**Development of highly permeable thin film composite polyamide membranes for water desalination through reverse osmosis with polydopamine/molecular sieve particles layer**

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Current reverse osmosis technology widely uses ultrathin, crosslinked, aromatic polyamide (PA) thin film composite (TFC) membrane which is interfacially polymerized onto microporous polysulfone support membrane. The dense PA structure is highly selective and the thinness of this layer enables high water permeability. Recently, a class of mixed matrix membranes called thin film nanocomposite (TFN) membranes has been developed to tailor the water desalination performance by embedding particles into polyamide structure during interfacial polymerization. The addition of nanoparticles to TFC membranes is a promising technology to reduce energy costs and increase the performance in desalination processes. However, there may be some "non-ideal effects" in the membrane such as particle aggregation at higher zeolite loadings and void or rigidified polymer formation at the polymer/particle interface. Furthermore, there might be particle loss under high pressure during cross-flow desalination process which may reduce the performance of the membrane. To overcome these drawbacks, we developed a method to increase separation performance and particle stability of molecular sieves in TFN membranes. First, we stabilized particles on microporous polysulfone support by thin bio-inspired polydopamine layer, and then we interfacially synthesized polyamide on top of this layer. This method also minimizes the expensive particle usage compared with the common TFN synthesis procedure (particle addition into polyamide casting solution). In this work, we present our results for development of thin film composite polyamide membranes on polydopamine layer with molecular sieves particles on polysulfone support membrane. First, we synthesized dopamine layer with different particle content and different particle size. Then, we synthesized a series of polyamide membranes via interfacial polymerization. For comparison, we also synthesized regular TFC and TFN polyamide membranes. Then we measured the permeability and selectivity performance using dead-end filtration and cross-flow testing system. We report the synthesized membrane surface and morphology result with contact angle, Fourier transform infrared spectroscopy, scanning electron microscopy, and atomic force microscopy.