THE UNIVERSITY OF HONG KONG

DEPARTMENT OF CIVIL ENGINEERING

SEMINAR

Rapid Enrichment of Methanotrophs Using a Membrane Biofilm Reactor

Professor Hee-Deung Park
School of Civil, Environmental and Architectural Engineering, Korea University, South Korea

Date: July 6, 2023 (Thursday)
Time: 11:00 a.m. - 12:00 noon
Venue: Room 612B, 6/F Haking Wong Building, The University of Hong Kong

Abstract
Methane is a greenhouse gas affecting global warming. It is estimated that a quarter of global warming is contributed by methane emission. Although natural emission is important, significant anthropogenic emission is reported, including energy, agriculture, and waste sectors. Wastewater treatment plants (WWTPs) also emit methane to atmosphere, mostly volatilization of dissolved methane from return flow. In 2020, WWTPs in South Korea emitted around 2.9 million tons of CO_2 equivalent of methane which corresponded to 0.5% of the total greenhouse gas emission. A possible approach to reducing the dissolved methane and eventually reducing methane emission to the atmosphere is the biological oxidation of methane to carbon dioxide by methanotrophs. Methanotrophs are microorganisms that can use methane as carbon and energy source. To develop a process reducing methane based on methanotrophs, as the initial step, we attempted to isolate methanotrophs from anaerobic sludge in a WWTP. For a rapid enrichment and following isolation of methanotrophs, the “grow fast” and “go out” strategy was tried using a membrane biofilm reactor (MBfR). The MBfR was operated by supplying methane gas into a gas-permeable hollow-fiber membrane and by flowing mineral medium saturated with oxygen into the reactor. We successfully enriched methanotrophs greater than 50% of the total microorganisms in a two-week MBfR operation. During the MBfR operation, we isolated several methanotrophs from the biofilms formed on the membrane outer surface. In my presentation, I will introduce the new approach for the enrichment and isolation of methanotrophs using the MBfR and some methanogenic evidence of syntrophic association of methanotrophs with non-methanotrophs in the enrichment.

About the Speaker
Hee-Deung Park has been a Professor at the School of Civil, Environmental and Architectural Engineering at Korea University, Seoul, South Korea, since 2009. He received his PhD in Environmental Engineering from the University of Wisconsin, Madison, USA, and MS and BS in Biology from Korea University, Seoul, Korea. Prior to joining the faculty at Korea University, he worked at Kolon Engineering and Construction, South Korea, and conducted post-doctoral research at Stanford University, USA. He is interested in microbial community compositions and functions in environmental engineering settings such as activated sludge reactors, anaerobic digesters, and membrane reactors. He uses modern culture-independent molecular biological tools such as metagenomics and meta-transcriptomics for a rapid, precise, unbiased, and high-throughput examination of environmental samples. The final goal of his research is to identify microorganisms and genes critical to the optimal design and operation of environmental engineering systems. He has published around 150 international journal papers and two books.

- ALL ARE WELCOME -