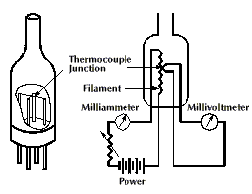
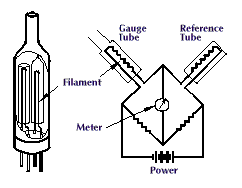
1. PA II Qual
2. Procedure for the Qual.
   1. Reading list; Book chapter, papers, MSDS, Datasheet
   2. Q&A with SU.
   3. Demonstration with SU.
      1. Operation procedure.
      2. Whole system cleaning is required. If the accumulated film thickness is less than 5um, the cleaning may be hard.
3. What are the reading materials?
   1. Manual in \\touch\public\committee\equipment\manual\Thin film\Parylene II
   2. Papers, data sheet in \\touch\public\committee\equipment\manual\Thin film\Parylene II\Reading
   3. Book chapter
4. Three trainings.
5. Are your gloves clean? What is the possible uncleanness of your gloves?
6. Did you clean your wafer?
7. Why do we use tweezer to handle the wafers and chips during the process?
8. Is the oven clean enough to dry your wafer?
9. How do you check pump oil? What is a good condition and bad condition? What should we do if pump oil is dirty? (dark brown to black or milky)
10. On the front panel, there are four controllers. What the numbers mean?
    1. From the left, a temperature of furnace, a temperature of pressure gauge, a temperature of evaporator and the pressure of the chamber.
11. What is the Pirani gauge and how it works? Why do we heat up the whole gauge with external heater? How do we set a base pressure? Sometimes, why pressure reading goes to below 0?
    1. **Thermocouple Gauges**  
       To determine a chamber's pressure range between 10 and 10-3 Torr, a gauge measures the voltage of a thermocouple spot-welded to a filament exposed to system gas (see Figure 1). A constant current supply feeds the filament, and the filament reaches a temperature dependant on thermal losses to the gas. At higher pressure, more molecules hit the filament and remove more heat energy, changing the thermocouple voltage.[4]



*Figure 1. Diagram of a Thermocouple Gauge.*[4]

* 1. **Pirani Gauges**  
     In a Pirani gauge (see Figure 2), two filaments (platinum alloy in the best gauges), act as resistances in two arms of a Wheatstone bridge. The reference filament is immersed in a fixed-gas pressure, while the measurement filament is exposed to the system gas.  
     A current through the bridge heats both filaments. Gas molecules hit the heated filaments and conduct away some of the heat. If the gas pressure (or composition) around the measurement filament is not identical to that around the reference filament, the bridge is unbalanced and the degree of unbalance is a measure of the pressure. In reality, modern Pirani gauges electronically adjust the unbalance and use the current needed to bring about balance as a measure of the pressure. This improves the linearity of measurement.  
     Any particular Pirani gauge has roughly the same dynamic range as a thermocouple gauge but the measurement principle allows these gauges to cover a greater total range (from 20 Torr to 10-5 Torr) than is available from the thermocouple principle. Pirani gauges and their circuitry are typically 10 times faster than thermocouple gauges.[5]



*Figure 2. Diagram of a Pirani Gauge.*[5]

1. What is the proper starting condition for PA II? Pressure, temperature?
2. Which vacuum cleaner is for PA machine cleaning?
3. What should we do if the furnace temperature doesn't go up?
4. What should we do if the pressure cannot reach the base pressure?
5. Would you describe deposition process? For example, what happens in the evaporator, the furnace, the pirani gauge, the chamber and on the cold trap?
6. Would you draw a graph of the pressure in the chamber, the temperature of furnace and evaporator? Please, make it sure, when the process begins, when the chamber pressure rises, what happens for the pressure and the evaporator temperature during the deposition and what happens at the end of the process?
7. Have you ever recorded and madden a graph for the chamber pressure and the temperature of furnace and evaporator? If not and if you think you couldn’t make a good answer for the former question, this is the time to do it. Please, record the data.
8. How A-174 works. Can you describe the molecular roughly (but specify the functional groups) structure and how the functional group works?
9. What is the required condition for the surface of Si wafer that makes A-174 can bind on.
10. Does A-174 work on metal surface? Explain for the case of Cr, Ti, Al, Au and Pt.
11. Does A-174 work with glass or polymer surface?
12. Why do we need wait at least 2 hours after preparing of A-174 solution? And why we cannot use A-174 solution after 1~2 day?
13. How do you improve the adhesion between bottom parylene layer and 2nd parylene layer?
14. What is the typical deposit condition for PA-C, PA-N and PA-D?
15. What is the Parylene-C, Parylene-N and Parylene-D? Draw the molecular structure of each dimer, monomer and polymer.
16. How do we measure the thickness of deposited film using P15, WYKO and nanospec? What is the limitation of the each measurement equipment?
17. What is the concentration of soap solution? What is the proper soap?
18. Where is the liquid nitrogen Dewar bottle and how to use it? How do you know it is full or empty? If it is empty how do you change and where do you order from? What should we care about?
19. Why do you use an ultra high vacuum aluminium foil not a cheap kitchen foil?