SOP for Polydimethylsiloxane (PDMS) molding with SU-8

SAFETY: Use with adequate ventilation. Wear gloves and other appropriate protective apparel.

1. Thoroughly mix sylgard184-base and sylgard184-curing agent with a weight ratio of 5:1 in a container (beaker or dish). Pour the mixture into a 1.5-inch plastic petridish.
2. Put the petridish with sylgard184 PDMS mixture into the BCB vacuum oven. Open vacuum valve, keep temperature at room temperature, degas the mixture for 0.5-1h (depends on the amount of mixture).
3. Purge the BCB vacuum oven with N2, take the degassed PDMS mixture out.
4. Insert the stainless steel master mold into the PDMS mixture.
5. Put the petridish with PDMS mixture and master mold on a hotplate at 60 deg.C for 2-3h to completely cure the PDMS.
6. Cool the PDMS to room temperature naturally.
7. Remove the master mold.
8. Pour SU-8 2020 into the petridish with cured PDMS.
9. Put the petridish into the BCB vacuum oven. Open vacuum valve, set the temperature to 60 deg.C, wait for 3-5h, increase the temperature to 95 deg.C, wait for 8-12h (or over night).
10. Purge the BCB vacuum oven with N2. Keep the petridish in the oven at 95 deg.C. Load a plastic or metal plate on top of the melted SU-8, then load a heavy weight (1-2kg) on the plate. Open the vacuum valve again and wait for 0.5-1h.
11. Cool down the compressed system to room temperature naturally. Remove the weight and plate.
12. Use MA6 mask aligner to do a flood exposure (300s) on the SU-8 in the petridish.
13. Manually separate the SU-8 and PDMS pieces.
14. Observe the structures in the SU-8 piece using optical microscope.
15. Put the SU-8 piece in the BCB vacuum oven, keep temperature at 150 deg.C, bake the SU-8 piece for 1h (no vacuum applied).

In the future, we may switch the PDMS to Poly(vinyl alcohol) or other polymers, and switch SU-8 to PMMA or other polymers. Processing temperatures and vacuum conditions may be modified accordingly.