

Supporting Information

Elastomeric Angled Microflaps with Reversible Adhesion for Transfer-Printing Semiconductor Membranes onto Dry Surfaces

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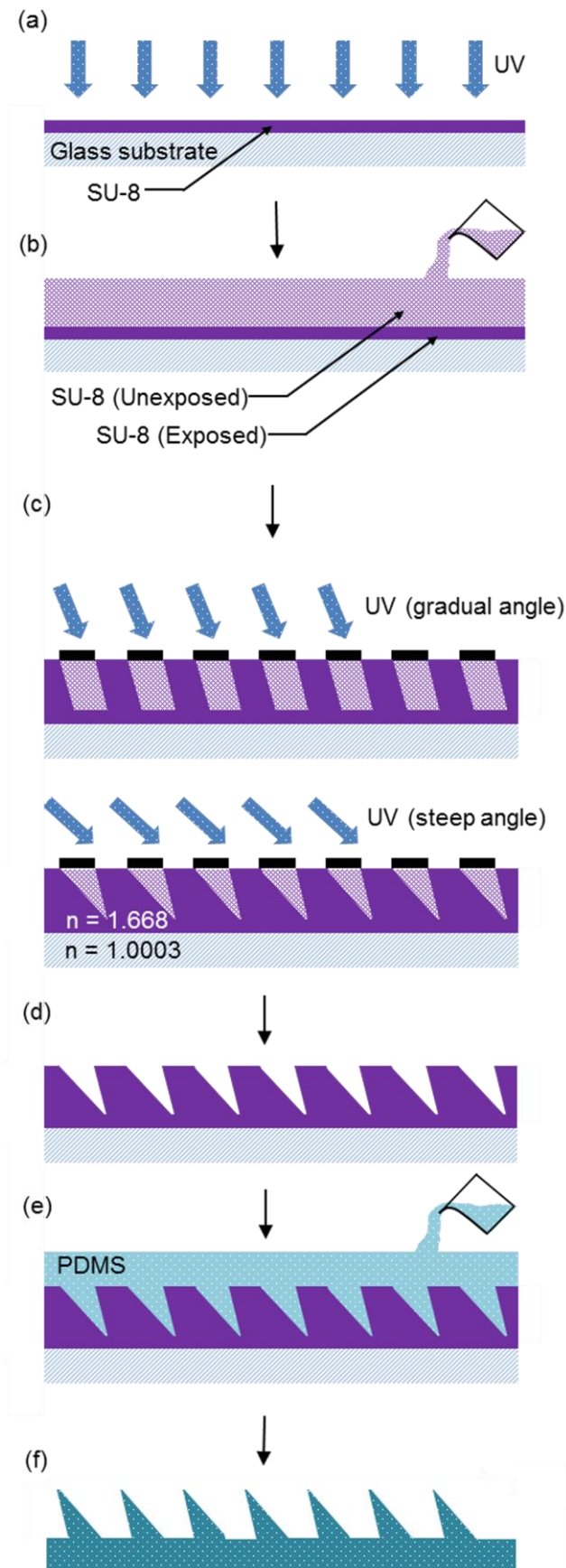


Figure S1. Schematic illustration of the fabrication process for angled microflap stamps. (a) UV Flood exposure on the thin SU8 (thickness $\sim 30\ \mu\text{m}$) spun on the transparent glass substrate. (b) Spin coating another SU-8 layer (thickness $\sim 80\ \mu\text{m}$). (c) UV exposures at 60° and 45° . (d) Developing the master mold after post exposure baking. (e) Casting and curing PDMS into the master mold. (f) Peeling off the replica of the angled microflap stamp.

