Supporting information

Fabrication of PVDF membrane with tailored morphology and properties *via* exploring and computing its ternary phase diagram for wastewater treatment and gas separation application

S. Ashtiani [a]*, M. Khoshnamvand [c], P. Číhal [a], M. Dendisová [a], A. Randová [a], D. Bouša [b] A. Shaliutina-Kolešová [d], Z. Sofer [b], K Friess [a]*

[a] Department of Physical Chemistry, University of Chemistry and Technology, Prague, Technická 5, 16628 Prague 6, Czech Republic

[b] Department of Inorganic Chemistry, University of Chemistry and Technology, Prague, Technická 5, 16628 Prague 6, Czech Republic

[c] State Key Laboratory of Environmental Chemistry and Ecotoxicology, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, Beijing 100085, China, University of Chinese Academy of Sciences, Beijing 100049, China

[d] University of South Bohemia in České Budějovice, Faculty of Fisheries and Protection of Waters, South Bohemian Research Center of Aquaculture and Biodiversity of Hydrocenoses, Research Institute of Fish Culture and Hydrobiology, Zátiší 728/II, 389 25 Vodňany, Czech Republic

* Corresponding authors:

E-mail address: jamalias@vscht.cz (S. Ashtiani); karel.friess@vscht.cz (K. Friess).

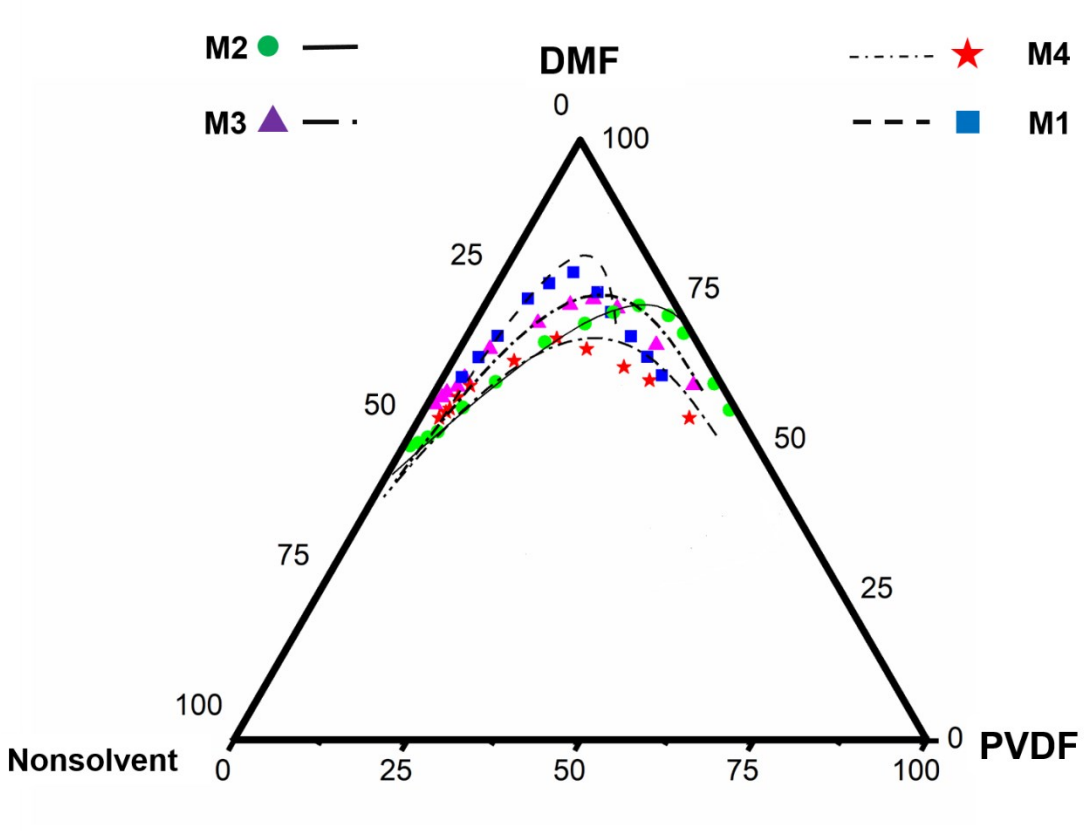


Fig. S1 Theoretical cloud points curves calculated based on interaction parameters for M1–M4.

