

QUESTS FOR EFFICIENT NITROUS OXIDE-REDUCING BACTERIA TO MITIGATE N₂O EMISSIONS IN ENGINEERED SYSTEMS

Speaker

Prof. Akihiko Terada

Tokyo University of Agriculture and Technology

Abstract

Nitrous oxide (N₂O) is a highly potent greenhouse and ozone-depleting gas. The emissions of N₂O, produced during nitrification and denitrification, are critical concerns in agroecosystems and engineered systems. N₂O-reducing bacteria, capable of converting N₂O into nitrogen gas, hold significant potential for mitigating N₂O emissions. Nevertheless, their ecophysiology remains insufficiently understood. To address this gap and explore their potential as an N₂O sink, active and efficient N₂O-reducing bacteria from biomasses in nitrification/denitrification and anammox systems were enriched. Selective enrichment from denitrifying bioreactors yielded isolates with unique physiological traits that function as dedicated N₂O sinks. Metagenomic analyses and ¹⁵N tracer studies revealed previously uncharacterized N₂O-reducing bacteria actively contributing to N₂O mitigation in anammox systems. Moreover, this presentation highlights the opportunities and challenges of leveraging these unexplored N₂O-reducing bacteria in an engineered system for effective N₂O mitigation technologies.

Biography

Akihiko (Aki) Terada is a professor in the Department of Applied Physics and Chemical Engineering at the Tokyo University of Agriculture and Technology (TUAT). He earned Ph.D. degree from Waseda University, Japan in 2006. After his postdoctoral experience at the Technical University of Denmark in the period of 2006-2009, Prof. Terada was inaugurated at TUAT as a senior assistant professor and then promoted to an associate and a full professor. Prof. Terada's expertise lies in the development of biofilm-based technologies for wastewater treatment and the exploration of bacteria responsible for the nitrogen cycle, especially nitrous oxide, and resource recovery. He has published over 160 peer-reviewed journals at the intersection of environmental engineering, biotechnology and microbial ecology. He serves as a committee member for IWA Biofilm Specialist Group and Microbial Ecology and Water Engineering Specialist Group. Additionally, he contributes as an editorial board member, including roles as an Associate Editor for Bioresource Technology and as a Guest Editor for Water Research X.



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Enquiry:

Ms. Crystal Lau
cecrystal@ust.hk