How-To: Spin Processing

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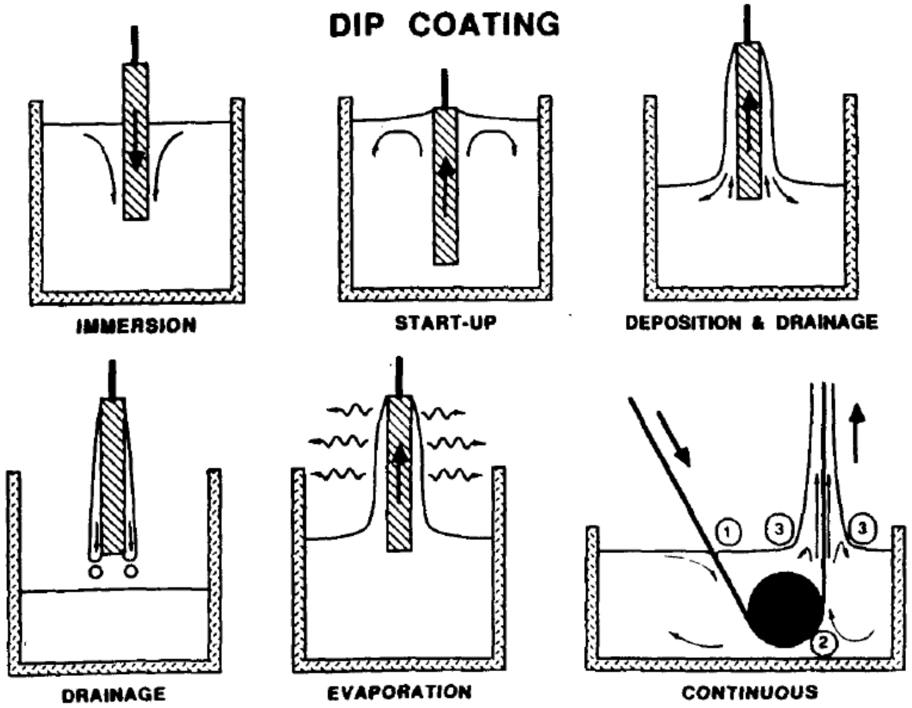
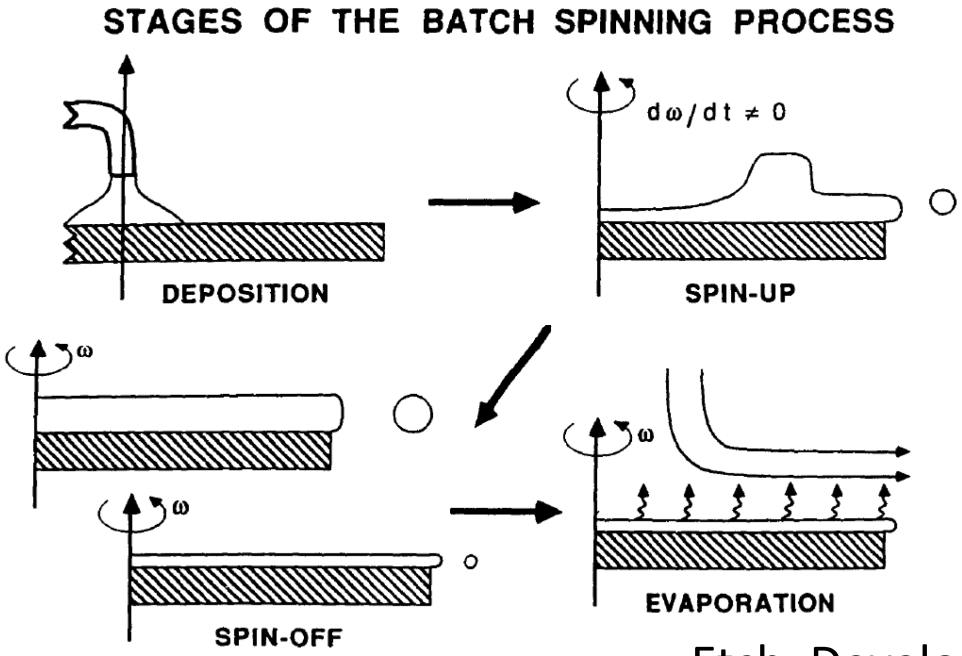
SHAW GROUP MEETING

