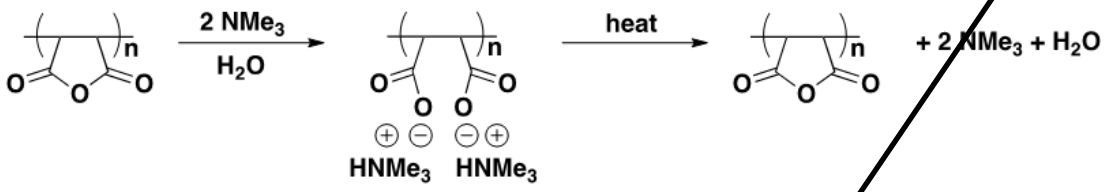
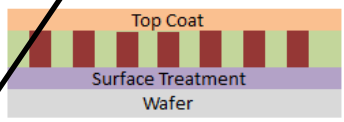
FIGURE 1









Not soluble in polar casting solvent
Cannot spin-coat onto block copolymer

- Spin-coatable out of base
- BUT, now it has a high surface energy because it is very polar

- Lower surface energy!
- Enables perpendicular orientation of block copolymer

FIGURE 2

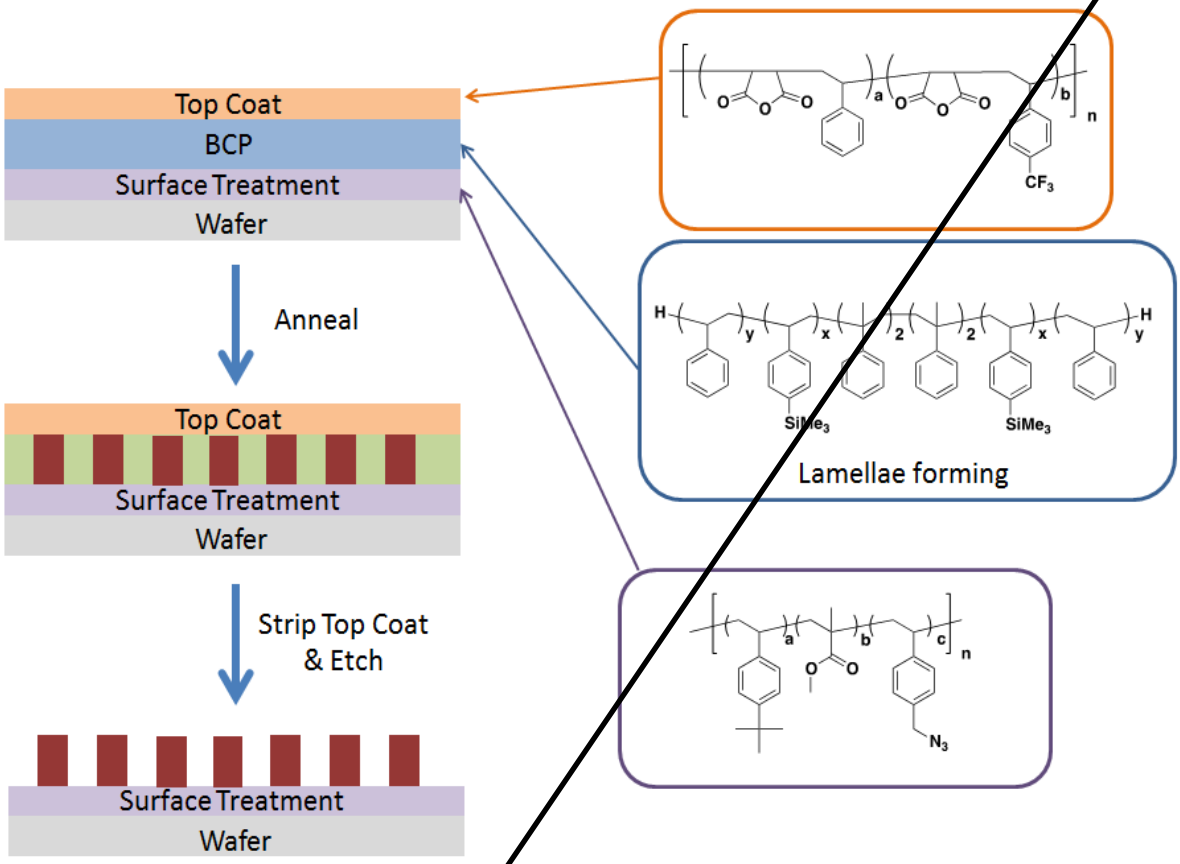
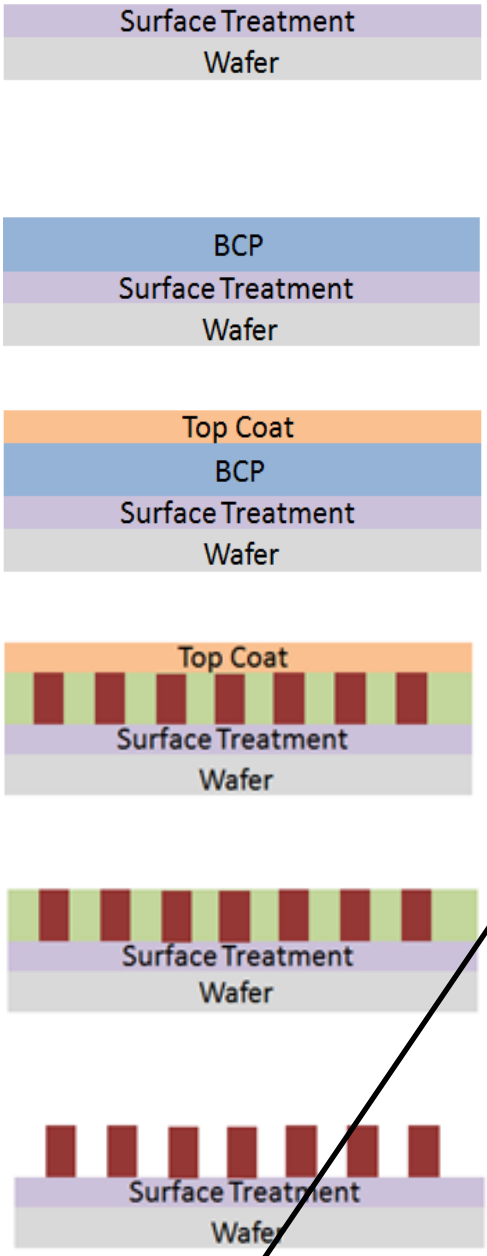

