

Thin films

Lecture (4) (part two)



Thin film preparations on Glass

Spin-coating is used for the deposition of organic thin films, a small amount of a liquid is dispensed on the substrate using spin coating system works in the range of 500 rpm to 11000 rpm, then the film was left to dry in room temperature to form solid films. The thickness of the respective organic layers can be controlled by the spin speed.

Compared to a drop casting, the deposited thin film by using the spin-coating technique can produce a thinner thin film. The value of rotation per minute (rpm) is inversely proportional to the thickness of the thin film. This means, that by increasing the value of rpm, the film thickness will decrease. However, CuPcTs solution did not show any adherence to the substrate when the rpm was set below 800 rpm and beyond 1500 rpm. Thus the rpm value was limited by the ability of the solution to adhere on the substrate. In this work, the spin speed was set at 1500 rpm for 1.5 min.

Advantages

As evidenced by its maturity, spin coating has many advantages in coating operations with its biggest advantage being the absence of coupled process variables. Film thickness is easily changed by changing spin speed, or switching to a different viscosity. But among the alternative coating techniques, many have multiple coupled parameters, making coating control more complex. Another advantage of spin coating is the ability of the film to get progressively more uniform as it thins, and if the film ever becomes completely uniform during the coating process, it will remain so for the duration of the process. It is low cost and fast operating system.

Disadvantages

The disadvantages of spin coating are few, but they are becoming more important as substrate size increases and photoresist costs rise. Large substrates cannot be spun at a sufficiently high rate in order to allow the film to thin. The biggest disadvantage of spin coating is its lack of material efficiency. Typical spin coating processes utilize only 2–5% of the material dispensed onto the substrate, while the remaining 95–98% is flung off in to the coating bowl and disposed. Not only are the prices of the photoresist increasing substantially, but disposal costs increasing as well.

Applications

Spin coating has been used for several decades for the application of thin films. It is widely used in the manufacture of integrated circuits, optical mirrors, magnetic disk for data storage, device of solar cells, detectors, sensors, VLSI (very large scale integration), nano scale device (quantum dots, carbon nanotubes), DVD and CD ROM, photoresist for patterning wafers in microcircuit production, insulating layers for microcircuit fabrication such as polymers (where it can be used to create thin films with thickness below 10 nm), flat screen display coatings, antireflection coatings and conductive oxide.

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