

Preparation and characterization of high performance asymmetric membranes using phase inversion process

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Asymmetric membranes have been developed to apply large-scale applications such as water desalination or gas separation because of their extraordinary permeation properties. Asymmetric membranes, such as hollow fiber membranes, or spiral wound membranes, usually consist of a thin and dense top-layer supported by a porous sub-layer, and both layers are simultaneously prepared in an in-situ process. The main issue in the asymmetric membrane preparation is how to form a thin and defect-free top-layer. In this study, the ternary system of a polymer in a mixture of a solvent and a non-solvent are used to obtain the membrane morphology in sponge-like or finger-like structure. Poly(amic acid) with ortho-positional functional group has been introduced as a membrane material, and converted to polyimide and polybenzoxazole by thermal treatment. Various solvents and non-solvents are used to control the phase inversion phenomena with poly(amic acid). The morphologies of membranes prepared from the ternary system were characterized by FE-SEM and their gas permeation properties were investigated for various small gas molecules.