Organic Solvent Nanofiltration via Ultrathin Membranes Synthesized with Initiated Chemical Vapor Deposition (iCVD)

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Separations of solutes in organic solvents are crucially important in chemical and pharmaceutical industry. Energy-efficient membrane-based separations can be an alternative to thermal separation such as distillation. Organic solvent nanofiltration (OSN) is a pressure-driven membrane process that separates solute molecules with molecular weights of 200-1000 g mol^{-1} from organic solvents. However, most polymeric OSN membranes have poor organic solvent stability, and are easily dissolved especially for harsh polar aprotic solvents. The solubility of polymers in harsh polar aprotic solvents can have advantages in membrane fabrication such as dip-coating and knife casting, but the separation process for harsh solvents can only be used through post-treatment. In particular, harsh solvents are a more major issue in the pharmaceutical industry. In this work, the OSN composite membrane was fabricated using a solvent-free iCVD process and an organosilica polymer that has a hyper-crosslinking structure to provide excellent solvent stability.