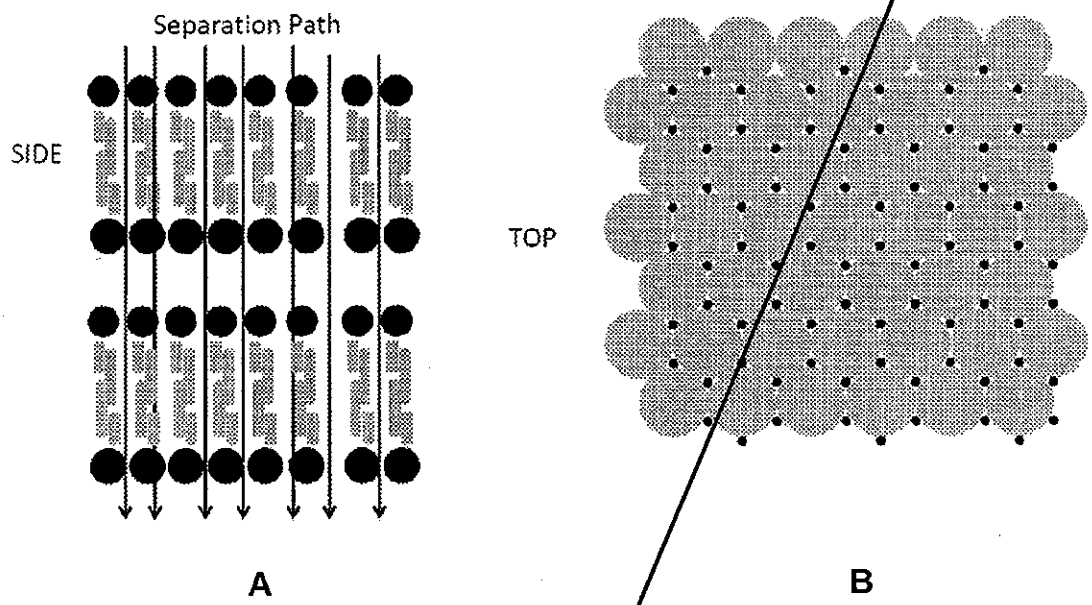


FIG. 1

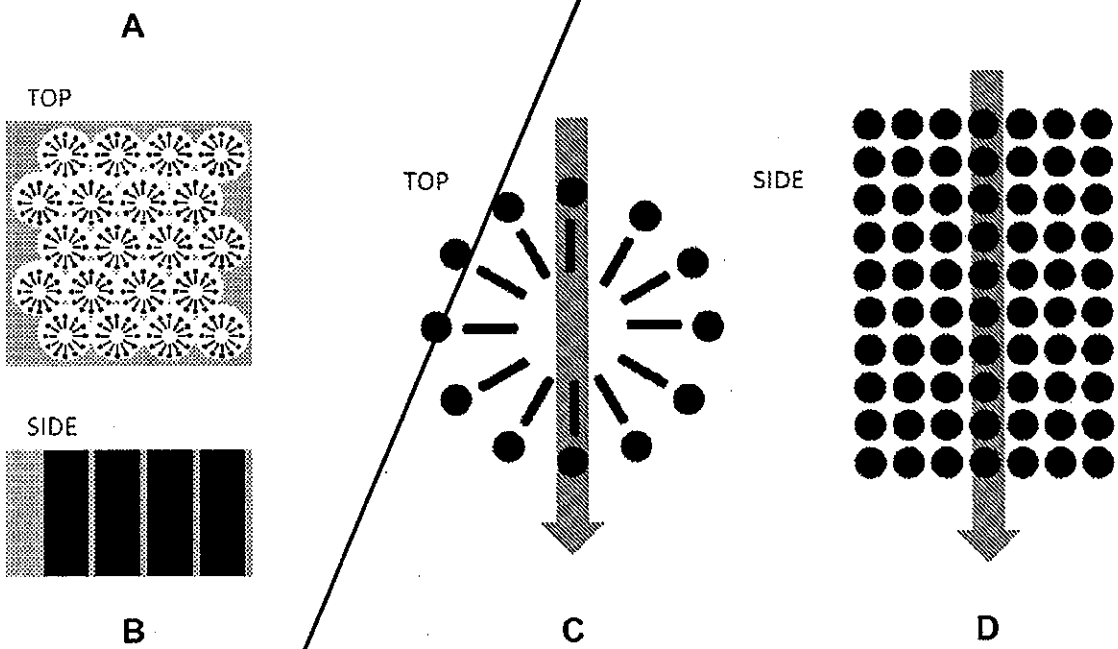


FIG. 2

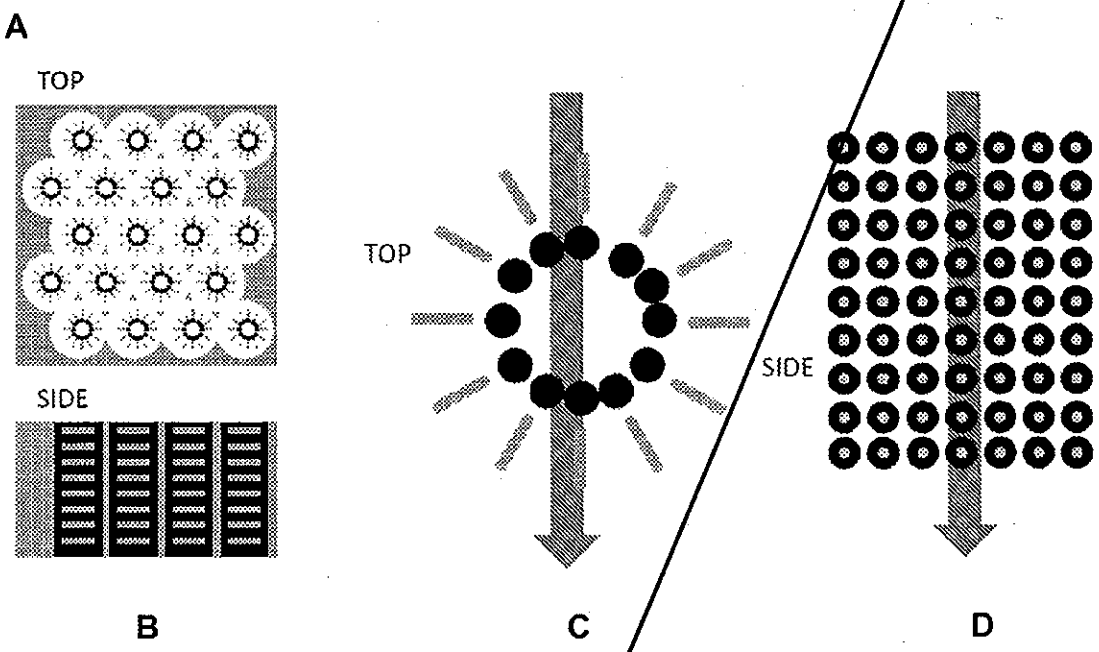


FIG. 3

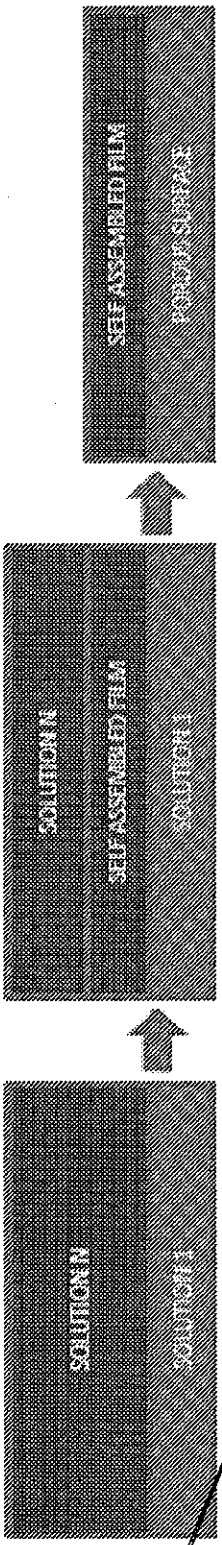

SOLUTION N
SOLUTION 1
SOLUTION N
SELF ASSEMBLED FILM
SOLUTION 1
SELF ASSEMBLED FILM
POROUS SURFACE

FIG. 4

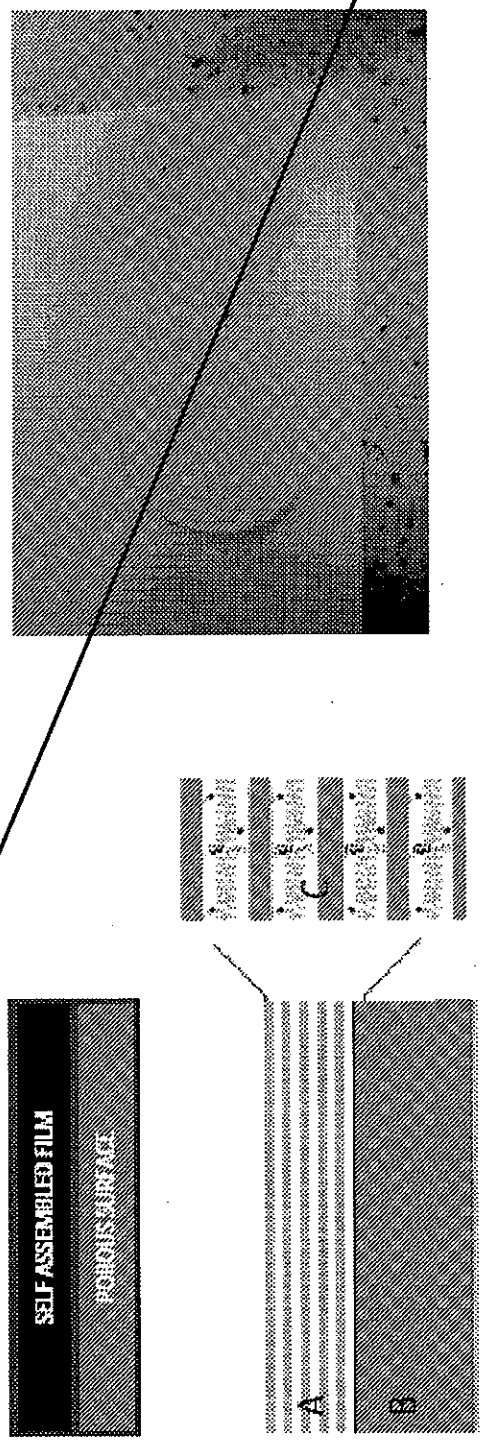
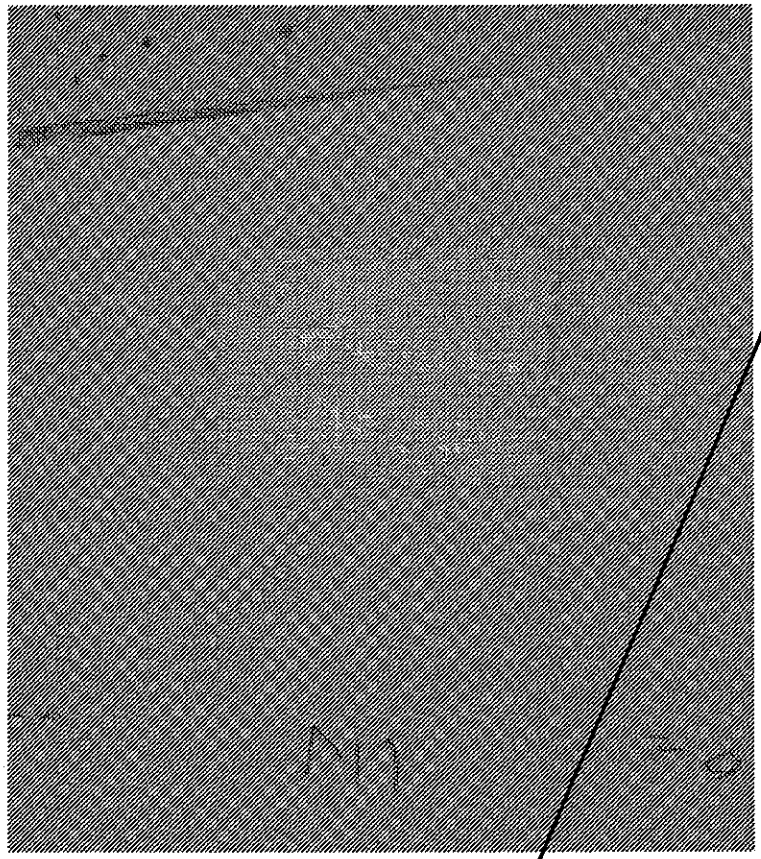
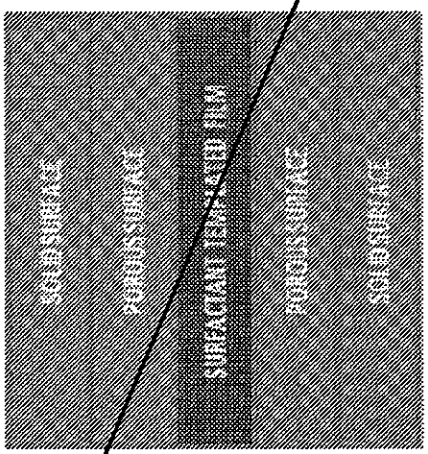

SELF ASSEMBLED FILM
POROUS SURFACE
A
B

FIG. 5



B


SOLID SURFACE
POROUS SURFACE
SURFACTANT TEMPLATED OIL
POROUS SURFACE
SOLID SURFACE

A

FIG. 6

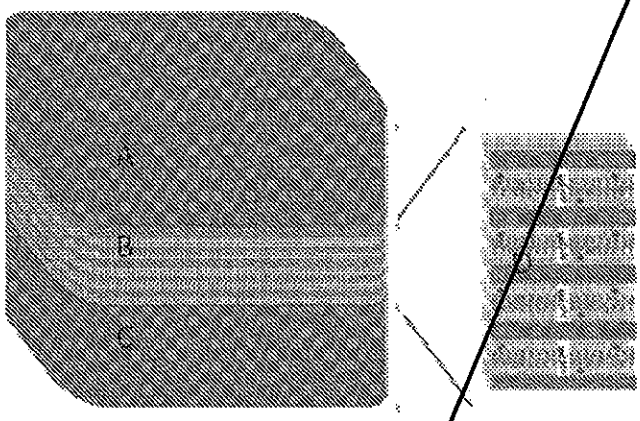


FIG. 7

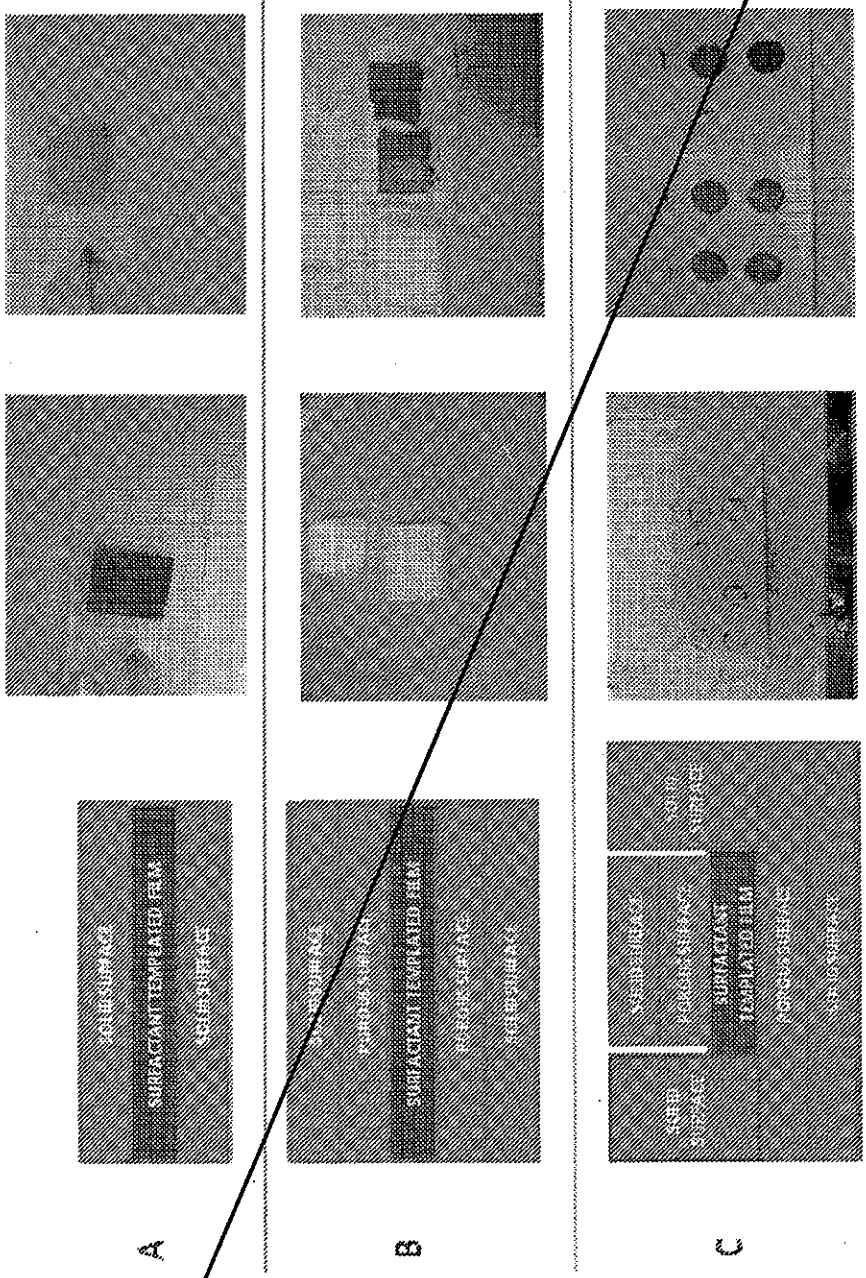

A
B
C
SUBSTRATE
SUBSTRATE TEMPLATED FILM
SUBSTRATE
SUBSTRATE
SUBSTRATE TEMPLATED FILM
SUBSTRATE
SUBSTRATE
SUBSTRATE
SUBSTRATE TEMPLATED FILM
SUBSTRATE
SUBSTRATE
SUBSTRATE
SUBSTRATE TEMPLATED FILM
SUBSTRATE

FIG. 8

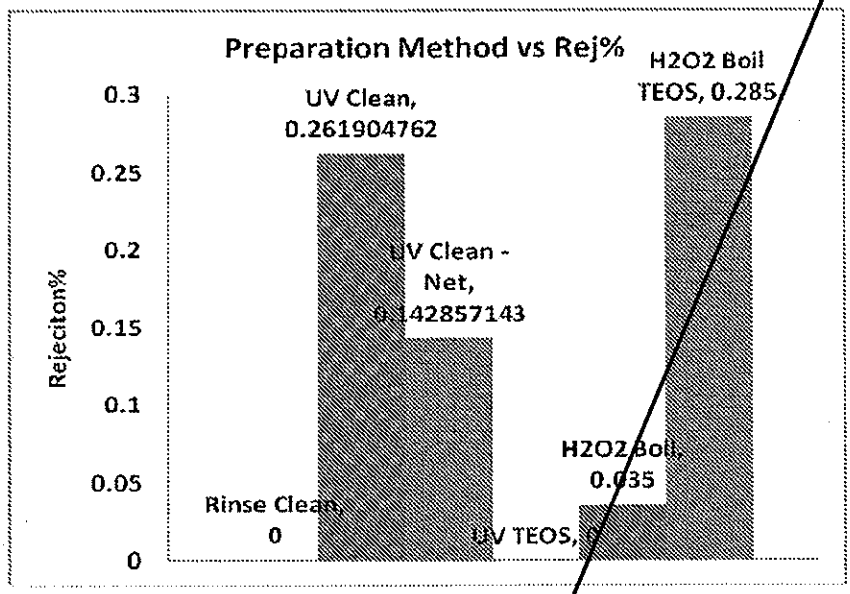

Preparation Method vs Rej%
Rejecitonn%
0.3
0.25
0.2
0.15
0.1
0.05
0
Rinse Clean, 0
UV Clean, 0.261904762
UV Clean - Net, 0.142857143
UV TEOS, 0
H2O2 Boil, 0.035
H2O2 Boil TEOS, 0.285

FIG. 9A

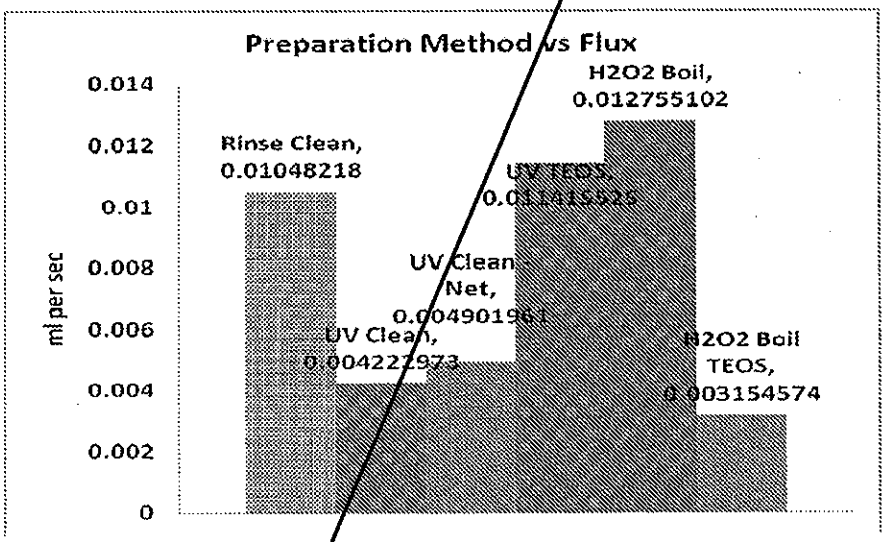

Preparation Method vs Flux
ml per sec
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
Rinse Clean, 0.01048218
UV Clean, 0.004222973
UV Clean - Net, 0.004901961
UV TEOS, 0.011415525
H2O2 Boil, 0.012755102
H2O2 Boil TEOS, 0.003154574

