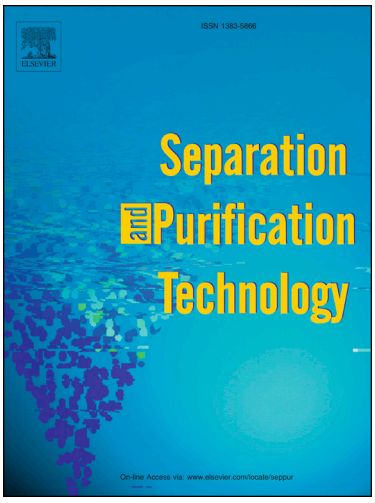


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# Mixed Matrix Membranes comprising of Polysulfone and Microporous BIO-MOF-1: Preparation and Gas Separation Properties

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**Abstract**

This paper reports the development of high performance mixed matrix membranes (MMMs) comprising of bio metal-organic framework (Bio-MOF-1) and polysulfone (PSf) polymer matrix. For the very first time, a Bio-MOF was used as filler in MMMs. Bio-MOF-1 crystals showed well defined rectangular-like shapes (nano-bars) with lengths of ~0.5-4.0 µm and widths of ~0.05-0.20 µm and smooth surfaces. SEM images of membranes demonstrate good dispersion and interaction of the filler in the polymer matrix, even at high loadings. The gas transport properties of MMMs with Bio-MOF-1 loading up to 30 wt% were investigated, and the results showed such MMMs had a $CO_2$ permeability of 16.57 Barrer and ideal selectivity of 42.6 and 45.6 for $CO_2/CH_4$ and $CO_2/N_2$ respectively. This corresponds to an increase in 168% and 58% for $CO_2$ permeability and ideal selectivity respectively in comparison to pristine polymer membranes. Analysis of solubility-diffusivity in the MMMs revealed that the presence of adeninate amino and pyrimidine Lewis basic sites that decorate the pores and have relatively narrow pore dimensions in Bio-MOF-1 can greatly enhance the adsorption of the $CO_2$ molecules. All synthesized MMMs were tested at different condition of $CO_2$feedconcentration, various operating temperatures and their activation energies were also calculated. Finally, the comparison with relevant literature showed that even without any functionalization of Bio-MOF-1, it showed higher selectivity than amine functionalized MOFs and quite comparable permeability.

***Keywords****: Mixed matrix membranes; Bio-MOF-1; Gas separation*