

Efficient PDMS through-hole membrane fabrication for microwell-based bioassay utility

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A variety of miniaturized and microwell devices have shown useful in many chemical and biological assays. Miniaturization allows low volume sampling at a high number of tests per area that enables to test as many compounds as possible from a raw sample. PDMS (Polydimethylsiloxane) based microwells has been used in many applications as well; however, many issues such as restricted chemical compatibility, swelling when in contact with many common chemicals, shrinking when ambient humidity is low, and readily partition of small molecules from the bulk PDMS can complicate the on-chip concentration and may invalidate the measurement. To address this problem, a thin PDMS through-hole membrane has been realized. A thin PDMS can minimize absorption and having a glass bottom can ensure easy surface modification for a variety of assay applications. The conventional mechanical press, PDMS between weight and SU-mold, has been utilized for fabrication. A COP film coated with PVA was used as carrier film (Figure 1a). Briefly, after curing the PDMS in the assembly, the PDMS side of the carrier film is attached to a glass slide by O₂ plasma. Afterwards, the PVA is melted in an autoclave. Figure 1b shows the thin (50 μm) PDMS membrane on a glass slide. To demonstrate the efficiency of the fabrication method, FITC-dextran solution was filled in the microwell. Figure 1c shows various microwell diameter and pitch. As further study, the PDMS microwell with glass bottom shall be further tested for assay application.

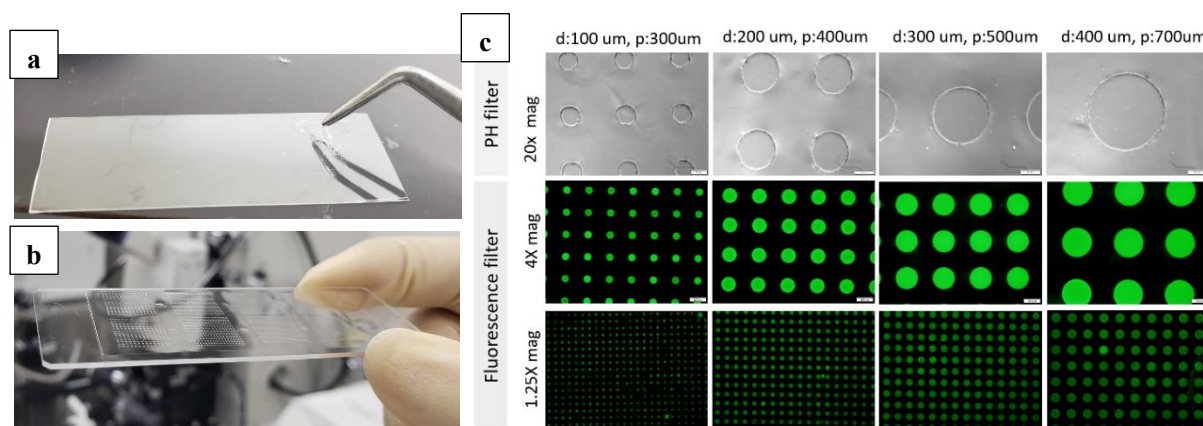


Fig. 1. Thin PDMS through hole on glass slide. (a) PVA coated COP film that served as carrier film (b) transferred PDMS layer (50 μm) on glass slide. (c) PDMS microwell with glass bottom filled with FITC-dextran solution.