YES LP-III Vapor Prime Oven Instructions

OVERVIEW:

It is essential a photoresist adheres well to a substrate surface during a lithography process. A substrate's surface must be treated with an adhesion promoter before photoresist is applied to the substrate. The YES oven first completely dehydrates the substrate and then treats it with a hexamethyldisilazane (HMDS) vapor. The YES HMDS oven eliminates single substrate liquid priming and hotplate dehydration baking. The oven is set-up for batch processing of entire cassettes or multiple cassettes. Treated wafers can last several weeks without any change to surface adhesion.

HMDS(Hexamethyldisilazane, $[(CH_3)_3Si]_2NH$) is widely used in the semiconductor industry to improve photoresist adhesion to oxides. The HMDS reacts with the oxide surface in a process known as silylation, forming a strong bond to the surface. At the same time free bonds are left which readily react with the photoresist, enhancing the photoresist adhesion.

This YES-3DR system dehydrates the wafers at 150ºC and primes the wafers with just a monolayer of HMDS, which can be chemically stable for several weeks. In addition to HMDS vapor prime, this oven can also be used for vacuum dehydration of wafers.

RESTRICTIONS:

- Any materials that cannot withstand 150ºC temperatures.
- Substrates should be clean and dry
- Use only quartz, glass or aluminum substrate holders

SAFETY PRECAUTIONS:

- HOT CASSETTES. Use the handles when handling the cassettes. Do not touch cassettes with hands.
- Do not attempt to fill HMDS vessel. All HMDS fills will be performed by lab staff.
- Please contact lab staff if any ammonia-like odor is detected.
- NEVER Leave door open.
- NEVER Place low-temperature materials(<150 °C) in chamber.
- Wafers with resist, polymer, or any organic film are NOT allowed!
- Wafers should be very dry prior going into the oven!
- In case of abnormal smell (Vapor prime process will generate ammonia), press 'Emergency' button to terminate the process and report to NFCF staff.

CONTAMINATION CONTROL PROCEDURES

- Proper cleaning of substrates is recommended before starting any lithography process.
- Do not touch cassette with hands. Use proper handle for cassettes.

Log In

Use the iLabs utility and begin a walk-up or a scheduled session.

Vent Chamber and Place Substrates in the Oven

On the process controller, press **PGM** and **RUN.** This will vent the chamber to open the door.

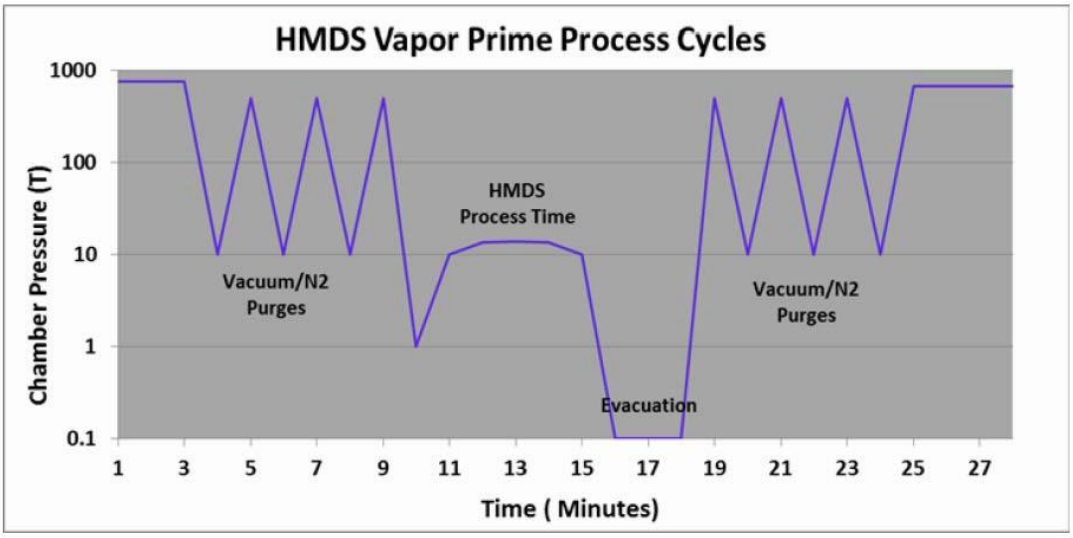
Place your substrates in the oven on the top shelf. There is glassware available for 3", 100mm, and 150mm wafers. For other size or shape substrates, lay your substrates flat on glassware or aluminum foil.

