

Yinuo (Noah) Yao

CONTACT INFORMATION

Postdoctoral Researcher
Energy Resources Engineering
Stanford University
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Personal Website
Google Scholar

RESEARCH INTERESTS

Computational fluid dynamics, water and wastewater treatment, autonomous control, artificial intelligence, membrane technologies, environmental biotechnology, homogenization theory and multiscale modeling

EDUCATION

Stanford University, Stanford, California USA
Ph.D., Civil and Environmental Engineering **2016 - 2021**

- Dissertation Topic: “Particle resolved simulations of particle-flow interactions in fluidized beds to optimize design and operation of domestic wastewater treatment systems”
- Advisors: Craig S. Criddle and Oliver B. Fringer
- Readers: Perry L. McCarty and Robert F. Hickey

Stanford University, Stanford, California USA
M.S., Institute for Computational and Mathematical Engineering (ICME) **2018 - 2021**

Stanford University, Stanford, California USA
M.S., Civil and Environmental Engineering **2015 - 2017**

National University of Singapore, Singapore, Singapore
B.ENG. (First Class Honors Degree), Civil and Environmental Engineering **2011 - 2015**

RESEARCH EXPERIENCE

Postdoctoral Research, Stanford University, Stanford, California USA
Postdoctoral Researcher in Energy Resources Engineering **2021 -**
Advisors: Ilenia Battiato

- Developing a simulation framework to optimize membrane technologies for water purification (Collaborators: Ali Mani and Meagan Mauter).
- Developing models to optimize energy storage in batteries (Collaborators: Palo Alto Research Center (PARC)).

Doctoral Research (Simulations), Stanford University, Stanford, California USA
Research Assistant in Civil and Environmental Engineering **2015 - 2021**
Advisors: Craig S. Criddle and Oliver B. Fringer

- Quantified fine-scale particle-flow interaction to provide design and optimization strategies for domestic wastewater energy recovery processes such as the Staged Anaerobic Fluidized-bed Membrane Bioreactor (SAF-MBR).

Doctoral Research (Experiments), Stanford University, Stanford, California USA
Research Assistant in Civil and Environmental Engineering **2015 - 2021**
Advisors: Craig S. Criddle and Oliver B. Fringer

- Developed stable Coupled Aerobic-anoxic Nitrous Decomposition Operation (CANDO) for recovering energy from high strength ammonium wastewater.
- Developed robust bioreactors for converting ammonium to nitrite.

Industrial Research, Codiga Resource and Recovery Center, Stanford, California USA

Research Assistant in Civil and Environmental Engineering **2016 - 2018**

- Developed lab protocols for sample analysis and operated and maintained the start-up operation of the Staged Anaerobic Fluidized-bed Membrane Bioreactor (SAF-MBR).

Undergraduate Thesis, National University of Singapore, Singapore, Singapore

Undergraduate Student in Civil and Environmental Engineering **2012 - 2015**

Advisors: How Yong Ng

- Developed anaerobic processes for treating high-strength pharmaceutical wastewater.

PUBLICATIONS

Yao, Y., Beigert, E., Vowinkel, B., Köllner, T., Meiburg, E., Balachandar, S., Criddle, C. S., & Fringer, O. B. A collocated immersed boundary method for particle-resolving simulations of polydispersed particle-laden flows. *Submitted to International Journal of Numerical Method in Fluids*, arXiv:2109.03972.

Yao, Y., Fringer, O. B. & Criddle, C. S. (2022) CFD-accelerated bioreactor optimization: reducing the hydrodynamic parameter space. *Environmental Science: Water Research & Technology*, 8, 456-464.

Yao, Y., Criddle, C. S., & Fringer, O. B. (2021) Competing flow and collision effects in a monodispersed liquid-solid fluidized bed at a moderate Archimedes number. *Journal of Fluid Mechanics*, 927, A28.

Yao, Y., Criddle, C. S., & Fringer, O. B. (2021) Comparison of the properties of segregated layers in a bidispersed fluidized bed to those of a monodispersed fluidized bed. *Physical Review Fluids*, 6, 084306.

Yao, Y., Criddle, C. S., & Fringer, O. B. (2021) The effects of particle clustering on hindered settling in high-concentration particle suspensions. *Journal of Fluid Mechanics*, 920, A40.

Yao, Y., Wang, Z., & Criddle, C. S. (2021) Robust nitrification of anaerobic digester centrate using dual stressors and timed alkali additions. *Environmental Science & Technology*, 55, 2016-2026.

