Enhanced CO_2 Separation Performance Using Mixed Matrix Membranes with Mesoporous TiO_2 Hollow Nanospheres

이재훈, 노동규, 김상진, 김진규, 김종학†
연세대학교
(jonghak@yonsei.ac.kr†)

The CO_2 permeability and CO_2/N_2 selectivity was enhanced from mixed matrix membranes (MMMs) by introducing dual functionalized mesoporous TiO_2 hollow nanospheres (f-MTHS). Mesoporous TiO_2 hollow nanaspheres (MTHS) were prepared through a hydrothermal reaction using potassium titanium oxide oxalate dehydrate (PTO), water, and poly(ethylene glycol). The morphology of MTHS was confirmed by scanning electron microscopy (SEM) and transmission electron microscopy (TEM). The surface of MTHS was modified with (3-aminopropyl)-trimethoxysilane (APS) and poly(ethylene glycol) diglycidyl ether (PEGDE) to produce dual functionality (f-MTHS), which could improve CO_2 affinity and increase interfacial properties, leading to void-free MMMs. The MMM with 30 wt% f-MTHS improved not only the CO_2 permeability by 90.7% but also the selectivity by 13.3%. This proved that the mesoporous hollow spheres are effective way to improve the gas permeability, while the surface modification with APS and PEGDE plays key role in improving selectivity.