

Polysulfone mixed-matrix membrane incorporating talc clay particles for gas separation

ABSTRACT

Mixed-matrix membranes (MMMs) have showed advantages in membrane-based gas separation in recent years. However, there is still intensive demand for the development of membranes incorporated by proper fillers for further enhancement of gas separation performance. In this study, mixed-matrix membrane (MMMs) has been synthesized by incorporating of different content of talc into polysulfone (PSf) polymer specifically upon the separation of carbon dioxide from methane. The influence of filler content on the gas separation performance of the fabricated membranes was studied. The prepared MMMs were analyzed by thermal gravimetric analysis (TGA), X-ray diffraction (XRD), derivative thermo-gravimetric (DTG), field emission scanning electron microscopy (FESEM), atomic force microscopy (AFM) and pure gas permeation testing. XRD analysis suggested that talc layers crystalline structure was changed slightly due to blending and just limited PSf chain intercalation occurred. The results showed that the rate of gas permeation increased with increasing talc content while the selectivity declined at 0.5 wt% due to filler agglomeration as confirmed by FESEM. The best results were obtained at 0.1 wt% talc compared to neat PSf with superior gas separation behavior.

Keyword: Polysulfone; Talc; Mixed-matrix membrane; Gas separation