

Reduction of physical aging of glassy polymers through integration of Polymer of Intrinsic Microporosity with Zeolite Templated Carbon

김규남, 고동연[†]

KAIST

(dongyeunkoh@kaist.ac.kr[†])

Polymer of intrinsic microporosity (PIM-1) is highlighted in the field of membrane-based separation due to its high permeability caused by random porous packing owing to the contorted linear chain formation by the spirocenters. However, the critical barrier to this highly prominent candidate to industrial application is that the physical aging of the glassy polymers will reduce the fractional free volume within the polymer matrix, resulting in severe loss in permeability over time. The degree of offset of the operational temperature from glass transition temperature, which are overserved to be above decomposition temperature, enables this particular glassy polymer to lose its gas permeability significantly over time. To overcome this property, zeolite template carbon (ZTC) is added to the polymer as fillers to act as support for the polymer to retain its free volume as well as permeability over time. PIM-ZTC with different wt% was observed over time, and it showed that PIM-ZTC-15 exhibited over 2 folds increase in N₂ and He permeability compared to that of pristine PIM-1. Also, the observation of permeability decrease over 45 days showed noteworthy percent loss in permeability.