161006

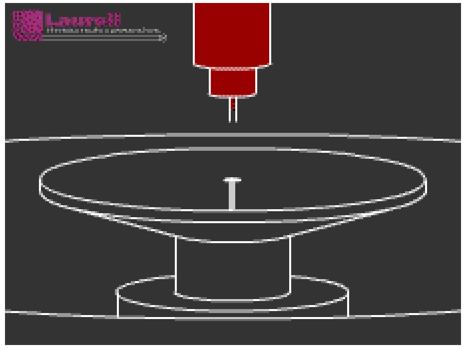
Dip vs. Spin Coating



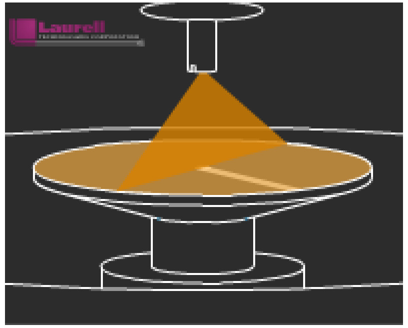
Drainage and evaporation form thin film



Spin-off and evaporation form thin film

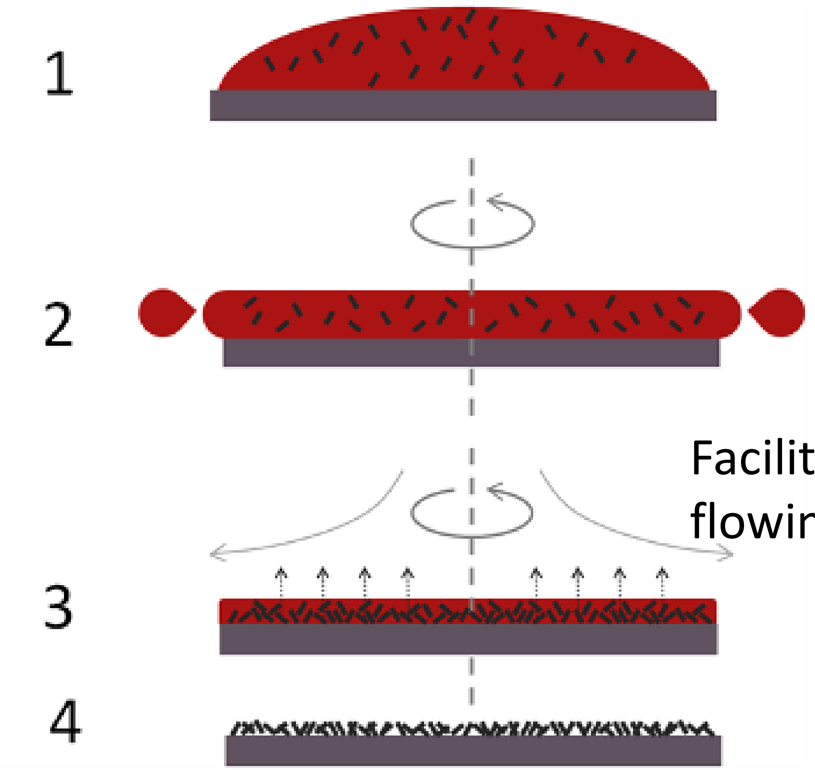


Etch, Develop, Clean (EDC)



Scriven. Mat. Res. Soc. Symp. Proc. **1988,** *121,* 717.

Spin Coating Theory



Facilitated by flowing inert gas

$$h = \left(1 - {}^{\rho_A}\!/_{\rho_{A0}}\right) \cdot \left(\frac{3\eta.m}{2\rho_{A0}\omega^2}\right)^{\frac{1}{3}}$$

h = film thickness
ρ = density of volatile liquid
η = viscosity of solution
m = rate of evaporation
ω = rotational velocity

- Centrifugal force drives film formation
- Some variables experimentally determined – difficult to calculate theoretical film thickness
- Trial and error to achieve desired thickness

Pasargad Nano Equipment
Ossila

Operation

Chamber (note hole in top for dispensing solvent onto sample)

Sample (resting on stage with vacuum pinhole to immobilize)