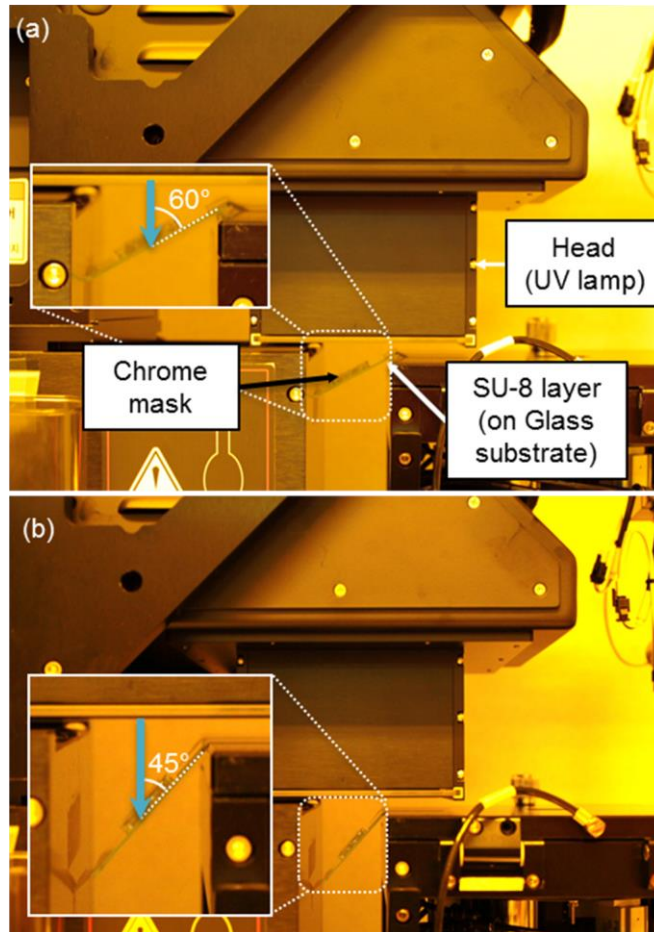


Figure S2. Optical images of angled UV exposures (a) at 60° and (b) 45°.

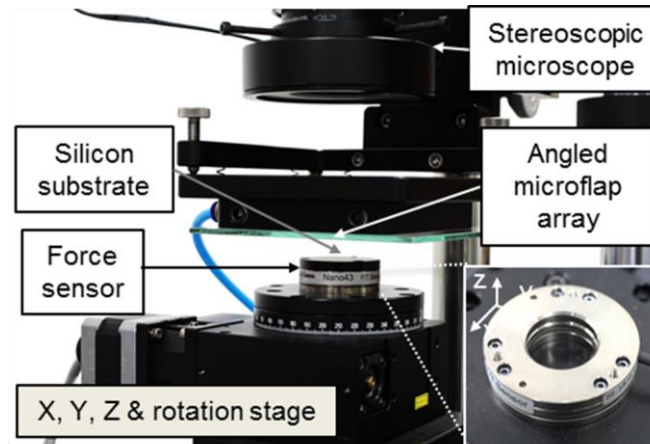


Figure S3. Optical image of the sensor and stage system consisting of a programmable motorized microstage, multi-axis force sensor, vacuum chuck and stereoscopic microscope.

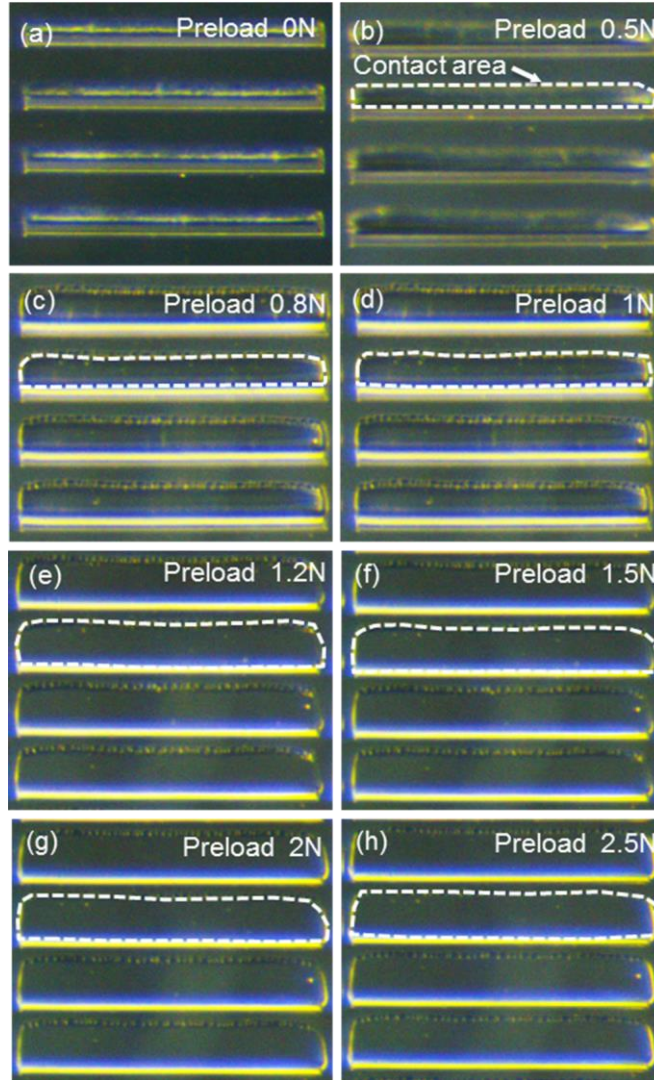


Figure S4. Optical microscope images of the angled microflap stamp under preload increasing from 0 to 2.5 N: (a) 0 N, (b) 0.5 N, (c) 0.8 N, (d) 1 N, (e) 1.2 N, (f) 1.5 N, (g) 2 N, (h) 2.5 N. The contact area is circled with a dashed line.

