Fabrication Techniques for Mems-based Sensors: Clinical Perspective

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Lecture – 38
Introduction to Equipments: Desiccator

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Welcome, all this is the next module, where we are introducing you to the microfabrication lab environment; we have Suman Chatterjee here who is another Ta for this course. So, he will introduce you to how a desiccator works and how to desiccate samples. So, if you look at the overall procedure, in this lab what we do is we fabricate sensors from a fabrication facility, bring those senses into the lab and test them with the different equipment and samples that we have in the lab. So, while we transport, so, the fabrication will be done in another clean room environment and testing will be done in a different clean room environment.

So, we have to transport the sensors or fabricated devices from one lab to the other. In that process, it is very important that there is no contamination that happens on the device. And as, as we all know the best way to do away with contamination or to eliminate contamination is to create a vacuum and to store your equipment or whatever component that you want to say from contamination in a vacuum environment. So, desiccator is the equipment that is used to store devices and sensors in a vacuum environment.

So, as you can see Suman has already bought brought few sensors that we have fabricated somewhere else in the desiccator. So, now, that he has, he is inside our lab which is again a clean room environment. He can open, now see to know that it is vacuum, he can actually lift the desiccator. And you will know that, it is not falling apart it is actually a lid on top, but then because there is vacuum created inside, it is totally sealed from outside air. Now, we have to take out the sensors to test them in our lab. So, how do we do that? Suman will release the vacuum in the desiccator using the knob that is there, the red knob, he will turn the, know as he turns a knob you will be able to hear air coming out.

So, air, not air coming out air is going inside and filling the desiccators. Now that, now that this has happened, he will be able to remove the lid after sufficient air has entered the desiccator. So, now the desiccator has come back to the normal outside pressure and Suman will remove the lid.

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See, it is initially there are some tightness, because it has still not going back to the (Refer Time: 02:49). So, as he removes it you can see the sensors that are kept inside.

So, we have used 2 inch wafers, sensors are made on 2 inch wafers and they are kept in a wafer carrier. So, we have to make sure, we have to do all these precautions. So, that your experimental results are top class, that is your fundamental goal. So, Suman can even he will take out the sensors using only tweezers, you take out your sensors you can

see the sensors, he will put the sensors back into the wafer carrier and do the test whenever is required. Right now, we will not go into the details of the sensors and how the equipment testing is done. The our aim of this module is to show you how to bring in sensors to the lab, do the your testing and how to take them back or even how to store them.

Now, Suman, has brought the desiccator to the normal pressure taken the sensor out. So, he will take the sensor, sensor wafer carrier outside he can keep it outside also and once he is kept is outside he can do the testing.

And while he does the testing he has to handle the wafer using tweezers as we showed just before. There are different types of tweezers as you can see, one is metal, one is metal tweezer, another is PVC tweezer.

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So, these are made for specific purposes, if you focus properly you can see that the tips of these tweezers are also different. So, again these tips, different tips are meant for different, different purposes. And we will go into these details much later in the course. So, now assume that Suman has taken out the sensors, he has done his experiments. Now, he needs to take it back outside the lab and store it for future use. Now he has to desiccate it, now he will keep the sensor tray back into the desiccator, properly put it back then close the lid. Now the lid is closed.

Now, if you see you can he can easily take out the lid and put it back as there is no vacuum created. Next is to create vacuum inside the desiccator for that we use something called as a vacuum pump.

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So, he has, we have a vacuum pump connected to the table. So, we will connect this tube through which air will be sucked out from the dessicator. So, as you can see behind the desiccator so, Suman will show you the vacuum pump. So, that is a vacuum pump, it is a portable vacuum pump which you can carry on around within the lab.

So, that you can do the desiccation process anywhere in the lab. Preferably, you should do it on a table top so, that you do not have to kneel down and cause any unexpected incidents within the lab. So, that is a vacuum pump, if you closely look at the vacuum pump, you have a meter pressure gauge on the right side which Suman is pointing at.

