Supplementary Material (ESI) for Lab on a Chip

SUPPORTING INFORMATION

Large Scale Lithography-free Micro/Nano Channel Array on Polystyrene

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Figure S1. Optical image of centimeter long nanochannel. Growth condition of 24hrs 3mL ethanol, temperature gradient 80℃~25℃

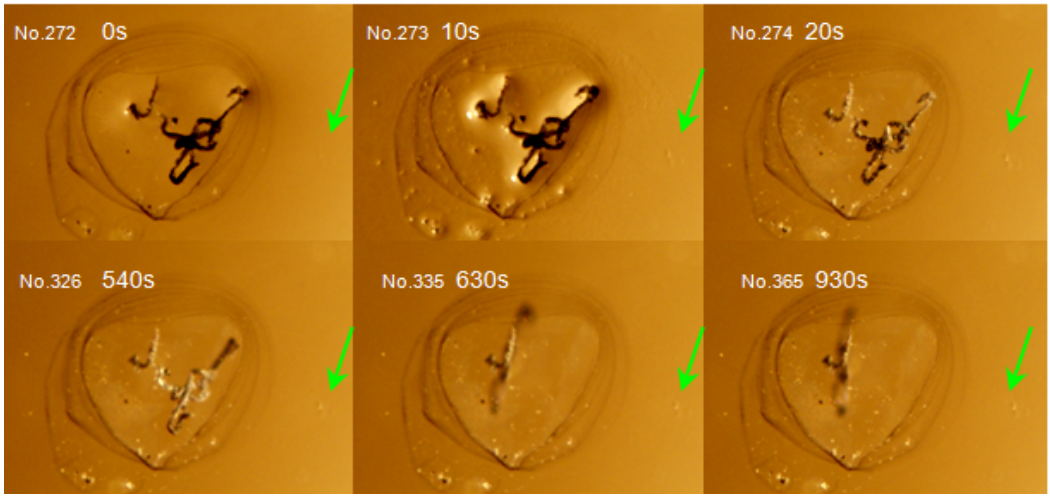

Figure S2 Time sequence of the nanochannel growth before the cracking start. The photos were taken with an interval of ten seconds. A dust fiber is deliberately placed on the surface of the lid to measure the moisture of ethanol on it. At 2720s (photo No. 272), ethanol in the bottom dish disappeared; the lid quickly lose its moisture within 20 seconds as photo No. 273 and No. 274 shown. The green arrow pointed to the defect same as in Figure 2. The cracking has not presented even at 3650s (photo No. 365).

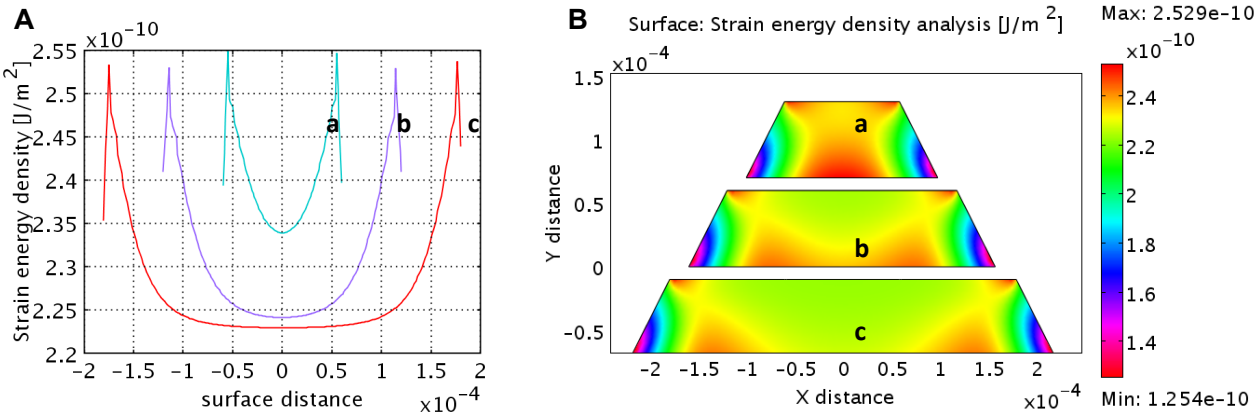

Figure S3 Strain energy density analysis of the swelled PS surface layer (cross section). A. Strain energy density on the cross section surface. a, b, c corresponds to surfaces of relatively shorter, medium and longer surface cross sections distances. The longer the distance, the lower the energy would be in the center. B. Strain energy density of the whole cross section. Strain energy density reach local minimum in the center of each plain.