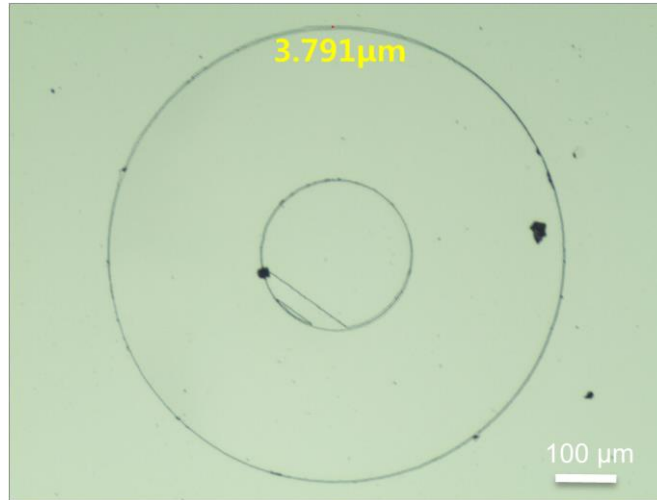


Figure S5. Top view of a Si membrane aligned and transfer-printed on top of another identical Si membrane. Aligning accuracy of the micro Si membrane is less than 4 μm with the custom microstage and optical microscope.

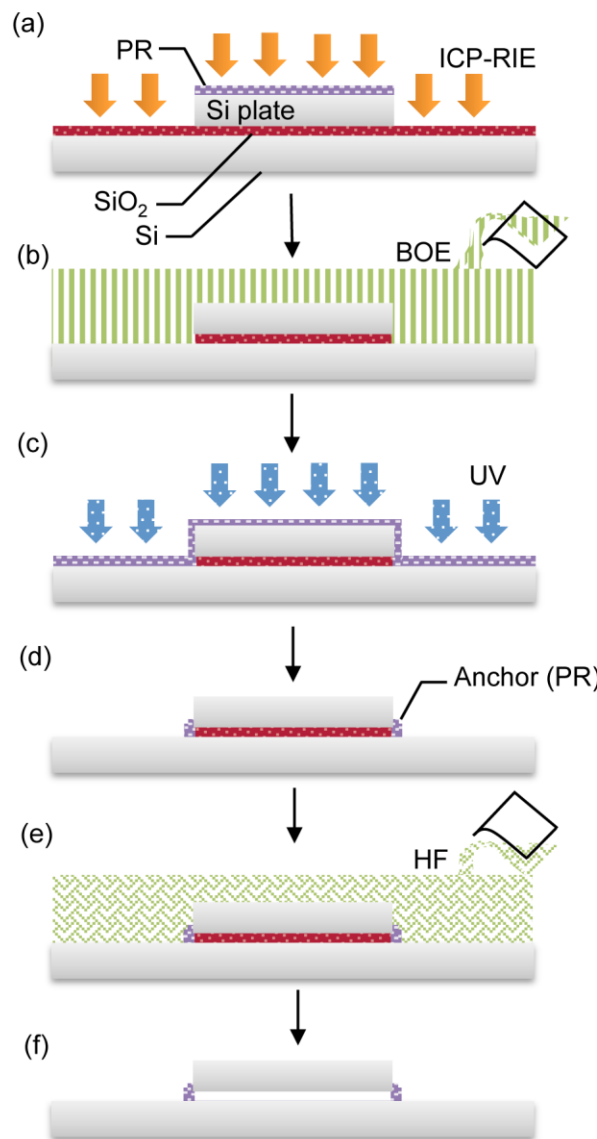


Figure S6. Schematic illustration for fabrication of micro Si membranes. (a) Dry etching (ICP-RIE) of the top Si membrane masked with PR. (b) Wet chemical etching (BOE) of the exposed oxide layer. (c) Flood UV exposure of PR spun on the sample. (d) Narrow ring of PR (anchor, width ~1 μm) around the boundary of the Si membrane after developing. After (e) removing the underlying oxide layer in hydrogen fluoride (HF) acid, (f) the anchor holds the Si membrane temporarily.