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Short fiber/polyurethane composite membrane for gas separation

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Abstract

In this research, short fiber/polymer composite membranes is introduced for gas separation. Our attempt is to increase the membranes performance by using wide interface between fiber and polymer. Short glass wool fiber (SGWF) was used as a polar micro size reinforcement and was mechanically dispersed in polyurethane matrix. Scanning electron microscope (SEM) images showed that fibers have a good dispersion and adhesion to polymer matrix. In order to survey the phase separation and crystallization behavior of polyurethane segments, differential scanning calorimetery (DSC) and dynamic mechanical thermal analysis (DMTA) were used. The results indicated that polar surface of glass wool is a suitable site for attraction of hard segments. Thermal transition of soft segments were assisted using DMTA. Obtained results were showed that the presence of glass wool fiber remarkably reduced the soft segments glass transition temperature (T_g). Gas permeation properties of membranes were assisted using pure CO_2, CH_4 and N_2 gases. Presence of SGWF caused a simultaneous increase in permeability and ideal selectivity (permselectivity) in a way that composite membranes showed high performance.

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