

## Frontier Chemistry Center フロンティア化学教育研究センター

講演会

演題: High-performance poly(1,3-dioxolane)-based membranes for CO<sub>2</sub> capture

講 師: Prof. Liang HUANG (黄 亮)

School of Environmental Science and Engineering,

Huazhong University of Science and Technology,

China(中国・華中科技大学・環境科学与工程学院)

日時: 2025年7月22日(火) 13:30~14:30

場 所:フロンティア応用科学研究棟 2階セミナー室



**Abstract:** The majority of electric power in the world is still generated by the combustion of fossil fuels (e.g., coal and natural gas), which produces enormous amounts of  $CO_2$  in the flue gas being released to the atmosphere. To mitigate the  $CO_2$  emissions, the  $CO_2$  in the flue gas must be captured for utilization and sequestration without drastically increasing the cost of power production. Membrane technology has emerged as an attractive approach for  $CO_2$  capture due to its high energy-efficiency, small footprint, and simplicity of operation and maintenance. As the flue gas has a huge volume and low  $CO_2$  partial pressure, membrane materials should exhibit both high  $CO_2$  permeability and  $CO_2/N_2$  selectivity to minimize the size of the membrane skid and maximize the purity of the product.

Polymers containing poly(ethylene oxide) (PEO) chain segments demonstrate superior CO<sub>2</sub>/N<sub>2</sub> separation properties owing to their polar ether oxygen groups exhibiting strong affinity towards CO<sub>2</sub>. Poly(1,3-dioxolane) (PDXL) shows ether oxygen content higher than PEO and is expected to have higher CO<sub>2</sub>/N<sub>2</sub> solubility selectivity. However, similar to PEO, the high crystallinity of PDXL greatly reduces its gas permeability. In this talk, I will introduce a series of amorphous PDXL-based branched or multi-block polymers we designed and synthesized. The PDXL-based membranes we developed show robust CO<sub>2</sub>/N<sub>2</sub> separation performance when evaluated with simulated flue gas. The relationship between membrane material structure and gas transport properties will be discussed. This talk will demonstrate that branched and multi-block structures are effective routes to construct amorphous PDXL-based polymers and achieve superior gas separation performance.

## **References:**

1) Macromolecules, 2022, 55, 382.; 2) J. Membr. Sci., 2022, 648, 120352.; 3) Chem. Mater. 2024, 36, 9603.

主催:北海道大学工学研究院 フロンティア化学教育研究センター

共 催:高分子学会北海道支部

連絡先:工学研究院応用化学部門 LI Feng (リ ホウ) (内線:6603)