Silicon Template Fabrication Recipe (for Thermal Nanoimprint)

1. Substrate Clean –Hamatech Hot Piranha Program 1 Wafer Clean
2. Dehydrate – bake at 170C hotplate for at least 10 mins
3. Lithography: DUV
    a. Apply BARC – DSK101-3, dynamically dispense at 700rpm, spin at 1500rpm, 1000rpm/s, 60sec, bake at 175C for 75sec on proximity hotplate
    b. Apply DUV resist – UV210-0.6, spin at 3000rpm, 1000rpm/s, 60s, bake at 135C for 60sec
    c. Expose – ASML, 23.5mJ/cm^2
    d. PEB – bake at 135C for 90sec on proximity hotplate
    e. Develop – Hamatech run recipe “726MIF 60s SP” twice
    f. Optical microscope inspection
    g. Descum – Anatech O2 descum 2mins
4. Template etch – Unaxis Photonics Etch Recipe: NICKZOR1
    a. Condition the chamber with clean Si wafer for 5min
    b. Run NICKZOR1
    c. Run 0release and 0Trench to condition the chamber back to Bosch etch
5. Resist stripping – Anatech O2 stripping at least 10min
6. Optical microscope inspection
7. Profilometry measurement of etch depth – P10
8. Anti-stiction coating – MVD 100, FOTS single-layer recipe

Thermal Nanoimprint Process

1. Take mr-9030M resist bottle out of fridge next to the Nanonex and let it slowly warm back to room temperature. Remember to put it back to fridge for storage.
2. Imprint substrate clean – Hamatech Hot Piranha Program 1 Wafer Clean
3. Dehydrate – bake at 170C hotplate for at least 10 mins
4. Line the spinner in the e-beam room with beta wipes; these resists are not allowed down the drain!
5. Apply mr-9030M thermal nanoimprint resist – 4000rpm, 1000rpm/s, 30s, 250nm(thickness should exceed maximum protrusion height of the template)
6. Soft-bake at 100C for 2min
7. Log into the Nanonex on Coral.
8. Log into the computer: **User: engineer PW: nx2500**
9. Log into the nanonex software (Nanonex Nanoimprint Machine Control V3.7, on the desktop) using the same username and password. When it asks if you want to do UV imprints, select “no.”
10. Stretch large silicone disk across metal ring, fix with magnets – make as flat as possible.

11. Load: small disk (on the bottom), substrate, template (on top), large disk on ring. *Make sure the springs in the Nanonex drawer are completely under the large silicone disk ring.*
12. Set imprint parameters: pump time 2min; pre-imprint temperature 90C and pressure 400psi; imprint 120C, 400psi, processing time 5min; venting temperature 30C.
13. Hit start.
14. Template removal: the template and substrate can be firmly stuck together; use razor blade with caution as quartz chips easily. *Be careful, and try to use a razor blade as little as possible — the resist you scrape up will end up on the edges of your template. Slide the blade in between the template and the wafer and carefully pry them apart.*
15. mr-9030M descum etch – Oxford 82, 50 sccm O2, 15 mTorr, 50 W, 2 min; if the plasma doesn't light, set the low-pressure strike parameters to 60 mTorr strike pressure, 10 V DC bias, ramp 10 (rate: 80nm/min)
16. Substrate etch – Unaxis, Photonics Etch, (NICKZOR1) (rate: 150nm/min, selectivity: ~4:1) *This etch transfers the pattern from the underlayer resist into the substrate.* If using Bosch deep Si etch (0Trench), rate: 0.33um/loop, selectivity: ~40:1.
17. Inspection – optical microscope, AFM or SEM
18. Remove residual resist – oxygen plasma stripping