# Yan Liu

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## Education

**Institute of Nuclear Science and Safety, Shanghai Jiao Tong University (SJTU), China**

- Ph.D. in Nuclear Science — Expected Jun. 2026
  Advisor: Prof. Xiaojing Liu, Distinguished Professor of Nuclear Science
  Dissertation: Multiphysics Coupling Mechanisms of CRUD-Induced Axial Power Shift in PWRs
- B.S. in Nuclear Engineering — Jun. 2021

## Research

### Research Focus

- CRUD depositions and the mitigation strategies
- Advanced materials for phase-change heat transfer enhancement
- Novel interface characterization under extreme conditions

### Projects

- National Natural Science Foundation of China. ***The multi-physics coupled mechanism for the material-thermal hydraulics-neutronics behaviors of CRUD layers***. Jan. 2021-Dec. 2024.
  Role: Principal Researcher
  (1) **Corrosion product deposition** – Developed an ex-core accelerated CRUD deposition platform replicating in-core Fe/Ni precursor chemistry, achieving 98.2% agreement with plant measurements; identified synergistic bubble–solute–crystal–particle evolution under subcooled boiling.
  (2) **Boron hideout** – Proposed a boron precipitation criterion and built a non-equilibrium convection-diffusion-radiolysis-reaction transport model with <10% error, revealing morphology-based and boundary-dependent boron hideout mechanisms.
  (3) **Multi-physics coupling** – Developed refined CRUD boron distribution and porous boiling heat transfer models within a coupled neutronic-thermal hydraulic-material-chemistry framework, employing a half-time-step strategy to map thresholds and spatial patterns of CRUD-induced axial power shift.

### Self-Developed Research Software

- ICBA: Innovative nuclear system laboratory code for Crud Boron Analysis
  A high-fidelity simulation code for CRUD formation, solute transport, and multi-physics interactions in PWRs. Built on a finite volume method framework with feature-resolved meshing and a dynamic porous media model, ICBA achieves strong agreement with laboratory and in-core measurements and supports both steady-state and transient analyses for advanced CRUD mitigation strategy development.

## Skills

- **Modeling & Simulation** – High-fidelity multi-physics simulation, CFD, FVM
- **Experimental Techniques** – Heat transfer testing; Materials synthesis and advanced characterization
- **Programming & Data Analysis** – MATLAB, Python, C++, COMSOL
- **Others** – Thermodynamic-kinetic database development; Image analysis; Machine learning

## Selected Publications

Full list of publications available on my personal website.

- **Yan Liu**, *et al*. Understanding flow fouling deposition and solute hideout-return behavior at the phase change interface. ***ACS Applied Materials & Interfaces*** 16, 4719-4728 (2024).
- **Yan Liu**, *et al*. Synthesizing nuclear power plant fouling with fractal characteristics enables an in-depth study of concerned nuclear safety issues. ***iScience*** 27, 108789 (2024).
- **Yan Liu**, *et al*. Pressurized water reactor fuel corrosion-related unidentified deposit and its related safety issues - I. Corrosion product deposition and heat transfer. ***Annals of Nuclear Energy*** 208, 110758 (2024).
- **Yan Liu**, *et al*. Pressurized water reactor fuel corrosion-related unidentified deposit and its related safety issues - II. Corrosion product deposition and heat transfer modeling. ***Annals of Nuclear Energy*** 211, 110932 (2025).
- **Yan Liu**, *et al*. Pressurized water reactor fuel corrosion-related unidentified deposit and its related safety issues - III. N-TH-M coupled CIPS prediction. ***Annals of Nuclear Energy*** 208, 110800 (2024).

## Honors & Awards

- 2024 Best Paper Award, The 31st International Conference on Nuclear Engineering ICONE-31
- 2022 Best Poster Award, The 23rd Pacific Basin Nuclear Conference PBNC2022
- 2023 Outstanding Postgraduate Presentation Award, Shanghai Nuclear Society
- 2024 ENEN++ Nuclear Mobility Fund, European Nuclear Education Network ENEN
- 2024 China National Scholarship (Top 0.2%), Ministry of Education of the People's Republic of China
- 2022 China National Scholarship (Top 0.2%), Ministry of Education of the People's Republic of China
- 2023 President's Award of SJTU, Shanghai Jiao Tong University

## Professional Services & Memberships

- **Conference Organization** – Section Co-chair, The 31st International Conference on Nuclear Engineering
- **Academic Advising** – Faculty Advisor for 2021 B.S. Nuclear Cohort, Shanghai Jiao Tong University
- **Professional Societies** – Member, Chinese Nuclear Society; American Nuclear Society; American Society of Mechanical Engineers

## References

- Prof. Xiaojing Liu (Ph.D. Advisor)
  Executive Vice Dean of College of Smart Energy, Shanghai Jiao Tong University
  Editorial Advisory Board Member, Nuclear Engineering and Design, Elsevier
  Email: xiaojingliu@sjtu.edu.cn
- Prof. Jinbiao Xiong
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