Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information for:

Direct nanofluidic channels via hardening and wrinkling of thin polymer films

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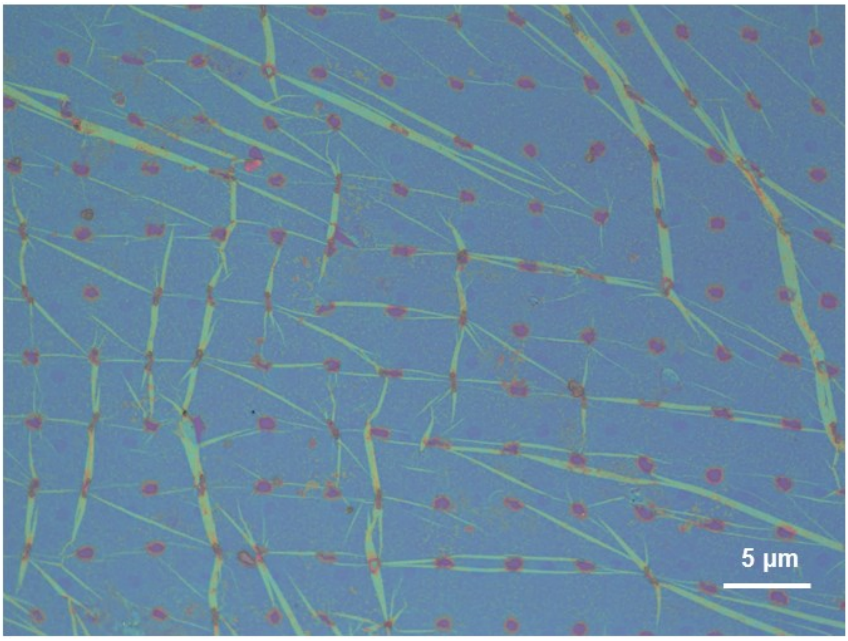

Fig. S1 OM image of an unregulated and random wrinkling pattern in the polymer film in the absence of clamping around the edges.

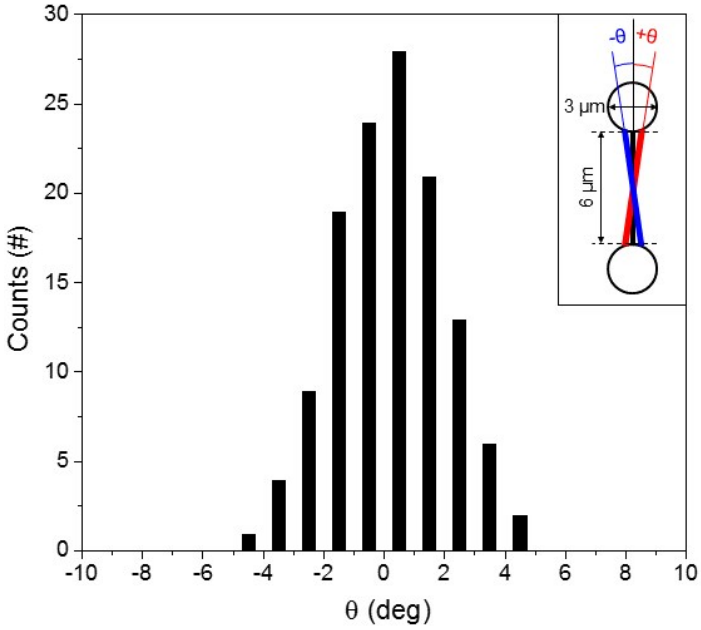

Fig. S2 Histogram of orientation (θ) of wrinkles interconnecting the holes with the D_h and spacing of 3 μm and 6 μm, respectively.

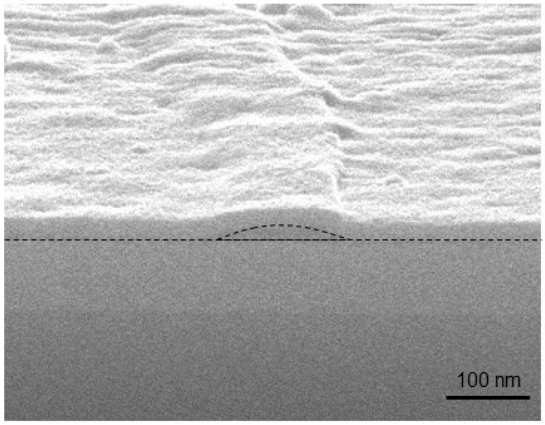

Fig. S3 Cross-sectional SEM image of the wrinkles prepared by focused ion beam cross sectioning shows the hollow channels inside the wrinkles.

