **Virginia AWWA Graduate Student Scholarship Recipient** (Merit-based Scholarship, Virginia AWWA, 2018)
3. **WaterJAM 2018 Young Professional "Fresh Ideas" Poster Contest** (*First Prize*, VA AWWA/VWEA 2018, Virginia Beach)
4. **WaterJAM 2017 Young Professional "Fresh Ideas" Poster Contest** (*First Prize*, VA AWWA/VWEA 2017, Hampton)
5. **Environmental Competition international (ECi): Feasibility Assessment of Hydraulic Fracking in Southwestern Pennsylvania by FracKing Drilling** (*Second Prize*, Air & Waste Management Association 2017, Pittsburgh)
6. **WaterJAM 2016 Young Professional "Fresh Ideas" Poster Contest** (*First Prize*, VA AWWA/VWEA 2016, Virginia Beach)
7. **Environmental Competition international (ECi): Feasibility Assessment of the ReFuel Natural Gas Liquefying Plant for Quainville, Louisiana** (*Second Prize*, Air & Waste Management Association 2016, New Orleans)
8. **Inventors of the Month** (The Office of the Vice President & Virginia Tech Intellectual Properties, Inc., 2016, Virginia Tech)

## First-author Journal Publication (\* stands for co-first author)

Google Citation: 252

H-index: 10

Published Peer-reviewed Papers: 19

Researchgate Score: 25.50

1. Zou, S.,\* Smith, E.,\* Martin, S., & He, Z. (2019) Mitigation of Bidirectional Solute Flux in Forward Osmosis via Membrane Surface Coating of Zwitterion Functionalized Carbon Nanotubes. *Under Review*.
2. Zou, S., Qin, M., & He, Z. (2019) Tackle reverse solute flux in forward osmosis towards sustainable water recovery: reduction and perspectives. *Water Research*, 49, 362-374.
3. Zou, S.,\* Guan, L.,\* Taylor, D.P., Kuhn, D., & He, Z. (2018) Nitrogen removal from water of a recirculating aquaculture system by a bioelectrochemical system. *Aquaculture* 497, 74-81.
4. Zou, S. & He, Z. (2018) Efficiently “pumping out” value-added resources from wastewater by bioelectrochemical systems: a review from energy perspectives. *Water Research* 131, 62-73.
5. Zhang, B.,\* Zou, S.,\* Cai, R., Li, M., & He, Z. (2018) High-efficient photocatalytic disinfection of *Escherichia coli* under visible light using carbon supported Vanadium Tetrasulfide nanocomposites. *Applied Catalysis B: Environmental* 224, 383-393.
6. Zou, S.,\* Kanimba, E.,\* Diller, T.E., Tian, Z., & He, Z. (2018) Modelling assisted evaluation of direct electricity generation from waste heat of wastewater via a thermoelectric generator. *Science of the Total Environment* 635, 1215-1224.
7. Zou, S. & He, Z. (2017) Electrodialysis recovery of reverse-fluxed fertilizer draw solute during forward osmosis water treatment. *Chemical Engineering Journal* 330, 550-558.
8. Zou, S., Qin, M., Moreau, Y., & He, Z. (2017) Nutrient-energy-water recovery from synthetic sidestream centrate using a microbial electrolysis cell - forward osmosis hybrid system. *Journal of Cleaner Production* 154, 16-25.
9. Zou, S. & He, Z. (2017) Electrolysis-assisted mitigation of reverse solute flux in a three-chamber forward osmosis system. *Water Research* 115, 111-119.
10. Zou, S., Yuan, H., Childress, A., & He, Z. (2016) Energy consumption by recirculation: a missing parameter when evaluating forward osmosis. *Environmental Science & Technology* 50, 6827-6829.
11. Zou, S. & He, Z. (2016) Enhancing wastewater reuse by forward osmosis with self-diluted commercial fertilizers as draw solutes. *Water Research* 99 (1), 235-243.
12. Zou, S., Yao, S., Ni, J. (2014) High-efficient nitrogen removal by coupling enriched autotrophic-nitrification and aerobic-denitrification consortiums at cold temperature. *Bioresource Technology* 161, 288-296.

