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Optimization and Characterization of Self-assembled Triblock Polymer Membranes with Chemically-Tunable Pore Walls for Nanofiltration Applications JESSICA SARGENT, RYAN MULVENNA, RAFAEL PRATO, Purdue University, JACOB WEIDMAN, WILLIAM PHILLIP, University of Notre Dame, BRYAN BOUDOURIS, Purdue University — The field of block polymer-based membranes for separation applications has grown considerably in the past several years. However, decreasing the domain sizes of these membranes to below 5 nm has proven to be a challenge in many instances. Here, we demonstrate that a triblock polymer, polyisoprene-*b*-polystyrene-*b*-poly(*tert*-butyl methacrylate) (PI-PS-PtBMA), can be utilized to form nanoporous membranes capable of high flux and high selectivity based on both size and chemical composition. By controlling the synthesis, solution self-assembly, and non-solvent induced phase separation of these polymers, a scalable fabrication process can produce thin-film membranes that feature monodisperse pores approaching 1 nm in diameter, tunable pore-wall chemistry, good mechanical stability, and chlorine degradation resistance. The PtBMA functionality can further be converted to a number of side chain functionalities through simple coupling chemistry to produce membranes with specific chemical and structural characteristics tailored to meet the needs of various applications. In particular, these membranes provide a promising, inexpensive platform for chlorine degradation and fouling-resistant membranes for water purification that can be produced on an industrial scale.

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