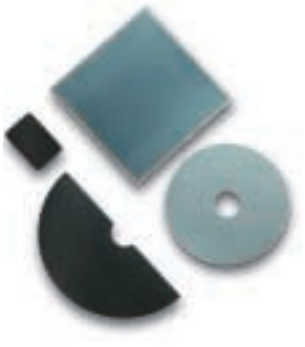
SpinTek T_d Ceramic™ Membrane



TiO_2 Membranes in Flat Sheet, Disk, "Half Moon," and coupon

Unique Ceramic Membrane

The SpinTek T_d ceramic membrane offers a new tool for the separation of micro-sized solids from liquid, gas and air influent. The unique T_d membrane starts as a 185 micron thick stainless steel substrate and then a thin (15 micron) nanopowder coating of ceramic is bonded to the substrate. The ceramic coating has a smooth surface that resists fouling which occurs with conventional "depth" type ceramic membranes. The T_d membrane is available in pore sizes as small as 0.07 microns and as large as 0.8 microns. The base ceramic of the Td membrane is titanium dioxide (TiO_2) manufactured from nano-sized ceramic powders. This can be blended with either zirconia or with a composite of alumina and silica dioxide depending on the intended service.

Membrane Sizes

The SpinTek Td membrane is available in square sheets 285 mm (11.2") x 285 mm (11.2"). Larger sheets are available by precision welding standard T_d sheets together. Standard circular and rectangular configurations are available and custom configurations can be laser cut to meet most needs. The T_d membrane can also be rolled to a minimum dimension of 10 mm (3/8") without damaging the membrane surface.

System Configurations

The T_d membrane can be used in the SpinTek ST-II and Speedy rotary microfiltration applications. Our engineers can also custom design and fabricate specific membrane modules for most applications.

Membrane

KEY BENEFITS

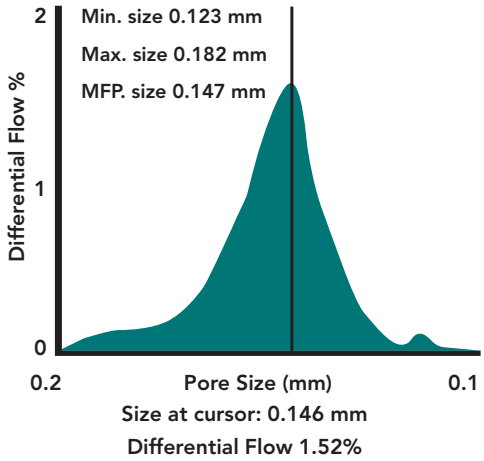
- **0.07 to 0.8 micron pore sizes can be specified**
- **100% membrane stability in highly alkaline and solvent environments**
- **Operationally stable to 300°C in air and up to 800°C in an inert or reducing atmosphere**
- **Smooth membrane surface resists fouling**
- **Tight mean pore diameter for precise filtration**
- **Excellent performance in oil/water separation applications**
- **Titanium substrate available**
- **Resistant to bacterial attack**
- **Can be sterilized with live steam**

SpinTek™ filtration
Advancing the flow of industry

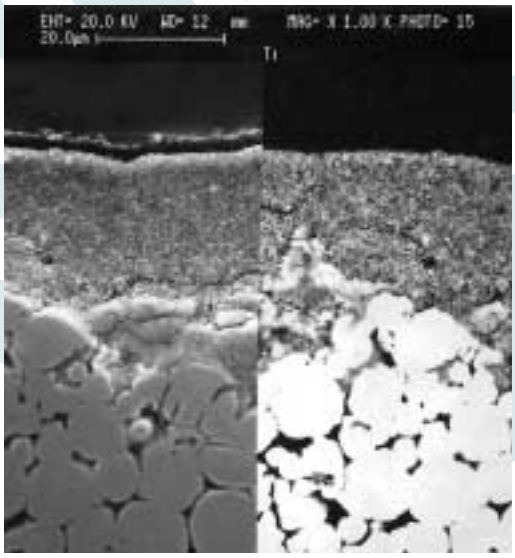
SpinTek T_d Ceramic™ Membrane

Differential Flow Distribution

Argon Gas at 0.5 kg/cm² (7.1 psig) TMP



The Coulter Porometer II analysis demonstrates the tight pore distribution of the SpinTek T_d0.15 micron membrane with a maximum pore of 0.182 mm and a minimum of 0.123 mm with 34 x109 pores/cm².



Electron Microscope view of an 0.2 micron membrane showing the 3 micron size stainless steel particles coated by the nanopowder ceramic layer.

SPINTEK T_d MEMBRANE FLOW RATES

Pore Size	Water Flow l/h.m²	Water Flow gpd/ft²	Gas Flow l/h.m²	Gas Flow scfm/ft²
0.07	1,000	590	75,000	4.1
0.10	2,200	1,300	140,000	7.7
0.15	2,500	1,475	160,000	8.7
0.20	3,800	2,240	190,000	10.4
0.40	5,500	3,250	200,000	10.9
0.80	7,000	4,125	250,000	13.7

Water flow rate is distilled water at 2.0 kg/cm² (28.4 psig) TMP. Gas flow rate is Argon at 0.5 kg/cm² (7.1 psig) TMP.

CERAMIC MEMBRANE SPECIFICATIONS

The SS-316L/3CSB means a stainless steel substrate* with a 3CSB ceramic membrane coating. The 3CSB membrane is a composite of TiO_2, Al_2O_3 and $Si0_2$ (Titanium Oxide, Aluminum Oxide and Silicon Oxide).

**The substrate can be 316L SS, titanium or nickel.*

Membrane	Pore size
SS316L/3CSB	0.05 microns to 0.5 microns
SS316L/ TiO_2	0.10 microns to 0.5 microns
SS316L/ZrO_2/TiO_2	0.07 microns to 0.5 microns
SS316L/no ceramic	1.5 microns to 3.0 microns
Titanium/no ceramic	1.5 microns to 3.0 microns
Nickel/no ceramic	1.0 microns to 3.0 microns

Standard SpinTek Stainless Steel Membranes:

SS-R-05 (0.5 micron on a Ryton plate)

SS-R-01 (0.1 micron on a Ryton plate)

SS/Ceramic membranes for hot caustic "T_d" Membrane:

Pore size	Temp	Flux Rate
0.05 to 0.5 microns	100C° max	same as SS/3CSB

The new "R-Mem" membrane is a $Ti0_2$/Zirconium composite with a pore size of .005. A smaller "mean" pore size on the 3CSB is to be determined.

Membrane

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