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PEBAX BASED MIXED MATRIX MEMBRANES AND THE EFFECT OF FILLER LOADING AND POLYMER CONCENTRATION ON POST-COMBUSTION CO_2 CAPTURE

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Burning of fossil fuels causes huge CO_2 emission to the environment every year causing global warming, so Carbon Capture and Storage (CCS) is recommended. Mixed matrix membranes (MMMs) with metal organic framework (MOF) as fillers is one of the growing fields of research for post combustion CO_2/N_2 separation as an alternative to adsorption, cryogenic distillation etc. Membrane based operations have the potential to replace conventional energy-intensive technologies and provide reliable solutions for CCS mainly due to their low energy consumption, operation flexibility and simplicity, good stability, easy control and scale-up. Pebax® MH 1657 polymer matrix and MOF ZIF-94 filler are interesting components for this research. Pebax® MH 1657 commercial rubbery and thermoplastic polymer that offers good thermal and mechanical stability and they are very attractive especially for polar gas separation, such as CO_2, from nonpolar light gases, such as N_2. ZIF-94 also known as SIM-1 possess SOD topology shows high CO_2 absorption ability 2.4 mmol g^{-1} compared to other ZIFs at 1 bar operating pressure. Synthesized ZIF-94 particles were found polydisperse having average particle size of 175 ± 68 nm. Different ZIF-94 loadings were used (5wt% - 20 wt.%) as well as variety of Pebax concentration (6 wt% - 12 wt.%.) to study the influence of these parameters on the final membrane performance. Incorporation of ZIF-94 significantly improved CCS performance of bare Pebax® membrane. MMMs having 10 wt.% ZIF-94 loading in 9 wt.% of the polymer matrix produces an average selectivity (CO_2/N_2) of 36 ± 7 and permeability of 137 ± 31 Barrer which are 71% and 80% increment respectively when compared with bare membrane that is defined by the selectivity of 21 ± 2 and permeability of 76 ± 7 Barrer.