



## **Usage Policies Notebook for PERKIN-ELMER 2400-8L RF Sputtering System for Dielectric Materials**

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# Emergency Plan for PE 2400 Sputtering System

## 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
High voltage	Electrical shock, ignition source
High RF voltage	
Ar (Argon) gas	nonflammable gas
N <sub>2</sub> (nitrogen) gas	Asphyxiant



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## Alarms or indications of danger

Alarm type	Condition and response
Excess Temp Alarm	Problem with process state. Halt the process. Correct the problem or notify the staff and the lab manager before continuing.
Pungent or foul smell	Gas leak. Shutdown the tool at once and evacuate the area. Contact the staff and the lab manager.
Gas Detector	

### 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 entrance of the room 1*, this will shutdown the gas system, and stop gas flow. Leave the facility at once, and then contact the lab manager or the staff.

### Emergency shutdown plan #2

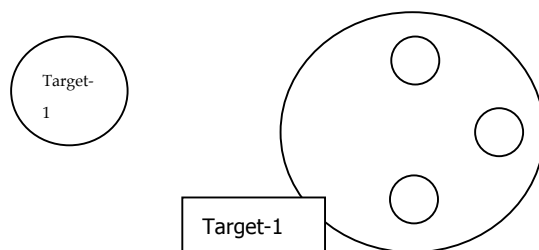
In the event of an emergency, when there are a few minutes available, *turn off gas switches on the gas panel, the control power and the main power*. This will stop gas flow into the system. If there is no fire, and no smell of gases, enter the room and close off all gas cylinders by turning them fully clockwise. Check the oxygen tank in **room w**, feel the door for possible fire, and if safe, close the oxygen tank by turning the cylinder head valve fully clockwise. Leave the facility at once, and then contact the staff and the lab manager.

# Usage Policies for PE 2400 Sputtering System

## Standard Policies for Usage

### Description

The model 2400-L Sputtering System deposits a wide variety of dielectric materials onto substrates such as ceramics, metals, plastics, glass and semiconductors. The system is capable of depositing material in RF and DC sputtering modes. The bombarding ionized gas is argon and can be mixed with O<sub>2</sub> gas for reactive sputtering. So when high voltage is passed into the vacuum chamber and ionizes the Argon gas within, these positively charged argon ions strike the dielectric target at the top of the chamber and the “newly freed” dielectric particle deposit onto the substrate resting below.



### Contact information

The INRF staff or the lab manager can be reached at (949) 824-8239 or (949) 824-9831.

### Authorized users

Only the 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 activities in the log sheets provided. All users must log when they used the system (name, date and time), which dielectric target they used, and when they completed their process run in the user log sheets. If users notice anything unusual, they should record it in the user log sheet, and add details in the main comments area of the log sheets. Any maintenance to the tool will be logged in the maintenance log sheet (maintenance staff only).

## **Safety equipment**

As safety equipment for use on this equipment, cleanroom gloves and tweezers should be used when handling substrates in the system chamber.

## **Standard equipment and materials**

The laboratory provides the following gases: Ar, and O<sub>2</sub>. Other gases must be cleared with the lab manager.

## **Waste disposal**

Dispose of alcohol soaked wipes in a waste container marked for flammable solid waste.

## **Scheduling**

Reservation can be done online, and the system can be use 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 system. This includes the time when the system pumps down the chamber.

Gases should be turned off at the cylinders valves when finished.

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 PE 2400 Sputtering System

## Guide for using the PE 2400 Sputtering System

### 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.



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## PE 2400-L RF Sputtering-etching process for Dielectric Targets

Follow these steps for deposition of dielectric materials on substrates using RF power.

**Verify that the chamber pressure is less than  $1 \times 10^{-6}$  Torr before beginning your process, that the argon gas supply is on.** Record on the log sheets your name, the date, and your process run.

### 1. Check list for system:

- a. Record the chamber base pressure in the user log sheets.
- b. Make sure that the chilled water flow indicator shows flow. The chilled water cools the RF power supply, the targets and the substrate platform.
- c. There is LN<sub>2</sub> for the megasorb pump.
- d. The cryo pump temperature must be below 20K
- e. The compressed air is open, and at 80 (psig).
- f. The N<sub>2</sub> gas is open and is at 60 (psi).