FIG. 9B

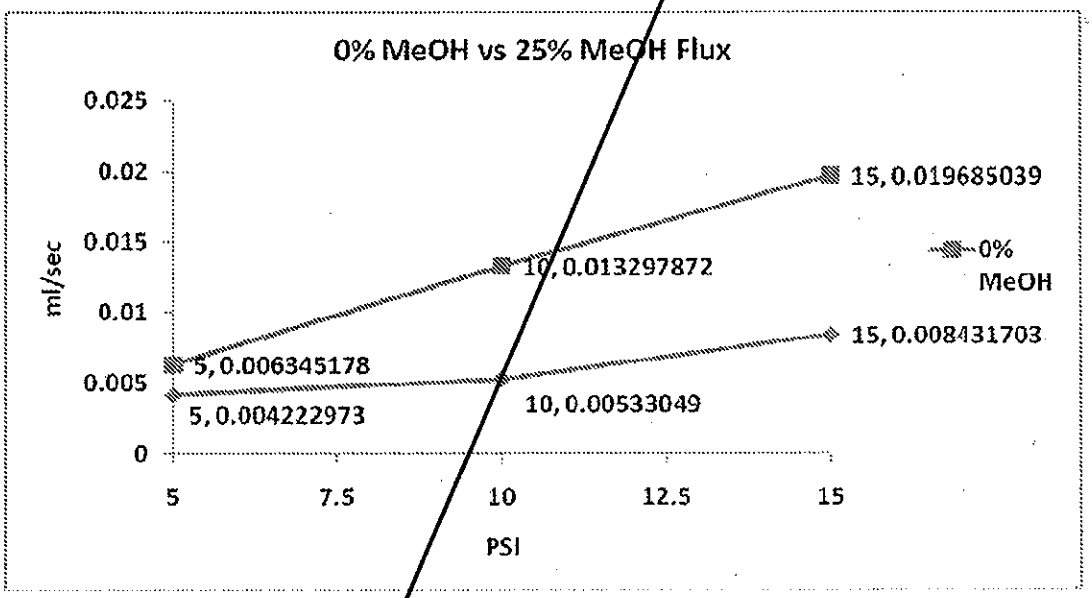

0% MeOH vs 25% MeOH Flux
0.025
0.02
0.015
0.01
0.005
0
ml/sec
5
7.5
10
12.5
15
PSI
15, 0.019685039
10, 0.013297872
5, 0.006345178
15, 0.008431703
10, 0.00533049
5, 0.004222973
0% MeOH

FIG. 10

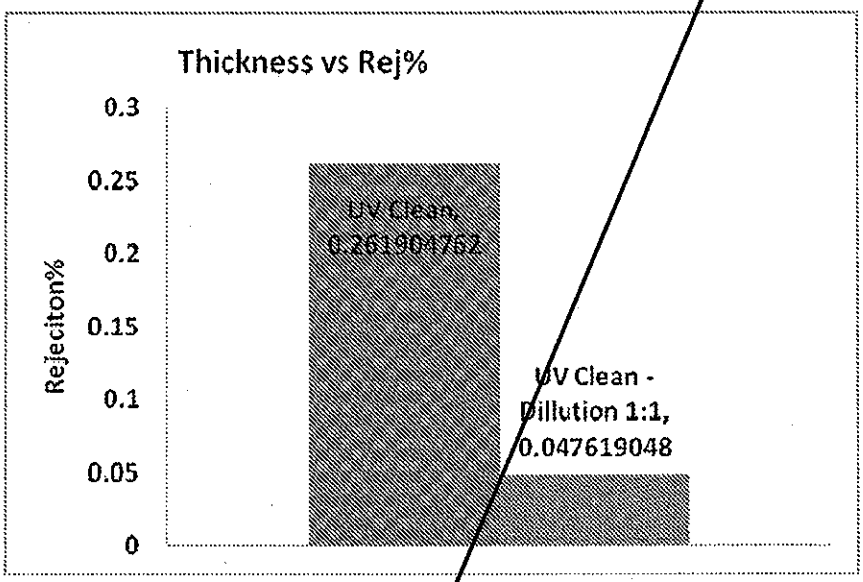


Fig 11A

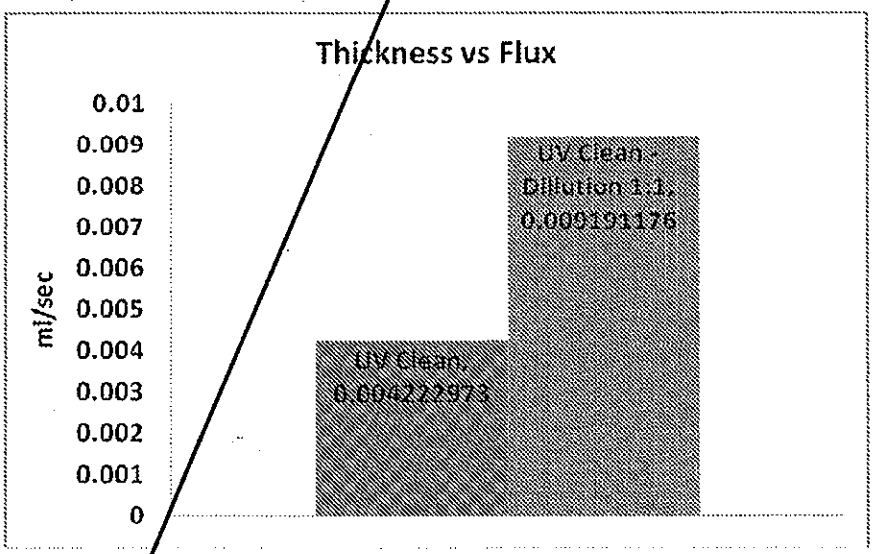


Fig. 11B

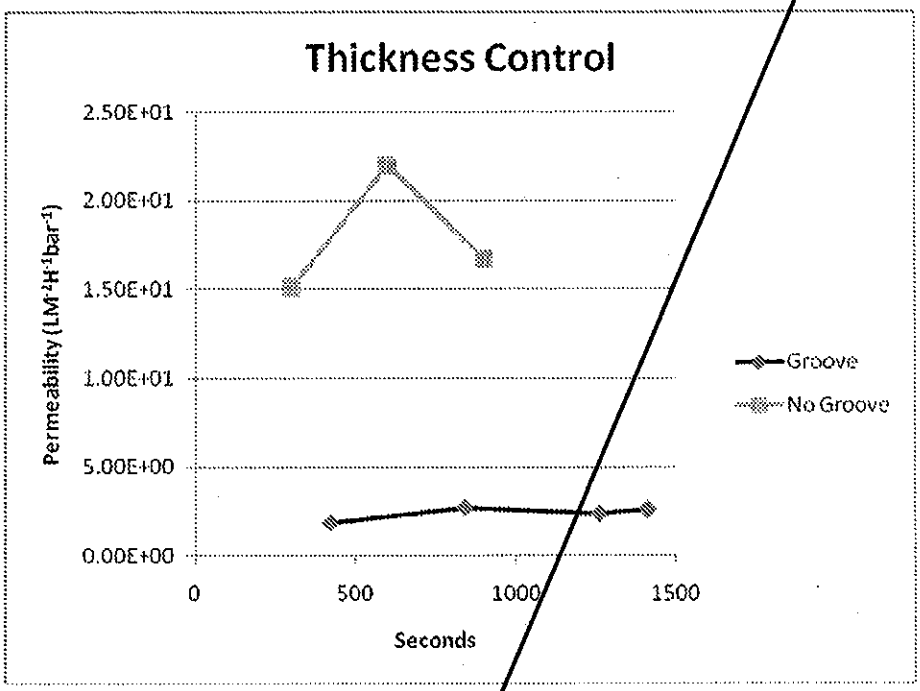

Thickness Control
2.50E+01
2.00E+01
1.50E+01
1.00E+01
5.00E+00
0.00E+00
Permeability (LM⁻²H⁻¹bar⁻¹)
0
500
1000
1500
Seconds
Groove
No Groove

FIG. 12

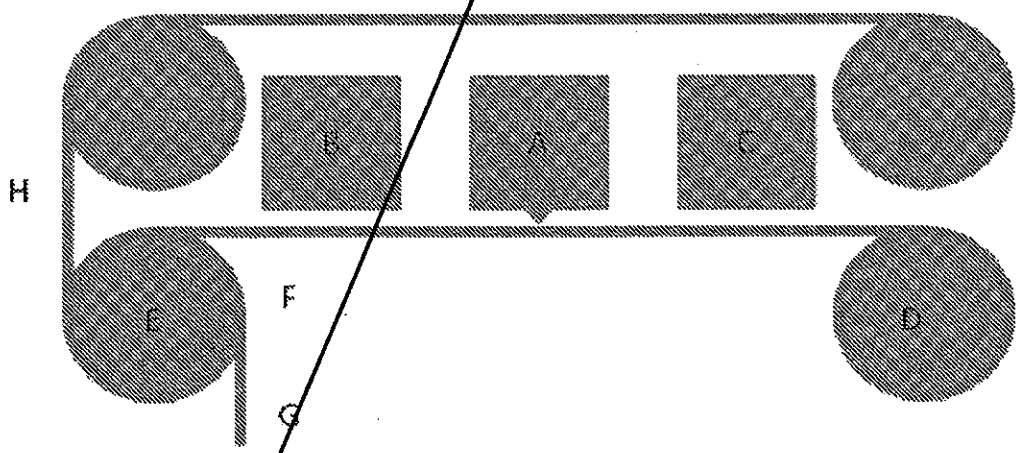

B
A
C
H
E
F
D
G

FIG. 13

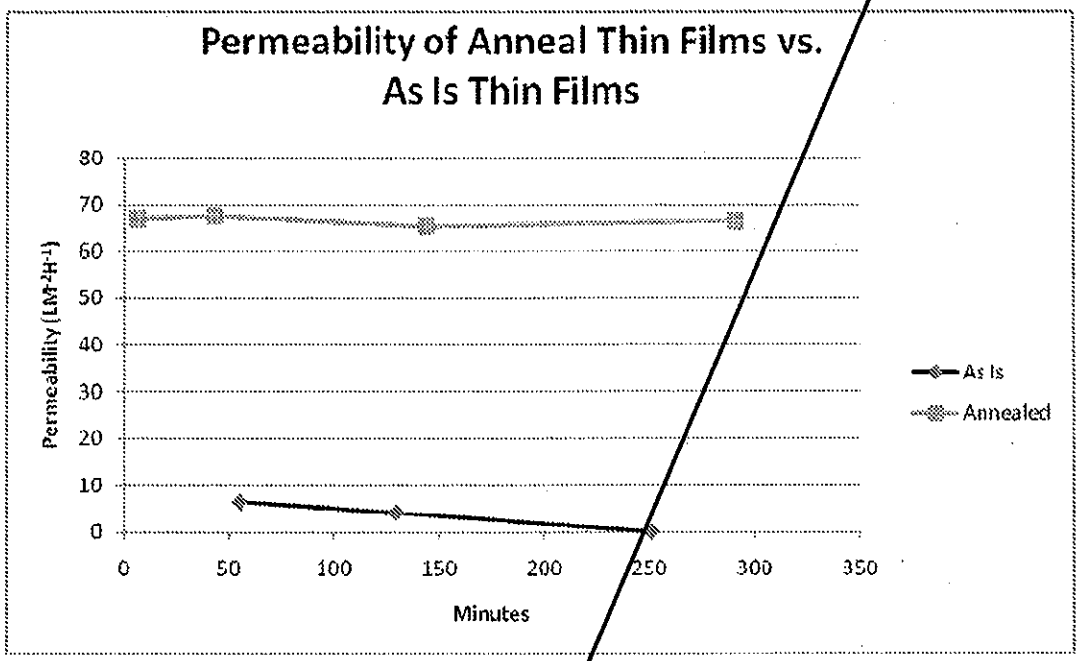

Permeability of Anneal Thin Films vs. As Is Thin Films
Permeability (LM-2H-1)
80
70
60
50
40
30
20
10
0
0
50
100
150
200
250
300
350
Minutes
As Is
Annealed

FIG. 14

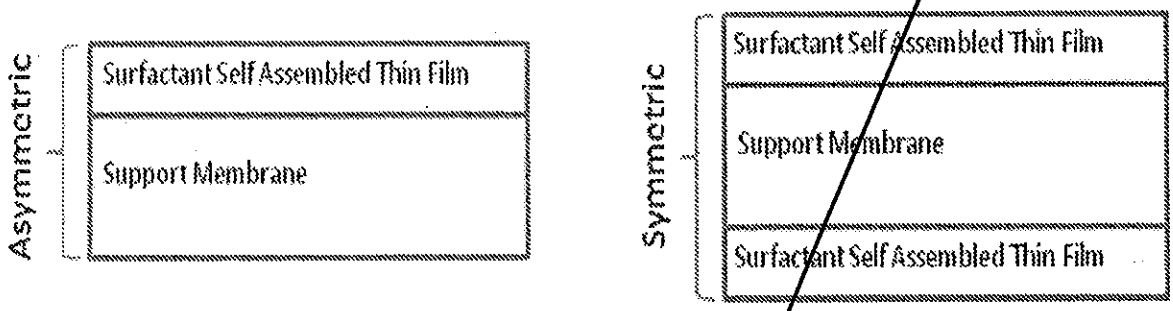

Asymmetric
Surfactant Self Assembled Thin Film
Support Membrane
Symmetric
Surfactant Self Assembled Thin Film
Support Membrane
Surfactant Self Assembled Thin Film

FIG. 15

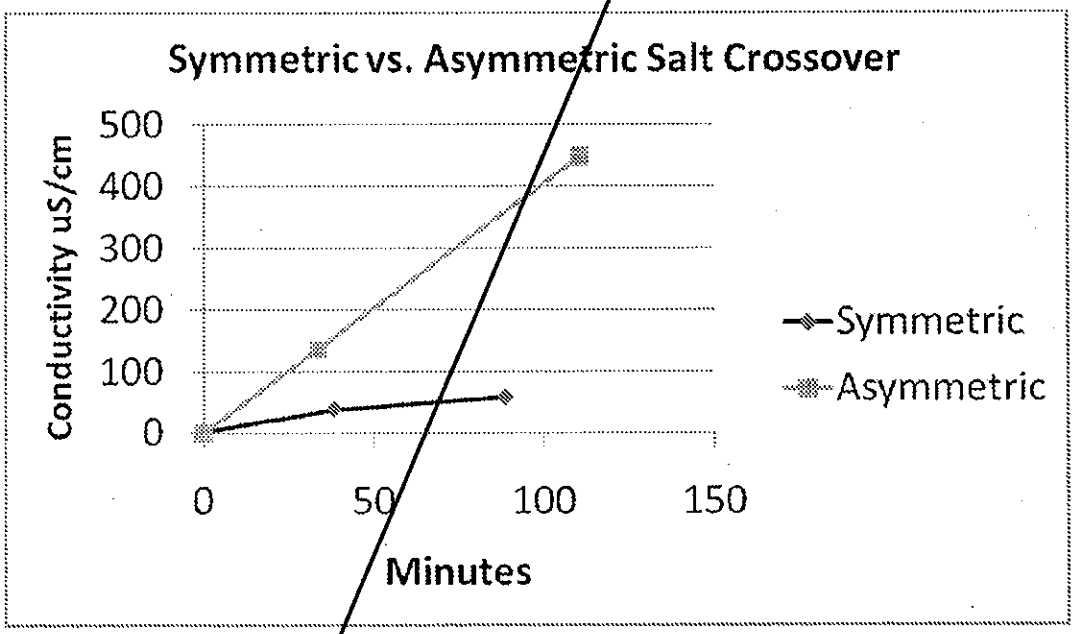

Symmetric vs. Asymmetric Salt Crossover
Conductivity uS/cm
500
400
300
200
100
0
0
50
100
150
Minutes
Symmetric
Asymmetric

