Siyu Zou (邹思宇)

Lecturer, Ph.D.
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https://zousiyu1995.github.io/zousiyu/
Born in Songzi (松滋), Hubei, China

Research Interests

My main research interests lie in mathematical modeling and numerical simulation of transport phenomena (fluid dynamics, mass and heat transfer, and reaction kinetics) in nature and industry. I leverage chemical engineering principles to develop multi-physics models to understand, design, and optimize these processes. Some examples of application,

- Modeling and design of biosensor, e.g, enzyme electrodes.
- Modeling and optimization of chemical reactors, e.g, fixed bed reactors, CVD reactors.
- Understanding biological systems from chemical engineering perspective, e.g, eyelashes, digestive system, cardiovascular system.

Employment

Since 09/2024 **Lecturer**
School of Chemical Engineering, Xiangtan University, Xiangtan, Hunan Province, China

07/2021 – 06/2024 **Post-Doc in Physical Chemistry**
College of Chemistry, Chemical Engineering and Materials Science, Soochow University, Suzhou, Jiangsu Province, China
Co-Advisors: Prof. Xinjian Feng and Prof. Jie Xiao
Project: "Mathematical Modeling of Three-Phase Interface Enzyme Electrode"

Education

09/2016 – 06/2021 **Ph.D. in Applied Chemistry**
School of Chemical and Environmental Engineering, Soochow University, Suzhou, Jiangsu Province, China
Advisors: Prof. Xiao Dong Chen and Prof. Jie Xiao
Dissertation: "Modeling and Simulation of Reactors with Unique Structures" (Defense 02/06/2021)

09/2016 – 09/2018 **M.Eng. in Chemical Engineering**
School of Chemical and Environmental Engineering, Soochow University, Suzhou, Jiangsu Province, China
Advisor: Prof. Jie Xiao
Successive postgraduate and doctoral programs of study. Transferred to Ph.D. in Applied Chemistry

09/2012 – 06/2016 **B.Eng. in Chemical Engineering**
School of Chemical Engineering and Pharmacy, Jingchu University of Technology, Jingmen, Hubei Province, China

Skills

Expertise Chemical Engineering, Process System Engineering, Transport Phenomena, Mathematical Modeling, Numerical Simulation, Fluid Mechanics, Mass Transfer, Heat Transfer, Reaction Engineering, Reacting Flows, Porous Media, Incompressible Flows, Chemical Process Intensification

Modeling & Simulation Physics-Based Modeling, Continuum Modeling, Multi-Physics Modeling, Multi-Scale Modeling, Machine Learning, Deep Learning, Differential Equation, Finite Element Method (FEM), Computational Fluid Dynamics (CFD), Turbulence Modeling, Moving Mesh

Software ANSYS Fluent, COMSOL Multiphysics, MATLAB, LaTeX, Pandas, Numpy, Matplotlib, Linux, Blender

Programming MATLAB, Python, C, Algorithms, Data Structures

Languages Chinese (native speaker), English (intermediate)

Honours and Awards

01/12/2024 **Best Oral Presentation Award**: In the 4th National Conference on Process Modeling and Simulation (hosted by South China University of Technology), my talk "Mathematical Modeling of Three-Phase Interface Enzyme Electrode" was honored with the Best Oral Presentation Award. This work has been published in AIChE Journal and Industrial & Engineering Chemistry Research.

07/2022 **Jiangsu Funding Program for Excellent Postdoctoral Talent**: This funding is provided by the Jiangsu provincial government.

16/07/2020 **Best Student Oral Presentation Award**: In the 2nd National Conference on Process Modeling and Simulation, my talk on eyelashes ("Inhibition of Ocular Water Evaporation by Eyelashes: Computer Simulation and Mechanism Analysis") was honored with the Best Student Oral Presentation Award (1 of 12 awardees out of 62 student talks). This work has been published in Journal of the Royal Society Interface. This conference was organized by the Simulation & Virtual Process Engineering Committee, one of the professional committees of the Chemical Industry and Engineering Society of China (CIESC).

