1)Hot Wire Chemical Vapor Deposition (HWCVD) is a thin-film deposition technique where precursor gases are thermally decomposed using a high-temperature filament (typically tungsten or tantalum), instead of plasma, to deposit semiconductor films under vacuum.

2)I explored the inner lab today, the one which had a big hwcvd setup, right after my midsems!

3)The existing work was to make the setup more reliable and over the next three months , the phd scholar working there would be doing this , taking readings daily and essentially making the system better and then use the setup for different activities.

4)I got to know how the setup was:
One bulky big closed container with many small (5 of them) chambers **(Multi-Chamber Architecture)**

5)The bulky container is just used for the purpose of wafer transportation to different chambers based on the settings one selects or sets . The wafer had to be put inside the box , and a hand or an arm extended out of the big bulky middle container.

6)Why different chambers -> if one had to make many depositions like the n type , the p type and so on .. different chambers carry different depositions out .

7)We cannot risk bringing the wafer into the atmosphere , all processes are mostly automated within the setup and we have to just change the settings.

8)Now, this of course doesn't use plasma as the name suggests so the concept is’ hot wire‘.

9)Substrate sits on top of this hot wire (or opposite hot wire above) and hot wire act as a catalyst (made of tantalum he said not sure though)

10)Hence it is also known as catalytic deposition (The filament acts like a catalyst surface that assists gas decomposition)

11)The gas precursors are made to pass through below and they decompose into radicals and thus deposit from the hot wire onto the substrate.
$SiH_4 \rightarrow Si + 2H_2$

12)Almost all the machines present are self designed by lab ppl itself which is quite amazing! But also disadvantageous at the same time because you yourself have to solve the errors in the setup yourself which takes up a lot of time.

13)Thin film fabrication includes :

- N type deposition
- P type deposition
- Intrinsic layer
- Cleaning step
- Annealing

14)If you expose the wafer to air:

- Oxygen contamination
- Moisture adsorption
- Interface defects
- Film quality degradation

So wafers stay in vacuum the entire time.

15)Comparison

HWCVD	PECVD
Thermal cracking	Plasma excitation
No ion bombardment	Ion bombardment present
High radical density	Plasma dependent
Lower substrate damage	Possible plasma damage

16)Observing a self-designed multi-chamber HWCVD setup gave insight into the system-level challenges of thin-film research, especially reliability and automation in vacuum-based semiconductor processing