Top Coat
BCP
Surface Treatment
Wafer
Anneal
Top Coat
Surface Treatment
Wafer
Strip Top Coat & Etch
Surface Treatment
Wafer
Lamellae forming

FIGURE 3



1) Surface treatment is dissolved in toluene and spin coated
2) Cross-linked at 250 °C for 5 min
3) Washed with toluene 2 times

4) Block copolymer is dissolved in toluene and spin coated

5) Top coat is dissolved in aqueous trimethylamine and spin coated.

6) Anneal the thin films at 190 °C for 1 minute.

7) Strip the top coat by spinning the wafer at 3000 rpm and applying 40 drops of aqueous trimethyl amine followed by 10 drops of methanol

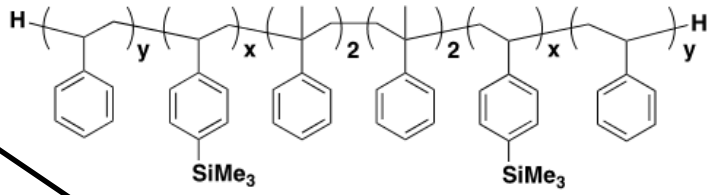
8) Oxygen plasma etch the block copolymer with the following conditions:

Pressure=20 mTorr, RF Power=10 W, ICP Power=50 W, O2 flow rate=75 sccm, Argon flowrate=75 sccm, temperature=15 °C, time=30 sec