Table S1 Calculated binary interactions between solvents, nonsolvents(s) and the polymer with different four methods.

	x_{13}(A)	x_{23}(A)	x_{13}(B)	x_{23}(B)	x_{13}(C)	x_{23}(C)	x_{23}(D)	x_{23}(D)
M1	0.042238	0.088199	0.382238	0.428199	0.261404	0.016563	0.156843	0.009938
M2	4.481748	0.088199	4.821748	0.428199	0.101497	0.016563	0.060899	0.009938
M3	4.549688	0.088199	4.889688	0.428199	0.119920	0.016563	0.071952	0.009938
M4	0.002823	0.088199	0.342823	0.428199	0.438337	0.016563	0.263002	0.009938

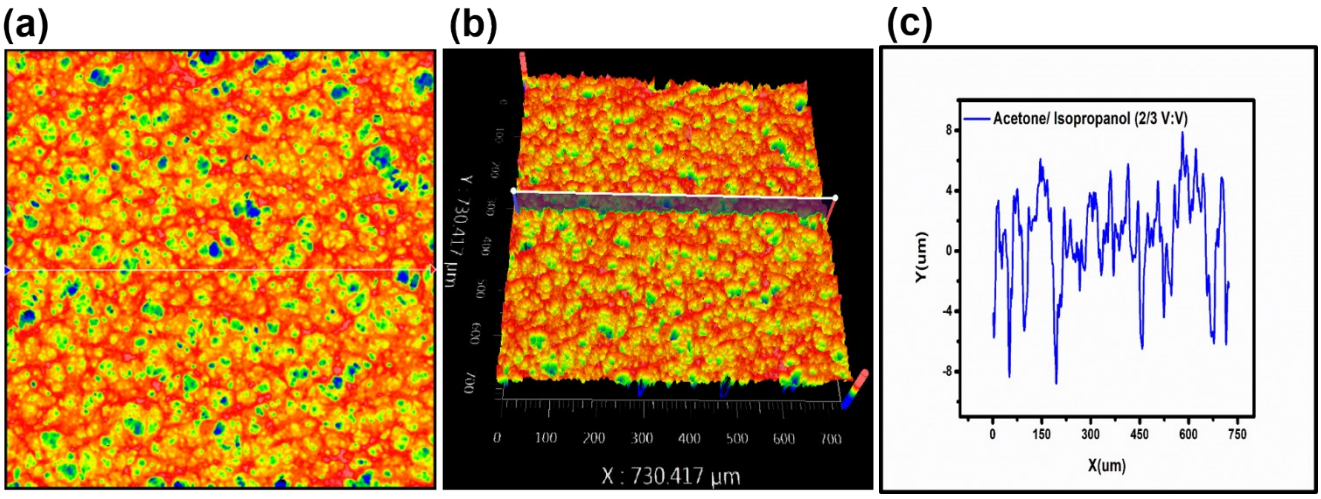


Fig. S2 Optical profiler topography 2D (a) and 3D (b) images with the linear profile of the respective section graph (c) which demonstrating the patterning of PVDF membrane (M1) fabricated with the optimum quantity of solvent, polymer and nonsolvent driven by its ternary phase diagram via the NIPS method by using DMF and acetone/isopropanol (2/3 V:V) as the solvent and nonsolvent respectively.

