Flexible metal-organic frameworks (MOFs) for CH4/N2 separation

정민지, 박재우, 오현철†
경남과학기술대학교
(oh@gntech.ac.kr†)

Nitrogen is a serious contaminant in natural gas as it decreases the energy density. The natural gas specification in Korea requires N2 contents less than 1 mol%. Therefore, cost-effective N2 removal technology from natural gas is required, but only energy-intensive process, e.g. cryogenic distillation, exists up to now. Hence, the separation of CH4/N2 mixtures is one of the challenges in modern separation technology due to its very similar size of each other. Structural flexibility is a unique property of some metal–organic frameworks that clearly distinguishes them from other porous materials. A MIL-53(Al), the most well-known flexible MOFs, leads to dynamic changes as closed pore transitions to open pore. During the flexible and reversible transition, the pore apertures are continuously adjusted, thus providing the tremendous opportunity to separate mixtures of N2/CH4 mixtures that require precise pore tuning. Herein we demonstrate the separation performance of CH4/N2 mixtures of MIL-53 and MIL-53-NH2. The CH4/N2 separation selectivity of MIL-53-NH2 is enhanced over 4times than pristine MIL-53(Al), implying the possible candidate of MIL-53-NH2 for large scale CH4/N2 separation