Start Process

Close the door, making sure that the latch is securely in place.

Depress the button switch on the right side of the equipment. Depress two times to start the process.

The process will start automatically. The whole process is depicted below:



①Purge

A series of vacuum/N_2 (pump down to 10 Torr then vent to 600 Torr) rapidly remove O_2 and moisture from the chamber interior. Pre-heated N_2 warms substrates to

process temperature (150 °C, soak time: 5 mins).

②Process step

Chamber is pumped down to base temperature (100 mTorr). HMDS vapor admitted into the chamber for designated process time. (Process pressure: 2 Torr, process time: 5 mins)

③Evacuation

Chamber is pumped down to remove excess HMDS. Vacuum/N_2 cycles ensure complete removal. (Pump down to 10 Torr then vent to 600 Torr)

④Vent

Chamber is vented to atmosphere.

- This program will take about 31 mins in total. During the process, the door will be automatically blocked, don't attempt to open it.
- Once the program is finished, the alarm will sound, press 'RESET' button.

1) Delatch the handle and open the door. Take out the wafers carefully. Then close the door and latch the handle.
2) Put the thumbwheel to program #8(vacuum) and press 'START' button to vacuum the chamber.
3) Once it's pumped to base pressure, the alarm will sound, press 'RESET' button. **Then, you are done!**

When the Process is done, the amber **COMPLETE** light will flash and an alarm will sound. These will both turn off by themselves in several minutes or you can press the **RESET** button, located below the **COMPLETE** light.

Remove your substrates. Make sure you latch the door closed. You may leave the glassware on the table for the next user.

Process Recipes

Oven Program

Inputs: A = start button, B = Baratron setpoint 1, C = 2 or 3 on thumbwheel, D = Baratron setpoint 2, E = 1 or 3 on thumbwheel

Outputs: O0 = Signal Tone, O1 = Nitrogen, O2 = Vacuum, O3 = Chemical

Step	Func/Data	Output	Comments
01	IF A>03	-	**KEY LOCK SEQUENCE** System is running,
02	GOTO 01	-	waiting for the start button
03	IF E>35	-	Program 1 = Purge cycle
04	GO TO 05	-	**Program 0** = Vapor Prime
05	M02:00	2	Vacuum 2 min.
06	IF B>30	2	If above setpoint 1, abort to step 30
07	M02:00	1	N2 2 min.
08	IF B>09	1	If above setpoint 1, continue

09	M02:00	2	vacuum 2 min.
10	IF B>30	2	I If above setpoint 1, abort to step 30
11	M010:00	1	10 min. N2 purge
12	IF B>13	1	If above setpoint 1, continue
13	M03:00	2	Vacuum 3 min.
14	IF D>30	2	If above setpoint 2, abort to step 30
15	L=150	3	Loop signal begins
16	S=02:00	3	2 seconds HMDS
17	IF D>30	3	If above setpoint 2, abort to step 30

18	L>16	3	Loop back to step 16
19	M00:30	2	30 secs. vacuum
20	M00:30	1	30 secs. N2
21	M00:30	2	30 secs. vacuum
22	M02:30	1	2.5 min. N2
23	M01:00	0	Complete alarm
24	GO TO 00	-	**Reset**
30	S00:10	0,1	**Abort** alarm and N2 purge
31	S00:10	1	N2 purge
32	GO TO 30	1	Loop alarm and N2 purge
35	M02:00	2	**Program 1 -** 2 min. vacuum
36	M00:30	1	30 secs. N2
37	M01:30	2	1.5 min. vacuum
38	M00:30	2&3	30 secs. Vacuum to chamber and HMDS flask
39	GOTO 19	-	Purge cycle

