

INDUSTRIAL & MANUFACTURING ENGINEERING SEMINAR ANNOUNCEMENT

Rational Design and Manufacturing of Polymer–Inorganic Hybrid Materials for Controllable Water Treatment

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Rice University

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MRB Room 114



FAMU-FSU
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Global clean water scarcity underscores the urgent need for advanced materials that can enable practical and sustainable water treatment technologies. The key challenges in translating these materials into real-world industrial applications include not only achieving high performance, but also enabling active process control, manufacturability, and seamless integration into engineered systems.

In this talk, I will present a set of manufacturing-oriented strategies that leverage photo- or electricity-driven process control to actively regulate water treatment by modulating the behavior of rationally designed polymer–inorganic hybrid materials. These hybrid materials integrate the tunability and processability of polymers with the stability and functional properties of inorganic components, making them a manufacturable and multifunctional platform. By combining nanoscale material design with advanced manufacturing, I will demonstrate how these hybrid materials can be translated into practical technologies addressing three representative challenges in water treatment: pollutant removal, mineral scaling prevention, and metal resource recovery. These strategies pave the way for scalable, cost- and energy-efficient water treatment technologies, highlighting their potential for industrial and environmental applications.



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Dr. Yifan Zhu is a postdoctoral researcher in the Department of Materials Science and Nanoengineering at Rice University, under the supervision of Prof. Jun Lou. He earned his Ph.D. in Materials Science and Engineering from Rice University and his B.S. in Materials Chemistry from the Special Class for the Gifted Young, University of Science and Technology of China.

His research focuses on the design and manufacturing of polymer–inorganic hybrid materials to address practical challenges in water treatment and energy conversion.