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LICENSING & PARTNERING OPPORTUNITY

جامعة حمد بن خليفة
HAMAD BIN KHALIFA UNIVERSITY
عضو في مؤسسة قطر
Member of Qatar Foundation

# MXene Filter for More Efficient Water Desalination

## A DURABLE, EFFICIENT MEMBRANE LOWERS OPERATING COSTS

Researchers at the HBKU and Energy Research Institute and Drexel University have developed a novel MXene-based membrane for reverse osmosis desalination and water filtration.

Made from titanium carbide ($Ti_3C_2$), this nanometer-thin film outperforms graphene oxide membranes in durability, salt rejection, and contaminant removal. Its interlayer slit pores selectively filter particles by size and charge while reducing fouling and degradation, which lowers maintenance costs.

With superior mechanical strength, flexibility, and conductivity, the MXene membrane is a promising solution for efficient and reliable water purification.

## ABOUT THE TECHNOLOGY

Over 300 million people across 150 countries rely on desalinated water, with over 11,000 reverse osmosis (RO) plants worldwide making seawater potable. However, RO processes face high costs due to membrane fouling, scaling, and degradation, alongside the removal of essential ions that require costly replacement.

This advanced MXene-based membrane offers a durable, efficient, and highly selective solution for water filtration. Developed using a vacuum-assisted filtration technique, the membrane layers $Ti_3C_2$-based MXene sheets to selectively exclude ions by size and charge while retaining mechanical integrity.

It filters particles as small as 4 Å and captures various ions (e.g., Cu2+, Li+, Mg2+, Na+, K+, SO42−, Ca2+, Cl−, Ni2+, Al3+). The membrane's performance has been validated through electrical conductivity and UV-visible spectroscopy tests.

## APPLICATIONS

This technology enhances any form of RO desalination or other water filtration:

- Large systems: Municipal drinking water from seawater or contaminated sources
- Small systems: Yachts, submarines, cruise ships, and other seabound marine craft

## VALUE PROPOSITIONS

**Economical:** More robust membrane with reduced fouling lowers operational costs

**Faster:** Higher flux rates

**More efficient:** Selectively removes more salt and other undesired particulates than other materials

**Less toxic:** Provides a low-pressure, cost-effective, and less toxic method for producing DMC.

### PATENT STATUS

Patent US10493408B2 Granted.

### LICENSING OPPORTUNITIES

Hamad Bin Khalifa University is offering this technology for license.

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