

Critical Point Drying SOP

As we have been using the Tousimis 915B Critical Point Dryer in SNF we improved the standard operating procedure as described in the main text of our Winter Quarter Report. The basic version of the Standard Operating Procedures for this tool is already available online but we propose a modified version that ensures higher yield of successful releasing and better overall cleanliness of the process on small chips:

1. Sample Preparation
 - 1.1. Rinse sample at least 3x in DI water at the flexible corrosive wet bench.
 - 1.2. Place the sample in Isopropyl Alcohol for at least one hour at the flexible solvent wet bench
 - 1.3. Place a dummy wafer in 2-propanol for at least 1 hour.
2. Prepare the tool and load samples
 - 2.1. Contact staff in charge and ask about availability of LCO₂ (99.99%).
 - 2.2. Enable cpd.
 - 2.3. Record LCO₂ weight in log sheet. One run uses 3 to 4 pounds of LCO₂.
 - 2.4. Check valves:
 - Fill 1.1
 - Bleed 0.14
 - Purge-Vent 0.15
 - 2.5. Turn off the Fill knob.
 - 2.6. "Chiller Power" press ON, wait for *30 minutes*.
 - 2.7. Press "Condenser Power" ON.
 - 2.8. Press "Chamber Power" ON (VENT light on), wait for *3 – 5minutes*.
 - 2.9. Remove the chamber lid and place it on aluminum foil.
 - 2.10. Check inside of the chamber lid, o-ring, inserts, and baskets for particles. Rinse off particles using IPA at the solvent bench, wbflexsolv, or use IPA on a thin cleanroom wipe.
 - 2.11. Check o-ring, if the o-ring is flat, shutdown the system and contact maintenance.
 - 2.12. Place 2 largest inserts, 4" basket and small, 4-chip basket, and 4 4" spacers in the chamber.
 - 2.13. Press VENT (VENT light will blink).
 - 2.14. Fill with 150 ml of 2-propanol.
 - 2.15. Transfer up to 4 chips directly from an IPA dish to the small basket.
 - 2.16. Cover the chips with a dummy wafer from IPA, placing it on 4 stacked spacers.
 - 2.17. Lower chamber lid onto chamber and use fingers to evenly tighten the 8 nuts.
 - 2.18. Tighten 8 nuts in a numbered sequence using the wrench and repeat until nuts are unable to tighten further. Don't overdo it.
3. Run the critical point drying process
 - 3.1. Set PURGE time to 10 minutes (15 minutes is max).
 - 3.2. Press COOL (VENT light goes off, COOL light goes on), Temperature drops to 10°C within 4 minutes.
 - 3.3. Once Temperature reaches 10°C press FILL (COOL light off, FILL light on).
 - 3.4. Pressure starts going up, when it reaches 400 psi start opening the FILL valve gradually until you reach 1.1, you need to do this within 8 minutes of the initial FILL time. Pressure goes up to 800 to 900 psi.

- 3.5. Automatic switch to PURGE (FILL light off, PURGE light on), LCO₂ will continue to fill the chamber, preset purge time will run.
- 3.6. Automatic switch to POST-PURGE-FILL (FILL and PURGE lights on), 4 minutes, LCO₂ will continue to fill the chamber.
- 3.7. Automatic switch to HEAT. HEAT light will be on until the system reaches Critical Point, pressure rises above 1072 psi and temperature above 31°C. Pressure goes up to 1400 psi and temperature can reach up to 40°C.
- 3.8. Heat will blink for 4 minutes. Automatic switch to BLEED (HEAT blinking light off, BLEED light on), pressure drops in a rate of 100 – 150 psi/min, ~ 10 minutes.
- 3.9. Around 360 psi, automatic switch to VENT (BLEED light off, VENT light on), ~ 3 minutes.
- 3.10. Open chamber at 0 psi and loosen 8 nuts in reverse pattern (8,7...1).
- 3.11. Remove wafer, wafer should be dry, if not, contact SNF staff.
4. Turn off the tool
 - 4.1. Clean chamber, lid, inserts, and basket with IPA and blow dry.
 - 4.2. Place the lid back on the chamber, don't tighten nuts.
 - 4.3. Press "Chiller Power" OFF
 - 4.4. Press "Condenser Power" OFF
 - 4.5. Press " Chamber Power" OFF
 - 4.6. Fill out the log sheet.
 - 4.7. Disable cpd.