



Cactus Materials

Cactus Water Solutions

CoreSil™ Antifouling Membrane



The Problem

Biofouling is a major challenge that plagues industrial water infrastructure globally. It is one of the leading causes of increased energy costs and chemical consumption in membrane systems.

Our Solution

Cactus Materials, Inc. offers innovative nano-enabled CoreSil™ technology for reverse osmosis (RO) membranes for superior biofouling control.

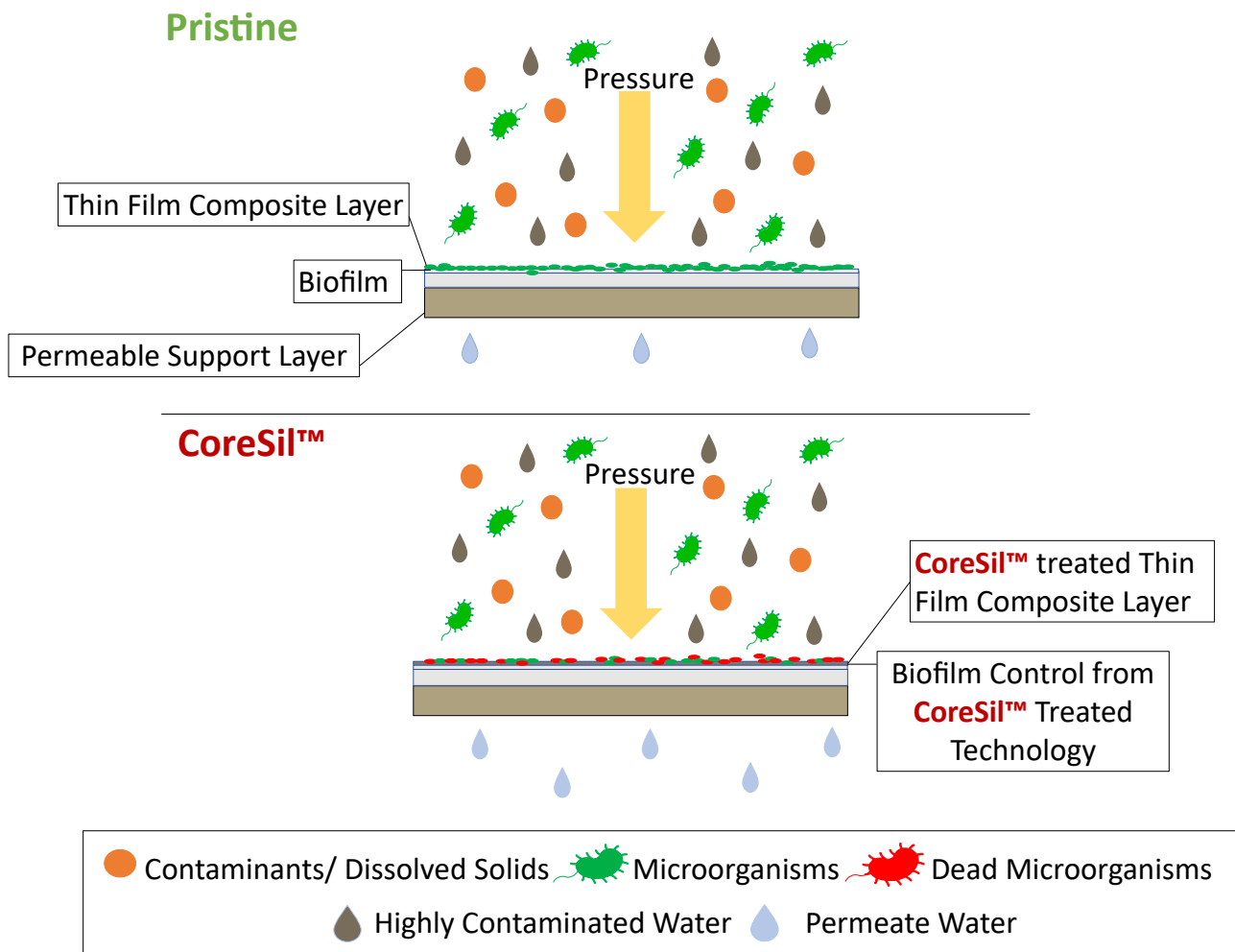


Figure 1. Biofouling Control with CoreSil™ Membrane Technology

CoreSil™ Benefits

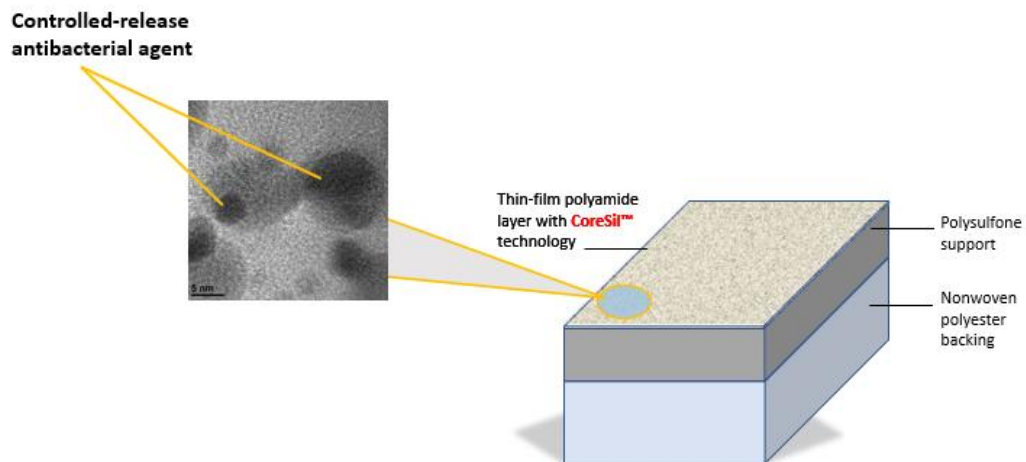


Figure 2. Transmission electron microscopy (TEM) image shows nano-sized antibacterial agent on thin-film polyamide surface layer

CoreSil™ technology applies nanoparticles *in-situ* on thin film composite (TFC) membranes to provide intrinsic anti-biofouling properties and superior performance:

- Customizable for a wide selection of commercial polyamide TFC RO membrane products
- Preserves key physical characteristics of RO membrane without compromising salt rejection
- Increases membrane flux (>31%) by mitigating biofilm formation
- Reduces cleaning frequency (up to > 60%) *current data set
- Reduces energy consumption (up to 19%) at the same water productivity *current data set
- Improves membrane lifespan (up to 2x)
- Lowers overall cost of ownership (COO)
- Treated water meets stringent discharge standards for various industries

Data Summary

Biofouling Control:

CoreSil™ treated RO membranes experienced significantly less biofilm formation on used RO membrane surfaces. 3D optical Coherence Tomography and Epifluorescence data indicated an approximate 60% reduction after biofouling experiments.

