THE UNIVERSITY OF HONG KONG

DEPARTMENT OF CIVIL ENGINEERING

SEMINAR

Advanced Membranes for Industrial Decarbonization and Hydrogen Purification

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Date: Aug 27, 2025 (Wednesday)
Time: 10:30 a.m. -11:30 a.m.
Venue: Room 612B, 6/F Haking Wong Building, The University of Hong Kong

Abstract
Although the majority of the world has now accepted that global climate change is due to human activities, we will not be able to switch gears and only go for "green energy" without fossil fuels for many decades. One way of contributing to combat climate change is hence to capture the CO_2 from flue gases, and either find ways to utilize the CO_2 or sequestrate it in aquifers or depleted oil fields. Another way is to slowly develop a "green way of living" by using renewable and less carbon-intensive energies such as H_2 and biomethane. Membranes will for sure represent one of the emerging technologies to be used for CO_2 capture, biogas upgrading, hydrogen purification, etc. The type of material developed at the pilot scale is facilitated transport composite membranes where a polyvinylamine selective layer is coated on top of polysulfone, which shows high separation performance for CO_2 capture from flue gas in power plants and cement factories. However, the technology development is not straightforward, and moving from a lab-scale module using a few cm^2 up to several m^2 of a pilot-scale module is particularly challenging. This presentation will then report on the material development, module design and upscaling, pilot testing, and techno-economic feasibility analysis of FT membranes for post-combustion carbon capture. Moreover, carbon molecular sieve membranes show particular interest in high-temperature and/or high-pressure applications, especially hydrogen purification and recovery. Cellulose and polyimide-based carbon membranes present high performances toward H_2/CO_2 separation from steam methane reforming processes, H_2 recovery from natural gas grid, and as well as CO_2 removal from biogas or natural gas. Both the material development and techno-economic feasibility analysis for different scenarios will be presented.

About the Speaker
Dr. Xuezhong He received his B.Sc. degree in Chemical Engineering from Zhengzhou University and his Ph.D. degree from Norwegian University of Science and Technology (NTNU) in 2011. He joined Guangdong Technion-Israel Institute of Technology as an Associate Professor in August 2020. His primary research interest is membrane separations, including facilitated transport and carbon membranes for post-combustion carbon capture, hydrogen purification, etc. He has authored/co-authored of >90 papers (published in Nat. Commun., J. Membr. Sci., Chem. Eng. J., AIChE J., etc.), one book, 13 book chapters, and 4 patents, with a total citation of 5800 and an h-index of 39 (Google Scholars). He serves Editorial Board of *Separation and Purification Technology*, and *Carbon Capture Science & Technology*. Prof. He was awarded the national high-level talent program and the Research Fund for International Excellent Young Scientists of NSFC.

- ALL ARE WELCOME -

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