Supporting Information

Transient block copolymer topologies for generating nanoporous polymer membranes

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Volatility of the casting solvents

The vapor pressures at 20°C are given by $p^0_{THF} = 173\,\text{mbar}$ and $p^0_{DMF} = 3.8$ mbar, i.e. THF has a 48-fold vapor pressure compared to DMF (see Table S1). Assuming a similar diffusivity of the two solvents (similar values of λ) we expect a similar ratio of 48:1 for the evaporation rates.

Evaporation rates were measured for the pure solvents. The data are displayed in Table S1

Table S1. Measured loss of weight for the pure solvents THF and DMF starting from 70 µL and 50 µL respectively.

THF (70 µL)		DMF (50 µL)	
Time [sec]	Mass [mg]	Time [sec]	Mass [mg]
0	61.2	0	48
5	54.2	5	43
15	48.5	10	42.2
25	43	20	42
35	37	30	41.9
45	32	40	41.7
55	27	50	41.4
65	22	60	41.1
75	17	70	40.8
85	13	80	40.5
95	8	90	40.4
105	5	100	39.9
115	2	110	39.8
125	1	120	39.4
135	0	130	39
-	-	140	37.8
-	-	150	38.4
-	-	160	38.2
-	-	170	37.6
-	-	180	37.6

The experiments confirmed the expectations and rendered a ratio 43:1 relative to equal volumes (10 µL).

Anisotropic PS-P4VP-scattering patterns

Kinetic studies using *in-situ* synchrotron SAXS were also performed with PS-*b*-P4VP diblock copolymers. Evidence of the ordered cylindrical phase (OC) mentioned in the trajectories described in Figures 4 and 5 was obtained at higher evaporation times where anisotropic scattering patterns were found after 70 seconds.

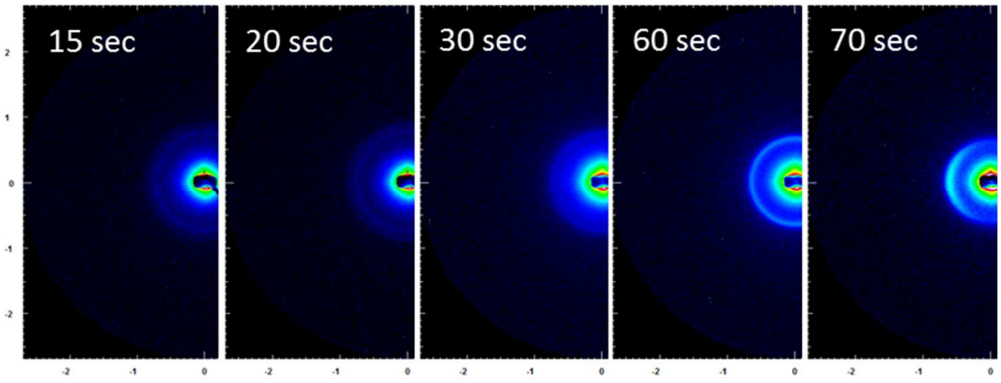

Figure S1. Evolution of scattering patterns of an evaporating PS-*b*-P4VP (M_n=100k, f(4VP)=0.25) solution in DMF/THF: 7/3. The anisotropic scattering pattern appears after 70 seconds.

Anisotropic patterns were found for PS-P4VP block copolymers likely due to the better solubility of P4VP in DMF which results in a different swelling behavior and a more stable OC-phase than found for PS-P2VP.

More detailed ternary phase diagram (see Figure 4)