FIGURE 4

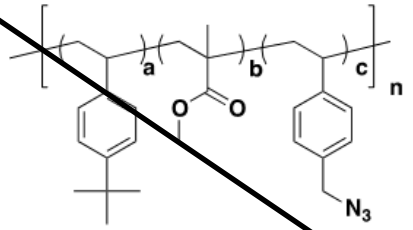
X			Y		
R_1	R_2	R_3	R_4	R_5	R_6
—H	—CF_3	—H	—H	—CF_3	—H
—F	—H	—CF_3	—F	—H	—CF_3
—CF_3	—H	—CF_3	—CF_3	—H	—CF_3
—H	—$C(CH_3)_3$	—H	—H	—$C(CH_3)_3$	—H
—$C(CH_3)_3$	—H	—$C(CH_3)_3$	—$C(CH_3)_3$	—H	—$C(CH_3)_3$
—H	—$SiMe_3$	—H	—H	—$SiMe_3$	—H
—H	—Me	—H	—H	—Me	—H

Block copolymer:



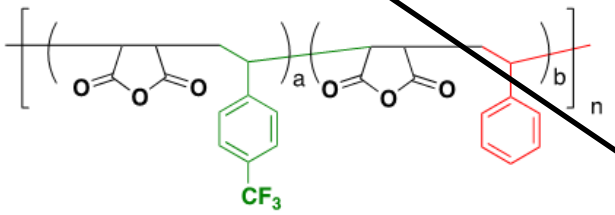
L_0= 30 nm

Surface treatment:



Composition (mol%)
a:b:c = 46:48:6

Top coat:



Composition
(mol% MA-CF_3S-S): 48-37-15

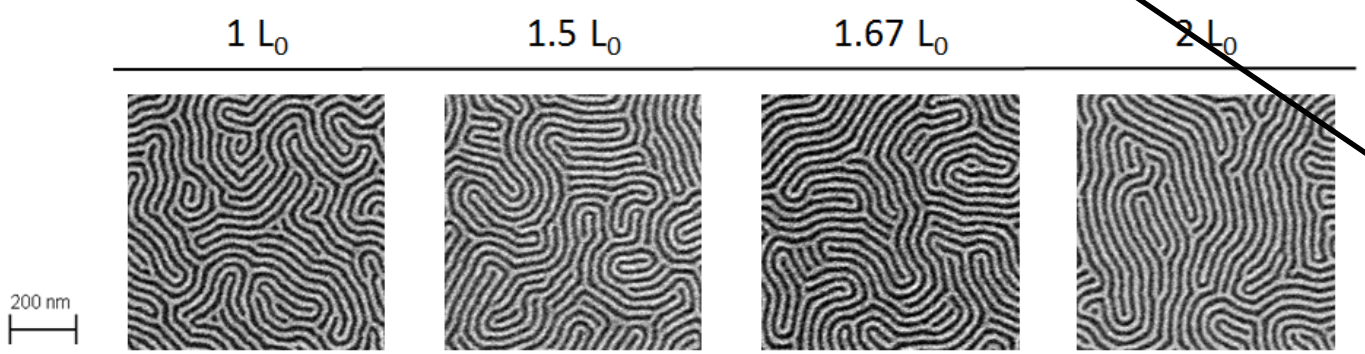
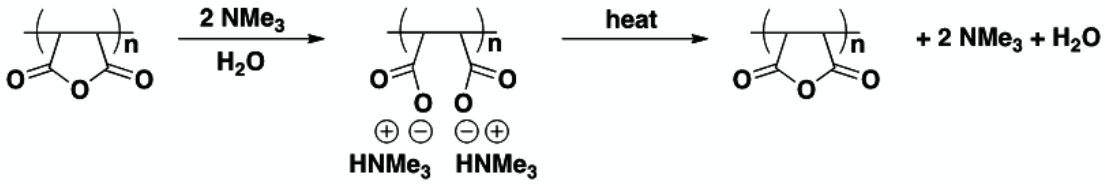


