**Electronic Systems for Cancer Diagnosis**
**Dr. Hardik J. Pandya**
**Department of Electronic Systems Engineering**
**Indian Institute of Science, Bangalore**

**Lecture – 48**
**Lab: Introduction to Clean Room and Cleanroom Equipments**
**Introduction to Equipments: Desiccators**

Hello everyone. Welcome to the next module on Electronic Systems for Cancer Diagnosis. Like we have already studied in the previous module, how contamination plays a major role while you work in an environment, while you do micro fabrication and how do you prevent contamination. It could be physical contamination; it could be you know metal contamination, it could be particulate contamination.

So, yes; so now, when you are working in a cleanroom environment, let us see we assume we have fabricated a device or chip is on a scale it could be at micro or nano level. So, once these fabricated devices are you know, are to be transported from where from a clean room facility to another place. Say we have a micro; you know a micro fabricated heater and you have used a clean room facility to fabricate the device.

So, your job is not done, once the fabrication of say you have done some metal deposition and once the deposition is done, you have to do characterization. Characterization is nothing but validating for results you know. So, you expect certain results from the fabricated device. So, you validate; cross validate, cross verify if your expected results are you know matching with what are being obtained.

So, assume your characterization facility is elsewhere and now you have to carry your device from where you have been fabricated to the place where you have to characterize the device. So, how do you transport this? So, how does it matter? Why donot you just carry your device and then transported to another place? It does matter, like I mentioned contamination that plays a major role in hampering the functioning of your device.

Now, say I have a device a micro fabricated chip in my hand. When you just expose it to an a natural environment it is highly you know a it is a highly absorbent service silicon surface is highly absorbent and it attracts the moisture in the air and forms an oxide layer. Forming an oxide layer is not what we want. These oxides have to be prevented. This could hamper the, you know the functionality of the device. So, how do you do that? You

need to create an environment which is vacuum free; you anything, any kind of contamination from the air should not affect you are should not get settled on your device.

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So, how do we avoid all this contamination, we have a chamber called the desiccator which looks something like this; we have a container called the desiccator. The Desiccator is a chamber by itself with a tight sealant at the bottom. If you could see this, it has a ring like structure which would actually form a sealant and create a vacuum space inside the chamber. So, there is no air or moisture inside the chamber when you compare it to the outside environment. So, the chamber has a valve to open and close and this is the tube which actually goes into the pump.

The pump has a dial gauge for us to see how much pressure has been maintained. So, now, let us see how to operate a desiccator. Let us say this load of air inside there is no there is no vacuum and then, I have my lid which is which lid sitting tightly. Ensure just sits properly in its place and once this is done, I switch on the desiccator. Now, you can see the dial; air is actually being sucked from inside the chamber by the pump.

So, initially there is a lot of increase. Let us say there is vacuum inside my chamber right now; I would slowly turn the knob and remove the vacuum. So, you see the noise that is nothing but air which is entering in inside the chamber. Now, let us see how to create vacuum inside this chamber. Now, I put back the knob and then, I turn on the vacuum

pump. Now, if you could zoom in and if you could see the dial gauge, there is a rapid increase in pressure. The air is actually being sucked and this does not and this happens linear like rapidly there is a lot of air which is being sucked out. But as time progresses, there is not much air which is actually left out in the chamber that is when it takes a little longer time compared to the you know the initial stages to create a perfect vacuum inside the chamber.

Now, let us see; now that there is sufficient you know pressure that has been created. Let us turn off the vacuum pump and let us see if we are able to take the lid of the desiccator. Now, that you see it is really hard to pull up the lid and it tightly fixes. Now, there is a perfect vacuum which has been created inside the chamber. Now, it is a safe place to preserve all your devices which are highly you know which could highly be impacted with the atmospheric air and could be contaminated.

Now, that we have created a a highly pressure; a preserving chamber et us see. Now, that there is lot of air which would flow out. I will show you how easily the lid would actually open up. So, there is no more vacuum that has been created. Now, this is another example, where we have actually created vacuum and all the wafer that has been deposited has been safely preserved in this chamber.

Now, let us see this desiccator here, another desiccator in lab. So, here we see a lot of you know deposited silicon wafers which have been safely preserved inside chamber in order to prevent contamination. So, this is a vacuum has been created into this desiccator and then has been placed into this for future use. Now, let us see the entire process how a fabricated wafer should actually be placed into the desiccator and how do you preserve it. So, we will have Suman who will be helping us in explaining this.