FIG. 16

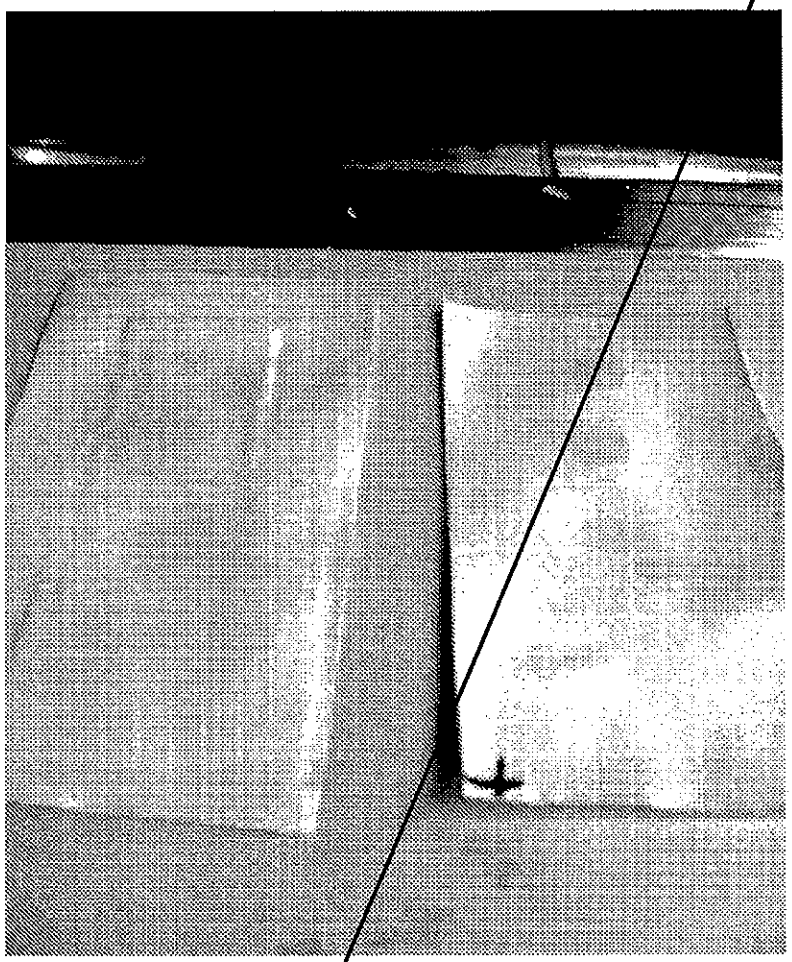


FIG. 17

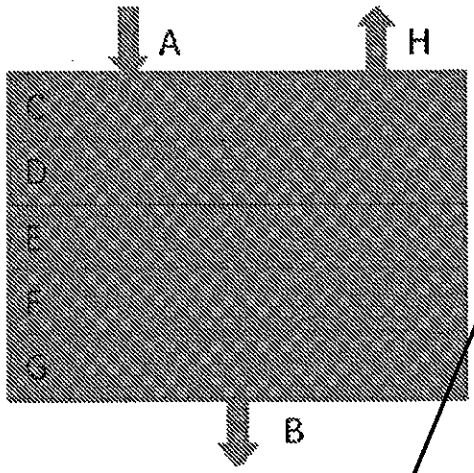


FIG. 18

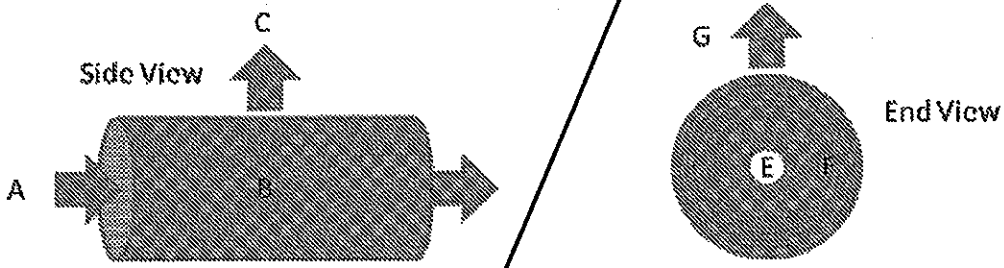


FIG. 19

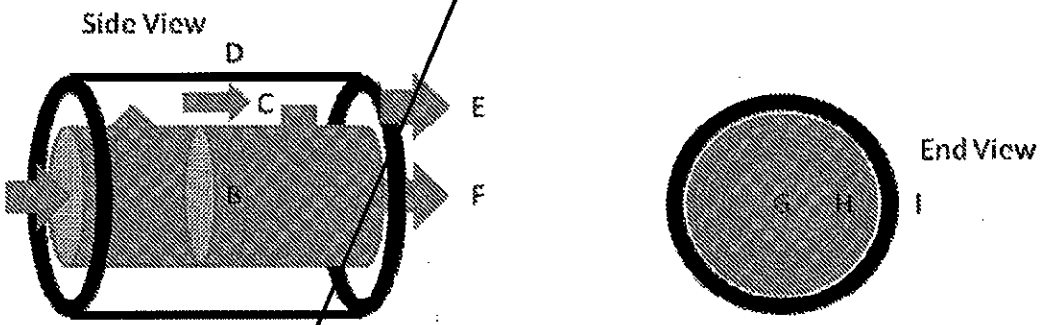


FIG. 20

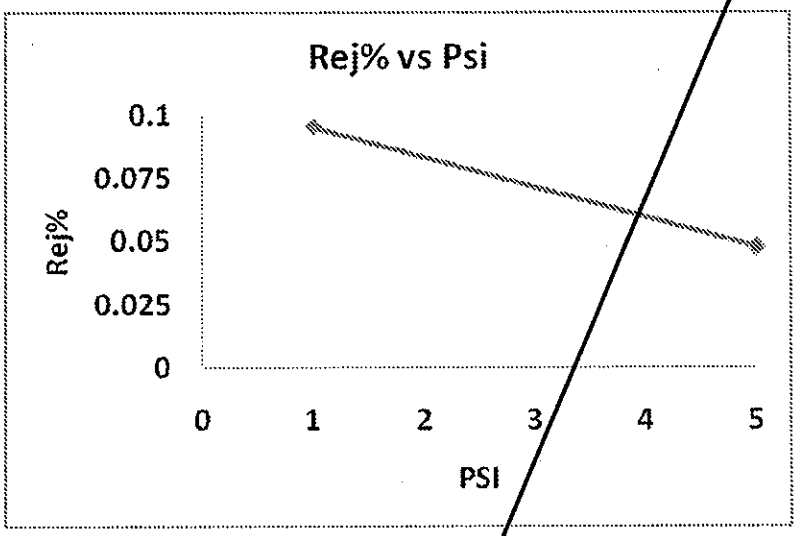


FIG. 21A

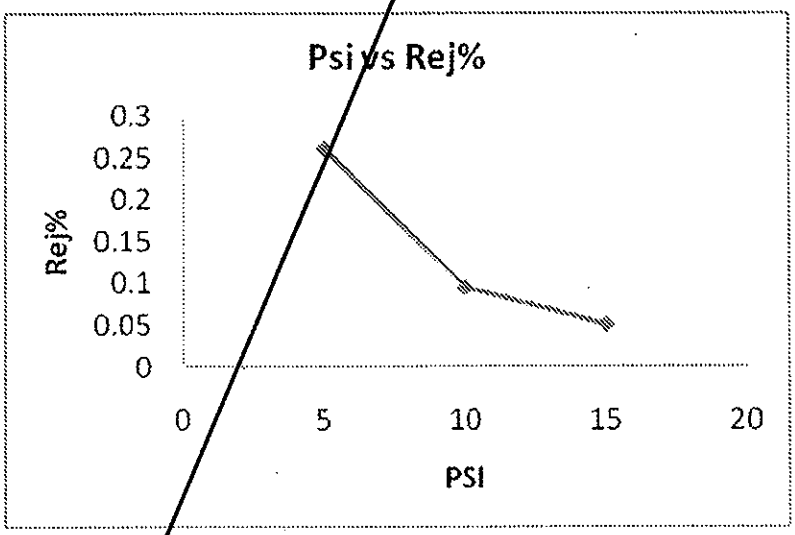


FIG. 21B

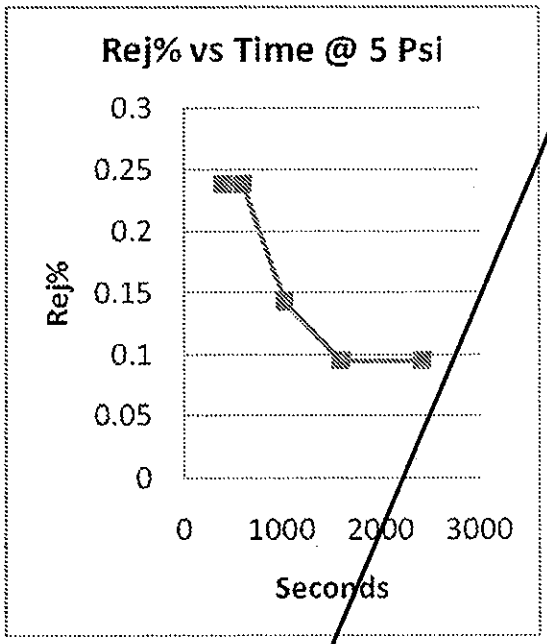


FIG. 22A

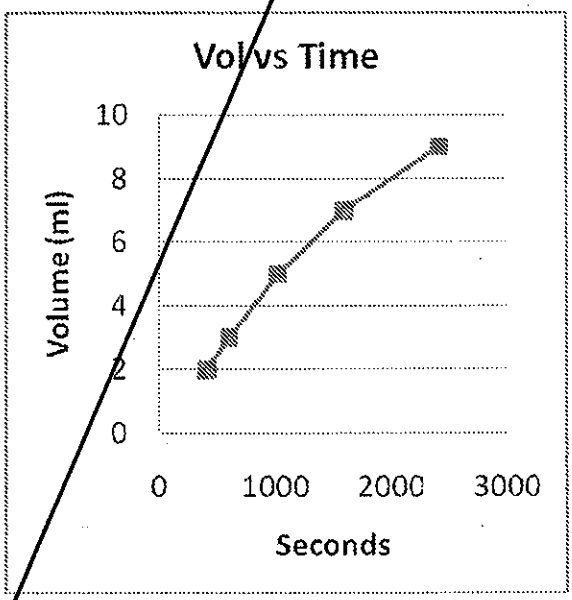
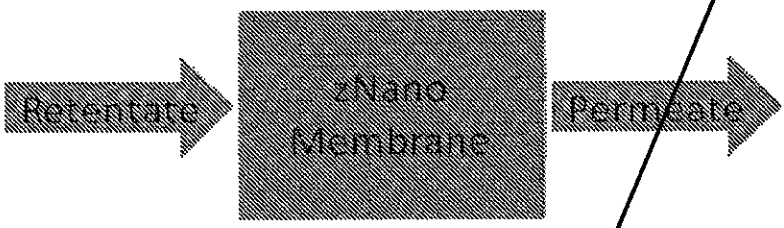


FIG. 22B



Initial	Methanol Concentration	Volume
Retentate	19%	25 ml
Permeate	0%	0 ml

Final	Methanol Concentration	Volume
Retentate	20%	19.5 ml
Permeate	17%	5.5 ml

FIG. 23

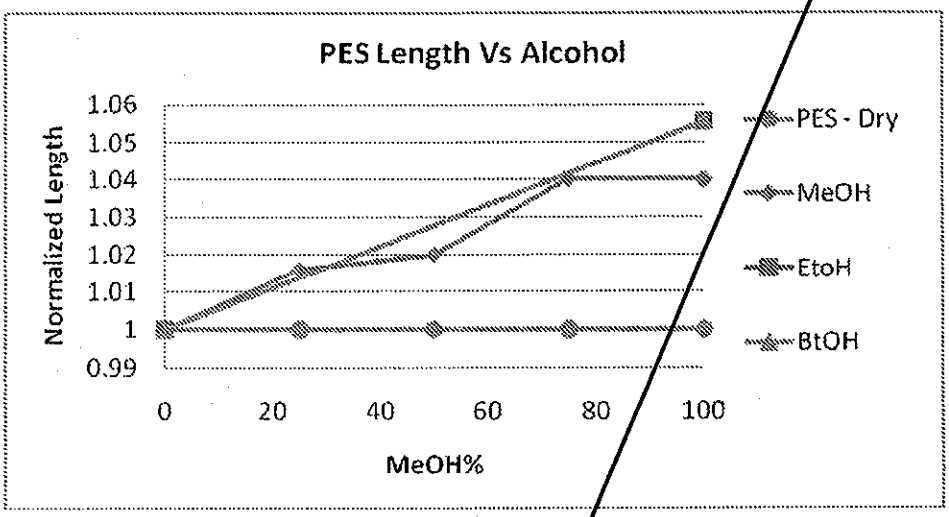


FIG. 24A

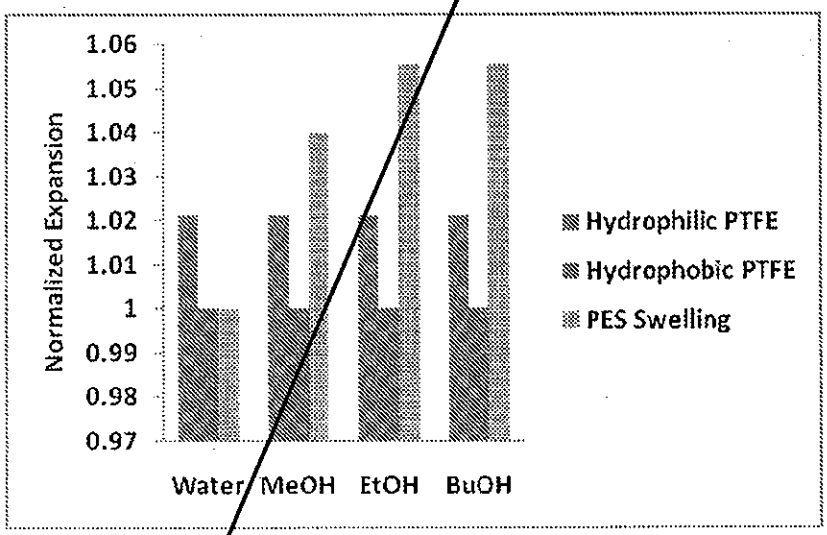


FIG. 24B

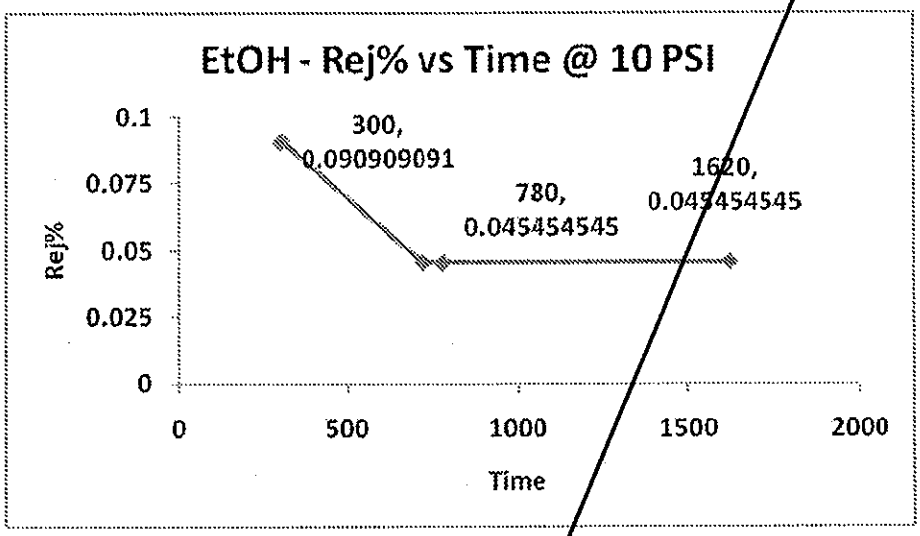


FIG. 25A

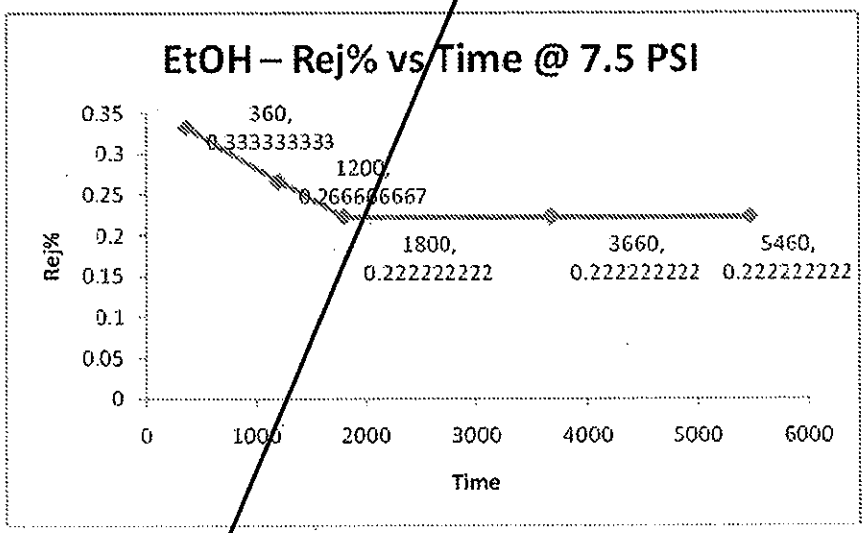
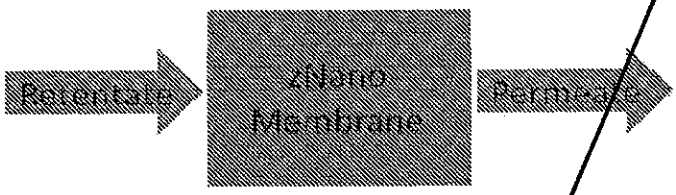


FIG. 25B



Initial	Ethanol Concentration	Volume
Retentate	20.5%	25 ml
Permeate	0%	0 ml

Final	Ethanol Concentration	Volume
Retentate	21%	17.5 ml
Permeate	19.2% (Average)	7.4 ml

FIG. 26

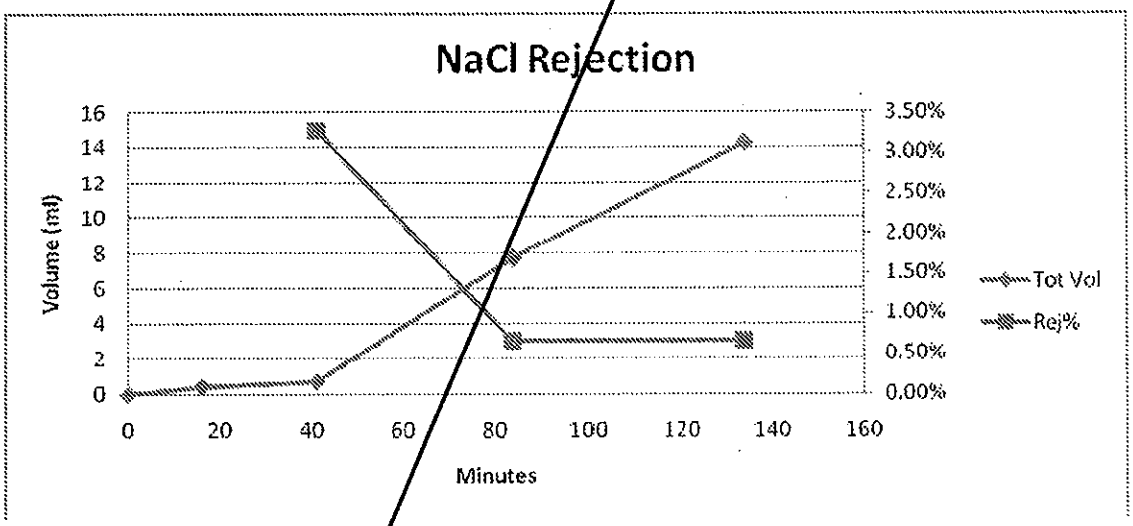


FIG. 27

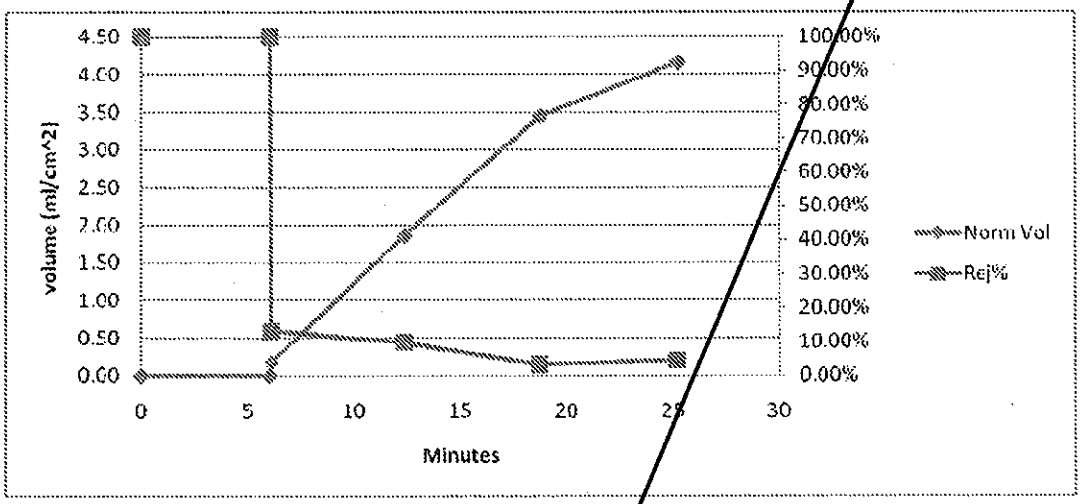

4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
volume (ml/cm^2)
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
0
5
10
15
20
25
30
Minutes
Norm Vol
Rej%

