

ABSTRACT:

This paper focuses on the effect of montmorillonite nano-clay fillers on polyetherimide (PEI) mixed matrix membrane, specifically upon the removal of carbon dioxide. Five different types of montmorillonite (MMT) nano-clays, including unmodified and industrially modified clays, were used as filler to fabricate asymmetric flat sheet mixed matrix membrane (MMM) via a dry/wet phase inversion technique. The five types of clay used were: raw MMT, Cloisite 15A, general MMT, hydrophobic MMT and hydrophilic MMT. The MMTs were characterized by X-ray diffractometry (XRD), thermal gravimetric analysis (TGA), Fourier-transform infrared (FTIR). The fabricated MMMs were characterized by differential scanning calorimetry (DSC), field emission scanning electron microscopic (FESEM) and pure gas permeation testing. The gas permeation results revealed the following order in terms of the permselectivity for CO₂/CH₄ separation: Cloisite 15A > general MMT > hydrophilic MMT > hydrophobic MMT > raw MMT. The best results were obtained at 0.5 wt.% Cloisite 15A loading where the selectivity enhancement was about 28% as compared to that of neat PEI.