Publications

∇ denotes the corresponding author. Also find me on Google Scholar, Research Gate, ORCiD, ScholarGPS, and Github.

Main Publications

7. **Siyu Zou**, Jie Xiao∇, and Xinjian Feng∇. "Engineering Enzyme Electrode with 3d Three-Phase Interface to Boost Enzymatic and Electrochemical Cascade Reactions". In: *Chemical Engineering Science* 318 (Dec. 2025), p. 122189. ISSN: 0009-2509. DOI: 10.1016/j.ces.2025.122189

6. **Siyu Zou**∇, Jie Xiao, and Xiao Dong Chen∇. "A Comprehensive Comparison of Different Reynolds-Averaged Navier–Stokes Turbulence Models in Modeling Turbulent Plane Jets". In: *ACS Omega* 10.19 (May 20, 2025), pp. 19873–19886. ISSN: 2470-1343. DOI: 10.1021/acsomega.5c01448

5. **Siyu Zou**, Jie Xiao∇, and Xinjian Feng∇. "Modeling Enzymatic and Electrochemical Cascade Reactions at the Three-Phase Interface Enzyme Electrode". In: *AIChE Journal* 70.6 (Mar. 2024), e18420. ISSN: 1547-5905. DOI: 10.1002/aic.18420

4. **Siyu Zou**, Dandan Wang, Jie Xiao∇, and Xinjian Feng∇. "Mathematical Model for a Three-Phase Enzymatic Reaction System". In: *Industrial & Engineering Chemistry Research* 62.10 (Mar. 2023), pp. 4337–4343. ISSN: 1520-5045. DOI: 10.1021/acs.iecr.2c04492

3. **Siyu Zou**, Jie Xiao$^{\nabla}$, Viola Wu, and Xiao Dong Chen$^{\nabla}$. "Analyzing Industrial CVD Reactors Using a Porous Media Approach". In: *Chemical Engineering Journal* 415 (July 2021), p. 129038. ISSN: 1385-8947. DOI: 10.1016/j.cej.2021.129038

2. **Siyu Zou**, Jinping Zha, Jie Xiao$^{\nabla}$, and Xiao Dong Chen. "How Eyelashes Can Protect the Eye through Inhibiting Ocular Water Evaporation: A Chemical Engineering Perspective". In: *Journal of The Royal Society Interface* 16.159 (Oct. 2019), p. 20190425. ISSN: 1742-5662. DOI: 10.1098/rsif.2019.0425

1. **Siyu Zou**, Ersuo Ling, Shurong Le, Shengpeng Sun, Zhangxiong Wu, Xiao Dong Chen, Duo Wu, and Jie Xiao$^{\nabla}$. "Numerical Simulation and Analysis of the Catalytic Ozonation Reactor". In: *Chemical Industry and Engineering Progress* 38.9 (May 15, 2019), pp. 3969–3978. ISSN: 1000-6613. DOI: 10.16085/j.issn.1000-6613.2018-2476 (In Chinese)

Other Publications

5. Kaixin Li, **Siyu Zou**, Jun Zhang$^{\nabla}$, Yang Huang, Lin He$^{\nabla}$, and Xinjian Feng$^{\nabla}$. "Superhydrophobicity-Enabled Efficient Electrocatalytic CO_2 Reduction at a High Temperature". In: *ACS Catalysis* 13.14 (June 2023), pp. 9346–9351. ISSN: 2155-5435. DOI: 10.1021/acscatal.3c01444

4. Xiao Dong Chen$^{\nabla}$ and **Siyu Zou**. "Reaction Engineering Approach to Turbulence Modelling—Universal Law of the Wall, Pipe Flow, and Planar Jet Flow". In: *Journal of Chemical Engineering of Japan* 54.1 (Jan. 2021), pp. 1–11. ISSN: 1881-1299. DOI: 10.1252/jcej.20we056