FIG.28

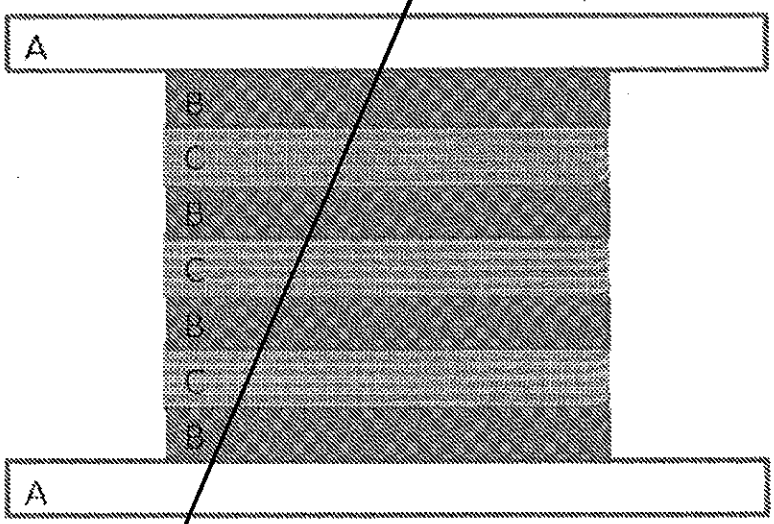

A
B
C
B
C
B
C
B
A

FIG. 29

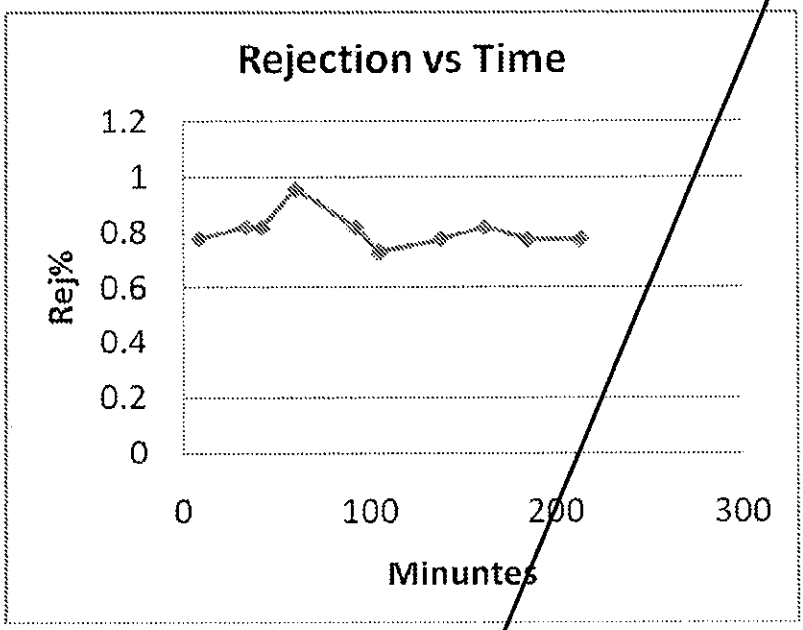


FIG. 30A

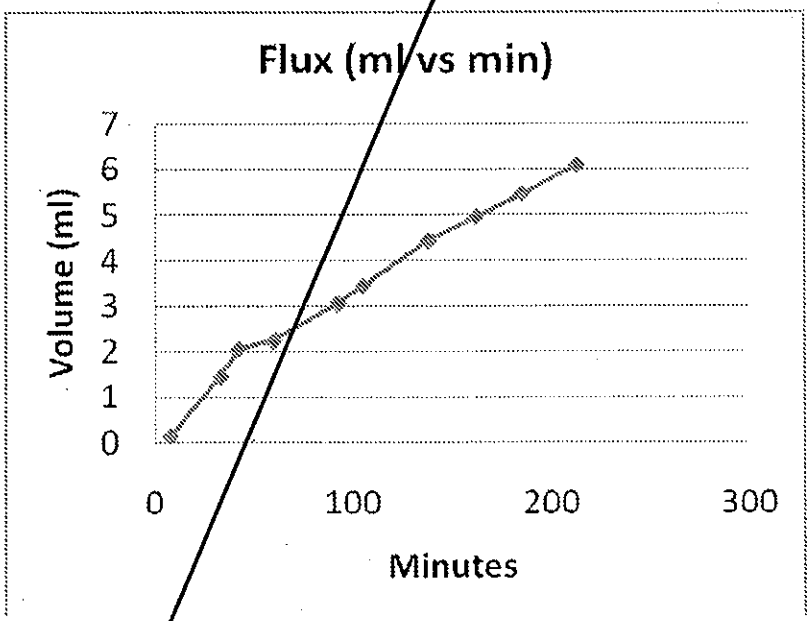


FIG. 30B

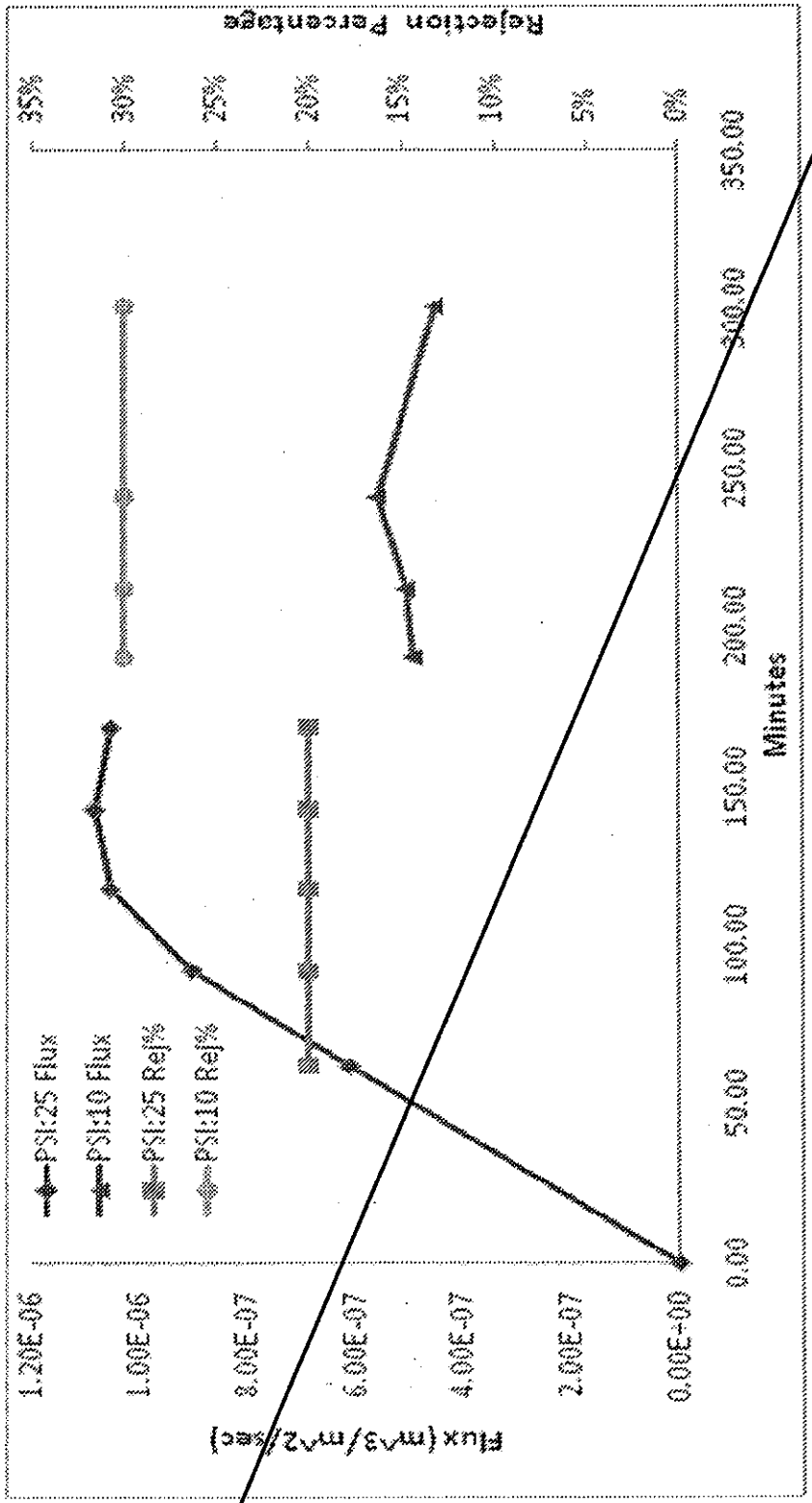

Flux (m^3/m^2/sec)
1.20E-06
1.00E-06
8.00E-07
6.00E-07
4.00E-07
2.00E-07
0.00E+00
Rejection Percentage
35%
30%
25%
20%
15%
10%
5%
0%
PSI:25 Flux
PSI:10 Flux
PSI:25 Rej%
PSI:10 Rej%
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
Minutes

FIG. 31

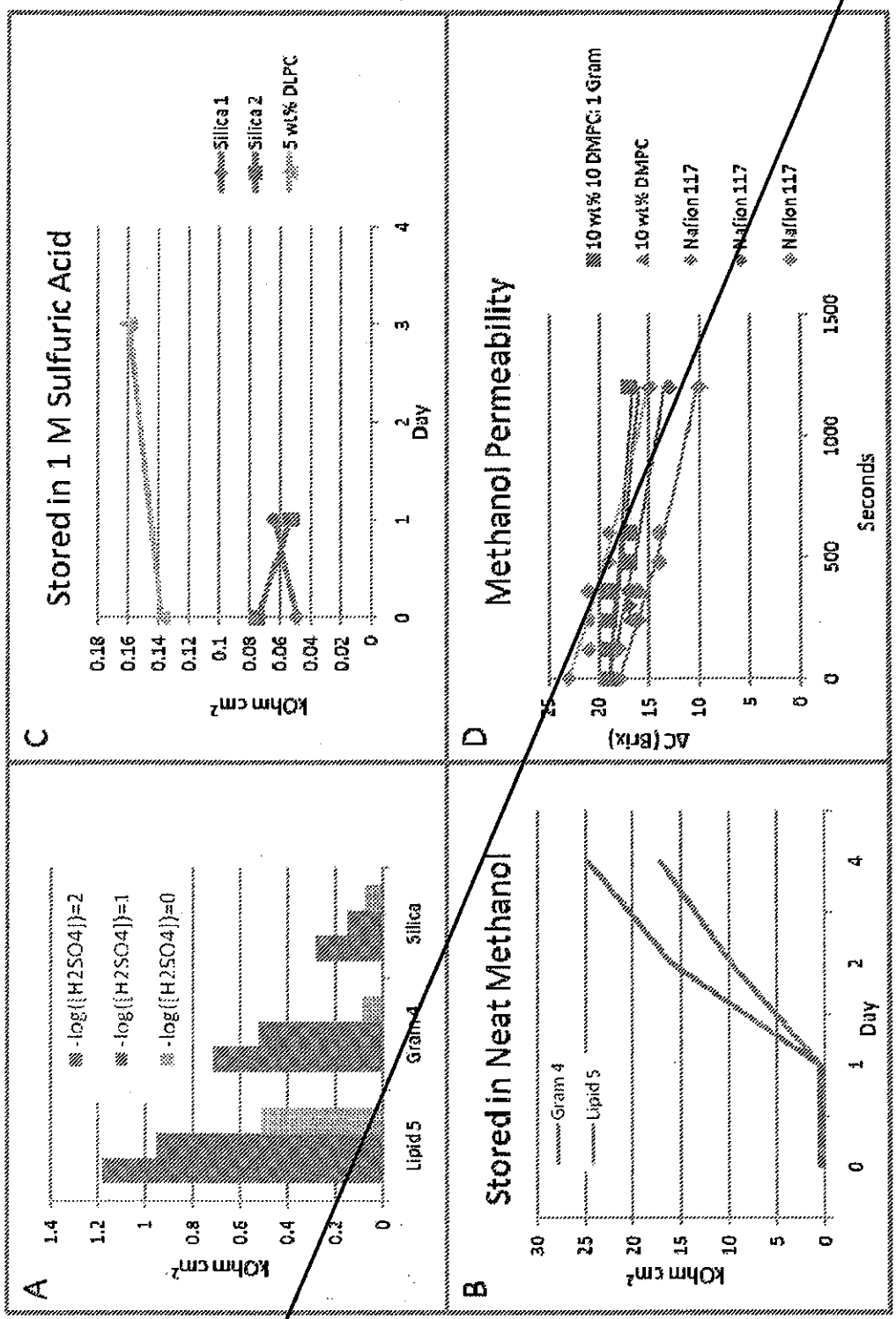

A
kOhm cm²
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-log([H2SO4])=2
-log([H2SO4])=1
-log([H2SO4])=0
Lipid 5
Gram 4
Silica
B
Stored in Neat Methanol
kOhm cm²
30
25
20
15
10
5
0
Gram 4
Lipid 5
0
1
2
4
Day
C
Stored in 1 M Sulfuric Acid
kOhm cm²
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Silica 1
Silica 2
5 wt% DLPC
0
1
2
3
4
Day
D
Methanol Permeability
AC (Brix)
20
15
10
5
0
10 wt% 10 DMPC: 1 Gram
10 wt% DMPC
Nafion 117
Nafion 117
Nafion 117
0
500
1000
1500
Seconds

FIG. 32

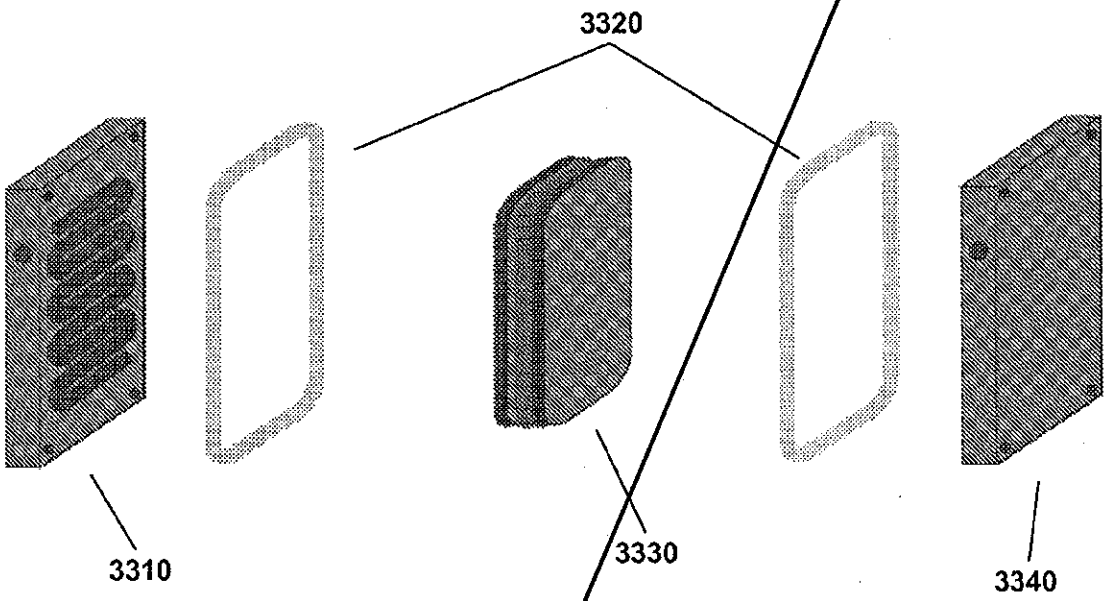


FIG 33

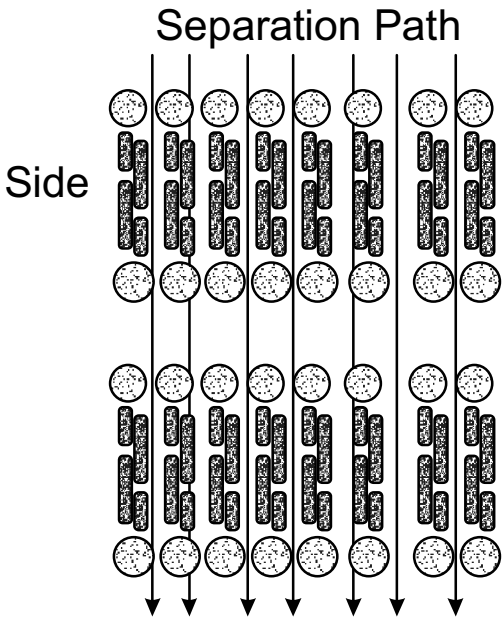


Figure 1A

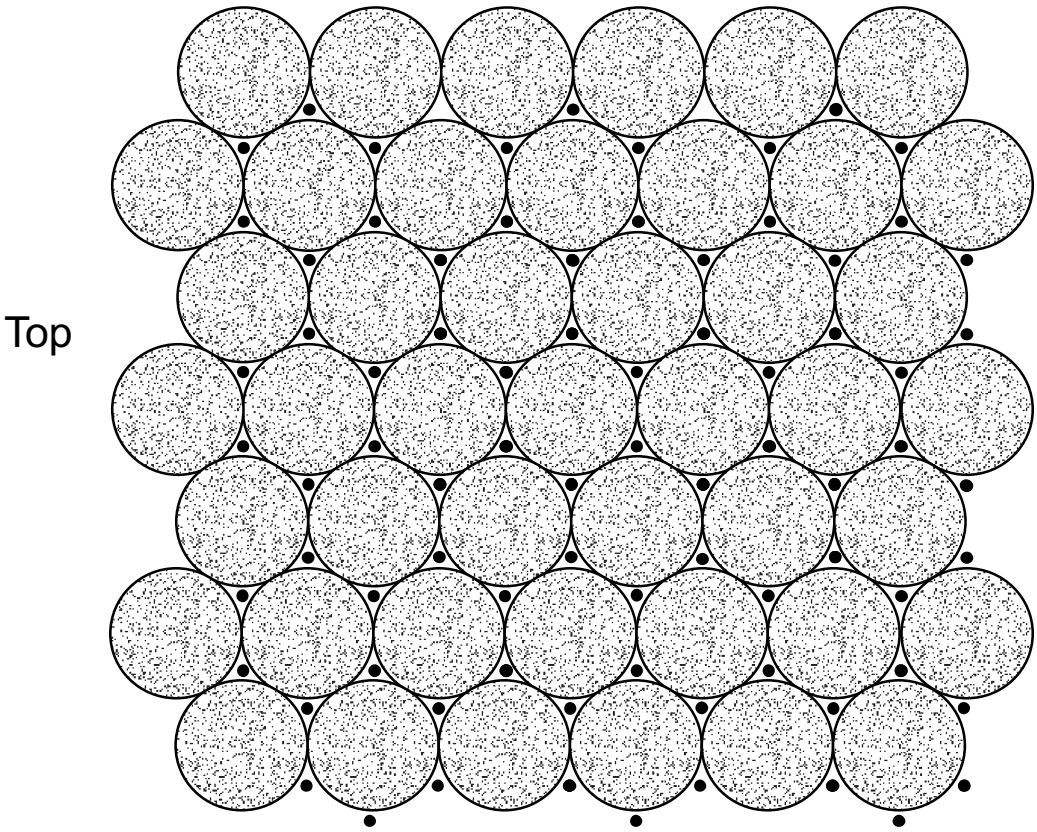


Figure 1B

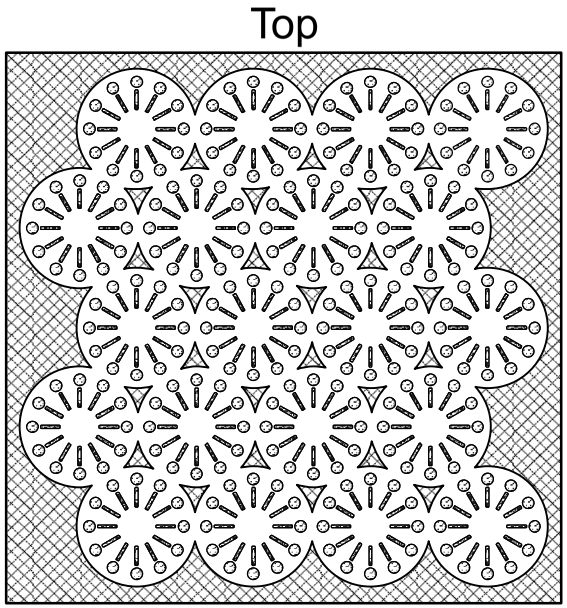


Figure 2A

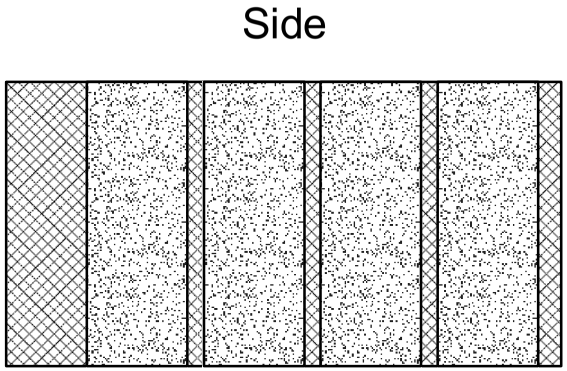


Figure 2B

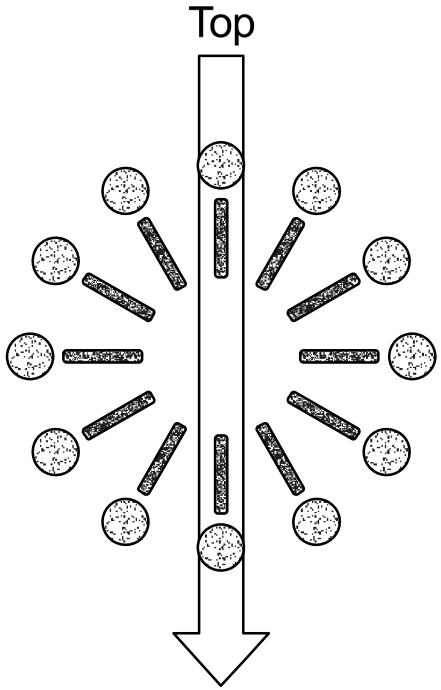


Figure 2C

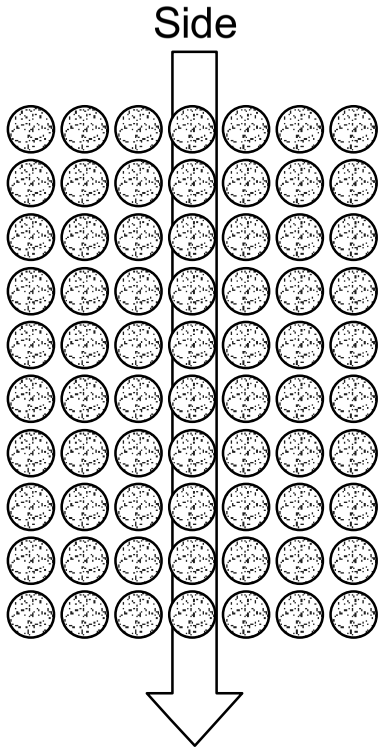


Figure 2D

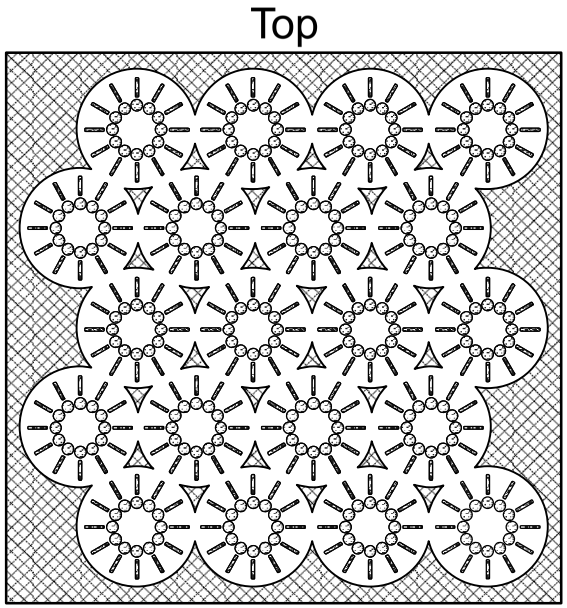


Figure 3A

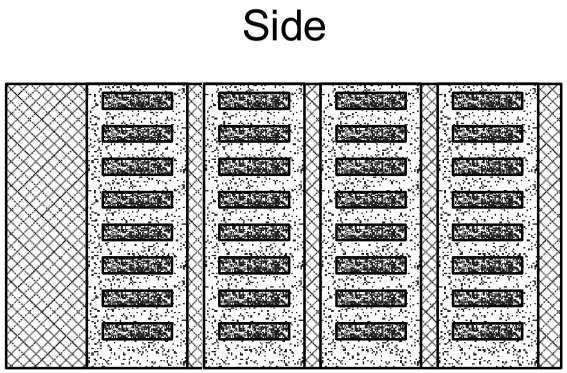


Figure 3B

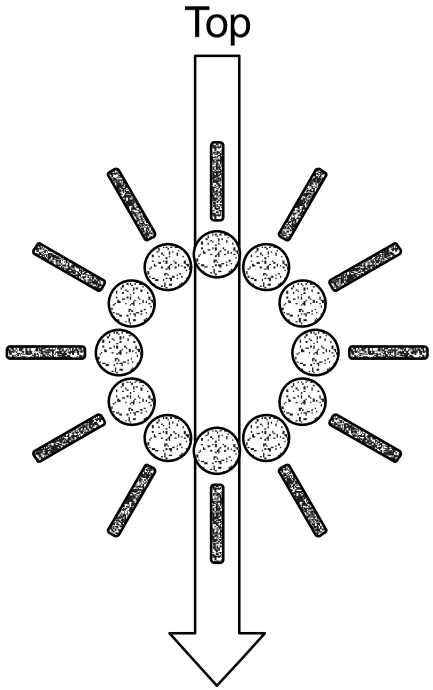


Figure 3C

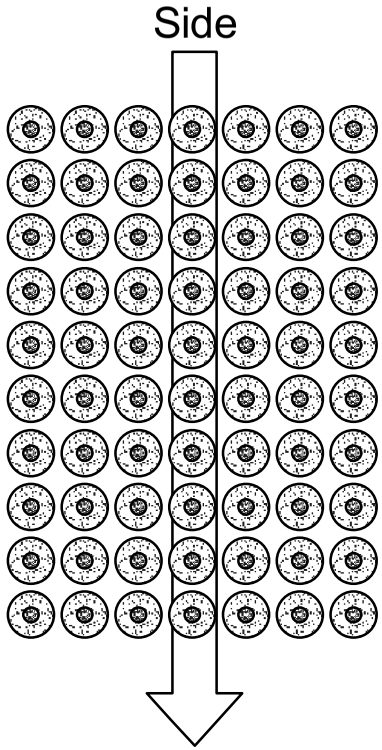


Figure 3D

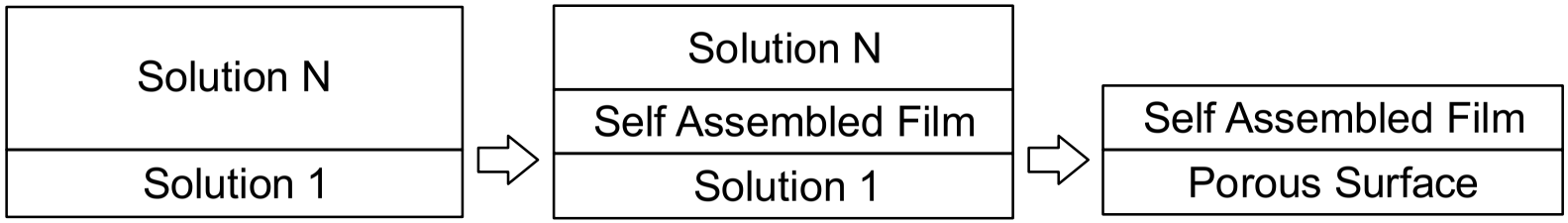
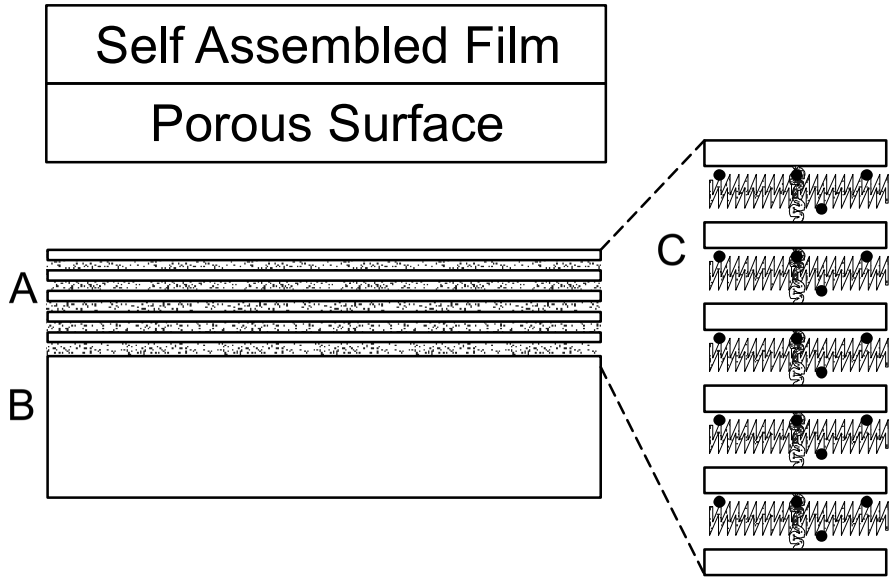

