Title:

Synthesizing CTF Membranes for Ultrafast Organic Solvent Transport and Photocatalytic Cleaning

Authors & affiliations:

Guiliang Li[1], *Fu Liu**[1, 2]
[1] *Ningbo Institute of Materials Technology and Engineering, Chinese Academy of Sciences, China*
[2] *University of Chinese Academy of Sciences, China*

Abstract:

Covalent organic framework (COFs) materials possess adjustable pore size and designable framework for mass transfer, broad range light absorption, and crystalline nature for charge separation, which can be rationally designed to achieve molecular separation and catalytic cleaning. However, it is challenging to obtain the stable structure and fouling issue of lamellar membranes. In this study, the heterogeneous self-standing covalent triazine framework (CTF) membranes with centimeter scale and photocatalytic properties were synthesized through moderated interfacial crystallization, exhibiting high aqueous and organic solvent permeance and solar cleaning. The self-standing crystalline CTFs membranes (CTF-1(~1.4 nm) and CTF-2 (~2 nm) membrane) with large transverse size and controllable thickness were prepared by aliphatic amine assisted method based on organic solvent/air interfacial polymerization. The CTF membranes exhibit superior water and organic solvent transport and high molecule rejection (>96%) to reported membranes. More practically, the heterogeneous membranes showed stable organic solvent permeance including polar solvent and non-polar solvent via continuous flow-through filtration. The photocatalytic and photothermal catalytic degradation for the foulants on the membrane surface was investigated. Especially, the contribution of solar-thermal, specific light absorption, electron-hole separation, and reactive oxygen species was studied. This work offers a new insight to design ultrafast organic solvent transport and solar cleaning membranes.

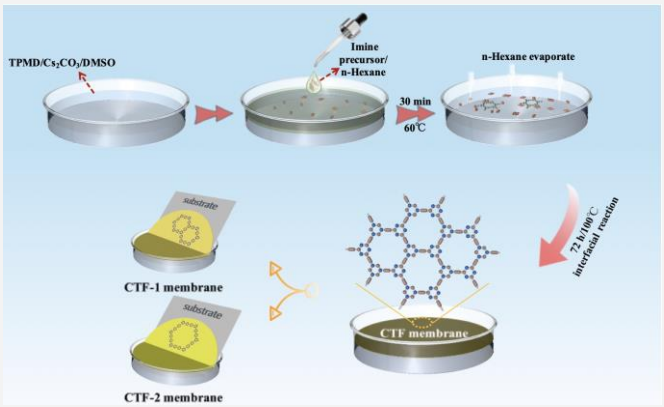

Figure 1. Synthesis of CTF membranes