

ZIXUAN (ZACH) WANG

Curriculum Vitae

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EDUCATION

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| Environmental Engineering (Ph.D.) , Energy, Environmental & Chemical Engineering Department, Washington University in St. Louis | 01/2020-present |
| • GPA 4.0/4.0 | |
| •Advisor: Zhen (Jason) He | |
| Civil Engineering (M.S.) , Civil and Environmental Engineering Department, Virginia Tech | 08/2018-12/2019 |
| • GPA 3.96/4.0 | |
| Environmental Engineering (B.Eng.) , School of Energy and Power Engineering, Xi'an Jiaotong University | 09/ 2014-07/2018 |
| • Cyrus Tang Scholarship | |
| • GPA 90.06/100 | |
| Economics (Minor) , School of Economics and Finance, Xi'an Jiaotong University | 02/2016-07/2018 |

AWARDS

1. **Outstanding Self-financed Students** (China Scholarship Council, Chicago, Aug., 2023)
2. **Outstanding Graduate Student Award for excellence in scholarly research in the field of environmental engineering and science by Chinese-American Professors in Environmental Engineering and Science** (AEESP conference, June 22, 2023, Northeastern University, Boston)
3. **Co-first prize in student 5-min talk presentation competition (Center for Water Innovation research symposium, Apr. 2023, St. Louis)**
4. Second place in 2022 IWEA Intelligent Water Systems Challenge (IL IWPC, Apr. 2022, Springfield)
5. Third place in 2022 Fresh Ideas Student Poster Competition (MO AWWA/MWEA, Mar. 2022, Osage Beach)
6. Best Poster Presentation Award (2021 Virtual CAPEES student e-poster competition, Chinese-American Professors in Environmental Engineering and Science, Jul., 2021)
7. Graduate Student Research Award Annual Research Impact (Department of Energy, Environmental & Chemical Engineering, WashU, Apr. 2021, St. Louis)
8. **First prize in WaterJAM 2019 Young Professional “Fresh Ideas” Poster Contest** (VA AWWA/VWEA, Sep. 2019, Virginia Beach)
9. Pratt Fellowship (Department of Civil and Environmental Engineering, Aug. 2018, Virginia Tech)
10. **National Outstanding Undergraduate Thesis in Environmental Discipline** (Chinese Society for Environmental Science, Aug. 2018)
11. Outstanding Student Leader (Chung Ying college, Dec. 2016, Xi'an Jiaotong University, China)
12. First prize in College Physics Competition (Xi'an Jiaotong University, Jun. 2016, China)

FUNDED PROJECTS

1. Enhancing Carbon Utilization by Algal Systems via Integrated Biogas Purification, Nitrogen Reuse, and Innovative Carbon Dioxide Delivery (**Department of Energy, Bioenergy Technologies Office and the Office of Fossil Energy and Carbon Management's Carbon Utilization Program**, Aug. 2023-present)
 - Award amount \$2,522,518
 - Demonstrated a novel electrochemical-microalgae system that captured carbon and wastewater nutrients for high-purity microalgae cultivation
2. Trace Metal Dynamics and Limitations on Biogeochemical Cycling in Wetland Soils and Hyporheic Zones (**Department of Energy, Office of Science, Office of Biological and Environmental Research**, Subsurface Biogeochemical Research program, DE-SC0019422, Aug. 2021-Dec. 2021)
 - Examined the effect of oxic and anoxic fluctuation cycles on the bioavailability of trace metals Cu, Ni, Co, Zn, and Fe
 - Contributed to the knowledge base of complex natural systems
3. Collaborative Research: Enhancing Bioenergy Recovery from Wastewater in an Integrated Microbial-Algal Photobioelectrochemical System (**National Science Foundation, CBET 1603190, 1603196**, Aug. 2018-Apr. 2020)
 - Award amount \$186,756.00
 - Led the first efforts to identify key algal and bacterial taxa in algae-bacteria wastewater communities for nutrient removal and electricity generation