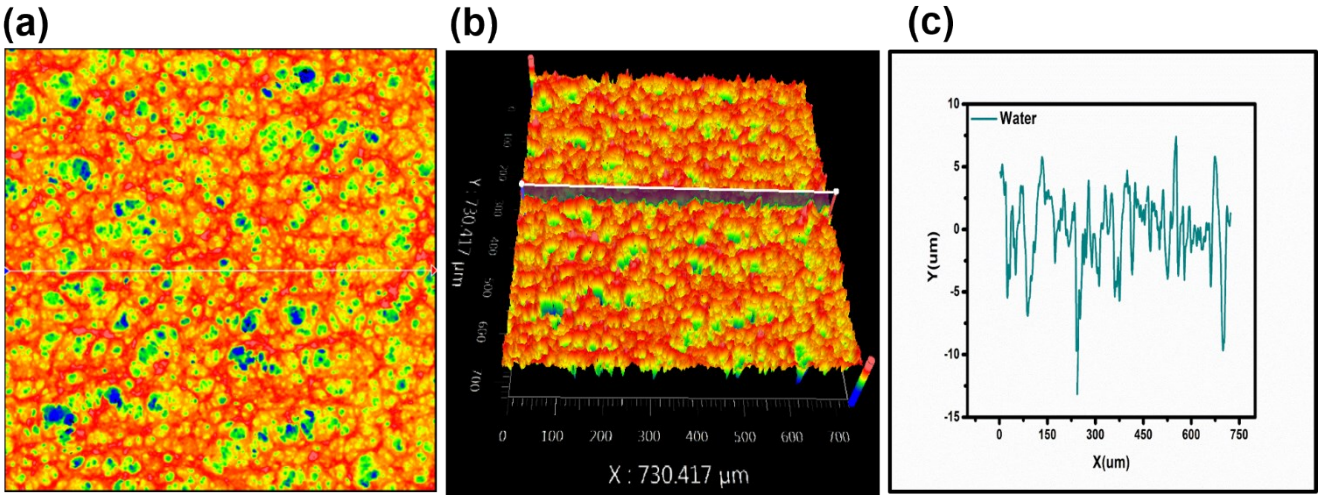


Fig. S3 Optical profiler topography 2D (a) and 3D (b) images with the linear profiles of the respective section graphs (c) which demonstrating the patterning of PVDF membrane (M2) fabricated with the optimum amounts of solvent, polymer and nonsolvent driven by its ternary phase diagram via the NIPS method by using DMF and water as the solvent and nonsolvent respectively.

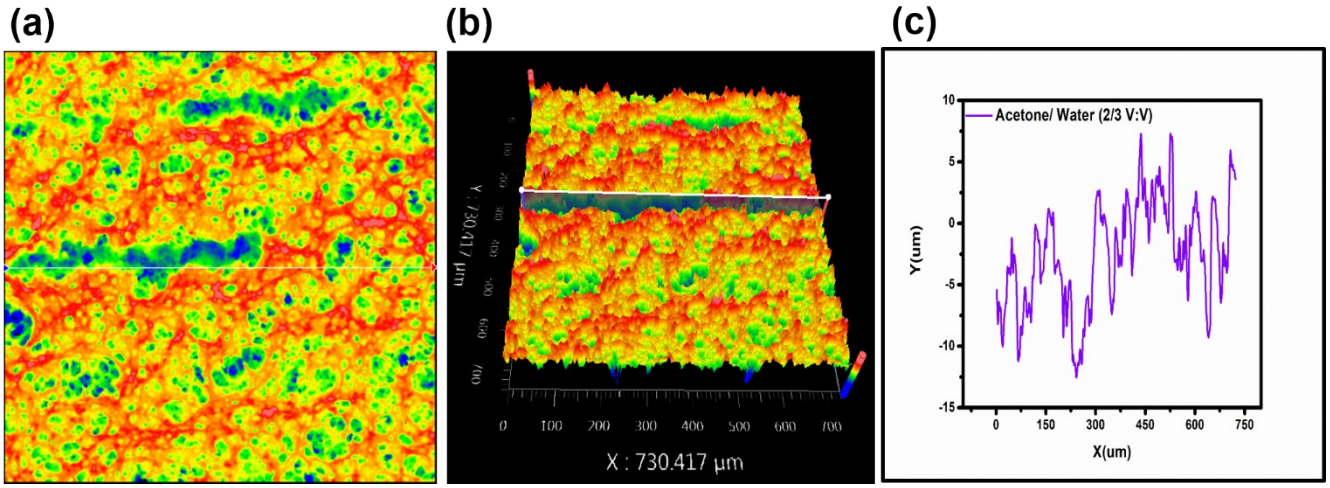


Fig. S4 Optical profiler topography 2D (a) and 3D (b) images with the linear profiles of the respective section graphs (c) which demonstrating the patterning of PVDF membrane (M3) fabricated with the optimum amounts of solvent, polymer and nonsolvent driven by its ternary phase diagram via the NIPS method by using DMF and acetone/water (2/3 V:V) as the solvent and nonsolvent respectively.

