

Adsorptive membrane and adsorbent/membrane hybrid processes for hydrogen separation

한윤진, 하현배, 문종호¹, 백일현¹, 이창하*
연세대학교 화공생명공학과; ¹한국에너지기술연구원
(leech@yonsei.ac.kr*)

Hydrogen is widely used in various fields of industries and is also expected as a clean alternative energy source, anticipating enormous demand for hydrogen in the near future. In addition, application of inorganic membranes to practical gas separation has attracted much attention because of the possibility of application under harsh conditions.

In this study, the transport mechanisms of the MTES (methyltriethoxysilane) templating silica/alumina composite membrane were evaluated by using CO₂, N₂, CH₄, CO and H₂ single gases and their hydrogen mixtures. And the separation characteristics and dynamics of hydrogen mixture produced from natural gas reformer (H₂/CH₄/CO/CO₂: 69/3/2/26 vol.%) were studied on both experimentally and theoretically. In addition, AMH (Adsorbent/Membrane Hybrid) system, which adsorbents (zeolite 5A) were packed to the MTES membrane, was developed to improve the performance of hydrogen separation. The permeation flux in the MTES membrane was affected by molecular sieving effects as well as surface diffusion by adsorption. The transient permeation/separation behaviours of hydrogen multi-component systems on the MTES membrane were predicted by using gPROMS.