화학과 대학원 세미나

일시 : 2023년 10월 12일 (목) 오후 5 : 00 장 소 : 이학관 331

Key Low Energy Separations using Membranes and Sorbents

Sustainable production of nearly every chemical is largely impacted by the efficiency of separation and purification processes in the product supply chain. Approximately 15% of the world's energy supply is consumed in these separation and purification processes; moreover, the majority of this energy is provided from hydrocarbon resources, which results in significant concomitant CO2 emissions. Fortunately, this heavy energy burden for separation processes is avoidable. The majority of the separation processes are energy-inefficient—highly engineered distillation columns for water purification consume 50x more energy than thermodynamically necessary. Advanced membrane and adsorption separators can be much more efficient than existing separation processes. Considering this, there is a major opportunity to offset or avoid a significant portion of the world's energy use and associated carbon emissions by implementing advanced separators. In this talk, I'll emphasize the thermodynamics and diffusion processes in membranes and sorbents from a fundamental perspective. Transforming fundamental theories into a scalable, functional separation device is the overarching goal of our research group. In this context, I'll discuss the "direct air capture (DAC)" and "membrane-based crude oil refining" as a prominent field of application of such theories and systems.

References.

1. Electron-mediated control of nanoporosity for targeted molecular separation in carbon membranes, B Oh, H Seo, J Choi, S Lee, DY Koh - Nature Communications, 2022
2. Refining petroleum with membranes, H Seo, DY Koh - Science, 2022
3. Rational tuning of ultramicropore dimensions in MOF-74 for size-selective separation of light hydrocarbons, BL Suh, T Hyun, DY Koh, J Kim - Chemistry of Materials, 2021
4. Shape-Selective Ultramicroporous Carbon Membranes for Sub-0.1 nm Organic Liquid Separation, H Seo, S Yoon, B Oh, YG Chung, DY Koh - Advanced Science, 2021
5. Controlled synthesis of metal–organic frameworks in scalable open-porous contactor for maximizing carbon capture efficiency, YH Lee, YS Kwon, C Kim, YE Hwang, M Choi, YI Park, DY Koh, JACS Au, 2021

고 동 연 교수

KAIST 생명화학공학과