Zhiying Xiao, Ph.D.

Note: Eligible to work under STEM OPT until January 2027. May apply for an O-1 visa to avoid the potential $100,000 H-1B filing cost. Likely to qualify for a green card through EB1A or EB1B in 2026, supported by a previously approved NIW priority date.

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RESEARCH INTERESTS

- **Dynamic Building Envelopes:** passive/active thermal switches, adaptive thermal control
- **Thermal Energy Storage (TES):** PCMs, solid–solid PCMs, sorbent thermal batteries.
- **Radiative Cooling:** daytime radiative cooling, thermo-optical and switchable coatings.
- **Building Energy Modeling:** EnergyPlus, building-scale simulation, techno-economic analysis.
- **Advanced Building Insulation:** cement-based insulation foams, porous thermal composites.
- **AI-Driven Building Thermal Management:** ML-based energy prediction, surrogate modeling, data-driven analysis.

EDUCATION

Ph.D., Civil Engineering (Building Thermal Sciences) – Worcester Polytechnic Institute, MA | GPA: 4.0/4.0

M.S., Structural Engineering – Hunan University, China

B.S., Civil Engineering – Hunan University, China

ACADEMIC & RESEARCH

Postdoctoral Researcher – Mechanical Engineering / Building Technologies

National Renewable Energy Laboratory (NREL), Golden, CO | 2024 – Present

- Designed, prototyped, and optimized insertable passive thermal switches targeting high on/off thermal conductance ratios while maintaining retrofit-friendly installation.
- Developed analytical and COMSOL/ANSYS transient heat-transfer models to characterize switching behavior and guide design optimization.
- Analyzed supermarket HVAC and refrigeration thermal networks, including glycol loops, condenser/evaporator configurations, defrost strategies, heat-recovery potential, and TES integration opportunities to improve load shifting and reduce peak demand.
- Performed thermal and mechanical characterization of cement-based insulation materials (thermal conductivity, compressive strength, moisture uptake, cycling durability) to support product development and cladding system optimization.

Graduate Research Assistant – Building Science / Thermal Materials

Worcester Polytechnic Institute (WPI) | 2019 – 2023

- Modeled solid–solid phase change materials (SS-PCM) using coupled conductive and radiative heat-transfer frameworks.
- Designed and optimized adaptive thermo-optical coatings (SS-PCM/PDMS/Ag multilayers) for dynamic building façades.
- Established ML models (RF, SVM, KNN) to predict optical/thermal properties of porous PCM structures from COMSOL datasets.
- Developed sorbent-based thermal storage batteries using PNIPAM/zeolite composites.
- Mentored undergraduate students, supervised laboratory sessions

Structural Engineer

POWERCHINA Kunming Engineering Corporation | 2016 – 2019

- Designed and analyzed 10,000+ m² concrete and masonry structures in high-seismic regions.

- Built ETABS/SAP2000 models for 11–18-story buildings and delivered 100+ structural drawings.
- Coordinated with architecture, HVAC, and MEP disciplines contributed to two structural utility patents.

Graduate Researcher – Structural Engineering / Offshore Wind
Hunan University, China | 2013–2016

- Conducted fluid-structure interaction (FSI) modeling and hydrodynamic simulation of reinforced-concrete floating offshore wind turbine platforms.
- Analyzed modal behavior, frequency response, aerodynamic damping, and ultimate strength of an offshore platform under wind-wave excitation.
- Completed master's thesis on reinforced-concrete floating platform hydrodynamics.

TEACHING EXPERIENCE

Teaching Assistant, WPI: Courses assisted: CE 2002 (Structural Analysis), ES 3004 (Fluid Mechanics), CE 3062 (Hydraulics), GE 2341 (Geology), and AREN 3003 (HVAC).
Teaching Assistant, Hunan University: Structural Mechanics
Responsibilities included leading problem-solving sessions, grading assignments, and supervising laboratory activities.

AWARDS & HONORS

Top pitch in SCI3 Directorate preliminaries, NREL.
Graduate Research Assistantship, Graduate Research Innovation Exchange (GRIE) winner, WPI.
National Scholarship, National Encouragement Scholarship, Hunan University.

CONFERENCE PRESENTATIONS & TALKS

Presenter, NREL SCI3 competition round 1&2, 2025
Presenter, US Department of Energy BTO Peer Review, 2024
Presenter, ACEEE Summer Study on Energy Efficiency, 2024
Presenter, NREL Building Thermal Energy Science Group Seminar, 2023
WPI Graduate Research Symposium, 2021–2023