### 2. Stand by Mode:

- a. The chamber is under vacuum, and the chamber pressure on the ion gage system is below  $2 \times 10^{-6}$  Torr.
- b. The chilled water is off.
- c. The high vacuum valve is open.
- d. The RF power supply is off.
- e. The Ar gas supply to the system is off.

### 3. Load Substrates into the Chamber:

- a. Record the chamber base pressure in the log sheets.
- b. Fill the megasorb pump with LN<sub>2</sub>, once the system is full power up the pump.
- c. Close the high vacuum valve and wait 5 seconds, then open the vent valve, there is a delay for the valve opening, wait until the chamber is at atmospheric pressure.
- d. Make sure that the table is at position number one before loading your substrate.
- e. Now you can raise the hoist and open the chamber, close the vent valve now and load the samples. Wipe the rim of the RF head, and lower the hoist to close the chamber.
- f. Now you are ready to rough out the chamber by using the megasorb pump. Open the roughing valve on the tool, turn the selector switch to stage one on the megasorb pump, and open the manual valve at the pump. Toggle the switch on the megasorb pump panel to auto start.
- g. Push the start switch located on the front panel of the megasorb pump. Stage one will pump down to 20" Hg, stage two will pump down to 50 mTorr and stage three will pump down to 20 mTorr.
- h. The chamber is now below 50 mTorr close the roughing valve, wait a few seconds, and open the high vacuum valve. Close the manual valve at the megasorb, and turn off the power. It will take 90 min to pump down to less than  $5 \times 10^{-6}$  Torr, the ion gage must be on to read the actual chamber base pressure.

#### 4. RF Sputter Deposition:

- a. Using select mode, place the toggle switch to sputter deposit for deposition. Now select the dielectric target by placing the switch to the desired target to be sputtered.
- b. Turn on the Ar gas to the tool, close the gas throttle, and turn on the power to the MKS pressure controller. Adjust the flow until the pressure rise is displayed on the TC gauge and the argon flow is displayed on the flow meter digital readout, standard pressure and flow ranges are 7-20 mTorr and 7-10 sccm respectively. Adjust the Ar gas flow as needed.
- c. Make sure that the RF wattage control is set to zero (counterclockwise).
- d. Make sure that there is water flow to the system, by checking the water paddle wheel motion for flow.
- e. Turn on the main power switch on the RF generator, the power light will come on.
- f. Turn the RF power switch on, the RF power is now on, and slowly increase the RF wattage clockwise at 50 watts or less the meter scale is x10. Adjust the forward and reflected power by using the load and tune switches. Keep increasing the RF wattage control until the desired power is reached. The maximum usable power is 450 watts.
- g. For some targets it desirable to pre-sputter for 5-10 minutes.
- h. With the plasma ignited move the table to the desired target using table rotation control. Example position number two is for target one (7740 glass).
- i. Start the timer when your samples are under the desired dielectric target for the deposition time.
- j. When the deposition run is completed, turn off the RF power, and turn the wattage control knob completely counterclockwise.
- k. Turn off the Ar gas at the MKS pressure controller, by closing the valve and setting to zero the set point. Open the throttle valve.
- l. Turn off the Ar gas to the tool, and switch off the main power to the RF generator.
- m. Record your process run in the log sheets.

#### 5. Unload Substrates & Put System in Standby Mode :

- a. Close the high vacuum valve and wait 5 seconds, then open the vent valve, there is a delay for the valve opening, wait until the chamber is at atmospheric pressure.
- b. Make sure that the table is at position number one before unloading your substrate from the chamber.
- c. Now you can raise the hoist and open the chamber, close the vent valve now and unload your substrates. Lower the hoist to close the chamber.
- d. Now you are ready to rough out the chamber by using the megasorb pump. Open the roughing valve on the tool, turn the selector switch to stage one on the megasorb pump, and open the manual valve at the pump. Toggle the switch on the megasorb pump panel to auto start.
- e. Push the start switch located on the front panel of the megasorb pump. Stage one will pump down to 20" Hg, stage two will pump down to 50 mTorr and stage three will pump down to 20 mTorr.
- f. The chamber is now below 50 mTorr close the roughing valve, wait a few seconds, and open the high vacuum valve. Close the manual valve at the megasorb, and turn off the power. It will take 90 min to pump down to less than  $5 \times 10^{-6}$  Torr, the ion gage must be on to read the actual chamber base pressure.