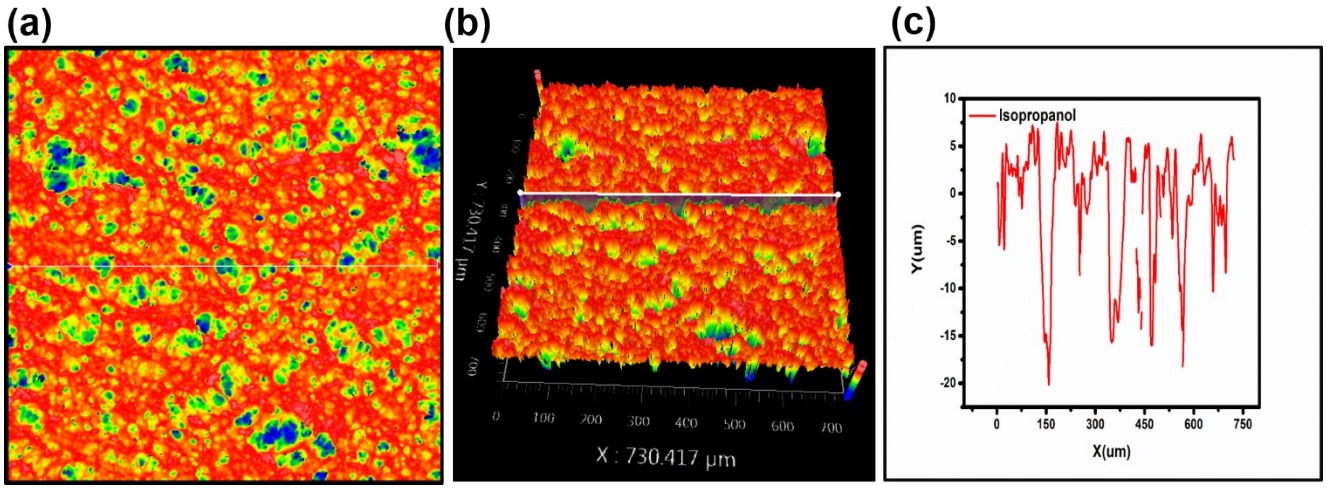
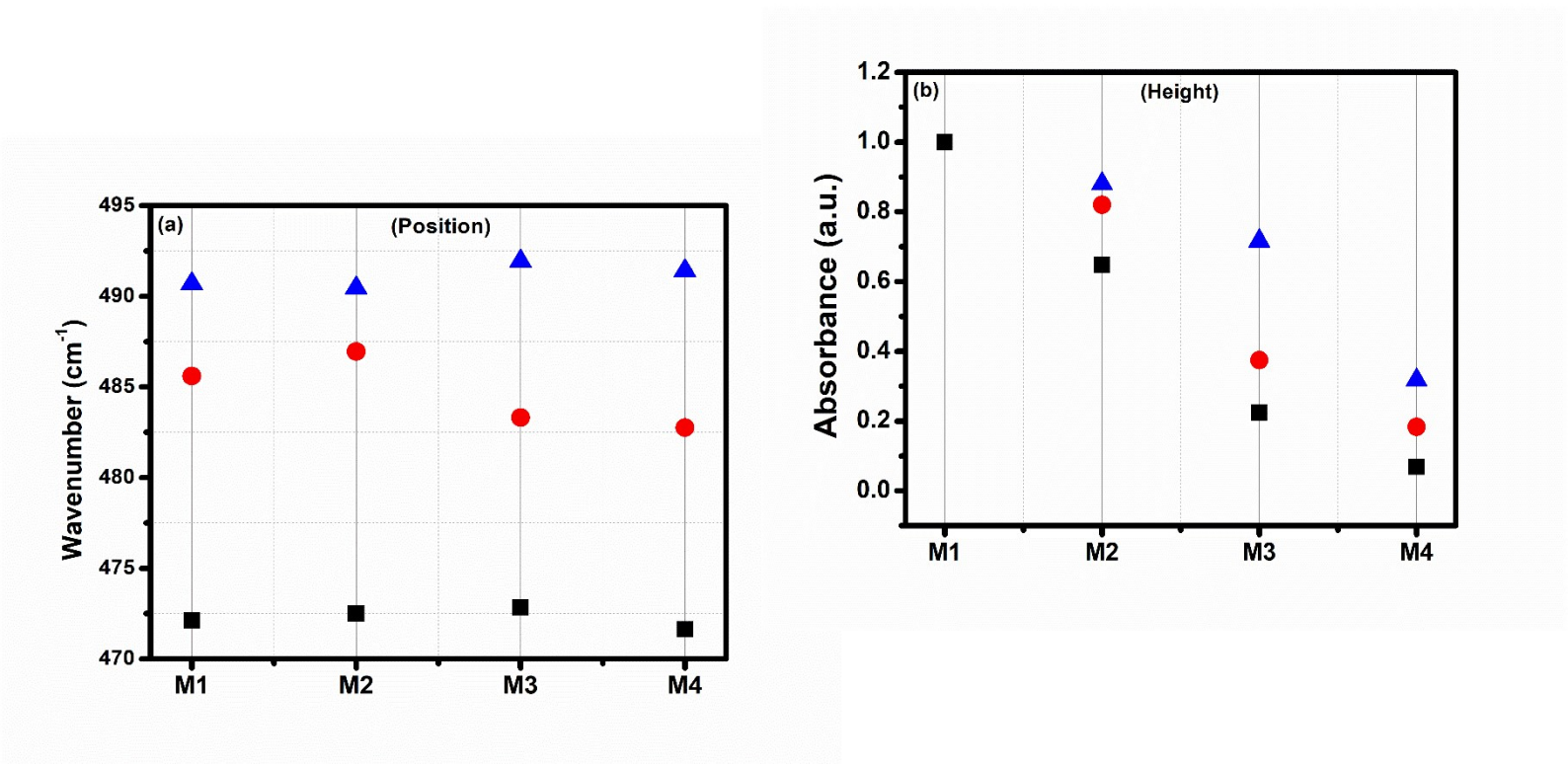