Controller

```
Edit Program 1
Step:003/003  Vac↓non
Time: 00:17.0  CPM:00
RPM: +03000  Loop:003
Acel: 00500  GoTo:002
Valv:
Sens:..
```

1. Center sample on stage and shut lid (do not open until protocol is complete)
2. Plug controller into outlet to power on
3. Press “Edit” to enter edit mode, use pg up/down keys and arrows to edit your recipe/protocol (# of steps, spin time/speed)
4. Press “Run” to enter run mode, turn on ultrapure nitrogen feed to 60 psi (error “need CDA” will display if nitrogen feed insufficient), plug in vacuum and **press “Vacuum” on controller** (error “need vacuum” will display if not engaged)
5. Press “Start” and wait until protocol is complete, if nitrogen feed or vacuum is interrupted it will stop automatically
6. Unplug vacuum, controller, and turn of nitrogen feed when finished

Laurell

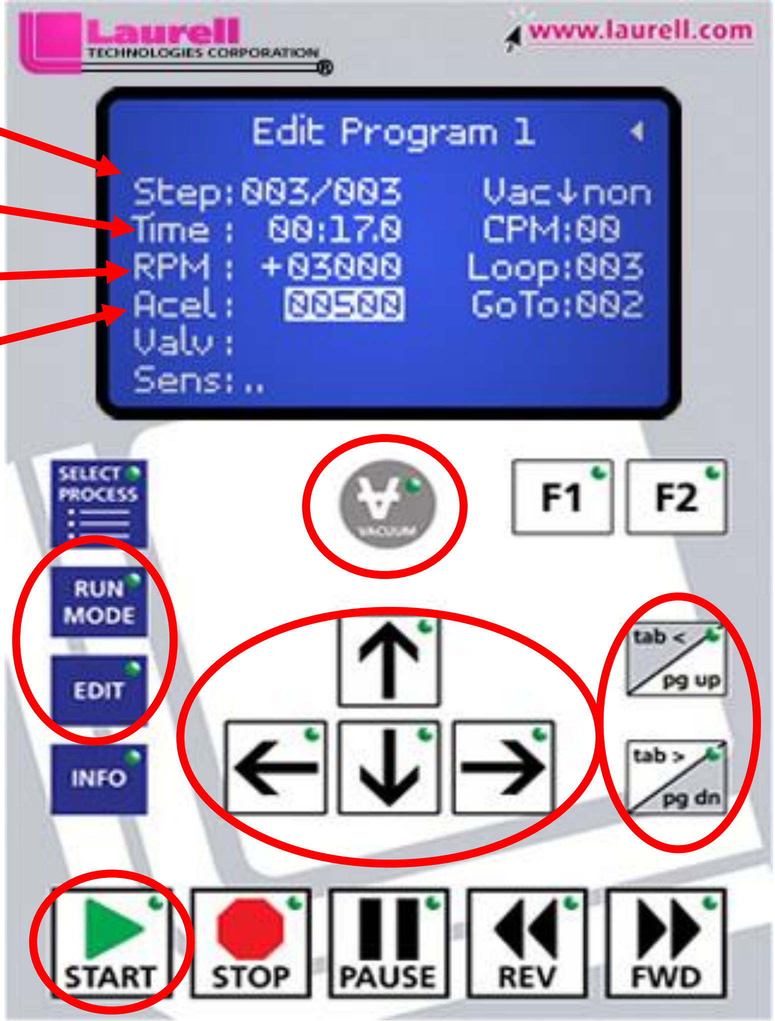
Operation

Change the number of steps and which step you're editing

Time up to 99 min

Spin speed up to 12,000 rpm

How fast it accelerates from one step to the next (we keep at 1200)



```
Edit Program 1
Step:003/003    Vac↓non
Time : 00:17.0   CPM:00
RPM : +03000   Loop:003
Acel: 00500    GoTo:002
Valv:
Sens:..
```

Laurell

I want to spin coat something, how do I make a protocol? I have no idea what the spin speed/time should be?????? ?????????????????????????????????

- Search the literature and find a system with variables similar to yours
- As a rule of thumb, liquids with viscosities similar to water should take ca. 30 s
- More viscous liquids will take several mins and potentially multiple spinning steps
- Generally spin speeds are 2000-8000 rpm