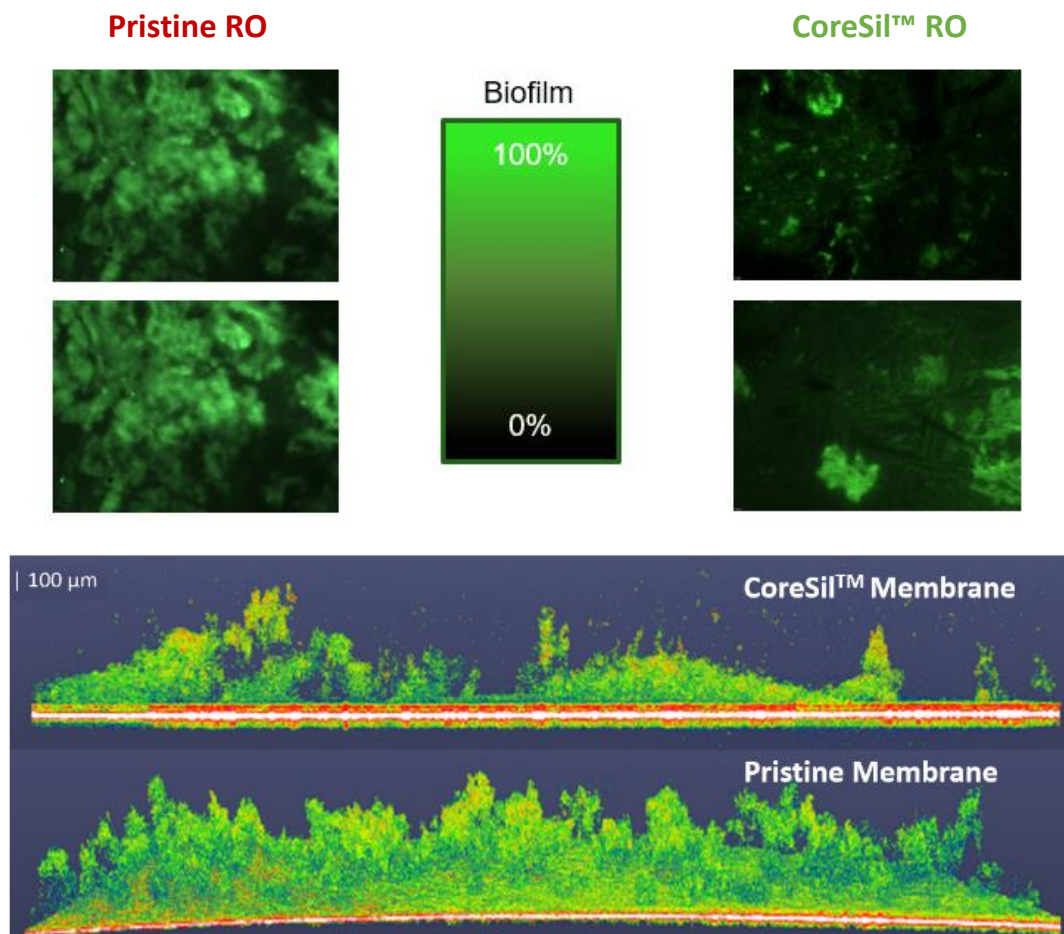


Figure 3. Superior Biofilm Control by CoreSil™ Technology*

*Test Conditions (*Accelerated Biofouling): feed water of synthetic secondary wastewater at 800 mg/L TDS, 2.5×10^6 cells/mL bacterial concentration, 100 psi (0.69 MPa) applied pressure, 77°F (25°C) feed water temperature, feed water pH 7-8. Chemical cleaning solution of 0.1% NaOH and 1.0% Na₄EDTA. Element permeate flow may vary \pm 20%.*