(The comsol-multiphysics modeling is realized under the generous help of Ph.D candidate Wu Zengqiang of Prof. Xia Xinghua's group. The analysis only considered the negative pressure on the material surface upon shrinking process. The phenomenon is enlarged with a relatively thicker and slim bulk material for a much obvious qualitative illustration.)

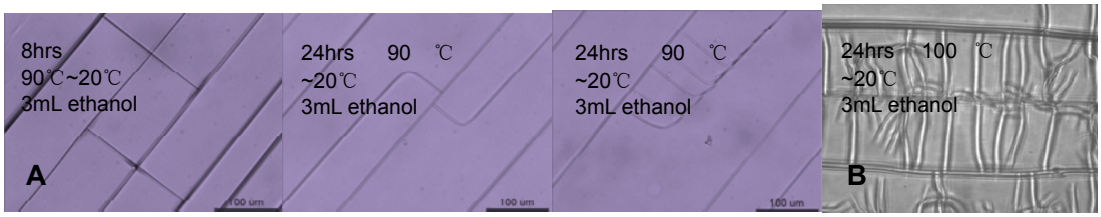

Figure S4. Influence of the heat plate temperature and time on the channel patterns.

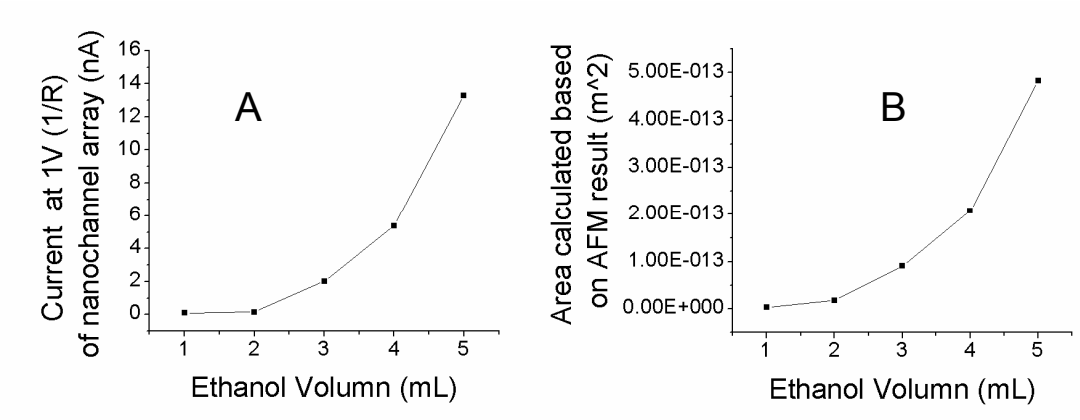

Figure S5. Comparison of the nanochannel geometries by electrical and AFM methods. A. conduction analysis of the nanochannel array of different ethanol volumes by 0.1M KCl. B. Area of each nanochannel calculated from AFM data.

Since 1/R=I/V=I (at 1V), and R= η L/A, thus other factors the same I (1V) should be proportional to A. The result here is consistent with this relationship.

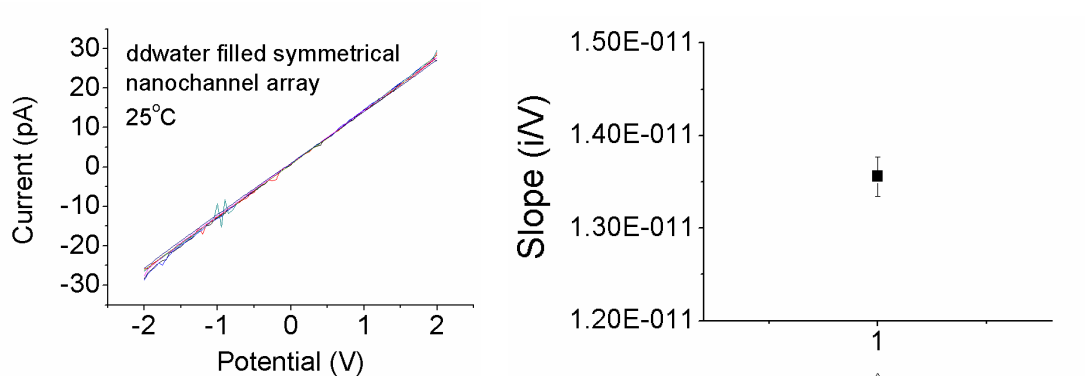

Figure S6. I~V relationship for symmetrical nanochannel array. 5 times of repeating i~V potential sweeping is carried out using the same pair of Ag/AgCl microelectrode for the asymmetric chip experiment. The time between the first and the last are 15 minutes. PS nanochannel array growth condition: 24hrs, 2mL ethanol, temperature gradient 80℃~25℃