High-Flux Membrane for Membrane Distillation

A Novel Thin UHMWPE Membrane for Saline Water Treatment

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Technology Overview

This invention involves a method to create high flux for membrane distillation (MD) using a salt rejection ultrahigh molecular weight polyethylene (UHMWPE) membrane. This UHMWPE membrane has a homogeneous porous and multi-layered structure and shows extremely high flux even at low temperatures and robust mechanical strength. MD can produce fresh water with a salt rejection rate higher than 99% (compared with less than 90% for other technologies), and with few effects from the concentration of salt. Its anti-fouling property and long-term performance will help overcome the drawbacks of MD, making it a promising method for commercial saline water treatment.

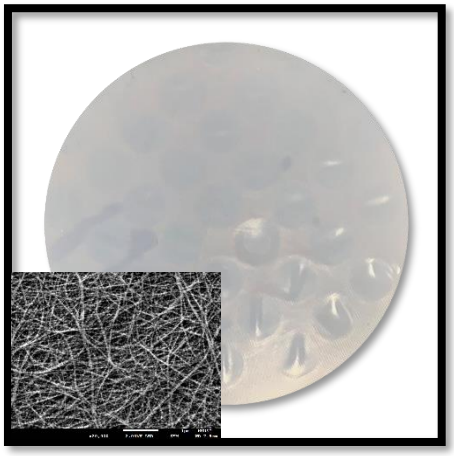
Marketing Opportunity

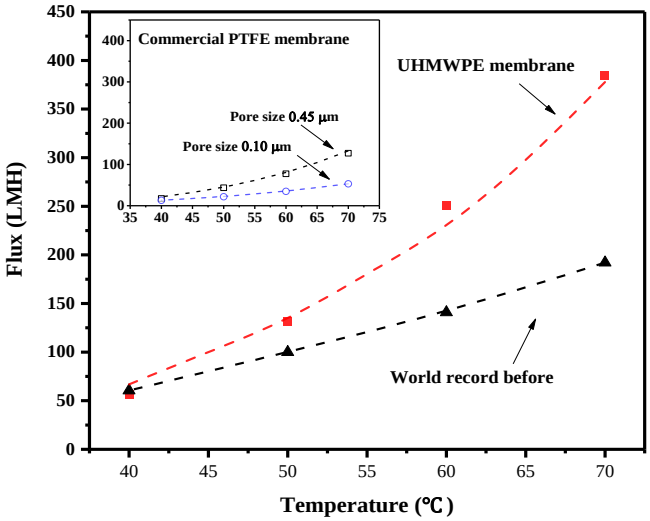
Commercial membranes for MD are currently not competitive with common distillation technologies because of their low efficiency caused by low flux and short-term operation stability. Our membrane can be made very thin, from no more than 100 nm up to a few micrometres, while maintaining its strong mechanical properties. Compared with the state-of-the-art technology, this UHMWPE membrane provides higher flux in high water salinity and durability with an anti-fouling property. As the demand for clean water increases, more energy-saving and efficient methods of water desalination such as MD will have excellent opportunities.

Highlights of the Technology

- Extremely high flux at relatively low feed temperature
  (Flux is 400 kg m^{-2} h^{-1} at 70 ^{o}C; Flux is 75 kg m^{-2} h^{-1} at 30 ^{o}C)
- High salinity treatment
- Robust mechanical properties against high external pressures
- High anti-fouling property for long-term operating stability
- Potential to use with low-grade energy
- Low cost and easy fabrication

Figures




Commercial PTFE membrane
Pore size 0.45 μm
Pore size 0.10 μm
UHMWPE membrane
World record before
Flux (LMH)
Temperature (℃)