



DEPARTMENT OF CIVIL ENGINEERING

SEMINAR

**Tuning nanostructure of thin-film composite membrane
to enhance removal of trace organic contaminants**

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Time: 3:30 p.m. - 4:30 p.m.

Venue: Room 612B, 6/F Haking Wong Building, The University of Hong Kong

Abstract

Membrane-based technology, including nanofiltration (NF) and reverse osmosis (RO) processes, has been prevailed in the water/wastewater treatment and water reclamation/reuse. Current (commercial) NF and RO membranes can effectively remove a variety of contaminants from aqueous systems, such as dissolved ions and natural organic matters; however, their removal efficiency of some trace organic contaminants (TrOCs) is unfavorable for those with low molecular weights, neutral and positive charges, and/or high hydrophobicity. We first synthesized a kind of hydrophilic and porous metal organic framework (MOF) MIL-101(Cr), and directly incorporated the MOF into the polyamide rejection layer of nanofiltration membrane, forming a MOF thin-film-nanocomposite (TFN) membrane. We demonstrated that the MIL-101(Cr) acted as the primary water transport nanochannels in the polyamide layer, dominating the separation performance of the MOF-TFN membrane. The MOF-TFN membrane performed favorable removal rates against various endocrine disrupting compounds. Moreover, the nanochannels of MIL-101(Cr) can be further manipulated in a dually charged manner to enhance the removal of both positively charged and negatively charged pharmaceutically active compounds by nanofiltration membrane. Furthermore, CuBDC nanosheets were synthesized and pre-aligned to the interfacial polymerization interface for retarding downward transfer of heat, aqueous monomer and nanobubbles, which allowed formation of highly cross-linked, rough, and ultra-permeable polyamide layer at free-interface. The CuBDC nanosheet templated RO membrane showed a high rejection rate (>90%) to the neutral, small organic molecule N-nitrosodimethylamine (NDMA). Our studies drew a new paradigm to tune structure of advanced thin-film nanocomposite polyamide membranes for efficient removal of trace organic contaminants from wastewater.

About the Speaker

Prof. Dr. Zhiwei Wang is the Dean of School of Environmental Science & Engineering at Tongji University, China. His interests are in the field of wastewater treatment and reclamation using physical-chemical and biological technologies. He is particularly interested in the membrane-based processes for wastewater treatment and energy/resource recovery. Prof. Wang served as Chair of the International Water Association (IWA) China Young Water Professionals, and currently is an IWA Fellow and the member of Management Committee of IWA Specialist Group on Membrane Technology. He also serves on the Editorial Boards of several journals including Desalination, Journal of Environmental Chemical Engineering, Environmental Research, Fundamental Research (NSFC), etc. He has authored/co-authored over 200 peer-reviewed papers in SCI-indexed journals including Nature Water, Science Advances, Environmental Science & Technology, Water Research and so on, with a total citation of ~11,000 and H-index of 62 @ Web of Science, and listed as Most Cited Chinese Scholars in Environmental Sciences Field (Scopus-Elsevier). He was awarded Science & Technology Development Award of Ministry of Education of China (First-class) in 2017 and National Distinguished Young Scholar Funding of NSFC China in 2019.