

**Fabrication Techniques for Mems-based Sensors: Clinical Perspective**  
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**Lecture – 36**  
**Introduction to Equipments: Refridgerator**

Welcome, in the previous module we show we saw how the gowning process for a lab environment needs to be done. That time Seetharam showed you what all are the core equipment core items that are that need to be worn in a lab environment. Now we will go to the next level and introduce you to the different components in a typical micro fabrication lab. Now, Seetharam is already outside the lab and he has fully worn like this gown and we will see how he enters.

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Why we are showing you this is that at the entrance of the lab, you can see an equipment placed on top there is an air curtain again. So, the air curtain will allow to push dust particles outside. Now, Seetharam will enter the lab as he enters the lab you can see that the air curtain is falling, that air curtain will ensure that the dust particles do not enter inside.

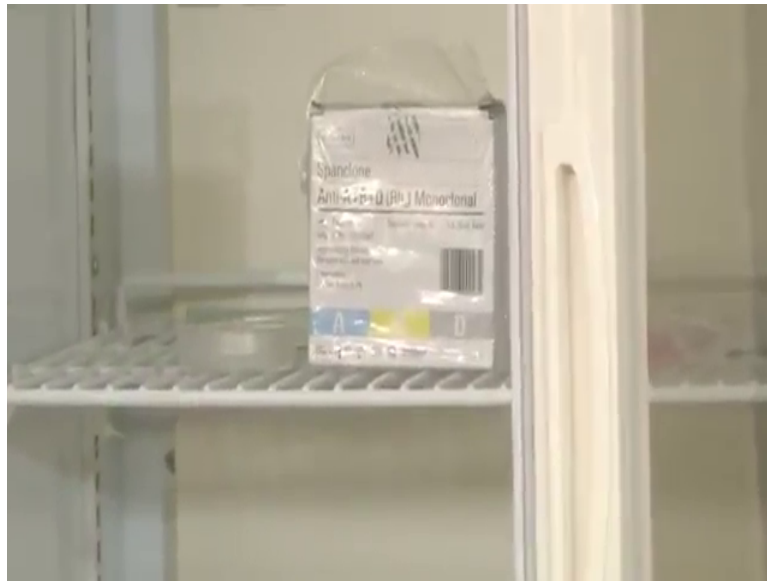
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Now Seetharam is inside the lab and the on as soon as the door closes the air curtain stops. This way particulate matter within the lab will be controlled as Professor Pandya would have explained to you, we are maintaining a class 10000 clean room here just like that in any clean room we can have different classes of clean rooms starting from class 10 and that goes on up to class 10000 or class 100000 you would already know what a different what these different classes are and how they are related to the sizes of the particulate matter that will be contained within the lab.

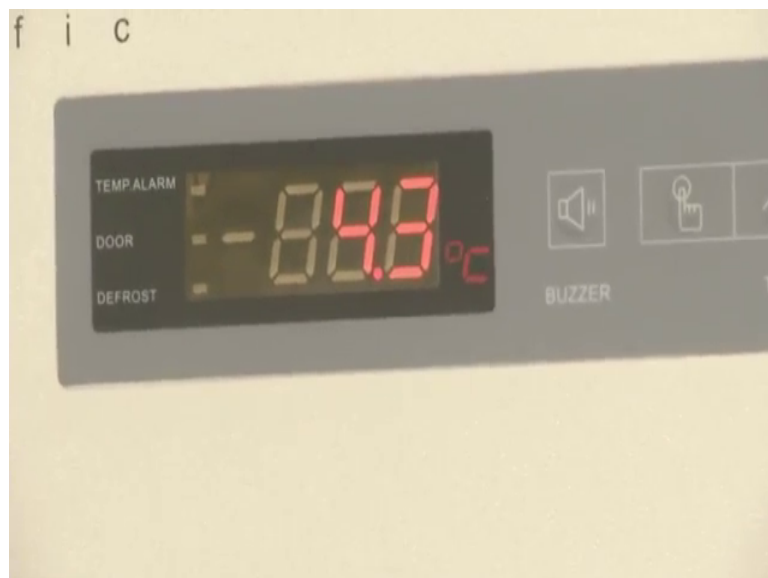
So, first primary item as you enter the lab is an air curtain which we saw, now Seetharam has entered the lab, now he will go about explaining to you what are the different equipment that are available in the lab. So, we have to maintain chemicals at different low temperatures so, that they do not get contaminated and get spoiled. So, Seetharam is near to at as you enter the lab we see a fridge, that is maintained at 4 degree Celsius and you can keep chemicals in that fridge. So, Seetharam will now go and open the fridge and show you the chemicals that can be kept inside so, we have few antibodies that are kept inside.

