A simply Approach to Size Tunability of Nanoporous PS-b-PMMA membranes for Ultrafiltration

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Block copolymers can be used as nanopore-generating materials to produce scaffolds for the fabrication of nanostructured materials, since one component can be selectively removed by chemical treatment. Especially, for ultrafiltration membrane applications, the self-assembly of BCP present an attractive approach for highly size-selective, permeable membranes due to their narrow size distributions and high pore densities. Here, nanoporous ultrafiltration membranes were obtained by the self-assembly of PS-b-PMMA where, cylindrical microdomains were oriented normal to the substrate and air interfaces, and in the interior of the films, the microdomains were randomly oriented. Continuous nanopores that penetrated through the film were readily produced by a simple preferential swelling of the PMMA microdomains. The confined swelling and rapid contraction of PMMA microdomains generated well-defined uniform pores with diameters to 17.5 nm. The size selectivity and rejection of Au nanoparticles for these ultrafiltration membranes were demonstrated.