3. Jinping Zha, **Siyu Zou**, Jianyu Hao, Xinjuan Liu, Guillaume Delaplace, Romain Jeantet, Didier Dupont, Peng Wu, Xiao Dong Chen, and Jie Xiao$^{\nabla}$. "The Role of Circular Folds in Mixing Intensification in the Small Intestine: A Numerical Study". In: *Chemical Engineering Science* 229 (Jan. 2021), p. 116079. ISSN: 0009-2509. DOI: 10.1016/j.ces.2020.116079

2. Hongtao Xia, **Siyu Zou**, and Jie Xiao$^{\nabla}$. "Numerical Simulation of Shear-Thinning Droplet Impacting on Randomly Rough Surfaces". In: *CIESC Journal* 70.2 (Feb. 5, 2019), pp. 634–645. ISSN: 0438-1157. DOI: 10.11949/j.issn.0438-1157.20181213 (In Chinese)

1. Jie Xiao$^{\nabla}$, Fei Pan, Hongtao Xia, **Siyu Zou**, Hui Zhang, Oluwafemi Ayodele George, Fei Zhou, and Yinlun Huang. "Computational Study of Single Droplet Deposition on Randomly Rough Surfaces: Surface Morphological Effect on Droplet Impact Dynamics". In: *Industrial & Engineering Chemistry Research* 57.22 (May 2018), pp. 7664–7675. ISSN: 1520-5045. DOI: 10.1021/acs.iecr.8b00418

Conference Presentations

21/09 – 19/09/2025 Contributed Talk, "Construction of a Multiphase Reaction-Diffusion Model for Three-Phase Interface Enzyme Electrodes and Its Guidance for Electrode Optimization", The 4th Symposium on Simulation Methods and Technologies in Process Industries, Changsha, China.

04/08 – 06/08/2025 Contributed Talk, "Mathematical Modeling of Three-Phase Interface Enzyme Electrode", Young Scholar Forum, The 17th Annual Conference of the Global Academy of Chinese Chemical Engineering Scholars (GACCE-2025), Zhengzhou, China.

29/11 – 01/12/2024 Contributed Talk, "Mathematical Modeling of Three-Phase Interface Enzyme Electrode", The 4th National Conference on Process Modeling and Simulation, Guangzhou, China.

16/07 – 17/07/2020 Contributed Talk, "The Inhibitory Effect of Eyelashes on Water Evaporation on Ocular Surface: Computer Simulation and Mechanism Analysis", The 2nd National Conference on Process Modeling and Simulation, Online, China.

25/08 – 27/08/2018 Poster, "Multiscale Numerical Simulation of the Catalytic Ozonation Reactor for Wastewater Treatment", The 1st National Conference on Process Modeling and Simulation, Shanghai, China.

Research Grants

01/2025 – 12/2030 **Mathematical Modeling of Three-Phase Interface Enzyme Electrode**
Funded by Xiangtan University (KZ0809969)
Budget: CNY 100,000
Role: Proposal, Project Manager

Research Project Participations

06/2020 – 05/2025 **High-Efficiency Enzyme Catalysis and Sensing System at Nanointerface**
Funded by Ministry of Science and Technology of the People's Republic of China (2019YFA0709200)
Budget: CNY 21,760,000
Role: Post-Doc, Researcher

01/2020 – 12/2023 **Basics of Particle Structure Control and Process Optimization of Uniform Particle Size Droplet Spray Drying Products at Multi-Scale Levels**
Funded by National Natural Science Foundation of China (21978184)
Budget: CNY 650,000
Role: PhD student, Researcher

Student Supervision

Master Students

1. Qi Peng (彭 琦), 2025, Master thesis, xxx, Supervisor.
2. Chongyang Bu (卜 重 阳), 2025, Master thesis, xxx, Supervisor.

Teaching

Spring 2026	**Analysis and Synthesis of Chemical Processes**, undergraduate level, 3 credits, x students.
Fall 2025	**Principles of Food Engineering**, undergraduate level, 3 credits, 62 students.
Fall 2024	**Virtual Simulation of Chemical Technology & HAZOP Safty Analysis**, undergraduate level, 2 credits, 34 students.

Last updated: 12/09/2025