STAR-POWERED OSMOSIS SOLUTIONS

Novel approach to improve thin film composite forward osmosis membranes for seawater desalination, wastewater treatment, and other applications.

Case ID:
Joint IBM - SJSU Invention

IP Position:

US Patent 10654002B2, PCT WO2016132249A1

Development Status:

TRL 8: System complete and qualified.

Opportunity
Partners sought for testing and licensing.

Category(s):

Membrane Technology, Osmotic Driven Membrane Processes, Water Treatment, Polymer Chemistry

Keywords:

Forward Osmosis (FO), Thin-Film Composite (TFC), Star Polymer, Water Flux, Desalination, Wastewater treatment

Date Released:
December 11, 2023

Revision No:
1.0

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SJSU RESEARCH AND INNOVATION

Technology Overview

Forward osmosis (FO) is a membrane-based process that uses an osmotic pressure difference to drive water across a semi-permeable membrane. Thin-film composite (TFC) membranes are commonly used in FO applications, but the support layer is typically hydrophobic and they can suffer from internal concentration polarization (ICP), which can significantly reduce osmotic driving forces across the membrane, leading to decreased water flux.

This invention introduces a solution for enhancing TFC FO membranes by modifying the support layer with hydrophilic-functionalized star polymers. This approach improves wetting behavior, reduces ICP, and customizes interactions, offering a solution to enhance the efficiency of osmotically driven membrane processes. Moreover, the modified TFC FO membranes improved performance by reducing ICP and increasing water flux.

Overall, this technology offers a promising solution to address the limitations of current membranes, potentially leading to cleaner water and more sustainable processes.

Key Features & Benefits

- **Hydrophilic Modification:** Introduces hydrophilic-functionalized star polymers to modify the support layer of TFC FO membranes, enhancing wetting behavior and promoting efficient water and salt transport.
- **Improved Water Flux:** Star polymers reduce ICP, leading to higher water flow through the membrane.
- **Tunable Properties:** Star polymers can be customized with various functional groups to achieve desired hydrophilicity, charge, and cross-linking.
- **Enhanced Efficiency:** Increased water flux translates to greater efficiency in desalination, wastewater treatment, and other FO applications.

Potential Applications

- **Desalination:** Efficiently purify seawater or brackish water into freshwater.
- **Wastewater Treatment:** Separate water from pollutants in wastewater, reducing environmental pollution and enabling water reuse.
- **Power Generation:** Harness the osmotic pressure difference between two solutions to generate electricity, contributing to clean and renewable energy production.
- **Emergency Relief:** Provide clean water sources in disaster situations where traditional water purification methods are unavailable.

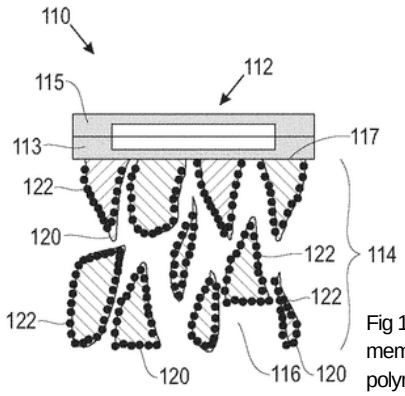

Fig 1. TFC membrane with star polymers

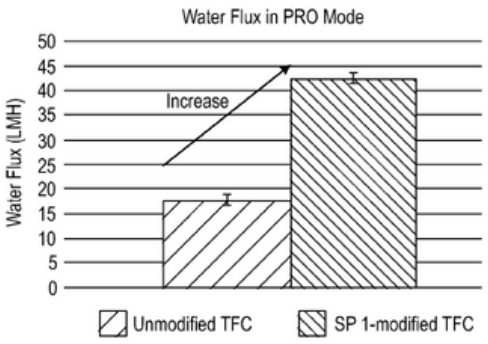

Fig 2. Water flux of unmodified and SP 1-modified TFC FO membranes in PRO mode