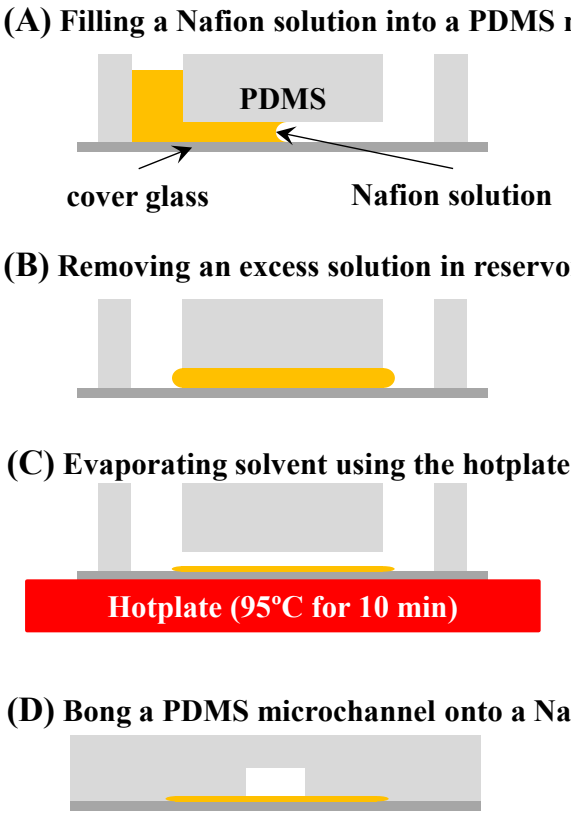
Electronic Supplementary Information:

Ion Concentration Polarization in A Single and Open Microchannel Induced by A Surface-patterned Perm-selective Film

Minseok Kim, Mingjie Jia, and Taesung Kim*

CORRESPONDENCE: tskim@unist.ac.kr



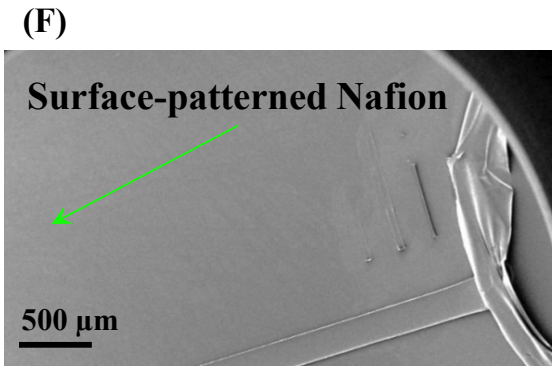


Figure S1 Fabrication processes of a Nafion film on the microchannel surface. (A) A Nafion-containing solution flowed through a microchannel and reversibly bonded on a glass substrate (no oxygen plasma treatment of the glass and PDMS surfaces was required). Microchannels with a width of 200 μm and depths of 25 μm, 50 μm, and 100 μm were used. (B) The excess solution in the reservoir was removed. (C) The Nafion solution was cured on a 95 °C hotplate for 10 min to remove the solvent via evaporation and the PDMS channel was peeled off (see Fig. E). (D) For irreversible bonding, another PDMS channel and the glass substrate with the Nafion film were treated with oxygen plasma (less than 50 sccm of O_2 and 70 W for 90 s, Cute-MP, Femto Science, Korea). The PDMS channel was perpendicular to the surface-patterned Nafion film. (E) Scanning electron microscopy (SEM) image of the surface-patterned Nafion film on the glass surface.