FIGURE 5

FIGURE 6

Block copolymer:
Surface treatment:
Top coat:
B With Top Coat
No Top Coat
100 nm

FIGURE 1





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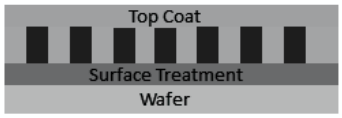
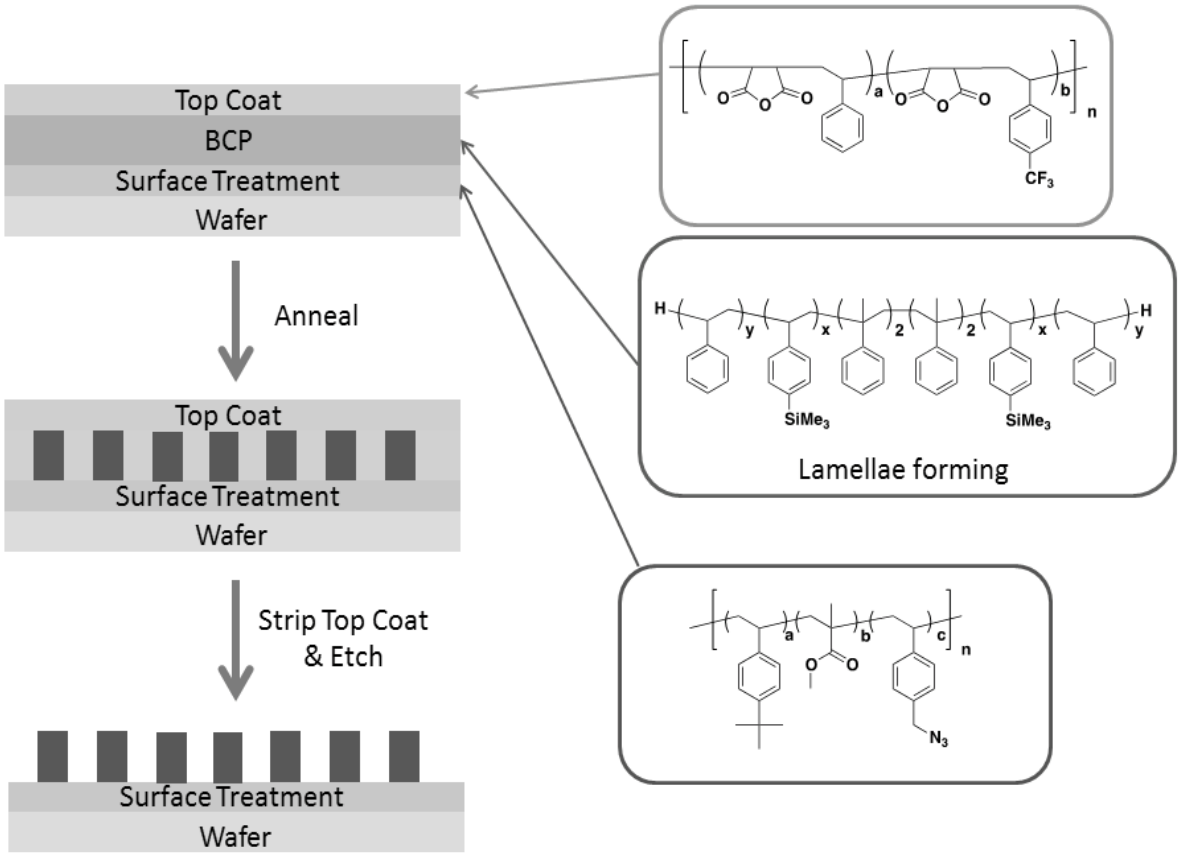


- Lower surface energy!
- Enables perpendicular orientation of block copolymer

FIGURE 2


Top Coat
BCP
Surface Treatment
Wafer
Anneal
Top Coat
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Wafer
Strip Top Coat
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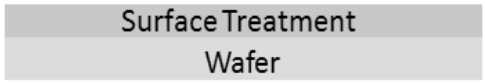
Surface Treatment
Wafer
Lamellae forming

