|  |  |  |
| --- | --- | --- |
|  |  | הטכניון - מכון טכנולוגי לישראל  TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY |
| הפקולטה להנדסה כימית  ע"ש וולפסון |  |  |
| The Wolfson Department of Chemical Engineering |  |  |

**Wolfson Department of Chemical Engineering Seminar**

**Monday, August 5th, 2024, at 13:30**

**Zoom:** <https://technion.zoom.us/j/96298325147>

**Capturing CO2 by a Fixed-Site-Carrier Polyvinylamine-based Facilitated Transport Membrane**

**Yang Li**

**PhD mid-seminar**

Advisor: Prof. Dario R. Dekel & Prof. Xuezhong He

Department of Chemical Engineering, Technion-Israel Institute for Technology

Facing the increased concern of global warming that mainly originating from greenhouse gas emissions, The Paris Agreement has proposed worldwide goals for capturing or removing CO2 from different gas streams before dispersing it in the atmosphere. Since then, enormous efforts focusing on the development of cost-effective CO2 technologies have been undertaken. Most recently, membranes as the main branch of emerging competitive technology for gas separation have gradually stepped from laboratories into industrial applications. In this work, an ultrathin amine-rich selective layer comprising the fixed-site carriers from high-molecular-weight (HMW) PVAm and the mobile carriers as well as nanofillers (e.g., cellulose nanocrystals (CNC and graphene oxide (GO)) was successfully coated on top of polysulfone (PSf) substrate to boost the gas separation performance. Different batches of PVAm with various molecular weights and hydrolysis degrees (DOH) were synthesized through the inverse emulsion polymerization (IEP) method and acid hydrolysis. In addition, the polar groups improve the chain packing efficiency and induce polymer crystallization which reduces gas permeability. Herein, the fractional free volume (FFV) of PVAm can be adjusted by incorporating compatible nanofillers. Moreover, several sterically hindered poly(N-vinylamine)s, such as poly(N-methyl-N-vinylamine)(PVAm-CH3) were synthesized from modifying unhindered poly(N-vinylamine) and the effect of steric hindrance on membrane performance have been investigated under the different gas CO2 capture conditions. At last but not least, incorporating covalent organic frameworks (COFs) with high base stability for facilitated transport membranes (FTMs) fabrication further enhances CO2 capture. Perspectives and potential have been showed for the use of PVAm-based FTMs in commercial-scale gas separation processes.