Tystar Furnaces

Introduction
Dry/Wet oxidation furnace is used for dry/wet oxidizing the Si wafers to form a thermal oxide layer. The oxide uniformity is better than 1%.

N and P doping furnaces are used for doping the Si wafers with pre-loaded doping sources.

LPCVD nitride furnace is for depositing Silicon Nitride, including standard stoichiometric Si3N4 and low stress SiNx.

Features
- Designed for processing wafers from 4” diameter down to wafer pieces
- 25 slot wafer carrier for 4”/100mm wafers
- 18” flat zone
- Load station with vertical, down draft laminar flow module and class 100 HEPA filter
- Automatic, speed controlled non-contact cassette loader
- Touch screen panel computer control system
- Host computer control and data collection system
- Operating temperature: up to 1050 °C
- Temperature accuracy: ±1 °C
- Automatic recipe controller

Safety
- Burn Hazard. Furnace cantilevers, boats, and wafers come out of the furnace are very hot. Proceed with caution.
- If anything doesn’t follow the automatic procedure described below, contact staff. Do not attempt to open the furnace.
Process Rules

- Allowed materials are Si, SiO₂, and SiNx. Metal coating on the samples are absolutely not allowed.
- Never mix use the tools and the sample holders for each furnace.
- The maximum temperature for oxidation furnace is 1050 °C.
- The maximum temperatures for the doping furnaces are determined by the pre-loaded doping sources. Please consult staff.
- Clean surfaces are very important for successful oxidation/doping/deposition. It’s strongly recommended that the samples should be cleaned with HF (to remove native SiO₂ if applicable) and plasma cleaner (to remove organic residues) before loading.

Operation

   Get familiar with front panel. Figure 1 shows the interface with useful bottoms highlighted. Figure 2 explains the status.

Figure 1: Touch screen interface with useful buttons highlighted
2. Press Display Status to view current status. Make sure that STEP: IDLE is displayed as current step (Figure 2).
3. Press Main Menu to go to main menu.
4. Press Recipe Load.
5. Select a recipe with the arrows. Press Enter twice to load the recipe.
   Oxidation furnace: Wet oxide.001 for wet oxidation. Dry oxide.001 for dry oxidation
   Doping furnaces: B1250VAR.002 for boron (P) doping. NDOPEVAR.003 for phosphors (N) doping.
   LPCVD: STDNTRD.006 for stoichiometric Si$_3$N$_4$. LSNTRD.006 for low-stress SiN$_x$
6. Input growth temperature and time. Input the same temperature value for Temp L, C, and S.
   Follow the format of xxxx.x for temperature and the format of hh.mm.ss for growth time. Press Enter after each value.
   Note: Exactly follow the temperature and time formats. Don’t skip any zero or dot. Otherwise, the recipe won’t run. If you entered a wrong number, use the arrows to move back to edit.
   Oxidation furnace: Please use the calculator https://cleanroom.byu.edu/OxideTimeCalc to find the growth temperature and time.
   Doping furnaces: Temperature should not exceed the activation temperature of the doping source.
   LPCVD: The deposition temperature is fixed at 835 °C. Only enter the deposition time. The deposition rate is about 3.2 nm/min.
7. Press Main Menu, then press Run.
8. View status by pressing Display Status. Verify the current recipe. STEP: STRT should be shown as current step. Meanwhile, green light is on. (If remain at STEP: IDLE, press RUN again).
9. Wait for boat to come out. An alarm will be triggered once the boat is completely out. The LPCVD boat needs about 30 min before moving out.
10. Press Alarm Ack to cancel the alarm.
11. You have 20 min to load wafers. If you finish early, press Event to send the boat in. If the boat
starts moving in before you finish, press Event, it will come out and give you another 20 min.
12. Wait until the boat is completely in. You can leave.
13. Return after the estimated time of your recipe. Both green and orange light should be on. The
process should be hold at STEP:HLD2.
14. Press Event to move the boat out. Press Alarm Ack when the alarm sounds. LPCVD needs about
30 min before the boat moving out.
15. Unload the wafers. Keep the doping sources on the sample holder.
16. Press Event to close the tube door.
17. Make sure that the door is securely closed and light changes to orange before you leave.