

WATER-ENERGY NEXUS AND ADVANCED TECHNOLOGIES FOR WASTEWATER RESOURCE RECOVERY

Speaker

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Abstract

Water reuse and resource recovery present effective solutions to address water and resource scarcity. The rapid advancement of energy-driven technologies has the potential to revolutionize traditional approaches and drive development of low-carbon and sustainable circular economy of water-energy-resource. My research focuses on advanced electrochemical technologies and interfacial solar evaporation processes for water reuse and resource recovery, resulting in several innovative outcomes: (1) Novel electrochemical processes were developed to achieve “self-supplied” and “chemical-free” treatment approaches for water reuse; (2) The mechanisms and risks associated with byproduct formation during electrochemical oxidation were revealed and composite electrode materials were designed for successful byproduct control, ensuring safe water reuse; and (3) I conducted the first in-depth analysis of mineral scaling effects on interfacial solar evaporation and uncovered the fundamental science and mechanisms of multi-salt crystallization processes. These studies demonstrate the great potential of integrating energy-driven technologies into water systems, offering valuable insights for advancing the water-energy-resource nexus.

Biography

Dr. Kaichao Yang is a Postdoctoral Researcher in the Department of Civil and Environmental Engineering at University of California, Berkeley. He obtained his Ph.D. degree from Washington University in St. Louis, and his M.S. and B.S. from Tianjin University. Dr. Yang’s research centers on water-energy nexus and advancing energy-driven technologies to promote a circular water economy. He developed innovative electrochemical- and solar-based processes for water reuse and resource recovery, and explored the fundamental sciences and mechanisms of electrochemical oxidation/reduction and interfacial solar evaporation processes. Dr. Yang currently serves as a student officer for the Chinese-American Professors in Environmental Engineering and Science (CAPEES) and has organized several academic symposiums. He published > 13 first-author papers and has received many awards including 2025 UC Riverside Future Academics and Mentorship Excellence Award, 2025 CAPEES-Elsevier Outstanding Graduate Student Award and 2024 Washington University Research Impact Award.



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