## Coauthored Journal Publication

1. Ferby, M., Zou, S., & He, Z., Reduction of reverse solute flux induced salinity buildup in the feed solution of forward osmosis: a Review. *In Preparation*.
2. Wu, S., Zou, S., Yang, Y., Qian, G., & He, Z. (2018) Enhancing the performance of an osmotic microbial fuel cell through self-buffering with reverse-fluxed sodium bicarbonate. *Chemical Engineering Journal* 349, 241-248.
3. Ceconet, D., Zou, S., Capodaglio, A.G., & He, Z. (2018) Evaluation of energy consumption of treating nitrate-contaminated groundwater by bioelectrochemical systems. *Science of the Total Environment* 636, 881-890.
4. Wu, Z., Zou, S., Zhang, B., Wang, L., & He, Z. (2018) Forward osmosis promoted in-situ formation of struvite with simultaneous water recovery from digested swine wastewater. *Chemical Engineering Journal* 342, 274-280.
5. Qin, M., White, C., Zou, S., & He, Z. (2018) Passive separation of recovered ammonia from catholyte for reduced energy consumption in microbial electrolysis cell. *Chemical Engineering Journal* 334, 2303-2307.
6. Wu, S., Zou, S., Liang, G., Qian, G., & He, Z. (2018) Enhancing recovery of magnesium as struvite from landfill leachate by treatment of calcium with simultaneous reduction of liquid volume via forward osmosis. *Science of the Total Environment* 610-611, 137-146.
7. Yang, Y., Chen, M., Zou, S., Long, T., Yang, X., & He, Z. (2017) Efficient recovery of polyelectrolyte draw solutes in forward osmosis towards sustainable water treatment. *Desalination* 422, 134-141.
8. Iskander, S., Zou, S., Brazil, B., Novak, J., & He, Z. (2017) Energy consumption by forward osmosis treatment of landfill leachate for water recovery. *Waste Management* 63, 284-291.
9. Xiang, X., Zou, S., & He, Z. (2017) Energy consumption of water recovery from wastewater in a submerged forward osmosis system with commercial liquid fertilizers as draw solutes. *Separation and Purification Technology* 174, 432-438.

## Patents

1. Ni, J.R., **Zou, S.**, & Yao, S. Application of psychrotolerant heterotrophic consortium capable of anoxic nitrogen removal in water treatment. Grant Number: CN 103342417 B, **Peking University**, China.
2. Ni, J.R., Yao, S., & **Zou, S.** Application of psychrotolerant autotrophic nitrifying consortium in wastewater treatment. Grant Number: CN 103319000 B, **Peking University**, China.
3. Ni, J.R., Chen, Q., Fu, D., & **Zou, S.** Application of *Comamonas testosteroni* with denitrification and dephosphorization function. Grant Number: CN 102531202 B, **Peking University**, China.
4. Chen, Q., Ni, J.R., **Zou, S.** Application of *Achromobacter xylosoxidans* with denitrification and dephosphorization function. Grant Number: CN 102533623 B, **Peking University**, China.

## Academic & Teaching Experience

1. **Instructor**, Via Teaching Fellow, Department of Civil and Environmental Engineering, Virginia Tech (2019)
  - Independent instructor for a junior-level course “**CEE 3104 Introduction to Environmental Engineering**”.
2. **Instructor**, Water/Wastewater Treatment Plant Operators Short School, VT & Department of Environmental Quality (2018)
  - Taught water level-2 class “**Chemistry Concepts and Applications**” for 20 water plant operators.
  - Taught wastewater level-4 class “**Advanced Membrane Treatment and Applications**” for 35 wastewater plant operators.
3. **Graduate Mentor**, Research Experience for Teachers (**RET**), National Science Foundation & Virginia Tech (2017 & 2018)
  - Designed a one-to-one research experience for Christiansburg and Salem High School teachers regarding forward osmosis experiments, which can be easily translate into high school science, math, and AP chemistry courses.
4. **Graduate Mentor**, Research Experience for Undergraduates (**REU**), National Science Foundation & Virginia Tech (2018)
  - Designed a one-to-one research experience for University of Florida undergraduate student regarding resource recovery via 3-D printed bioelectrochemical systems.
5. **Graduate Teaching Assistant**, Department of Civil and Environmental Engineering, Virginia Tech (2016)
  - CEE 4174 Solid & Hazardous Waste Management. Synchronous distance learning module.
  - Advised undergraduates for course-related questions. Provided feedback to the instructor.