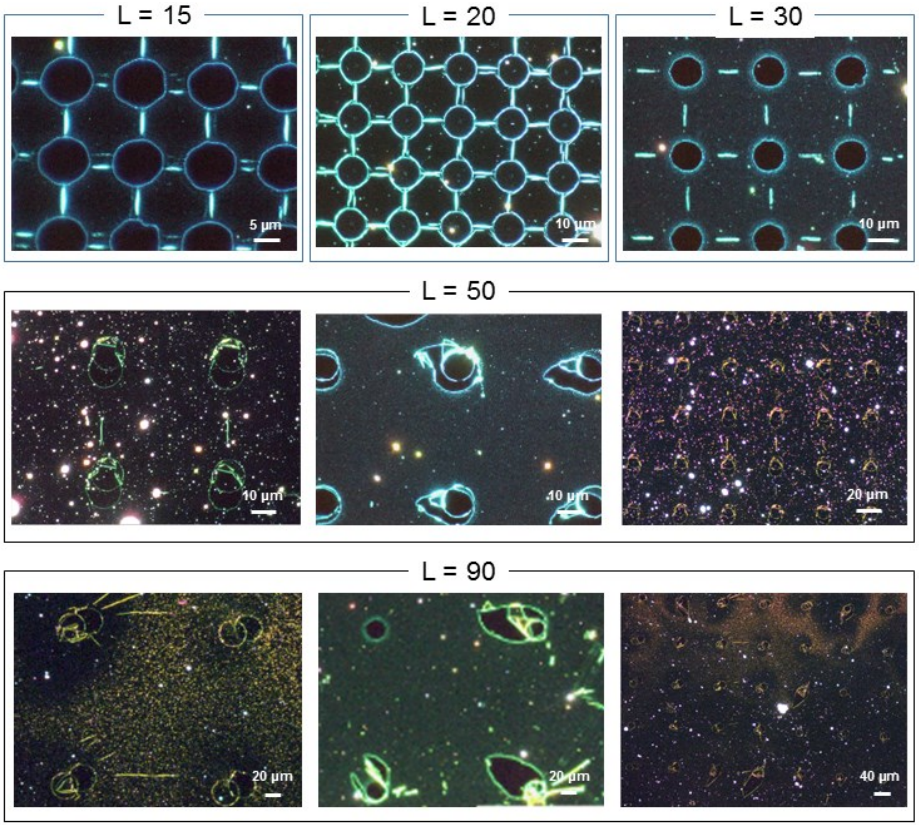

Fig. S4 OM images of wrinkles with diverse L in the range of 15-90 µm for the D_h of 10 µm and film thickness of 25 nm.

