UNIVERSITY OF CALIFORNIA, MERCED
SCIF CLEANROOM FACILITY
STANDARD OPERATING PROCEDURE (SOP)
Spin Coater Operation (Laurell / Specialty Coating Systems or Equivalent)
Location: SE1: 154, Class 100 Cleanroom

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1. PURPOSE

To provide a standardized and safe procedure for applying uniform thin films (e.g., photoresist) using a spin coater, ensuring reproducibility, uniformity, and contamination control.

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2. SCOPE

Applicable to all trained users performing spin coating for photolithography, thin film deposition, and surface coating processes.

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3. RESPONSIBILITIES

- **Users:** Follow SOP and coating parameters
- **Core Staff:** Maintain system and provide training
- **Facility:** Ensure safe operation and compliance

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4. SYSTEM OVERVIEW

The spin coater deposits uniform thin films by dispensing liquid onto a substrate and rotating at high speed to spread the material via centrifugal force.

Capabilities:
- Photoresist coating (positive/negative)
- Polymer thin film deposition
- Thickness control (nm–μm range)
- Multi-step spin programs

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5. REQUIRED SYSTEM CONDITIONS

5.1 Utilities

- AC Power
- Vacuum chuck operational
- Exhaust system active (chemical fumes)
- Nitrogen (optional for drying)

5.2 System Conditions

- Chuck clean and free of residue
- Proper chuck size installed
- Vacuum holding stable
- Bowl and lid clean
- No solvent buildup

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6. SAFETY REQUIREMENTS

6.1 Hazards

- Chemical exposure (photoresist, solvents)
- High-speed rotation
- Splashing of chemicals
- Fume inhalation

6.2 PPE (Class 100 REQUIRED)

- Full cleanroom gown (bunny suit)
- Cleanroom gloves (double gloving recommended)
- Safety glasses or face shield

6.3 Critical Safety Rules

- Always operate with lid closed
- Use only approved chemicals

• Avoid over-dispensing resist
• Ensure proper exhaust is active
• Do not touch rotating chuck

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7. CLEANROOM PROTOCOL (CLASS 100)

• Handle wafers with tweezers only
• Use filtered chemicals only
• Avoid particle contamination
• Keep spin bowl clean and dry
• Do not introduce dirty samples

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8. DETAILED OPERATION PROCEDURE

STEP 1: SYSTEM PRE-CHECK

• Verify:
o Power ON
o Vacuum functioning
o Bowl clean
o Correct chuck installed

STEP 2: LOAD SAMPLE

• Place wafer on chuck
• Center properly
• Turn ON vacuum to secure sample

STEP 3: DISPENSE MATERIAL

• Apply photoresist at center of wafer
• Typical volume:
o Small wafer: ~1–2 mL
o Large wafer: ~2–5 mL

STEP 4: SET SPIN PROGRAM

• Define parameters:
o Spin speed (e.g., 1000–5000 rpm)
o Acceleration
o Spin time (e.g., 30–60 sec)

STEP 5: RUN SPIN PROCESS

• Close lid
• Start program
• Monitor spin cycle

👉 Film thickness depends on spin speed and viscosity

STEP 6: COMPLETE PROCESS

• Wait until chuck stops completely
• Open lid
• Turn OFF vacuum

STEP 7: REMOVE SAMPLE

• Remove wafer carefully
• Inspect coating uniformity

STEP 8: POST-COATING (IF REQUIRED)

• Soft bake (hot plate or oven)
• Follow resist-specific protocol

STEP 9: CLEAN SYSTEM

• Wipe bowl with solvent (IPA/acetone)
• Remove residue buildup
• Ensure system is clean for next user

STEP 10: SHUTDOWN

- Leave system clean
- Turn OFF if required

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9. TROUBLESHOOTING GUIDE

Issue	Cause	Action
Non-uniform coating	Improper dispense	Adjust volume
Edge bead	High viscosity	Use edge bead removal
Streaks	Contamination	Clean wafer
Film too thick	Low speed	Increase RPM
Film too thin	High speed	Reduce RPM

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10. CRITICAL DOs & DON'Ts

DO

- Use clean substrates
- Filter photoresist
- Optimize spin parameters
- Clean bowl after use

DON'T

- Overfill resist
- Spin without lid closed
- Use contaminated samples
- Leave residue in bowl

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11. CONTAMINATION CONTROL

- Use filtered chemicals only
- Clean chuck and bowl regularly

• Avoid particle introduction
• Keep resist bottles sealed

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12. WASTE HANDLING

• Dispose photoresist waste in designated containers
• Follow SCIF hazardous waste procedures
• Do NOT pour chemicals into sink

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13. EMERGENCY PROCEDURES

• Chemical spill → Follow spill protocol
• System malfunction → Stop immediately
• Exposure to chemicals → Wash and seek assistance
• Fire risk → Use appropriate extinguisher

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14. TRAINING COVERAGE

Users are trained on:
• Spin coating principles
• Resist handling and dispensing
• Parameter optimization
• Contamination control
• Safety procedures

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15. ACKNOWLEDGMENT & APPROVAL

Director Name: _____

Director Signature: _____

Date: _____

User Name: _____

User Signature: _____

Date: _____