Usage Policies Notebook for BMR HIDEP
Low Temperature Plasma Enhanced CVD (LTPECVD)

Revision date
September 2014

INRF UCIrvine

Emergency Plan for BMR HIDEP
Low Temperature Plasma Enhanced CVD (LTPECVD)

Standard Operating Procedures for Emergencies

Contact information

Person	Phone number
Lab Manager	Jake Hes, 949-824-8239 (day), 562-522-8328 (alternate)
Director	G.P. Li: 949-824-4194 (day), 949-824-2047 (alternate)
Staff	Mo Kebaili: 949-824-8239 (day), 949-494-5892 (alternate)
Super User	Carlos Ruiz (818) 527-6349 (Anytime, voicemail or text only)

Hazardous chemicals, gases, and conditions

Hazard name	Description of hazard
Vacuum	Implosion
High temperature	Burn or ignition source
High voltage	Electrical shock, ignition source
Isopropyl alcohol	Flammable solvent
SiH_4 (silane) gas	Pyrophoric (explodes on contact with air)
O_2 (oxygen) gas	Oxidizer gas
H_2 (hydrogen) gas	Flammable gas
N_2 (nitrogen) gas	Asphyxiant

Alarms or indications of danger

Alarm type	Condition and response
Alarm on the scrubber in the utility room	Problem with scrubber. Halt any running process. Correct the problem or notify the staff or the lab manager before continuing.
Alarm on the console	Problem with process state. Halt the process. Correct the problem or notify the staff or the lab manager before continuing.
Pungent or foul smell	Gas leak. Shutdown the machine at once and evacuate the area. Contact the staff and the lab manager.

Emergency shutdown plan #1

In the event of an emergency, when there is very little time, *press the large red emergency shut-off button at the front of the machine*. This will shutdown the system and will stop the gas flow into the system. Leave the facility at once. Then contact the lab manager or the staff.

Emergency shutdown plan #2

In the event of an emergency, when there are a few minutes available, *press the large red emergency shut-off button at the front of the machine*. This will shutdown the system, and stop gas flow into the system. Next, check the gases in the utility room w2331, adjacent to the Plasma-therm room. If there is no fire, and no smell of gases, enter the room and shut off all gas cylinders valves by turning them fully clockwise. Check the oxygen tank in room w2336, feel the door for possible fire, and if safe, close the oxygen tank by turning fully clockwise. Leave the facility at once, then, contact the staff and the lab manager.

Usage Policies for BMR HIDEP
Low Temperature Plasma Enhanced CVD (LTPECVD)

Standard policies for usage

The HIDEP system from BMR Technology opens a new horizon for plasma-enhanced chemical vapor deposition (PECVD), BMR's new high density plasma CVD system HIDEP, can deposit high quality dielectric films at temperature below 100°C with high deposition rates based on BMR's patented Hybrid Electromagnetic Energy Coupling technology (US Patent 6310577 B).

Conventional PECVD processes typically need operating temperatures in excess of 400°C to produce films with necessary electrical or physical properties at economically viable deposition rates. In typical PECVD systems, as the deposition temperature decreases below 300°C, film morphology and integrity also decrease rapidly due to pinholes.

Contact information

The INRF staff or the lab manager may be reached at 824-8239 or 824-9831.

Authorized users

Only INRF registered users who have completed the training and passed the certification may use this equipment. Users may only use the portion of the system for which they have been trained.

Training

Users must have received direct training from the staff in order to use this equipment. Users are expected to understand the nature of the system, as well as the proper control and use of the gases. Training varies slightly, depending on the process to be performed. Contact the staff for details and to arrange for a training session.

Usage logs

Users are required to log all activity in the log sheets provided. All users must log in when they used the BMR HIDEP System (date and time), which gases they used and quantity, and when they completed their process in the user log sheets. If users notice anything unusual, they should record it in the user log sheets, and add details in the maintenance log sheets. Any maintenance to the machine must be logged in the maintenance log sheets (maintenance staff only).

Safety equipment

There is no specific safety equipment for use on this tool, however, cleanroom gloves and tweezers should be used when handling pieces in the chamber. Care should be taken to avoid burns when working near the chamber hot plate.

Standard equipment and materials

The laboratory provides the following gases: O_2, SiH_4, N_2, and H_2. Other gases must be cleared with the lab manager.

User maintenance

Users are requested to clean the chambers after use by first, wiping them down with the isopropanol, then run the required cleaning process. Spray the isopropanol into a lint-free cloth and wipe the inside of the chamber, (you must wait until the unit is cool to do this). Dispose of the cloth in a waste container marked for flammable solid waste.