Wang, Z., **Yao, Y.**, Woo, S.-G., & Criddle, C. S. (2020) Impacts of nitrogen-containing coagulants on the nitrification/denitrification of anaerobic digester centrate. *Environmental Science: Water Research & Technology*, 6, 3451-3459.

Wang, Z., Woo, S.-G., **Yao, Y.**, Cheng, H.-H., Wu, Y.-J., & Criddle, C. S. (2020). Nitrogen Removal as Nitrous Oxide for Energy Recovery: Increased Process Stability and High Nitrous Yields at Short Hydraulic Residence Times. *Water Research*, 173, 115575.

Ng, K. K., Shi, X., **Yao, Y.**, & Ng, H. Y. (2014). Bio-Entrapped Membrane Reactor and Salt Marsh Sediment Membrane Bioreactor for the Treatment of Pharmaceutical Wastewater: Treatment Performance and Microbial Communities. *Bioresour. Technol.*, 171, 265-273.

CONFERENCE PRESENTATIONS

Yao, Y., Wang, A., Battiato, I., Mauter, M., Ling, B., & Dudchenko, A. (2021) Three-dimensional

Flows and Dean Vortices in Membrane Distillation Systems. *The North American Membrane Society (NAMS)*. (Oral Presentation)

Yao, Y., Fringer, O., & Criddle, C. (2020) Particle-resolved DNS (PR-DNS) to study the effect of flow and collisions in a monodispersed fluidized bed reactor. *Bulletin of the American Physical Society*. (Oral Presentation)

Yao, Y., Fringer, O., & Criddle, C. (2019) Particle-Resolved DNS (PR-DNS) to Study the Bulk Settling Velocity of Poly-Dispersed Particles. *Bulletin of the American Physical Society*. (Oral Presentation)

Yao, Y., Wang, Z., & Criddle, C. S. (2019) Complete nitrification of Anaerobic Digester Centrate without pH setpoint control. *ReNUWIt IAB Meeting*. (Poster Presentation)

Yao, Y., Wang, Z., Woo, S.-G., & Criddle, C. S. (2018) Achieving long-term stable nitrification in SBRs through alternating the presence of dual stressors. *ReNUWIt Annual Meeting*. (Poster Presentation)

Wang, Z., **Yao, Y.**, Woo, S.-G., & Criddle, C. S. (2018) Lab-scale nitrous denitrification reactor in CANDO system. *ReNUWIt Annual Meeting*. (Poster Presentation)

Wang, Z., Woo, S.-G., **Yao, Y.**, Lasana Power, Hai-Hsuan Cheng, Yi-Ju Wu, & Criddle, C. S. (2017) The Coupled Aerobic Anoxic Nitrous Decomposition Operation (CANDO). *ReNUWIt Annual Meeting*. (Poster Presentation)

INVITED TALK

Using particle-resolved computational fluid dynamics simulations to optimize wastewater treatment systems: Shrinking the parameter space to accelerate reactor optimization. **University of California, Berkeley**, USA, 02/2021. (Delivered virtually due to COVID-19)

Physics-informed design for MINEWater systems. **Massachusetts Institute of Technology**, USA, 01/2021. (Delivered virtually due to COVID-19)

FELLOWSHIP AND PROPOSALS

Robust decentralized wastewater treatment through autonomous control, submitted to Schmidt Science Fellowship.

Particle-resolved simulations to understand the effects of flow rate and particle size distributions in fluidized bed reactors, submitted to Extreme Science and Engineering Discovery Environment (XSEDE).

TEACHING EXPERIENCE

Air Quality Management **Stanford, CA**
Teaching Assistant **2021**

Aquatic Chemistry and Biology **Stanford, CA**
Teaching Assistant **2020**

Pathogens and Disinfection **Stanford, CA**
Teaching Assistant **2020**

Modeling Environmental Flow **Stanford, CA**
Teaching Assistant **2020**

Modeling Environmental Flow **Stanford, CA**
Teaching Assistant **2019**

Environmental Engineering Applications of Membrane Technology **Stanford, CA**
Teaching Assistant **2016**

SERVICE AND OUTREACH

Graduate reviewer
• Stanford Exposure to Research and Graduate Education (SERGE) **2021**

Student editor
• Chinese-American Professors in Environmental Engineering and Science (CAPEES) **2021**

Graduate Mentor, Stanford University, Stanford, California USA
• College Track **2021**
• Summer Undergraduate Research Fellowships (SURF) **2021**
• Summer First **2021**
• Research Experience for Undergraduates (REU) **2020**

Organizer Assistant, Stanford University, Stanford, California USA
• Energy@Stanford & SLAC **2016**

Student Officer, Stanford University, Stanford, California USA
• Stanford Energy Club **2016 - 2017**