

## Zeolitic Imidazolate Framework 7 Membranes: Studies on Synthesis, Properties, and Hydrothermal Stabilities

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Membrane based separation is considered to be emerging technology enabling cost-effective separation of chemicals and easy operation. Metal-organic frameworks (MOFs) have been substantially studied for membrane because their reticular solid-state structure composed of metals and organic ligands have a flexible conformational-variation. Zeolitic imidazole frameworks (ZIFs) 7, a subcategory of MOFs, based membrane was fabricated on alpha alumina support by dip-coating method. The synthesized well-intergrown and adhesive-to-support membrane was explored to separate 4 mixed gas of H<sub>2</sub>, CO, CO<sub>2</sub>, and CH<sub>4</sub> from 423 K to 573 K. The gas permeation test of the ZIF-7 membrane showed great gas permeation ( $4 \times 10^{-7} \text{ mol m}^{-2} \text{ s}^{-1} \text{ Pa}^{-1}$ ) and selectivity (9.5 H<sub>2</sub>/CO, 9.8 H<sub>2</sub>/CH<sub>4</sub>, and 9.8 H<sub>2</sub>/CO<sub>2</sub>) at 573 K. Moreover, we investigated hydrothermal stabilities of the ZIF-7 membrane to reveal its plausibility of application for Water-Gas-Shift reaction. To the best of our knowledge, this is the first detailed study on hydrothermal effect to ZIF-7 membrane.