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So, as to open it you have to open it and immediately we have to close the fridge. So, you this might meet seem very trivial for you, because you will be operating refrigerators in your home, but then we are dealing with very crucial chemicals that need to be maintained at definite temperatures in a microfabrication environment. So, the moment you open and close, the control system on the fridge on the top of the fridge you can see the temperature of the internal environment that is maintained.

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So, when Seetharam opens the fridge and if he keeps the fridge open for sufficiently long time, you can see that the temperature is going up.

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So, there is a allowance kept so, it will if it is staying within like 4.6 and 3.8 degree Celsius it is fine. But, if you somehow you forget to close the fridge or the fridge is not closed properly the temperature will go keep going up continuously and that can cause damage to the chemicals that are kept inside.

So, these small things need to be kept in mind properly so, that you get best results out of your experiments. At the end of the day you have to use these chemicals you have to use your micro fabricated sensors and perform experiments so, that you get your intended results. As I told your aim is to perform experiments with your fabricated sensors, you start doing the experiment with your hypothesis. So, at for any research work you have you begin with the hypothesis. So, you say that I have this sensor I give these inputs to these sensors and I expect these results that is your hypothesis.

So, to prove your hypothesis what do you do? You start first to design your sensor, what all different materials will be there, what are chemicals will be used to fabricate the sensor you make a plan of action. Then you go to a fabrication facility and you make your sensors once you make your sensors you have to first confirm whether your sensor or your fabricated device is actually confirming to the norms of your design for that there

are characterization techniques. These details that Professor Pandya will cover in the course work or he would have already covered.

So, these characterization techniques will enable you to confirm whether the your design and your fabricated final device are matching. Once this is done you will have your device ready that is meeting your design specifications. Once a device is ready just having the device is not useful for you need to prove your hypothesis, fundamentally your device is part of your hypothesis you take your device bring it back to the lab in a device called a desiccator which will introduce you shortly.

So, the desiccator will prevent the device from getting contaminated, you bring the device to the lab then you will identify the inputs or the samples that will go with your sensor. You introduce these samples and inputs to your sensor again with another array of devices which we will be introducing again in this course. And then you apply the inputs to the device and you see the response. So, these sensors will respond in different ways, but then that is just raw data. You need to make sense out of the raw data and process the data in a meaningful manner for that we have other data acquisition systems which are also available in this lab and which we will be introducing.

Once the data acquisition systems acquire your data you make sense out of that data find a meaning in it and see if that is meeting your hypothesis. This is your whole hypothesis testing life cycle or process cycle where you start with the sensor and you end with the results. You may or may not get your intended result, but then for you one main thing for you to get your result provided every other process is correct is to follow good lab practices and the first step in that is to perform the gowning process properly.

Follow the stated specifications and standard operating procedure for each and every equipment in your lab. You have to follow the standard operating procedure for each and every equipment in the lab some procedures may sound very trivial and simple for you, but in the grand scheme of things if you don't follow that small step and if your device gets contaminated or stop or stops working, you have to go back to your start and you will lose a lot of time money investment everything will be lost if don't follow this small step.

Hope you understood the importance of following the operating procedures, we are telling this beforehand because, now we will be going into full details about different

equipment that are used in a typical micro fabrication lab and you have to keep this in mind so, that you appreciate the equipment has also work in the lab as a responsible researcher.