Kinetic selectivity of SF_6 in hydrate-based SF_6 separation

고결, 서용원†
울산과학기술원
(ywseo@unist.ac.kr†)

This study investigated hydrate-based gas separation (HBGS) to capture sulfur hexafluoride (SF_6), one of the most potent greenhouse gases, from gas mixtures with a primary focus on its kinetic selectivity. A time-dependent SF_6 selectivity in the hydrate phase during hydrate formation was examined with SF_6 (50%) + N_2 (50%) gas mixtures at 8.0 MPa and 275.15 K. Enclathrating behaviors of SF_6 and N_2 in the hydrate phase were analyzed by observing the changes in the intensity and area of enclathrated SF_6 and N_2 molecules using in-situ Raman spectroscopy. Furthermore, gas uptakes and changes in SF_6 compositions in the vapor phase were measured during hydrate formation to demonstrate the rate of hydrate formation and time-dependent selectivity of SF_6 in the hydrate phase. SF_6 had a higher thermodynamic selectivity in the hydrate phase compared to N_2, but SF_6 was not kinetically selective in the hydrate phase during the hydrate formation. The experimental results obtained in this study would be useful for designing and operating the hydrate-based SF_6 separation process from SF_6 + N_2 gas mixtures.