**Metal-organic framework composite membranes for molecular and ionic separations**

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Metal–organic frameworks (MOFs) have shown great potential for many applications such as energy-efficient gas separation, ion separation and chiral separation. Ultrathin and defect-free MOF membranes are required to achieve high flux and thus reduce process costs. We have developed new seeding strategies for fabricating ultrathin and high-quality molecular sieving membranes on various porous substrates. For instance, hybrid MOF nanosheets are formed by growing MOF nanocrystals on both sides of 2D GO nanosheets. These flexible, micro-sized hybrid nanosheets allow for seeding substrates with large-pores and rough surface, eliminating substrate modification required in the conventional synthesis using nanocrystal seeds [1]. We have further developed a novel nanocrystal-mask plasma etching method for synthesizing MOF/mesoporous GO (MOF/MGO) hybrid nanosheets. Due to their ultrathin thickness (about 430 nm) and well-aligned mesoporous GO nanosheets, this hierarchical structural MOF/MGO membrane exhibit excellent hydrogen molecular sieving performance with H2/C3H8 selectivity and H2 permeance as high as 2409 and 1.17×10-6 mol m-2 s-1Pa-1. We have recently found that MOF molecular sieving membranes have fast, selective ion permeation properties and ion selectivities [2, 3]. By introducing homochirality into a ZIF-8 membrane, we have demonstrated the functionalized ZIF-8 membrane has excellent separation properties of chiral molecules [4].

**References**

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