Chemical Vapor Deposition on Chabazite (CHA) Zeolite Membranes for Effective Post-Combustion CO_2 Capture

김은주[1], 최정규[1,2,†]
[1]고려대학교 화공생명공학과; [2]고려대학교 그린스쿨
(jungkyu_choi@korea.ac.kr[†])

Chabazite (CHA) zeolite pores (0.37 × 0.42 nm2) are expected to separate CO2 (0.33 nm) from larger N2 (0.364 nm) by recognizing their minute size differences. Furthermore, the hydrophobic siliceous constituent in CHA membranes can allow for maintaining the CO2/N2 separation performance in the presence of H2O. In this study, the pore mouth size of all silica CHA (Si-CHA) particles was reduced via the chemical vapor deposition (CVD) of a silica precursor. Accordingly, an increase of the CVD treatment duration decreased the penetration rate of CO2 into the CVD-treated Si-CHA particles. The CVD process was also applied to siliceous CHA membranes to improve their CO2/N2 separation performance. Compared to the intact ones, the CO2/N2 maximum separation factor (max SF) for CVD-treated CHA membranes was increased by ~2 fold under dry conditions. More desirably, the CO2/N2 max SF was increased by ~3 fold under wet conditions at ~50 °C. The presence of H2O in the feed disfavored the permeation of N2 more than that of CO2 through CVD-modified CHA membranes and thus, contributed to the increased CO2/N2 separation factor.