Forming Gas Anneal

SOP

I. General Information and Usage

1. The Bruce Furnace is a tube furnace capable of temperatures reaching (at least 1550°C). The Bruce is used for annealing, diffusion, and oxidation. It has four available tubes, each utilized exclusively for a different process. The Bruce can be programmed to allow for multi-step processes requiring various gasses at different flow rate ratios.

II. Equipment Specifications

1. Available gases: O2 (wet and dry),
2. H_2/N_2 (forming gas), Argon, N_2
3. Ability to process up to (about 100) 4" wafers simultaneously
4. Max Processing Temp: >1250° C
5. Max # of process steps: 9

III. Operating Instructions

1. CAUTION: Only use the tubes for their specific labeled uses. (Tube 2: Dry/Wet Oxidation. DUTT1_Tube 4: trans-LC HCl dry oxidation. DUTT2_Tube 4: forming gas anneal.
2. Start Up (In the Support Area)
    1. Turn on any necessary gases. (Low-Pressure N2 at 40psi, Hydrogen and H2/N2 in the H2 gas cabinet behind the Bruce in Room 464, O2 tied against the wall for gas cylinders along the walkway) There are valves on the Bruce that must also be opened and checked for proper settings.
    2. Flip the main power breaker. An alarm will go off inside the furnace room. On the control panel hit the reset switch.
    3. Flip the power breaker (for heating) of the desired tube furnace.
    4. Cooling: switch on the fan and cooling water
    5. Forming gas N2/H2(5%) anneal: N2/H2 pressure at ~20psi, N2 at ~30psi.
3. Programming the Furnace (In the Furnace Room)
    1. In interval 0, set gas flow to pass N2 (gas#1 at 40%) through the tube furnace for 5 min to clean the tube.
    2. In interval 0, set the furnace to the process temperature (350~435°C). Allow furnace temperature stabilize at 435°C.
    3. Then open the Nupro valves for N2 and H2/N2 (gas#3), both at 40% of the MFC's maximum.
    4. Plug-in the power cord for hydrogen burn-off coils. After about 1 min, the furnace should alarm and start the automatic timed purge sequence.

5. Press ACK to silence the alarm
6. While the system is in timed purge, no gases will flow into the tube, and Binary Alarm 5 will be indicated in the Alarm Status display.
7. The timed purge will continue for about 15 minutes, after which N2 and H2/N2 flow will resume.
8. Call Interval #1, press START to launch the cycle.
9. Open the furnace using the manual boat loader control, open the furnace only to the point where the wafer boat is accessible(to minimize the cooling effect during the loading)
10. Quickly load wafers directly onto the boat
11. Close the furnace
12. Periodically monitor the status of the gases and temperatures for the run.
13. On completion of the run, the automatic timed purge will start again. Press ACK to silence alarm.
14. Take the boat out and remove wafers, close the furnace.
15. In interval 0, set temperature to room temperature to allow the furnace to cool.
16. Wait for the timed purge cycle to elapse (15min). Binary alarm 5 will go off and N2 flow will resume.
17. Unplug the H2 burn-off coils. The controller will start its timed purge cycle again.
18. After the timed purge cycle is done, turn off N2 flow and close the Nurpos for N2 and H2/N2.

4. Shut Down (In the Support Area)
    1. Turn off gas valves
    2. Close valves to the gas cylinders
    3. Shut off cooling fans and water running until the temperature of all furnaces in the stack is below 100°C

Recipe of Intervals

Interval 1	Boat in (3min)	N2(40%), H2/N2(40%)	Ch1,3 and C (ON)
Interval 2	Allow temperature to stabilize (10min)	N2(40%), H2/N2(40%)	Ch1,3 and C (ON)
Interval 3	Sinter in forming gas (25min)	H2/N2(40%)	Ch3 (ON)
Interval 4	Boat out (3min)	N2(40%), H2/N2(40%)	Ch1,3 and C (ON)

*** Breaker for heater hard to switch ON, either wait for a few minutes after main breaker ON or after Inverval 0 to switch on N2.**

Last Update
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