Fig. S5 Optical profiler topography 2D (a) and 3D (b) images with the linear profiles of the respective section graphs (c) which demonstrating the patterning of PVDF membrane (M4) fabricated with the optimum amounts of solvent, polymer and nonsolvent driven by its ternary phase diagram via the NIPS method by using DMF and isopropanol as the solvent and nonsolvent respectively.



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52 **Fig. S6** Fitting peaks analysis. Position of bands of the samples (a), the intensity of bands of the samples

53 (b).

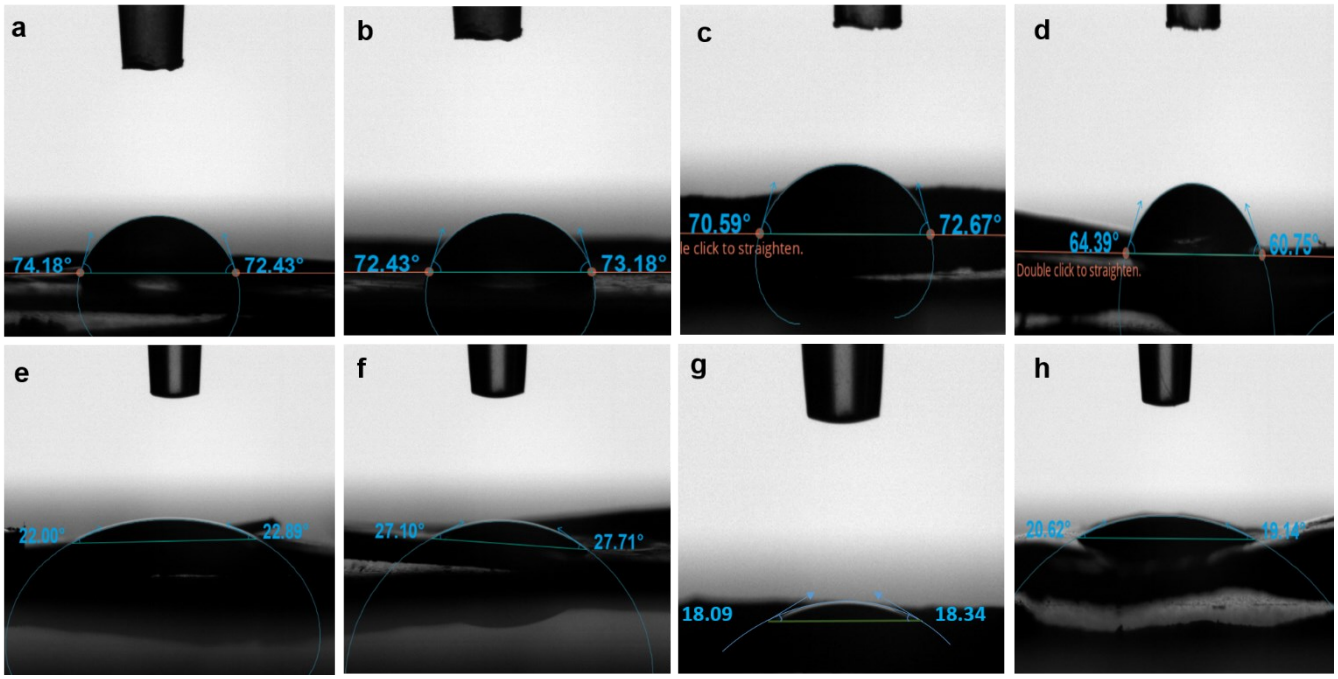

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Fig. S7 Contact angle images of M1–M4 PVDF membranes: water contact angle (a–d) and Oil contact angle (e–f).

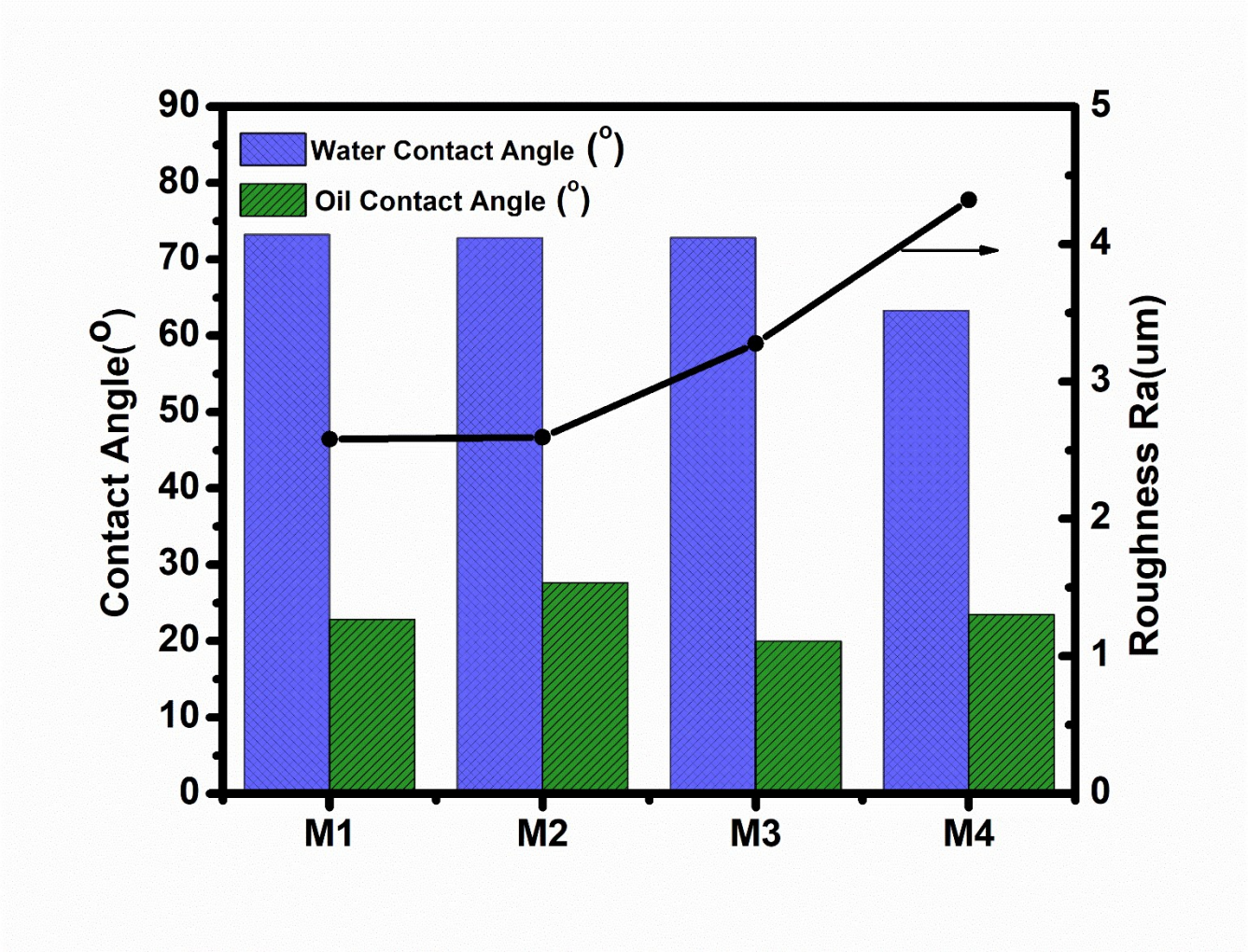

Fig. S8 Variation of the water contact angle and its relation with surface roughness Ra.

