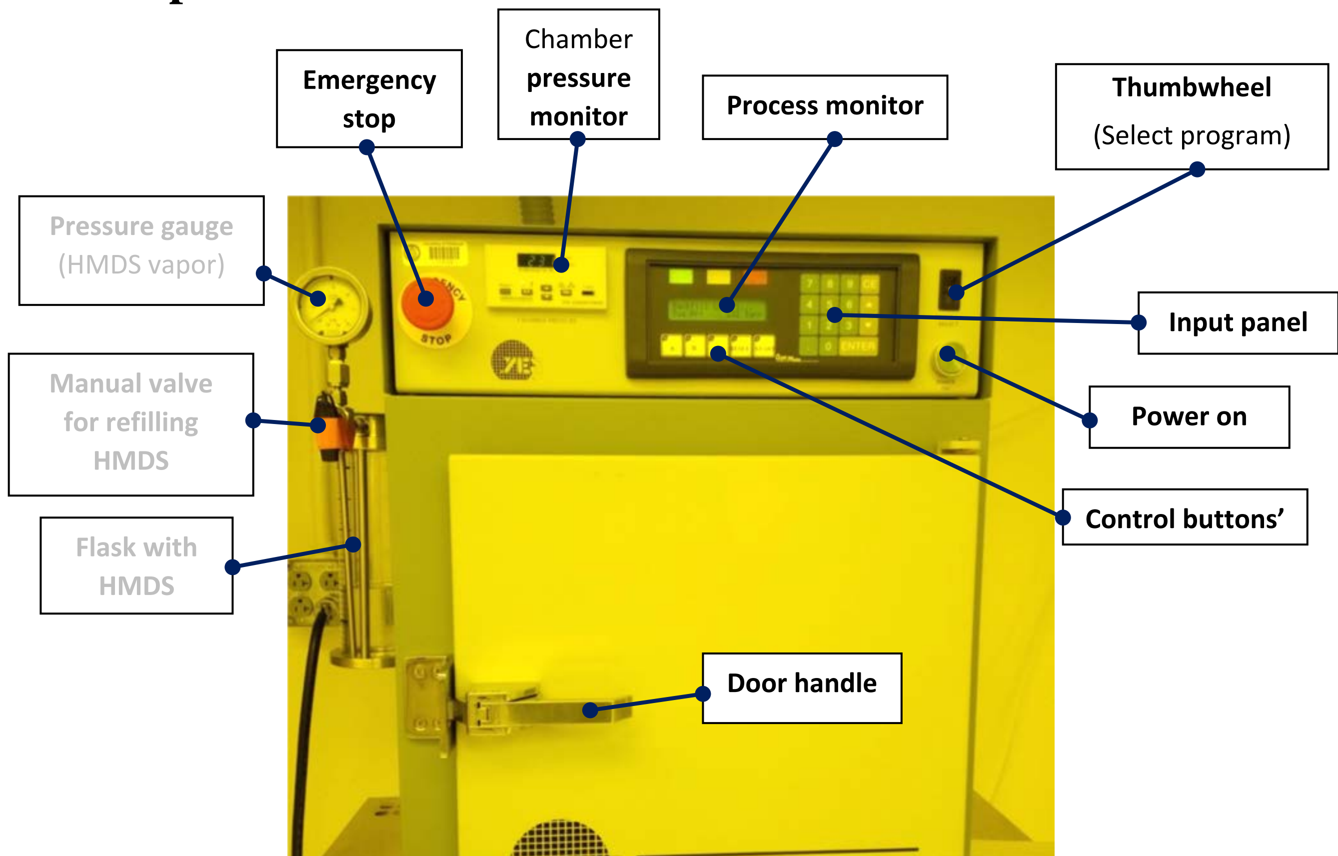
YES-3DR HMDS OVEN USERS GUIDE

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 prim, this oven can also be used for vacuum dehydration of wafers.

