NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE | Nanyang Environment and Water Research Institute

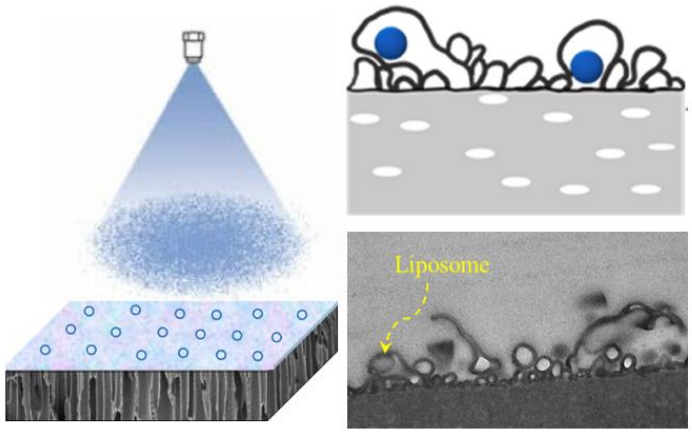
8-INCH BIOPROGRAMMABLE REVERSE OSMOSIS SPIRAL WOUND MODULE FOR SEAWATER DESALINATION

Abstract:
Our preliminary findings on biomolecule-assisted interfacial polymerization (IP) showed that this approach could form a polyamide rejection layer with increased water permeance as compared to the conventional IP method. Unlike other nanoparticle- or new materials-assisted IP, our approach can be easily scaled-up with minimal alteration made to the existing fabrication line (with only an additional single biomolecule-spraying step added following aqueous monomer soaking).

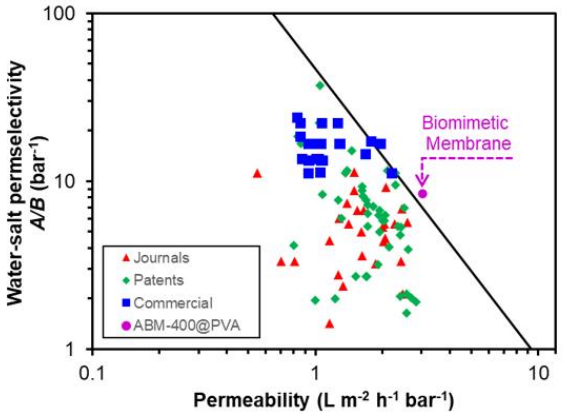
The aim of this proposed project is to further scale-up the membrane fabrication method from 2.5-inch to 4-inch and 8-inch commercial scale, and to demonstrate the first Singapore-made seawater reverse osmosis (SWRO) spiral wound module at single-pass configuration. Based on our current 2.5-inch spiral wound module (SWM) performance, it is expected that the 8-inch membrane module will have a permeate flow of approximately 52 m^3/day (with a membrane effective surface area of 37 m^2) at an operating pressure of 55 bar. This is equivalent to a pure water permeability of ≥3 $Lm^{-2}h^{-1}bar^{-1}$ (for ultrapure water feed) and saltwater permeability (seawater feed) of ~2 $Lm^{-2}h^{-1}bar^{-1}$.

The specific energy consumption (SEC) is expected to be reduced by 3-15% as compared to the state-of-the-art commercially available SWRO modules. At the same time, the single-pass product water will have a boron concentration of less than 1 ppm.

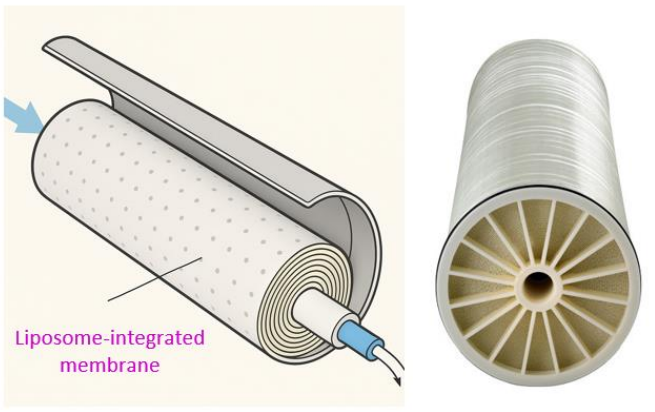
SEAWATER DESALINATION MEMBRANE



Membrane fabrication: spray-assisted interfacial polymerization



Membrane performance: competitive performance compared to current state-of-the-art membranes



Membrane scalability: scalable fabrication of 8-inch spiral wound membrane module


PI: Wang Rong (NTU)


Co-PI: Goh Li May (START NTUitive)

Objective: **Scale-up fabrication of promising desalination technology**