Solution N
Solution 1
Solution N
Self Assembled Film
Solution 1
Self Assembled Film
Porous Surface

Figure 4



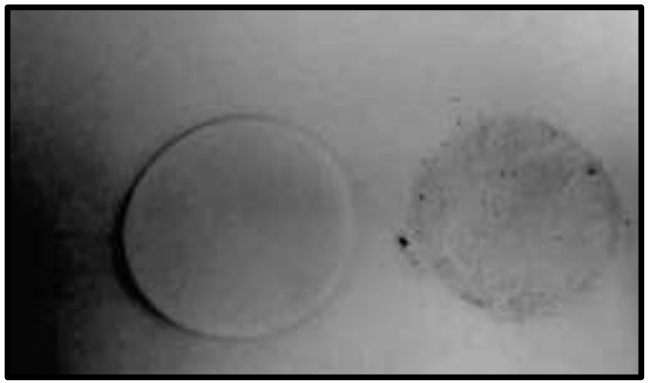


Figure 5

Solid Surface
Porous Surface
Surfactant Templated Film
Solid Surface
Porous Surface

Figure 6A

Figure 6B

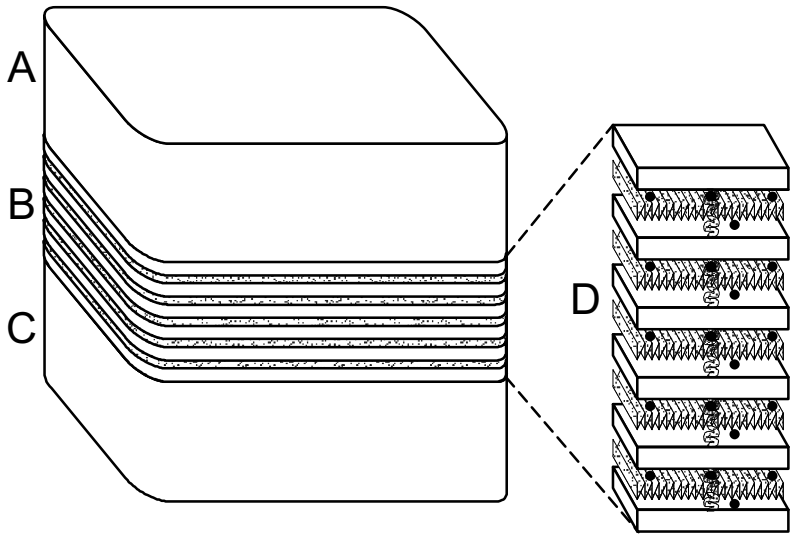
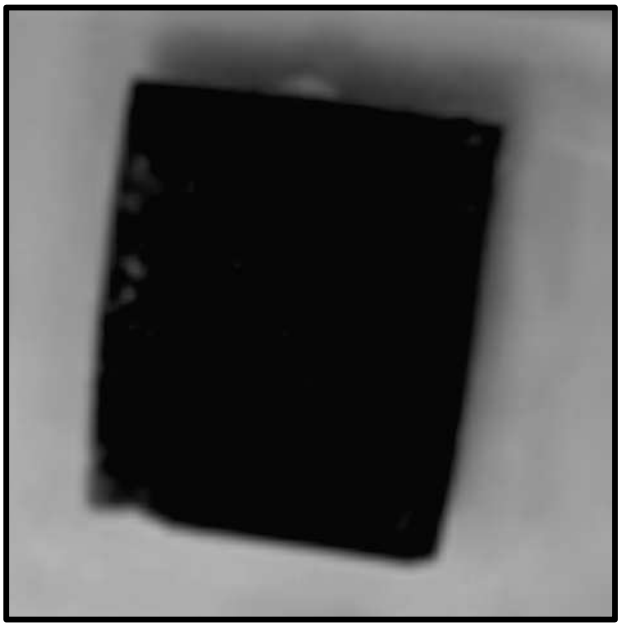


Figure 7

Solid Surface
Surfactant Templated Film
Solid Surface



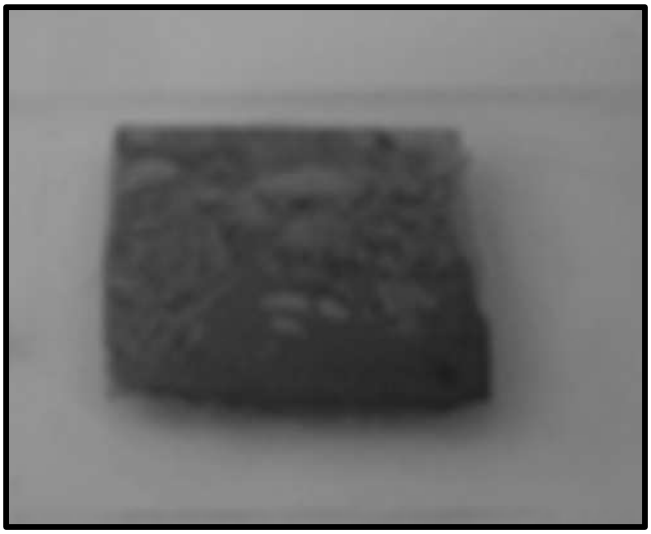
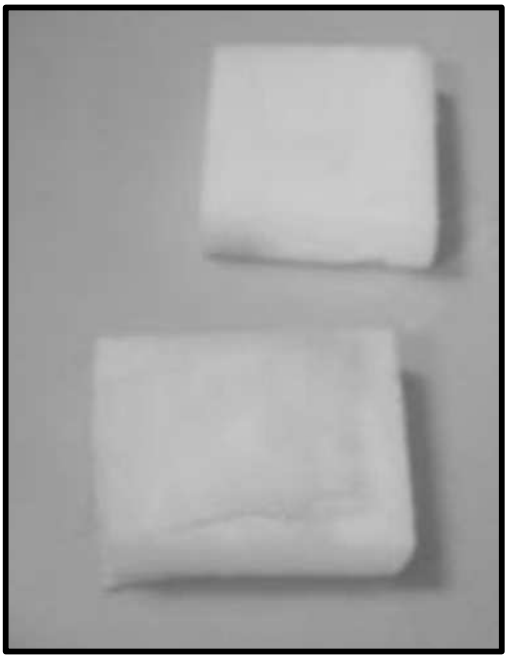


Figure 8A

Solid Surface
Porous Surface
Surfactant Templated Film
Porous Surface
Solid Surface



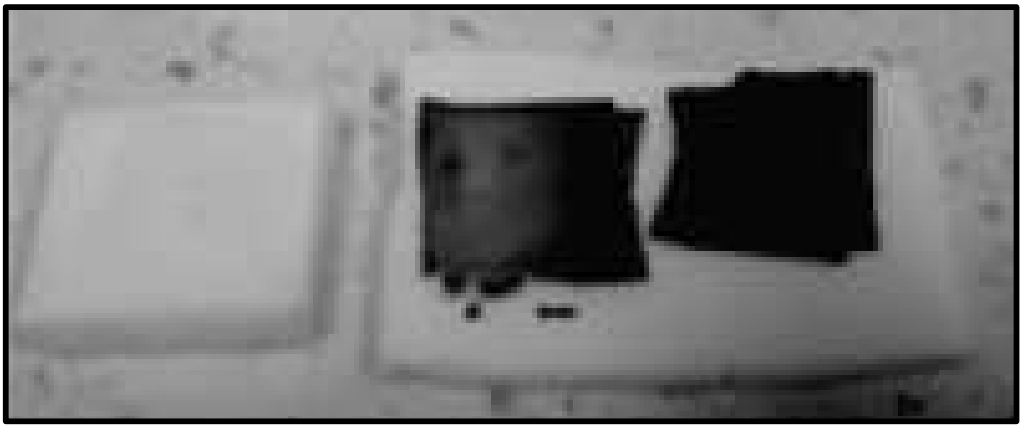
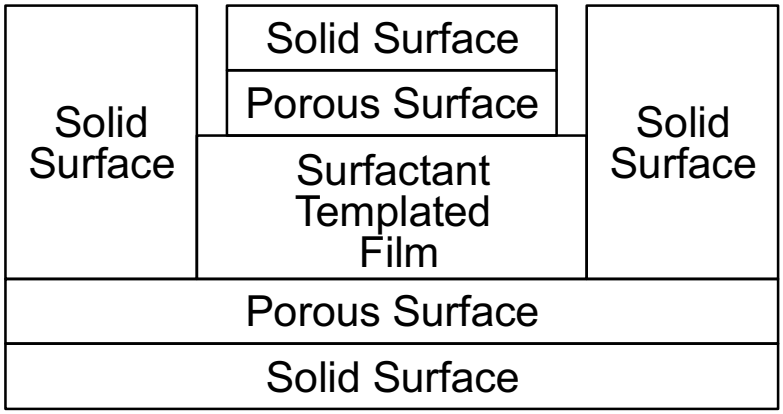
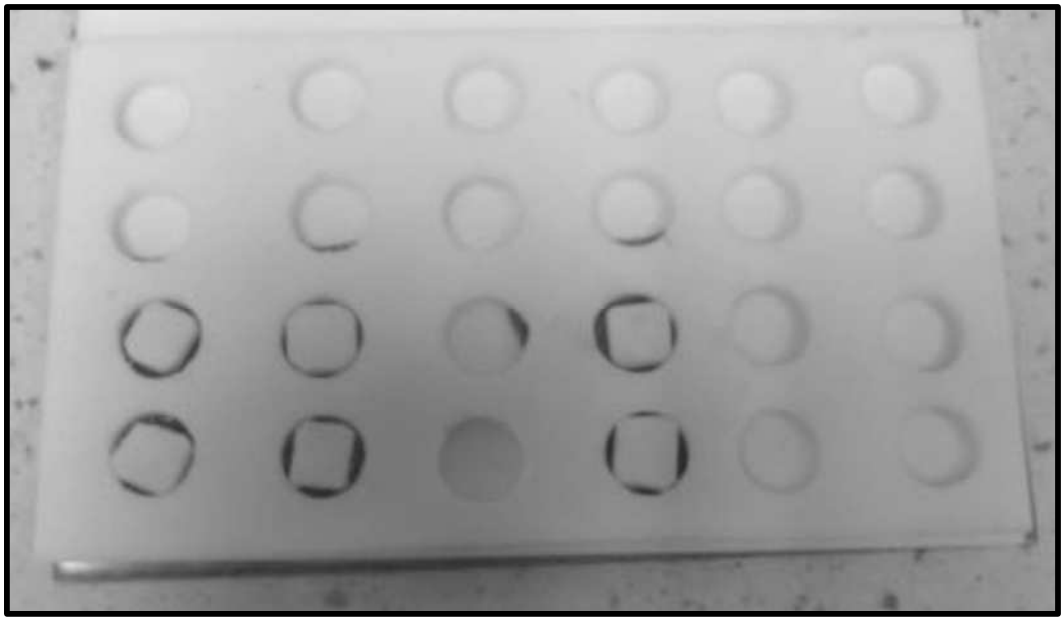


Figure 8B


Solid Surface
Solid Surface
Porous Surface
Surfactant Templated Film
Solid Surface
Porous Surface
Solid Surface