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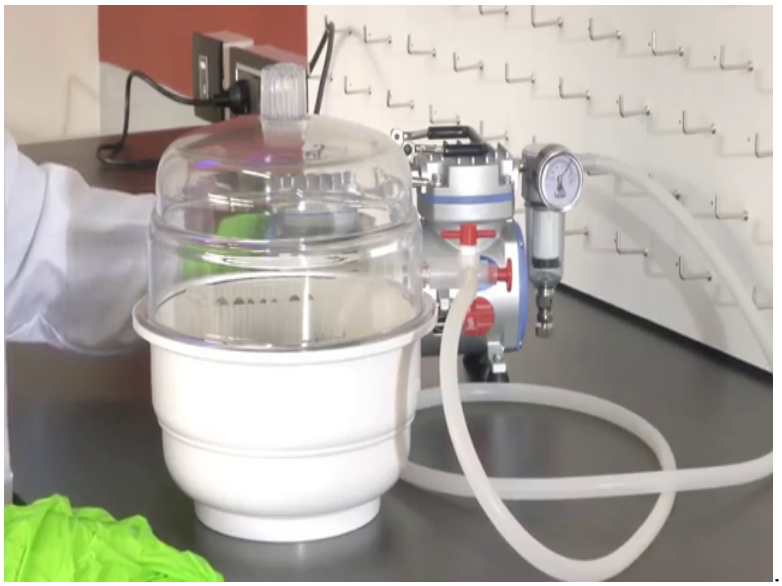 .

It has so, next to that pressure gauge the tube is connected, so, that tube will effectively go and connect to the desiccator. Now, Suman will connect that tube to the inlet port of the desiccators, you can see him connecting it. So, the red knob on top is the release valve. So, if he puts it in one position, it will allow the tube to suck out air. And once he puts in another position, it will lock the inside environment from the lockout inside environment from the outside world.

Now, Suman has connected the tube, now the vacuum pump is connected to the power supply. Now we just needs to switch on the vacuum pump and it will start taking air from inside the desiccator and pushing it out.

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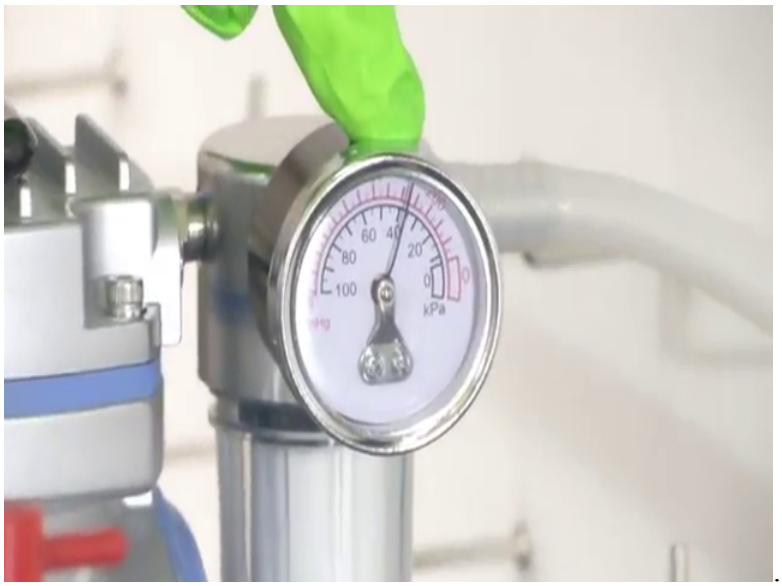

So, as you can hear the vacuum pump is taking out the air. Now, if you focus on the meter, you can see the pressure going down inside the desiccator 40, So, you can see it slowly going down as and when. So, another thing is the desiccation process is not linear for you when you start of, it is very easy to draw air outside the desiccator, but then as and when the amount of air inside the desiccator goes down, it becomes even more difficult for you to extract that extra air that is inside, that is why the pressure that is going down is less.

Now, we have reached a sufficiently low pressure inside. Now, Suman will try to see if it is sufficiently desiccated by just lifting the desiccator. You can see now, water. You can see water. You can see now that the desiccator is now sufficient vacuum is created, that is why Suman is able to lift the lid and it is not falling apart. This is not the exact way to ensure that you have maintained sufficient vacuum inside, we have to check the pressure gauge there, fix definite pressure gauge and once it reaches that pressure gauge you, you ensure that your vacuum is created.

Now, we have to make sure that you close the lid on the desiccator first before we remove the tube. So, after Suman closes, it he will switch off the vacuum pump and then he will remove the tube. So, as you can see as he removes a tube, you do not see the air sound going in. So, the vacuum is created properly and the sensors are now ready to be

transported outside the lab or to another facility where there is a further processing needs to be taken care of.

So, in this module, we have seen what is a desiccator how you carry sensors inside, how you bring that desiccator inside, how you release the vacuum inside the desiccator. Once, you take out the sensors how do you handle it, what are the different types of tweezers that are used. And if you want to take it back how do you create the vacuum inside the desiccator using a vacuum pump. What are the precautions that need to be taken? How you see the pressure gauge in the vacuum pump and finally, how do you lock and unlock the desiccator? In, in further modules, we will see other different components in the lab.