When we are talking about micro fabricated sensors or semiconductor devices, it is important to keep a note that we are talking about a scale which has extremely small geometries. In that case not only particulate contamination, metal contamination, but also chemical or molecular contamination plays a vital role in hampering the device performance. The high tendency of water to get absorbed on the surface of silicon wafer has been increasingly has can cause a detrimental impact on the performance and reliability of the device. It could be unintentional. But now let us see how to safely procure the device and safeguard it into a preserving device like the desiccator.

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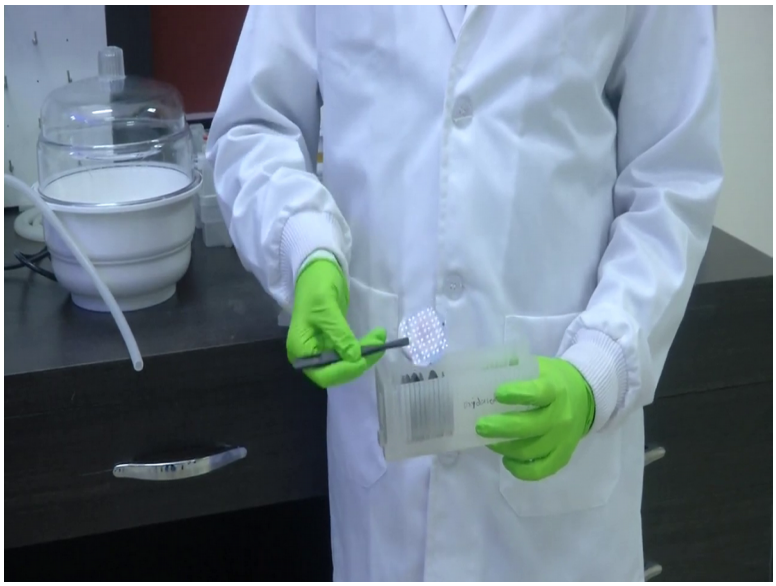

Now, Suman has 2 inch wafers which are all lined up and safely replaced in the wafer carrier. So, like you can see he is using a tweezer to pick up the micro fabricated wafer; just to ensure there is no contamination with the help when he uses you know his bare hands or fingers, he uses a tweezer while he shows you the wafer. Now, let us see how these can actually be placed inside the desiccator.

Now, that you know that previously, I had removed all the vacuum and this has no vacuum and the chamber is now normal. The pressure or humidity is just like the outside environment. So, he places the wafer carrier into the desiccator, closes the lid, uses the tube what is there on the pump to create; to connect between the desiccator and the vacuum pump.

Now, when he turns on the desiccators; so now, that the wafer carrier has been placed inside the desiccator and it is means sealed with and then the tube has been connected thoroughly with the pump. Now, let us turn on the pump, the desiccation is in process. The air that is inside the desiccator has been sucked out of the chamber and you would see gradually how the dial gauge moves. This clearly shows that vacuum is being created inside the chamber and all the air is being pulled out. But as time progresses you see the dial gauge does not; there is no linear increase that is because it becomes even difficult, when there is as slowly vacuum gets created. There is very little air that remains and pulling this air becomes a little challenging process and it consumes a little time.

Once now that; now it clearly shows that sufficient vacuum has been created. You can turn on; turn off the pump so, now that sufficient vacuum has been created. Suman just closes the valve and turns off the pump. Now the chamber is perfect and has clear vacuum has been created and your wafer is free of any kind of outside contamination. Now, as you can see he tries to lift, there is a tight contact between the lid and the bottom surface, which actually ensures it has been sealed and vacuum has been created yeah.

Now, this can be stored until you require the device for further characterization. Now, that we have seen how desiccator can actually help you create vacuum and safely preserve your devices. So, the performance yield reliability of your device can be ensured only when they are free of contamination.

So, let us follow these procedures. Now, that we have seen how the desiccator helps preserve your device from all the outside moisture content and all the contaminants. Now, it is very clearly understood that the performance yield and reliability of your device can be obtained only when they are free from contamination.

So, all the unintentional artefacts can be avoided and the unexpected instability in your device characterization all of this could be avoided. Only when you practice procedures like following the right gowning procedure avoiding as much as contamination as possible and then using desiccators once your device has been fabricated and transporting it from you know one facility to another.

So, let us see the other modules which would actually be used even before you get your hands on making your own micro chip or a bio chip various other purposes.

Thank you.