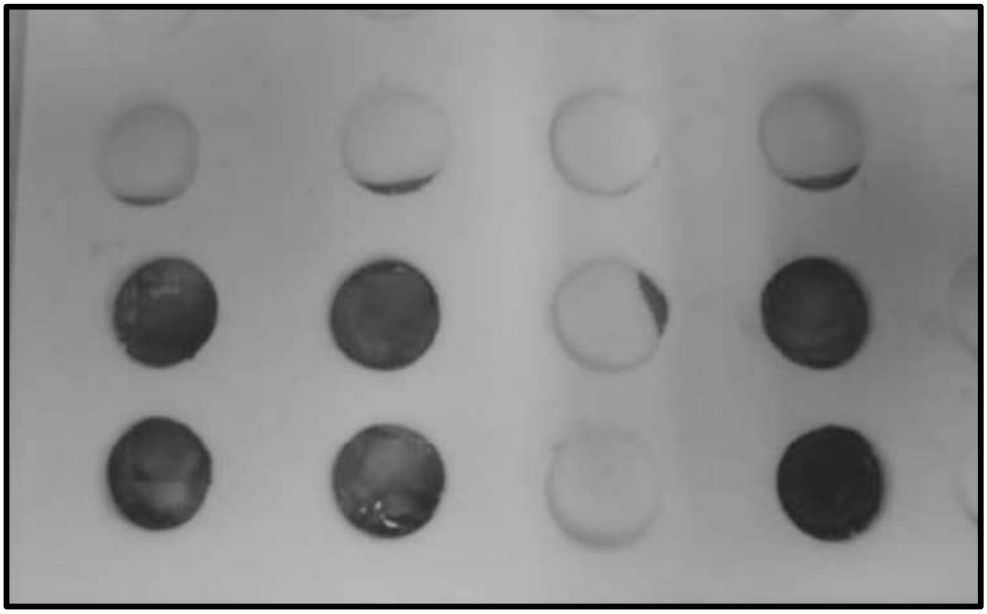


Figure 8C

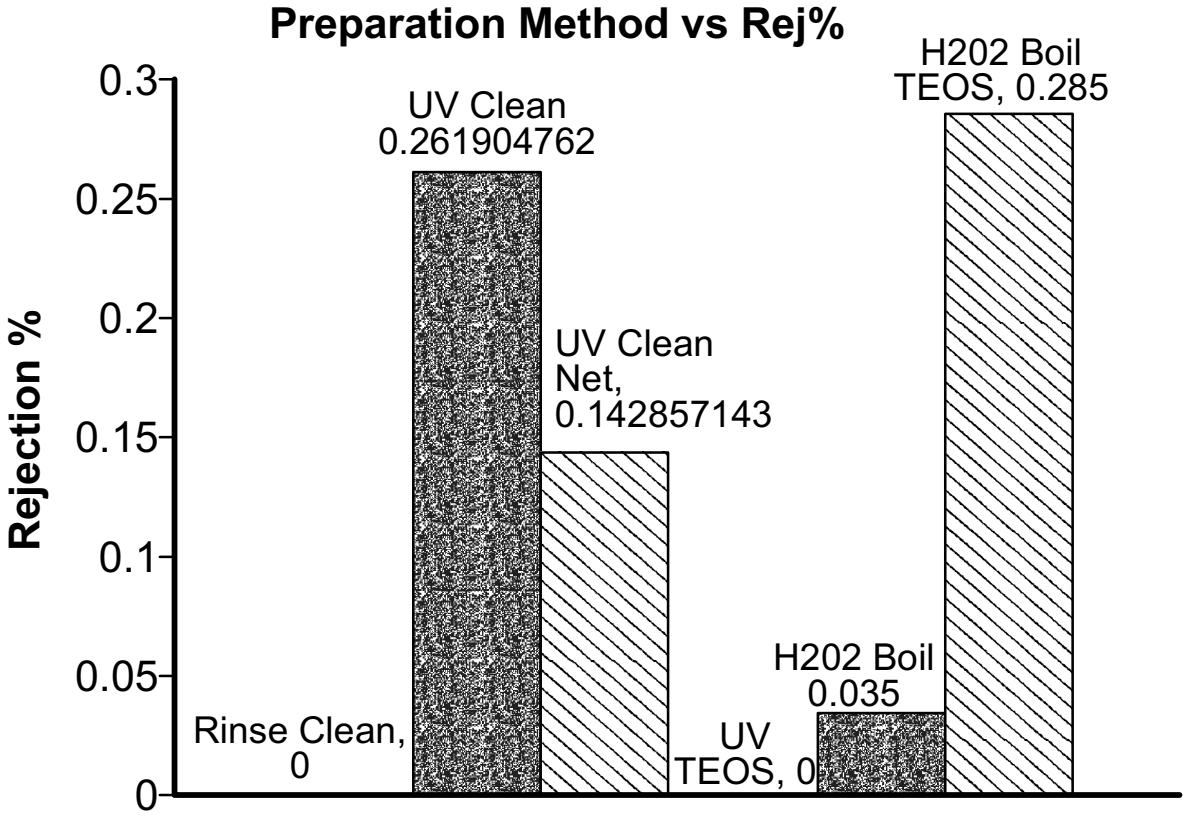


Figure 9A

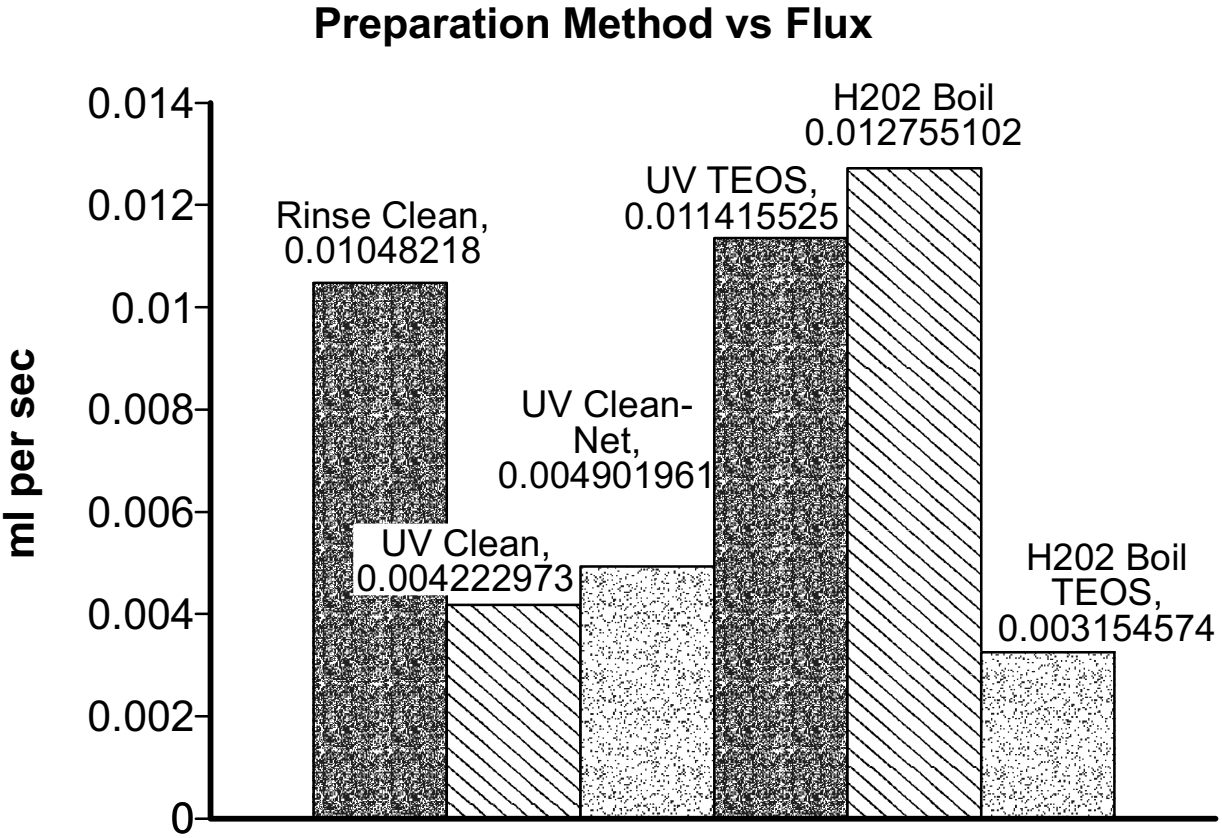


Figure 9B

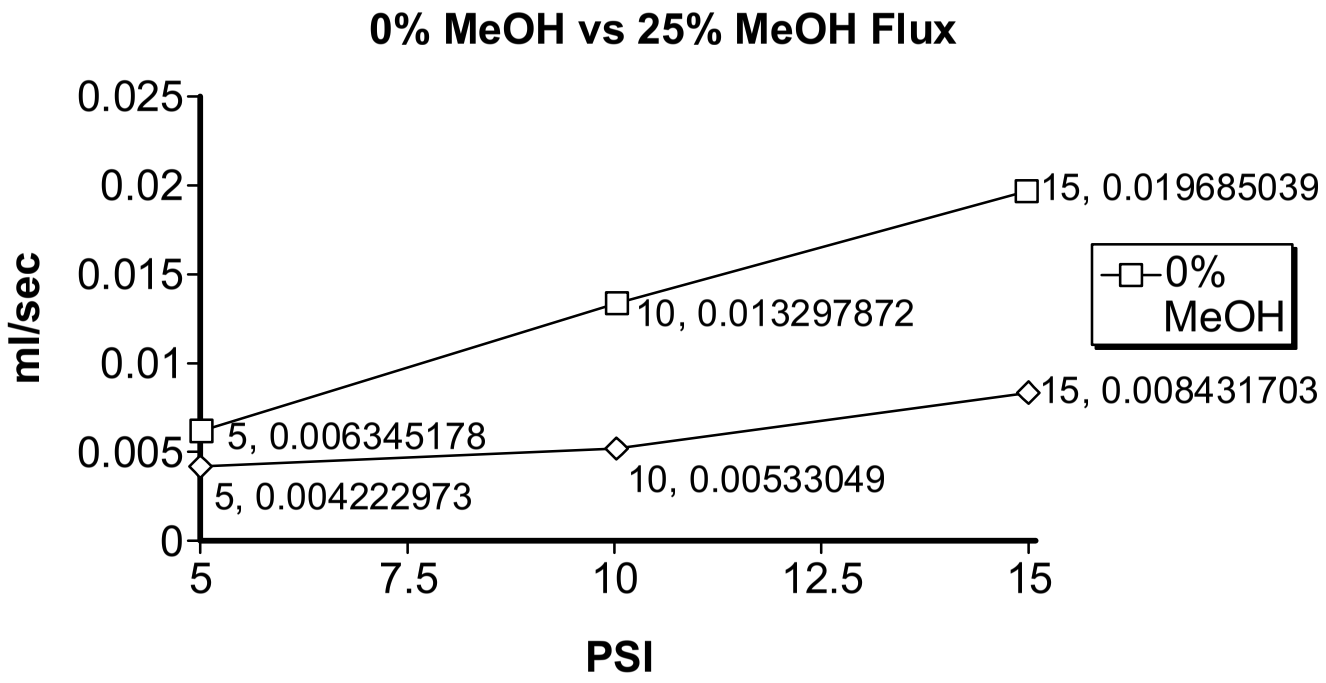

0% MeOH vs 25% MeOH Flux
0.025
0.02
0.015
0.01
0.005
0
ml/sec
5
7.5
10
12.5
15
PSI
15, 0.019685039
10, 0.013297872
5, 0.006345178
15, 0.008431703
10, 0.00533049
5, 0.004222973
0%
MeOH

Figure 10

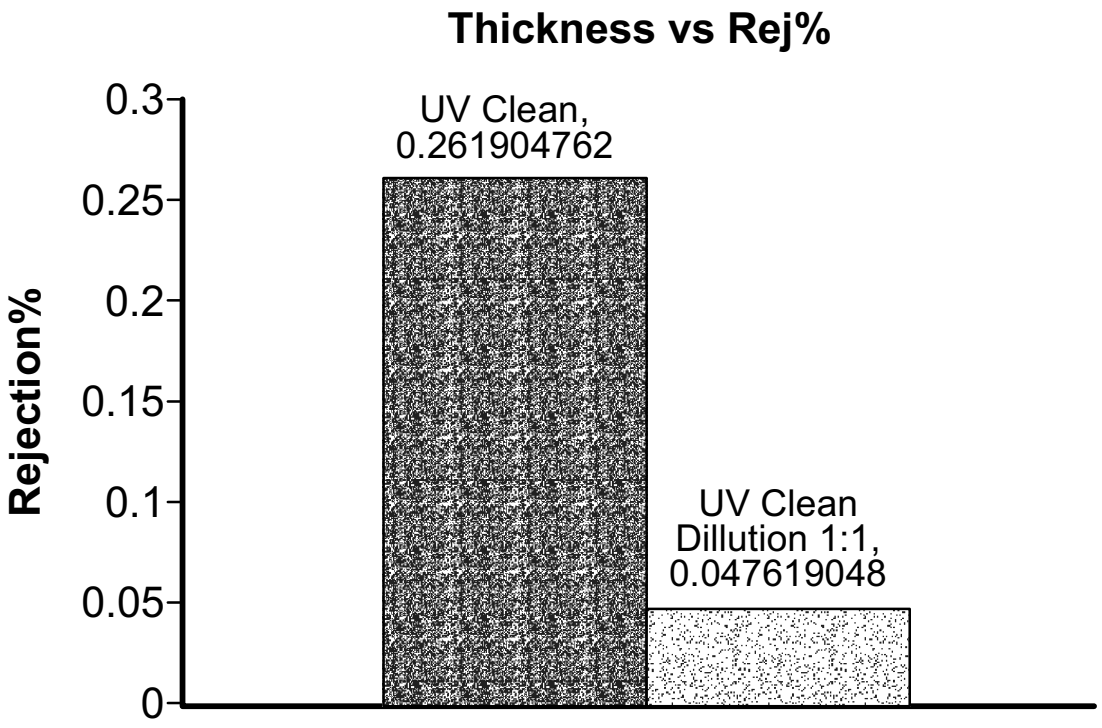


Figure 11A

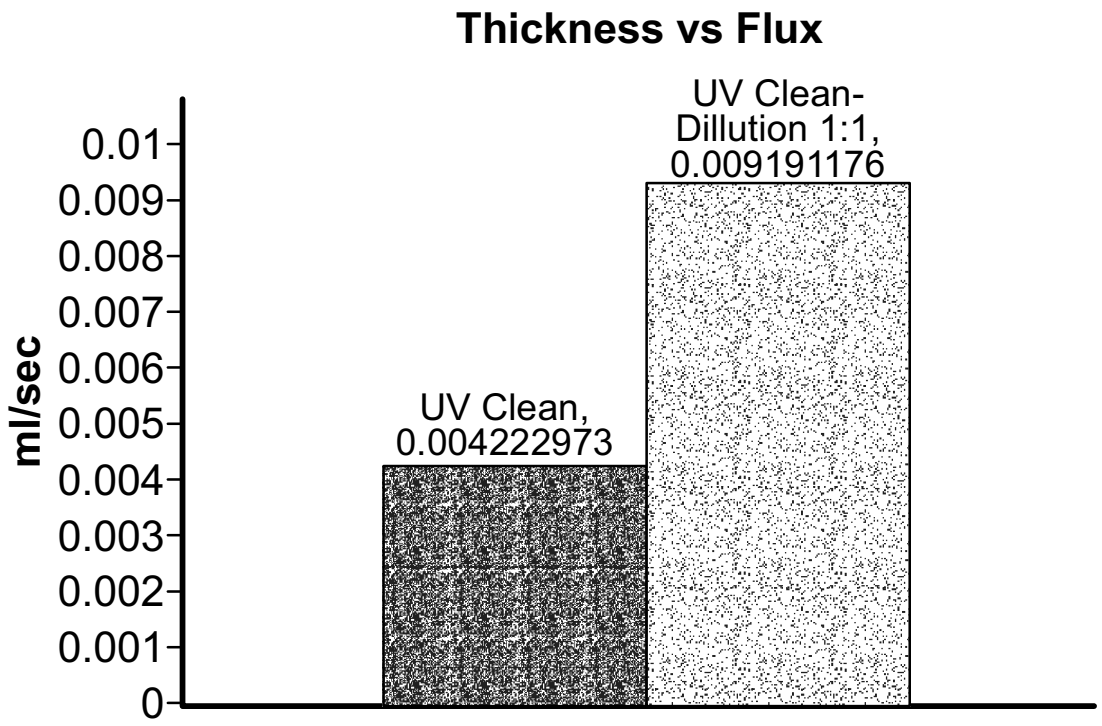


Figure 11B

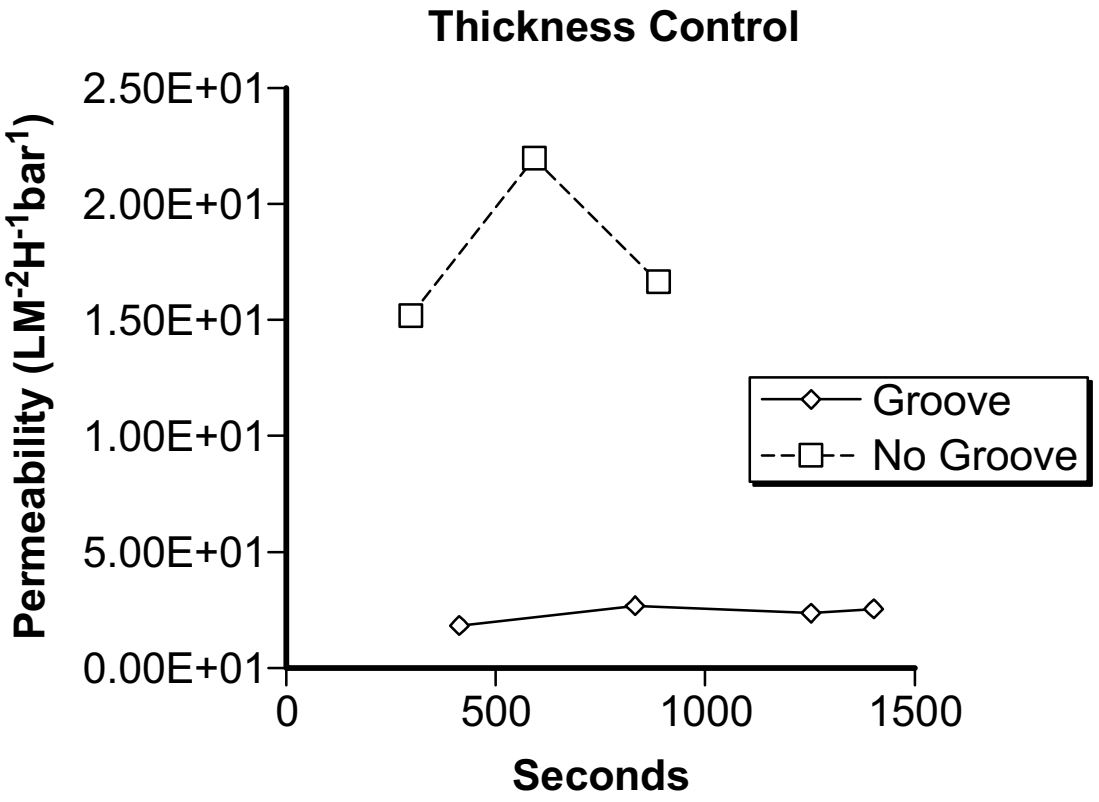


Figure 12

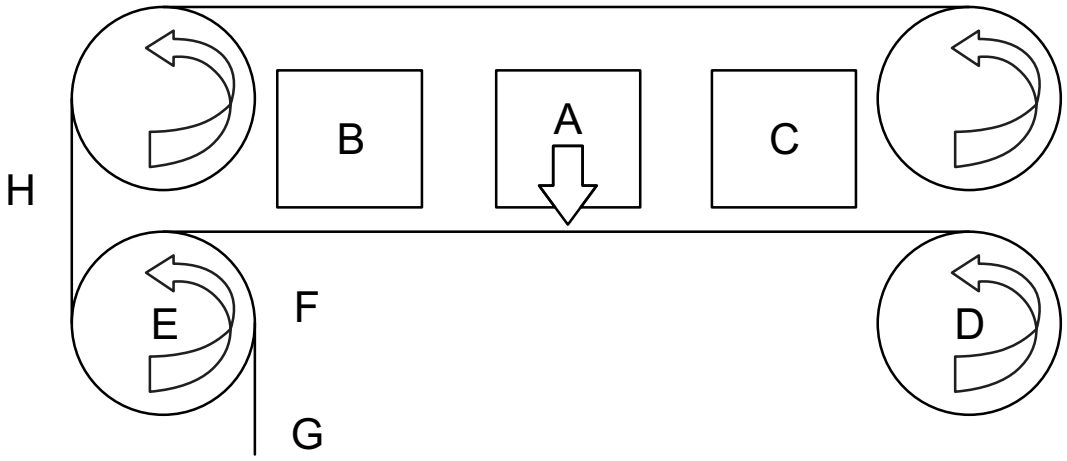


Figure 13

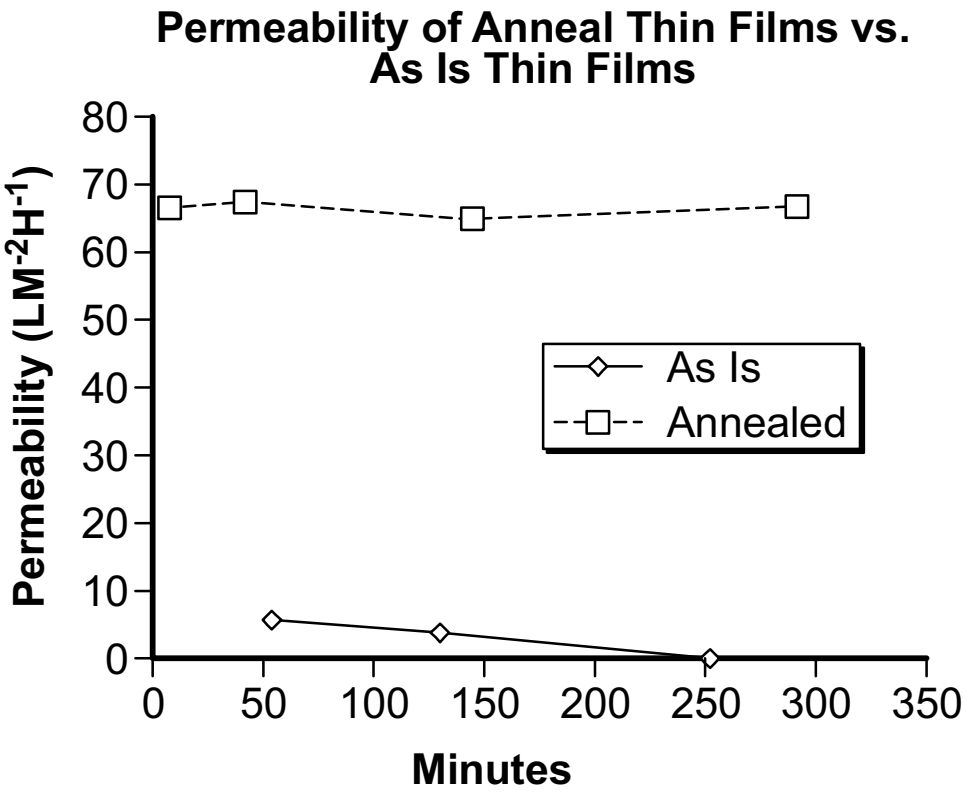

Permeability of Anneal Thin Films vs.
As Is Thin Films
Permeability (LM-2H-1)
80
70
60
50
40
30
20
10
0
0
50
100
150
200
250
300
350
Minutes
As Is
Annealed