RO Performance:

CoreSil™ treatment enabled better operation stability (35 – 52% improvement) by mitigating biofouling and flux decline.

CoreSil™ treatment resulted in better permeate flux recovery (22 – 37% improvement) after alkaline chemical cleaning post membrane fouling.

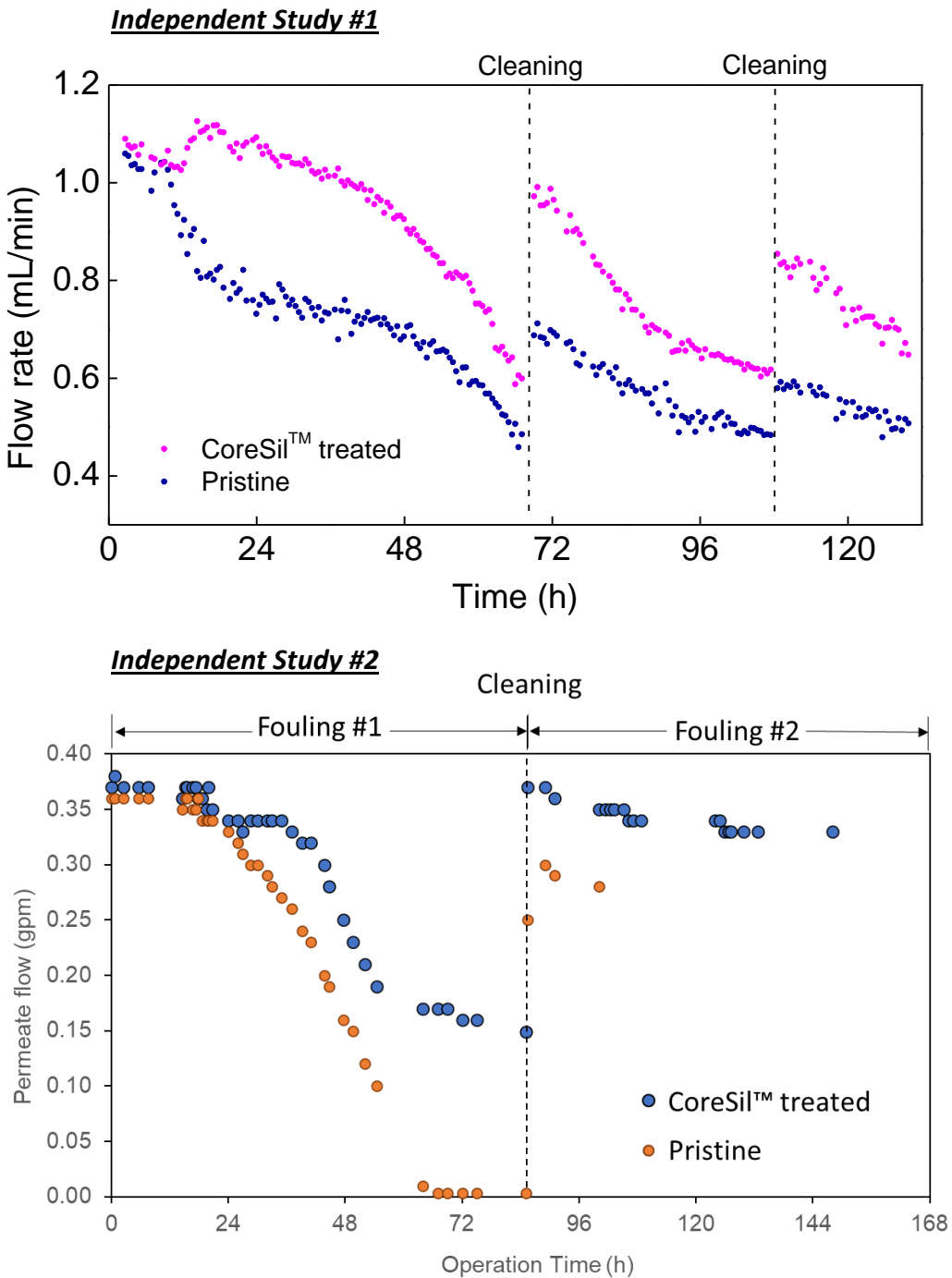
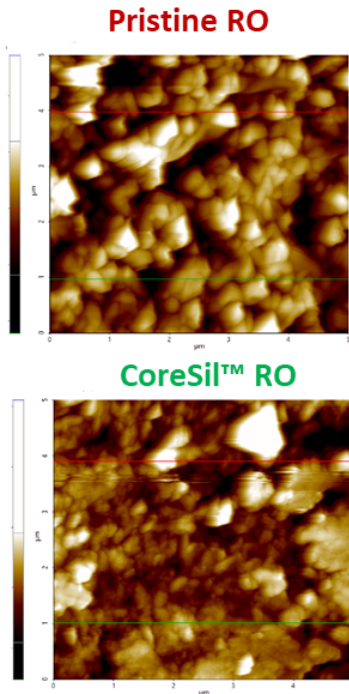


