

# Manual Operation of the AJA Orion

## 8 Sputter Tool

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## Safety Information and Overview

Advanced Science Research Center	Graduate Center CUNY
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SOP Title	Manual Operation of the AJA Orion 8 Sputter Tool
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### **Section 1 – Process or Experiment Description**

This SOP is only for the general use of depositing thin films. Only approved users are allowed to use the equipment, after passing a qualification with the tool manager. Any maintenance will be

done by trained staff members. Some maintenance creates additional hazards which will be described in the Instrument Manual.

\*Note: Any sample preparation is to be done by the user, and this document does not cover any information related to sample preparation. Any materials listed outside of the approved list, must be discussed with the tool manager. NO high vapor pressure materials

## **Section 2 – Hazardous Substances**

**Substance Name:** Chromium



**Substance Name:** Silver

**Common Name:** Chrome

**Abbreviation:** Ag

**Abbreviation:** Cr

## **Section 3 – Potential Hazards**

Hazard	Hazard Sign	Hazard Description
Thermal		Sample(s) and sample plate can get hot to touch
Chrome		<p>Exposure to particulate or vapor form may present significant health hazards and is toxic to aquatic organisms.</p> <p>Under the high temperatures involved in e-beam evaporation, <b>metallic Cr can oxidize</b> into Cr(VI), especially in the presence of residual oxygen. This is highly toxic to aquatic organisms and is a known human carcinogen.</p>

Silver		<p>Silver is toxic to aquatic life in nanoparticulate or ionic forms.</p> <p><b>low acute toxicity</b>, but chronic exposure (especially to nanoparticles or silver dust) may lead to:</p> <p><b>Argyria:</b> A bluish-gray discoloration of the skin.</p> <p><b>Respiratory irritation</b> from dust or vapor in poorly ventilated areas.</p>
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## Section 4 – Routes of Exposure

Thermal hazard is present if using the sputter's sample heater for a long period of time, which can heat up the plate and the sample(s).

## Section 5 – Personal Protective Equipment

All personnel are instructed to use pliers to handle the sample plate, if it has not cooled down to sufficient temperature; and to work with tweezers to remove the sample(s) from the hot plate too.

## Section 6 – Waste Disposal

Kapton or copper tape that has silver and/or chrome on the top layer, must be disposed into the container found on the workbench. Staff will transport the container for waste disposal when the container is full.

Hazardous compound, element, or chemical name	State (L,G,S)	Hazardous	Non-hazardous	Which hazards?	How is waste managed?
Silver	S	x		Solid waste is toxic to	Must be collected and

				environment, aquatic, and human health	disposed of as Hazardous waste
Chrome	S	x		Solid waste is toxic to environment, aquatic, and human health	Must be collected and disposed of as Hazardous waste

## **Tool operation**

1. Verify the material you want to sputter is in the tool and locate its position on the Phase II control screen. (ie: Gun number)
2. If the gun you want is grayed out but you can still see the info on the screen (this may happen with Guns 3, 5 and 6), click to toggle the lower right button called "SW" to "On".
3. Load substrate into tool (see those instructions)

### **Strike Plasma**

4. On the Phase II control screen do the following:
  - a. Set the Argon setpoint to 30sccm and turn Gas 1 "On"
  - b. Click the pressure button and set it to 30m Torr for the initial Strike. Wait for pressure to reach this set value.
  - c. Go to the Gun that you are using and set the STPT to 20 Watts
  - d. Set the ramp time to 5 seconds
  - e. Turn "on" the output button
  - f. Watch to see that the plasma ignites. You will see several things if it does:
    - i. You will be able to see a purple glow from around the lid if it is on
    - ii. You will see a current (in mA) lower right of the gun screen
    - iii. The "Plasma" button in the gun panel will change from gray to purple

### **Ramp Power**

5. Now that the plasma is ignited decrease the pressure value to 3 mTorr for deposition
6. Knowing what power you want your final deposition to be at, set the ramp time to

- 1W/sec. ie: if you want your final deposition power to be 150, set the ramp to 150.
7. Set the STPT power to the final deposition power.
  8. Click enter on the keyboard and wait till the power reaches its final value
  9. Verify the WFDBK field also has this same power value.

## Deposition

10. Now adjust the knob for substrate rotation for 30 or 50 RPM
11. Turn on Phase II Substrate rotation.
12. Verify the substrate is turning by watching the arm the substrate is attached to.
13. Now set a timer and open the shutter
14. Deposit for the length of time that you want. (20 minutes for Al at 150W for >100 nm)
15. Close the shutter when time is completed.

## Ramp Down

16. Turn off substrate rotation
17. Set the ramp value equal to the current power in seconds. This will ramp down the power at a rate of 1W/sec. This step is important so as not to crack the target by cooling too quickly.
18. Set the STPT to 0
19. Hit "Enter" on the keyboard to start the ramp down.
20. When the power is at 0, (the purple turn the "output" button to "Off"
21. Click "Opened" on the pressure controller to open the pump valve all the way.
22. Turn off the Argon - ie: Gas 1
23. Unload your sample following the appropriate protocol.

## **Common Errors and Troubleshooting**

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