tube6C-LTO

STANDARD OPERATING PROCEDURE

This equipment donated by Intel

CORAL Name: *tube6C-LTO*

Model Number: Thermco LPCVD Low Temperature Oxide (LTO) reactor

Location: ICL

What it does: Low-pressure chemical vapor deposition reactor.

Introduction: THERMCO "6C-LTO" Furnace is a Low Pressure Chemical Vapor Deposition (LPCVD)Reactor, designated to deposit thin Low Temperature Silicon Dioxide films on Silicon wafers up 6 inch in diameter. The LTO film is deposited by the reaction of Silane (SiH4) and Oxygen at low pressure (150–300 mTorr) in the temperature range of 400 – 450C

The process runs in the "Reaction Rate Limited Regime"; i.e. operating at low pressure the mean free path of the reactant gases is high and assures an uniform gas supply, so the mass transfer to the Silicon substrate does not limit the deposition rate. In this regime the deposition thickness is a linear function of time. There is hazard of particles generation due to the Gas Phase Nucleation effect; a Quartz cage is used, to avoid the particles deposition on the wafers.

The Silane and Oxygen are introduced into the reactor from both load and source zone Using two separate Quartz injectors; with an uniform gas concentration along the tube.

That facilitates Using a flat temperature profile, which is easier to achieve at low temperature.

The LTO deposition process parameters are:

- Temperature : 425 °C
- Pressure: 200 mTorr
- SiH4 flow: 175 sccm
- O2 flow: 125sccm
- deposition rate is constant: ~ 70 A/ min\
- Thickness uniformity across the wafer : < 5 % @ 5,000 A

The THERMCO furnace is controlled by the TMX tube computer; while the SEMY supervisor system is used to monitor the system and to edit and store the process recipes.

The THERMCO "6C-LTO" horizontal reactor is for CMOS process only.

Safety: Silane SiH4 is a Pyrophoric gas , extremely flammable when it comes in contact with Oxygen or air. The Material Data Safety Sheet (MSDS) is in the yellow binder.

The system has hardware and software safety interlocks, to prevent any Silane related hazard

High temperature: many furnace parts can be hot. Use caution when handling them.

Avoid breathing the LTO particles from the Quartz cage during wafer handling.

Procedure:

1. Engage Machine in CORAL for ICL "tube6C-LTO" machine, before you start. The wafers should have been RCA cleaned less than 4 hours before and your process must be approved by the PTC.
2. Pull the tube boat out as follows:
   - On the SEMY terminal double click on "RUN" ; the "Minispec Loader" pops up on the screen.
   - From the OPTION/ TUBE menu choose "6C"
   - Click on File/Open menu , select the "LTO BOAT OUT" minispec and click OK

- On Minispec Loader window click “Compile & Send”; Compile Status window will be show up. Wait until the OK button is active, then click on it: the recipe was successfully sent to the TMX tube computer

Note: The tube should be in “Standby” mode to accept a new recipe; if it is in “Complete” status, push the “STOP” button on the tube TMX display to bring the system in ” Standby “ mode. If it is in “HOLD” status, push “START” & “STOP” buttons in that sequence to bring it in Standby mode.

- On the tube TMX display push the “START” button; the system will go in Processing mode, and the boat will come out in 30 minutes.

3. Pull the central Quartz cage from the tube paddle after it got cold, Using double gloves, place it on the designated LTO transfer quartz plate, unload the dummy wafers and place your wafers with the flat down in the quartz boat.

   Place the Quartz cage back in the central position on the tube paddle, with the wafers front side facing the Source Zone end.
4. Start the processing recipe, by following these steps:

   - On the SEMY terminal double click on “RUN” icon; the “Minispec Loader” pops up on the screen.
   - From the OPTION/ TUBE menu choose “6C”
   - Click on File/Open menu , select the “LTO 400C 53A SPK” minispec and click OK.
   - On Minispec Loader window click “Compile & Send; the Compile Status window and the Variable Delay Entry window will show up. On the Variable Delay Entry window input the deposition time and push “ENTER”, input the deposition time again to confirm and wait until the OK button on the Compiler Status window is active, then click on it: the recipe was successfully sent to TMX tube computer

   Note: The tube should be in “Standby” mode to accept a new recipe; if it is in “Complete” status, push the “STOP” button on the tube TMX display to bring the system in ” Standby “ mode.

   - On the TMX tube display push “START” button, the system will go in “Processing” mode.
5. When the process is finished, take the Quartz cage (cold) from the tube paddle, and place it on the designated LTO transfer Quartz plate. Remove your process wafers from the Quartz cage and replace them back with the original dummy wafers. Place the Quartz cage back on the tube paddle and put the boat in by following these steps:

   - On the SEMY terminal double click on “RUN” icon; the “Minispec Loader” pops up on the screen.
   - From the OPTION/ TUBE menu choose “6C”
   - Click on File/Open menu , select the “LTO BOAT IN” minispec and click OK
   - On Minispec Loader window click “Compile & Send”: the Compile Status window shows up. Wait until the OK button is active, then click on it: the recipe was successfully sent to the TMX tube computer.

   Note: The tube should be in “Standby” mode to accept a new recipe; if it is in “Complete” status, push the “STOP” button on the tube TMX display to bring the system in ” Standby “ mode.

   - On the tube TMX display push the “START” button; the system will go in Processing mode, and the boat will start going in.

“Disengage Machine” in CORAL, after you input the test data from the monitor wafers into the comments section of the engage machine window.

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