PUBLICATIONS

1. **Xiao, Zhiying**, Kishore, Ravi Anant, Booten, Chuck. Demonstration and Characterization of Insertable Passive Thermal Switches for Dynamic Building Envelopes. Cell Reports Physical Science, 2025.
2. **Zhiying Xiao**, R. Bousselham, M. Tao, et al. Machine Learning-Optimized Porous Thermally Responsive SS-PCM with Switchable Transparency for Adaptive Building Envelope Coatings. Energy and Buildings, 2025.
3. **Zhiying Xiao**, Sajith Wijesuriya, Kishore, Ravi Anant, et al. Experimental Characterization and Potential Energy Savings Benefits of Insulated Cladding for US Residential Buildings. Energy and Buildings, 2025.
4. **Zhiying Xiao**, P. Mishra, A. Mahdavi Nejad, M. Tao, S. Granados-Focil, S. Van Dessel. Thermal Optimization of a Novel Thermo-Optically Responsive SS-PCM Coating for Building Enclosures. Energy and Buildings, 2021.
5. R. Bousselham, **Z. Xiao**, M. Tao, et al. A Bioinspired Approach for Adaptive Solid-Solid Phase Change Material Coatings with Optimized Surface Features for Passive Thermal Regulation. Solar Energy Materials and Solar Cells, 2026.
6. Kishore, Ravi Anant, **Xiao, Zhiying**, Booten, Chuck, et al. Retrofittable Thermal Switches for Dynamic Building Envelopes Integrated with Thermal Energy Storage. 2024 ACEEE Summer Study on Energy Efficiency in Buildings.
7. El Ouaragli J, **Xiao, Zhiying**, Tao M, Granados-Focil S, Van Dessel S. A Novel Passive Polymer-Sorbent Thermal Battery for Low-Temperature Energy Applications: A Numerical Feasibility Study. Journal of Energy Storage, 2022.
8. Zhong W, Deng L, **Xiao Zhiying**. Flow Past a Rectangular Cylinder Close to a Free Surface. Ocean Engineering, 2019.
9. Deng Lu, **Xiao Zhiying**, et al. Numerical Simulation of Dynamic Response for Offshore Wind Turbines Including Fluid-Structure Interaction. Journal of Hunan University: Natural Science, 2015. (In Chinese)
10. Deng Lu, **Xiao Zhiying**, et al. Intact Stability Analysis of a Semi-Submersible Platform for Floating Offshore Wind Turbines. Journal of Harbin Engineering University, 2016. (In Chinese)

11. Deng Lu, Wang Biao, **Xiao Zhiying**, et al. Conceptual Design and Performance Analysis of a Reinforced Concrete Floating Platform for Offshore Wind Turbine. Journal of Huazhong University of Science and Technology (Natural Science Edition), 2016. (In Chinese)

12. Deng Lu, Huang Mingxi, **Xiao Zhiying**, et al. Analysis on Frequency Response of Floating Wind Turbine Considering the Influence of Aerodynamic Damping. Journal of Hunan University: Natural Science, 2016. (In Chinese)

13. Deng Lu, Wang Biao, **Xiao Zhiying**, et al. Review of Offshore Floating Wind Turbine Concepts. Journal of Marine Engineering, 2018. (In Chinese)

14. Wang Biao, Bi Tao, **Xiao Zhiying**, et al. Summary of Foundation Design for Offshore Floating Wind Turbine. Electric Power Survey and Design, 2018. (In Chinese)

PATENTS

1. (US) Thermal Diode and Thermal Switch Bi-Directional Heat Transfer in Building Envelopes, 2025
2. (CN) Prefabricated Bay Window, 2019
3. (CN) A kind of Bi-directional Sliding Seismic Isolation Devices, 2017

RESEARCH FUNDING & PROPOSAL EXPERIENCE

- Participated in NREL-LDRD proposals involving thermal storage materials, building envelope innovations, and energy modeling workflows.
- Participated in proposals in DOE Building Technologies Office (BTO), Geothermal Technologies Office (GTO), DoD's Environmental Security Technology Certification Program (ESTCP), and NSF Engineering programs.

SKILLS

- Modeling & Simulation: COMSOL Multiphysics, ANSYS, EnergyPlus + Python API, MATLAB
- Thermal Experimentation: Thermal cycling, heat-flux sensors, conductivity tests, optical characterization
- Programming & ML: Python, MATLAB; Regression, SVM, Decision Tree, Random Forest, KNN, LSTM, CNN, RL, LLM
- Engineering Tools: AutoCAD, SolidWorks, ETABS, SAP2000, Open Studio, SketchUp.
- Soft Skills: Mentoring, proposal writing, interdisciplinary collaboration, technical communication

Peer review experience

Journals: Applied Energy; Energy and Buildings; Journal of Building Engineering; Solar Energy; Building Simulation; Case Studies in Thermal Engineering; International Journal of Green Energy; Journal of Energy Storage; The International Journal of Ventilation; Advances in Mechanical Engineering; Buildings; Energies; Sustainability; Advances in Building Energy Research; Journal of Engineering for Sustainable Buildings and Cities; Journal of Physics: Energy

Conference: ASME Energy Sustainability Conference 2025; Building Simulation Conference 2025

REFERENCES

Mingjiang Tao	Associate Professor	Worcester Polytechnic Institute	taomj@wpi.edu
Steven Van Dessel	Professor	Worcester Polytechnic Institute	svandessel@wpi.edu
Xin Wang	Assistant Professor	Texas A&M University	xin.wang@tamu.edu