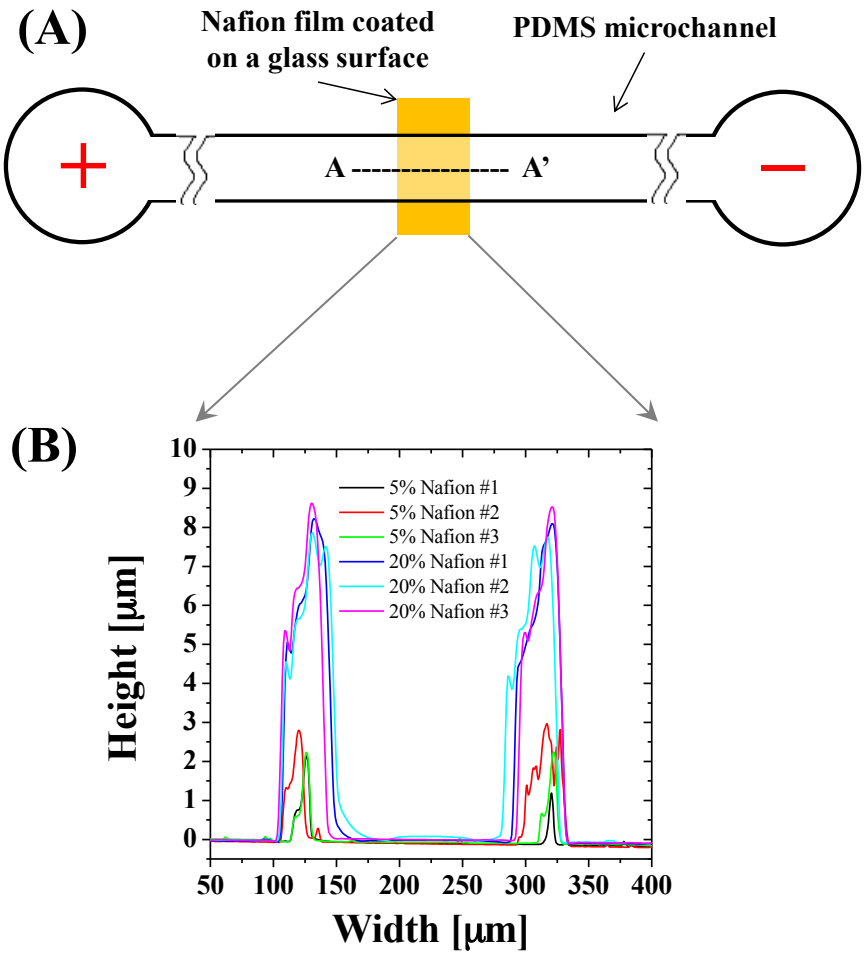


Figure S2 (A) Top view of the SC-ICP device. (B) Thickness measurement of Nafion films prepared at different mixing ratios using a surface profiler (Alpha Step, KLA-Tencor, USA).

