

High-Performance Membrane for Wastewater Distillation

Summary

Vanderbilt researchers have developed a novel membrane for membrane distillation that is resistant to both fouling and wetting and can be used to treat highly contaminated saline wastewater.

Addressed Need

Water scarcity and environmental regulations have created a need for low cost treatment methods for contaminated wastewaters such as those found in the fracking, petrochemical, and pharmaceutical industries. Existing membranes are prone to fouling and/or wetting and struggle to adequately treat wastewater. As such, an expensive and time-consuming pretreatment step is required when using current membranes. The novel membrane developed at Vanderbilt is both anti-fouling and anti-wetting, which creates a one-step, integrated solution for treating wastewater.

Unique Features

- ◇ Dual-layered membrane is simultaneously resistant to both fouling and wetting
- ◇ Desalinates hypersaline water with near 100% salt rejection
- ◇ Treats wastewater contaminated with surfactants and organics such as oil.
- ◇ Straightforward to integrate with existing membrane distillation systems already on the market

Technology Development Status

The process for creating the membranes has been developed and membrane prototypes have been produced. The membranes have been used to treat synthetic wastewater that included a high salinity water solution with surfactants present and a high salinity/crude oil emulsion. Additional synthetic wastewater tests including both surfactants and oil are in process. Lastly, testing with real wastewater from industrial sources is planned (e.g., fracking wastewater, petrochemical wastewater, and coal-to-chemical wastewater).

Intellectual Property Status

Issued US patent [10,722,847](#)

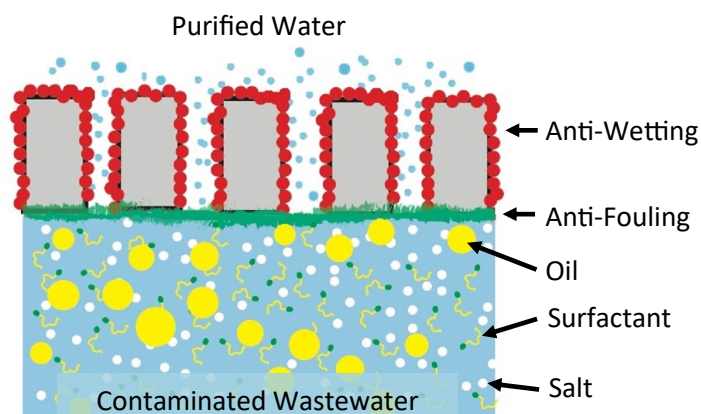


Figure 1: During the membrane distillation process, the bottom layer of the novel membrane creates an interface that prevents contaminants (oil and surfactants) from fouling the surface of the membrane, while the anti-wetting layer allows water vapor molecules (blue dots above) to freely pass through the membrane without wetting it.

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