Characterization of polymer composite membranes prepared by wet spin coating for gas separation application

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Composite membranes with poly(methyl methacrylate) (PMMA) dense skins on porous cellulose nitrate (CN) were prepared by wet spin-coating method. Prior to coating the skin layer, the porous CN membrane was soaked in DI water to wet out the pore structure. Wetting of the pore structure with water is essential to prevent coating solution from infiltrating into the porous support layer. PMMA (Mw. 120k) were spun from solution onto CN membrane in wet condition. The solvents used were toluene and chloroform with polymer concentrations ranging from 5 to 10 wt. %. Prepared composite membranes were dried at 120 ℃, 100 torr for 1 hr. The morphology of composite membrane was studied by SEM, and the thickness of polymer skin layers ranged from 1 to 4 μm depending on polymer concentration. The gas separation performance of the composite membrane was evaluated by permeation measurements with pure gases of methane and hydrogen, and the 50:50 mixture under 35 ℃. The permeance of the gas mixture was *ca.* 1.5 GPU for 1 μm PMMA skin layer, and *ca.* 0.4 GPU for 4 μm, while hydrogen selectivity from 50:50 mixture feed was enhanced from 68.8% to 84.8% as the skin thickness increased.