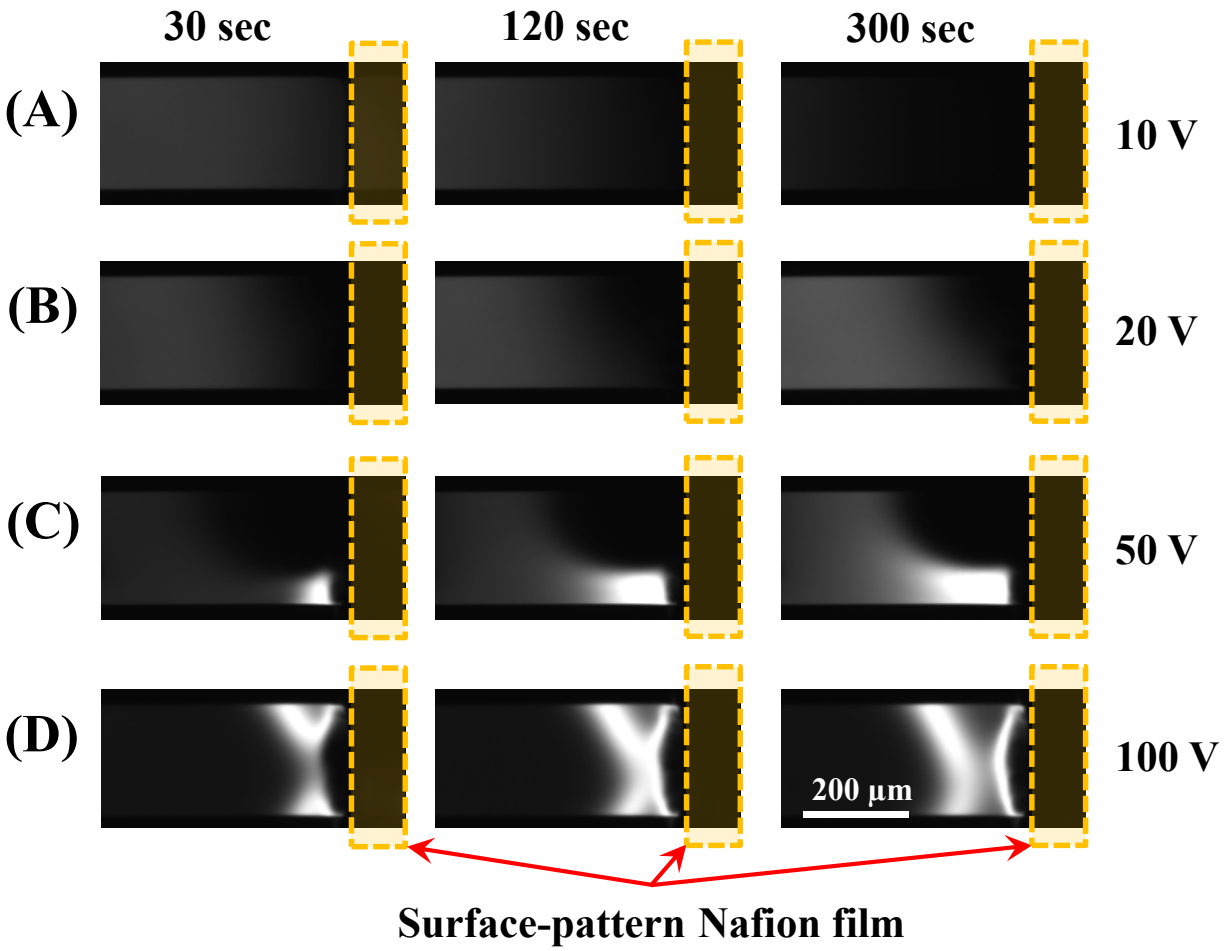


Figure S3 Effects of electric field strengths on the SC-ICP are visualised indirectly by measuring the depletion area of FITC (10 V, 20 V, 50 V, and 100 V). The depletion area gradually increased with time but it saturated within 5 min.

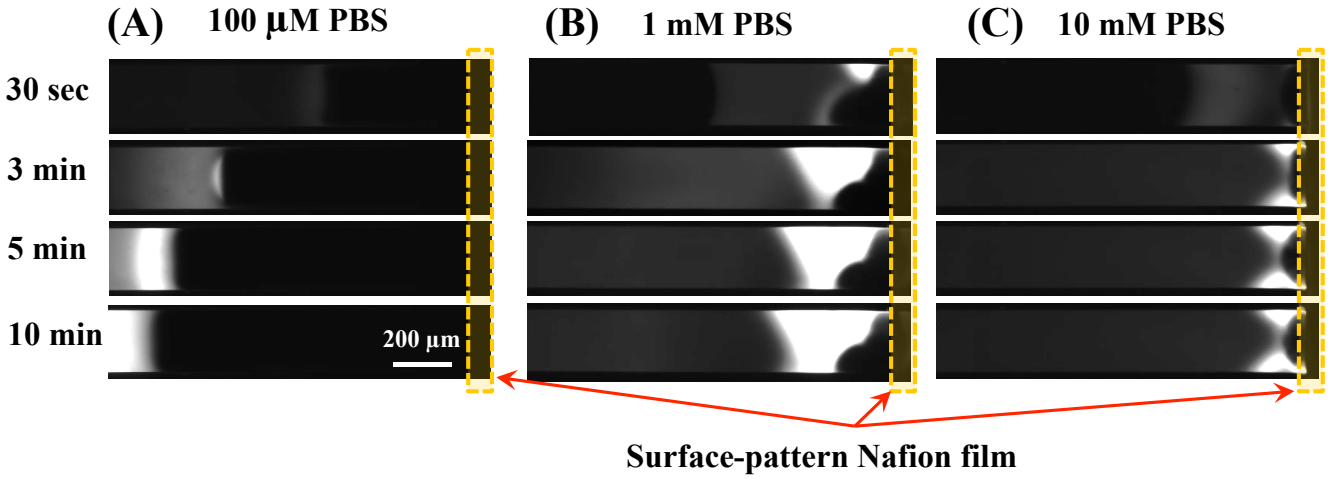


Figure S4 Effects of ionic strengths on the SC-ICP are visualised indirectly by measuring the depletion area of FITC. 100 μM and 1 mM PBS buffer solutions were used. The depletion area gradually increased with time but it saturates over time.