Pollution Control

Turn on the scrubber when using the following gases: SiH_4, H_2. Dispose of the alcohol soaked wipes in a waste container marked for flammable solid waste. Purge the gas lines after using corrosive gases.

Scheduling

Reservations can be done online, also, the system can be used on a first come, first served usage if no reservation was made.

Other issues

Users should remain physically present in the cleanroom facility during the entire use of the BMR HIDEP System. This includes the time when the chamber hotplate is warming up.

Gases should be turned off at the cylinders valves when finished. Users should not modify any standard recipe in the software. New recipes can be created, but once created, they should stay unedited. A modified recipe should be given a new name. This allows us to track down the history of a problem later, if necessary.

At no time should a user adjust a pressure regulator on a gas line. Gas control should be “on” or “off” only, using only the valves appropriate. For most gases, this is usually the valve at the cylinder head.

Non-standard use

Users may not modify any hardware on this equipment. For use of non-standard processes, gases or materials, contact the staff or the lab manager.

Usage Notes for BMR HIDEP
Low Temperature Plasma Enhanced CVD (LTPECVD)

Guide for using the BMR HIDEP LTPECVD correctly

BMR HIDEP LTPECVD System generates highly dissociated plasmas by using time-varying magnetic fields excited by a specially designed antenna array at radio frequency (RF), this proprietary antenna array provides the HIDEP plasma with high power efficiency over a wide range of operating pressure and power settings. A special magnetic field is localized at the chamber circumference to further enhance electron confinement and hence deposition properties.

Additional RF power can be applied to the top electrode and to the wafer chuck. These additional RF powers are useful in controlling film characteristics such as film stress, conformality, film density, etc. It can be also used for an effective chamber cleaning process.

Dielectric Films Deposited Below 100°C

The highly dissociated plasmas of HIDEP significantly lower the required process temperature for excellent quality dielectric films such as SiO_2 and Si_3N_4 deposited below 100°C.

This capability enables dielectric film deposition on temperature sensitive materials, including polymers.

Gas cylinders

All gas cylinders should be turned on or off at the cylinders valves. At no time should a user adjust a pressure regulator. Clockwise for all valves, means CLOSED. The standard off configuration for the system is to close the cylinders valves, but leave all other valves alone.

BMR HIDEP CVD Process Operating Procedure

I. Deposition Process

Make sure that the scrubber is on.

Turn on gases

Open the appropriate gas cylinders in w2331 by turning the main valve on the cylinder head counter-clockwise. The pressure on the regulator should read between 10 and 20 psi. For oxide processes, SiH_4 and O_2 gases are used; for nitride, SiH_4 and N_2 gases are used.

Manual Wafer Loading to the Load Lock Chamber

1. **Wafer loading to process chamber.**
   a. Go to load lock auto mode.
   b. Push **"Wafer Load"** button.
   c. Wafer loading will be done automatically.
   d. System will be ready to start process.

2. **Go to recipe mode and select your own recipe.**
   a. Go to recipe mode.
   b. Go to recipe editor.
   c. Make your own recipe (save and close) or
   d. Select your recipe from the recipe list.

3. **Push "Run" button in the recipe mode, then the process will start automatically.**
   a. Process run.
   b. Purging routine after process run.
   c. Process finished.

4. **Go to load lock auto mode then push "Wafer Unload" button.**
   a. Wafer unload.
   b. Load lock chamber vent, and remove your wafer.

II. Cleaning the Chamber by Plasma

Manual Wafer Loading to the Load Lock Chamber

1. **Wafer loading to process chamber.**
   a. Go to load lock auto mode.
   b. Push **"Wafer Load"** button.
   c. Wafer loading will be done automatically.
   d. System will be ready to start process.

2. **Go to recipe mode and select your own recipe.**
   a. Go to recipe mode.
   b. Go to recipe editor.
   c. Make your own recipe (save and close) or
   d. Select your recipe from the recipe list.

3. **Push "Run" button in the recipe mode, then the process will start automatically.**
   a. Process run.
   b. Purging routine after process run.
   c. Process finished.

4. **Go to load lock auto mode then push "Wafer Unload" button.**
   a. Wafer unload.
   b. Load lock chamber vent, and remove your wafer.

Turn off gases

Close the gas cylinders in w2331, by turning the main valves on the cylinder heads clockwise.

Record the date and time in the user log sheets. Also record your process recipe and any problems encountered during your session.