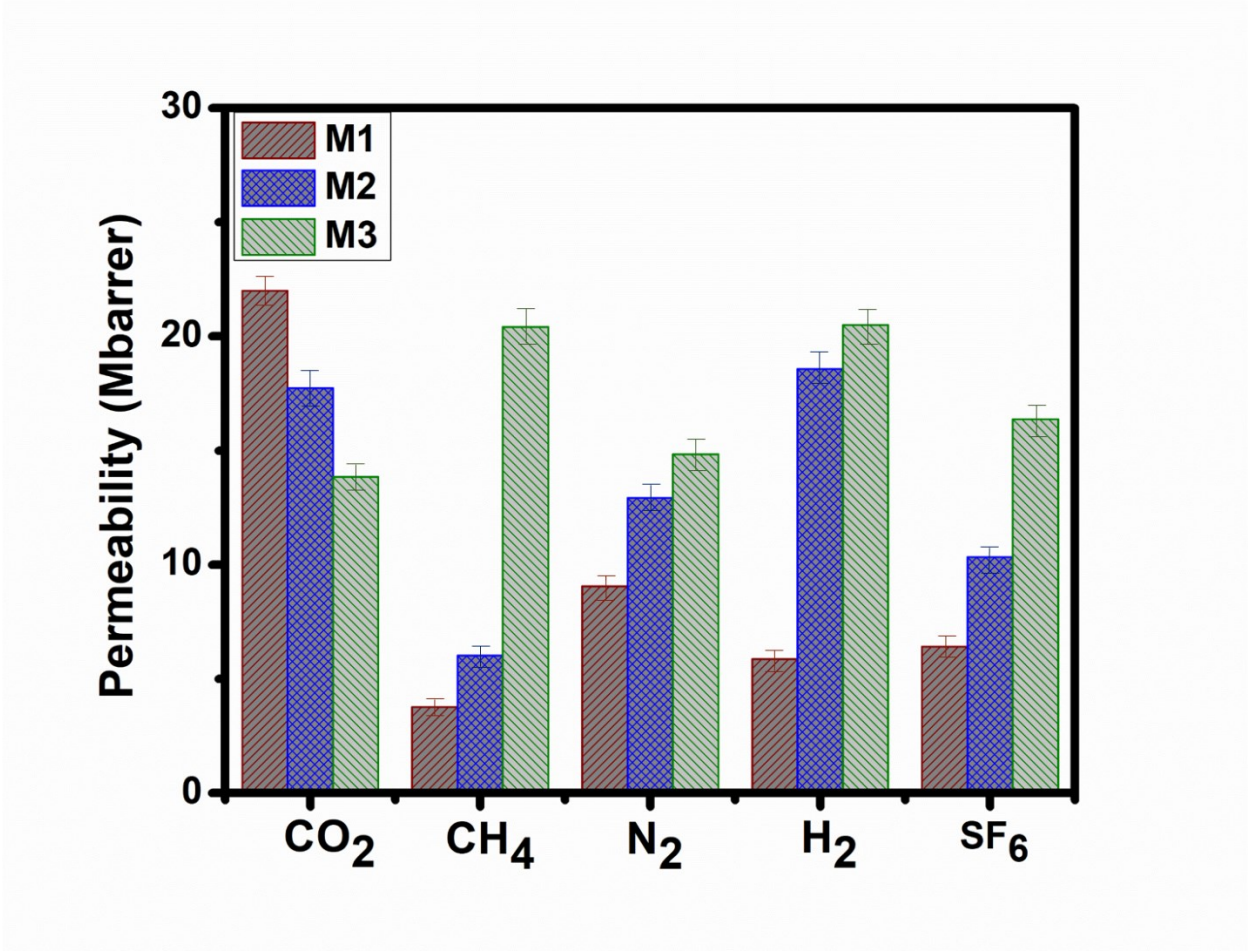

Fig. S9 Gas permeability measurements (Mega barrer, Mbarrer) for M1–M3 of 12 wt. % PVDF membranes prepared with different nonsolvents(s).