

Deep Eutectic Solvent/ Polyimide Blended Membranes for Anaerobic Digestion Gas Separation

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Abstract : Efficient separation technologies are required for the removal of carbon dioxide from natural gas streams. Membrane-based natural gas separation has emerged as one of the fastest growing technologies, due to the compactness, higher energy efficiency and economic advantages which can be reaped. The removal of Carbon dioxide from gas streams using membrane technology will also give the advantage like environmental friendly process compared to the other technologies used in gas separation. In this study, Polyimide membranes, which are mostly used in the separation of gases, are blended with a new kind of solvent: Deep Eutectic Solvents or simply DES. The three types of DES are used are choline chloride based mixed with three different hydrogen bond donors: Lactic acid, N-methylurea and Urea. The blending of the DESs to Polyimide gave out high permeability performance. The Gas Separation performance for all the membranes involving CO₂/CH₄ showed low performance while for CO₂/N₂ surpassed the performance of some studies. Among the three types of DES used the solvent Choline Chloride/Lactic acid exhibited the highest performance for both Gas Separation applications. The values are 10.5 for CO₂/CH₄ selectivity and 60.5 for CO₂/N₂. The separation results for CO₂/CH₄ may be due to the viscosity of the DESs affecting the morphology of the fabricated membrane thus also impacts the performance. DES/blended Polyimide membranes fabricated are novel and have the potential of a low-cost and environmental friendly application for gas separation.

Keywords : deep eutectic solvents, gas separation, polyimide blends, polyimide membranes

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