Front panel:



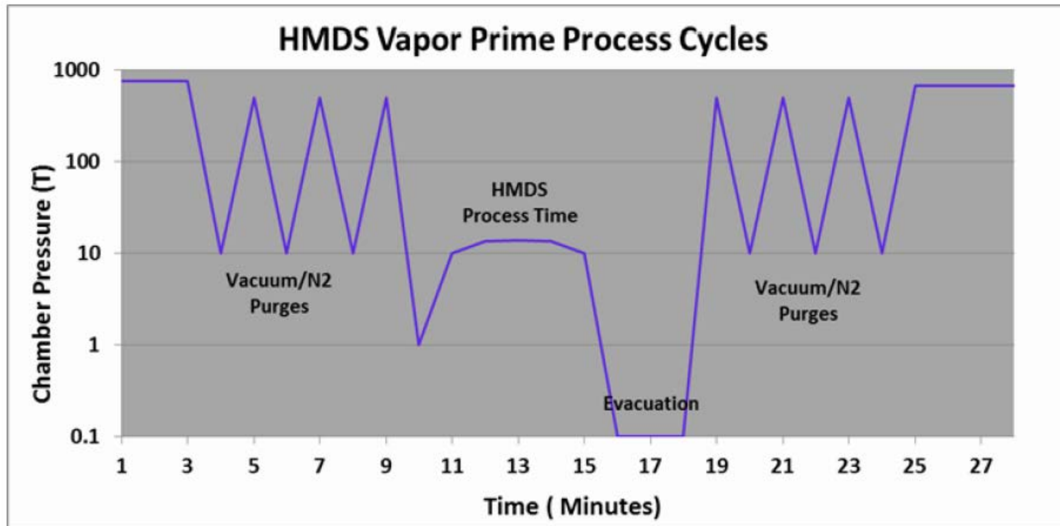
Attentions:

- 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!
- Check HMDS liquid level (HMDS tank on the left side of the oven)
  If less than 'HMDS REFILL' line, report to NFCF staff.
- In case of abnormal smell (Vapor prime process will generate ammonia), press 'Emergency' button to terminate the process and report to NFCF staff.

Instructions for HMDS prim:

1) Log into FOM
2) Put thumbwheel to program #0(vent) and press 'START' button to vent the oven, the pressure will go to atmosphere (~750 Torr) and the alarm will sound, press 'RESET' button.
   The alarm will sound for five minutes if RESET is not pressed! (Same as follows)

3) 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!
4) 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:



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 31mins 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.

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

Programs with thumbwheel number:

0- VENT CHAMBER
1- VAPOR PRIM
2- N/U
3- N/U
4- N/U
5- N/U
6- FILL FLASK (ONLY NFCF STAFF CAN USE THIS PROGRAM!!!)
7- N/U
8- VACUME TO BASE PRESSURE
9- VACUME CONTINOUSLY

Instructions for wafers dehydration (manual mode):

1) Put thumbwheel to program #0(vent) and press 'START' button to vent the oven, the pressure will go to atmosphere (~750 Torr) and the alarm will sound, press 'RESET' button.
2) 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!
3) Close the door (and latch the handle). Put thumbwheel to program #8(vacuum), then press 'START' button, wait for reaching base pressure. Press 'RESET' when vacuum is done.
4) Put thumbwheel to program #0(vent), then press 'START' button, wait for venting to atmosphere. Press 'RESET' when vent is done.
5) Repeat step 3) and 4) for another two times.
6) Leave wafers in the chamber for 5 mins(count by stopwatch) for dehydration (in hot N_2 condition). For dehydration in vacuum, just vacuum the chamber (program #8) and wait for 5 mins.
7) Once dehydration is done, vent the chamber (program #0) and take out wafers.
8) Close the door and vacuum the chamber (program #8). Then you are done!

HMDS removal:

Oxygen plasma or UV-Ozone. We can use RIE for very gentle cleaning in NFCF.

RIE recipe:

Power: 50 W, Pressure: 500 mTorr (O_2), time: 10 seconds (~10 nm photoresist etched away)

Application notes (Attached)

More information can be found here:

1)http://www.yieldengineering.com/Portals/0/HMDS%20Application%20Note.pdf

2) https://cmi.epfl.ch/photo/Yes_primer.php