

Ruochen Zhang

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Research Interest

Experimental fluid dynamics; Turbulence; Heat transfer; Multiphase Flow;

Education

Xi'an Jiaotong University, China

Master of Engineering

2023 - 2026

- **GPA:** 88.79/100 (ranking 5%)
- **Relevant Coursework:** Numerical Heat Transfer(A+), Advances in Multiphase Flow Mechanics(A), Advanced Engineering Thermodynamics(A), Low-Temperature Refrigeration Technology(A)

Xi'an Jiaotong University, China

Bachelor of Engineering with Honors

2019 - 2023

- **GPA:** 81.45/100 (ranking 20%)
- **Relevant Coursework:** Engineering Thermodynamics, Fluid Mechanics, Heat Transfer, Principles of Automatic Control, Process Equipment Control Technology, Fluid Machinery

Publications

Submitted papers

1. Zhang, R., Wang, S.* Investigation of Vortex-Driven Transport and Fragmentation Mechanisms of Microbubbles in Swirl-Venturi Systems. **Chemical Engineering Journal**, Under review

Published Peer-reviewed papers

1. Zhang, R., Xiao, J., Wang, S.* Study on foaming performance of swirl-Venturi micrometer bubble generator based on CFD-PBM coupling. **Industrial & Engineering Chemistry Research**,
<https://doi.org/10.1021/acs.iecr.5c00930> [SCI Q2, IF=4.2]
2. Zhang, R., Wu, Y., Wang, S.* Thermal-hydraulic characteristics and optimization of coiled-tube resistance furnace based on response surface method and multi-objective genetic algorithms. **Case Studies in Thermal Engineering**,
<https://doi.org/10.1016/j.csite.2025.106259> [SCI Q2, IF=6.8]
3. Wang, J.* , Zhang, R., Liu, Y. Numerical simulation of normal collision process between liquid-coated particles in the micrometer scale. **Powder Technology**,
<https://doi.org/10.1016/j.powtec.2024.120546> [SCI Q1, IF=5.6]
4. Zhang, R., Wang, J.* , Wang, S.* Dynamic collision behavior and energy dissipation mechanism of micron wet particles. **Chemical Industry and Engineering Progress**,
<https://doi.org/10.16085/j.issn.1000-6613.2024-0780> [EI Compendex]

Patents

1. Wang, S.* , Duan, X., Zhang, R. An integrated device for heat exchange and water electrolysis and a method for water electrolysis. CN202311123586.6 [P]
2. Deng, J.* , Zhang, R., Zhang, K. An Air-water Production Device and Water Production Method Utilizing Compressed Air Expansion Refrigeration. CN202111452474.6 [P]

Research Experience

Vortex-Driven Transport and Fragmentation Mechanisms of Microbubbles

Jun.2024-Now

Master thesis / Advisor: Prof. Simin Wang

- Built a visual swirl-Venturi microbubble generator and performed high-speed imaging to capture bubble deformation, deceleration and breakup.
- Revealed three breakup modes in swirl-Venturi microbubble generators, static erosive, dynamic erosive, and tensile.
- Simulations captured vortex cores, adverse pressure gradients, and turbulent kinetic energy peaks that coincide with these zones, confirming that vortex-pressure coupling is the primary driver of breakup.

Particle collision during Coupling Process of Phase Change Condensation

Jul.2023-May.2024

(Funded by the National Natural Science Foundation of China)

Collaborator / Advisor: Prof. Jiarui Wang

- Developed a computational framework combining VOF and overset grids to simulate gas–liquid–solid interface evolution during particle collision.
- Analyzed the deviation between classical dry-particle collision theory and actual behavior of liquid-coated particles.
- Quantified energy dissipation mechanisms and proposed improved modeling strategies for coagulated particle systems.

Multi-Objective Optimization of Coiled-Tube Resistance Furnaces

Oct.2022-Jun.2023

Undergraduate thesis / Advisor: Prof. Juan Xiao

- Developed a three-dimensional numerical model of a coiled-tube resistance furnace to analyze heat transfer and pressure drop characteristics.
- Conducted experiments to validate the computational model by assessing temperature rise under different inlet flow rates and heating power conditions.
- Applied response surface methodology combined with multi-objective optimization to establish empirical correlations between structural parameters and furnace performance.

Compressed Air-Driven Water Production System Based on Air Expansion

Mar.2021-Aug.2022

(College Students' Innovative Entrepreneurial Training Plan Program)

Leader / Advisor: Prof. Jianqiang Deng

- Designed an air-to-water production setup using mechanical compression and refrigeration condensation principles, reduced the operating limits of the system to 20% relative humidity.
- Established empirical correlation equations for water production under various operating conditions.

Conference

Chinese Society of Engineering Thermophysics Conference on Multiphase Flow

Nov.2024

Oral Presentation: Optimization simulation of foaming performance of micro/nano bubble generator

Teaching Experience

Fundamentals of Two-Phase Flow Numerical Simulation, *Teaching Assistant*

Mar.2024-Jun.2024

- Delivered in-class demonstrations of ANSYS Fluent for two-phase flow modeling, including mesh generation, solver setup, interfacial models, and post-processing.
- Guided undergraduate students through the full CFD workflow and assisted the instructor with homework.

Extracurricular Activities

- XJTU Varsity Rowing Team, *Member*
- The 14th National Games, *Volunteer*

Sept.2019-Apr.2023

Sept.2021

Honors & Awards

- **National Scholarship, China's highest honour for graduate students** (National, 2025)
- 1st Prize Scholarship of Xi'an Jiaotong University (2024)
- Graduate with honor (2023)
- 1st Prize in The National Competition of innovation and Creation in Mechanical Engineering (2022)

Skills

- **Languages:** English (IELTS 7.0), Chinese
- **Technical:** MATLAB, Python, OriginPro, Adobe Illustrator, ANSYS Fluent, High-speed imaging
- **Interest:** Tennis, Swimming, Rowing