Water Purification Membranes Bearing Antimicrobial Polymers

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing methods for attaching novel antimicrobial polymers to reverse osmosis membranes to combat biofilm formation and biofouling.

OVERVIEW

Thin-film composite (TFC) membranes for reverse osmosis and nanofiltration are widely used in the production of drinking water, desalination and wastewater treatment. A major problem with these membrane-based technologies is the accumulation of microorganisms, which leads to biofilm growth and biofouling.

Cleaning methods for TFC membranes have proven ineffectual or problematic. For example, chlorine generates harmful byproducts and is unsuitable for most water treatment applications. A safer, more effective approach would be to render the membranes intrinsically resistant to microbial colonization.

THE INVENTION

UW–Madison researchers and collaborators at Ben Gurion University in Israel have developed novel antibacterial water treatment membranes suitable for a wide range of water purification applications. The new entities are conventional membranes to which antimicrobial polymers have been attached. The antimicrobial agents are nylon-3 copolymers, which can be prepared via ring-opening polymerization of beta-lactams. Optimized nylon-3 copolymers display antimicrobial activity on par with natural antibiotic peptides. The polymers are immobilized on the surface of the membranes with chemically defined linkers.

APPLICATIONS

- Water purification membranes that inhibit biofilm growth and reduce biofouling
- Reverse osmosis and nanofiltration
KEY BENEFITS

- Reduces biofilm growth and biofouling
- Works in saline and non-saline environments
- Nylon-3 copolymers have many advantages over natural peptides
  - Effective against a range of bacteria (both Gram-positive and Gram-negative)
  - Easier and less expensive to synthesize than antimicrobial peptides
  - Can be prepared on a large scale
  - Inherently stable to enzymes

STAGE OF DEVELOPMENT

Reducing biofilm on the surface of reverse osmosis membranes was tested in a flow cell system with Pseudomonas aeruginosa. Biofilm growth was inhibited by up to 65 percent compared to a conventional membrane.

ADDITIONAL INFORMATION

Related Technologies
WARF reference number P06009US describes the researcher’s method for synthesizing antimicrobial peptides and copolymers.

Tech Fields
Clean Technology - Water purification

CONTACT INFORMATION

For current licensing status, please contact Rafael Diaz at rdiaz@warf.org or 608-960-9847.