Figure 14

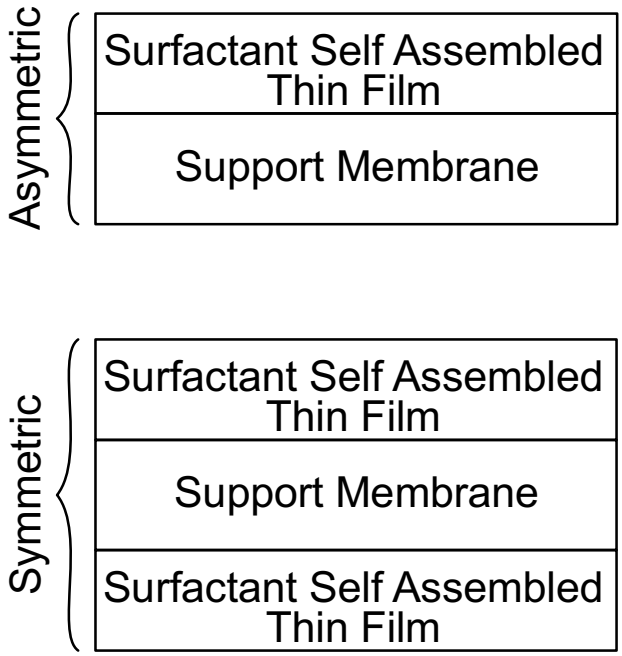


Figure 15

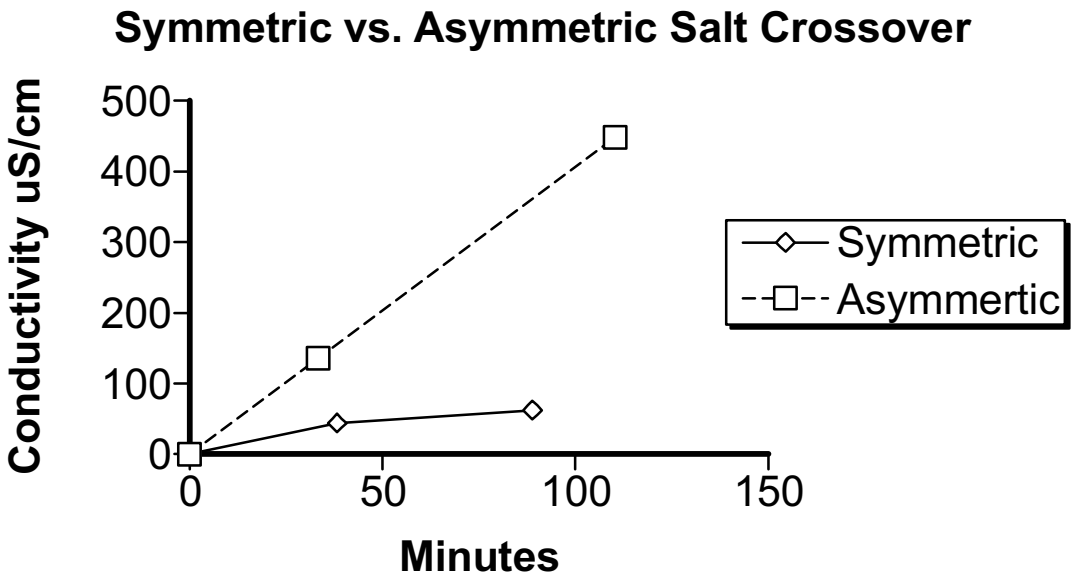


Figure 16

Figure 17

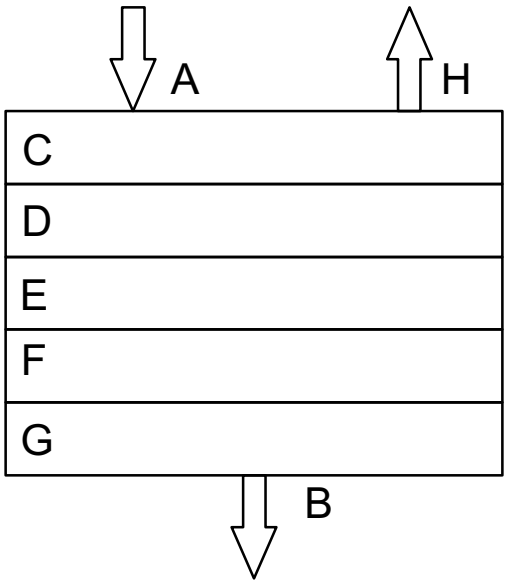


Figure 18

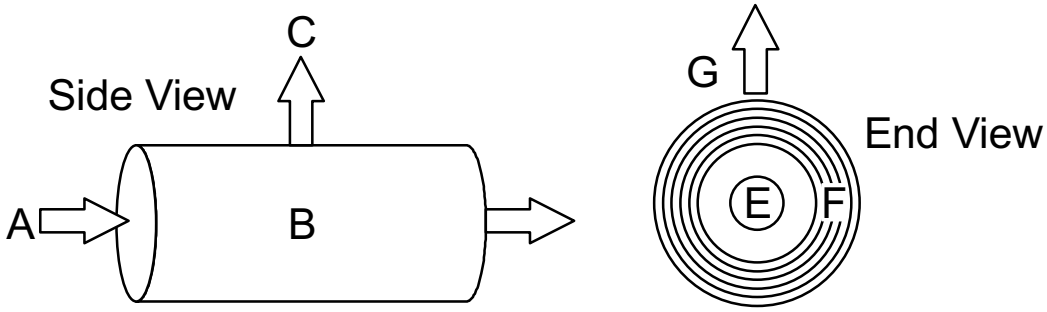


Figure 19

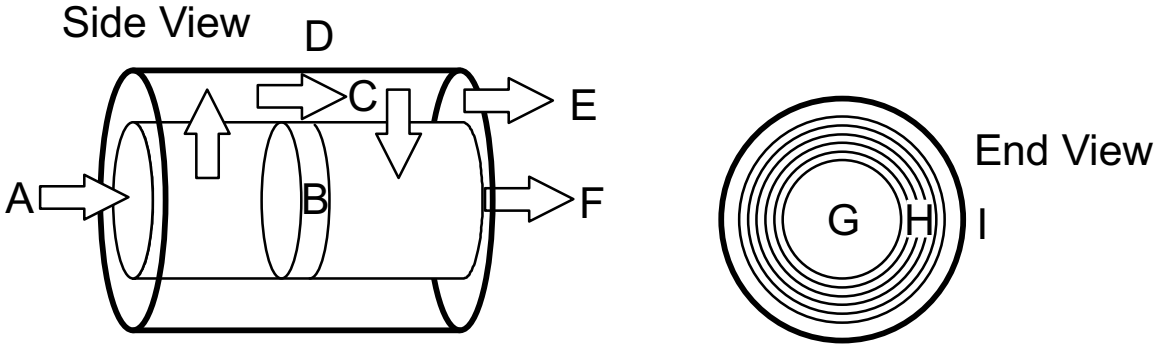


Figure 20

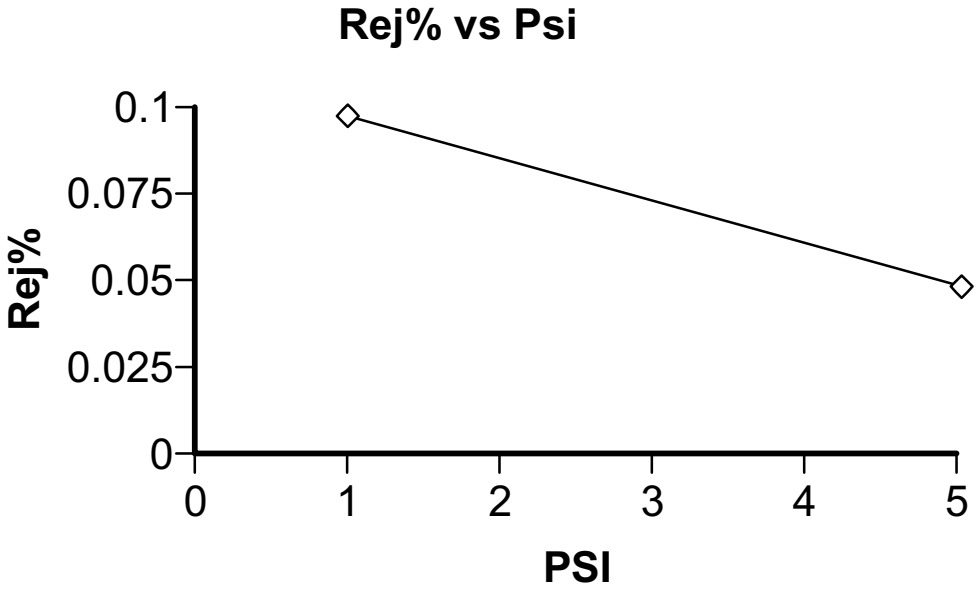


Figure 21A

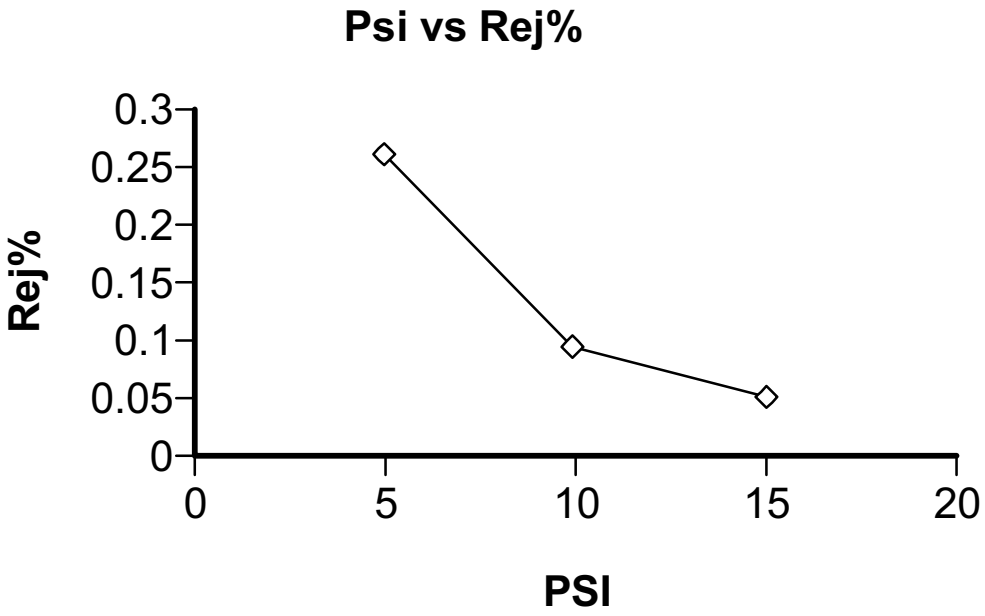


Figure 21B

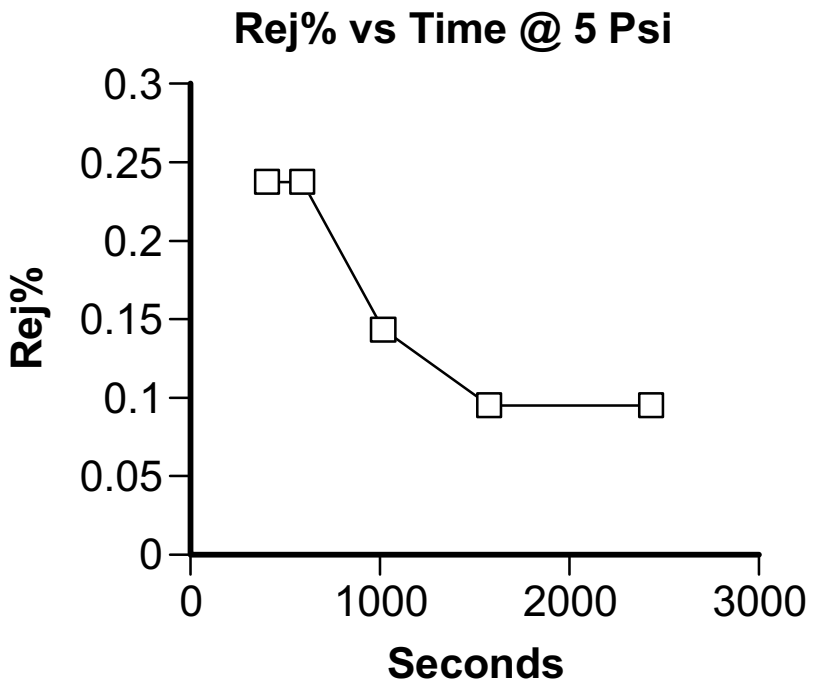


Figure 22A

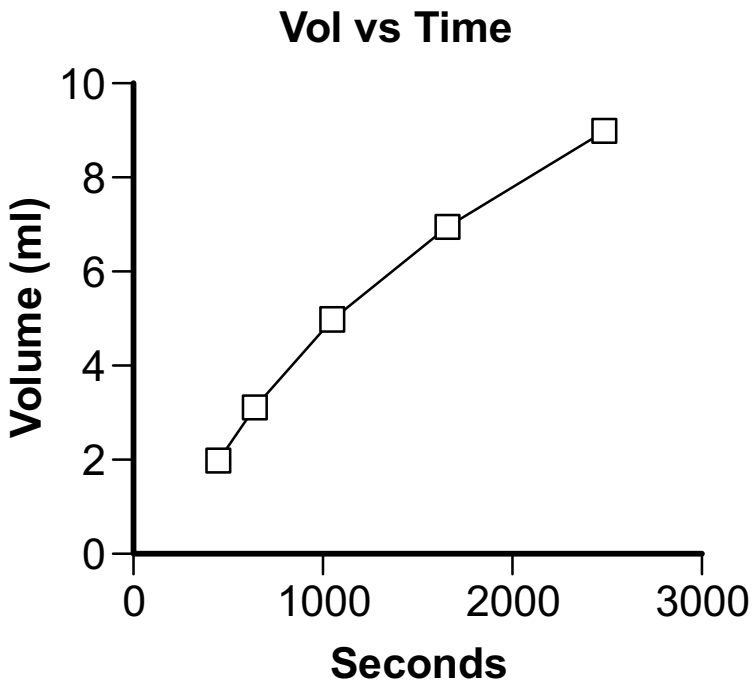


Figure 22B

Initial	Methanol Concentration	Volume
Retentate	19%	25 ml
Permeate	0%	0 ml

Final	Methanol Concentration	Volume
Retentate	20%	19.5 ml
Permeate	17%	5.5 ml

Figure 23

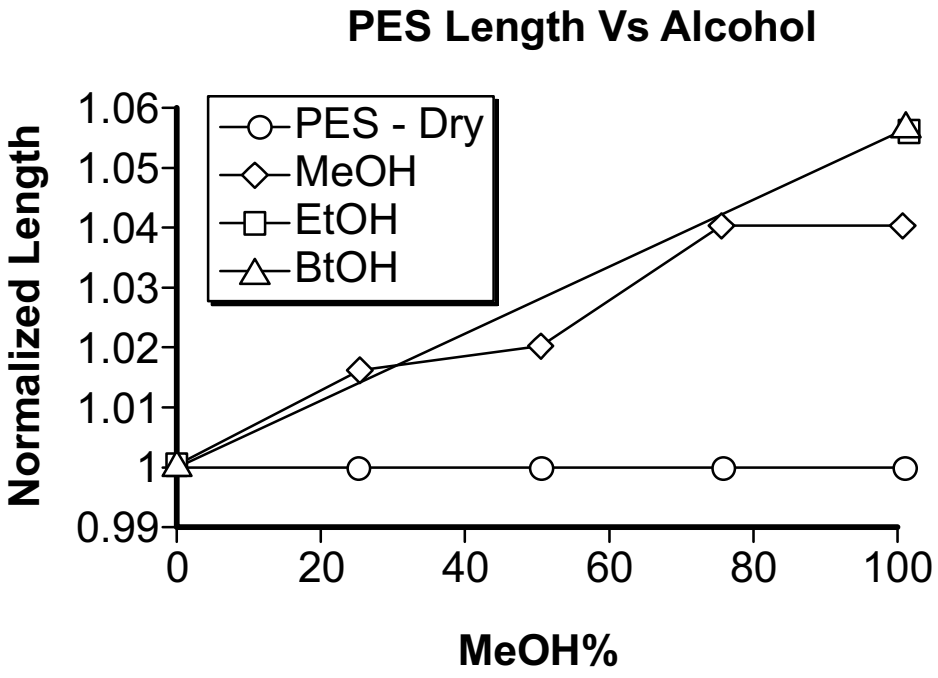


Figure 24A

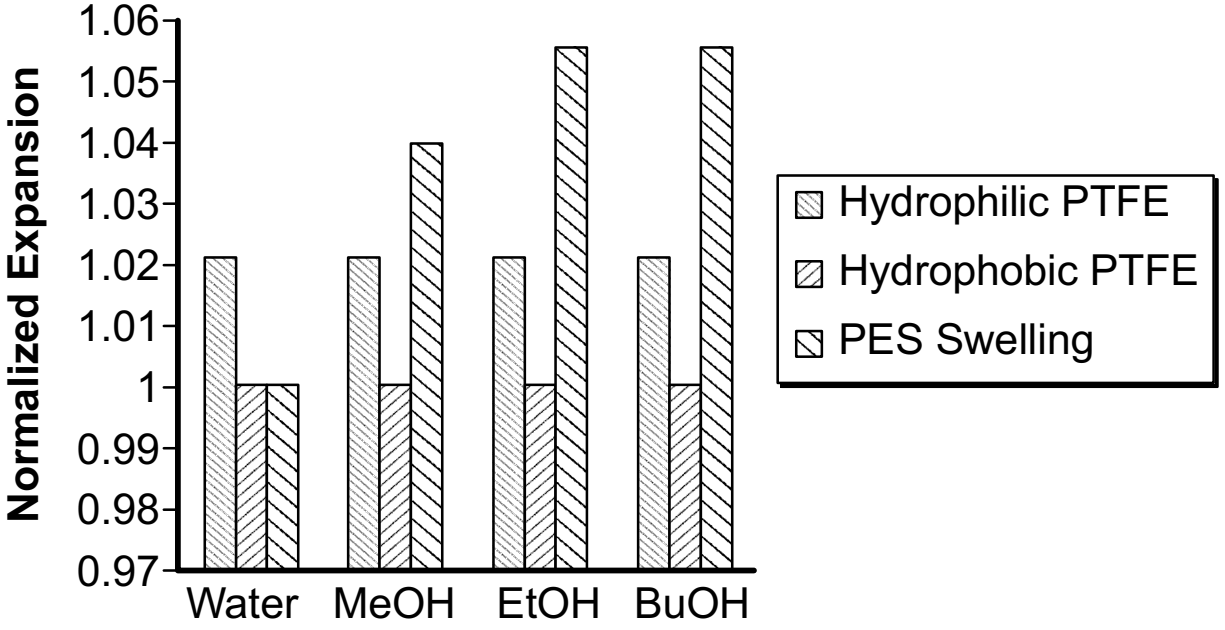


Figure 24B

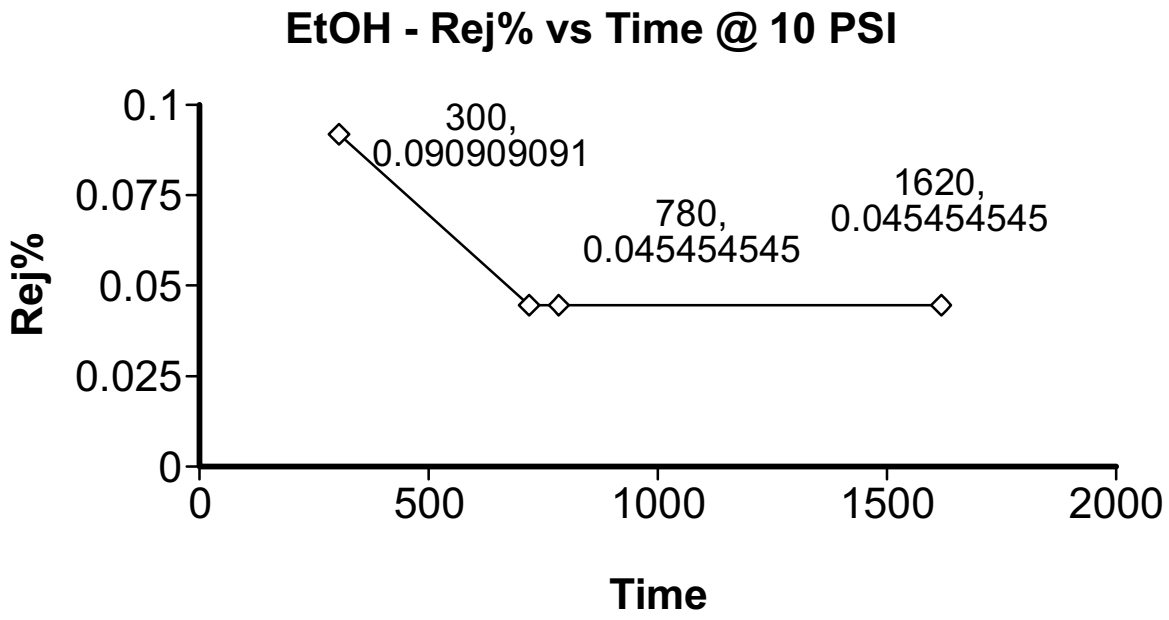


Figure 25A

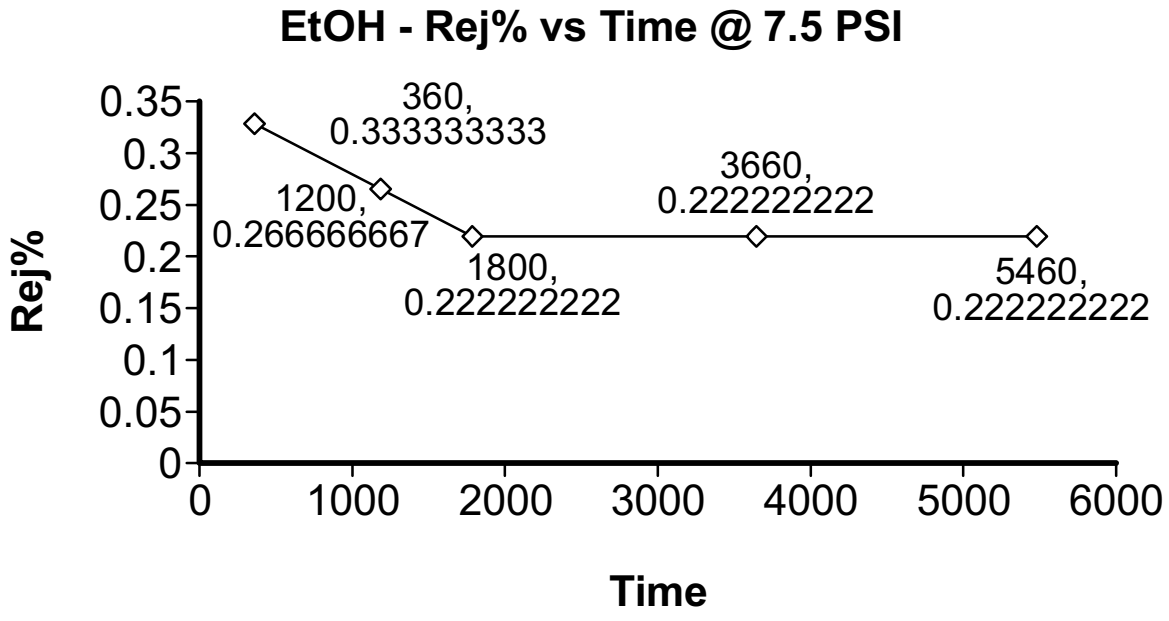


Figure 25B

Initial	Ethanol Concentration	Volume
Retentate	20.5%	25 ml