FIRST-AUTHOR PUBLICATION

1. **Wang, Z.**, and He, Z.* (2023) Enhancing sewage sludge dewaterability through synergetic effects of acidification and divalent cation removal in Electrochemical Treatment. *In preparation*.
2. **Wang, Z.**, Anand, D. and He, Z.* (2023) Phosphorus recovery from whole digestate through electrochemical leaching and precipitation. *Environmental Science & Technology*. Vol 57, pp 10107–10116.
3. **Wang, Z.**, Liu, F. (co-first author) and He, Z.* (2023) Electrochemical phosphorus release and recovery from wastewater sludge: A review. *Critical Reviews in Environmental Science and Technology*. Pages 1-19.
4. **Wang, Z.**, & He, Z.* (2022). Electrochemical phosphorus leaching from digested anaerobic sludge and subsequent nutrient recovery. *Water Research*. Volume 223, Article 118996
5. **Wang, Z.**, Hartline, C., Zhang, F. and He, Z.* (2021) Enhanced microalgae cultivation using wastewater nutrients extracted by a microbial electrochemical system. *Water Research*. Volume 206, Article 117722.
6. **Wang, Z.**, & He, Z.* (2020). Frontier review on metal removal in bioelectrochemical systems: mechanisms, performance, and perspectives. *Journal of Hazardous Material Letters*. Volume 1, Pages 100002.
7. **Wang, Z.**, Lee, Y., Scherr, D., Senger, R., Li, Y., He, Z.* (2020) Mitigating nutrient accumulation with microalgal growth towards enhanced nutrient removal and biomass production in an osmotic photobioreactor. *Water Research*. Volume 182, Pages 116038.
8. **Wang, Z.**, He, Z.* & Young, E.B.* (2020) Towards enhanced performance of integrated photo-bioelectrochemical systems: taxa and functions in bacteria-algae communities. *Current Opinion in Chemical Biology*. Volume 59, Pages 130-139.

9. **Wang, Z.**, & He, Z.* (2020). Demystifying terms for understanding bioelectrochemical systems towards sustainable wastewater treatment. *Current Opinion in Electrochemistry*. Volume 19, Pages 14-19.
10. **Wang, Z.**, Wu, S., & He, Z.* (2019). Production of electricity and water in an osmotic microbial fuel cell by using EDTA-Na₂ as a recoverable draw solute. *Science of Total Environment*. Volume 677, Pages 382-389.

CO-AUTHOR PUBLICATION

1. Chen, M., Rholl, C. A., Persaud, S. L., **Wang, Z.**, He, Z., Parker, K. M.* (2023) Permanganate preoxidation affect the formation of disinfection byproducts from algal organic matter. *Water Research*. Volume 232, Article 119691
2. Xu, Y., **Wang, Z.**, Nairat, S., Zhou, J. and He, Z.* (2023) Artificial intelligence assisted prediction of effluent phosphorus in a full-scale wastewater treatment plant with missing phosphorus input and removal data. *ACS ES&T Water*. In press.
3. Mahmoud, H. R., **Wang, Z.**, and He, Z.* (2022). Production of Algal Biomass on Electrochemically Recovered Nutrients from Anaerobic Digestion Centrate. *Algal Research*. Volume 67, Article 102846
4. Sharma, N., **Wang, Z.**, Catalano, J. and Giammar, D. E.* (2022) Dynamic Responses of Trace Metal Bioaccessibility to Fluctuating Redox Conditions in Wetland Soils and Stream Sediments. *ACS Earth Space Chem*. Volume 6, Pages 1331-1344
5. Wang, J., **Wang, Z.**, Liang, J.* and He, Z.* (2021) Electrolysis-assisted recovery of reverse-fluxed solutes in forward osmosis. *Desalination*. Volume 520, Article 115346.
6. Liu, T., Serrano, J., Elliott, J., Yang, X., Cathcart, W., **Wang, Z.**, He, Z., Liu, G*. (2020). Exceptional capacitive deionization rate and capacity by block copolymer-based porous carbon fibers. *Science Advances*. Volume 2, Pages eaaz0906.
7. Jin, Q., **Wang, Z.**, Feng, Y., Kim, Y. T., Stewart, A. C., O'Keefe, S. F., Neilson, A. P., He, Z.* , Huang, H.* (2020). Grape pomace and its secondary waste management: Biochar production for a broad range of lead (Pb) removal from water. *Environmental Research*. Volume 186, Pages 109442.
8. Wang, L.* , Wang, J., **Wang, Z.**, Feng, J., Li, S., & Yan, W.* (2019) Synthesis of Ce-doped magnetic biochar for effective Sb(V) removal: Performance and mechanism. *Powder Technology*. Volume 345, Pages 501-508.
9. Wang, L.* , Wang, J., **Wang, Z.**, He, C., Lyu, W., Yan, W.* , & Yang, L. (2018) Enhanced antimonate (Sb(V)) removal from aqueous solution by La-doped magnetic biochars. *Chemical Engineering Journal*. Volume 354, Pages 623-632.
10. Wang, L.* , Yan, W., He, C., Wen H., Cai Z., **Wang Z.**, Chen Z., Liu W. (2018) Microwave-assisted preparation of nitrogen-doped biochars by ammonium acetate activation for adsorption of acid red 18. *Applied Surface Science*. Volume 433, Pages 222-231.
11. Wang, L.* , Chen Z., Wen H., Cai Z., He, C., **Wang Z.**, Yan, W. (2018) Microwave assisted modification of activated carbons by organic acid ammoniums activation for enhanced adsorption of acid red 18. *Powder Technology*. Volume 323, Pages 230-237.

