

Preparation and Characterization of Mixed Matrix Membranes Containing Hollow ZIF-8 Nanoparticles for Gas Separation

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Gas separation process based on membrane has been drastically spotlighted in industry and government because of its numerous advantages such as low energy consumption, operating costs, facile manufacturing process and green-friendly behavior. Many researchers focused on combining inorganic fillers disposed in polymeric membrane, which has been well known for mixed matrix membranes (MMMs) to surmount trade-off behavior of polymeric membrane between permeability and selectivity.

In this study, we tried to improve the permeability of polymeric membrane without sacrificing selectivity using zeolitic imidazolate frameworks (ZIFs), sub-types of MOFs. Hetero-nanostructure consisting of a Polystyrene (PS) core and ZIF-8 shell was prepared via solvothermal surface coating method. Fabricated MMMs showed 8-9 fold enhanced CO₂ permeability from 70.0 to 623 Barrer (1 Barrer = 1 × 10⁻¹⁰ cm³ (STP)•cm /cm²•s•cmHg) without sacrificing a large amount of selectivity in CO₂/CH₄ separation from 13.7 to 11.2 at 35 °C measured by the time-lag method.