Permeate	0%	0 ml

Final	Ethanol Concentration	Volume
Retentate	21%	17.5 ml
Permeate	19.2%	7.4 ml

Figure 26

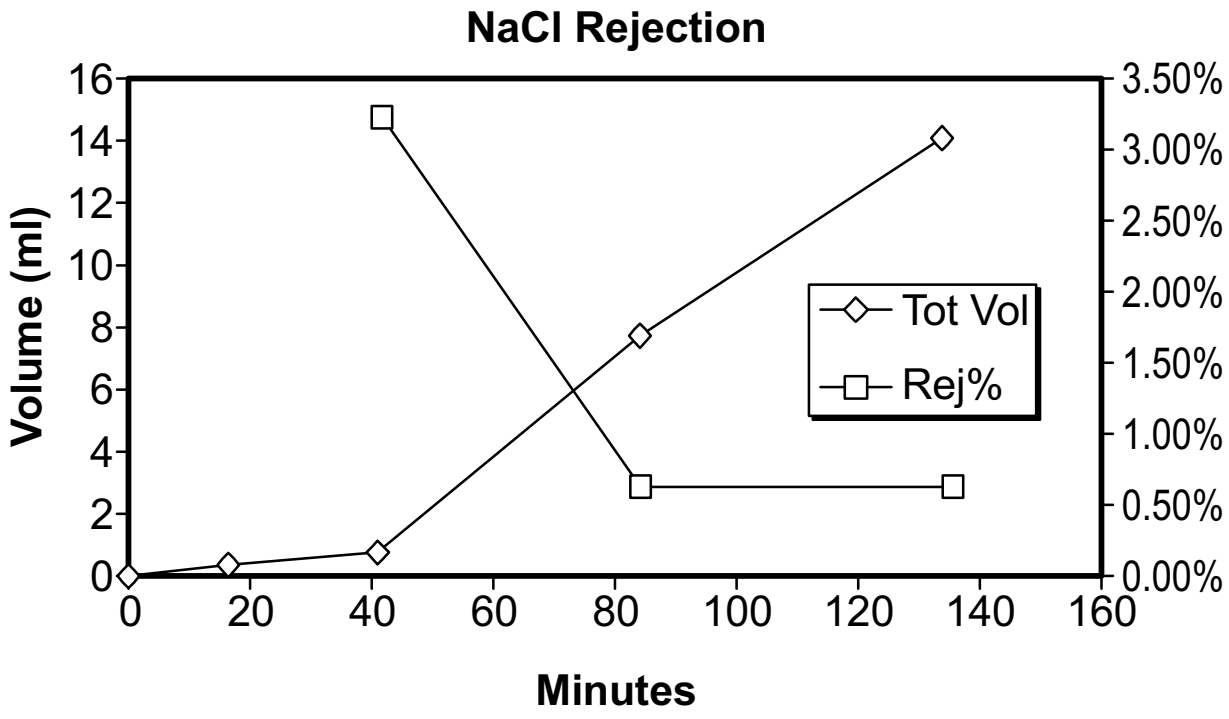


Figure 27

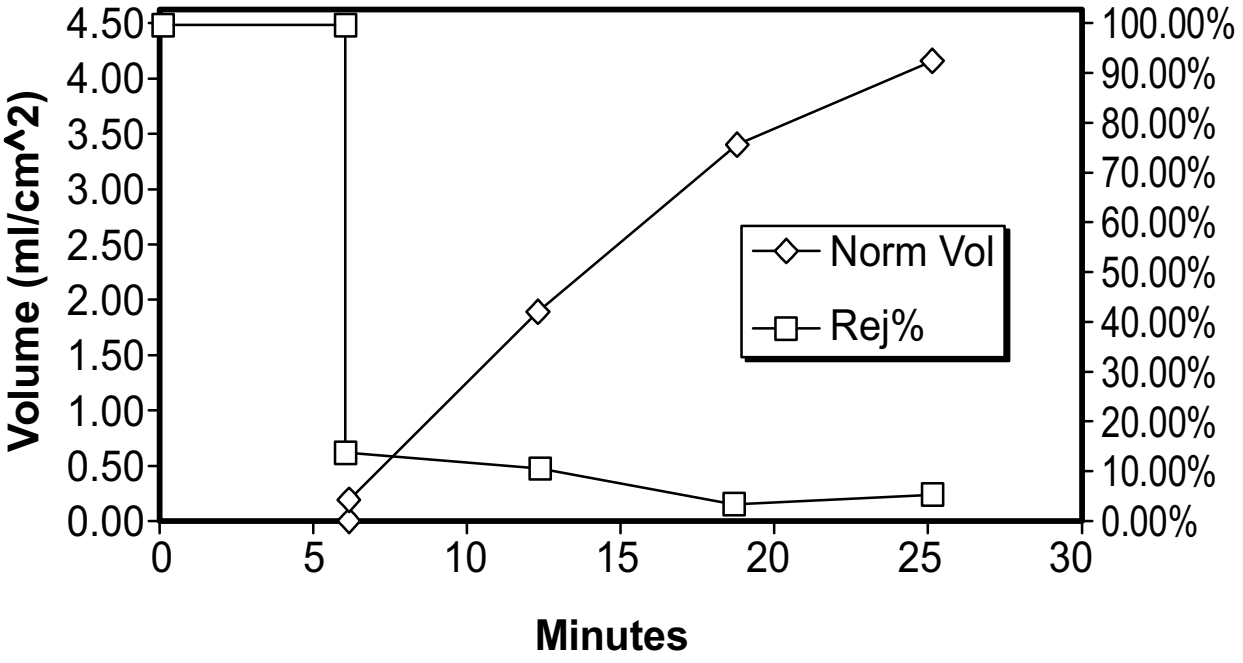


Figure 28

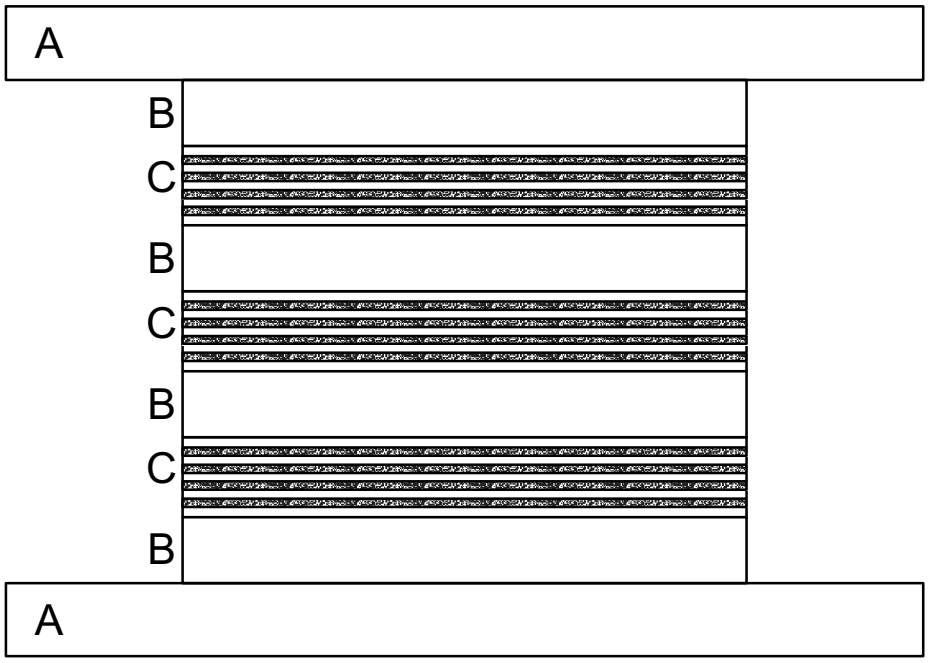


Figure 29

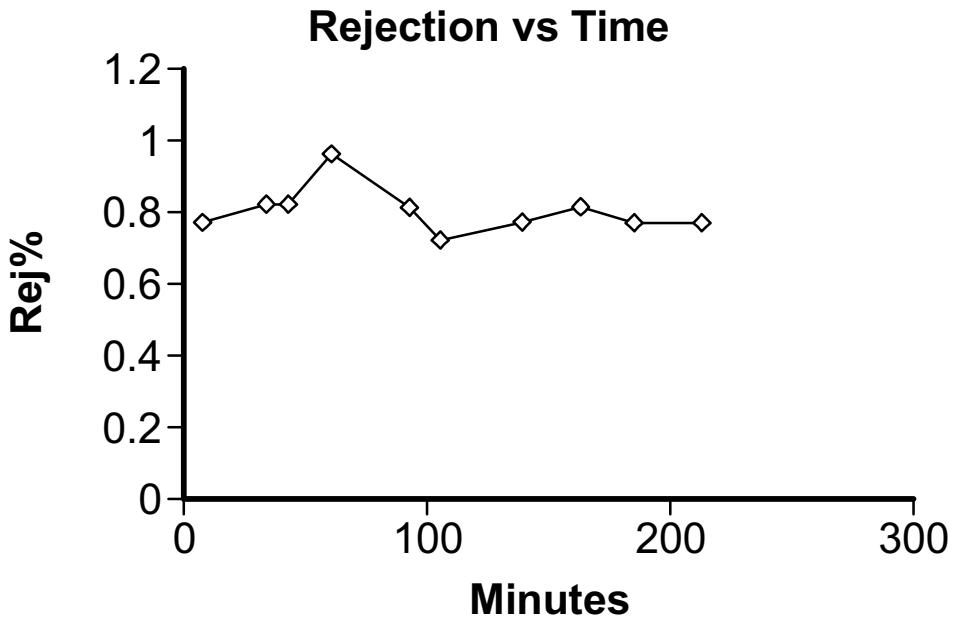


Figure 30A

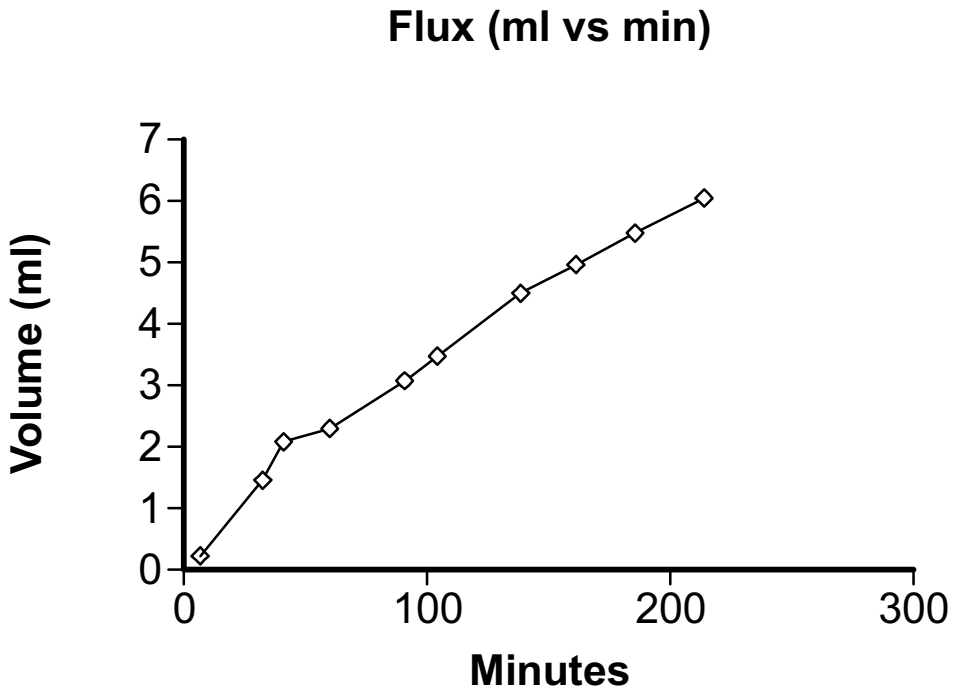


Figure 30B

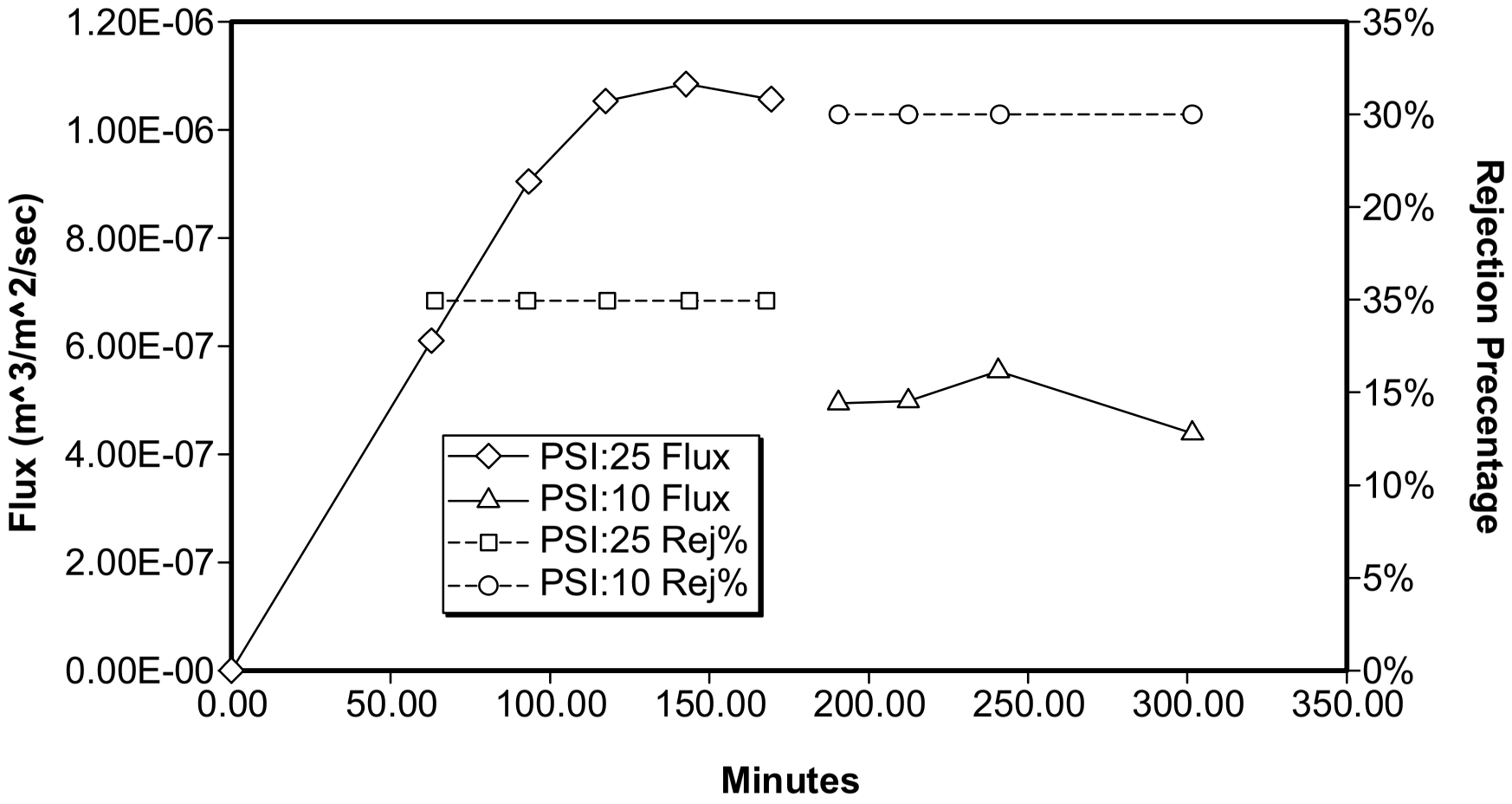

Flux (m^3/m^2/sec)
1.20E-06
1.00E-06
8.00E-07
6.00E-07
4.00E-07
2.00E-07
0.00E-00
Rejection Precentage
35%
30%
20%
35%
15%
10%
5%
0%
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
Minutes
PSI:25 Flux
PSI:10 Flux
PSI:25 Rej%
PSI:10 Rej%

Figure 31

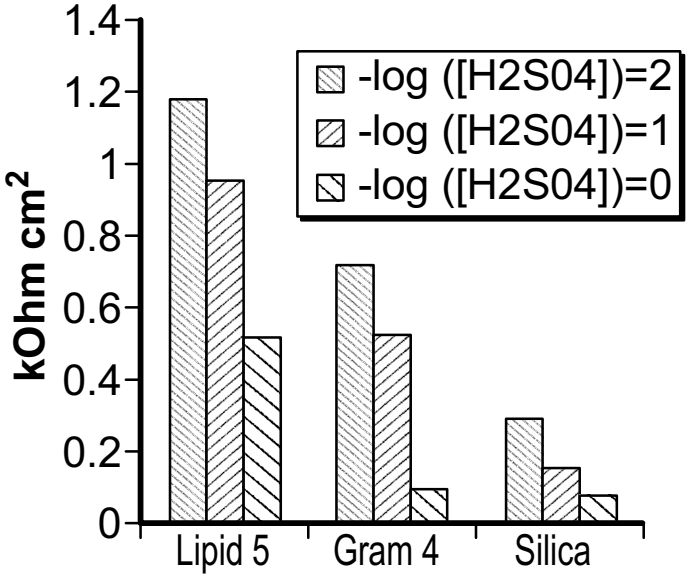


Figure 32A

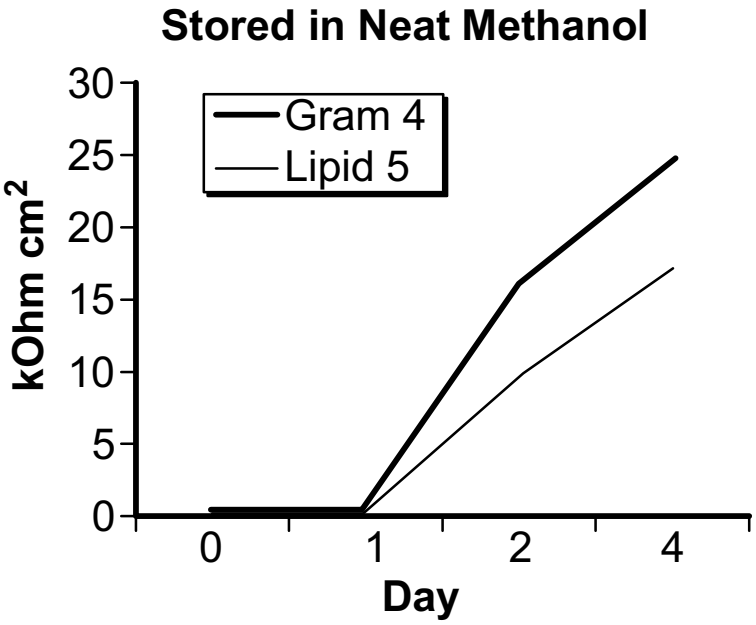


Figure 32B

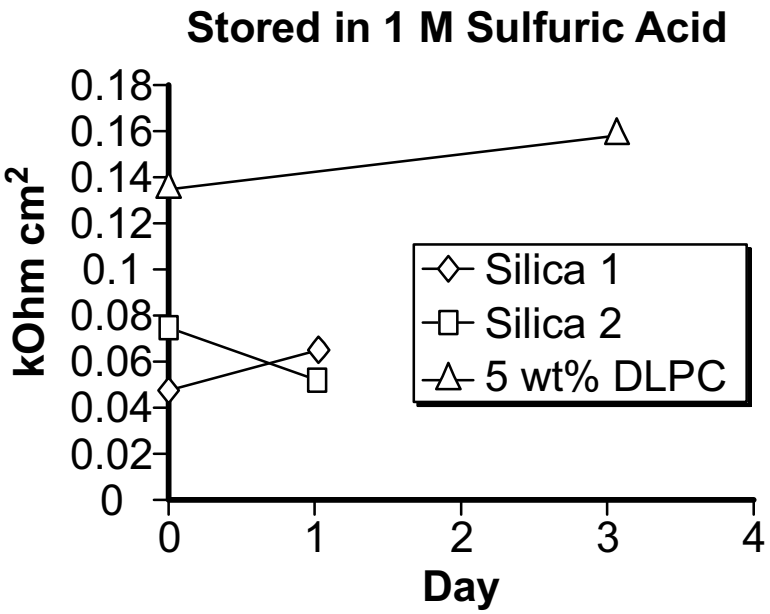


Figure 32C

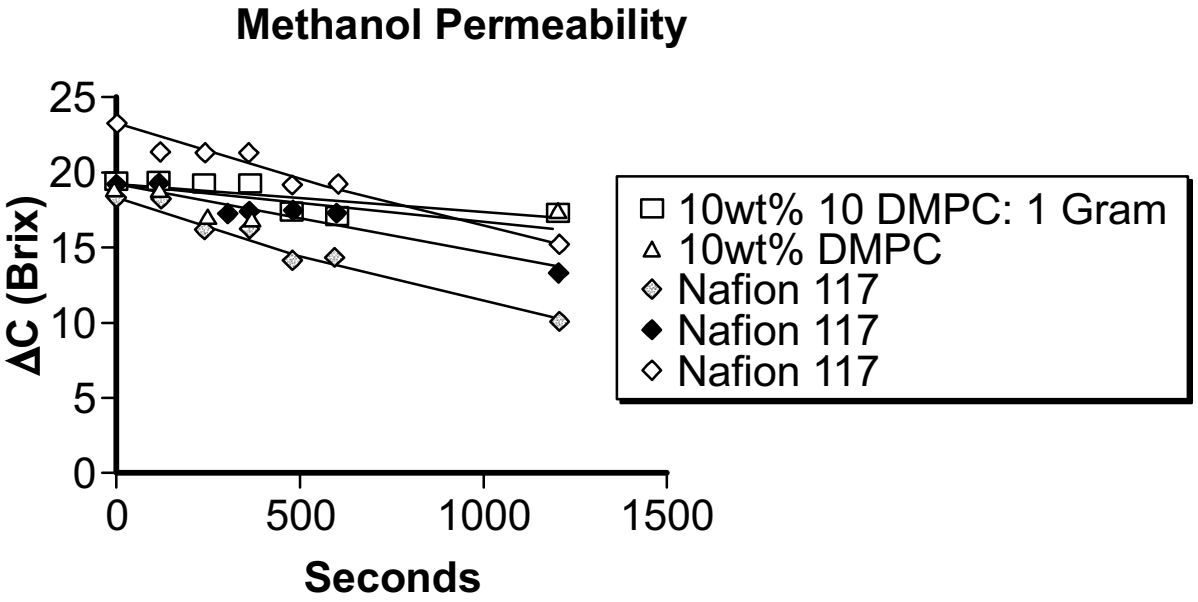


Figure 32D

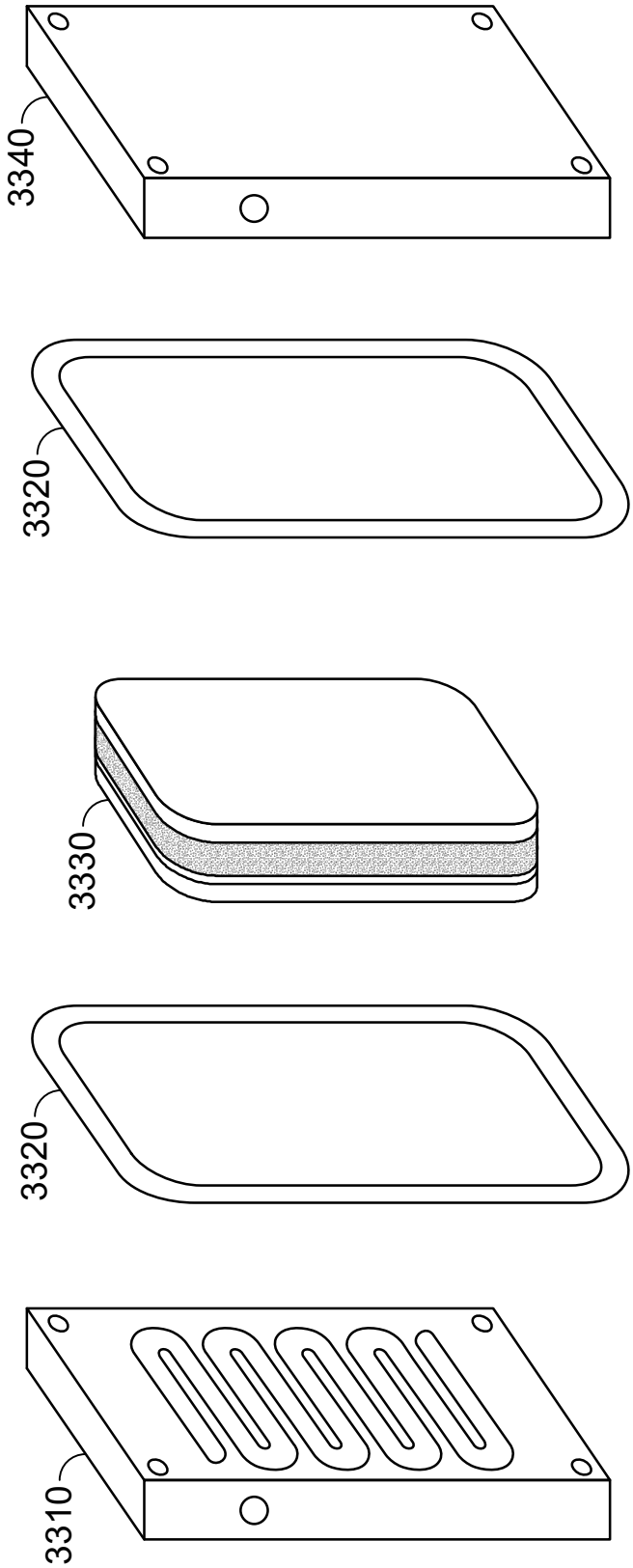


Figure 33