Ilke Ilicak et al., J Membra Sci Technol 2017, 7:2 (Suppl)
DOI: 10.4172/2155-9589-C1-002

The synthesis of zeolitic imidazolate framework-95/matrimid® mixed matrix membranes for CO_2, CH_4 and H_2 separations

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Global warming is affect negatively such as loss of biodiversity, rising sea levels, transition of ecosystems, and reduction in value and variety of agricultural products. Membrane-based gas separation has a few advantages over traditional separation techniques. It has several industrially and economically important processes such as air purification, flue gas treatment, natural gas purification, hydrogen recovery from plant, and refineries. The permeability and selectivity of membranes are important to select materials for efficient separation. Polymeric membranes generally have been improved by incorporating the inorganic high surface area particles to enhance either the gas pair selectivity or the permeances. Zeolitic Imidazolate Frameworks (ZIFs) have emerged as a novel type of crystalline porous material for the preparation of superior molecular sieve membranes attributed to their zeolite-like properties such as permanent porosity, uniform pore sizes, and exceptional thermal and chemical stability. In this work, zeolitic imidazolate framework-95 (ZIF-95) particles were prepared and incorporated into Matrimid® 5218 polyimide matrix, with loadings varying between 0 and 30 wt.%. Matrimid mixed matrix membranes (MMMs) loaded with different amounts of ZIF-95 were prepared by solution casting method and the interaction between ZIF-95 and matrimid was characterized by x-ray diffraction (XRD), scanning electron microscopy (SEM), fourier transform infrared spectroscopy (FT-IR) and thermogravimetric analysis (TGA). Gas separation performance of Matrimid® 5218 /ZIF-95 mixed matrix membranes (MMMs) with various ZIF-95 percentages were analyzed at 35 °C and 4 bar pressure. Surface and cross-sectional scanning electron microscopy images of the mixed matrix membranes (MMMs) were taken to serve the dispersion of particles in the polymer matrix. Results show that prospects and potential new development of ZIF materials are presented.

Biography

Ilke Ilicak has received her BS degree in Chemical Engineering (2014), from Beykent University, Turkey. She has been studying as an MSc Student at Istanbul University, Faculty of Engineering, Chemical Engineering Department since May 2015. Her research interests include polymer synthesis and characterization, gas separation.

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