

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-Current **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**.
- Achieved significant reduction in **RSF (>55%)** and **FSF (up to 100%)** with coating rate of $<1.0 \text{ g m}^{-2}$.
- Observed **enhanced fouling resistance** in coated FO 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**

- Developed three-chamber FO system with *in-situ* electrolysis modules and self-neutralized pH circulation.
- Successfully achieved **> 50% RSF reduction** through electrolysis-assisted ion capture (*first study*).
- Achieved desirable energy consumption of **0.02 kWh m⁻³** 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 partial compensation of generated H₂ towards an energy-efficient system. One share of energy invested (**< 2 kWh m⁻³** treated centrate), 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.
- Obtained psychrotolerant consortia with **>75%** aerobic total nitrogen removal under 4 °C.

Selected Publications (* stands for the co-first author)

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. *Submitted*.
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.** & He, Z. (2018) Efficiently "pumping out" value-added resources from wastewater by bioelectrochemical systems: a review from energy perspectives. *Water Research* 131, 62-73.
4. 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.
5. **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.

- Zou, S. & He, Z. (2017) Electrodialysis recovery of reverse-fluxed fertilizer draw solute during forward osmosis water treatment. *Chemical Engineering Journal* 330, 550-558.
- 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.
- Zou, S. & He, Z. (2017) Electrolysis-assisted mitigation of reverse solute flux in a three-chamber forward osmosis system. *Water Research* 115, 111-119.
- 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.
- 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.
- 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.

Academic & Teaching Experience

- 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**”.
- 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.
- 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.
- 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.
- 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.

Conference (* stands for the presenter)

- 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
- 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.
- 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.

Competition & Awards

- Virginia AWWA Graduate Student Scholarship Recipient** (Merit-based Scholarship, Virginia AWWA, 2018)
- WaterJAM 2018 Young Professional “Fresh Ideas” Poster Contest** (*First Prize*, VA AWWA/VWEA 2018, Virginia Beach)
- WaterJAM 2017 Young Professional “Fresh Ideas” Poster Contest** (*First Prize*, VA AWWA/VWEA 2017, Hampton)
- Environmental Competition international (ECi):** Feasibility Assessment of Hydraulic Fracking in Southwestern Pennsylvania by FracKing Drilling (*Second Prize*, Air & Waste Management Association 2017, Pittsburgh)
- Graduate Research Symposium & Expo** (*Gold Prize*, Virginia Tech Graduate School 2017, Blacksburg)
- WaterJAM 2016 Young Professional “Fresh Ideas” Poster Contest** (*First Prize*, VA AWWA/VWEA 2016, Virginia Beach)
- 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)

Ad hoc Journal Review

Science of the Total Environment	ACS Sustainable Chemistry & Engineering	International Journal of Hydrogen Energy
Journal of Membrane Science	Water Environment Research (2017 Top Reviewer)	RSC Advances Cellulose
Electrochimica Acta	Environmental Engineering Science	Separation and Purification Technology