STATIC DYNAMIC MULTI RPM SPIN COATER
MK-9000

www.markstronics.com

AFM IMAGES of ZnO thin films by MK 9000 spin coater

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Spin Coater Theory

Spin coating has been used to prepare thin films for various applications. A small puddle of a fluid material onto the center of a substrate is spin coated the on substrate at high speed. Centripetal acceleration causes the formation of a thin film of material on the substrate. The film thickness depends on the solution properties such as viscosity, drying rate, percent solids, surface tension, etc. and RPM and coating time. One of the most important factors in spin coating is repeatability, as subtle variations in the parameters that define a spin-coating process can result in drastic variations in the coated film. A typical spin process consists of a dispense step in which the resin fluid is deposited onto the substrate surface, a high speed spin step to thin the fluid, and a drying step to eliminate excess solvents from the resulting film.

The spin coating methods are static spin coating, dynamic spin coating and multi rpm coating methods.

Static spin coating method is simply depositing a small puddle of solution on or near the center of the substrate. This can range from 1 to 10 ml depending on the viscosity of the solution and the size of the substrate to be coated. Higher viscosity and or larger substrates typically require a larger puddle to ensure full coverage of the substrate during the high speed spin step.

Dynamic spin coating method is the process of dispensing while the substrate is turning at low speed. A speed of about 100 rpm is commonly used during this step of the process. This serves to spread the fluid over the substrate and can result in less waste of resin material since it is usually not necessary to deposit as much to wet the entire surface of the substrate. This is a particularly advantageous method when the fluid or substrate itself has poor wetting abilities and can eliminate voids that may otherwise form

After the dispense step it is common to accelerate to a relatively high speed to thin the fluid to near its final desired thickness. Typical spin speeds for this step range from 1500-6000 rpm, depending on the properties of the fluid as well as the substrate. This step can take from 10 seconds to several minutes. The combination of spin speed and time selected for this step will generally define the final film thickness. In general, higher spin speeds and longer spin times create thinner films.

A separate drying step is sometimes added after the high speed spin step to further dry the film without substantially thinning it. This can be advantageous for thick films since long drying times may be necessary to increase the physical stability of the film before handling. Without the drying step problems can occur during handling, such as pouring off the side of the substrate when removing it from the spin bowl. A moderate spin speed will aid in drying the film without significantly changing the film thickness.

Spin Speed

Spin speed is one of the most important factors in spin coating. The speed (rpm) affects the degree of centrifugal force applied to the resin and the turbulence of the air immediately above it. Relatively minor speed variations at this stage can result in large thickness changes. Film thickness is largely a balance between the force applied to shear the fluid resin towards the edge of the substrate and the drying rate of the resin. As the resin dries, the viscosity increases until the radial force of the spin process can no longer move the resin over the surface. At this point, the film thickness will not decrease significantly with increased spin time. All Cee® spin coating systems are specified to be repeatable to within ±0.2 rpm at all speeds.

Film too thin

Spin speed too high Select lower speed Spin time too long Decrease time during high speed step Inappropriate choice of resin material Contact resin manufacturer

Film too thick

Spin speed too low Select higher speed Spin time too short Increase time during high speed step Exhaust volume too high Adjust exhaust lid or house exhaust damper Inappropriate choice of resin material Contact resin manufacturer

MARKSTRONICS Spin Coater Includes

This spin coater coat the organic materials and metal oxides and all-in solutions.

The spin coater is a complete solution coating system.
The system contains the following elements:
Spin coater

Spin rate: 100-12000 RPM Spin coating time: 1-9999 s Solution pouring time: 1-99 s Static Spin Coating Method Dynamic Spin Coating Method Multi RPM Spin Coating Method Acceleration range: 1-2000 Rpm/Sec

Deceleration range: 1-2000 Rpm/Sec
5 variable speed sequences

Easytouse and maintenance free design •Rotational
LCD touch screen
Vacuum chuck
Vacuum pump
Vacuum free chucks (optional)

MARKSTRONICS SC-9000 spin coater have two methods

i. **Static spin coating**

In this method, speed of spin coater is zero and it send a message to user to drop the solution onto substrate and then, it reaches to constant speed and it starts the coating process for a certain time.

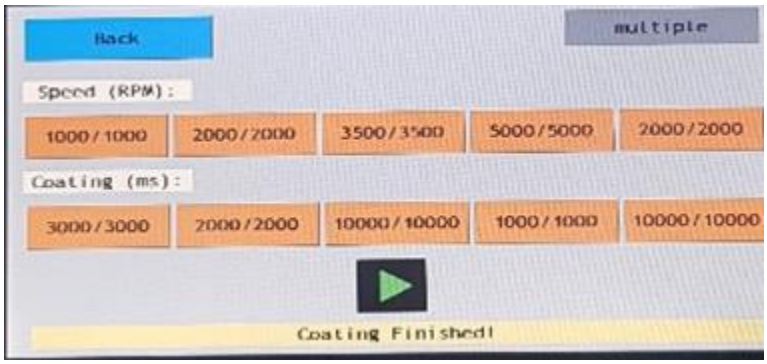
ii. **Dynamic spin coating**

In this method, spin coater reaches to requested speed and it send a message to user to drop the solution onto substrate and then, it reaches to constant speed and it starts the coating process for a certain time.
This methods is used to prepare the thickness in nm

iii. **Multiple RPM spin coating method**

In this method, the spin coater coats the film for variable RPMs.

For example:



In variable RPM method, as shown above image, the spin coater firstly, coats the film under 1000 rpm for 30 s, then, the RPM goes to 2000 rpm for 20 s, then, it goes to 3500 RPM for 10 s, then, it goes to 5000 RPM for 1 s and finally it goes to 2000 RPM for 10 s and then, it stops.

2 years warranty, 10 years spare parts supply, service commitment