FIGURE 3



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—CF_3	—H	—CF_3	—CF_3	—H	—CF_3
—H	—$C(CH_3)_3$	—H	—H	—$C(CH_3)_3$	—H
—$C(CH_3)_3$	—H	—$C(CH_3)_3$	—$C(CH_3)_3$	—H	—$C(CH_3)_3$
—H	—$SiMe_3$	—H	—H	—$SiMe_3$	—H
—H	—Me	—H	—H	—Me	—H

FIGURE 5

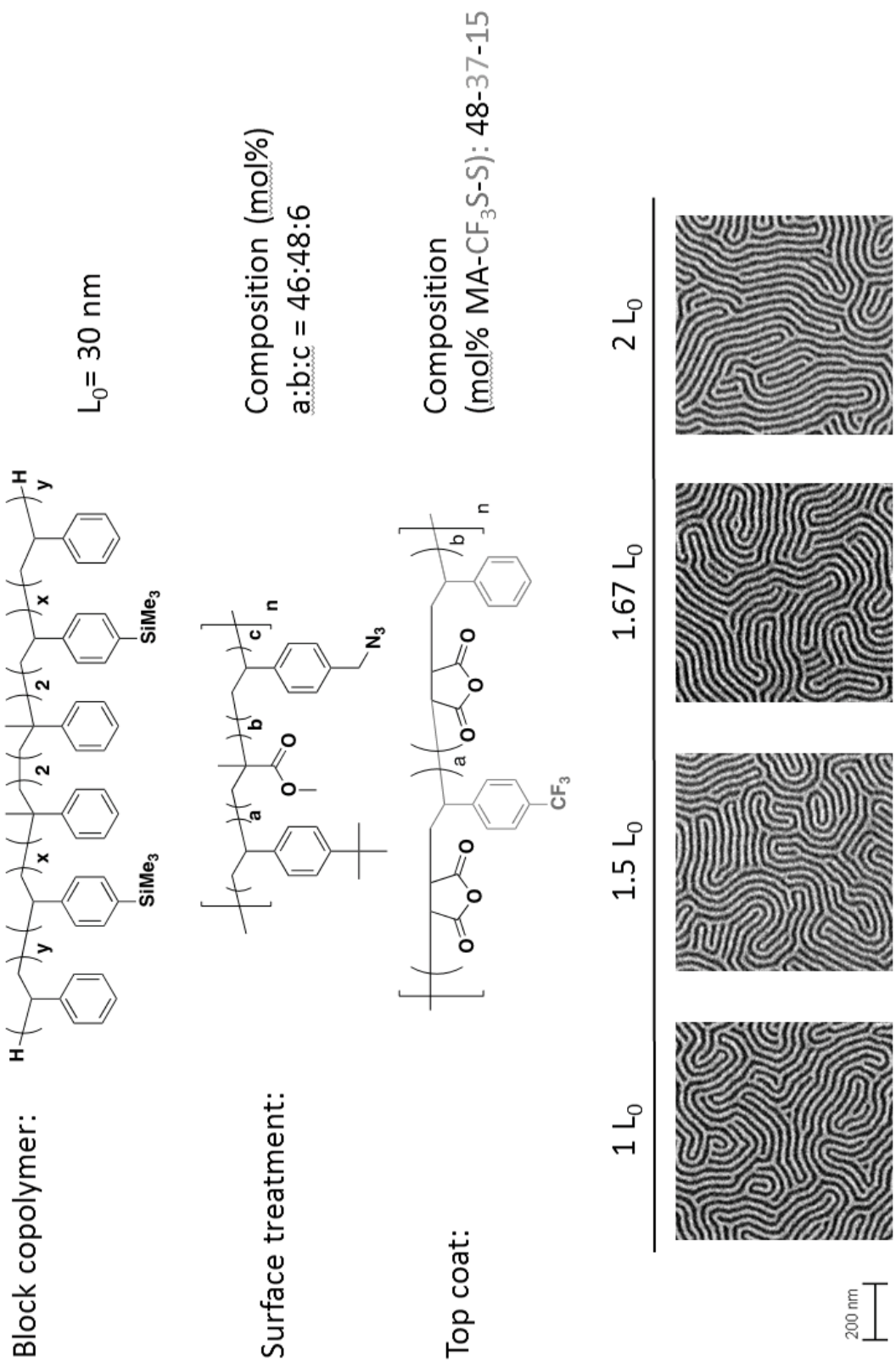
