

Electronic Supplementary Information (ESI)

S8: Fabrication of the molds by multiple-layer soft lithography

The alignment step in fabricating multilayer molds is usually assumed to be both complex and time consuming, especially if the thickness ratio between the layers is large. Here, we use a very fast and precise method to create multiple-layer wafers, in which alignment structures are fully visible whatever the thickness of the upper layers. We use tape to protect the alignment structures, a technique that enables the fabrication of high thickness ratios between the resist layers.

Fabrication of the molds is outlined in Figure S1. The first layer is fabricated using the conventional procedure (steps 1 and 2: deposition, soft bake (SB), exposure, post-exposure bake (PEB), development), then tape pieces are glued onto the alignment structures (step 3). The second layer is spin-coated and tape pieces are removed with tweezers before the SB (steps 4 and 5). Removing the tape after the SB is possible, but sometimes results in the presence of residues on the wafer. Precise alignment is achieved using a mask aligner and the PEB is performed according to the resist data sheet. The final development step is then performed.

Multiple-layer lithography can be performed by repeating the process (Fig. S1, steps 3 - 5; layer 3 appears in yellow).

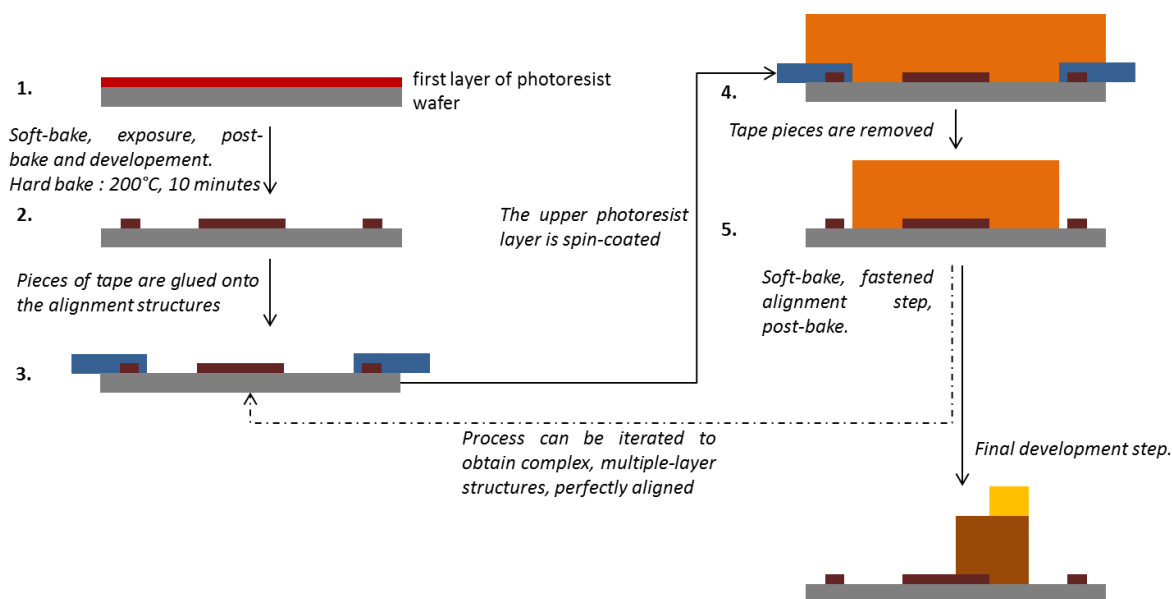


Figure S1. Multi-layer fabrication process in the case of a thin first layer. The first layer is constructed (SB, exposure, PEB) and developed (steps 1 and 2), then pieces of tape are glued onto the alignment structures (step 3). The second layer is deposited (step 4) and tape pieces are removed before finishing the conventional procedure (step 5: SB, alignment, exposure, PEB, development). Alignment structures are reusable for multiple alignments, without the need for intermediate development steps for more than two layers.

Figure S2a is a photograph of the wafer during the taping process to create a first layer of 1.4 μm and a second layer of 28 μm . After the second layer deposition, the tape is removed, leaving a clean surface and completely visible alignment marks. Figure S2b shows the resulting alignment procedure. For demonstration purposes, only the right alignment structure was taped, while the left one was covered by the second layer. The alignment structures are completely hidden on the left, while they remain fully visible on the right as a result of taping, enabling a precise and very fast alignment.

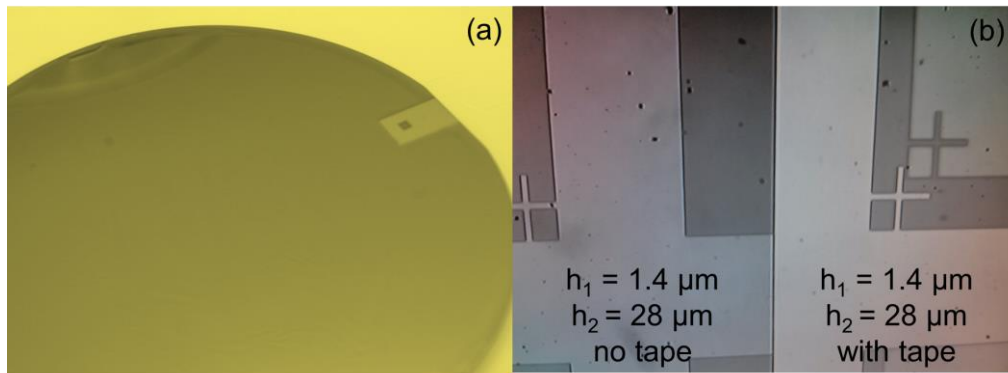


Figure S2. (a) Picture of a wafer after deposition of the second layer and the removal of the tape on the right. The alignment structure is fully visible. (b) Picture of the alignment process. The first layer (SU8 2002 – 3000 rpm) is developed prior to the second layer deposition (SU8 2025 – 3000 rpm). On the left, the alignment structures are completely hidden whereas they are fully visible on the right.