SREE VIDYANIKETHAN ENGINEERING COLLEGE
(Autonomous)
Sree Sainath Nagar, A.Rangampet-517 102

Department of Electronics and Communication Engineering

Program Details: Expert Lecture on, **"Thin Film Deposition by Sol-gel Spin Coating Method"**
Date of the Program: 03 March 2017
Organizing Department: Electronics and Communication Engineering

REPORT

A spin coater is an important tool to coat the photo-resist for photolithographic process in advance device fabrication. It can also be used for thin film synthesis of different materials. The solution containing coating material like Sno2, Zno & Cuo etc. is poured on the chuk of the spin coater and chuk is rotated to spread the material evenly on the substrate. The speed of the rotation and stickiness of the solution decide the thickness of the thin film of particular material. Basically Solgel method is suitable for coating of the variety of materials on varieties of substrates by spin coater. The Spin coater available in Nano-electronics lab is automated. The speed of the spin coater is 10,000 RPM. There are 8 programs compiled at a time for different speed, time period of spinning and different acceleration rates. The materials of interest in present research work Zinc oxide and Gallium Nitride. In this method a zinc acetate precursor is used to get zno thin film on different substrates. The Expert demonstrated the instrument in front of PG students and Lab-incharge how to work on this automated instrument. The PID controller was used in this instrument to control the speed of chuk. The servo motor assembly is installed in the instrument to rotate the chuk at predefined speed without error. To control other parameter a microprocessor is also inbuilt into the instrument. To hold the substrate on the chuk, vacuum pump is utilized. The working of the diffusion form to create a pressure to hold the substrate on the chuk. This arrangement provides a friendly environment to work on the spin coater and provide the option to bind the substrate tightly on the chuk. The rotation speed pressure in the line of the vacuum pump is monitored by the digital monitor. The digital is also provided on the front panel of the device to indicate the pressure speed and acceleration. There is a minimum pressure required to run the motor. If the pressure is below the specified pressure then motor will not run. There is an option to mount different chuk sizes on the device which provide coating of thin film on different size of the substrate as per the requirement. For example some devices need small area of deposition like simple micro or nano-

electronic devices and some devices need large area like resistance and other devices for gas sensing applications.

The period of the demonstration was for full day. There were number of queries solved by the expert regarding the speed control, material used, building blocks of the instrument and its maintenance.

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Department of Electronics and Communication Engineering

Program Details: Expert Lecture on, **"Working Principle of Magnetic Stirrer and Ultrasonicator and their use for cleaning substrate and solution synthesis by suitable precursor "**

Date of the Program: 03 March 2017

Organizing Department: Electronics and Communication Engineering

REPORT

Generally silicon substrate is used to fabricate the nanoelectronic high speed devices like FET, Shottky diode, MSM structure, MIM structure, MESFET etc. Zno,Sno2, Gallium nitride are used now a days to fabricate these devices because of their high band gap, high exciton binding energy and unique optical mechanical properties. This is the reason why these materials are overcoming the limitations of silicon in the field of optoelectronics and gas sensing applications based on Nanoelectronic devices. These materials are easily deposited on silicon substrate by number of techniques like Pulse Laser Deposition, Atomic Laser Depostion, Molecular Beam Epitaxy, Chemical Vapor deposition, Metal Organic Chemical Vapour Deposition, Plasma Enhanced Vapour deposition, Thermal Evaporation deposition, Electron Beam Evaporation, Thermal Evaporation, Solgel Spin Coating, Hydro Thermal Method etc. Among these methods Solgel Spin Coating method is suitable method for thin film preparation because of its low cost, large area deposition, easy doping, low temperature, etc. The equipment required for Solgel deposition of thin film are ultra sonicator, Magnetic stirrer, hot oven and spin coater. Ultrasonicator is used to mix the solution or dissolve the solution and also to remove the dust particles from the surface of silicon or other substrates. The ultrasonicator available in our lab is 2.5 Litre capacity and 2 KHz frequency. The usage of this instrument is demonstrated by expert team from Bross Scientifi LTD.

He took 2 hours to install and demonstrate the ultrasonicator. This session was followed by a practical session in which they have demonstrated cleaning of the silicon substrate for dusty particle removal. In this process they had taken acetone in a beaker and placed the substrate on a Teflon stand. The Teflon containing substrate dipped in Acetone and placed in the ultrasonicator for 5-15 minutes. He demonstrated that removal of dust particle on the surface of silicon by ultrasonicator and proof of this was observed by us by investigating the substrate under the optical microscope.

The second device for the solution preparation for the solgel spin coating method is magnetic stirrer. The working principle of the Magnetic stirrer is magnetic field effect means north pole attract south pole. The building block of the Magnetic stirrer is a plate on which the beaker containing solution is placed and a changing magnetic field electro magnet is placed inside the equipment. When a magnetic bit is placed in beaker above the magnetic stiirer plate it experiences a force due to the electromagnet inside the magnetic stirrer. Due to this force this magnetic bit is bounded to the electromagnet and start rotating. when magnetic field changes in electromagnet because of electric current change the magnetic bit start rotating and dissolve the solute in the solvent.

There were number of queries solved by the expert regarding the speed control, material used, building blocks of the instrument and its maintenance.

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