Interfacial polymerization: new chemistries, synthesis and advanced characterization

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Interfacial polymerization has been one of the most successful methods of large-scale membrane fabrication with application in desalination and nanofiltration. The flexibility of the method enables a rich variety of approaches and exploration of monomers and reactions that could extend the applications to more challenging separations and minimize the limitations of the current membranes. Examples of membranes for reverse osmosis and nanofitration developed in our research group will be presented. Among them are membranes based on macrocycles such as amino-functionalized cyclodextrin, crown ether and other monomers. The influence of pre-assembly of monomers on the membrane formation and performance will be discussed. The morphology of interfacial polymerized layers is complex. To fully understand the membrane formation and transport and be able to propose new approaches, we have been working at the frontier of the currently available methods of morphological characterization. We apply advanced methods of high-resolution transmission electron microscopy and synchrotron x-ray ptychography, with the objective of resolving sub-nanometer structures or providing information in water, closer to the operation conditions.