

## Fabrication of mixed matrix membranes via in-situ growth in amphiphilic graft copolymer for improved CO<sub>2</sub> separation performance

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To improve the performance of gas separation membrane, mixed matrix membranes (MMMs) have been fabricated by adding inorganic fillers into the polymer matrix. However, it cannot be used effectively due to poor dispersion of fillers and interfacial adhesion. Thus we suggest in-situ growth of ZIF-8 nanoparticles in amphiphilic graft copolymer matrix, poly(vinyl chloride)-graft-poly(oxyethylene methacrylate) (PVC-g-POEM) to fabricate improved MMMs. While PVC-g-POEM/Zn(NO<sub>3</sub>)<sub>2</sub> complex membranes are prepared, Zn<sup>2+</sup> ions form strong coordination interaction with hydrophilic POEM domains, reducing free volume and decreasing gas permeability. By immersing as-prepared complex membranes into 2-methylimidazole (2MI) organic linker solution, in-situ grown ZIF-8 nanoparticles are synthesized, improving permeability and selectivity simultaneously. The best separation performance was achieved with the in-situ grown MMM with 28.7% loading, showing 244.9 Barrer of CO<sub>2</sub> permeability, 39.3 of CO<sub>2</sub>/N<sub>2</sub> selectivity, and 14.0 of CO<sub>2</sub>/CH<sub>4</sub> selectivity. Compared to common MMMs with pre-synthesized ZIF-8, in-situ grown MMMs show much higher performance.