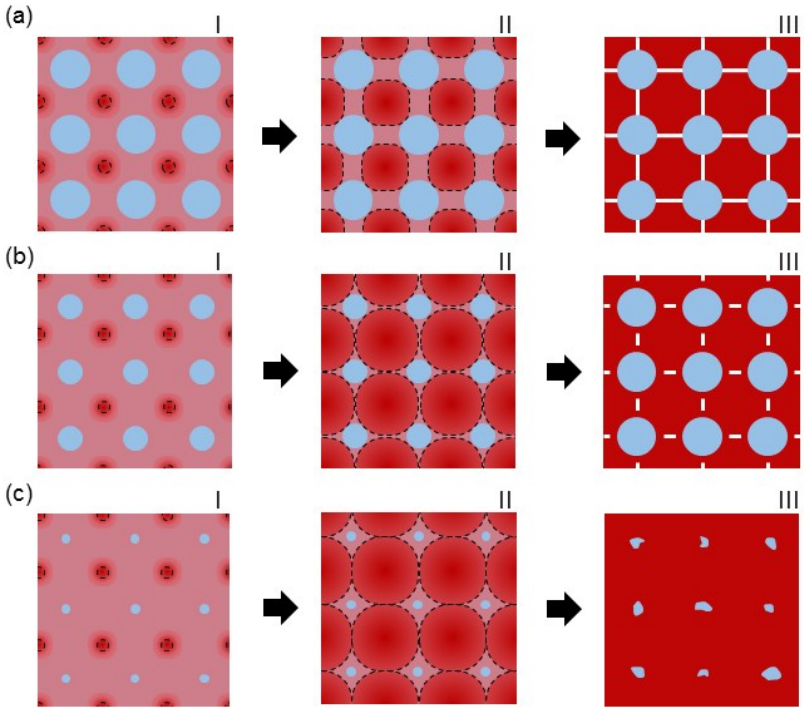

Fig. S5 Schematics illustrating wrinkling and/or tearing of polymer films with increasing L/D_h ratio in Fig. S4. (a) In the case of relatively small L (or the spacing between the holes is smaller than or comparable to the D_h) the adhesion regions of the polymer membrane (marked by dashed lines) come into contact with the adjacent hole edges as the volume of trapped solvent gradually deceases. The resulting wrinkles have straight channel interconnecting the neighboring holes. (b) the development of the broken wrinkles for the intermediate range of L/D_h. (c) As the L is much larger than D_h ($L/D_h > \sim 3$), the adhesion regions of the polymer membrane they come into direct contact with each other rather than hole edges. As a consequence, the trapped organic solvents congregate around the holes, the polymer films would be frequently torn rather than developing a wrinkle.

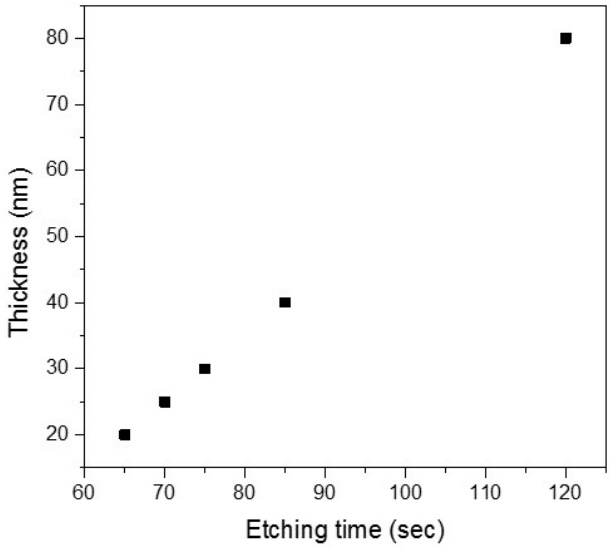

Fig. S6 Thickness of the hardened films depending on O_2 plasma treatment time (at 50 W).

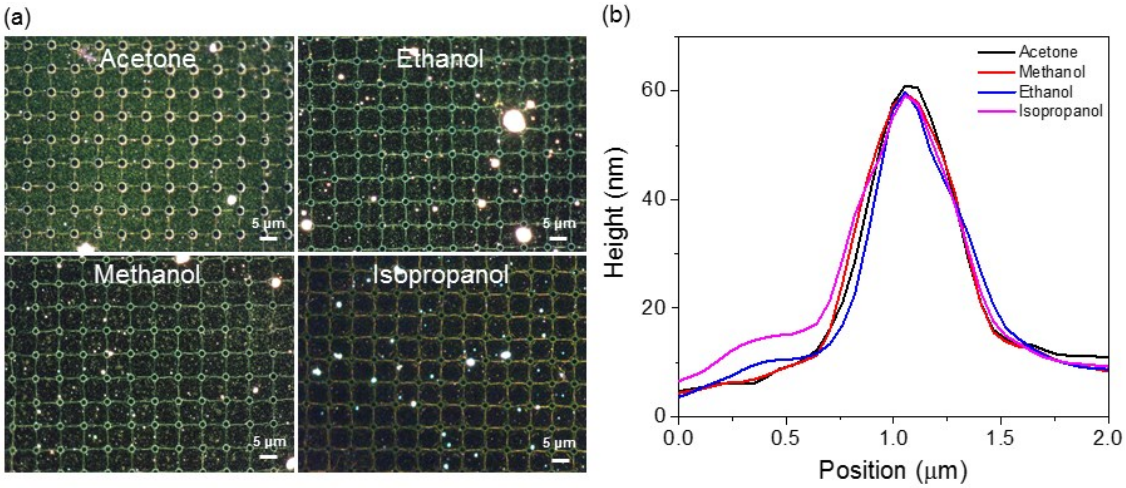

Fig. S7 Dark-field OM images of wrinkles with diverse organic solvent. (b) Cross-sectional profiles of the wrinkles achieved with diverse organic solvents.