RESEARCH EXPERIENCE

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|---|------------------------|
| 1. Nutrient recovery cell for microalgae cultivation | 05/2020-Present |
| <ul style="list-style-type: none"> • Recovered wastewater nutrients for segregated microalgae cultivation and wastewater treatment • Testing electrochemical CO₂ capture and ammonium delivery from anaerobic digestion | |
| 2. Electrochemical phosphorus recovery from whole digestate | 08/2021-Present |
| <ul style="list-style-type: none"> • Investigating three electrochemical systems with migration-based separation, precipitation-based separation, and heavy metal removal • Assessed electrochemical biosolids dewaterability improvement | |
| 3. Machine learning for phosphorus concentration prediction | 10/2021-04/2022 |
| <ul style="list-style-type: none"> • Applied machine learning models to predict the phosphorus concentration in the effluent of a wastewater treatment plant | |
| 4. Integrated photo-bioelectrochemical systems (IPB) | 07/2019-05/2020 |
| <ul style="list-style-type: none"> • Identified key bacteria and algae taxa and their functions critical for IPB performance | |
| 5. Osmotic photobioreactor (OsPBR) with a fertilizer draw solute | 05/2019-12/2019 |
| <ul style="list-style-type: none"> • Removed reversed NH₄⁺ and PO₄³⁻ with steady algae growth | |
| 6. Osmotic microbial fuel cell (OsMFC) with EDTA-Na₂ as a recoverable draw solute | 11/2018-04/2019 |
| 7. Enhancement of antimonate removal by synthesis of Ce/La-doped magnetic biochar adsorbent | 11/2017-06/2018 |

TEACHING EXPERIENCE

1. Teaching Assistant

- **EECE 404 Environmental Engineering Capstone (EECE, WashU, Jan.-present. 2023)**
Gave a guest lecture on desalination technologies, supervised lab activities, helped design a prototype electrochemical reactor to recover ammonium from produced water
- **EECE 505 Aquatic Chemistry (EECE, WashU, Aug.-Dec. 2021)**
Gave a lecture on software Visual MINTEQ and MINEQL+, hold office hours, updated answer key for homework and exam, and grading
- **EECE 574 Electrochemical Engineering (Jan.- May. 2022)**
Hold office hours, grading
- **CEE 4174 Solid & Hazardous Waste Management (CEE, VT, Aug.- Dec. 2018)**
- **CEE 3104 Introduction to Environmental Engineering (CEE, VT, Aug.- Dec. 2018)**
Answered students' questions on course and homework, graded homework and exam

2. Graduate Mentor

- **Rotation doctoral student**
Shruti Kadam (WashU, Sept. 2022-present), Siyang Xing (WashU, Aug. 2023-present)
- **Undergraduate students**

Jiusi Wang (Virginia Tech, Dec.-Feb. 2018-2019), Manh Bui (WashU, April-Jun. 2021), Daran Anand (WashU, Jun.-Dec. 2022), Marcelle Santana Rovira (WashU, Jun.-Aug. 2023), Research Experience for Undergraduates (REU), National Science Foundation & Virginia Tech/ King Abdullah University of Science and Technology & Institute for Critical Technology and Applied Science (Jun.-Aug. 2019)