Figure 4. Permeate flow during accelerated biofouling events*

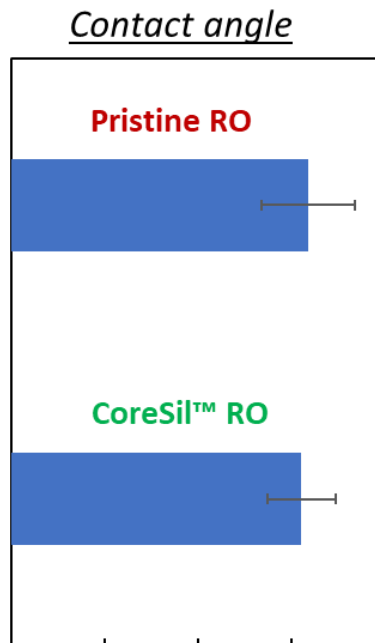
Other Membrane Characteristics:

CoreSil™ technology was shown to preserve the key characteristics, including surface roughness, hydrophilicity, and surface charge*. CoreSil™ treated RO do not exhibit significant change in the physical characteristics compared with pristine RO membrane.

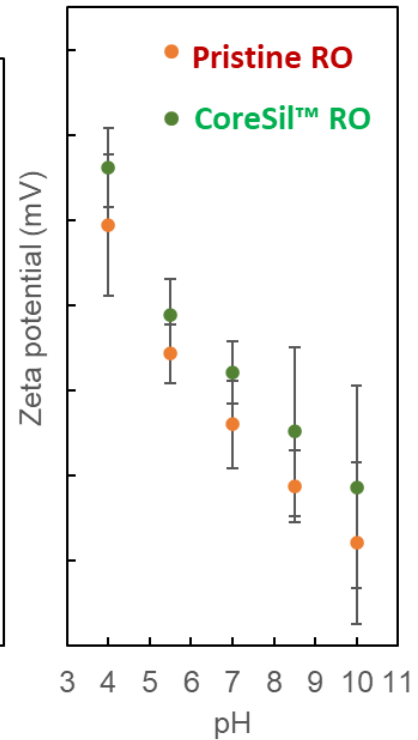
Surface Roughness



Hydrophilicity



Surface Charge



*Other characteristics can be provided upon request.

2507 W Geneva Dr

Tempe, AZ 8528

sales@cactusmaterials.com

www.cactusmaterials.com