University of Minnesota Nano Fabrication Center
Standard Operating Procedure

Equipment Name:	Thermal evaporator		
Coral Name:	thermevap	**Revision Number:**	7
Model:	various	**Revisionists**:	Kevin Roberts
Location:	Area 2	**Date:**	9/17/2013

1 Description

The Thermal Evaporator evaporates deposits metal onto substrates. Under vacuum, current is passed through a filament boat, which heats up the metal contained on the boat. When the evaporation current is reached, the melted metal evaporates onto the substrate.

2 Safety

a The Main Power Supply circuit breaker should be in the OFF position prior to loading the system or switching power to the boats.

3 Restrictions/Requirements

a Must be a qualified user on the Thermal Evaporator.
b Wear poly glove when handling the metal or loading samples to prevent contamination.
c If the Bell Jar is raised too far, it will bend the support rod.
e Wear UV glasses when viewing the beam to prevent eye damage.
f Fill out the log book completely.
g No silver, copper or gold is to be used in the system. NFC will supply the following materials:
Ti pellets, Al pellets, Cr sticks, molly boats, Tungsten boats, aluminum oxide boats, moly boats. Please contact staff if you need to evaporate any other metals.

4 Required Facilities

a

5 Definitions

a Ion gauge filament. Measures the pressure of the chamber while pumping with the diffusion pump (Cryo Pump)

6 Setup

a Check to ensure that the Main Power Supply circuit breaker is in the OFF position.
b The Ion Gauge should be OFF. The ION button LED is green when ON. Toggle the rocker switch off
c Move the High Vacuum toggle to the CLOSED position.
d Move the Vent Valve toggle to the OPEN position. In 8 – 10 minutes the bell jar will be vented to atmosphere and should move slightly when pushed lightly.

7 Operating Instructions

a Toggle the Vent switch to the CLOSED position.
b Raise the Bell Jar by pushing the CABLE IN button ton the HOIST control. Only raise the Bell Jar enough to load the sample.

c Turn on the Inficon deposition controller by pushing the ON/STBY switch. If the words CRYSTAL FAIL appear on the LED, the crystal needs to be replaced.

d There are two positions to load 2 separate metals to evaporate. They are labeled 1 and 2. To place the boat between the clamps, loosen the bolt grip with an allen wrench. Place the boat between the clamps and tighten.

e Load the sample onto the stage with the side to receive the depositing facing the boat.

f CLOSE the Bell Jar by pressing the CABLE OUT button on the HOIST control aligning to the bell to the base evenly.

g Turn on the Roughing Valve toggle to the ON position.

h When the Teledyne pressure gauge located on top of the Inficon deposition controller is reading below 100 mTorr, move the Roughing Valve toggle to the CLOSED position. A reading of - - - can be either no vacuum, or a vacuum that is lower than the gauge will display.

i Move the High Vacuum toggle to the OPEN position.

j To monitor the vacuum pressure, turn on the filament by pressing the ION button on the black box located next to the bell jar.

k A sufficient vacuum can be reached after 40 – 60 minutes.

l Turn on the Inficon deposition controller by pushing the ON/STBY switch by pushing the ON/STBY button. The green LED will light.

m On the Inficon deposition controller, push the button labeled PGM to toggle the display between PROGRAM and OPERATION modes.

n Enter the Z-RATIO and DENSITY for the metal by using the up and down arrows and noting where the solid black dot is located. This indicates the parameter that will be updated. Enter the updated value. If you need to change a value, press C (clear).

o Return to the OPERATION screen. Press the CLEAR: (C button) and the RESET: (ZERO button) to clear the previous deposition thickness.

p Push START to start monitoring the deposition.
Pushing the 2 or the ZERO at anytime resets the display thickness to 0. Push STOP measuring and START to restart again.

q Make sure that the remote current controller is off and the dial is set on 0. This is how you control the power to the boats.

r Turn the circuit breaker on the power supply unit ON.

s Turn the remote controller ON

t Slowly begin to turn the remote current controller clockwise. Watch the deposition monitor as you turn up the current. Try to keep the deposition under 10 Å/ second. Usually, the lower the deposition rate, the better the film quality is.

u When the deposition is complete, turn off the remote current controller.

v If you are depositing another metal, Check to ensure that the Main Power Supply circuit breaker is in the OFF position prior switching the cable to the other position – 1 or 2. Follow the procedure starting at step m. If you are done, go to step w.

w Once you have completed the deposition, Turn off the power supply, the Inficon deposition monitor and the ION Gauge tube.

x Cool Down: Wait 30 minutes prior to venting.

y Close the Hi Vac valve.

z Move the Vent Valve toggle to the OPEN position. In 8 – 10 minutes the bell jar will be vented to atmosphere and should move slightly when pushed lightly.

aa Close the VENT valve and remove the substrate.

bb CLOSE the Bell Jar by pressing the CABLE OUT button on the HOIST control aligning to the bell to the base evenly.

cc Turn on the Roughing Valve toggle to the ON position.

dd When the Teledyne pressure gauge located on top of the Inficon deposition controller is reading below 100 mTorr move the Roughing Valve toggle to the CLOSED position.

ee Move the High Vacuum toggle to the OPEN position.

8 Problems/Troubleshooting

a If the current is not increasing when turning up the current controller, the boat might not be placed properly between the clamps and the system needs to be vented and the boats repositioned.