# Microwave Reactor Standard Operating Procedure (SOP)

1. Switch on the microwave power generator supply, the exhaust valve controller, the MFC controller, the pyrometer display, the water flow meters (wall switches), and the solenoid valve (behind rack)

\*\*IMPORTANT: The gas-line tap must either be closed with positive pressure of Ar behind it, or open with gas (Ar or H2 at least) flowing through the box.\*\*

## Switching samples

1. Flow Ar into the chamber. ACK(nowledge) the interlock if tripped, and open (slowly, < 10 torr **if pumping**) the gas-line tap (reach through) if closed.
2. Close the exhaust valve if open.
3. Remove baseplate bolts from underneath chamber
4. (If filling with Ar, do this step at ~ 480 Torr) Close the gas-line tap and acknowledge the interlock if tripped.
5. Slowly open the leak valve until pressure begins to rise. *p* should increase steadily
6. At atmospheric pressure, slowly lower the lab jack, re-raise if baseplate doesn’t go down freely.
7. (Re)place wire, disk and substrate as required (see “procedures” or your own)
8. Check that baseplate O-ring is clean and sitting in its groove snuggly
9. Raise lab jack, making sure not to vibrate baseplate. Keep baseplate aligned with chamber so it goes in freely. Do not force
10. Close the leak valve
11. Turn exhaust valve control dial to SS, make sure pressure set point is on 0. When pumping starts, acknowledge the interlock if tripped (flashing).
12. Lower lab-jack and reattach baseplate bolts, replace lab jack
13. When below 0.1 torr, open the exhaust valve fully. Close Ar tap.

## Running reactor

1. When at or near base pressure, open water tap (180o) and check flow. Turn on air flow “blower” behind rack.
2. Open taps for required gases (see procedures) apart from B2H6.
3. Open the gas-line tap (slowly, < 10 torr). Near the end of opening, when *p* begins to drop, turn on H2 flow.
4. Turn the set point pressure dial to 15 torr. Set the exhaust valve to “Auto”. Wait for *p* to stabilise. Open B2H6 if using.
5. Check the striking power (45%) on the microwave supply, and check air, water and gas flow. Make sure you know steps 20-22 as they must be performed directly.
6. Strike by pressing HV on, alternate OFF/ON until red light appears. Check for the plasma through the side window of the chamber – if not there then turn off.
7. Turn up pressure ***immediately* after striking**. If plasma hasn’t struck, slowly reduce pressure from 15 torr until it does. Do not go below 10 torr. Check plasma.
8. Set conditions required for growth or H-termination (see “procedures” or your own). If using CH4, turn on at about 50 torr. Try to change *P* and *p* together by setting *p*, then dialling *P* slowly. Aim for *P* ~10 × *p*.
9. Minimise reflected power using knobs on top of the reactor setup
10. -----------Watch pretty colours-------------
11. If used, switch off non-hydrogen gases after growth time is complete. Wait at least 2 minutes.
12. Turn microwave power dial and p set-point dial down slowly, stopping p at 30 torr, until plasma goes out. Press “HV off”
13. Set *p* to 0 (unless doing H-termination, see procedures). Open exhaust valve.
14. Turn on Ar tap at the back of the reactor.
15. Switch off H2 on MFC controller. **If venting the reactor, go to *step 3***.
16. Close the gas-line tap
17. Turn off gas taps
18. Turn off water and air flow after chamber is cool

## End of the day

1. Turn off the microwave power generator supply, the exhaust valve controller, the MFC controller, the pyrometer display and the solenoid valve