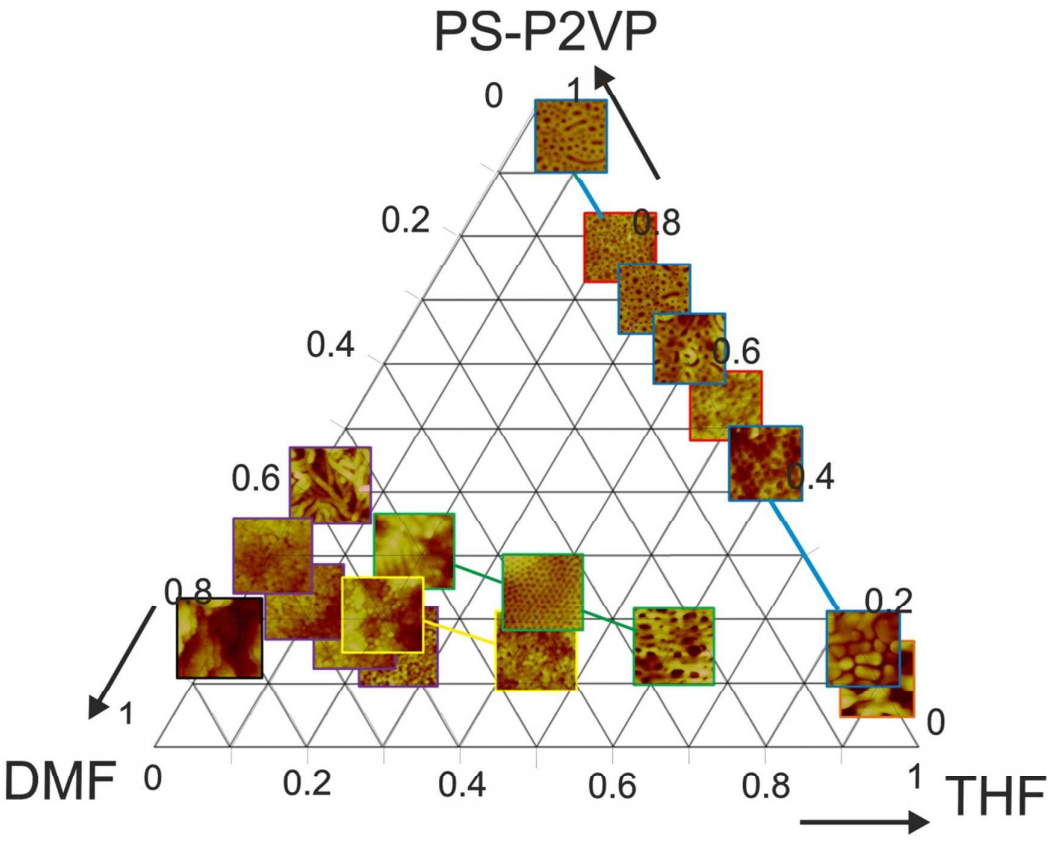

Figure S2. Detailed version of Fig. 4 displaying more AFM-images obtained along the evaporation trajectories. In Fig. 4 the number of images have been reduced to improve clarity.

Enlarged AFM images of the ternary phase diagram (see Figure 4)

Series black: 15wt% SVP-1 in DMF

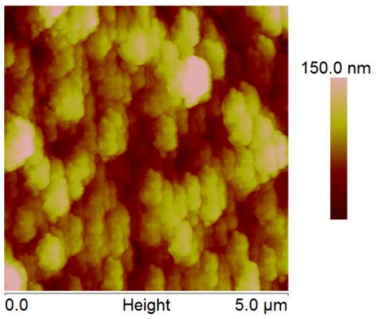

Figure S3. AFM height image of a polymer membrane cast from a solution of 15 wt% S2VP-1 in pure DMF after an evaporation time of 40 seconds.