HMDS – Recipe#1 Summary Temperature: 150ºC

- Number of dehydration cycle purges: 3
- Number of exit cycle purges: 3
- Process Duration (HMDS): 300 seconds Purge Pressure High: 500 Torr
- Purge Pressure Low: 10 Torr Base Pressure: 1 Torr
- Hi Abort Pressure: 20 Torr

Sequence:

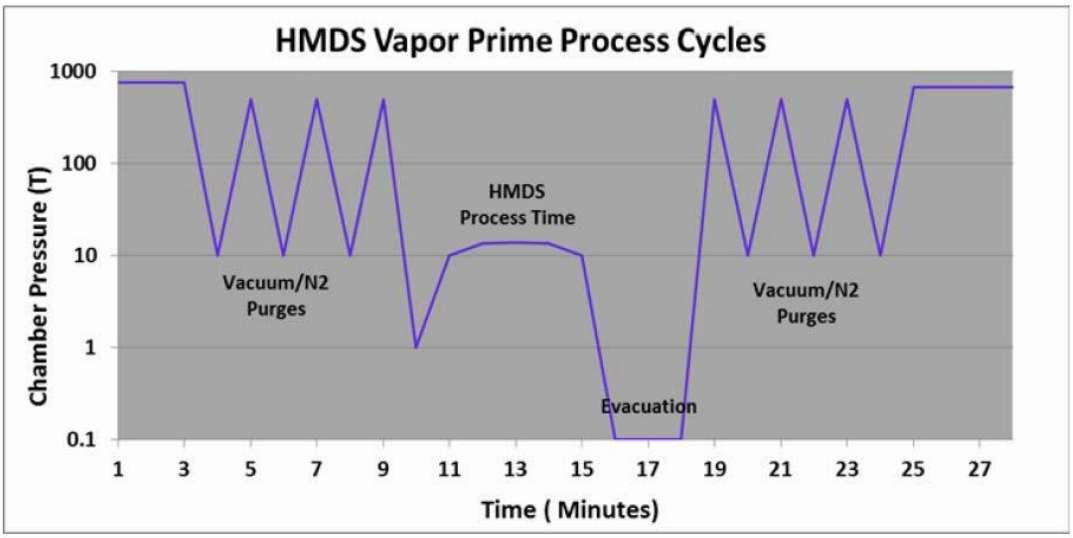
1. Evacuate chamber to “Purge Pressure Low”
2. Fill chamber with nitrogen to pressure “Purge Pressure High”
3. Repeat cycle purge chamber - steps 1 and 2, three times set by “Number of dehydration cycle purges”
4. Evacuate chamber to “Base Pressure”
5. Open process gas – HMDS vapor into for “Process Duration” set point

6. Evacuate chamber
7. Fill chamber with nitrogen to pressure “Purge Hi”
8. Evacuate chamber to pressure “Purge Low”
9. Repeat cycle purge chamber - steps 7 and 8, three times set by “Number of exit cycle purges”
10. Fill chamber with nitrogen to pressure “Purge Hi”
11. Process complete

Functions:

S00.00	Seconds an output stays on (up to 99.99 sec)
M00:00	Minutes an output stays on (up to 99:99 min)
1-100:00	Hours an output stays on (up to 99:99 hours)
IF ?>00	If a positive signal from input A, B, C, D or E than GOTO step 00
GOTO 00	GOTO step 00
L=0000	Do the following step until L> is encountered 0000 times
L>0	GOTO step 0 and subtract 1 from the L loop

4) Open the door (pull the handle) and carefully put wafers on the grids. If wafers are too small, put the wafers on the sliding glass (already on the grids).
The whole chamber and the grids are hot (150 °C), watch yourself! Do not put wafer box in the chamber!
5) Close the door (and latch the handle). Put the thumbwheel to program #1(vapor prim), then press ‘START’ button.
The vapor prim would start automatically. The whole process is depicted below:



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