## Invited Talk

1. Energy analysis of bioelectrochemical systems. Invited by Prof. Marika Kokko, **University of Tampere**, 11/2018, Finland.
2. Advancing forward osmosis for energy-efficient wastewater treatment towards enhanced water reuse. Invited by Prof. Marika Kokko, **University of Tampere**, 11/2018, Finland.
3. Optimizing forward osmosis process for enhanced water reuse. Invited by **Nanjing Agricultural University**, 05/2018, China.

## Conference (\* stands for the presenter)

1. Zou, S., Smith, E.,\* Martin, S., & He, Z. (*Poster Presentation*). Towards sustainable desalination: mitigation of bidirectional solute flux in forward osmosis process. **AIChE Annual Meeting**, 10/29/2018, Pittsburgh, PA
2. Zou, S.\* & He, Z. (*Oral Presentation*). Efficiently “Pumping Out” Value-added Resources from Wastewater by Bioelectrochemical Systems: A Review from Energy Perspective. **AWWA & VWEA WaterJAM**, 09/13/2018, Virginia Beach.
3. Zou, S.,\* Qin, M., & He, Z. (*Oral Presentation*). Advancing Forward Osmosis for Energy-Efficient Wastewater Treatment towards Enhanced Water Reuse. **AWWA Annual Conference & Exposition**, 06/14/2018, Las Vegas, NV.
4. Zou, S.,\* Qin, M., & He, Z. (*Oral Presentation*). Nutrient-energy-water recovery from sidestream centrate via microbial electrolysis cell - forward osmosis hybrid system. **AWWA Annual Conference & Exposition**, 06/13/2018, Las Vegas, NV.
5. Zou, S.,\* Kanimba, E., Diller, T.E., Tian, Z., & He, Z. (*Poster Presentation*). Direct Electricity Generation from Waste Heat in Water via Thermoelectric Generator. **AWWA & VWEA WaterJAM**, 09/13/2017, Hampton, VA
6. Zou, S. & He, Z.\* (*Oral Presentation*). NEW recovery from sidestream centrate via a microbial electrolysis cell - forward osmosis hybrid system. **2nd International Resource Recovery Conference**, 08/09/2017, New York, NY.
7. Zou, S.\* & He, Z. (*Poster Presentation*). Electrolysis-Assisted Mitigation of Reverse Solute Flux in a Three-Chamber Forward Osmosis System. **AEESP Research and Education Conference**, 06/21/2017, Ann Arbor, MI.

## Ad hoc Journal Review (>30 reviews)

Science of the Total Environment	ACS Sustainable Chemistry & Engineering	International Journal of Hydrogen Energy	
Journal of Membrane Science	Water Research	RSC Advances	Water Environment Research (2017 Top Reviewer)
Electrochimica Acta	Environmental Engineering Science	Separation and Purification Technology	
Advanced Powder Technology	Desalination and Water Treatment	Trends in Food Science & Technology	

## Professional Societies

American Water Works Association	Virginia Water Environment Association	Water Environment Federation
International Water Association	Air & Waste Management Association	American Membrane Technology Association
Association of Environ. Engineering & Science Professors		American Academy of Environ. Engineers & Scientists

## Activities & Service

### Oct. 2018-Nov. 2018 Graduate Advisor, Water INTERface at Virginia Tech & Roanoke Elementary School

- Assisted a research team composed of kids between 4th and 7th grades of Roanoke Elementary School.
- Offered constructive suggestions to help kids built an engineering system to recovery water in space.

### June 2017-July 2017 Graduate Ambassador, Center for Enhancement of Engineering Diversity, Virginia Tech

- Built a scientific device to convert heat energy in water to electricity for demonstration purpose.
- Guided a full-day tour for C-Tech<sup>2</sup> Summer Camp for Middle School Women (~50 girl students).

### Feb 2017-Mar 2017 Graduate Ambassador, Center for Enhancement of Engineering Diversity, Virginia Tech

- Constructed a membrane process to demonstrate osmosis phenomenon and natural water extraction.
- Guided a half-day tour for Radford City Middle School students (~30 students).

### Sept 2016-Oct. 2016 Graduate Ambassador, Center for Enhancement of Engineering Diversity, Virginia Tech

- Constructed a small model to demonstrate wastewater treatment process and water reuse.
- Guided a half-day tour for Roanoke County Middle School students (~30 students).

### June 2008-Aug. 2008 Beijing 2008 Olympic Volunteer, Spectator Services, Baseball Stadium, China

- Provided information inquiry, translation service and operation support in 32 baseball games.
- Awarded with the "Outstanding Olympic Volunteer" for excellent operation support and service.