香港科技大學
THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

土木及環境工程學系
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

SEMINAR

BIOMASS VALORIZATION FOR A CARBON-NEUTRAL FUTURE: THERMOCHEMICAL CONVERSION TO HYDROGEN AND HIGH-VALUE CARBON MATERIALS



Speaker

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Abstract

Biomass, the sole renewable resource containing carbon, holds immense potential to replace fossil fuels for power generation while also serving as a feedstock for high-value chemicals and materials, making it crucial across energy, chemical, and environmental sectors. When integrated with carbon capture and utilization (CCU) technologies, biomass conversion can even achieve carbon negativity, playing a pivotal role in realizing global carbon neutrality goals and thus standing as a cornerstone of future green energy systems. Thermochemical conversion technologies, including gasification, pyrolysis, and liquefaction, are recognized as the most promising routes for biomass valorization, enabling the production of hydrogen-rich syngas, liquid bio-oils, carbon-based materials, and a variety of chemicals. This presentation introduces these thermochemical processes with a specific focus on hydrogen production and the synthesis of high-value carbon materials. Furthermore, it highlights emerging advancements, particularly the integration of novel heating methods driven by renewable energy sources, such as solar power, molten salt energy storage, and flash joule heating. Simultaneously, the integration of artificial intelligence (AI) methods is expected to break through the previous empirical research paradigm and promote the development of biomass pyrolysis towards high-value utilization. This presentation also involve the development of research related to AI-driven high-value utilization of biomass pyrolysis. Finally, the presentation elaborates on the future prospects of biomass utilization from the perspective of achieving carbon negativity, underscoring its significance in the transition towards a sustainable and low-carbon economy.

Biography

Haiping Yang is a Distinguished Professor at Huazhong University of Science and Technology. She is a recipient of the National Science Fund for Distinguished Young Scholars, a 2024 Clarivate Highly Cited Researcher, and was consecutively named an Elsevier Chinese Highly Cited Researcher from 2014 to 2025. Her research focuses on green hydrogen, liquid fuels and carbon materials derived from biomass and organic solid wastes. She has led numerous national and provincial projects, published over 400 papers, authored 1 monograph and 2 textbooks, co-edited four English monographs, and holds more than 20 patents. Her works have received over 20,000 SCI citations with over 25 ESI highly cited papers. She serves as Associate Editor of Bioresource Technology and Fuel Processing Technology, and board member of Energy Conversion and Management, Fuel, Journal of the Energy Institute, Journal of Analytical and Applied Pyrolysis, Carbon Capture Science and Technology and Green Carbon, etc., she is also Board Directors member of the Combustion Institute and Chinese Renewable Energy Society. She has won multiple awards including the Geneva Invention Exhibition Gold Medal.

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