Nanoporous Graphene Membrane for Organic Solvent Diafiltration

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Organic solvent nanofiltration (OSN) can be one of the most promising technologies for the purification and separation of synthesized chemicals in petrochemical and pharmaceutical industries due to its low energy cost and environmentally friendly operation. While graphene oxide (GO) has been widely adopted for the fabrication of OSN membrane, its low organic solvent flux limits its practical applications. In this study, we developed an ultrafast IPA flux nanofiltration membrane using nanoporous graphene (NG) membrane which is prepared by rapid thermal activation of GO. The feature size of nanopore can be tuned by varying thermal activation temperatures. The NG membranes showed high IPA permeance in the range of 241 to 295 $Lm^{-2}h^{-1}bar^{-1}$ with a precise molecular weight cut off (MWCO) of 616 Da depends on the thermal activation temperatures. The membrane showed excellent diafiltration performance with around 1000 separation factors for mixed dye solution under cross-flow filtration. Also, the single filtration step can separate each mixed dyes with 100% purity.