3. Teaching program

- Community Member (Center for teaching and learning, WashU, May. 2023)
 - Exploring Practices in the Classroom Learning Community (Center for teaching and learning, WashU, Jan.-Dec. 2022)
- Discussing topics critical to teaching in the twenty-first century classroom

4. Lab management

- Safety manager of Environmental Biotechnology and Bioenergy Lab
- Developed lab specific training protocols
- Safety training and annual EHS inspection (WashU, May 2020- May 2023)
- Maintenance of Dionex Integrion HPIC and Dionex Easion (WashU, May 2020-present)

CONFERENCE (PRESENTER)

1. Wang, Z., Anand, D., He, Z. (Oral Presentation). Phosphorus Recovery from Whole Digestate in an Electro Phosphorus Leaching and Precipitation Process, **AEESP Conference**, 06/21/2023, Boston, MA
2. Wang, Z., Anand, D., He, Z. (Poster Presentation). Phosphorus Recovery from Whole Digestate through Electrochemical Leaching and Precipitation, **Borchardt Conference**, 05/24/2023, Ann Arbor, MI
3. Wang, Z., He, Z. (Oral Presentation). Phosphorus Release and Recovery from Whole Digestate in Electrochemical Systems, **WEF/IWA Residual and Biosolids Conference**, 05/18/2023, Charlotte, NC
4. Wang, Z., He, Z. (Poster Presentation). Phosphorus Release and Nutrient Recovery from Anaerobic Digestate by an Electrochemical Process, **Mid-America Environmental Engineering Conference**, 10/15/2022, Rolla, MO
5. Wang, Z., He, Z. (Poster Presentation). Phosphorus Release and Nutrient Recovery from Anaerobic Digestate by an Electrochemical Process, **AEESP Conference**, 06/30/2022, St. Louis, MO
6. Wang, Z., Hartline, C., Zhang, F. & He, Z. (Poster Presentation). Wastewater Nutrient Extracted by Microbial Nutrient Recovery Cell Enhanced Microalgae Cultivation, **AWWA&MWEA Joint Conference**, 03/28/2022, Osage Beach, MO
7. Wang, Z., Hartline, C., Zhang, F. & He, Z. (Oral Presentation). Wastewater (WW) Nutrient Medium Extracted by Microbial Electrochemical System (MES) Enhanced Microalgae Cultivation. Electrified Water Treatment Processes, Division of Environmental Chemistry, **The American Chemical Society**, 08/25/2021, Atlanta, GA
8. Wang, Z., Lee, Y., Scherr, D., Senger, R., Li, Y., He, Z. (Oral Presentation). Reverse-fluxed Nutrients Removal and Microalgae Production in an Osmotic Photobioreactor for Tertiary Treatment. Osmotically Driven Process, **The North American Membrane Society**, 05/19/2020, Virtual

9. Wang, Z., Wu, S., & He, Z. (Poster Presentation). Water and Electricity Production in an Osmotic Microbial Fuel Cell by Using EDTA-Na₂ as a Recoverable Draw Solute. **AWWA & VWEA WaterJAM**, 09/12/2019, Virginia Beach, VA

PEER REVIEWS

Chemical Engineering Journal
Desalination
Journal of Hazardous Materials
Bioresource Technology
Science of the Total Environment
ACS Omega
Electrochimica Acta
Water Science and Technology
(43 peer reviews)

SERVICES

1. Leader of student volunteer team, 10th International Water Association Membrane Technology Conference (Aug. 23-26, WashU)
2. Graduate ambassadors, McKelvey School of Engineering (Aug. 2022-present, WashU)
3. Conference volunteer, AEESP Conference (Jun. 28-30, 2022, WashU)
4. Teaching volunteer, University City School System and STL Aquarium (Mar. 31 & Apr. 15, 2022, St. Louis)
5. Conference volunteer, Mid-America Environmental Engineering Conference (MAEEC, Sep. 25, 2021, WashU)
6. Community service volunteer, 2019 BIG Event (Apr.6, 2019, Virginia Tech)

PROFESSIONAL SOCIETIES

Water Environment Federation (WEF)
American Water Works Association (AWWA)
Missouri Water Environment Association (MWEA)
North American Membrane Society (NAMS)
American Chemical Society (ACS)
Association of Environmental Engineering & Science Professors (AEESP)
Chinese-American Professors in Environmental Engineering and Science (CAPEES)