Series purple: 15wt% SVP-1 in DMF/THF: 70/30

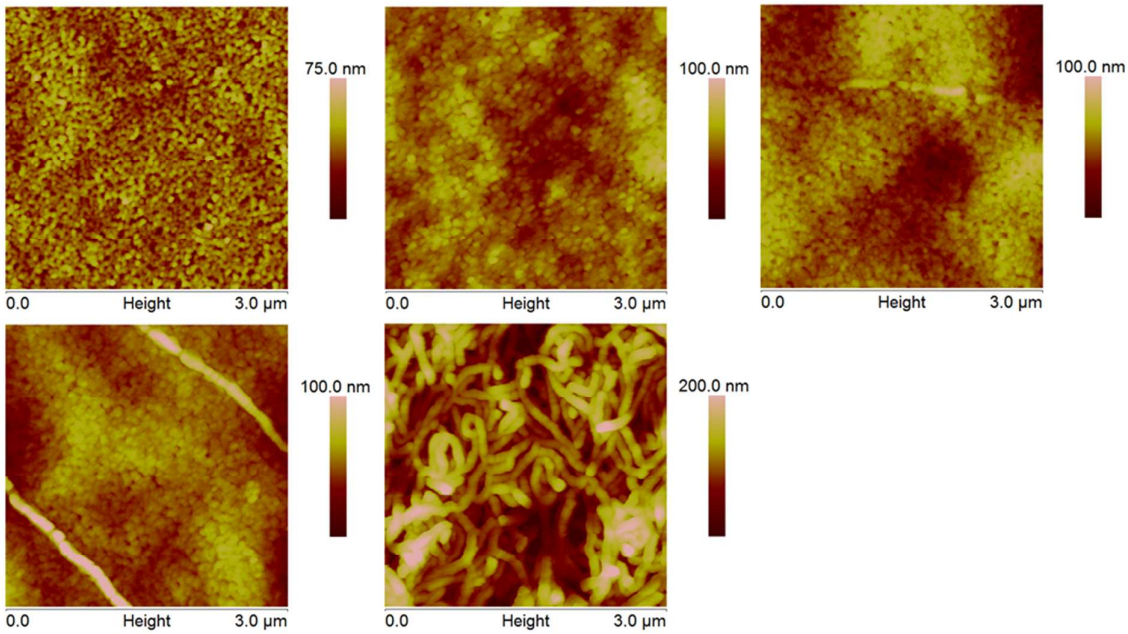

Figure S4. AFM height image of a polymer membranes cast from a solution of 15 wt% S2VP-1 in DMF/THF: 70/30. The evaporation times are 0 sec, 15 sec, 30 sec, 40 sec and 60 sec respectively.

Series yellow: 15wt% SVP-1 in DMF/THF: 50/50

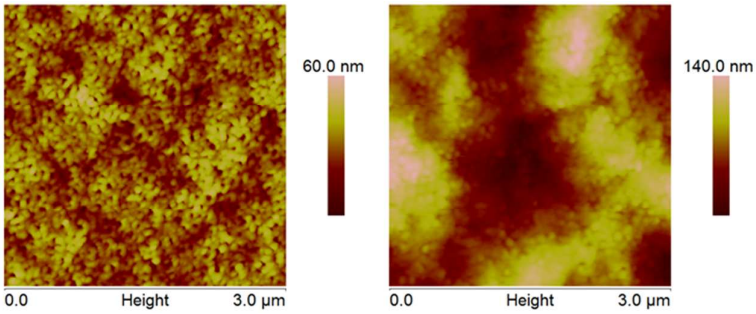

Figure S5. AFM height image of a polymer membranes cast from a solution of 15 wt% S2VP-1 in DMF/THF: 50/50. The evaporation times are 0 sec and 15 sec respectively.

Series green:

Series green: 15wt% SVP-1 in DMF/THF: 30/70

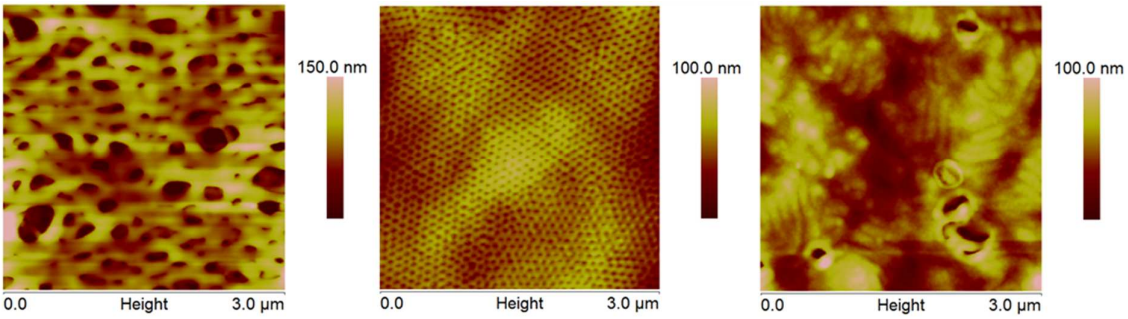

Figure S6. AFM height images of polymer membranes cast from a solution of 15 wt% S2VP-1 in DMF/THF: 30/70. The evaporation times are 0 sec, 15 sec, 30 sec, respectively.

