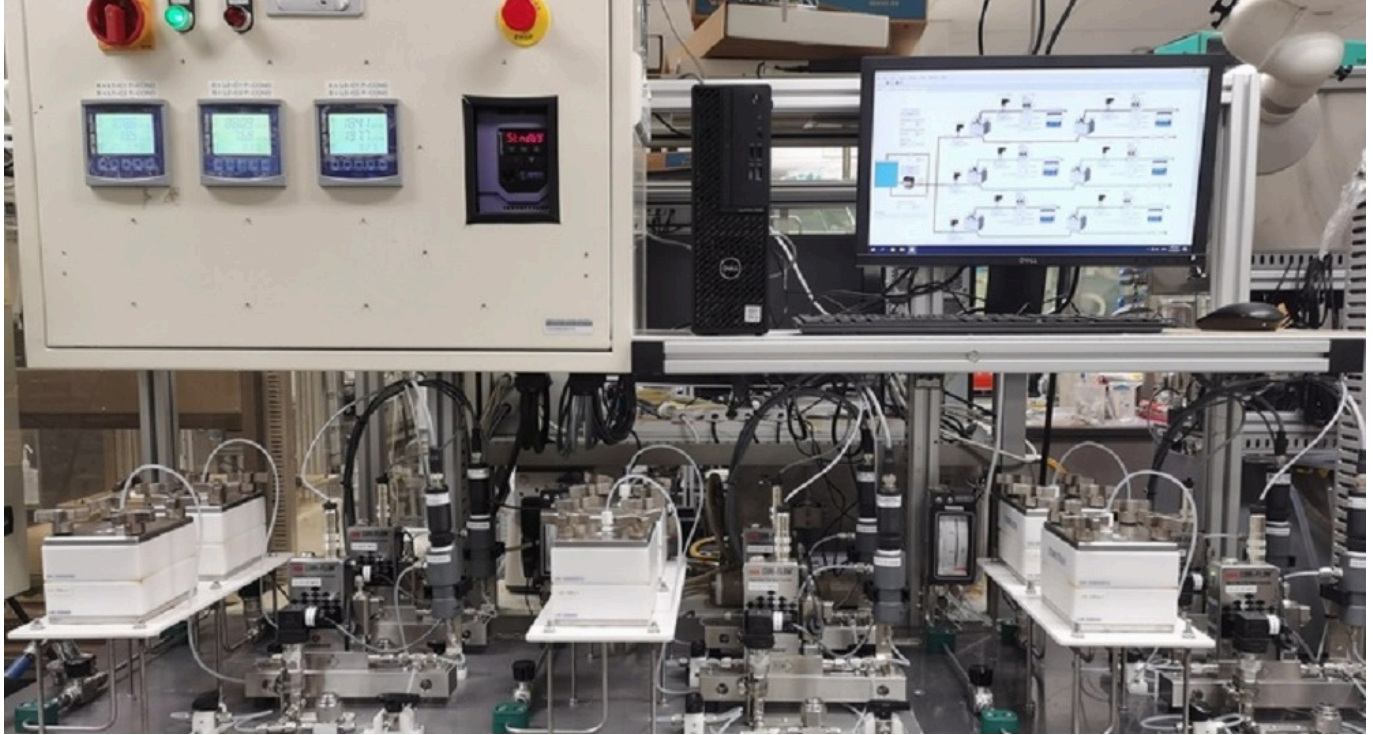


TECH OFFER

Ultra-Permeable Biomimetic Membrane For Desalination



KEY INFORMATION

TECHNOLOGY CATEGORY:

Environment, Clean Air & Water - Filter Membrane & Absorption Material

TECHNOLOGY READINESS LEVEL (TRL): **TRL4**

COUNTRY: **SINGAPORE**

ID NUMBER: **TO174590**

OVERVIEW

Seawater reverse osmosis (SWRO) is the state-of-the-art technology to transform the inexhaustible supply of seawater into freshwater to alleviate water stress worldwide. Nevertheless, the least energy-intensive seawater desalination plant still consumes around 3 kWh per m³ water produced, which is three to four times higher than surface water treatment. Thus, the biomimetic membrane is explored to improve the energy efficiency to maintain the sustainability of seawater desalination.

A unique aquaporin-based biomimetic membrane (ABM) is formulated by incorporating the water channel proteins, aquaporins, into a polyamide membrane matrix to fabricate ultra-permeable SWRO membrane for clean water production. This robust ABM can be operated at the harsh condition of the desalination plant, i.e., high salinity, high operating pressure and extreme chemical cleaning process for the membrane. In addition, the ABM exhibits excellent performance stability and antifouling propensity. Most importantly, it is scalable to the industrial production level.

The technology owner is interested in seeking technology licensing collaborators or manufacturing partners.

TECHNOLOGY FEATURES & SPECIFICATIONS

The ultra-permeable biomimetic membrane is the only membrane reported in open literature to use natural aquaporins in improving the separation performance of SWRO membrane.

The ABM not only demonstrates over 70% higher water flux compared to commercially available SWRO membranes, but it can also reject up to 99.5% of dissolved salt in seawater when applying a low crossflow velocity of 0.15 m/s at an operating pressure of 50 bar. The introduction of an extra protective coating layer on the membrane surface further enhances the membrane fouling resistance and guarantees a high flux recovery after membrane chemical cleaning. As the designed ABM is configured as flat-sheet membrane, spiral-wound membrane modules can be readily fabricated for commercialization.

POTENTIAL APPLICATIONS

By fabricating a spiral-wound membrane module, the biomimetic SWRO membrane is ideally suited for:

- Seawater desalination plants, either land or sea-based
- Marine water makers in shipboard application, i.e., cruise ship
- Ultrapure water production for healthcare and food & beverage industries

The global RO membrane market size is estimated to thrive a compound annual growth rate (CAGR) of 7.6% and valued at over USD 19.07 billion over the forecast year 2020-2023 based on the estimated value of over USD 8.52 billion in 2019.

UNIQUE VALUE PROPOSITION

The rise in demand for water purification across the developing nations along with the lack of potable water owing to the geography in some regions is expected to create great opportunities for SWRO membrane market growth.

The developed ABM offers better energy-efficient seawater desalination by demonstrating high water production and excellent solute rejection. Besides, it possesses good fouling resistance and chemical stability in long-term filtration, which is comparable with the commercial SWRO membranes that are present in the current market. The readiness of the fabrication protocol in preparing ABM demonstrates the great potential of ABM in the seawater desalination market.