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

RUMEN-INSPIRED HYDROLYTIC BIOREACTOR FOR COMPLEX ORGANIC WASTES DIGESTION

Speaker

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Abstract

Natural digestive systems provide valuable design principles for achieving high-rate hydrolysis and fermentation of complex organic wastes. Guided by these concepts, we developed a two-phase anaerobic dynamic membrane bioreactor (AnDMBR) in which a rumen-inspired hydrolytic bioreactor is integrated with a recirculating methanogenic AnDMBR for downstream biogas recovery. While our work examines the performance of both phases, particular emphasis is placed on the rumen-inspired hydrolytic bioreactor, which operated under rumen-like conditions (pH 6.3, 39 °C, 0.5-day HRT) and used a dynamic membrane to decouple HRT and SRT, enabling rapid solids breakdown and VFA production. This system achieved VFA yields of around 0.4 g COD/g VS under different operating conditions. The coupled methanogenic AnDMBR converted these VFAs to biogas at ambient temperature, producing 0.45 L CH_4/g VS without added alkalinity due to extended biomass retention. Together, these results demonstrate how biomimetic hydrolysis, integrated with stable methanogenesis, can support high-rate and robust treatment of diverse organic wastes.

Biography

Renisha Karki is a PhD candidate in Civil and Environmental Engineering at the University of Michigan, co-advised by Professors Lutgarde Raskin and Steven Skerlos. Her research focuses on biomimetic anaerobic digestion systems, drawing inspiration from natural digestive strategies to develop sustainable technologies for bioenergy recovery from diverse organic wastes. She integrates microbial ecology with process engineering to better understand the microbial communities that drive these processes. Renisha holds an MS in Molecular Biosciences and Bioengineering from the University of Hawai'i at Mānoa, where she was advised by Prof. Samir Khanal, and a BS in Microbiology from Tribhuvan University in Nepal.

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Room 3574 (Lift 27/28),
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