Shunt capacitor fabrication

Recipe for shunt capacitor fabrication in MoRe cavities

- High resistivity silicon substrate (10x10 mm), 525 micron substrate. Diced from 4 inch wafer

1. Clean dicing resist off with Acetone and IPA baths (with or without ultrasound)
2. Optional: Clean with BHF etch (BOE 7:1) for about 1-2 minutes and stop in water. Dry from IPA to avoid dirt from drying from water.
3. Sputter MoRe in MB-AJA:
    - 60 sccm Argon flow
    - Position mode on pressure controller
    - 100W rf power
    - Sputter rate, 60 nm in 5 minutes
4. Coat wafer in positive e-beam resist AR-P 6200.09:
    - 4000 rpm: approximately 200 nm thickness
    - 3 min at 150C on hotplate
5. Expose bottom layer pattern in Ebeam at 210 uC/cm2 dose.
    - If features are larger than 100 nm, 250-300 uC/cm2 can be used.
6. Develop in Pentylacetate for 60 seconds and stop in MIBK:IPA 1:1
7. Etch MoRe layer by RIE:
    - SF6/He 12.5/10 sccm, 10 ubar, 50W rf power
    - Etching time of about 1:35 min for 50 nm of MoRe
8. Strip resist in warm PRS3000, 70C for 1-2 hours. Dry from IPA.
9. Coat with PECVD Si3N4
    - Use PECVD Si3N4, 300C HiQuality recipe
    - 3:35 min, 50 nm approximately
10. Coat in negative resist AR-N 7700.18:
    - 3000 rpm: approximately 450 nm thickness
    - 1 min at 90C on hotplate
11. Expose dielectric layer pattern in Ebeam at 210 uC/cm2 dose (or higher)
12. Develop using MF321 for 60 sec, stop in MF321:H20 1:10 for 15 seconds twice and once in water
13. Etch Si3N4 in BHF for 45 seconds (50 nm of Si3N4 removed). Dry from IPA if possible
14. Strip resist in warm PRS3000, 70C for 1-2 hours. Dry from IPA.
15. Coat in triple layer liftoff positive Ebeam resist:
    - layer 1: PMMA 950K A7, 3000 rpm, 180C bake on hotplate for 4 minutes
    - layer 2: PMMA 450K A4, 3000 rpm, 180C bake on hotplate for 4 minutes
    - layer 3: PMMA 950K A7, 3000 rpm, 180C bake on hotplate for 4 minutes
16. Expose top layer metal pattern in Ebeam at 1200-2400 uC/cm2 dose (maybe even higher)
17. Develop in MIBK:IPA 1:3 for 90 seconds and stop in IPA for 60 seconds.
18. Sputter top layer of MoRe in MB-AJA
    - 60 sccm Argon flow
    - Position mode on pressure controller
    - 100W rf power
    - Sputter rate, 60 nm in 5 minutes
19. Liftoff in warm PRS3000 (70C) preferably also using a stirrer (1-2 hrs). Blowdry after rinsing in IPA.
