UNIVERSITY OF CALIFORNIA, MERCED
SCIF CLEANROOM FACILITY
STANDARD OPERATING PROCEDURE (SOP)
Plasma System Operation (Glow Research GLOW or Equivalent)
Location: SE1: 154, Class 100 Cleanroom

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1. PURPOSE

To provide a standardized and safe procedure for operating the Glow Research plasma system for surface treatment, cleaning, activation, and plasma processing while maintaining Class 100 cleanroom standards.

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2. SCOPE

Applicable to all trained users performing plasma cleaning, surface modification, or plasma-assisted processes using the Glow Research plasma system within a Class 100 cleanroom environment.

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3. RESPONSIBILITIES

- **Users:** Follow SOP, maintain cleanliness, and operate within approved parameters
- **Core Staff:** Maintain system, enforce cleanroom compliance, provide training
- **Facility:** Ensure utilities, environmental control, and safety compliance

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4. SYSTEM OVERVIEW

The Glow Research plasma system is a tabletop RF plasma reactor used for surface treatment, cleaning, and modification using low-pressure plasma.

Capabilities:
- Surface cleaning and activation
- Plasma etching and modification
- Improved wettability and adhesion
- Treatment using air, oxygen, argon, or similar gases

The system operates using RF plasma (~100 kHz, up to 50 W) to generate reactive species for surface interaction.

5. REQUIRED SYSTEM CONDITIONS

5.1 Utilities

- AC Power (110–230V, single phase)
- Vacuum pump operational
- Process gas (Air, O_2, Ar, or approved gas)
- Gas supply pressure ~10 psi (if external gas used)

5.2 System Conditions

- Chamber clean and particle-free
- Sample holder installed (mandatory)
- No vacuum leaks
- Pump oil at proper level (if oil pump used)
- Ventilation openings unobstructed

6. SAFETY REQUIREMENTS

6.1 Hazards

- RF electrical exposure
- Plasma UV radiation
- Vacuum hazards
- Hot chamber surfaces
- Gas exposure risks

6.2 PPE (Class 100 REQUIRED)

- Full cleanroom gown (bunny suit)
- Cleanroom gloves (double gloving recommended)
- Safety glasses
- Face mask / hood
- Boot covers

6.3 Critical Safety Rules

- Do NOT override safety interlocks
- Operate only with chamber door closed
- Do NOT use flammable or toxic gases
- Ensure proper vacuum before plasma ignition
- Maintain strict particle control

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7. CLEANROOM PROTOCOL (CLASS 100)

- Handle all samples with tweezers only
- No direct hand contact with substrates
- Pre-clean samples (IPA, DI, or approved method)
- Minimize chamber exposure time to ambient air
- Avoid introducing particulates (dust, tape residue, fibers)
- Use only cleanroom-approved wipes and tools
- Ensure gowning compliance before operation

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8. DETAILED OPERATION PROCEDURE

STEP 1: SYSTEM PRE-CHECK

- Verify:
  - o Pump oil level
  - o Gas connections
  - o Chamber cleanliness (no particles)
  - o Sample holder installed

STEP 2: LOAD SAMPLE

- Open chamber door
- Place sample using tweezers
- Ensure proper positioning on holder
- Close chamber securely

STEP 3: POWER ON SYSTEM

- Press **AC ON**
- Set desired process time on timer

STEP 4: VACUUM PUMP DOWN

- Press **VACUUM**
- Allow chamber to pump down
- Target:
  - Base pressure ~0.2 Torr
  - Operating range: 0.5–1.2 Torr

STEP 5: START PROCESS

- Press **PROCESS START**
- System automatically:
  - Verifies interlocks
  - Opens gas solenoid
  - Activates RF

- Observe plasma through viewport

STEP 6: ADJUST GAS FLOW

- Adjust flowmeter to control pressure
- Maintain pressure:
  - 0.5–1.2 Torr

STEP 7: PROCESS RUN

- Monitor:
  - Plasma glow stability
  - Pressure display
  - LED indicators

- Confirm:
  - INTERLOCKS ON
  - VACUUM ON
  - GAS FLOW ON
  - RF ON

STEP 8: PROCESS COMPLETION

- Timer stops process automatically
- RF and gas shut off

STEP 9: VENT CHAMBER

- Turn OFF vacuum
- Allow chamber to vent fully
- Wait for door release

STEP 10: UNLOAD SAMPLE

- Open chamber
- Remove sample using tweezers
- Close chamber

STEP 11: SHUTDOWN

- Turn OFF AC power (if finished)
- Ensure system is clean

9. TROUBLESHOOTING GUIDE

Issue	Cause	Action
No plasma	Low pressure / interlock issue	Check vacuum & door
No gas flow	Pressure not reached	Verify vacuum

Issue	Cause	Action
RF not ON	Interlock failure	Check chamber closure
High pressure	Excess gas flow	Reduce flow
Poor plasma	Contamination	Clean chamber

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10. CRITICAL DOs & DON'Ts

DO

- Ensure proper vacuum before starting
- Maintain Class 100 cleanliness
- Use approved gases only
- Monitor pressure continuously

DON'T

- Override safety interlocks
- Use toxic or flammable gases
- Touch samples with bare hands
- Introduce particles into chamber

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11. CONTAMINATION CONTROL

- Clean chamber regularly
- Use particle-free tools
- Avoid outgassing materials
- Store samples in clean containers
- Minimize air exposure during loading

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12. WASTE HANDLING

- Dispose wipes and residues per cleanroom protocol
- Handle pump oil per safety guidelines
- Follow SCIF hazardous waste procedures

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13. EMERGENCY PROCEDURES

- Power failure → System auto vents
- Vacuum failure → Stop process immediately
- Gas leak → Shut off gas supply
- RF fault → Abort process

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14. TRAINING COVERAGE

Users are trained on:

- Plasma fundamentals
- System controls and operation
- Pressure and gas flow control
- Cleanroom handling procedures
- Safety and interlocks

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15. ACKNOWLEDGMENT & APPROVAL

Director Name: ____________________________________

Director Signature: _________________________________

Date: ____

User Name: ____

User Signature: ____________________________________

Date: ____