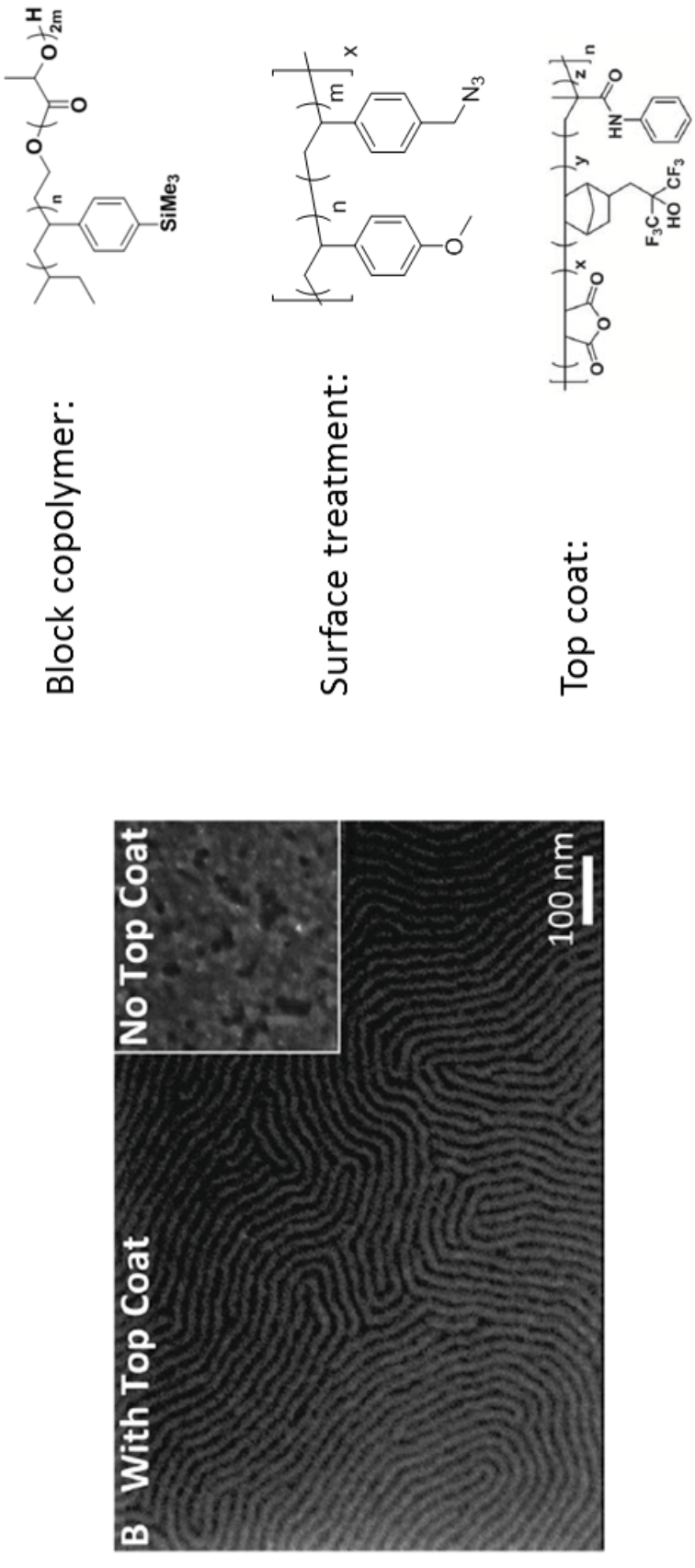

Block copolymer:
L_0= 30 nm
Composition (mol%)
a:b:c = 46:48:6
Surface treatment:
Composition
(mol% MA-CF_3S-S): 48-37-15
Top coat:
1 L_0
1.5 L_0
1.67 L_0
2 L_0
200 nm

FIGURE 6


Block copolymer:
Surface treatment:
Top coat:
B With Top Coat
No Top Coat
100 nm