Series blue: 15wt% SVP-1 in pure THF

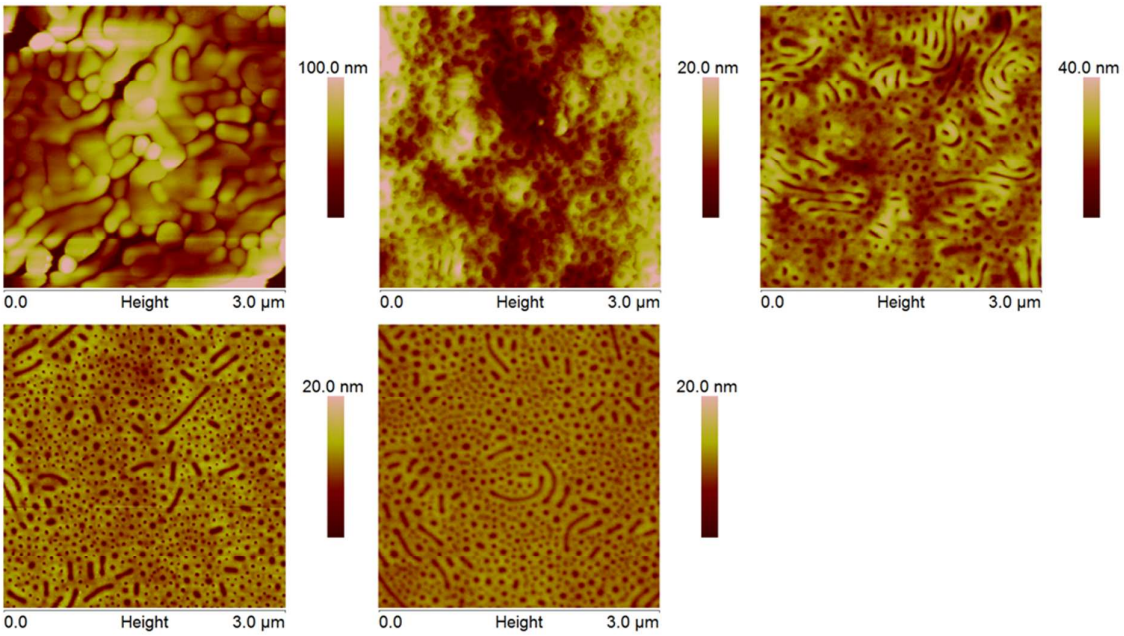

Figure S7. AFM height images of olymer membranes cast from a solution of 15 wt% S2VP-1 in pure THF. The evaporation times are 0 sec, 15 sec, 30 sec and 60 sec. The last image was taken from a completely dried membrane.

Series orange: 10 wt% SVP-1 in pure THF

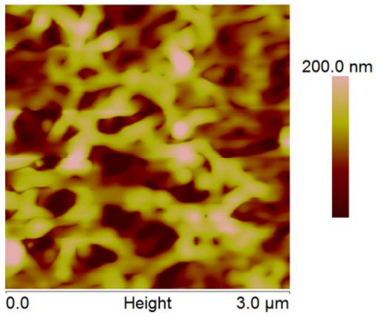

Figure S8. AFM height image of a polymer membrane cast from a solution of 10 wt% S2VP-1 in pure THF.

Series red: 20 wt% SVP-1 in pure THF

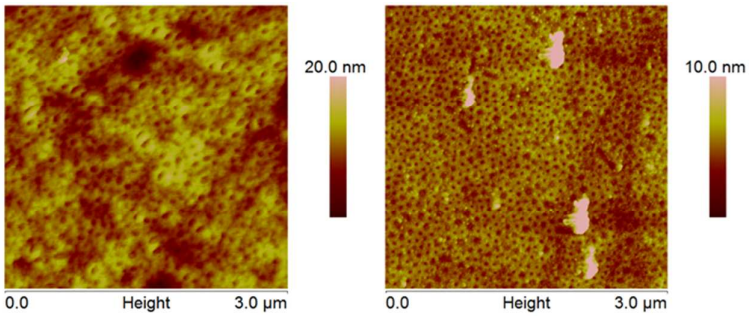

Figure S9. AFM height images of polymer membranes cast from a solution of 20 wt% S2VP-1 in pure THF.